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SUMS CHANCELLOR'S MESSAGE

Dear Colleagues,

As the chancellor of Shiraz University of Medical Sciences (SUMS) and chairman of the conference, it is my great pleasure to welcome you to the 1st MEFOMP International Conference of Medical Physics. In the coming days, delegates from different countries in the Middle East and beyond will have an opportunity to present their innovativeresearch projectsand discuss the research findings. This conference provides a great opportunity for medical physicists to exchange ideas, express their success and achievements and make research networks.

Founded in 1950, SUMS is one of the oldest and largest universities in IR Iran. Currently, SUMS has more than 600 faculties and 5000 students studying in 83 health-related fields. Shiraz University of Medical Sciences wishes to extend sincere thanks to the organizing committee of the conference for their priceless efforts and also to all of you for participation in this conference.

I would like to thank Professor SMJ Mortazavi, the secretary general of the conference, Drs. MA Mosleh-Shirazi and AR Mehdizadeh, the scientific secretaries, Dr. A Tavakkoli-Golpayegani, Mr. MM Movahhadi, Mr. M Mahdavi and their colleagues for organizing this conference.I hope this conference will build strong global connections and explore the scientific relationship in different aspects of medical physics.

Shiraz is the cultural capitalof Iran. This city has been the cradle of civilization and art for many centuries. I extend my best wishes for a successful and productive conference and hope that you enjoy your stay in Shiraz.

Prof. MH Imanieh, MD
SUMS Chancellor and Conference Chairman

PREFACE

Dear Colleagues,

It is indeed a great pleasure for me to welcome you all to the 1st MEFOMP International Conference on Medical Physics. In the era of rapid development of science and technology, we should try to establish a lifelong learning system. The Shiraz conference will provide an opportunity for valuable exchange of research ideas and achievements. It will also provide an opportunity to establish professional and personal relationships with other scientists all around the world, in particular in the Middle East.

The MEFOMP International Conference on Medical Physics in Shiraz is the first medical physics conference in the region that is organized jointly with IOMP and MEFOMP. There have been a large number of abstracts and participants. Among the initial 500 abstracts, 90 were rejected and the remaining 410 are included in the abstract book. Although we have three parallel sessions, only 108 oral presentations (including interactive posters in radiobiology sessions) are listed in the final program.

The evenings and one afternoon are kept free for social programs. Shiraz is an exciting place to visit, offering a wide range of exciting sightseeing. In Shiraz, you'll never be in short of interesting and exciting places to visit.

I would like to express my sincere gratitude and deep appreciation to Professor M.H. Imanieh, the chancellor of Shiraz University of Medical Sciences (SUMS) and Dr. Gh. Hatam, the SUMS vice chancellor for research, for their invaluable support and cooperation. I would also like to thank my colleagues Drs. AR Mehdizadeh and MA Mosleh-Shirazi, the scientific secretaries of the conference for their efforts. The success of the conference is also immensely indebted to Professors F. Nusslin, B. J. Allen and Mr. I. Duhaini. I would like to specially thank Professor A. NiRoomand-Rad, who unfortunately cannot attend the conference due to her medical condition.

Before closing this brief welcome note, I would like to thank the members of the international and local scientific / organizing committees, especially Dr. A. Tavakkoli-Golpayegani, Mr. M Mahdavi and Mr. MM Movahhedi. Special thanks are due to Mr. M. Haghani and Ms. M. Hashemi-Zadeh

Finally, as Secretary-General of the Conference, I wish you all a very successful and enjoyable conference.

Prof. SMJ Mortazavi, PhD
Secretary General

DAY 1: Wednesday 2 November 2011

Time	Mins	Program	Venue
08.00 - 08.30	30	Registration	Homa Hotel-West Lobby
08.30 - 08.35	30	Quran & National Anthem of the Islamic Republic of Iran	Vessal Hall
08.35 - 09.35	60	1. Dr. SR Mahdavi, President of the Iranian Association of Medical Physics. (10 min) 2. Professor M.H. Imanieh, Chancellor of Shiraz University of Medical Sciences. (10 min) 3. Professor F Nusslin (Germany), President of International Organization for Medical Physics (IOMP) (15 min) 4. Mr. I. Duhaini (Lebanon), President of Middle East Federation of Organizations of Medical Physics (MEFOMP). (15 min) 5. Professor SMJ Mortazavi (Iran), Conference Secretary. (10 min)	Vessal Hall -Plenary
09.35 – 10.15	40"	Keynote Speaker President B. J. Allen (Australia), Past President of International Organization for Medical Physics (IOMP). (40 min) [Patient responses in a phase 1 clinical trial of targeted alpha therapy for metastatic melanoma]	Vessal Hall -Plenary
10.15 - 10.45 "	30	Coffee Break	West Lobby
10.45- 12.30	105	Featured Speakers 1. Prof. Indra Das (USA), PhD. (25 min) [Advances in Proton Beam Radiotherapy] 2. Prof. Meigooni (USA), PhD. (20 min) [New Techniques in Brachytherapy] 3. Prof. Ishmail Parsai (USA), PhD (20 min) [ThermoBrachyTherapy seed for treatment of solid tumors] 4. Dr. SMR Aghamiri (Iran) (20 min) [Contribution of Iranian Medical Physicists in Science and Technology] 5. Dr. MR Kardan (Iran), PhD. (20 min) [Promotion of Public Information on radiation Risk] Chairman: Prof. M. Sohrabi Co-chairs: Prof. MT Bahreyni and Prof. MA Behrouz	Vessal Hall - Plenary
12.30 - 14.00	90	Lunch Break, Praying	Homa Hotel Restaurant/ Mosque
14.00 - 16.00	120	Parallel Session Presentations-1 (8 Talks in each parallel session, presenters will be announced later) A. Radiation Therapy B. Medical Imaging C. Non-Ionizing Radiation	Vessal Hall Negar Hall Ayeneh Hall
16.00-16.30 "	30	Coffee Break	West Lobby
16.30-18.00	90	Parallel Session Presentations-2 (6 Talks in each parallel session, presenters will be announced later) A. Radiation Therapy B. Medical Imaging C. Radiation Biology (Interactive Poster Session) Kraal session1 – General Radiobiology Moderator: Prof. Barry J Allen	Vessal Hall Negar Hall Ayeneh Hall

DAY 2: Thursday 3 November 2011

Time	Mins	Program	Venue
08.00 - 08.30	30	"Keynote Speaker Prof. F Nusslin (IOMP) (30 min) [Imaging in Cancer Research – Perspectives for Clinical Translation] Chairman: Prof. Karim Vessal Co-chairs: Prof. H. Mozdarani and Dr. Duhaini	Vessal Hall - Plenary
08.30- 10.10	100	Featured Speakers 1. Prof. H. Mozdarani (Iran), PhD. (20 min) [Biological complexities in radiation carcinogenesis and cancer treatment] 2. Prof. Sabee Molloi (USA) , PhD (20 min) [To be announced later] 3. Prof. KP Mishra (India), PhD (20 min) [Radiation Biology Based Strategies for Radioprotection with Implications to Environment and Health] 4. Prof. Elias Saion (Malaysia), PhD (20 min) [Developments of 3D Polymer Gel Dosimeters for Radiotherapy Treatment Planning] 5. Dr. Yassin Bouchareb (Qatar), PhD (20 min) [To be announced later]	Vessal Hall - Plenary
10.10 - 10.30 "	30	Coffee Break	West Lobby
10.30 - 12.30	120	" Parallel Session Presentations-1 (8 Talks in each parallel session, presenters will be announced later) A. Radiation Protection and Dosimetry B. Biomedical Engineering C. Radiation Biology (Interactive Poster Session) Kraal session2 - Radiosensitivity and radioprotection Moderator: Prof. Barry J Allen	Vessal Hall Negar Hall Ayeneh Hall
12.30- 14.00	60	Lunch Break, Praying	Homa Hotel Restaurant/ Mosque
14.00- 17.30	210	Social Tours (Shiraz Tourist Attraction) 1. Visit to Holy Shah-e-Cheragh Shrine 2. Visit to Saadi Tomb 3. Visit to Hafez Tomb	
17.30 – 20.30	180	Dinner Party All participants are invited to participate in a dinner party hosted by Prof. MH Imanieh, the Chancellor of Shiraz University of Medical Sciences.	Afif-Abad Garden

DAY 3: Friday 4 November 2011

Time	Mins	Program	Venue
08.00 - 08.30	30	Keynote Speaker Prof. Malek Makki (Switzerland), PhD (30 min) [Asymmetric micro-structural brain development of neonates with congenital heart disease: A DT- MRI study before and after cardio-pulmonary bypass surgery] Chairman: Prof. F. Nusslin Co-chairs: Dr. A. Arbabi and Dr. Sharafi	Vessal Hall - Plenary
08.30 - 10.10	90	Featured Speakers 1. Mr. Ibrahim Duhaini (Lebanon), PhD (20 min) [Radiation Safety Training in Hospitals] 2. Prof. K Vessal (Iran), PhD (20 min) [On the need for BMPE Journal] 3. Dr. Habib Ashoor (Bahrain), PhD (20 min) [To be announced later] 4. Mr. Ibrahim Mheidat (Jordan), PhD (20 min) [To be announced later] 5. Prof. S Sarkar (Iran), PhD (20 min) [Modern Applications of Nanotechnology in Medical Physics]	Vessal Hall - Plenary
10.10-10.30	30	Coffee Break	West Lobby
10.30-12.30	120	Parallel Session Presentations-1 (8 Talks in each parallel session, presenters will be announced later) A. Radiation Protection and Dosimetry B. Medical Imaging & Non-Ionizing Radiation C. Radiation Therapy & Biomedical Engineering	Vessal Hall Negar Hall Ayeneh Hall
12.30-14.00	60	Lunch Break, Praying	Homa Hotel Restaurant/Mosque
14.00-15.30	90	Panel A. Radiation Protection and Dosimetry B. Radiotherapy C. Non-Ionizing Radiation & Biomedical Engineering	Vessal Hall Negar Hall Ayeneh Hall
15.30-16.30	60	Debate	Vessal Hall
16.30-17.30	60	Closing Ceremony	Vessal Hall

Parallel session schedule DAY 1

Room	Vessal Hall	Negar Hall	Ayeneh Hall
DAY 1, Wednesday 2 November 2011	Parallel Session 1 (2.00 - 4.00 pm) Track A	Parallel Session 2 (2.00 - 4.00 pm) Track B	Parallel Session 3 (2.00 - 4.00 pm) Track C
	Radiation Therapy	Medical Imaging	Radiation Biology
Keynote Speaker Dr.	Dr. Ibrahim Duhaini	Dr. R. Faghihi	Prof Sohrabi
Discussant	1. Mohammadi M 2. Yarahmadi M 3. Rasaneh S 4. Nourollahi S 5. Mohammadi M 6. Momennezhad M	1. Keshtkar A 2. Zahmatkesh Z 3. Olumi Sh 4. Robatjazi M 5. Salehnia Z 6. Navvabpour M	1. Deevband M.R 2. Tayebi M 3. Anvari A 4. Afaneh F 5. Akhlaghi P 6. Seif F
Chairman	Prof. A. Meigooni	Dr. MA Oghabian	Prof. E. Saion
Co-Chairs	Dr. MR Aghamiri, Dr.	Dr. R. Faghihi, Dr.	Dr. MR Kardan, Dr. Khosravi and Dr. MT Eivazi

Parallel session schedule DAY 1

Room	Vessal Hall	Negar Hall	Ayeneh Hall	
DAY 1, Wednesday 2 November 2011	**Parallel Session 1 (4.30 - 6.00 pm)** Track A	**Parallel Session 2 (4.30 - 6.00 pm)** Track B	**Parallel Session 3 (4.30 - 6.00 pm)** Track C	
	Radiation Therapy	Medical Imaging	Radiation Biology	
Keynote Speaker Dr.	MA Mosleh-Shirazi	Dr. AR Mehdizadeh	Prof. Barry Allen	
			Interactive Poster Session (Kraal 1- Radiosensitivity and Radioprotection	
Discussant	1. Hosseini SMA 2. Mahani H 3. Hariri S 4. Hegazy M 5. Asgharnasab Baboli A 6. Jabbari K 7. Hosseini Daghigh SM 8. BaradaranGhahfarokhi M	1. NasiriAvanaki M. R 2. RiyahiAlam N 3. Alavi MS 4. Vyas A 5. Zergoug I 6. Ravanfarhaghighi R 7. Arabbafrani Z 8. Kalantari F	1. Samani F 2. MohammadiNejad A 3. Aghaee F 4. Aghaee F 5. Zamani M 6. TahamtanR 7. Mohammadi Z 8. Tiwari R 9. Puthli Abhay 10. Montazerabadi AR	11. NaghaviBehzad M 12. Babaloui S 13. Heidari AH 14. Rasaneh S Mini Lectures Saki M Hakimi A Anvari A Vakili A
Chairman	Dr. E. Parsai	Dr. M. Makki	Prof. Barry Allen	
Co-Chairs	Dr. H. Gharaati, Dr. SR Mahdavi and Dr. B. Hashemi-Malayeri	Dr. H. Rajabi and Dr. D Shahbazi-Gahrouie	Prof H Mozdarani	

Parallel session Shedule DAY 2

Room	Vessal Hall	Negar Hall	Ayeneh Hall	
DAY 2, Thursday 3 November 2011	Parallel Session 1 (10.30 - 12.30 pm) Track A	Parallel Session 2 (10.30 - 12.30 pm) Track B	Parallel Session 3 (10.30 - 12.30 pm) Track C	
	Biomedical Engineering	Non Ionizing Radiation	Biomedical Engineering	
Dr. Keynote Speaker	Prof. Firouzabadi	Prof. Shahbazi-Gahrouie	Prof. Barry Allen	
			Interactive Poster Session (Kraal 2- Radiobiology)	
Discussant	1. Karevan H 2. Tavakol 3. YounessiHeravi M.A 4. Sadeghi M 5. Mohsenian N 6. Sadeghi MJ 7. Ashtiani MN 8. Mofidian S.M.M	1. Bahaeddini N 2. Shirkavand A 3. Alani A 4. Mortazavinia Z 5. KoohianAfzal F 6. Motaghian F 7. Shanei A 8. Pourmand R 9. Rasta S.H	1. Azimian H 2. Haghani M 3. HadadiGh.H 4. Haghshenas R 5. Mahdavi M 6. Mirzakhanian L 7. Toushih M 8. Abdollahi H 9. Tanha K	10. Shahidi M 11. Azimian H 12. ArunChougule 13. Assadi N 14. BabadySoltanzadeh N **Mini Lectures** 1. Rasaneh S 2. Koosha F 3. NavabSfa N
Chairman Co-Chairs	Dr. SM Firouzabadi Dr. AR Ahmadian Dr. A TavakkoloiGolpayg	Prof. MH Bahreyni-Toosi MJ Abolhasani and Dr. B. Bloori	Prof. Barry J Allen Dr. AR Shirazi	

Parallel session Shedule DAY 3

Room	Vessal Hall	Negar Hall	Ayeneh Hall	
DAY 3, Friday 4 November 2011	Parallel Session 1 (10.30 - 12.30 pm) Track A	Parallel Session 2 (10.30 - 12.30 pm) Track B	Parallel Session 3 (10.30 - 12.30 pm) Track C	
	Radiation Protection & Dosimetry	Radiation Therapy/Medical Imaging	Non-Ionizing Radiation/Biomedical Engineering	
Keynote Speaker	Dr. Bouzarjomehri	Dr. Asnaashari Dr.	SH Abbasi	
Discussant	1. Sathish L.A 2. Rouintan MS 3. Fardid R 4. Zoliana B 5. Salek N 6. Arun Chougule 7. Mostaar A	1. Zeinali-Rafsenjani B 2. Gholami S 3. Akhbardeh M 4. Safarzadeh L 5. Jahanfar T 6. Ma'soumBeigi M 7. Gharbali A	1. Sobhany N 2. Tohidi F.Z 3. Zareayan Jahromy F 4. Jahangerri N 5. Hasan F. 6. Heidari F	7. Taheri R 8. Akbari MA
Chairman Co-Chairs	Dr. F. Faghihi Dr. A Asgharzadeh and Dr.Tavakoli	Dr. AR Shakiba-Fard Dr. M llahverdi and Dr. HA Nedaie	Dr. M. Mokhtari Mr. MM Mowahedi and Ms. D.Farvadin	

PANEL PROGRAM DAY 3, Friday 4 November 2011 14.00- 15.30

ROOM	Vessal Hall	Negar Hall	Ayeneh Hall
DAY 3, Friday 4 November 2011	PANEL A (14.00- 15.30)	PANEL B 14.00- 15.30	PANEL C 14.00- 15.30
Theme	Radiation Therapy/ Radiation Protection & Dosimetry	Medical Imaging/ Biomedical Engineering	Radiobiology/ Non-Ionizing Radiation
Participants	Ali Shabestani Monfared Azim Arbabi Bijan Arjomandy (USA) Esmail Parsai (USA) Fathollah Bouzarjomehri Fridtjof Nüesslin (Germany) Hosein Gherraati Ibrahim Duhaini (Lebanon) Mohammad Ali Behrooz Moham Amin Mosleh Shirazi Seyed Rabi Mahdavi Bijan Hashemi Malayeri Ibraheem Mheidat (Jordan) Mahmood Reza Aghamiri Mehdi Sohrabi Mohammad Reza Kardan Moham Taghi Bahreyni Tousi Mohammad Taghi Eivazi Mohsen Hajizadeh Saffar Simin Mehdizadeh Bagherzadeh R A Nedaiee Khosravi M ahmood Allahverdi	Ali Reza Mehdizadeh Daryoush Shahbazi Gahrouei Elias Saion (Malaysia) Fariborz Faeghi Habib Ashoor (Bahrain) Hossein Rajabi Malek Makki (Switzerland) Mohammad Ali Oghabian Mohammad Reza Ay Mojtaba Salouti Roghie Bagherzadeh Sadek Nehmeh (USA) Saeed Sarkar Yassine Bouchareb (Qatar) Ali Reza Ahmadian Ali Tavakkoli Golpayegani Estaki Hashemi-Golpayegani Mohammad Bagher Shiran Mohammad Mehdi Movahedi Seyed Mohammad Firouzabadi Reza Faghihi	Hosein Mozdarani S Omidvari Ali Neshasteh Riz Ali Reza Shirazi Barry Allen (Australia) SMJ Mortazavi Mohi Rezvani (England) Naba Naji (Iraq) Siamak Haghdoost (Sweden) Abbas Takavar Ameneh Sazgar Niya Bahram Bloori Manijeh Mokhtari Mohammad Bagher Tavakkoli Moham Hosein Bahreyni Tousi Mohammad Javad Abolhasani K. Keshavarzi MB Shiran S. Khoiee
Moderator	Prof. Meigooni & Prof. Das	Prof. Malek Makki	Professor Allen/ Prof. Mozdarani

Panel program DAY 3, Friday 4 November 2011 14.00- 15.30

Room	Vessal Hall	Negar Hall	Ayeneh Hall
DAY 3, Friday 4 November 2011	PANEL A (14.00- 15.30)	PANEL B 14.00- 15.30	PANEL C 14.00- 15.30
Theme	Radiation Therapy/ Radiation Protection & Dosimetry	Medical Imaging/ Biomedical Engineering	Radiobiology/ Non-Ionizing Radiation
Participants	Ali Shabestani Monfared Azim Arbabi Bijan Arjomandy (USA) Esmail Parsai (USA) Fathollah Bouzarjomehri Fridtjof Nüesslin (Germany) Hosein Gherraati Ibrahim Duhaini (Lebanon) Mohammad Ali Behrooz Moham Amin Mosleh Shirazi Seyed Rabi Mahdavi Bijan Hashemi Malayeri Ibraheem Mheidat (Jordan) Mahmood Reza Aghamiri Mehdi Sohrabi Mohammad Reza Kardan Moham Taghi Bahreyni Tousi Mohammad Taghi Eivazi Mohsen Hajizadeh Saffar Simin Mehdizadeh Bagherzadeh R A Nedaiee Khosravi M ahmood Allahverdi	Ali Reza Mehdizadeh Daryoush Shahbazi Gahrouei Elias Saion (Malaysia) Fariborz Faeghi Habib Ashoor (Bahrain) Hossein Rajabi Malek Makki (Switzerland) Mohammad Ali Oghabian Mohammad Reza Ay Mojtaba Salouti Roghie Bagherzadeh Sadek Nehmeh (USA) Saeed Sarkar Yassine Bouchareb (Qatar) Ali Reza Ahmadian Ali Tavakkoli Golpayegani Estaki Hashemi-Golpayegani Mohammad Bagher Shiran Mohammad Mehdi Movahedi Seyed Mohammad Firouzabadi Reza Faghihi	Hosein Mozdarani S Omidvari Ali Neshasteh Riz Ali Reza Shirazi Barry Allen (Australia) SMJ Mortazavi Mohi Rezvani (England) Naba Naji (Iraq) Siamak Haghdoost (Sweden) Abbas Takavar Ameneh Sazgar Niya Bahram Bloori Manijeh Mokhtari Mohammad Bagher Tavakkoli Moham Hosein Bahreyni Tousi Mohammad Javad Abolhasani K. Keshavarzi MB Shiran S. Khoiee
Moderator	Prof. Meigooni & Prof. Das	Prof. Malek Makki	Professor Allen/ Prof. Mozdarani

Parallel Sessions, Day 1- Nov 2, 2011

Radiation Therapy (Parallel Session A, 14:00 – 16:00)

Chairman: Dr. E. Parsai
Co-Chairs: Dr. SR Mahdavi and Dr. B. Hashemi-Malayeri
Keynote Speaker: Dr. MA Mosleh-Shirazi
Speakers:

1. HosseiniSMA :An Innovative Monitor System for Centro Nazionale di AdroterapiaOncologica (CNAO) in Pavia (Italy) [15 min]
2. Mahani H : An optimization algorithm for beam angle, beam weight and wedge angle in forward treatment planning of external-beam radiotherapy based on an integer-representation adaptive mutation probability genetic algorithm [15 min]
3. Hariri S : Introducing a Complementary Treatment Planning Software for GZP6 High Dose Rate (HDR) Brachytherapy System [15 min]
4. Hegazy M : The new advanced radiotherapy techniques -Challenge of quality insurance –OBI experience [15 min]
5. AsgharnasabBaboli A: Influence of shield tray on reducing the neutron dose equivalent from Linac head
6. Jabbari K: Evaluation of Accuracy and Performance of a Fast Monte Carlo Code for Dose Calculation in Proton Therapy [15 min]
7. HosseiniDaghigh SM: Applicator Attenuation Effect to Dose Calculations in Esophageal HDR Barchytherapy [15 min]
8. BaradaranGhahfarokhi M: A Novel Four-Dimensional Method of Organ Dosimetry in Prostate Brachytherapy [15 min]

Medical Imaging (Parallel Session B, 14:00 – 16:00)

Chairman: Dr. M. Makki
Co-Chairs: Dr. H. Rajabi and Dr. D Shahbazi-Gahrouie
Keynote Speaker: Dr. AR Mehdizadeh
Speakers:

1. NasiriAvanaki M. R: En face dynamic focus optical coherence tomography to study BCC [15 min]
2. RiyahiAlam N: Development of a T1 Contrast Agent for Magnetic Resonance Imaging Using Gd2O3 Nanoparticles [15 min]
3. Alavi MS: Recent Advances in Nuclear Medicine [15 min]
4. Vyas A: On the attenuation coefficient of coronary artery plaque [15 min]
5. Zergoug I: MRI simulation with patient [15 min]
6. Ravanfarhaghighi R: Dependence of the x-ray attenuation coefficient of mixtures on the energy of the photon and the effective atomic number of the sample [15 min]
7. Arabbafrani Z: Assessment advantage of myocardium movement in longitudinal axis view in comparison with short axis view [15 min]
8. Kalantari F: A model based, anatomy dependent method for creation of the SPECT projections [15 min]

Radiation Biology (Parallel Session C, 14:00 – 16:00)
Moderator & Keynote Speaker Professor Barry J Allen

Interactive Poster Session (Kraal 1- Radiosensitivity and Radioprotection

1. Samani F: EvaluationofPederin and Gama Radiation Combined Effect on HeLa Cells Survival Curve
2. MohammadiNejad A: Radioprotective effects of garlic extract against gamma- irradiation in mice
3. Aghaee F: 2 - deoxy - D - glucose and ionizing radiation responses of T47D and SKBR3 breast cancer cells
4. Aghaee F: Doxorubicin and ionizing radiation responses of T47D and SKBR3 breast cancer cells

5. Zamani M : Neuroprotective effects of Concurrent treatment of Vitamin C and the Adenosine A1 receptor Agonist on Hippocampus in Animal Model of Brain Radiotherapy
6. Tahamtan R :The Histopathological Evaluation of Melatonin Effect As a Radioprotector Against Radiation Pneumonia in Gamma Irradiated rats
7. Mohammadi Z: An in vitro Study on photosensitivity of 5-aminolevulinic acid(5ALA) conjugated gold nanoparticle(GNPs)
8. Tiwari R: Betulinic acid confers radiosensitizing effect on breast cancer cell lines which was reversed by tocopherol
9. PuthliAbhay: Oleic acid protects normal cells exposed to Irradiated Cell Conditioned Medium (ICCM)
10. Montazerabadi AR: Mitoxantrone as a prospectivesensitizer for photodynamic therapy of breast cancer
11. NaghaviBehzad M: Protecting against rays, one usage of drugs
12. Babaloui S: Evaluation of Combination Effects of 2-Methoxyestradiol and Methoxyamine on IUdRInduced Radiosensitization in Glioma Spheroids
13. HeidariAH: Impact of radioprotectory of sulfur soluble in Ramsar mineral water
14. Rasaneh S: Radiolabeling of magnetic nanoparticles with 177Lu for local drug delivery

Mini Lectures

1. Saki M: EGFR directed radiolabled-C225: binding kinetics,specificity and radiosensitization
2. Hakimi A: A kinetic model for 153Sm-[Tris (1,10Phenanthroline) Samarium (III)] trithiocyanate in normal mice
3. Anvari A: Production and tracer studies of cost-effective agents of ethylene diamine tetra methylene phosphonic acid (EDTMP) ligand for bone pain palliation in normal wild-type rats
4. Vakili A: Estimation of Beta radiation absorbed dose in human based on distribution data in rats

Radiation Therapy (Parallel Session A, 16:30 – 18:00)

Chairman: Prof. A. Meigooni
Co-Chairs: Dr. MR Aghamiri and Dr. A. Shabestani-Monfared
Keynote Speaker: Dr. Ibrahim Duhaini
Speakers:

1. Mohammadi M : Portal Dosimetry an essential stage for Adaptive radiotherapy [15 min]
2. Yarahmadi M : The Effect of Flattening Filter Removing on Radiosurgery Small Field Sizes Penumbra [15 min]
3. Rasaneh S : Active tumor targeting with 177Lu Using manganese ferrite nanoparticles [15 min]
4. Nourollahi S :Optimization of 3D Planning Dosimetric in Breast Phantom for Match Region of Supraclavicular and Tangential Fields [15 min]
5. Mohammadi M : Development of a method to reduce patient positioning errors during prostate cancer treatment [15 min]
6. MomennezhadM: Dosimetry verification of small fields used in Stereotactic Radiosurgery by Monte Carlo simulation [15 min]

Medical Imaging (Parallel Session B, 16:30 – 18:00)

Chairman: Dr. MA Oghabian
Co-Chairs: Dr. MR Aye and Dr. R. Bagherzadeh
Keynote Speaker: Dr. R. Faghihi
Speakers:

1. Keshtkar A: Bladder cancer detection using electrical impedance spectroscopy [15 min]
2. Zahmatkesh Z : From Positron Emission Tomography (PET) to Positron Emission Particle Tracking (PEPT) [15 min]
3. OlumiSh : New Klin_Nishina based scatter correction approach for nuclear medicine images [15 min]
4. Robatjazi M : Use of noninvasive molecular imaging for target definition in treatment planning of prostate radiotherapy [15 min]
5. Salehnia Z : Distinction of normal and malignant gastric tissue using electrical impedance spectroscopy in in vivo study [15 min]
6. Navvabpour M : Assessment of an Tentative Novel X-Ray Anode in order to Decrease the Applicability

Limitation in Medical Practice [15 min]

Radiation Protection &Dosimetry (Parallel Session C, 16:30 – 18:00)

Chairman: Prof. E. Saion
Co-Chairs: Dr. MR Kardan and Dr. MT Eivazi
Keynote Speaker: Prof Sohrabi
Speakers:
1. Deevband M.R :Patient dose reduction in some routine radiographic Examinations in Iran [15 min]
2. Tayebi M : A Novel Design for Production of Efficient Flexible Shields against X-ray Photons in Diagnostic Energy Range [15 min]
3. Anvari A : Resistive Plate Chambers (RPC) in Radiation Medical Applications [15 min]
4. Afaneh F : A Beamline for Medical Imaging and Therapy at SESAME Synchrotron[15 min]
5. Akhlaghi P :Designing and optimization of neutron dosimeter [15 min]
6. Seif F : Determination of the effective point of measurement for cylindrical ion chamber in Mega voltage
photon beams [15 min]

Parallel Sessions Day 2- Nov 3, 2011

Biomedical Engineering (Parallel Session A, 10:30 – 12:30)

Chairman: Dr. SM Firouzabadi
Co-Chairs: Dr. AR Ahmadian and Dr. A Tavakkoloi-Golpayegani
Keynote Speaker: Prof. Firouzabadi
Speakers:
1. Karevan H : Modeling and Analysis of a Novel Method to Check Suture's Tension during Laparoscopic Surgery [15 min]
2. TavakolA :Object Recognition with Piezoresistive Tactile Sensor [15 min]
3. Younessi Heravi M.A: Continuous and Noninvasive and Cuff less Blood Pressure Monitoring using ECG and SpO2 Signals [15 min]
4. Sadeghi M : Simulation and Analysis of motor unit action potential by Using Macro,SF,CNelectrods [15 min]
5. Mohsenian N :Application of Voice Analysis for Early Diagnosis Hypothyroidism [15 min]
6. Sadeghi MJ :A novel haptic system for use in human hand rehabilitation [15 min]
7. Ashtiani MN : Design and Fabrication of a Novel Wearable Automated Peritoneal Dialysis Device [15 min]
8. MofidianS.M.M :Application of lattice Boltzmann method to simulate blood flow in carotid artery [15 min]

Non-Ionizing Radiation (Parallel Session B, 10:30 – 12:30)

Chairman: Prof. MH Bahreyni-Toosi
Co-Chairs: MJ Abolhasani and Dr. B. Bloori
Keynote Speaker: Prof. Shahbazi-Gahrouie
Speakers:
1. Bahaeddini N : High Tesla MRI Accelerates the Release of Mercury from Dental Amalgam Fillings [15 min]
2. Shirkavand A :Modeling of Heat Distribution and Thermal Damage Pattern Diode Hair Removal lasers for various skin types: a Novel Method for Optimizing Treatment Process1 [15 min]
3. Alani A : Direct Additional Acceleration of Relativistic Electron and Generation of Electron irradiationin

vacuum bycombination intense Short Pulse Lasers TEM*(0,1) doughnut mode and TEM(0, 0) mode [15 min]
4. Mortazavinia Z :Numerical Simulation of Human Eye: New Insights in Glaucoma [15 min]
5. KoohianAfzal F :Effects of MRI on sex hormones and other fertility parameters [15 min]
6. Motaghian F :Effect of polarized visible Laser radiation on viscoelastic behaviour of soft tissue [15 min]
7. ShaneiA :Therapeutic effects of acoustic cavitation in the presence of gold nanoparticles and intense pulsed light on a colon tumor model [15 min]
8. PourmandR :Ultra-sensitive Optical DNA and peptide biosensor based on whispering gallery mode [15 min]
9. Rasta S.H :Spectral Optical Imaging in the Eye Using Scanning Laser System [15 min]

Radiation Biology (Parallel Session C, 10:30 – 12:30)

Interactive Poster Session (Kraal 2- Radiobiology

Moderator &Keynote Speaker: Prof. Barry J Allen

1. Azimian H : Effect of Low-Dose Exposure of gamma Radiation on Apoptotic Genes Expression in Human Peripheral Blood lymphocytes
2. Haghani M : Does Specific Absorption Rate of GSM Mobile Phones Affect the Magnitude of Induced Radioresistance to Lethal Doses of Gamma Rays?
3. HadadiGh.H :Radiation- Induced Apoptosis in The Rats spinal cord is associated with TNF-α Gene Expression
4. Haghshenas R :Evaluation of the Effect of Light Guide Thickness on the Linearity of Gamma Camera: a GEANT4 Based Monte Carlo Simulation with Optical Photon Tracking
5. Mahdavi M : Radioprotective Effect of polysorbate 20 against whole Body Gamma radiation in Balb/C mice
6. MirzakhanianL :Simulation of DNA strand breaks due to the direct and indirect effects of the incorporated 123I using Geant4 computer code
7. Toushih M :The effects of ionizing radiation on the body physiology
8. Abdollahi H :The Importance of Time in Low Dose Radiobiology Phenomena
9. Tanha K : Protective Effect of Vitamin C and the A1Adenosine receptor Agonist on Cortical neurons following irradiation in mice
10. ShahidiM :Detection of individual differences in radiation-induced apoptosis of peripheral blood lymphocytes in normal individuals and breast cancer patients using neutral comet assay.
11. AzimianH :Early apoptotic response of ionizing radiation
12. ArunChougule :Past, present and future: Radiobiological modeling in Radiotherapy
13. Assadi N :The study of synergic effect ofvitamin C&adaptive dose on human lymphocyte
14. BabadySoltanzadeh N :A Mathematical Model of In vitro Cancer Cell and Treatment with Antimitotic Agent by Cellular Automata

Mini Lectures

1. RasanehS :Using magnetic nanoparticle to increase the therapieutic efficacy of Herceptin antibody
2. KooshaF :DNA damage induced in Glioblastoma cells by I-131: Experimental data and Monte Carlo simulation
3. NavabSafaN :Air Sterilization by Dielectric Barrier Discharge Plasma

Parallel Sessions Day 3- Nov 4, 2011

Radiation Protection & Dosimetry (Parallel Session A, 10:30 – 12:30)

Chairman: Dr. F. Faghihi

Co-Chairs: Dr. A Asgharzadeh and Dr. Tavakoli

Keynote Speaker: Dr. Bouzarjomehri

Speakers:

1. Bouzarjomehri F: Active personal dosemetery in a nuclear medicine center inYazd city, Iran [15 min]
2. Rouintan MS: A Novel Method for Removing I-131, Tc-99m and Lu-177 Radionuclides from Aqueous Solutions Using Montmorillonite Nanoclay [15 min]

3. Sathish L.A: 220Rn in indoor Environment of India: A Review [15 min]
4. Fardid R: Application of Electronic Personal Dosimeters to Estimate Radiation Dose of Interventional Cardiologists [15 min]
5. Zoliana B: The Study of Population Dosimetry in Highest Lung Cancer Occurrence Area in India. [15 min]
6. Salek N: Quality control of 191Os/191mIr generator produced by Tehran Research Reactor [15 min]
7. Arun Chougule: Quality Assurance Survey of X – Ray Machines and Patient Doses During Various Radiological Procedures. [15 min]
8. Mostaar A: Development and characterization of Radiological water equivalence formulation of PRESAGE dosimeter [15 min]

Radiation Therapy/Medical Imaging (Parallel Session B, 10:30 – 12:30)

Chairman: Dr. AR Shakiba-Fard
Co-Chairs: Dr. F. Faeghi and Dr. P. Shokrani
Keynote Speaker: Dr. Asnaashari
Speakers:

1. Asnaashari Kh :National audit for treatment planning Systems in Iran [15 min]
2. Zeinali-RafsenjaniB :Development and validation of a Monte Carlo model of a kilovoltage x-ray therapy unit for chest-wall irradiation [15 min]
3. Gholami S: A new verification phantom for GYN brachytherapy applicators [15 min]
4. Akhbardeh M :Results following gamma knife radiosurgical anterior capsulotomies for obsessive compulsive disorder. [15 min]
5. Safarzadeh L: Production of 175Yb and labeling by NHS-DTPA-Bevacizumab for lung cancer treatment [15 min]
6. Jahanfar T : Multispectral Imaging In FRI With QDs [15 min]
7. Ma'soumBeigiM :Repeatability of Detecting Visual Cortex Activity in Functional Magnetic Resonance Imaging [15 min]
8. Gharbali A: The Application of Automatic Texture Analysis for Discrimination of Liver Disease by Magnetic Resonance Imaging [15 min]

Non-Ionizing Radiation/Biomedical Engineering (Parallel Session C, 10:30 – 12:30)

Chairman: Dr. M. Mokhtari
Co-Chairs: Mr. MM Mowahedi and Ms. D. Farvadin
Keynote Speaker: Dr. SH Abbasi
Speakers:

1. Sobhany N: An invivo study on photobleaching in the presence of 5-aminolevulinic acid (5ALA) conjugated gold nanoparticles(GNPs) during photodynamic therapy(PDT) [15 min]
2. Tohidi F.Z : Mobile Phone Radiation exposure effects on Apoptosis Genes Expression in hippocampal formation of mice brain [15 min]
3. Zareayan Jahromy F: Category subcategory Effect of ultrasound on peripheral nerve repair in Rats [15 min]
4. Jahangerri N : A microsphere stimulated Raman spectroscopy for the measurment of glucose in aqueous solution [15 min]
5. Hasan F. : Examination of some physiotherapy methods for the selection of the best one in the treatment of each type of hip joint injury. [15 min]
6. Heidari F. : Developing Software for Experiments on Radiobiology of Non-Ionizing Radiation [10 min]
7. Taheri R: Fiber Optic (SiO2:Ge+P) Dosimetry in Medical Application [15 min]
8. Akbari MA: Digital Subtraction Phonocardiography Applied to the Detection and Characterization of Heart Murmurs [15 min]

INVITED TALKS

01: Imaging in Cancer Research – Perspectives of Clinical Translation

Nuesslin F

Technsiche Universität München

Abstract

The aim of radiotherapy is to maximize the energy dose absorption in the tumor whilst minimizing the radiation exposure to normal tissues. Currently, by introducing methods of conformation radiotherapy like intensity modulated beams the solution of this problem is primarily considered a merely spatial optimization task which is based on morphological image date, predominantly acquired by CT. Expanding from a spatial to a temporal approach of treatment optimization the integration of portal or cone beam CT allow for new concepts of image guided radiotherapy. Opening up the 5 th dimension of dose optimization by taking into account the biological heterogeneity of a tumor we are facing promising ways in cancer treatment. It is particularly the advent of PET/CT imagers which combine high resolution structural and high sensitivity functional and physiological data. Three aims are pursued when implementing biological images in the radiotherapy process, (i) characterizing the clinical tumor status, (ii) improving treatment planning by fusing multimodal image data sets, (iii) adapting the spatial & temporal dose distribution to the differential sensitivity profile of the tumor volume (BART), and (iv) assessing the tumor response to a given treatment modality and regime. As an example of the significance of BART the impact of hypoxia on the treatment outcome is discussed. Reduced dose response of poorly oxygenated tumors is well established. Via the HIF1 regulatory system hypoxia mediates activation of multiple genes enhancing several growth factors, promoting angiogenesis and inducing apoptotic pathways. This complex system challenges for modelling, for instance compartment analysis, to convert biological information into sound dose-painting concepts for treatment planning. Most interesting are treatment effect monitoring and therapy response by means of biological imaging which for instance allows for a significantly earlier detection of recurrence. Initial clinical data demonstrate the superiority of BART over traditional treatment regimes. However, reliable biomarkers are required for expanding biological guided radiotherapy.

02: An Overview of Technological Developments in Medical Applications of X-Rays and Radioactivity

Niroomand-Rad A

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Abstract

The years 1895 to 1898 were momentous for their impact on health and human well beings. First, Wilhelm Roentgen noted a glowing fluorescent screen, caused by invisible rays. This event subsequently led to the discovery of X-rays in 1895, and thus the birth of the “atomic age”. Next Becquerel’s investigations of these mysterious rays led to his experiments with uranium salt crystals. He thought that when these crystals are exposed to sunlight they could emit rays and cause exposure on photographic plates. This led to the discovery of radioactivity in 1896, with its full significance appreciated when the Curies discovered radium in 1897. The term “radioactivity” was first used by Marie Curie to describe this phenomenon that led to the birth of the “nuclear age”. Shortly after, the medical applications of x-rays and radioactivity were recognized and widely disseminated.

In the past 100 years, the technological developments in the production of x-ray beams along with the impact of the discovery of artificial radioactivity by Irene Curie and Frederic Joliot in 1930s, have revolutionized the practice of medicine. Currently x-ray imaging is being used, more than any other imaging modality, in diagnosis of diseases

and abnormalities. In addition, over 50% of all cancer patients receive radiation treatments as part of their treatment plan(s). Despite significant advances in imaging technology and in production and delivery of x-rays and radioactivity; about half of these patients are successfully cured with 5 to 10 years local control. Reasons for treatment failure with radiation may be several including physical, biological, or both. For example, because of the imaging limitations, the exact extent of disease for many tumors is often unknown. Moreover, some tumors are able to "repair" radiation damage very effectively and some are radio resistant due to relative hypoxia.

In recent years, the major "challenge" of radiation treatment is to deliver large enough doses to the most resistant cancer cells to provide a high probability of local control while minimizing the dose to normal tissues and hence reducing complications. With recent developments in "imaging" the metabolic or functional status of cancers, the position of tumors relative to surrounding normal tissue can be more clearly delineated. The therapeutic dosage of radiation to the tumors can be escalated without exceeding normal tissues tolerances. These special techniques include: 3D "conformal" radiation treatment where the shape of the high dose region "conforms" to the shape of the tumor ("target"), intensity modulated radiation therapy (IMRT) that uses combinations of radiation beams with varying spatial intensity across the fields ("intensity modulated") in order to achieve an "ideal" dose distribution, image guided radiation treatment, and heavy charged particle radiotherapy. As such, it is expected to increase the success rate of cancer treatment significantly with this radiation treatment modality.

O3: Patient Responses in a Phase 1 Clinical Trial of Targeted Alpha Therapy for Metastatic Melanoma

Allen BJ

Centre for Experimental Radiation Oncology, St George Cancer Care CentreGray St, Kogarah 2217, NSWAustralia, bjallen@unsw.edu.au

Abstract

Targeted alpha therapy is based on the cytotoxic properties of the high linear energy transfer (~ 100 keV/μm) and low range (20-80 μm) of alpha particles. Monoclonal antibodies are labeled with an alpha emitting radioisotope to form the alpha-immunoconjugate. Our phase 1 melanoma trial with intravenous injections of up to 25 mCi of the 213Bi-cDTPA-9.2.27 demonstrated that alpha therapy could regress solid tumours without any adverse events1.

The effect of key parameters such as melanoma inhibitory activity protein, age, sex, injected dose, lactate dehydrogenase, disease stage and treatment dose were examined. Thirty nine patients with stage IV melanoma or in transit metastasis were treated with activities of 55-1035 MBq. No adverse events of any type or level were observed, so the maximum tolerance dose was not achieved.

An objective partial response rate of 10% was observed for partial response, with 40% stable disease for 8 weeks and a median survival of 8.9 months. Survival analysis showed MIA, disease stage, LDH and treatment effect to be significant prognostic indicators for survival. The lack of dose response is indicative of the importance of the tumour capillary permeability, without which alpha therapy cannot function2.

References

1. Raja C, Graham P, Rizvi SMA, Song E, Goldsmith H, Thompson J, Bosserhoff A, Morgenstern A, Apostolidis C, Kearsley JH, Reisfeld R, Allen BJ. Interim analysis of toxicity and response in Phase 1 trial of systemic targeted alpha therapy for metastatic melanoma. Cancer Biology & Therapy. 2007 6:6, 846-52
2. Allen BJ, Raja C, Rizvi SMA, Song EY, Graham P. Tumour anti-vascular alpha therapy: a mechanism for the regression of solid tumours in metastatic cancer. Phys. Med. Biol. 52 (2007) L15-L19.

O4: Medical Physics Status in the Middle East Countries

Duhaini I

Rafik Hariri University Hospital , President of the Middle East Federation of Organizations of Medical Physicists

Abstract

Middle East Federation of Medical Physics (MEFOMP) has passed in different stages. During the ISEP – 2007 conference held in Bahrain in November 2007, a meeting was arranged among representative physicists from the region and was decided to move ahead with the establishment of IOMP Middle East chapter. This follows more discussion among local physics societies in ME to further collect support and encouragement for such initiative. During the 16 th International Conference on Medical Physics 2008 that was held in Dubai in April 2008, there was a meeting for all the medical physics societies in the Middle East and the delegates signed a "Motion of Intent" which stated that all the delegates approve to form the Middle East Federation of Medical Physics (MEFOMP) which is part of the International Organization of Medical Physics IOMP and Ibrahim Duhaini was appointed the Secretary General of this federation by the President of IOMP professor Barry Allen. The following countries have signed up for the chapter: Bahrain, Iran, Iraq, Jordan, KSA, Lebanon, Oman, Qatar, Syria, and UAE.

Keywords: IOMP, MEFOMP, Middle East, Medical Physics

O5: A Novel Design for Production of Efficient Flexible Lead-Free Shields Against X-Ray Photons in Diagnostic Energy Range

Aghamiri MR[1], Mortazavi SMJ[2,3]*, Tayebi M[4], Mosleh-Shirazi MA[5], Baharvand H[6], Tavakkoli-Golpayegani A[7], Zeinali-Rafsanjani B[3]

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[3] The Center for Research on Radiological Sciences, School of Paramedical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran
[4] Master Student of Radiobiology and Radiation Protection, ShahidBeheshti University of Medical Sciences, Tehran, Iran
[5] Assistant Professor of Medical Physics, Radiotherapy Department, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran
[6] Assistant Professor of Polymer Chemistry, Iran Polymer Institute, Tehran, Iran
[7] Assistant Professor of Medical Engineering (Biomechanics), Medical Physics & Engineering Department, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

Abstract

Background: Lead-based radiation shields are widely used in radiology departments to protect both workers and patients from any unnecessary exposure to ionizing radiation. Recently there has been a great deal of concern expressed about the toxicity of lead. Human lead toxicity is well documented. In this light, production of environmentally-friendly lead-free radiation shields which provide less weight compared to conventional lead-based shields is a challenging issue.

Objective: The aim of this study was to design lead free flexible radiation shields for protection against x and gamma rays.

Methods: In this investigation, a wide variety of metallic compounds which potentially could be appropriate radiation shields, were studied. The Monte Carlo code MCNP4C was used to model the attenuation of x-ray photons in shields with different designs. Besides simulation, experimental measurements were carried out to assess the attenuation properties of each shielding design. On the other hand, major mechanical properties of this shield such as tensile strength, modulus and elongation at break were investigated.

Results: Among different metals, tungsten and tin were the two most appropriate candidates for making radiation shields in diagnostic photon energy range. A combination of tungsten (45%) and Tin (55%) provided the best protection in both simulation and experiments. In the next stage, attempts were made to produce appropriate Tungsten-tin-filled polymers which could be used for production of shielding garments. The density of this tungsten-tin-filled polymer was 4.4 g cm-3. The MCNP simulation and experimental measurements for HVL values of this shield at 100 kVp were 0.26 and 0.24 mm, respectively.On the other hand, this novel shield provides considerable mechanical properties and is highly resistant to chemicals.

Conclusions: The cost-effective lead-free flexible radiation shield produced in this study offers effective radiation protection in diagnostic energy range. This environmentally-friendly shield may replace the traditional lead-based shielding garments.

Keywords: Radiation Protection, Lead-free Shields, Non-Lead Shielding Garments, Tungsten, Tin, X-rays, Diagnostic Energy

O6: Biological Complexities in Radiation Carcinogenesis and Cancer Treatment

Mozdarani H

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Abstract

Radiation carcinogenesis, a known stochastic process, has always been a major concern not only for those practicing with ionizing radiation but also for general population. Radiation carcinogenesis is shown experimentally and epidemiologically, however, one of the major modalities in cancer treatment is also the use of ionizing radiation. Various known cellular and molecular events are involved in carcinogenesis. The main key events are involvement of DNA repair genes, p53, cell cycle check point genes, chromosomal rearrangements, apoptosis, contact inhibition and specific genes for each type of cancer. Similarly the main treatment protocols used for cancer treatment is using the same physical or chemical agents capable of inducing key events involved in cancer induction. Apart from the known phenomena, there could be implications for carcinogenesis and cancer prevention by other biological processes such as bystander effect, abscopal effect, intrinsic radio sensitivity and radio adaptation. Implications for carcinogenesis of radiation-induced bystander effects are both mechanistic and practical. They include induction of second cancers, perturbations to tissue social control and induction of genomic instability and delayed or immediate mutations in areas not receiving a direct deposition of energy. Bystander effects have consequences for DNA damage mutation-cancer initiation paradigms of radiation carcinogenesis that provide the mechanistic justification for low-dose risk estimates. The abscopal effect is potentially important for tumor control and is mediated through cytokines and/or the immune system, mainly cell-mediated immunity. It results from loss of growth stimulatory and/or immunosuppressive factors from the tumor. Until recently, the abscopal effect referred to the distant effects seen after local radiation therapy. However, the term should now be used interchangeably with distant bystander effect. The abscopal effect is still extremely controversial with known data that both support and refute the concept. Intrinsic radio sensitivity is a feature of some chromosomal breakage syndromes such as ataxia telangectiasia. These affected individuals are highly cancer prone. However, some patients with various types of cancers show higher intrinsic radio sensitivity. Among these is breast cancer patients which show distinct radio sensitivity compared to normal individuals. This effect which is manifested as higher chromosomal aberrations and DNA repair impairment is now known as a good biomarker for breast cancer screening and prediction of prognosis. However, it is not known yet that this effect is good or bad for those receiving radiation or radiomimetic agents for treatment. The other major concern for carcinogenesis is the phenomenon of radio adaptation or radiation hormesis. This process which protect cells from higher doses of radiation or radio mimic chemicals, might lead to escape of cells from mitotic death or apoptosis and put cells with lower amount of damage in the process of cancer induction. On the other hand this phenomenon might intervene with the routine treatment protocols. Therefore either biological phenomenon might have impact on another process giving rise to genome instability of cells not in the field of radiation but cells receiving lower amount of radiation. For prevention of radiation induced carcinogenesis or risk assessment and also for successful radiation therapy all these phenomenons should be taken into account.

O7: Radiation Biology Based Strategies for Radioprotection with Implications to Environment and Health

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Abstract

Ionizing radiation effects on biological systems have been subject of extensive studies ever since the discovery of X rays and radioactivity at the end of 19th century. Applications of ionizing radiation and radioisotopes in medical fields began even without understanding the mechanism of biological effects on living tissues. As a result of constant research progress, ionizing radiation and radioisotopes have proved to become a familiar specialty as a powerful tool in hospitals to diagnose ailments and treat a variety of diseases including cancer. Moreover, nuclear energy has found applications in diverse areas ranging from biomedical research to weapon development. Radiation biology aims at understanding the biological effects of ionizing radiation with a hope to evaluate and predict the risk and to mitigate the injurious effects on public health. In modern times, radiation technology has been adequately exploited to optimize the usefulness of radiation in research, medicine, industry, military and agriculture. The use of ionizing radiation in study of cancer and its treatment owes heavily to contributions of radiobiological research. The understanding of basic concepts and mechanisms of radiobiological practice for formulation of radiation protection strategies has become an urgent requirement for safety of individuals, progeny and human race. Radiation biological research has made important contributions to determine permissible dose limits to occupational workers and general population. However, recent results in radiobiology have compelled scientists to re-examine the effects of radiation on biological systems. The observed non-targeted effects called bystander effect, genetic stability and radioadaptability phenomena have generated new excitements in research as these results have significant implications to radioprotection and cancer therapy protocols. This talk is designed to present a brief account of basic aspects of radiobiological principles together with a review of emerging new paradigm in radiation biology with implications to using nuclear radiation for improvement of quality of life. The talk will also outline the goals and challenges of nuclear technology in new millennium with an emphasis to develop new research strategies relevant to environment and human health.

O8: Review of Medical Equipment Needs in Vanuatu

Allen BJ

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Abstract

Vanuatu lies off the East coast of Australia with a Melanesian population of ~300,000. Of the working age population, only one quarter are engaged in monetary activity and two thirds work as subsistence farmers. Major businesses are mostly owned by overseas interests and villages are rarely involved in commercial livestock and fruit & vegetable production. As such, Vanuatu is seriously disadvantaged financially when it comes to rural public health services. In 2008 there were 34 Health Centers and 6 hospitals in 6 provinces, supported by ~46 midwives and 40 nurse practitioners.

A detailed review was undertaken of medical services in the villages and towns, with particular regard to equipment and training needs. Visits were made totheNational Referral Hospital: Vila Central Hospital, Efate (Level 6); Regional Referral Hospital: Northern Districts Hospital, Luganville, Santo (Level 5); Level 3 Health Centres at Paunagisu Health Centre, North Efate, Fanafo Health Centre, Santo and Port Olry Health Centre, Santo and a Level 2b Dispensary: Erakor Dispensary, Efate.

The following comments are pertinent to this report.

1. Staff morale would be enhanced by availability of improved communications.
2. Vacuum birthing equipment and ultrasound is requested.
3. In-house training and distant education for improved morale, skill base and service.
4. The villagers should provide voluntary maintenance support, so that accumulated funds can be spent on more important requirements.

5. Increase in the retirement age so as to retain experienced staff.
6. Microscopes needed for malaria and HIV in hospitals.
7. Need for pressurized autoclaves, drip stands for IV infusion, baby scales and blood pressure measurement.
8. Overall recommendations
9. Introduction of local, in-house apprenticeships at all levels.
10. Increase in the retirement age so as to retain experienced staff.
11. Engineer required for equipment repair (Engineers Australia support).
12. Support for cervical cancer screening.
13. Palliative pain centre is required for end-stage cancer patients.
14. Telemedicine via mobile phone technology using the existing transmission towers.

About the Author

Professor Barry Allen was the Inaugural Chair, Health Technology Task Group (HTTG). He is the President, International Union of Physics and Engineers in Medicine (IUPESM) and Past-President, International Organisation for Medical Physics (IOMP).

The author had previously reviewed appropriate health technology needs in the Mekong Delta, Vietnam and in several provinces in the Philippines.

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O9: Developments of 3D Polymer Gel Dosimeters for Radiotherapy Treatment Planning

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Abstract

Some formulations of anoxic and normoxicthree-dimensional(3D) polymer gel dosimeters have been successfully fabricated and studied from radiation sensitive soft-tissue equivalent monomers including acrylic acid (ACA), methacrylic acid (MCA), 2-Hydroxyetyl acrylate (HEA), 2-Hydroxyethyl methacrylate (HEMA), acrylamide (AA), methacrylamide (MAA), and N,N'-methylene-bisacrylamide (BIS). The dosimetric characteristics were measured using nuclear magnetic resonance and FT Raman spectroscopy and imaged using magnetic resonance imaging to obtain 3D radiation dose distribution.The fundamental science underpinning polymer gel dosimetry and the dosimetric information derived from the formulated polymer gel dosimeters areexamined and discussed.

Keywords: Polymer gels, monomers, crosslinker, radiation-induced polymerization, 3D dose distribution

O10: The Radiotherapy Challenge in Developing Countries and Initial Experiences with a New Type of Linac Installed in Iran

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Abstract

Background: The inequities in cancer radiotherapy services between the developed and developing worlds have

been highlighted in recent years. However, the utilization rate of radiotherapy as a major method of combating cancer is poorly estimated and documented in many cases within developing countries. A low utilization rate translates into the fact that significant fractions of cancer patients who could benefit from radiotherapy cannot do so because of shortages in radiotherapy centres and machines in many developing countries. Following a brief review of the current status of radiotherapy services in such countries, we report on our centre's initial dosimetric experiences of one of the first machines of a new type of linear accelerator (linac) installed in Iran as part of a national initiative to increase the availability of linacs to patients suffering from cancer in this country.

Methods: Publications by world authorities such as the International Atomic Energy Agency were used to compare the number of radiotherapy machines available per million population in different countries. Following the installation of a 6 MV Elekta Compact linac at Namazi Hospital, Shiraz University of Medical Sciences, daily measurements of beam characteristics were made over a 4-month period of clinical service to check their stability. Additional measurements throughout the length of a treatment day were also carried out on several days.

Results: The available evidence and statistics show that the utilization rate of radiotherapy machines in most developing countries is far below the highest international levels of approximately 50% to 60%. Our measurements of the linac's beam output, flatness, symmetry and energy stability were well within the 2% or 3% recommended acceptability criteria.

Conclusions: It is evident that the number of radiotherapy machines needs to be substantially increased in most developing countries. Treatment machines designed with less-resourced communities in mind constitute a step in the right direction towards solving this problem. Our centre's initial experiences of the dosimetric stability of a relatively simple design of linac marketed mainly as such a machine have been positive and encouraging.

Keywords: Cancer radiotherapy, Developing countries, Linear accelerators, Elekta Compact

O11: Non-Ionizing Radiation and Health Hazards

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Abstract

During the 20th century, human are exposed to a wide range of powerful, naturally and artificially generated non-ionizing radiation, which became a great deal of concern for scientists and physicians about the possible effects and their health hazards. New technologies, which use the non-ionizing radiation, are incorporated in many aspects of telecommunications, medicine, etc. Herein, if there is any impact of this kind of radiation on health, it would affect almost everyone in the world. There is a lot of interest about the possible effects of this wide range frequency spectrum radiation. Yet, there is a lack of awareness and understanding of the impact of this radiation can have upon health and wellbeing. Many studies have been carried out or are in progress about their various adversely effects upon the behavior, central nervous system, children, cancer, sleep, cardiovascular system, immune function, reproduction and development. These works can open new horizons of opportunity to protect against the potential hazards. The evaluation of the possible effects of new non-ionizing radiation sources such as mobile phones, radar and communicating base stations is a complex process that needs the combined contributions of many scientific disciplines. However, the progress of science will provide the world with new emitting sources and subsequently with new problems. The non-ionizing radiation was, is and will be a part of human life. The monitoring of literature on this scientific field shows a shift of research, which follows exactly the new technologies. In the meantime, we can help ourselves by learning how to detect the hazards and daily practice prudent avoidance.

Keywords: Non-ionizing radiation, health hazards, telecommunications, health status.

O12: Synthesis and Characterization of Magnetite Nanoparticles Stabilized with Citrate for Biomedical Applications

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ABSTRACT

In the present work Magnetite nanoparticles (MNP) of about 10 nm were synthesized by an economic, biocompatible chemical co-precipitation of Fe2+ and Fe3+ in an ammonia solution. The size and surface of the particles are crucial factors in the application of the particles. Synthetic methodology has been developed to get a well dispersed and homogeneous aqueous suspension of MNPs.The MNPs have extensive hydroxyl groups on the surface by contact with aqueous phase. Citric acid was used to stabilize the magnetite particle suspension, it was anchored on the surface of freshly prepared MNPs by direct addition method. The surface hydroxyl group react with the carboxylic functions of citric acid. The surface of magnetite nanoparticles can be stabilized in an aqueous dispersion by adsorbtion of citric acid. This acid may be adsorbed on the surface of the MNP by coordinating via one or two of the carboxylate functionalities depending upon steric necessity and the curvature of the surface. Carboxylic acid terminal group not only render the particles more water dispersible but also provides a site for further surface modification. The microstructure and morphology of the nanoparticles were characterized by X-ray diffraction (XRD) and transmission electron microscopy (TEM), and the interaction between citric acid and MNPs was characterized by Fourier transform infrared spectroscopy (FTIR), whereas the magnetic properties were investigated by vibrating sample magnetometry (VSM), It is found that the nanoparticles demonstrate well defined superparamagnetic behavior.

Keywords: Magnetite nanoparticle, Citric acid, biomedical

BIOMEDICAL ENGINEERING

01: Modeling and Analysis of a Novel Method to Check Suture's Tension During Laparoscopic Surgery

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Abstract

Introduction: During Suturing in laparoscopic surgery, sometimes, over-tensioning of the suture due to lack of haptic feedback will cause the tissue to be torn. In this paper, design and analysis of a novel device which measures the suture's tension was discussed.

Methods: The device worked in two modes to load the suture's knot, i.e. monitoring-state and ultimate-state. In order to investigate the performance of the mechanism a finite element has been developed.

Assumptions and Boundary Conditions: As shown in Fig. 1 there is a support for the surgeon's wrist and as a result it has been considered as the fix part and clamp constraint was applied on it. The stress is applied on bobbin's surface and thus on its center. Thus, the suture's tension which is transmitted through bobbins was modeled with surface distributed forces on the cable's way.

Results: The dimensions of the parts are suitable based upon the Von Misses theory, i.e. the maximum stress was 1.8 MPa while, the ultimate stress of the specific alloy is 90 MPa. The stress distribution contours also showed that the results of the analytical method and that of the finite element confirm each other. The overall result is that the device is appropriate to be used in suturing during laparoscopic surgery due to its ability to appropriately transfer the suture's tension to the measure side.

Keywords: Endoscopic surgery, Suture's tension, Tension measurement, Finite element analysis.

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O2: Digital Subtraction Phonocardiography Applied to the Detection and Characterization of Heart Murmurs

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Abstract

Under certain pathologic conditions, such as a small hole in the ventricular septum, the normal laminar blood flow becomes turbulent. This turbulence can be heard as a noise namely murmur. We suggest that in order to better identify the pathology and make a reliable diagnosis, the murmurs must be separated from the underlying deterministic heart sounds. In this study we have attempted to develop an easily-implemented and inexpensive non-invasive approach to distinguish the murmurs from the underlying normal heart sounds by processing the acquired phonocardiogram of a patient. The new technique of Digital Subtraction Phonocardiography was developed and evaluated first by applying advanced signal processing techniques on data acquired from healthy volunteers. Then, the technique was evaluated in a cohort of patients with pathological murmurs to determine its clinical potential through a comparison of the results with those from auscultation and echocardiography on these patients.

Keywords: Murmur, Phonocardiogram, Electrocardiogram, Echocardiography

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O3: Continuous and Noninvasive and Cuffless Blood Pressure Monitoring Using ECG and SpO_2 Signals

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Abstract

One the most important problems, especially in Operating Rooms and in monitoring devices is measurement of Continuous and Cuff less Variable Blood Pressure. Pulse transition time(PTT) Parameter is related to the cardiovascular system and Blood pressure(BP) is measured continuously with Help of pulse oximeter signal and ECG extraction, its linear relationship and BP. In this paper the method has been design that through it without shutting down cuff and with using PTT blood pressure will monitor. Continuously recorded the pulse wave and ECG through a Setup that has featured of recorded the two signals is performed. Pulse sensors on the left hand index finger and ECG are recorded in lead I. By detecting pulse signal peak and R wave in ECG signal, the PTT time interval is calculated and parameters of PTT relation and pressure are estimated using collected dataset. For 40 person, recorded pulse wave and ECG signal is done. Results show that the PTT parameters with a minimum amount of regression 0.95 were dependent to SBP and 0.93 to DBP and BP monitor with appropriate accuracy. In this way a new noninvasive method has been designed and evaluated for continuous measurement of BP in OR.

Keywords: Continuous measurements of blood pressure, Pulse Transition Time, Pulse wave, ECG

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O4: Simulation and Analysis of Motor Unit Action Potential by Using Macro,SF,CN Electrodes

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Abstract

Electromyography (EMG) is a valuable clinical test in detection of muscle and nerve pathology and distinguishing between myogenic and neurogenic conditions from normal condition. In neurological - muscle disorders geometry motor units are subject to change status. Help EMG signal waveform based on the profile record, we can find access to pathology. This subject requires detailed knowledge about the relationship between resources and creates a waveform parameters that are measured.

Computer simulation models and can extract the effective way to communicate, to be used. In this simulation study outside line motor unit action potential in normal mode and neurological - muscle disorders using three electrodes Macro - a single fiber(SF) - CN is designed. Also, with appropriate changes in the normal mode simulation parameters, signals, motor units in some neurological – muscular diseases simulated signal parameters values and ultimately ill health than the state - both in simulation mode and the clinical state - about is investigated.

Keywords: simulation EMG, needle electrode, motor unit, action potential

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O5: Application of Voice Analysis for Early Diagnosis Hypothyroidism

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Abstract

There are some diseases e.g. Parkinson, Hypothyroid, etc. that affect human voice. In this study we selected hypothyroidism because it was one of the most common diseases in Iran. The goal of this study was to distinguish healthy and hypothyroidism subjects. This process was performed by support vector machine and voice analysis. Subjects for this study consisted of 28 people whom 17 were diagnosed to have hypothyroidism. The voice of patients was recorded: just before beginning of treatments, two months after treatments and four months after treatments. Voice data processing for normal and patient subjects were performed. We used traditional parameters e.g. fundamental frequency, jitter, shimmer and NHR, and, nonlinear parameters e.g. RPDE and DFA. Then we applied SVM classification. In this process, different groups of parameters were compared. These groups of parameters which had the highest sensitivity were selected for the separation of healthy and hypothyroidism subjects. The sensitivity of classification at the first stage was 95.45%. In accordance with high sensitivity at the first stage, classification and voice analysis can be used to help the early diagnosis hypothyroidism.

Keywords: Thyroid dysfunction, Voice analysis, SVM classification

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O6: A Novel Haptic System for Use in Human Hand Rehabilitation

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Abstract

The sense of touch and force feedback are the essential components of the haptic. The most illustrious feature of the haptic systems is to change the healing process from a qualitative domain to a quantitative one.

Upper extremities hemiplegia after stroke is common and disabling. The ideal progress includes continuous practice by the patient at his home not only at the cure center. The haptic systems have many advantages e.g. they can reduce some costs include transportation and hospitalization. The aim of the paper is design and fabrication of a haptic system for rehabilitation of human hand muscles. It assists repetitive grasping and releasing movements while allowing the subject to feel real object in his hands during therapy and in a parallel way, forces and torques are gained. Thus, this arrangement confers a more precise criterion to the physician to forecast the time duration elapses for the healing. To facilitate movement, especially of grip, a novel haptic system has been designed and we are fabricating it to permit independent actuation of thumb and other fingers. This haptic system will be used to plan strategies for optimizing rehabilitation of grip following stroke. The critical torque occurs when hand is at the maximum flexion and extension during gripping. Generally, in human hand rehabilitation the maximum value of the torque applied by the patient is reported equal to 2 N.m. In order to calculate the actuators torque, Newton-Euler equations are employed.

Keywords: Haptic, Force feedback, Rehabilitation, Stroke, Hand muscles, Gripping.

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O7: Design and Fabrication of a Novel Wearable Automated Peritoneal Dialysis Device

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Abstract

End-stage renal diseases can be treated by three common routes – kidney transplantation, hemodialysis (HD), and peritoneal dialysis (PD) which is an efficient technique refrains from inconvenience of HD. Although the clearance of urea and creatinine in PD is relatively lower than in HD, the former method gives the patient more control on his/her life and significantly improves its quality. Two major types are defined and used for PD – continuous ambulatory (CAPD) and automated (APD). Studies on these two types indicate that the survivorship rate in APD is higher than CAPD; hence, those PD treatments that employ a cycler machine to handle the dialysis phases are more recommended in long-term usage. Therefore, designing a small-scale generation of PD devices is of practical importance. The present article aims to develop a novel generation of wearable automated peritoneal dialysis (WAPD) device. The device incorporates a peristaltic pump to inject and drain the dialysate, two flowmeters to measure the volume of dialysate, and, a servo motor-actuated triway valve to conduct the dialysate to the right path. Moreover, in order to disinfect the permanent tubes inside the device, an externally-attached steam sterilizer is designed.

Electrical power of the WAPD device is supplied by solar rechargeable batteries. Tests of the 15 × 13 × 5 cm device ensure that the three mentioned phases are efficiently performed, and the alarms work properly. This generation of PD can surmount the social isolation problems of either children or adults, and notably increase their life quality.

Keywords: End-stage renal disease, peritoneal dialysis, wearable automated

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O8: Application of Lattice BOLTZMANN Method to Simulate Blood Flow in Carotid Artery

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Abstract

The LBM can be used to study many of the flow properties that are important in hemodynamic modeling and has been used to blood flow simulation applications. In the clinical context, blood flow behavior plays a crucial role in the understanding, diagnosis and treatment of many conditions. The lattice-Boltzmann method can be viewed as a special discretization of the continuous Boltzmann equation and is thus a kinetic approach that, unlike conventional numerical schemes, does not discretize the macroscopic continuum equations with the attendant need to solve the Poisson equation. Therefore, the lattice-Boltzmann (LBM) method offers an attractive alternative, so our fluid solver is based on this modelling and simulation approach. Due to its simple implementation, straightforward parallelization, and easy grid generation, it might be considered a more suitable approach of blood flow simulations. These characteristics make LBM model be used as a promising tool for biomedical modeling with more easily augmented to include non-Newtonian rheology or biological processes. Recently, the interest in Lattice Boltzmann methods by the computational fluid dynamics community has notoriously increased as a way of addressing the problem of modeling complex flows. In this work, we implement a Lattice-Boltzmann model with the aim of simulating blood flows in the carotid artery. The selected model, based on a single-relaxation-time approach, is briefly described for both velocity and pressure profiles and proper equilibrium distributions that take care of the incompressible behavior of the fluid. As carotid artery Fluid flow simulation of very large and complex systems requires the use of a suitable physical model, substantial computational resources, as well as applications capable of exploiting them effectively.

Keywords: Carotid artery, Blood flow, Lattice Boltzmann method, Kinetic approach

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O9: Fiber Optic (SiO_2:Ge+P) Dosimetry in Medical Application

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Abstract

Measurements of ionizing radiation and dose determination has been a difficult task for physicians during the

radiotherapy in medical centers. Therefore, it is important to propose methods to obtain accurate dose given to an organ of the body. In this work, a fiber optic dosimeter has been designed and fabricated for the first time in Iran and capable of measuring precise biological dose. Advantages of this dosimeter are: 1-on-line dosimetry. 2-very small in size. 3-measuring in a broad range of energy. 4-can be used in a harsh environment. 5-very cheap and etc... This dosimeter system operates based on intensity modulation in a specific wavelength. When ionizing radiation interacts with the fiber, its index of refraction changes. This change is proportional to the intensity of light exiting the fiber. Once the fiber dosimeter is calibrated for a certain wavelength, the changes in light intensity could be related to the dose received by the biological organ.

Keywords: Detection, Fiber Optic Sensor, Gamma Ray, Light Absorption.

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O10: Object Recognition with Piezoresistive Tactile Sensor

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Abstract

The design and testing of a flexible tactile sensor and its application are presented. This sensor is made of polymer material can detect 2D surface texture images and contact-force estimation or pressure distribution. The sensing mechanism is based on the piezoresistive effect. The sensitive area of designed tactile sensor consist of an array of several piezoresistive elements that sandwiched between two polymer plates. Each cross section of the grid formed a contact piezoresistive force sensor, Fig 1 shows a schematic of our design scanning circuit. Furthermore, the sensor's size and shape can be easily tailored to the applications requirements. Tactile sensor with 4*4 and 8*8 array of elements are developed and tested, this facility is caused the more sensor capability in intelligent systems.We designed and constructed an interfaced to computer for the convenience of automatic scanning and making it more user interactive.

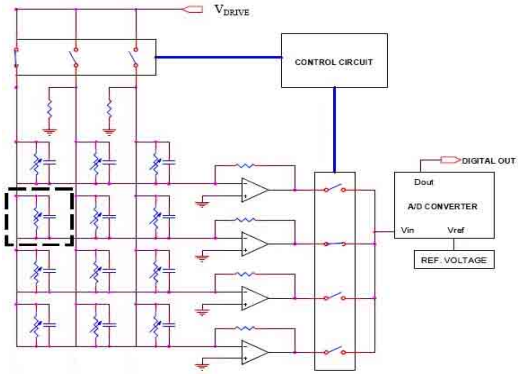

Figure 1: A schematic of scanning circuit

Keywords: Tactile sensor, Force Measurement, Piezoresistive, Object Recognition

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P1: Modeling Human Respiratory System Healthy and Breath Patients by Using PSO Algorithm

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Abstract

Because of lung vital role in the human body and its prevalence, respiratory system modeling has long been considered. so identified respiratory function is very important. Particularly for understanding the physiological diagnosis and treatment of lung and pulmonary diseases and other aspects such as applications to help identify the respiratory organs and the modeling is very important. The aim of this paper presented to achieve more realistic behavior and increased lung model is accurate. As possible so that the problems raised in previous models improve, so the main aim of this paper is to achieve a more comprehensive model that can complains static and dynamic respiratory system and characteristics of the nonlinear Flow resistance. Here, the PSO algorithm to estimate model parameters and respiratory changes in the model we have used and using PSO algorithm investigate changes in respiratory physiology of asthma and asthma medication the intended therapeutic effect.

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P2: Identification of Viscoelastic Constitutive Characteristics for Periodontal Ligaments

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Abstract

The majority of soft biological tissues such as ligaments and tendons exhibit as viscoelastic bodies or have time-dependent behavior. The constitutive characterization of soft tissues is of the most important objects in clinical medicine and especially in the field of biomechanics. The periodontal ligaments play an important role in initiating tooth movement when loads are applied to teeth with orthodontic appliances. It is also the most accessible ligament in the human body as it can be directly manipulated without surgical intervention. The periodontal ligament is a thin layer of soft tissue that connects the root of a tooth to the surrounding alveolar bone. From mechanical point of view, it can be considered as a thin interface made by a solid phase, consisting mainly of collagen fibers, immersed into a so-called ground substance. In particular, three-dimensional stress fields depend on the constitutive characteristics. Here we attempt to substantially model the viscoelastic constitutive characteristics of periodontal ligaments, by developing the generalized Voigt-Kelvin and Wiechert models into their load-displacement experimental data; these models have been used to model the constitutive characteristics, including creep and relaxation, in which relaxation and creep functions were represented by the sum of a constant plus a series of decaying exponential terms of time. The other aim of this work is to develop a mathematical model capable of determining the time-dependent Poisson's ratios of periodontal ligaments based on experimental data of stress relaxation and creep for viscoelastic ligaments. The resulting stress relaxation and creep curves are described by a three-parameter viscoelastic models. The time-dependent Poisson's ratios of periodontal ligaments have been obtained as increasing functions of time, because shear modulus of periodontal ligaments relaxes much more than their bulk modulus.

Keywords: Viscoelasticity, Periodontal Ligaments, Constitutive Models, Poisson's Ratio

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P3: Genetic-PID Control of Elbow Joint Angle for Functional Electrical Stimulation: A Simulation Study

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Abstract

Functional Electrical Stimulation (FES) is the most effective technique for improving motor functions in Spinal Cord Injury (SCI) individuals. In this study, we used a model consists of a joint, two links with one degree of freedom, and two muscles as flexor and extensor of the joint, which simulated in MATLAB using SimMechanics and Simulink Toolboxes. The muscle model is based on Zajac musculotendon actuator and composed of a nonlinear recruitment curve, a nonlinear activation-frequency relationship, calcium dynamics, fatigue/recovery model, an additional constant time delay, force-length and force-velocity factors.

In this study, we used a classic controller for regulating the elbow joint angle; a Proportional- Integral- Derivative controller. First, we tuned the PID coefficients with error and effort, and then a genetic algorithm was used to optimize them. This genetic-PID controller uses genetic algorithm to get the required pulse width for stimulating the biceps to reach the elbow joint to the desired angle. The fitness function was defined as sum square of error.

The results for Genetic-PID controller show smaller overshoot and less oscillation for reaching the range of the set point than the PID controller tuned by trial and error. The settling time is about half and also the steady state error is much less in Genetic-PID in comparison with PID tuned by trial and error. There is a point that a PID controller which has been tuned for a certain set point cannot support a wide range and the result may be unstable out of a certain range.

Keywords: Functional Electrical Stimulation, PID controller, Genetic Algorithm, Elbow Joint.

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P4: Feedforward-Feedback PID Control of Elbow Joint Angle for Functional Electrical Stimulation: A Simulation Study

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Abstract

Functional Electrical Stimulation (FES) is the most commonly used system for restoring functions after Spinal Cord Injury (SCI). In this study, the model contains one joint, two links with one degree of freedom and two muscles in the sagital plane which simulated in MATLAB using SimMechanics and Simulink Toolboxes. The muscle model is based on Zajac musculotendon actuator and composed of a nonlinear recruitment curve, a nonlinear activation-frequency relationship, calcium dynamics, fatigue/recovery model, an additional constant time delay, force-length and force-velocity factors.

In this study, we used a combined feedforward-feedback PID controller for regulating the elbow joint angle. Feedforward controller is unable to make corrections if the actual angle deviates from the desired angle. Feedback control monitors the system output, so it can correct the error. Therefore, a combination of feedforward and feedback control is the prefered control method in FES system designs. First, we tuned the PID coefficients with error and effort, and then a genetic algorithm was used to optimize them.

A comparison between the results of suggested controlling method and the results of genetic-PID feedback controller has been done. The results show a little overshoot and no oscillation for the combined controller. The settling time is near to 52 percent of corresponding value in genetic-PID feedback controller and the steady state error is about 15 percent less. And of course, the feedforward-feedback controller has much better results in wider range of set points, about 20 degrees more, before the system become unstable.

Keywords: Functional Electrical Stimulation, Feedforward-Feedback, PID controller, Genetic Algorithm, Elbow Joint.

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P5: Evaluation of the Droplet Collapsibility in Inhalation Drug Delivery: A 3D Computational Study

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Abstract

Release of the drugs into the human body through the pulmonary system gains a lot of attention during the last years. The principal concern about this safe, painless and fast method of delivery is whether the drug substances are targeted in the right place. To this end, several multiphase flow analyses have been developed to predict the fate of particles used in inhalation drug delivery; however, the collapse of droplets during their passage through respiratory tract has not been investigated. The goal of this study is to assess the probability of droplet collapse in upper human respiratory airways. The effects of the inhalation flow rate which is case-dependent, as well as droplet size which is the pharmaceutical design parameter, are examined within the analysis. A three-dimensional model of mouth-to-second generation airway after the trachea is employed with application of a computational fluid dynamics modeling. The model is undergone to a bi-phasic fluid mechanical analysis in order to track the droplets through the airways and indirectly determine where they are near to collapse. A new parameter, droplet collapsibility index (DCI), is defined to evaluate the probability of collapse during the release of droplets through the model. The dimensionless DCI evaluates how the viscous forces applied to a droplet from the surrounding carrier medium, i.e. the inspiratory air, is potent to overcome the internal surface tension forces that aggregate the molecules of the droplet together. In this way, when the DCI exceeds from unity, the droplet is about to collapse. In the present simulation, the inhalation regime is assumed to be turbulent and governed by the Renormalization Group k-e equations. The achieved results state that droplets with diameter between 0.1 and 1 mm are of higher risk of collapse. When different diameters of 0.1, 1, 10 and 100 mm are taken into account, results show a non-linear behavior. Among different diameters, lowest values of the DCI occur in droplets with largest diameters. Fundamentally, dispersion of the larger droplets in the respiratory air decreases the turbulence intensity and then the average velocity of the mixture; hence, the viscous forces are remained weaker than the surface tensions. Also the most probable region of collapse was distinguished to be glottal bend. The possibility of the collapse of droplets is strongly influenced by the inlet conditions. The condition becomes progressively severe by increase in the breathing air flow rate. By elevation of the inspiration flow rate from 10 to 30 L/min, the droplet collapsibility rises from 0.75 to 2.25 exceeding collapsibility threshold. Results can be applied in evaluation of risk of collapsibility of particles in design of inhalation drug delivery systems.

Keywords: Drug delivery, inhalation, droplet collapsibility, computational fluid dynamics

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P6: A New Mechanism for Detecting Breakthrough in Stapedotomy

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Abstract

A stapedotomy operation is carried out where the ossicular chain's movement is impaired by a common disease named otosclerosis. To remedy this condition, part of the chain must be replaced by a prosthetic piston. But, there is a problem during this surgery as the stapes will deflect when subjected to forces, and the penetration of membranes in the inner ear can result in total deafness. Also, the surgeon has the difficulty of monitoring the progress towards breakthrough and hand-held drills which are employed by some surgeons, offer very little tactile feedback at the time of breakthrough. Considering the present problems and limitations, a new measuring force mechanism on a microdrill tool which can be used for detecting breakthrough in ear surgery is described. So, the goal of this paper is to present the microdrill mechanism which can automatically stop drilling at the moment of breaking through.

The drilling unit is entirely controlled by the computer that analysis the force and torque imparted onto the drill bit in real time. Analysis of the force is by a force sensor which is located at the end of the mechanism. Also, the torque is determined by the electrical power needed to turn the drill at a specified speed. By equipping our microdrilling tool with measuring mechanism, we obtained a graph which represent drilling force respect to time. As a result, the feature corresponding with a peak in torque and a falling value of force, represents progress in the breakthrough process.

Keywords: Stapedotomy surgery, Breakthrough detection, Drilling force

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P7: Simulation of Cochlea Location and Its Impact on the ECAP in Cochlear System

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Abstract

cochlear implant is the most common system to restore hearing function of people with damaged hair cells but normal auditory nerve. Standard electrode array systems for MED-EL MAESTRO Cochlear approximately 31mm in length allows entering of 720 degree angle. The electrode is headed fully into the cochlear region. So far no reviews on different subjects with ECAP on CI Systems has been done. Through the ECAP threshold of hearing can be calculated (THR) and maximum comfort level (MCL) after cochlear implant. The purpose of this paper identify specific features that you can change the recorded ECAP. subjective data of this paper is received from Clinical audiology of Beheshti University of Medical Sciences in June 1389.

Keywords: cochlear implant, ECAP, hair cells, MED-EL MAESTRO, MCL.

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P8: Spectral Subtraction Based on Speech/Noise-Dominant Classification in Cochlear Implant System

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Abstract

The purpose of this paper was to improve the speech processing strategy for cochlear implants (CIs) based on speech/noise-dominant classification. This paper presents a spectral subtraction using the classifications between the speech dominant and the noise one. In our system, a new classification scheme between the speech dominant and the noise one is proposed. The proposed classifications use the standard deviation of the spectrum of observation signal in each critical band. Then the resulting signal send to channels of speech signal processing in Cochlear system. The proposed method is tested on several noise types from the Noisex-92 database.

Keywords: cochlear implants, spectral subtraction, speech processing, noise.

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P9: Classification of Auditory Brainstem Response by Wavelet Analysis

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Abstract

The auditory brainstem response (ABR) has become a routine clinical tool for hearing and neurological assessment. In order to pick out the ABR from the background EEG activity that obscures it, stimulus-synchronized averaging of many repeated trials is necessary, typically requiring up to 2000 repetitions. This number of repetitions can be very difficult, time consuming and uncomfortable for some subjects. In this paper, a method of wavelet analysis is introduced to reduce the required number of repetitions, which could offer a great advantage in the clinical situation. 314 ABRs with 64 repetitions and 155 ABRs with 128 repetitions recorded from eight subjects are used here. A wavelet transform is applied to each of the ABRs, and the important features of the ABRs are extracted by thresholding and matching the wavelet coefficients. subjective data of this paper is received from Clinical audiology of Beheshti University of Medical Sciences in June 1389.

Keywords: auditory brainstem response, stimulus-synchronized averaging, wavelet analysis, wavelet coefficients.

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P10: Determination of Residual Stress of Intervertebral Disks by Finite Element Approach

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Abstract

Residual stress is a kind of stress that is trapped in the tissue even if there is no mechanical loads form environment. Scientists believe that presence of residual stress would reduce the peak amount of the stress when a tissue is under loads. Determining the exact distribution of residual stress is necessary for not only measurement of stress and strain in non-stress state, but also for analysis of strain and remodeling process. In this study, for the first time, the residual stress of intervertebral discs (IVD) has been determined with a finite element approach.

Since residual stress is independent of loading, it could be hardly measured directly. As a result, it is usually calculated through the residual strain, which could be measured directly. To achieve this, in this study, the IVDs had to be cut so that the residual stress was eliminated. Then, the opening angle of the IVD, as the residual strain, was measured and considered as the input data. Finally, using ABAQUS 6.7-1 analysis, the stress that could form such a strain would be calculated.

To determine the residual stress in IVD, 28 intervertebral disks were extracted from 7 bovine tails. Since the discs had anelliptical shape, 14 were cut in the direction of longer diameter and 14 others in its shorter diameter. The average opening angle of the disks after cutting was 44.9±6 degree. The one-way ANOVA method was used, resulted the P value of 0.875, which proved that the direction of cutting had no effect on the amount of opening angle.

At next step, a finite element model of an elliptical disc with the longer diameter of 2.5 cm, shorter diameter of 2.2 cm, thickness of 1 cm, and opening angle of 44 degree was created. The hyperelastic properties with neo-Hookean strain energy model was used for ground tissue (puplosus nucleus) and elastic properties was used for elastic fibers of annulus fibrusus. Considering some position boundary conditions, two surfaces of the opened angle were attached to each other to simulate the disk's condition before cutting. This way, the forces that keep the two surfaces attached to each other could be calculated as the residual forces that were trapped in the disc. The finite element analysis resulted that the maximum and minimum amounts of Von-Misses residual stress was 0.76 MPa and 0.34 MPa respectively. The stress contour differed from 0.44 MPa to 0.76 MPa for the ground matrix, and from 0.33 MPa to 0.44 MPa for the nucleus.

Keywords: residual stress, residual strain, intervertebral disks, finite element method.

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P11: Finite Element Analysis of a Novel Robotic Flexible Instrument Applicable in Minimally Invasive Surgery

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Abstract

As an attempt to improve quality of life of a patient, minimally invasive surgery (MIS) is widely performed in medicine which is done through the incisions of 5 to 10 mm. MIS has a marvelous characteristic that can reduce a burden of patients. However, it causes difficult operation due to the inflexibility of surgical instruments and small work space. Some of laparoscopic surgeries maneuvers are difficult to perform, as they require using rigid instruments. So, multi degrees of freedom instruments have been developed to increase movement dexterity. In this paper, design, modeling and fabrication of a novel surgical hand held flexible instrument is presented. This flexible instrument consists of three main components, which are wrist mechanism, cable and back end mechanism, and end effector mechanism. The proposed surgical instrument has 5DOF with 8 mm diameter and has bending range of -90 to +90 degrees in horizontal and vertical directions. Main advantages of this instrument are its low weight and the ability of providing sufficient degrees of freedom for movement in complex spaces. For studying the instrument mechanical performance, instrument wrist finite element analysis (FEM) has been done. Two states are assumed. First, the instrument moves due to actuator cables and second, the instrument is located in a certain position by surgeon and a force equal to 0.1-11 N is applied on the end effector from the tissue. Finite element analysis of the constructed surgical instrument shows that the proposed instrument has a reliable mechanical structure for using in MIS.

Keywords: Laparoscopic surgeries, Snake-Like instruments, Flexible instruments, Finite element analysis, Mechanical analysis.

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P12: Mechanical Optimization in Dental Implant

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Abstract

Rapid progress in dental implants is mainly because of investigation of mechanical behavior of human tooth and its replacements. In this research the statical and Variable loading experiments has been done on enamel of human tooth and polymerical veneer teeth. Some mechanical parameters related to fatigue and statics such as Endurance Limit, Fatigue Strength, Young Modulus, Stiffness, Fracture Toughness and Yeild Strength has been calculated by using Experiment Results. Then the parameters were compared between two specimens, afterward the results were verified by valid referances. At the end some new optimization points were suggested for improvements of current types of tooth replacements and dental implants.

Keywords: Dental Implant, Tooth Replacements, Tooth Mechanical Behavior, Fatigue Parameters

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P13: Determination of the Force Applied by Surgical Flexible Instrument on the Biological Tissue in Minimally Invasive Surgery

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Abstract

Minimally invasive surgery (MIS) is an operating technique in which long slender surgical instruments are inserted into the patient's body providing advantages such as shorter hospital stays and lower trauma. In the robotic MIS systems currently available commercially, no force or tactile information is provided. This lack of haptic force feedback may cause accidental puncturing of blood vessels or tissue damage. To avoid such risks, sensing elements must be integrated with the instruments. This paper presents practical haptic system to provide force feedback for a novel flexible instrument.

To estimate the force on the tip of the surgical instrument, currents fed to the servo-motors could be measured as a factor of torque. As a result not only the device can be simply sterilized but it would be a cost-effective measurement. By using Inverse kinematics calculation the relationship between the motor torques and the force applied to the instrument tip could be calculated. For the first time, this technique has been combined with the current-based sensing method on a snake-like robot to estimate the end effector force. A numerical method was used to solve the equations by the instrument processor. The estimation error is also pointed out by developing test systems to evaluate the output and performance of the proposed method.

The experimental results have been reported for different test conditions. According to the results there is a nearly linear relation between the load and currents obtained in neutral position of the instrument. The results demonstrate that applied loads could be estimated to the instrument tip with a resolution of at least 50 grams. Although the estimator is designed for this particular robot, it is also applicable for other similar systems.

Keywords: Minimally invasive surgery, Cable-driven snake-like robot, Force feedback, Current sensing, Inverse kinematics.

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P14: An Impact Analysis of Human Ribcage in a Car-to-Car Crash: an Explicit Finite Element Study

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Abstract

Thoracic injuries occur commonly in vehicle crashes, sport accidents, or other brutal events. Majority of vehicle accident damages may be caused by either direct loadings of dash-board components or seat belt. The direct and harsh loads of the dash-board components, specifically wheel, on the chest is, however, more severe and may cause life-threatening injuries. Therefore, the present article aims to study the thoracic structural responses under the impact loading of a car-to-car crash. To this end, a realistic three-dimensional model of the human ribcage is employed to analyze the chest behavior using explicit finite element method. The model consists of sternum and first through tenth rib symmetrically located against saggital plane. A 5 kN load is normally applied to sternum, the rib ends are clamped and consider the effects of protected organs, a constant 40 kPa pressure is applied on internal faces of the ribs and the sternum. A strain failure threshold is considered based on the experimental data reported by literatures, i.e. e_f = 0.02. Results show that the most probable region to fracture is the lateral bending of the first and second ribs. The fracture's locations of the broken ribs clearly appeared where the maximum bending strains are. In the car-to-car crash in which the force reaches high magnitude of 5 kN, the most vulnerable rib is the first one. But if the time duration of the accident elapses more than 0.05 second, other ribs are seriously in risk of fracture threatening internal organs.

Keywords: Impact analysis, car-to-car crash, human ribcage, explicit finite element

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P15: Extraction of Tremor and Voluntary Movement From Accelerometer Data

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Abstract

There are so many people's lives that are affected by tremor. Only about 50% of them respond to medication. Surgery is expensive and also has side effects. So, alternative techniques are needed. Without considering the technique to suppress tremor, we have to record and process tremor and then generate control commands to attenuate tremor. But unfortunately, tremor is recorded with voluntary movement. Hence, the first step is to separate these two.

In this article, we used ADXL330 accelerometer which has three axes. It has sensitivity of 330 mv/g at 3.3 volt supply and can measure acceleration in range of. We had 4 test subjects that were asked to mimic tremor. Accelerometer attached to the dorsal side of the hand. Subjects were asked to move their hands toward a straight line and a spiral line while they mimic tremor during these movements. They also asked to mimic tremor while there was no movement. Recorded signals were 9 seconds and sampling time was 50 Hz.

For separation of tremor and voluntary movement we used an adaptive band-pass filter. The advantage of this filter is that we use tremor signal in a feedback loop to estimate the frequency of tremor and fed it back to band-pass filter. By doing this, we have a more accurate separation of tremor and voluntary movement, because filter adapts itself to the frequency at every moment.

Because we don't have a reference signal for tremor and voluntary movement, there is no quantified way to compare this filter with other methods. So, we used qualitative methods to evaluate this filter. For this purpose, we used time-domain representation and frequency spectrum of signals. Results show very good performance, regarding the separation of tremor and voluntary movement.

Keywords: Accelerometer, Tremor, Adaptive Filter

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P16: Analysis of Locomotive Robotic System Through the Flexible Environment for Use in Colonoscopy

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Abstract

The cancer of colon is one of the most common diseases of the gastrointestinal tract which many people in the world suffer from it. Furthermore, colonoscopy is the best diagnostic techniques that can be useful in colon cancer detection but many people do not accept it as a useful one due to its unpleasant procedure. According to this point, making the colonoscopy as a robotic procedure seems useful and necessary.

In this regard, a semi-autonomous device capable of propelling itself in the flexible environment would be introduced and assumed that the inchworm locomotion was underlined three different phases (elongation, retraction and clamping) and focused on the analysis of its locomotion in a flexible environment. At the first step, the efficiency of locomotion was proposed as the ratio of the effective advance in a cycle divided by the stroke (equation (1)): (Equation (1))

Following, the efficiency was calculated in each of these three phases. For elongation phase, by calculating the intestinal and mesenteric Lagrangian stresses and using constitutive pseudo-elastic equation, the critical stroke of elongation phase would be obtained. For retraction phase, by considering the longitudinal stiffness of an equivalent mesenteric strip and using the same mentioned constitutive equations, the critical stroke of retraction phase would be obtained. Then we can conclude that the critical stroke depend on the retraction phase; this point can be utilized as a design criterion in design and fabrication of new colonoscopy robotic systems.

Keywords: robotic colonoscopy, Inch worm-like robotic locomotion, Endoscopic robot, Locomotion efficiency, intestinal soft tissues, viscoelasticity

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P17: Quantification the Effect of Ageing on Characteristics of the Photoplethysmogram Using an Optimized Windkessel Model

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Abstract

In this research, a heuristic algorithm is presented to quantify the variation of physical characteristics of vessels, same as compliance and elasticity, with aging. The presented algorithm is based on investigation the variations of the photoplethysmogram signal using the automatic optimization of state space variables of the Windkessel's electrical model. The quantitative parameters such as error rate and cross correlation are calculated to evaluate

the optimized model. The experimental studies are done on 30 healthy subjects who were selected and grouped in six age intervals, from 20 to 50 years old. The simulation studies are implemented in the SIMULINK toolbox of MATLAB software environment. The results show that a delay time and amplitude reduction for the second peak of photoplethysmogram signal can be observed as age increases.

Keywords: photoplethysmogram, state space variable, ageing, Windkessel's electrical model

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P18: Interaction Effect of Spatial Frequency and Vertical Prism Induced Stress on Binocular Visual Evoked Potentials

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Abstract

The purpose of this study was to evaluate the interaction effect of spatial frequency and vertical prism induced stress on binocular visual evoked potential. The checkerboard stimulus patterns in two spatial frequencies (SFs) of 0.48 cpd and 2.18 cpd reversing in the temporal frequency of 4 Hz were used. The interaction effect of increasing visual stress by the vertical prisms of 0, 1, 2 and 3 prism diopter associated with modulation of SFs on binocular visual evoked potentials was investigated. The project was performed on the 23 participants (11 male and 12 female) with normal binocular visual system. The amplitude and latency of components of $N_{75,}$ P_{100} and N_{135} were measured during different vertical prism induced stresses in the two SFs for all cases. To compare the mean of amplitude and latency in the different vertical prism induced stresses in two different SFs, the Repeated Measure ANOVA statistical method with two main factors was used. The findings demonstrate a direct interaction between the vertical prism induced stress and the spatial frequency in effecting on The N_{135} component amplitude so that at higher spatial frequency, the vertical prism induced stress is more effective in decreasing amplitude (Repeated Measure ANOVA, $F_{3,63} = 4.706$, $P = 0.0\ 15$). The result of statistical analysis does not show a significant interaction between these two factors in other components. This result seems to be in agreement to the previous results indicating that the amplitude of N_{135} component more reveals the activity of extrastriate cortex.

Keywords: Visual Evoked Potential, Vertical prism induced stress, Binocular Vision.

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P19: Design and Modeling of a Powder Delivery System Used in Minimally Invasive Surgery

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Abstract

Minimally invasive surgery (MIS) has become increasingly an alternative to conventional open surgery. In spite of many advantages of MIS, some operations are restricted in this type of surgery because of the small incisions. One of the restrictions in minimally invasive surgery is delivery of medical powders to injured tissues. According to this point, in this paper, a new powder delivery system is presented to deliver various medical powders to the injured tissues during minimally invasive surgeries, which consists of a thin tube that the powder would be injected in it. The diameter of the designed powder delivery system is 4 millimeter and its length is 25 centimeter. The driving force for delivering the powder through the tube is gas. According to various advantages of carbon-dioxide, it is used in the designed instrument as the driving force.

In this paper, finite volume modeling of the designed powder delivery system is presented and Fluent is used as the finite volume modeling software. In this modeling, pressure of the gas flowing through the tube is in the range of 8-12 mmHg.

The effect of various geometrical parameters is investigated in this modeling and the pressure loss of the gas through tube length is calculated in different geometrical dimensions. Results show that in larger diameters there is less pressure loss and as a result more pressure in abdominal region. The results obtained from finite volume modeling are in agreement with the related existing theories.

Keywords: Minimally Invasive Surgery, Powder Delivery System, Finite Volume Modeling

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P20: Design and Modeling of a Novel Surgical Instrument Applicable in Esophagectomy

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Abstract

In transhiatal esophagectomy, the surgeon opens the diaphragmatic hiatus and mobilizes the esophagus by careful manual dissection up into the thoracic cavity. In this technique, surgeon's hand is entered in the patient's thorax blindly.

In this paper, design and modeling of a surgical instrument is presented which can be replaced with surgeon's hand in transhiatal esophagectomy. The proposed surgical instrument is one-fourth of surgeon's hand. It can enter the patient's body through a 5-cm incision in the abdomen. The instrument head consists of two parts; each part has five dynamic fingers. The two parts are unhooked and turns into a hollow cylinder embedding esophagus by means of a locking mechanism. So, the surgical instrument can surround the esophagus radially and dissect the adhesive tissues.

For evaluating the instrument, we analyzed its function with finite element method. For finite element modeling of esophagus and the tissues around it, we attributed mechanical properties to each delicate tissue around esophagus such as aorta artery. So, by applying mechanical movement on these tissues, their possible traumas and injuries can be determined.

As there is high adhesion between tumoral tissue and aorta artery, surgeon may harm the aorta while dissecting esophagus away from adjacent thoracic structures. So, we modeled the effect of the instrument on aorta while dis-

secting the adhesive tissues. The amount of forces applied on the tissues is achieved from force sensors installed on the instrument.

Keywords: Esophagectomy, Esophageal Cancer, Surgical Instrument.

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P21: A Novel Tactile Sensory System Based on Force and Displacement Feedbacks Used in Laparoscopic Surgeries

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Abstract

Laparoscopy is one of the primary methods of minimally invasive surgery that now is being widely used as a preferred choice for various types of surgery operations. Although this method of surgery offers many valuable advantages, but it suffers from a significant drawback; the less of surgeon's "tactile sense" which routinely used to extract a great deal of information about the health condition of tissues via palpation. In this regard, artificial tactile sensing approach is a new method that can be employed to attain tactile data in situations that human tactile sense cannot be used. Considering the present problems of kidney-stone-removal-laparoscopy, the aim of this research is to design and fabricate a novel tactile sensory system capable of detecting the exact location of hard object embedded in soft tissue during laparoscopy.

This new tactile sensory system consists of the following four main parts: sensory part (includes the displacement and force sensors), mechanical part (includes the hardware of instrument), electrical part (includes the tactile data processing system) and finally display part. Using a rotary motion and the rack-pinion mechanism, the sliding mechanism and following the head of instrument will move linearly. Simultaneously, the sensors recorded the tactile data. The recorded tactile data finally will be illustrated in a more interpretable way using LabView 8.5 software. Then, the fabricated new system was tested on experimental models which constructed using a sheep kidney containing an embedded hard object. According to the results (the graphs of force and displacement data), the new system is well capable of detecting hard object embedded in experimental models.

Keywords: Kidney stone, laparoscopic surgery, artificial tactile sensing, artificial palpation

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P22: Design and Manufacture Foot Reflexology Electrical System for Treatment and Pain Relief

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Abstract

Reflexology (Press down gently on the involuntary foot) of thumb can relieve pains such as headache. The aim of this study is design and manufacture electrical system to replacement a specialist for treatment and common pain relief. Therefore at first foot will be warm with usage of warm towels and infrared light and then by applying electrical current between 8 to 15 mA, pulse with stimulating electrodes is applied to toe. Stimulation electrodes from lateral of thumb was moving in one direction and up to down. This action was done for four side of toe. Results had shown for 20 people with range of 20 to 53 years, headache was cured after two time consecutive reflexology. After applying electrical current, feedbacks had seen such as thirst, sweating, chills and heat specially in people who cure that improve after the break. These complications can be due of increase circulation and release energy after stimulating. Therefore we can treat common pains with new method and combine traditional medicine and modern science without using sedative and reflexology specialist.

Keywords: Electric current, Foot reflexology, Stimulation electrodes, Pain relief

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P23: Partitioning the Reaching Movements During Activities of Daily Living and Clustering the Components Using Accelerometer Data

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Abstract

According to the studies in the context of learning and doing reaching movements, it seems that reaching movements in activities of daily living (ADLs) can be considered as the combination of several components. Different movements can also have similar movement components. Based on this theory, combining of the movement components that are learned, the human will be able to do a lot of various movements. In this paper, considering this basis, we attempt to partition reaching movements during ADLs and then cluster all this components of ADLs to determine basic movement classes.

The purpose of this paper is partitioning ADLs in to the movement components based on acceleration signals recorded from the arm and then clustering all this movement components with suitable method to determine movement patterns in this set of ADLs.

The idea is inspired from central nervous system (CNS), it seems that the CNS does not consider motion profile separately for each of ADLs but according to the patterns in the memory that the number of them is also limited, the activity is done.

In this study, signal is recorded during ADLs that is consist of eating, pouring drinks in the glasses, displacement an object between two points, flexion/ extension and abduction/ adduction of the shoulder during sport. Signals was recorded using a wireless triaxial acceleration sensor and data collecting system. Wireless acceleration sensor is attached to the subject's arm. Acceleration signals is recorded real-time, during ADLs for provide kinematics information from movements.

After recording signals, the acceleration signals is filtered by a second-order butterworth low-pass filter with cut-off frequency 2.5 Hertz and then, ADLs are partitioned in to the movement components. Since during reaching movements, joint angular velocity has a bell-shaped pattern, partitioning was done based on finding the points that the acceleration signals remain constant. To determine these points, differentiating of acceleration signals are done to detection where these three differentiated signals become zero simultaneously. In this manner for partitioning ADLs, 13 components have been achieved.

In the next step, clustering of the movement components is done using a hierarchical clustering called nearest-neighbor. The advantages of this algorithm are less sensitivity to cluster shapes, it is less sensitive to largely differing point densities of clusters and it can represent nested clusters.

We want the Euclidean distance between the center of each cluster and its components in the cluster is less than a threshold, in addition the number of the clusters is minimum as much as possible. Considering these cases, 13 components are clustered in to the 5 clusters as the basic movement patterns in set of ADLs.

Keywords: Activities of daily living, Movement Components, Accelerometer, Clustering

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P24: Evaluation and Comparison of a Number of Time-Based and Frequency-Based Methods Used for Assessment of Muscle Fatigue in Isometric and Dynamic Muscle Contractions Based on EMG

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Abstract

Muscle fatigue assessment is the basis of numerous studies, specially, in the field of rehabilitation. The assessment methods can be classified to three groups: time-based methods, frequency-based methods, and analytical time-frequency methods. The purpose of this study is to evaluate the efficiency of the first two groups (which were mainly used to assess fatigue in isometric contractions) for the assessment of muscle fatigue in dynamic contractions. Two sets of experiments were devised to produce isometric and dynamic contractions in the hand muscles (Biceps, Tripceps (long head), and Deltoid) of two healthy subjects. Simultaneously, the surface EMG signal for each muscle was recorded. After the removal of motion artifacts, the signal was divided to sequential data windows. Next, the data inside each window was processed and some time-based features including: peak to peak amplitude of the recorded signal (PTP), root mean square value (RMS), average rectified value (ARV), and the number of zero crossings, together with a frequency-based feature (power spectral density) were calculated for each window. Then, the overall trend for each feature in the sequential windows was plotted and the changes were analyzed over time. A quantitative value for muscular fatigue was calculated using a method proposed by Seibt and Schneider which described muscle fatigue as a function of the RMS values and the median frequency of EMG data. The results showed an overall increase in time-based features (PTP, RMS and ARV) and a decrease in number of zero crossings as well as the frequency-based feature as fatigue emerged.

Keywords: Muscle fatigue assessment, isometric and dynamic contractions, electromyogram

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P25: Biomedical Applications of Smart Materials in Dentistry

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Abstract

Smart materials provide new insights for the design of biomaterials in the dentistry, since they have specific characteristics and unusual properties. Smart materials exhibit a number of remarkable properties, which open

new possibilities in engineering and more specifically in biomechanical engineering. In this paper, a series of new biomedical applications for specific behavior of smart materials is presented. Examples are given of the use of the extraordinary shape ability of the martensitic material, in some cases in combination with high tensile strength, which makes memory metal a very special engineering material. Examples are given of instruments and dental implants using memory metals for functions as distraction, adjustability for customization, measuring, steerability, and locking-unlocking of devices. These materials have medical applications range from orthodontic arch wires and endoscopic instruments to endovascular stents. This paper will focus on key performance attributes of smart material that make it an ideal material for medical applications. Specific applications will be introduced through their use of the enabling features. The most important alloy used in biomedical applications is shape memory alloy. This alloy combines the characteristics of the shape memory effect and superelasticity with excellent corrosion resistance, wear characteristics, mechanical properties and a good biocompatibility. A shape memory alloy is widely recognized and accepted for using in the dentistry. In this work, the basis of the memory effect lies in the fact that the materials exhibiting such a property undergo a thermoelastic martensitic transformation. In order to understand even the most elementary engineering aspects of the shape memory effect it is necessary to review some basic principles of the formation and the characteristics of the martensitic phase. The different properties of shape memory, superelasticity, two-way shape memory, rubber-like behavior and a high damping capacity are reviewed.

Keywords: Smart Solids, Poisson's Ratio

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P26: Thermoelastic Analysis of Post-Restored Teeth Using a Generalized Mathematical Approach

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Abstract

Both tissue losses and missing teeth can affect the biomechanical equilibrium of the chewing system in a negative way. Thus the prophylactic restoration of these shortcomings is required. Many different materials can be used in restorative and prophylactic treatments. Metallic, ceramic and composite based filling are used in the restoration. In addition, the implant materials located in the jaw are selected of different kinds. Thermal stresses can be made in the restorations of teeth by heat changes. Thermal stress distribution in such a system is dependent on the geometry, rigidity and material. Because of different physical and thermal properties of different materials in a post-restored tooth, hot and cold liquid in the mouth can create temperature gradients in a tooth and these changes can cause different thermal stress. These thermal stresses can become higher than before in the vicinity of the interfacial contact areas between different materials. Thermal stresses can be also combined with mechanical ones, which they can cause the microscopic fractures in the dental structures. In this study, the constitutive relations of thermo-elasticity are rigorously formulated, and a generalized finite element formulation is derived. Due to second law of thermodynamics, a nonlinear term, which appears in both the energy equation and the Clausius-Duhem inequality, is incorporated in the finite element formulation. A MATLAB computer program was developed for this formulation. Tooth was assumed anisotropic, homogenous, elastic and symmetrical. Temperature changes on the restored tooth were calculated and then thermal stresses as a result of temperature changes were carried out. Post, core and crown material have a significant effect on concentrations of thermal stresses. It has been found that minimum stresses are found at the interfaces when Ti–Ti alloy is used as post material and crown material.

Keywords: Teeth Restoration, Thermoelasticity, Generalized Finite Element Formulation

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P27: Osteoprosis Effect on Vertebra

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Abstract

Osteoprosis is a disease characterized by low bone mass and micro-architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture. This disease reduces bone density through a series of structural changes to the honeycomb-like trabecular bone structure. The reduced bone density coupled with the micro-structural changes, results in significant loss of bone strength and increased fracture risk. The ability to determine the fracture of trabecular and cortical bone properties has biological and clinical importance.

The purpose of this work is to gain an improved understanding of the mechanical behavior of a motion segment. So, a non-linear elastic finite element model of the thoracic spine is developed to investigate spinal response during different loading.

The motion segment is modeled and analysed with a finite element method and it performs well compared with experimental data.

Keywords: Vertebra, Finite element analysis, vertebral fracture, thoracic motion segment

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P28: Effects of Intraocular Pressure on Optic Nerve Head Biomechanics in Glaucoma

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Abstract

Glaucoma is a blinding ocular disease which is characterized by progressive damage to retinal ganglion cell axons that form the optic nerve (ONH) and is commonly associated with elevated intraocular pressure (IOP). In this study, the effects of IOP on the biomechanics of ONH were investigated numerically, incorporating Finite Element Method. Simulations were carried out for IOPs of 15, 25, and 50 mmHg. It was concluded that increase in IOP influences the biomechanical environment within the ONH by increasing the stress values in that region which may lead to Glaucoma.

Keywords: Glaucoma, Intraocular Pressure, Finite Element Method

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P29: Mechanical Failure Mode Criteria of Degenerated Intervertebral Disk

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Abstract

This research reviews various failure modes of intervertebral disc due to degeneration, which is considered one of

the most important factors of low back pain. First, the physiology of the disc degeneration disease and the structural damage in intervertebral disc leading to disc degeneration are defined and then the effect of mechanical loading results in tears and cracks as reported by degeneration is expressed. In addition, the most important mechanical parameters of intervertebral disc that mostly influenced by degeneration and mechanical factors are defined. In this study, reviewed previous research, based on the more popular criterion that is manifested via comparing failure theories in the literature, the critical areas to begin disc failures under various static and dynamic loadings that are most affected by degeneration have been classified, and the influence of these two types of loading and disc degeneration on the mechanical properties of normal, and degenerated discs in various degrees of mild, moderate and severe are expressed. Finally the ultimate strength of the motion segment (containing two vertebral bodies and intervertebral disc) according to failure theories is surveyed.

Keywords: failure criteria, spine, intervertebral disc, degeneration

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P30: Mechanical Analysis of Cervical Spine Following Implantation of AnArtificial Disc – a Finite Element Investigation

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Abstract

This work aimed to evaluate the rate of motion of the cervical spine model including implantation of Bryan disc prosthesis at C5-C6 level, in order to investigate of the influence of disc arthroplasty on the biomechanics of the cervical spine. The calculated segmental motion resulted preserved after disc arthroplasty, with respect to the model of the intact spine, in both flexion and extension. For this purpose, an exact nonlinear finite element model of the C4–C7 segment data were obtained from computed tomography (CT) of the cervical spine of a 30-year-old woman. The model is loaded by the compressive preload of 100 N to the C4 superior endplate and sagittal moments on whole spine model. Moreover, the bottom surface of the C7 is completely constrained. In general, the disc prosthesis showed to be able to reproduce a nearly physiological motion. However, other important mechanical aspects, such as the possible degenerative conditions of the spine, need to be evaluated before drawing a conclusion about total disc arthroplasty from an engineering point of view.

Keywords: Finite element, cervical spine, artificial disc, rate of motion.

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P31: Biomechanical Modeling of the Spinal Muscles and Investigating Their Role in Mechanical Stability

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Abstract

Low back pain is an increasing problem and it is a major socio-economic problem consider to medical costs and lost productivity. Relatively there is little information about the processes underlying the development of the condition. This is because of the complex interaction between bone, muscle, nerves and other soft tissue of the spine, and direct observation of the human spine is not possible using non-invasive techniques. So, biomechanical models have been used extensively to estimate the forces and moments experienced by the spine. In this work, a finite element model is developed to investigate the thoracolumbar spinal stability which is induced by muscle forces and compression loads. This model includes thoracic and lumbar vertebra and major force generating muscles of the

region. The model performs well for compressive load-bearing of the passive thoracolumbar spine.

Keywords: Biomechanical model, Spinal, Stability, Thoracolumbar Spine, Compression, Finite element.

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P32: Calibration Accelerometer Sensor Based on Estimating Offset and Sensitivity of Triaxial and Also Compensating Misalignment

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Abstract

In this paper, we propose a method for calibration of the acceleration sensor. The advantages of this method are, being based on physical equations, its simplicity, easy application and also accessing accurate values of the acceleration signals.

First, the offset and sensitivity of the three axes were estimated. We proved there is an ellipsoid equation in 3 dimensional space (Vx-Vy-Vz) that by determining the center locus and diameters magnitude, offset and sensitivity values will be obtained, so we designed an experiment to access offset and sensitivity values.

As the practical results of the method implementation for a sample sensor; x, y and z offsets and sensitivities were obtained respectively 1.716/1.694/1.663 (v) and 0.034862/0.035372/0.034659 ($v.s^2/m$). In ADXL330 datasheet, offset and sensitivity for all three axes were expressed 1.65 (v) and 0.033 ($v.s^2/m$).

Sensor misalignment compensation is the next calibration phase. It was proved that with appropriate rotation, we could correct the data until the misaligned coordinate system was **coincide** with the aligned coordinate system, so we designed an experiment to achieve the rotation matrix.

To implement this calibrating method, we should convert three accelerometer voltages to three acceleration signals, using offset and sensitivity values obtained from the first calibration phase. Then, these signals were multiplied by rotation matrix to compensating sensor misalignment.

One application of the acceleration sensor is using these signals to calculate flexion/ extension angle of the elbow. The mean absolute error and the maximum error for the calculated joint angle with/without calibration were respectively 4.1749/8.9818 and 6.4162/13.2319 degrees.

Keywords: Accelerometer, Calibration, Misalignment, Sensitivity, Offset

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P33: A Design of Digital Wireless Transceiver for Biological Signal

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Abstract

Today's developing communication technology and promoting dispatches knowledge and also considerable progress of human knowledge in sending wireless data, manufacture's inclination and service receivers intends to using of wireless technology has been raised. That one of the advantages of using portable wireless is its permanent accessibility. In this relation, at this project, it has been presented designing and manufacturing two side transmit-

ter and receiver for sending biological signal, especially the cardiac signal (ECG) that sending and receiving data has been accomplished using transmitter modules HM-TR1,with FSK2 modulation, which receiving and transmitting rate is set at 19200 bps. Considering existing technology in ECG sets and fortifying them by serial port, this possibility has been used and the input related to installing communication has been considered. This mechanism is capable to connecting and installing communication with computer through USB3 port that to this purpose and installing easier communication, the USB2Serial intermediate orbit also has been designed to this apparatus. The maximum distant which covered to sending without need to use repeater in open environment, is about 300 meter. To showing, storing and transferring data via Internet we used GUI4 of MATLAB. Also the designed software can calculate and show heart rate with QRS detection protocol. At right now designed mechanism is capable to transmitting of data and connecting to data receiver system which support's serial's port protocol.

1.HM-TR: Hope Microelectronic Transfer and Receiver. 2. FSK: Frequency Shift Keying. 3. USB: Universal Serial Bus. 4. GUI: Graphic User Interface

Keywords: Transceiver, Wireless, HM-TR, USB2Serial, Serial Protocol

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P34: Optic Nerve Head Biomechanics in Glaucoma: Effects of Scleral Stiffness

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Abstract

Glaucoma is a leading cause of blindness worldwide which is due to progressive damage to retinal ganglion cell axons that form the optic nerve (ONH). The biomechanics of ONH depends highly on sclera mechanical properties. In this study, Finite Element Method was incorporated to study the effects of sclera stiffness on the ONH stress and strain values. Three material properties were considered: compliant, median, and stiff. It was observed that weak scleras result in remarkably increased ONH stress and strain values and consequently leads to Glaucoma.

Keywords: Glaucoma, Scleral Stiffness, Finite Element Method

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P35: In-Vivo Dosimetry in Medical Treatment Using Optically Stimulated Luminescence (OSL) Technique

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Abstract

Today, dosimetry of ionization radiation like gamma rays, beta and other charged particles has been the major difficulty for scientists in hospital's radiology. One of the most important measuring techniques of radiation has been the use of OSLD in which was designed and fabricated for the first time in Iran. The elements used in this dosimetry system are laser light, fiber optic and other optical elements. In this system the radiation can be measured linearly in the range of 4 μGy-10 Gy for energies between 5 keV-40 MeV. One important advantage of this dosimeter technique is on-line measurement of radiation in medical application. The phenomena of OSL is similar to the thermo luminescence (TL) measuring method of dosimetry. In OSL, the trapped electrons are stimulated by

the photon energy while, thermal energy is used in TL detectors. This OSL dosimeter is used in medical treatments, environment, personal dosimetry and in space for Heavy Charged Particles (HCPs). The important aspect of OSL is the design of measuring probe which is made of a fiber optic and a sensitive single crystal of aluminum oxide doped with carbon (Al_2O_3:C) with 9.1 ev band gap. This fiber optic probe is attached to a miniature single crystal of Al_2O_3:C and inserted into the body through the breathing path and or any other opening to perform precise measurements of radiation next to the tissue. It must be noticed that, the effective Z (atomic number) value of the crystal is near human, therefore, there is a similarity in reaction process of ionizing radiation between the crystal and human body. During the interaction of ionizing radiation with crystal, the following processes take place:

1. Absorption of radiation by valance electrons,
2. Trapping electrons and holes by defect centers,
3. Stimulate and de-trap electrons and holes by laser.

Keywords: Detection, Dosimetry, Fiber optic, Light Absorption, Radio luminescence, On-line dosimetry, OSLD.

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P36: Using a New Intelligent Confirmation System of Calibration Intervals for Medical Devices

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Abstract

In modern medical system, both diagnosis and treatment, it is necessary to confirm and control measuring and monitoring devices. The international standards in the filed of quality management systems require to establish a comprehensive control and confirmation system for the measuring and monitoring devices.

Measuring and monitoring equipment connected with medical diagnose or treatment procedure, are subject to a relatively high wear through constant use. Therefore a universal function capability for the entire diagnostic or treatment act is absolutely necessary. This confirms the necessity of regular examination and documentation system of these equipment.

A good calibration system is the way for a good achieving accuracy in measurement. Calibration systems require prevention of inaccuracy by detection of deficiencies and timely positive action for correction. Calibration assurance provisions require written descriptions covering measurement and test equipment and measurement standard which will satisfy the requirement for instrument accuracy. All measuring and test equipment according to these scopes are to be examined in determined distances. Most calibration systems allow for shortening calibration intervals if errors large than allowed are detected. Similarly, calibration periods are lengthened if instruments are well behaved within close limits of the original calibration. In any condition, the system must ensure, that the measuring and test equipment will be calibrated according to the determined time table.

"Optimal Interval"is that one where the total cost is a minimum. If the interval is chosen too small, the checking costs goes up, because there are more checking in the equal period than necessarily. If the interval is chosen too large, there arises the probability to find the device as "inadmissible" at next checking. The size of the optimal interval depends on a number of different elements such as: frequency of utilization, mode of using, behavior of abrasion, permissible tolerance range, number of the users, hazard risk index, etc. Since these elements are not temporal constant, the optimal interval cannot be a constant size. The dynamification of these elements allows optimizing the measuring expenditure and to increase the reliability of the measuring and test equipment. For this purpose, we developed a new and intelligent method. In this method, four input variable shall results an output variable, so this creates a multi dimensional model, shown in Fig. 1. By using a fuzzy logic algorithm in this system we designed a

reliable system which used for optimizing the confirmation intervals to a confident and qualified calibration system.

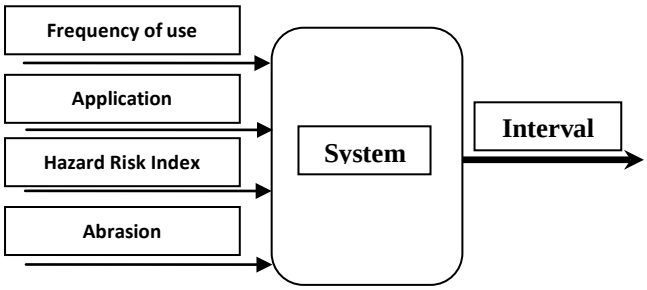

Fig 1: Schematic block diagram of system

Keywords: calibration system, optimum calibration Interval, Intelligent, Medical Devices

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MEDICAL IMAGING

O1: En Face Dynamic Focus Optical Coherence Tomography to Study BCC

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Abstract

Optical coherence tomography (OCT) is a promising imaging modality for investigation of skin tumour, tumour size and margin status. This approach uses a dynamic focus (DF) procedure where the coherence gate moves synchronously with the peak of confocal gate, this method ensures better signal strength and resolution from all depths.

In this paper we present the findings of a number of imaging experiments on periocular basal cell carcinoma (BCC) tissues using a novel OCT configuration to aid the dermatologists to decide with a higher level of confidence whether the skin is involved by BCC or not. We studied the B-scan and C-scan OCT images of periocular BCC specimens. The findings are the following: the skin layers are less distinctive, the tumour lobules are clearly identified as rounded areas with sharp edges, and there is a reduction of back reflection deep to the tumour. Employing dynamic focus, a more distinct border for BCC regions in C-scan tomograms was found, and deeper levels of the specimen were seen with greater detail. There was an excellent correlation between the features seen in OCT imaging and those identified in histological sections following standard processing.

This study is limited by the small number of cases examined. Further evaluation of this technique in a larger cohort is recommended to fully evaluate the potential of this promising new technique. The other limitation of this study was the in vitro scanning. Ideally, the study would have looked at in vivo scanning, as this is where the clinical application of OCT lies, but we were limited by the equipment available to us.

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O2: Development of a T1 Contrast Agent for Magnetic Resonance Imaging Using Gd2O3 Nanoparticles

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Abstract

The aim of this study by performing the development of gadolinium(III) oxide(Gd2O3) nanoparticles with diethylene glycol polymer (DEG) and also by achievement of the contrast enhancement evaluation of Gd loaded nanoparticles in comparison with Magnevist(Gd-DTPA), was to indicate that Gd2O3 nanoparticles with diethylene glycol polymer could produce a good MR signal and therefore could be a useful potential contrast medium for cell tracking in magnetic resonance molecular imaging(MRMI).

This study would be complicated with nanoparticles composed gadolinium(III) oxide (Gd2O3) with diethylene glycol polymer. The size and morphological structure of this Nano particle determined by particle size analysis device(zeta sizer) and Transmission Electronic Microscope. Proton relaxation times were measured with a 1.5-T MRI scanner. The measurements were performed in aqueous solution.

Other purpose of this study was to assess cytotoxicity of gadolinium oxide nanoparticles. The effects of nanoparticles on U-87 MG, THP_1 and SK_MEL 3 cell lines were evaluated by light microscopy, and by standard cytotoxicity assays.

The results showed a significantly higher incremental relaxivity for Gd2O3 nanoparticles compared to Gd-DTPA. The slope of R1 relaxivity(1/T1) vs. concentration curve of Gd-DTPA and Gd2O3 were 4.33, 13.37s−1 mM−1. The slope of R2 relaxivity(1/T2) vs. concentration curve of Gd-DTPA and Gd2O3 were 5.06, 9.05s−1 mM−1. Viability results indicate that U-87 MG, THP_1 and SK_MEL 3 cells endure treatment with Gd2O3nanoparticles for an wide-ranging stage of time and it is therefore concluded that results in this study are founded on viable cells. The study indicates the possibility of obtaining high relaxivity compared to Gd–DTPA using Gd2O3 as contrast agent.

Keywords: Gd2O3 Nanoparticle, MRI Contrast Agent, Relaxivity, Cytotoxicity

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O3: On the Attenuation Coefficient of Coronary Artery Plaque

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Abstract

The Dual Energy Computed Tomography (DECT) has become an important non invasive tool for diagnostic purpose. The method involves the measurement of the attenuation coefficient of the sample at two different energies and thus extracts the values of the two unknowns, (i) the electron density (ρe) and the effective atomic number (Zeff). A reliable numerical method, to determine the above quantities must use accurate information about energy dependence of (a) the Compton scattering (b) photoelectric absorption. The former is accurately described by the Klein- Nishina formula, while the latter is expected to follow dependence Z effx / Ey. In the published literature the values used to fit the data are seen to have wide variables, with and 3.0 Such large variations in the exponents x and y introduce large uncertainties in the calculated values of ρe and Zeff. It is thus extremely important to know

the values of x and y accurately.

While our theoretical work has shown that for low Zeff materials, y has a universal dependence y=3.0669, for all substances, the same is not true of x. We have seen experimentally, that for several mixtures the value of x also changes with the composition of the mixture. By fitting our calculations with the NIST data, we find, x=2.4757 for carbon, x= 2.5565 for nitrogen, x=2.5672 for water, x= 2.5926 for nitric acid, and x=2.6099 for oxygen.

It is known that the lipid and fibrous plaques have compositions of the type $\alpha H + \beta C + \gamma N + \delta O + \varepsilon P$, where α, β, γ, δ, ε represent the relative ratios of the atomic constitutes like hydrogen, carbon, nitrogen, oxygen and phosphorus. By varying the parameters α, β, γ, δ, ε, we calculate the corresponding values of the mass attenuation coefficient of different relevant combinations of α, β, γ, δ, ε. The expected HU values for these compositions are also calculated by using for the Boone Seibert X-ray source spectrum, at 80,120,140 kVp.

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O4: MRI Simulation with Patient

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Abstract

MRI simulation is an important step in the acquisition from an MRI. It provides the theoretical means for understanding the complexity of the technology of magnetic resonance equipment. It can be used as an educational tool in medical and technical environments. MRI simulation permits the validation of an existing analysis methods, and may help in the development and optimization of MR sequences. It provides forward models for artifact reduction techniques. Finally, with the increased interest in computer aided MRI image analysis methods (segmentation, data fusion,...), an MRI simulator provides an interesting assessment tool since it generates 3D realistic images from medical virtual objects perfectly known. In this context, we develop an MRI simulator, a simulation of the various steps performed by an MRI imager from proton to picture. Based on the Bloch equations, it includes an efficient management of the T*2 effect. It takes into account the main static field value. It also simulates the artifacts linked to the static field inhomogeneity like those induced by susceptibility variation within an object. It is implemented in MATLAB 7.0 with a simple programming interface. The inputs are in the form of pulse sequence that specify gradients, RF pulses, voxel number, filtration and different characteristic times such as relaxation times, echo delay time and repetition time.

Keywords: MRI simulation, medical imaging, filtration, artifacts

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O5: Dependence of the X-Ray Attenuation Coefficient of Mixtures on the Energy of the Photon and the Effective Atomic Number of the Sample

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Abstract

The Dual Energy Computed Tomography (CT) has, in recent years, developed as a very useful tool for the diagnostic purposes in many situations. The basis of image formation in CT scanning is linear attenuation coefficient,

μ(E) of the materials in the path of the x-ray beam, It is known that μ(E) of materials depends on the (1) electron density (ρe) and (2) the effective atomic number (Zeff) of the system under study., being given by,

$$\mu(E) = \mu C(E) + \mu P(E) \quad (1)$$

where μC (E) and μP(E) represent the Compton and the photoelectric parts respectively. The theoretical expressions for these two parts are given by,

$$\mu C(E) = (8\pi/3) re^2 fKN(E)(\rho e) \quad (2)$$

$$\mu P(E) = (256\pi/3)(1/137)(\rho e) fP(E, Zeff) \quad (3)$$

where re is the classical radius of the electron, fKN(E) is the Klein-Nishina formula and fP(E, Zeff) is a factor due to the photoelectric effect.

Our present investigations examine the importance of both these effects on the problem of DECT inversion.

Firstly, we note that the conventional approximation of using the low energy approximation, fKN(E)= 1.0 can give rise to large errors at photon energies, which the DECT sources use.

Secondly, the function fP(E, Zeff) is assumed to follow a dependence $fP(E, Zeff) \propto (Zeff^x/E^y)$. It is noted in the literature that $3.0 \leq x \leq 4.0$ and $3.0 \leq y \leq 3.5$. Such wide variations in the values of the exponents x and y are bound to give large errors in the calculation of μP(E) and it is necessary to assign proper values for both. From a separate study, we have found that the exponent y has to be fixed at y = 3.0669, for materials with Zeff < 8. The value of y being thus unmistakably fixed, we proceed to find the exponent x, from experimental studies

To find this, we prepared aqueous solutions of different electrolytic salts of known concentrations and thus obtained systems with known but different values of Zeff. We then found their average attenuation coefficients by experimentally determining their respective HU values, as given by a CT machine, on excitation at 80, 100, 120, 140 kVp. The energy spectrum of the energy source was assumed to follow the Boone-Seibert formula and we calculated the average attenuation coefficient of these samples, by using equations (1-3) with the Boone-Seibert source spectrum. It was found that for such mixtures, as the Zeff increases, the exponent x decreases. It is clearly seen that the value of x is not constant for the substances and its value is less than 3.0 in the energy range that we deal with in the CT studies. Furthermore it is pointed out that for the proper evaluation of the role of Compton scattering the full Klein Nishina formula has to be considered.

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O6: Assessment Advantage of Myocardium Movement in Longitudinal Axis View in Comparison with Short Axis View

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Abstract

Introduction: Numerous myocardial damages have been detected by quantitative analysis of cardiac motion. Speckle tracking is a new echocardiography method that seems to be a promising tool for better evaluation of the cardiac motion. Intraplanar motion (longitudinal motion) of myocardium in short axis view, particularly at the basal level, can cause loosing the speckle pattern from the view and there for motion estimation is appearing with error. In this study, the effectiveness of ignorance of intraplanar motion in estimating of myocardial motion in horizontal direction, that it is common in short axis and long axis views, is evaluated and compared in both apical and basal levels.

Methods: Two-dimensional echocardiographic images of 14 normal cases were scanned in both apical and basal parasternal short and long axis views with 50-60 frames/second, using a GE Vivid 7 ultrasound system. The speckle tracking under block matching algorithm was used to off-line analysis. Myocardial horizontal motion was therefore measured in the above mentioned views. The results of motion estimation were normalized assuming the diastolic phase as a reference. Behaviour of myocardial horizontal motion in two mentioned views was analyzed for apical and basal levels using paired-sample T-test.

Results: Horizontal displacement of basal level in long and short axis views were 3.59±1.54 mm and 5.17±1.45 mm respectively. This parameter was measured as 8.11±2.24 mm and 8.23±2.21 mm in apical level as well. A significant difference was detected between the horizontal motion of basal level of short axis view in compared with the long axis one, using paired-sample t-test analysis (P-value<0.05). Conversely, such a notable difference was not seen about the horizontal motion between the short and long axis views in apical level.

Conclusion: It is concluded the intraplanar motion causes revealing error in horizontal motion that estimated by speckle tracking method in basal level of myocardium at short axis view. It is seemed that estimation of cardiac horizontal motion in long axis view is better than short axis view.

Keywords: Echocardiography, Motion detection, Speckle tracking, Intraplanar motion

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O7: A Model Based, Anatomy Dependent Method for Creation of the SPECT Projections

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Abstract

Monte Carlo (MC) is the most common method for simulating virtual SPECT projections. It is useful for optimizing procedures, evaluating correction algorithms and more recently image reconstruction as a forward projector in iterative algorithms; however, the main drawback of MC is its long run time. We introduced a model based method considers the effect of body attenuation and imaging system response for fast creation of noise free SPECT projections. System response was modeled by layer by layer blurring of our activity phantom using suitable Gaussian functions. Weighted ray sum of this blurred phantom was driven to create a projection. Using the attenuation phantom, in each angle, attenuation factor (AF) was calculated for each voxel. This calculated AF is the weight for the emission voxel and states the detection probability of photons that are emitted from that voxel. For the next projection, our phantom was rotated and the procedure was repeated until all projections were acquired. These primary projections are then convolved with suitable exponential functions to model scatter projections. The final modeled projections were calculated as the sum of primary and scatter projections. To evaluate our suggested method, model based projections of a torso and a brain phantom were compared by their MC simulated projections. A perfect fit between modeled and MC simulated projections of brain phantom was observed. A negligible difference between modeled and simulated projections of torso phantom however was seen. This may be due to non-uniform attenuation in torso that causes some error when we use simple shift invariant functions for scatter modeling. Creation of SPECT projections in less than a minute may make this method as a proper alternative for MC simulation.

Keywords: Monte Carlo, Modeling, Attenuation, System response

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O8: Assessment of an Tentative Novel X-Ray Anode in Order to Decrease the Applicability Limitation in Medical Practice

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Abstract

Introduction: More than 99% of electrical energy in diagnostic X-Ray tubes converts to heat. This process causes limitation in medical applicability especially in higher intensity for diagnostic and treatment purposes.

Aim: To decrease the applicability limitation in x-ray generation via higher cooling rate

Methods: In this study, a proposed anode to be noticed with special geometric design and use of new materials in order to obtain higher cooling rate. For this reason compare to a conventional anode, we assessed a proposed anode of chromium, copper and silver allay to become equipped a tangstan ring (1×2 cm and 7 degree slope angle). In the same condition, inside a container without air flow the anode temperature grew hot until 1200 °C with using a plasma flame. Thereafter, anodes temperate were measured and recorded during cooling with using a contact thermometer for three times and finally means and standard deviation and also anodes cooling rates were calculated.

Results: In both anodes, the cooling shapes were exponentially but there was differences in cooling rate between proposed anode (approximately 180 °C/min) and conventional anode (approximately 76 °C/min) in 1200 °C.

Conclusions: In comparison with conventional anode, proposed anode has higher strength and higher cooling rate. Therefore this lead to lower limitation to select exposure factors such as mAs and kVp in medical practice.

Keywords: X-Ray Tube, Anode type and temperature, Applicability Limitation

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O9: New Klin-Nishina Based Scatter Correction Approach for Nuclear Medicine Images

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Abstract

Introduction: Large numbers of scatter photons are usually acquired in nuclear medicine planar projections which are due to wide energy windows (15-20%) and Compton component of the radiation at photo peak. Estimation of these photons and subtracting from each pixel would improve the quality of planar images.

Methods: There are different approaches for scatter compensation in nuclear medicine images. The aim of this study is to assess the scattered radiation estimated by a new approach, based on Klein-Nishina formula, in nuclear medicine images. As the scatter radiation supposes to vary with depth, medium and activity of the sources, it is planned to simulate a cylindrical phantom (25cm in radius) filled with different medium and a radioactive line source at 5 cm from its internal wall. A set of planar images of the phantom at different angles resemble the source in different depths, from 5 to 45 cm. Phantom images when filled with 4 different media (air, lungs, soft tissue and bone) and 2 (low and high) source activity at different depth are simulated by Monte Carlo. As the scattered measured by Monte Carlo (simset soft ware) suppose to be the true scatter, a K-factor is defined as the ratio of the scattering measured from Monte Carlo divided by scatter estimated by the new approach, based on Klein-Nishina formula. Therefore, the true scattered radiation can be calculated from: (K-factor) x (new approach K-N).

Results: The result shows that the K-factor is independent of the activity, and almost has the same trend at different depth in each medium. According to statistical analysis there is a significant difference between K-factors in different medium.

Conclusion: Estimation of the true scattered radiation via multiplication of K-factor and calculated scatter radiation based on modified Klein-Nishina formula can be used at different depth in different media after segmentation of planar images.

Keywords: Scatter correction,Klein-Nishina,nuclear medicine images

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O10: Use of Noninvasive Molecular Imaging for Target Definition in Treatment Planning of Prostate

Radiotherapy

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Abstract

One of the most important parameters in radiotherapy is determination of different volumes. Recently, magnetic resonance spectroscopic imaging (MRSI) as a molecular imaging method has been used for clinical target volume definition. In this study, we used MRS to define the target volume in prostate radiotherapy. Images of 20 prostate cancer cases were used for treatment planning. MRS and MR images were fused with CT images. Then, treatment planning was preformed for each patient in three methods (CT, CT+MRI and CT+MRSI planning). The ratios of MRI_{CTV} to CT_{CTV} and MRI_{PTV} to CT_{PTV} were 12.83% and 8.97%, respectively, that have been less than from CT only volumes. In contrast, MRSI CTV and PTV ratios were 21% and 27.41% more than from the corresponding CT volumes. Maximum dose for rectum showed 0.58% increase for MRSI relative to CT only, and 1.09% reduction in MRI relative to CT again. Maximum dose variation in femoral heads showed 5.4% increase in MRSI relative to CT and 0.67% reduction in MRI relative to CT. Application of MRSI for target volume definition of prostate cancer, leads to increasing of this volume in comparison to CT planning alone.

Keywords: target definition, treatment planning, prostate cancer

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O11: Distinction of Normal and Malignant Gastric Tissue Using Electrical Impedance Spectroscopy in in Vivo Study

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Abstract

Introduction: Gastric cancer is the most common cancer of the gastrointestinal tract. Unfortunately, the symptoms of early gastric cancer are non-specific and rather vague. Most patients with gastric cancer are being diagnosed in advanced stages of the disease and they do not gain any survival benefit from conventional therapeutic methods. Therefore, early cancer detection using an efficient surveillance program is a justified way to reduce gastric cancer mortality. But, it is not a particular screening test to be chosen.

Object: The aim of this paper is to introduce a novel minimally invasive diagnostic technique to be appropriate for the early detection of flat lesions and assessing gastric pathology.

Methods: A total of 97 points from 45 patients were studied in terms of their biopsy reports matching to the electrical impedance measurements (in vivo). Bio-impedance measurements were performed at 30 different frequencies in the frequency range of 2 kHz-1 MHz using electrical impedance spectroscopy system and 4-electrode probe. According to the reports, the impedance readings were classified histologically into normal, benign changes, malignant, and dysplasia groups. To evaluate the significance of separating measured impedance spectrum, the Kruskal-Wallis test was applied to these data. Finally, the ROC curves was applied to evaluate the possibility of individual classifications of the benign and malignant points.

Results: According to the results, the resistivity of normal group was higher than that of the benign group, and the resistivity of these groups was higher than that of the malignant group at frequencies between 470 KHz and 1MHz ($P < 0.05$). In these frequencies, the impedivity of dysplastic tissue was significantly lower than that for other groups ($P < 0.05$). The ROC curve for these impedance measurements indicated that the technique could provide diagnostic information partly(57%).

Conclusion: The impedance technique would be sufficiently sensitive to detect changes in a few cells. Thus, this minimally invasive technique would assist the Gastroenterologist to detect appropriate sites for biopsy because current diagnostic methods use random biopsies. Therefore, it seems that this minimally invasive technique can be a low cost technique and complementary method for endoscopy, biopsy and histopathological evaluation of the stomach abnormalities.

Keywords: Electrical impedance spectroscopy, 4-electrode probe, transfer impedance, gastric cancer, dysplastic tissue.

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O12: From Positron Emission Tomography (PET) to Positron Emission Particle Tracking (PEPT)

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Abstract

PET technique has widespread applications in nuclear medicine. In some cases this technique has been used to study of "slow processes" in engineering research. Thus, PEPT technique has invented for tracking labelled particle in industrial process. In PEPT, simultaneous detection of two emitted coincidence gamma rays by annihilation event in a PET scanner defines a line along which the annihilation occurred. With recording many such events in a short time, tracer position would be found by triangulation. This technique is a very fast process compared with PET. PEPT has widespread industrial applications and it recently has been used in medical research and red blood cell. Indeed, red blood cells can be labelled with ^{11}C and would be used in PEPT as tracer. Reported results from studying of tracking a blood cell in vitro experiment show that using the PEPT technique, with some adjustments, a tracer with an activity much less than 0.15 μCi should be still possible to be tracked.

Keywords: PET, PEPT, red blood cell

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O13: Multispectral Imaging In FRI With QDs

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Abstract

Fluorescence Molecular Imaging(FMI) has emerged as a powerful tool for monitoring biological functions in vivo in small animal. Using different probes tagged to different proteins or cells. In this study we present spectral unmixing algorithms capable of separating signal from different probes. The laser beam irradiated two QDs point

sources in an inhomogeneous phantom. The emitted back fluorescence emissions were collected for obtaining FRI images. The relative contributions of fluorescent signal of QDs in the FRI images were resolved by a linear unmixing method based on singular value decomposition. We showed results of applying the SVD algorithm to fluorescent activity in FMI images originating from phantoms containing two different fluorophores. Peak Signal-to-Noise Ratio, Signal to noise ratio is 39, 30.1 dB respectively. So, linear unmixing method based on SVD can be used as the most efficient multispectral detection techniques in FMI.

Keywords: FRI, Multispectral imaging, Linear unmixing algorithm, SVD, QD

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O14: Repeatability of Detecting Visual Cortex Activity in Functional Magnetic Resonance Imaging

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Abstract

Background: As functional magnetic resonance imaging is too expensive and time consuming, its frequent implementation is difficult. The aim of this study is to study repeatability of detecting visual cortex activity in fMRI.

Methods: In this study, 12 normal volunteers attended. Functional images were obtained during a visual task in three scan series. Two series of scans were provided in a session, and the third series were provided later. Then the BOLD signal and the number of voxels in response to visual stimuli were compared in different series.

Result: The results of this study demonstrate a considerable ICC in the BOLD signal intensity(ICC=0.76, P=0.009) and the number of activated voxels(ICC=0.73, P=0.017) between the first and second scans in one session.

Conclusion: As the repeatability of the scanning in one session is considerably better than that in the separate sessions; thus it is better that fMRI visual studies, that need to repeat scanning, take place during a session.

Keywords: BOLD signal, functional magnetic resonance imaging, Repeatability, Vision, Voxel numbers

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O15: The Application of Automatic Texture Analysis for Discrimination of Liver Disease by Magnetic Resonance Imaging

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Abstract

The purpose of this study was to apply an automatic novel method of feature descriptor derivation for differentiation any single sample MRI texture patterns within normal and pathological liver diseases. In this method, T_2-weighted–HASTE sequence MR images were acquired on a 1.5 Tesla scanner. The Liver MRI database consist of 6 Haemangiomas, 14 Metastasis, 6 HCCs, 11cirrhosis (6 mild and 5 severe) and 17 normal livers were reported by two radiologist.

Mazda and Math cad software used to feature extraction (230 parameters / ROI) by selecting region of interest

(ROI) on MRI. Discrimination performance of four texture analysis methods LDA (Linear discriminate analysis), PCA (Principle component analysis), FLPA (Fusion LDA and PCA) and PLA (PCA plus LDA) measured by the area (A_z) under the ROC (receiver operating characteristic) curve.

In distinguishing focal liver lesions, we found that the LDA yielded the highest Az value of 0.83 in distinguishing benign from malignant lesions, 0.90 in distinguishing Haemangioma from Metastases, 0.97 in distinguishing Haemangioma from HCCs and 0.83 in distinguishing normal liver from metastases In discrimination of cirrhotic (mild and sever) and normal liver, our methods yielded a high discrimination performance with Az values of 84% for LDA in distinguishing mild cirrhotic from normal, 98% for PCA and FLPA in distinguishing severe cirrhotic from normal liver.

It is shown that our new texture analyses procedure can effectively discriminate liver diseases and thus has the potential to increase confidence of radiologist in correctly distinguishing MRI of the liver with no need of other radiological and or pathological examination.

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P1: Calculation of Absorbed Fraction of Beta Rays From ^{131}I and ^{124}I in Ellipsoidal Thyroid Lobe with Different Mass

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Abstract

Introduction: It is well known that the success of using radioactive iodine therapy of hyperthyroidism and thyroid cancer depend on the absorbed fraction of radiations emitted from radioisotopes in thyroid lobes. The aim of this work is to evaluate the absorbed fraction of beta rays emitted from 131I and 124I radioisotopes in thyroid lobe with different volume by Monte Carlo simulation.

Methods: We have considered the thyroid lobes as an ellipsoidal with the major axis two times of the minor axis. The soft tissue has been used with the material composition suggested by ICRP and density of 1.05 g/cm3. We have calculated the beta absorbed fraction of 131I and 124I rays for different volumes of thyroid lobe by using the MCNPX code.

Conclusions: The results show that the beta absorbed fraction has a significant difference with unit value. The varied from 0.95 to 0.98 for 131I and form 0.75 to 0.91 for 124I beta rays, when the lobe's volume varies from 1 ml to 25 ml. Because by increasing the volume of ellipsoidal lobe, the beta ray fraction escaping from its surface increased.

Keywords: Thyroid gland; 131I and 124I radioisotopes; Beta absorbed fraction; MCNPX code.

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P2: Diagnostic of Mass and Abnormal Areas in Mammography Images Using Chebyshev Moments

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Abstract

Breast cancer is the most usual form of cancer of women. Every 12th female endures from this illness at least once

in her lifetime. Since the cause of breast cancer is unfamiliar, early detection is very significant. If detected early, the five-year percentage of people that endure exceeds 95%. If a global division were done, a enormous number of mammograms, would require diagnostics. The main goal is to produce a device that can comfort the work of radiologists by filtering out the true negative cases. This paper is studied a novel algorithm to detect the contour map of tumor using segmentation algorithms and Chebyshev moments. Chebyshev moments (CM), being discrete, are capable to struggle the discritisation errors as compared to Zernike Moments (ZM), which are continuous moments. It is also orthogonal and can very well be depicted in terms of Geometric moments (GM) to achieve rotation scale and translation (RST) invariant textural analysis. A novel approach to achieve RST invariance using joining of CM and Logpolar coordinate system is proposed. As Logpolar transformation (LPT) is famous for rotation and scale invariance, The translation invariance is archived by shifting the LPT image to centroid before CM calculation[3]. The images are extracted from the Mammographic Image Analysis Society's (MIAS) Mini-Mammographic database[4]. These images were detected using three thresholds whose values were 445, 450 and 455. The results of this experiment showed that using the thresholds with these achieved sensitivities of 100%, 92% and 84% with 2.56, 0.86 and 0.26 false positives per image respectively.

Keywords: Chebyshev moments, Logpolar transformation, mammogram, Breast cancer, False positive, Sensitivity

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P3: Investigating the Role of PACS in MRI Quality Control

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Abstract

Introduction: The Quality Control (QC) tests identify the degradation of image quality before it affects patient scans and also determine the equipment malfunction which requires preventive or immediate maintenance. Our objective is to establish an MRI QC baseline and compliance testing program and underline the advantages of Picture Archiving and Communication System (PACS) facility for QC.

Methods: The measurements were performed according to ACR protocols. The analyses parameters have been reported depending on the ACR specifications. Fifteen measurements of ACR MRI Quality Control applied on the new machine in Dubai Hospital to introduce a base line for our accreditation program. These measurements were done according to ACR recommendations which included (Geometric Accuracy, High Contrast Spatial Resolution, Slice Width Accuracy, Slice Position Accuracy, Image Intensity Uniformity, Percent Signal Ghosting, Low Contrast Object Detectability and SNR). All these data were implemented in Dubai Health Authority through the use of new PACS system. Images were acquired by the MRI scanner and then sent from MRI console to the medical imaging and processing unit for analysis. DICOM information are implemented to extract the central frequency for the MRI machine.

Results: The QC measurement ranges were reviewed in view of the ACR reference values. The MRI central frequency values were analyzed from the DICOM information. The same parameters in the selected views from all series were accurately applied depending on the PACS facility.

Conclusion: The base line measurements for MRI QC are considered as a crucial part for the accreditation of MRI program. We recommend using the PACS facility for accurate image analysis due to its easy and time saving nature as well as its ability to retrieve previous image data.

Keywords: MRI QC- ACR – PACS.

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P4: Energy Resolution in Animal SPECT Scanner

Base on Graphene Field Effect Transistor and NaI(Tl) Scintillators with Monte Carlo Simulation

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Abstract

Graphene field effect transistor (GEFT) detectors are consisting of Graphene on a radiation-absorbing electrically gated undoped semiconductor substrate (with a thin dielectric buffer layer in between). Preliminary results of scanner based on Si planar detectors are presented, and result of our simulation demonstrates very good energy resolution as compared to scanners based on NaI(Tl) scintillation detectors. In this paper we simulated the animal single photon emission tomography (SPECT) with Monte Carlo simulation in Geant4 application for tomography emission (GATE). Energy resolution was assessed around 0.3% and 11% for GFET and NaI(Tl) scintillation detectors respectively.

Keywords: Graphene field effect transistor, animal SPECT, scintillator, resolution, Monte Carlo

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P5: A Novel Method for Recording of Energy Dispersive X-Ray Diffraction (EDXRD) of Biological Tissues with Ability of Clinical Usage

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Abstract

It has been shown that x-ray coherent scatter from biological tissues can give information about the characteristics of tissue. The aim of this study was to introduce a novel method for recording of energy dispersive x-ray diffraction (EDXRD) of biological tissues with ability of clinical usage.

A flexible instrument constituting primary and scatter collimators had planned and built in our previous study. Using a setup including the mentioned instrument, an X-ray tube and a HPGe detector, the measurements was performed. Diffraction patterns from four kind of tissue equivalent materials and three kind of biological tissues were extracted.

The peak positions of acrylic, polyethylene, nylon, calcium carbonate, adipose, muscle and bone in corresponding diffraction patterns are located in 0.8 ± 0.04 nm-1, 1.03 ± 0.051 nm-1, 1.22 ± 0.061 nm-1, 1.7± 0.085 nm-1, 1.1± 0.055 nm-1, 1.41±0.072 nm-1 and 1.6± 0.08 nm-1 respectively. Generally the measured diffraction patterns agreed well with the results of previous studies. Consequently this study proved efficiency of new planned setup for distinguishing of different kinds of normal and cancerous biological tissues.

Keywords: EDXRD system-Diffraction pattern-Biological tissues

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P6: A Novel Method for Recording of Energy Dispersive X-Ray Diffraction (EDXRD) of Biological Tissues with Ability of Clinical Usage

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Abstract

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A flexible instrument constituting primary and scatter collimators had planned and built in our previous study. Using a setup including the mentioned instrument, an X-ray tube and a HPGe detector, the measurements was performed. Diffraction patterns from four kind of tissue equivalent materials and three kind of biological tissues were extracted.

The peak positions of acrylic, polyethylene, nylon, calcium carbonate, adipose, muscle and bone in corresponding diffraction patterns are located in 0.8 ± 0.04 nm-1, 1.03 ± 0.051 nm-1, 1.22 ± 0.061 nm-1, 1.7± 0.085 nm-1, 1.1± 0.055 nm-1, 1.41±0.072 nm-1 and 1.6± 0.08 nm-1 respectively. Generally the measured diffraction patterns agreed well with the results of previous studies. Consequently this study proved efficiency of new planned setup for distinguishing of different kinds of normal and cancerous biological tissues.

Keywords: EDXRD system-Diffraction pattern-Biological tissues

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P7: Assessment of Production Possibility of a Novel Radiopharmaceutical for Hypoxic Tissues Diagnosis

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Abstract

Hypoxia is an important determinant for biological behavior of malignant solid tumors. Based on the interesting properties of 61Cu, we were interested in the production and purification of this radionuclide and its ultimate use in radiolabeling of ATSM as a possible PET tracer. The production of 61Cu was performed at the Nuclear Research Center for Agriculture and Medicine. 61Cu-ATSM was prepared using in house made ATSM ligand. 61Cu-ATSM

was administered into normal and tumor bearing rodents up to 210 minutes followed by biodistribution and co-incidence imaging studies. 61Cu-ATSM radiochemical purity was >97%. A significant tumor/non-tumor accumulation was observed by either animal scarification or imaging method. The method used in this research for the production and chemical separation of 61Cu was quite simple and cost effective. Total labeling of 61Cu-ATSM took about 5 minutes. 61Cu-ATSM is PET radiopharmaceutical for hypoxia imaging and suitable for future PET studies in human.

Keywords: Radiopharmaceuticals, Copper-61, 61Cu-ATSM, hypoxia, Positron Emission Tomography, Fibrosarcoma, Imaging

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P8: CBCT for in Vivo PDI Treatment Verification

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Abstract

Purpose: It is usual to use the planning CT for the in-vivo portal dose prediction (PDI) for treatment verification. However the planning CT images might lead to uncertainties for the following reasons: (I) changes in patient anatomy, (e.g., weight loss, changing air gaps, deformations in anatomy) and (ii) errors in patient positioning. To correct for this, we used a Cone Beam CT (CBCT) for the in vivo PDI prediction. This CBCT is considered to most closely resemble the anatomy during the treatment more than the planning CT.

Method: The CBCT was corrected before it was used because of the large scatter contributions. This correction was performed by registering the planning CT with the CBCT using MATTERHORN in-house developed software, then mapping this information of the CBCT into the planning CT. The resultant image was used as an input for the in-vivo PDI treatment verification model. Finally we applied the method to 10 patients with prostate and 10 patients with head and neck cancer. The minimum number of fractions was 5 fractions per patient. The analysis was done using a gamma evaluation with 3% local dose, 3mm distance-to-agreement as reference criteria. For the head and neck patients, the field size of the cone beam is smaller to cover the shoulder region, in order to be able to compare the gamma with the planning CT; we inserted the shoulders from the planning CT into the cone beam.

Results: For the prostate patients the average dose difference between measured and predicted PDI was (….) and the number of pixels with gamma >1 was (….) when we used the CBCT compared to (…) and (…) when we used the planning CT. For the head and neck patients the average dose difference between measured and predicted PDI was (….) and the number of pixels with gamma >1 was (….) when we used the CBCT compared to (…) and (…) when we used the planning CT

Conclusion: A CBCT was used for the in-vivo PDI treatment verification after it was corrected for the large scatter contribution. Using the CBCT for the PDI treatment verification resulted in a substationally improvement between measured and predicted PDI for lung phantom, head and neck, and prostate patients, making the clinical interpretation of observed deviations straight forward.

Note: The results for this project is still running that is why I left it blank.

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P9: Comparison of Singh Index Accuracy and Dual Energy X-Ray Absorptiometry Bone Mineral Density Measurement for Evaluating Osteoporosis

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Abstract

Introduction: The Singh index is an inexpensive simple method to evaluate bone density. The purpose of this study was to compare between Singh index and bone mineral density (BMD) measurement using dual energy X-ray absorptiometry (DXA).

Methods: Three orthopedists evaluated radiographs of 72 patients suspected with osteoporosis. The inter-observer agreements of the Singh index were obtained by using kappa statistics. The BMD of proximal femur was measured by DXA, and then the BMD results were compared with those of Singh index by using reference radiographic charts.

Results: The inter-observer agreement kappa values were 0.01, 0.07 and 0.09 and the strength of the observer agreements was negligible. The obtained osteoporosis prevalence among the studied patients was 38.9%.

Conclusion: The inter-observer variation was large. There was no any correlation between the Singh index and bone densitometry. So, the index cannot be used for osteoporosis diagnosis, because of its low reliability.

Keywords: Singh index, BMD, Osteoporosis, DXA, Bone density

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P10: Infection Control Practices Among Radiographers and the Passive Role of Awareness on Them

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Abstract

Purpose: This study assessed the application of infection control policies, and the effect of increasing awareness on their practices.

Methods: The project was done on several steps, first to survey the prevalence of Device-Related Infection using transport swabs from x-ray table and wall Bucky, exposure control (including mouse and keyboard), collimator and door handles, hand washing sink and a control point. Checking types and quantity of the microorganisms present by counting the number of colonies present on the agar plate per centimeter square. After presenting the findings, the consequences and ways for prevention to the radiographers, another survey was done.

Results: A total of 12 vital points were surveyed. The organism found was mainly staphylococcus epidermidis bacteria. The hand washing sink had no bacterial colonies, while the x-ray table, collimator handles, & lead protection all had 2-3 colonies /cm, the exposure control had 5-6 colonies /cm, and the wall buck had the highest count of 8-9 colonies/cm. there were no change in the infection control and the hygienic practice even after presenting the results for the radiographer.

Conclusion: Radiographer didn't demonstrate significant change in there infection control habits and lifestyle. And as a results there was minimal or no change in the number of microorganism Device-Related Infection. Hospitals or a professional organization can play an important role in the prevention of health care–associated infection by reinforcing current infection control guidelines

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P11: The Energy Dependence of the Photoelectric

Attenuation Coefficient of Substances

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Abstract

The principle Dual Energy Computed Tomography (DECT) which is now emerging as a very important tool for non invasive diagnosis, is based on the mass attenuation coefficient of substances, which is given by,

$$[\mu(E)/\rho]j = [\ Ztot(j)/M(j)]\ (1/mp)\ \{8\pi/3)re2fKN(E) + (256\ \pi/3)(1/137)a02(I0/E)y\ [Zeff\ (j\ )\ ]\ x\ \} \quad (1)$$

Where ρe is the electron density of the medium, re is the classical radius of the electron, a02 is the radius of the first Bohr Orbit of Hydrogen and fKN(E) is the Klein Nishina coefficient, Ztot(j) is the total number of electrons in the factor fKN(E, Zeff) is generally identified to follow a dependence fph(E, Zeff) ~ (I0 / E)y Zeffx where I0 is the ionization energy of the first Bohr level of hydrogen.

For hydrogen, it can shown theoretically, that, y=7/2 and x=4.0. But the literature of medical physics is replete with various choices, 3.0 ≤y ≤3.5 and 3.0≤x≤4.0.W ith such wide choice of the two parameters, x and y various data can be "satisfactorily fitted". However, it also leaves wide gaps in our understanding and thus in this may act as a serious impediment for the design of effective and accurate inversion procedures.

We describe here a strategy for accurately finding x and y. The most important point is to obtain from (1), a new equation, in which one of the unknowns, x or y is eliminated. It is easy to see from (1) that,

$$\Delta\chi(E, Zeff) = [\mu/\rho][M(j)/Ztot(j)] - 8\pi/3)re2fKN(E)$$
$$= ((256\ \pi/3)(1/137)a02(I0/E)y\ [Zeff\ (j\ )\ ]\ x \quad (2)$$

Then the ratio R(E,E0; Zeff) follows

$$R(E,E0;\ Zeff) \equiv \chi(E,\ Zeff)/\ \chi(E0,\ Zeff) = (E0/E)y \quad (3)$$

and hence

$$\log[R(E,E0,:\ Zeff)] = y\log E0 - y\log E \quad (4)$$

We thus see that equation (3) and (4) are independent of Zeff and hence of the material.

On examining the published data on the attenuation coefficients of various low atomic number materials, i.e. Zeff≤ 8, as available from the NIST tables, we find that all of them satisfy and equation of the type give in (4), and a least square fit of the data with (4) gives y=3.0669 with 99% confidence. They observation allows us to arrive at two important conclusions. Firstly, the photoelectric coefficient can indeed be written as fphoto(E, Zeff) ~ E – yZxeff and secondly y=3.0669 in all substances of interest. With the uncertainty in the value of y being removed, if would be possible to unmistakably establish the dependence on Zeff.That will form the subject of a separate communication.

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P12: Experimental and Theoretical Investigation of Light Scattering in Tissue Like Phantoms Using Diffuse Optical Tomography

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Abstract

Breast cancer, after lung cancer, is the second rank cause of death due to cancer in women. Thus vital it is to find a way for its early detection. Current methods of detection are mostly harmful and of high cost. Optical imaging, is a new introduced method for imaging of cancerous cells. The ability to detect the tumor at its first growing stage and

being non-invasive are the prominent advantages of this method.

In this study we have used NIR laser for diffuse optical imaging. By means of studying the propagation of laser beam in various phantoms, we have found out the scattering manner of the samples. In order to study the propagating light, solid and liquid phantoms with similar optical properties like biological tissue were constructed. Using the optical imaging device, which we have established, we compare the transmitted light's properties with the result of diffuse optical theory. The experimental results accord closely with the theory. Application of this method as well as phantoms and the type of laser were confirmed by the results of the experiment.

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P13: Applying Interpolated Projections in Cardiac SPECT and Its Effect on Lesion Detectability Using Hotelling Trace

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Abstract

Introduction: Myocardial SPECT imaging is usually performed acquiring 32 views in 180 degree with equal steps of 5.625 degrees. Mathematically, increasing the number of projections can increase the image quality and decrease reconstruction artifacts. But acquiring more projections requires spending more time or injection of more activity to the patients. An idea to improve the quality of the reconstructed images without acquiring extra projections is applying interpolated data between adjacent projections. The aim of present study was using Hotelling Trace method to investigate the lesion detectability in reconstructed images with interpolated projections.

Methods: Such investigation cannot be performed on real patient's data. Therefore, data were simulated using NCAT digital phantom and SimSET Monte Carlo code. The imaging was performed as usual, acquiring 32 views from right anterior oblique to left posterior oblique. The data were interpolated to construct 5 images between adjacent projections convert it into 187 projections. The simulation was performed again acquiring 187 images as the reference. The conventional, interpolated and reference data set were reconstructed and compared for improvement and degradation in quality of final images. Four methods of interpolation used, linear, cosine, cubic and hermit. The above procedure was repeated for phantoms representing different types of heart disease, different cardiac size and different count densities. Then short-axis cuts were used for Hotelling Trace analysis. Comparing Hotelling J-number, would show the best method for interpolation.

Results: The results showed that linear interpolation technique produces better lesion detectability comparing to other interpolation methods tested. Results also confirmed that streak artifacts decreases, signal to noise ratio and contrast increased due to increasing the number of samples.

Conclusion: These results indicate that lesion detectability and the physical properties of reconstructed images improve significantly using interpolation.

Keywords: Myocardial SPECT, Projection data, Interpolation, Image quality, Hotelling trace

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P14: Cardiology Examinations Achieving by Interventional Radiology or Nuclear Medicine Methods?

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Abstract

Use of ionizing radiation in diagnostic and therapy methods in different modalities of radiology and nuclear medicine is neediness of modern medical sciences. Selection of diagnostic method depended on some variety of factors such as image quality, invasiveness, patient dose, economic and skill of medical specialist.

For survey of referring amount to nuclear medicine methods in Yazd province, frequency of these examinations with kind of radiofarmacutical and its activity during of 1390 was extracted. The patient dose, accumulation dose and per caput dose of each nuclear medicine examination was calculated and compared with similar examination in health care level I and II countries. The frequency of nuclear examinations per one million populations of bone, cardiac, lung, thyroid, renal and brain were 0.5, 0.51, 0.14, 0.16 and 0.01 respectively which was similar to health care level II countries although Yazd province in point of physician number per population is similar health care level (HCL) I countries. Patient dose of each nuclear examination is almost equal of DRL. The number of chronoangiography per 1000 people is 3.5 in Yazd province which is sevenfold of cardiac scan. The effective dose of cardiac scan and chronoangiography is almost equal whereas chroangiography is an invasive examination, so increase of cardiac scan in this province is proposed.

Keywords: nuclear medicine examinations, patient dose, interventional radiology, health care level, radiation protection

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P15: Evaluating the Effect of Using Nonlinear Fuzzy Controller in the Controller Loop of Radiography Exposure Compartment on Error

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Abstract

In this paper an a real radiography exposure compartment is modeled and it proves that using a combination of fuzzy logic controller and former linear controller in controller loop reduces error.

Adding fuzzy controller to controller loop,makes variation in current feasible while exposing, which leads to reduction in quantity of exposure that patient receives from diagnostic medical services and lowers risk of cancer.

Another advantage of using a fuzzy controller in contoller loop is increasing the life of filament,since high current can significantly damage the filament.

It also improve images quality,since it causes less error in system's output.

Next achievements regarding this model can be reducing error, using other membership functions like genetic algorithem,… or using a Neoro-Fuzzy controller.

Keywords: Radiography, controller loop

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P16: Determination of Correction Coefficient of the Sterlling's Formula

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Abstract

For high energy x-ray beams used in radiation therapy the head-scatter factor (Sc) account for the variation in scattered radiation with collimator setting of the incident beam that reaches the point of measurement on the central axis. for rectangular field a × b can be set up x = a, y = b or x = b, y = a the head scatter factor is different for these two arrangements, this is the collimator-exchange effect (CEE). Our results show that the influence of x (lower jows) on the head-scatter component is different from that of y (upper jaws). Vadash and et al pointed out the different weight of x and y jaws on head scatter.They obtained the empirical formula for the calculation of the side of the equivalent square for head –scatter factors: C=(A+1)xy/(Ax+y) Where A is the relative weight of the x and y collimators and paramerer specific for each treatment unit which depending on the collimator design and too beam quality for the same treatment unit. By regression between experimental and calculated data, we evaluated vadash factor (A) based on a physical analysis for 6 and 18 MV x ray beam for all field sizes respectively 2.14 and 2.29.

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P17: Assessment of Quality Control Status of Radiological Centers of Hospitals Associated to Mashhad University of Medical Sciences

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Abstract

Background: The using of ionization radiation for diagnostic and treatment fields is to spread worldwide dramatically. This issue causes to increasing of absorbed and collective dose to society noticeably. With regard to two main principles in radiation protection, that is justification and optimization, it is necessary to have imaging process with minimum dose to patients and personals. For achieving the mentioned purpose, it is vital to perform quality control tests programmability. On this topic, many studies performed and reported in the world in which this studies show necessities and meaningful of QC tests.

Methods: In this study, Mult-o-Meter model 303 made of Unfors company is used for surveying accuracy of kVp and time, linearity of exposure with mAs and reproducibility of exposure.

Results: According to recommendations of AAPM (2002) and ICRP 103 in this study 27 % of apparatuses in accuracy of kVp, 45 % in accuracy of timer and 30 % in accuracy of reproducibility were out of accepted range.

Conclusion: In surveyed apparatuses, the first and end of operating range have large errors in which it is recommended that these devices don't use in mentioned regions. With regard to achieved results, it is suggested some devices to be repaired or omitted and substituted.

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P18: Comparison Among NaI, BGO and HPGe Detectors for Cadmium In Vivo Analysis by PGNAA Method in Liver Phantom

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Abstract

In vivo detection of cadmium is one of the most important research area at the Medical Physics. The PGNAA method is based on the measurement of prompt γ-ray emitted during the neutron irradiation of a sample. In our PGNAA designed system for biological sample analysis, 20Ci Am-Be neutron Source is used. In This work, experimentally, we compared the detection ability of HPGe, BGO and NaI(Tl) for detecting 558.3 keV gamma rays resulting from 113Cd(nth,γ)114Cd. Results showed that HPGe is best detector for cadmium detection in PGNAA analysis system and could measure 10ppm/50μSv in liver phantom.

Keywords: PGNAA, Neutron Activations, Gamma Ray Detector, Cadmium, Liver

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P19: Hybrid Phantom Applications to Nuclear Medicine

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Abstract

Every year too many people are irradiated for diagnostic and therapeutic purposes all over the world. On the other hand, assessment of radiation dose and its related risks to patients is an important aim in radiation protection dosimetry. When we acquire knowledge about the amount of received doses to the body, we will be able to find the new methods for decreasing the absorbed dose. These cumbersome calculations of absorbed and effective doses are now possible with the help of anthropomorphic computational models of human body called phantoms and Monte Carlo codes (MCNP). Latest type of phantoms is hybrid phantom which has been introduced in 2007. Hybrid phantoms retain both the anatomic realism of voxel phantoms and the flexibility of mathematical phantoms. The absorbed dose can be evaluated for any specific patient before individual subjected to radiation exposure by using Hybrid phantoms. Then the energy of emitted particles and irradiation geometry can be determined for any special purpose.

The aim of present study is to construct Hybrid phantoms along with other countries for Iranian patients to be used in different applications such as testing new radio drugs or cancer treatments with high LET radiation.

Keywords: Hybrid phantoms, Radiation Protection Dosimetry, MCNP Monte Carlo Code, Absorbed Dose

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P20: Moderating Features of Nuclear Graphite, a Monte Carlo Study

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Abstract

Lightweight, excellent thermal stability at high temperatures, mechanical strength, high purity, low neutron absorption cross section, having high moderating ability and low production costs" this features of graphite are caused extensive use of this material in various industries, particularly in the nuclear industry. Among these features, the most important features for use in nuclear reactors are having the high moderating ability and low cross section for neutron absorption

In this study, beam properties of high purity graphite are studied using Monte Carlo simulation and performance of this sample are evaluated for using as neutron moderator.The results and compare of discussed properties show

that this type of graphite is able to use in nuclear industry for moderating applications.

Keywords: high purity graphite, Monte Carlo simulation, beam properties, moderating features.

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P21: Evaluation of Radiologist's Performance in Breast Masses Detection on Screening Mammograms with and Without Non- Commercial Computer Aided Detection System

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Abstract

In this study evaluate of radiologist performance on detection breast masses after changing quality of mammograms by software.Quality of images was improved by Computer Aided Detection through on 184 mammograms. Images scanned,were turned into digital data then processed by a software (contrast,resolution and segmentation changes).Images were examined by 3 radiologists before and after processing and Sensitivity and specificity of both phases were measured.Results revealed that 34 masses (in comparison with 27 cases for unprocessed images) out of 41 lesions were identified upon processing images. Sensitivity of identifying masses was 82.92% and 65.85% by using program and before processing respectively.Specificity of program on identifying normal images was 86.01% indicating high capability of the program on identifying normal case.CAD system designed had high sensitivity in final findings that indicated easy identification after processing images and minimizing false results

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P22: Medical Imaging by Pyroelectric X-Ray Generator

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Abstract

Pyroelectricity is a phenomenon that familiar to piezoelectricity, a transient voltage produced in response to change in temperature rather than to a physical stress. When the crystal temperature is change, internal charge accumulate near the crystal faces and produce the large potential about 100,000 volts and can be utilized to accelerate electrons and ions. By this setup we able to build accelerator that can operated by low voltage (9V battery). We prepared this setup to produce electron and X-ray and it was used for imaging of small object such as tooth

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P23: Effect of SENSE on Geometric Distortion and Signal Loss on FMR

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Abstract

Echo Planar Imaging is a commonly technique fMRI. It acquires multiple image lines in k space after a single excitation. On of the famous problem of EPI in regard to conventional MRI, being more sensitive to image distortion, due to the encoding scheme which is utilized. SENSE have been used in order to to reduce steps of phase encoding. this has been applied to susceptibility artifact reduction and improvement spatial resolution.The Aim of this study was to investigate effect of GRE-EPI with SENSE on Distortion and signal loss on a tree Tesla scanner. Whole-brain fMRI studies of 5 healthy right hand –dominant volunteers were carried out in a siemens 3 T Trio with 12 channel coil.The data was processed by using FSL.ANOVA data analyses were performed.Distortion was assessed by voxel displacement maps calculated from the field map data. signal loss was quantified by the measured % signal change in each of the EPI acquisitions. Our results show that distortion were reduction with the use of SENSE and as BOLD signal in the ROI not specifically reduces.

Keywords: EPI,fMRI, Parallel Acquisition,SENSE, Geometric Distortion,Field Map, Signal loss

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P24: Monte Carlo Study of Source Distance and Scattering Media Effect on Image Quality of Fanbeam Collimators

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Abstract

The aim of this study is impact assessment of scattering media and source distance on image quality of Fanbeam collimators. To do so, a multislice Fanbeam collimator was desigend and effect of source distance from collimator, scattering media and combination of them were surveyed using Monte Carlo method. By increasing the distance between source and collimator from 2 to 12 cm in air, FWHM and FWTM of System PSF increase from 4.4 to 10 mm and 7.6 to 18.6 mm, respectively. By repeating the process in scattering media, they increase from 4.6 to 10 mm and 8 to 19 mm, respectively. By changing the thickness of scattering media from 2 to 10 cm at the same source distance (10 cm), they increase from 8.9 to 9.1 mm and 15.5 to 16.1 mm, respectively. The Results show that increasing the distance declines the image quality, but this reduction is affected by inherent magnification of Fanbeam collimator. Also increase in the thickness of scattering media more affects FWTM and so image contrast.

Keywords: Fanbeam collimator, Source distance, Scattering media, Image quality, MCNP Monte Carlo code

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P25: Effect of Personal Beliefs and Morals On Adherence to Ethical and Moral Commitment Among Radiographers

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Abstract

Purpose: Ethics is the field that defines the human rights awareness based on the control and Balance human behavior in all ways of life, without exception and especially in medical field. The objective of this project is shows the effect of personal beliefs and morals on adherence to Ethical and moral commitment among radiographers. And try to find appropriate solutions to solve these problems, to improve the quality of life of patients coming to the Radiology Department and improve the quality of work of Radiographers.

Methods: The First step for this research was doing a Questionnaire for patients and for Radiology staff to get a specific and clear idea about the workflow in the department and staff backgrounds and knowledge about work ethics and rules, observe the radiographer for more than 15 days to see how they are working in the department of radiology in slmaniya medical complex specially focused on their relation with patient and there concept about the rules, regulation, medical ethics and patient care, visit other hospitals in Bahrain and outside Bahrain. Searching for Professional ethical opinion from different Religious scholars such as scientists of Islam and Christians was highly considered and effective way to affect the ethical concept of the radiographer due to (pregnancy rules, portable delay, contrast reaction problem, late and early leave, break time, applying radiation protection). Finally observe the radiographer for 15 days after doing lectures about work ethics, the opinions of the Religious scholars and scientists of Islam about these ethical problems in the department for the staff to see how those information effect their way of a lot of discussion and arguing about these issues that shows a major conflict between them about this issue. The final result that the radiographer is not effected by the religious opinion that I apply for them because its clearly shown from the result that there practical habit is the same and nothing got changed unfortunately also its shows that the religious side is not a great influence to make an positive changes in this issue and this is because that they find what they do is right and there is no harm if they do or maybe they think that these negative practical action and unethical behavior is considered as excellence and clever thing to do to make your self comfortable when you beat the system and rule, there is a lot of psychological reason which make the radiographer behave like thi work or their concept, Publication of an article in one of the Islamic Journal known in the region about the dangers of the x-ray to spread the awareness among the patients.

Result: In the first observation for the staff I noticed that most of the radiographers have limited ethical obligation due to there work and patient care because its shows that 80% of radiographer don't have commitment due the attendance time and 75% of them do not always apply the radiation protection and When the Islamic views and rules were introduced to the radiographer in the lectures some of them was knew these information and some of them was surprised when they saw these rules also there was s and to forget his ethics and his religious and what is the cost that they will pay regarding to their action in the other life or in the judgment day or even in this life.

Conclusion: I have chosen this subject for my research because I believed that I will makes an influence, even a fraction influence in the Radiology Department and to critically examine our and each other's professional role and to determine how ethics and religious effect our action toward the patient care furthermore toward our obligation to the work rules and system. Through this research and these statistics I find that neglect and lack of attention and staff who are free from ethics character or not applying medical ethics, this is seriously can affects care and life quality of patients and I discovered that ethics and religious cant effect there practice because they think that what they do is right ethically but not legally and I believe that the law is the number one factor that can seriously effect their professionalisms and their obligations to the rule of the department.

P26: Design and Construction of Anthropomorphic Breast Phantom with Various Breast Glandular Fractions

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Abstract

The purpose of this study is to design and construct a novel breast phantom, capable to simulate inhomogeneous composition of real breast tissue and potential application in mammography quality assurance and quality control system and even in optical imaging. This idea is resulting from the advantage of detecting the possible tumor within the breast through X-ray mammography while diagnosing type of the cancer using Optical imaging in which it

would eliminate the necessity of taking a biopsy from the cancerous tissue. In order to perform an early diagnosis of breast cancer, X-ray mammography is currently the most successful technique. Screening the women by mammography at age of 40 years and over, has reduced breast cancer deaths by 30% to 50%. Due to harmful influence of radiation dose, using a phantom is the best way to approach a better image quality. A good phantom should have the capability to simulate human breast tissue. There have been several attempts to make a phantom simulating X-ray properties using different materials with similar properties as real breast, however all have a major disadvantage of being solid and incompressible which could not mimic the elasticity of human breast tissue and its capability to reveal the displacement of the tumor from its initial position under compression and also provide a uniform background contrast against being X-rayed (see. Fig.1). Thus, there is still a possibility to have an improved phantom for more successful image quality.

Fig 1: (a) Ludlum, model L-011A (b) "Rachel" - The Anthropomorphic Breast Phantom, (c) Radiographic image of Rachel phantom

Since the breast thickness and composition are the key factors in determining image quality and mammography dose, it is attempted to design a special phantom to mimic the regional contrast from 2 glandular and adipose tissue, the main two constituents of human breast, upon being X-rayed. Thus, part of this investigation considers practical issues of selecting the best contrast material vulnerable to be applied into the phantom This study introduces a novel phantom based on compressible PVA (polyvinyl Alcohol) hydrogel that was used to adjust the breast adipose tissue and various fraction of scourer as substitute to glandular fraction that could show contrast in images resulting from the X-ray mammogram. An innovative easy method to construct breast phantom is proposed by firstly making PVA solution and secondly undergoing number of freez/thaw cycles to enhance mechanical properties of PVA hydrogel, alongside of inputting specific fractions of scourer into PVA solution, which is known as contrast material for phantom. The investigated PVA hydrogel revealed promising material for multi-modalities phantoms due to their scattering properties that makes it ideal for Optical imaging while comprising the required compressibility and stiffness for X-ray mammography.

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P27: Recent Developments in Medical X-Ray Tubes

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Abstract

X-ray imaging remains the work horse for modern medical imaging. The x-ray image quality and imaging speed in CT case depend to a large extent on x-ray source being able to deliver small and intense source of x-rays.

Mammography demands high spatial resolution attained by smaller focus spots. Cardiac and angiographic imaging requires high brightness source necessities higher intensity electron beam and higher heat transfer rates away from the focal track.

Generation of x-rays by bombarding a metal target with electrons is physically inefficient process at the diagnostic energies of 20-120 keV. An early development was to introduce rotational motion to avoid meltingthe target with focused electrons. The lecture will review several strategies to deal with heat management problem including, dual focus tracks, second mechanical motion, and rotating electron beam.

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P28: "Radiophilia": A Tragic Phenomenon in Diagnostic Radiology.

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Abstract

Diagnostic radiology is one of the most frequently used method in medical imaging that rate of its application is increasing daily. Generally working conditions in radiology departments seem to be normal and risk conception and risk perception about radiation protection standards among experts, physicians, radiation technologists, patients and public are similar so that all radiation safety considerations are respected at all levels. But there are many reasons and there is much evidence that not only the importance of risk conception and risk perception (not meant to Radiophobia) in relation to radiation safety and protection issues are ignored, but there are insignificancy and incuriosity among people somehow have a direct relationship with the radiology as an abnormal behavior of individual and organizational that can be called "Radiophilia". Radiophilia is not a term to describe a phenomenon, but it is an inconvenient truth that is not justified any way. The most important factors that are causing Radiophilia can be divided into three categories: scientific issues, cultural issues and economic issues. These factors have a direct relationship with risk conception and risk perception and defects in the proper implementation of them, will lead to Radiophilia.

Keywords: Diagnostic radiology, Risk conception, Risk perception, Radiation protection, Radiophilia

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P29: A Study on the Application Benefits of CR System in Mammography

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Abstract

Technologic innovations have been caused widespread evolutions in the diagnostic medical equipments. Computed radiography system (CR) is an approach to proper replacement of common analog mammography with a digital technology and also software applicability in the related image processing.

This research have studied the responses of radiology technologists for performing differences of common analog mammography with digital system in three diagnostic radiology centers of Tabriz city in Iran for two parameters: change in the time needed for the imaging, and also ability of radiation protection improvement when using the CR system. According to the data obtained from the centers, daily acceptances of radiographies were in ranges from 15 to 120 patients. There was a reduced imaging time from 12 minutes (with old system) to 5 minutes (with CR) on each case of mammography. The data obtained from the ability of CR systems in improving of radiation protection, for two factors including the exposure techniques and film and darkRoom conditions, showed that with CR systems there were a 40% agreement on increased KV up to10% without any change in MAs and 60% agreement on reduced exposure time for acquiring the proper mammograms. Eighty percent of the technologists have mentioned some problems related to radiography film (light exposed films and double exposed film) and darkRoom conditions, but CR systems with cassette encoding haven't the problems of double exposing the films and some other problems related to the film and darkRoom

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P30: A Comparison Study of Digital and Film Screen Mammography Imaging From the Viewpoint of Patient's Rights

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Abstract

Todays, conventional film-screen mammography has been extensively replacing with digital mammography systems. Effectiveness of mamograph and also considering the patient's rights during mammography, play an important role in the imaging procedure. In this study, we have studied the effect of three factors, including exposure factors, magnification and archiving methods of images in digitized and conventional film-screen mamography imaging, on the rights of patients and the diagnostic usefulness of images at three radiology center of Tabriz city in Iran. According to the obtained results, it appears that in the digitized mammography there are some advantages compared with the conventional imaging method, including: availability of image processing techniques that decrease the degradation effects of some improper exposure factors in 90 % of the cases, facility of magnifying in a suspected case of details on the original image without need to repeat the imaging for 95 % of cases, availability of digital archiving of mammograms can provide a quick compassion study compared to conventional film-screen method in more than 89 % of the cases. Thus, replacement of digital mammography, after proper training of the staff, can effectively improve the patient's rights and save the time due to the lack of need for repeat images of improper exposure factors, availability of original image magnification and also an accurate image diagnostic procedure

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P31: Comparison of Three Methods of Calculation, Experimental and Monte Carlo Simulation in Investigation of Organ Doses (Thyroid, Sternum, Cervical Vertebra) in Radioiodine Therapy

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Abstract

Radioiodine therapy is an effective method for treating thyroid cancer carcinoma, but since it has some affects on normal tissues, dosimetry is important to weigh the risks and benefits of this method of treatment. To determine the absorbed dose of thyroid, sternum and cervical vertebra a phantom was used and three methods of simualtion (MCNP4C), calculation (MIRD) and experimental (TLD) was used and their results were also compared using t-paired student test. For simulation method *F8 tallies was used to calculate the absorbed energy of beta particles and photons emitted from 131I. The absorbed dose obtained by three methods of MCNP4C, MIRD and TLD were 388.0, 427.9 and 444.8 cGy for thyroid, 208.7, 230.1 and 239.3 cGy for sternum and 272.1, 299.9 and 312.1 cGy for cervical vertebra, respectively.

The results of t-paired test was 0.24 for comparing TLD dosimetry and MIRD calculation, 0.80 for MCNP simulation and MIRD, and 0.19 for TLD and MCNP which all the results showed a good agreement among of absorbed doses using these methods.

Keywords: Radioiodine therapy, Thyroid cancer, MCNP4C, MIRD, TLD, Phantom, absorbed dose.

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P32: An Overview of Cardiac MRI Uses in Prevention of Cardioembolic Stroke & Diagnoses of Acute Chest Pain, Preferences & Limits

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Abstract

Background: During recent decade, usage of Cardiac MRI has been developed in cardiovascular domain. MRI has been shown to be an ideal non-invasive tool for imaging and diagnosing myocardial and pericardial diseases because of its good spatial resolution, lack of radiation, non-invasiveness, and three-dimensional imaging with highly reproducible measurements.

Methods: This study discusses two important applications of cardiac MRI which involves cardiac MRI effect on prevention of cardioembolic stroke and diagnoses of acute chest pain.

Discussion: The most common cause of cardioembolic stroke is AF, which has an increasing incidence with age. Common causes of cardioembolic stroke include myocardial infarction, left ventricular thrombus, reduced ejection fraction, valvular abnormalities, and endocarditis. The best way to prevent cardioembolic stroke remains early detection and treatment of AF and underlying stroke mechanism. Cardiac MRI is an emerging technology and reveals some sources of cardiac embolism missed by echocardiography, and might be a diagnostic tool in investigating cardioembolic stroke.

MRI in cardiac disease has been established as the non-invasive standard of reference in many pathologies. However, in acute chest pain the situation is somewhat special since many of the patients presenting in the emergency department suffer from potentially life-threatening disease including acute coronary syndrome, pulmonary embolism, and acute aortic syndrome. Those patients need an immediate evaluation under continuous monitoring of vital parameters. Due to those requirements MRI seems to be less suitable compared to X-ray coronary angiography and multislice CTA. Furthermore, MRI is considered the method of choice in patients with contraindications to CTA and for regular follow-up in known aortic disease.

Conclusions: By introduction of cardiac MRI, early diagnosis have been made possible. At last, the strength of MRI is that it can provide flow, function, and even metabolic data in a single examination. This is crucial as early treatment improves symptoms and prognosis.

Keywords: Cardiac Magnetic Resonance Imaging (MRI), cardioembolic stroke, Atrial Fibrillation(AF), Ultrasound Sonography(US), Computed Tomography Angiography(CTA).

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P33: Diagnosis Of Multiple Sclerosis(MS)Using Magnetic Resonance Spectroscopy(MRS)

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Abstract

Magnetic Resonance Spectroscopy (MRS) is a non-invasive tool for tissue characterization and has been used to study metabolic changes in brain tumors, strokes and other brain diseases. While Magnetic Resonance Imaging (MRI) uses the signal from hydrogen protons to form anatomic images, proton MRS uses this information to determine the concentration of metabolites (such as lipids, lactate, N-acetylaspartate (NAA), glutamate/glutamine, creatine (Cr), choline (Cho) and myo-inosito (MI), in the tissue examined. Each biochemical, or metabolite, has a different peak in the spectrum.Today, MRS is becoming a common clinical tool because it allows additional information about the pathophysiology of lesions, and to enhance the diagnostic accuracy of MRI by complementingit.

In this abstract, we have investigated Multiple Sclerosis (MS) using 1HMRS.

MS is an inflammatory disease that ends up to demyelination.

MRS helped us to differentiate progressive secondary from rent remmitent forms, acute from chronic forms and the pseudo-tumoral form of MS from a neoplasm.

Spectral analysis of MS lesions is include of NAA,NAA/Cr, Cho,Cho/Cr, MI,MI/Cr, Lipids, Lactate.

Keywords: MRS, 1HMRS, MS, Metabolites.

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P34: An Overview of Cardiac MRI Uses in Diagnoses of Congenital Heart Disease & Fetal Cardiac MRI, Preferences & Limits

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Abstract

Background: During recent decade, usage of Cardiac MRI has been developed in cardiovascular domain. MRI has been shown to be an ideal non-invasive tool for imaging and diagnosing myocardial and pericardial diseases because of its good spatial resolution, lack of radiation, non-invasiveness, and three-dimensional imaging with highly reproducible measurements.

Methods: This study discusses two important and non-negligible applications of cardiac MRI which involves diagnosis of CHD and fetal cardiac MRI.

Discussion: Initial diagnosis of CDH traditionally relies upon clinical examination and US. Development of MRI has changed the way those patients are evaluated for diagnosis or follow-up. MRI brings aside from the morphologic evaluation, helpful functional information about ventricles and evaluation of valvular disease. Those are critical data in the follow-up of patients treated for tetralogy of fallot or after atrial switch for transposition of the great vessels. The technique is also powerful in evaluating aortic diseases, e.g. aortic coarctation and restenosis, and Marfan's disease. Disadvantages are mainly the accessibility and the examination time, which in young patients may require sedation or general anaesthesia. Sometimes complementary techniques like Cross-sectional cardiovascular imaging and MSCT is preferred beside MRI to diagnose. Although prenatal US remains the primary imaging method for screening fetal anomalies, fetal MRI with ultrafast imaging technique is a complementary imaging method after first trimester. Some advantages of MRI over us are better tissue contrast images, large field of view and no limitation by large maternal body habitus and oligohydramnios.

Conclusions: By introduction of cardiac MRI, early diagnosis have been made possible. At last, the strength of MRI is that it can provide flow, function, and even metabolic data in a single examination. This is crucial as early treatment improves symptoms and prognosis.

Keywords: Cardiac Magnetic Resonance Imaging(MRI), Congenital Heart Disease(CDH), Ultrasound Sonography(US), Mitral Stenosis Computed Tomography(MACT).

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P35: Determination of Bone Mineral Density in Pre- and Post-Menopausal Women with Dual Energy X-Ray Absorptiometry

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Abstract

Introduction: Osteoporosis is a chronic disease that contributes substantially to decrease physical activity and decline in the quality of life. Osteoporosis can be diagnosed easily with the use of dual-energy X-ray absorptiometry (DXA) equipment. The aim of this study was to investigate the magnitude of bone loss on proximal femur and lumbar spine LS in pre- and post-menopausal women from Isfahan Osteoporosis Diagnosis Center (IODC) since 2005.

Methods: Bone mineral density (BMD) measurements using DXA have been performed at IODC. 185 pre-menopausal and 174 early post-menopausal women were selected randomly. A Norland XR46 system was used for the investigations. The student t-test was done to find the difference between the T-scores of the femoral neck (FN) and lumbar spine (LS) in pre- and post-menopausal women.

Results: Mean BMDs for the FN and LS in pre-menopausal women were 0.859 ± 0.136 and 1.012 ± 0.161 and in post-menopausal women were 0.816 ± 0.119 and 0.919 ± 0.140, respectively. Long-term BMD CVs of 1.0% and 1.2% for the LS and FN were found, respectively. The differences between the FN and LS for pre- and post-menopausal women were $t = -9.02$, $p < 0.05$ and $t = -3.50$, $p < 0.05$, respectively.

Conclusion: In spite of, the reported lower BMD T-scores for the LS compared with the FN for women, we found that the FN had significantly lower T-score than LS for both pre- and post-menopausal women.

Keywords: BMD, osteoporosis, proximal femur lumbar spine, DXA

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P36: A Comparison of DXA Measurement of Lumbar Spine and Femoral Neck for Premenopausal Women

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Abstract

Introduction: This study is used to compare the bone mineral density (BMD) of lumbar spine (LS) and femur neck (FN) for premenopausal women.

Methods: The BMD measurements using dual energy X-ray absorptiometry technique (DXA) have been performed at Isfahan Osteoporosis Diagnosis Center since March 2002. Among the referred subjects 185 premenopausal women who had no known history of disease or taking any medication that affects BMD were selected. The long-term reproducibility (coefficient of variation, CV) of the DXA scanner for BMD measurements during the study period was assessed, using the phantom provided by the manufacturer. A Norland XR46 system was used for the investigations.

Results: The mean BMD for the FN and LS were found to be 0.859 ± 0.136 and 1.012 ± 0.161, respectively. The long-term BMD for LS and FN had a coefficient of variation of 1.0 and 1.2%, respectively.

Conclusion: Although a lower BMT T-score has been reported for LS compared to FN for women, the result

obtained in this study shows a significantly lower BMT mean T-score (t = -9.02, p<0.0001) for FN. The BMD T-score of -0.551 ± 0.99 SD and -1.09 ± 1.17 SD was found for LS and FN, respectively. This finding is inconsistent with the previously reported results, which may be due to the physiological and life-style factors. Therefore, further research is required to determine the reason(s).

Keywords: BMD, DXA, Osteoporosis, Precision

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P37: Quantitative Assessment of Collimator Septal Penetration and Its Impact on Nuclear Medicine Image Quality

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Abstract

Body and edge penetration in nuclear medicine collimators that cause parallax error and affects hole pattern artifact, respectively, have a significant role in image quality. The aim of this study is quantitative assessment of these effects in image quality reduction and a solution for decrease of them. To do so, a validated model of LEGP (low energy general purpose) collimator was simulated by MCNP Monte Carlo code and for each material of lead and tungsten, ration of body and edge penetration in FWHM and FWTM of system response function was surveyed using an innovative model. For lead, body penetration ration in FWHM and FWTM was 14% and 15%, and edge penetration ration was 29% and 18%, respectively. For tungsten, body penetration ration was 10% and 11%, and edge penetration ration was 26% and 16%, respectively. The results show that penetration affects both spatial and contrast resolution but the amount of reduction can be decreased using higher absorber materials such as tungsten.

Keywords: Body penetration, Edge penetration, Image quality, LEGP collimator, Monte Carlo simulation

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P38: Comparison of Memory Processing in Temporal Lobe Epilepsy Patients and Healthy Subjects Using FMRI

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Abstract

Functional magnetic resonance imaging (fMRI) can be used to examine the cognitive processes. In patients with refractory temporal lobe epilepsy evaluation of memory function before surgery is important. This is due the fact that anterior temporal lobe resection may result in memory impairment. It has been shown that verbal memory declines following left anterior temporal lobe resection, and visual memory declines after right anterior temporal

lobe resection.

The purpose of this study is to examine and compare memory processing in patients with unilateral temporal lobe epilepsy (TLE) and healthy subjects using fMRI. Fifteen preoperative patients with unilateral TLE and Fifteen healthy controls were studied. During functional imaging, subjects performed a faces-encoding task. Activation data were analyzed with FSL- GLM models and unpaired t-test to compare patterns of activation between patients and controls. The results showed decreased activity bilaterally in medial temporal lobe in patients compared with the control group. This reduction was more pronounced on the ipsilateral side of the seizure focus. These results suggest a promising role for fMRI in improving the preoperative evaluation of epilepsy surgery.

Keywords: Functional MRI—Temporal lobe epilepsy—Memory processing—Encoding

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P39: Evaluation of FMRI Analysis in Order to Study Functional Changes in Borderline Personality Disorder Patients

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Abstract

Since borderline personality disorder (BPD) is spreading widely among people all around the world, evaluating the brain dysfunction in BPD is necessary. Yet, effects of the disease on functional activity of brain are unknown in BPD patients. In this work, we employed functional magnetic resonance imaging (fMRI) to evaluate patterns of brain activation in BPD patients and localize brain dysfunction in these patients. In our study, fMRI images were acquired while 15 BPD patients viewed emotion inducing pictures from International Affective Picture System set (IAPS). Each subject viewed 25 negative and 25 neutral pictures in a block design fMRI study. Activation data were analyzed with GLM models using FSL software to derive the effects from stimuli types. BPD data revealed activation obtained from negative stimuli in amygdala, fusiform gyrus, primary visual areas, superior temporal gyrus (STG), and premotor areas. In the future work, we are going to assess the treatment with RTMS on these patients, hypothesizing that a change in pattern of activity in prefrontal area may result. This has been proved in similar reports stating that changes in the limbic and prefrontal cortical regions are evident in psychotherapy effects in other mental disorders.

Keywords: Affective instability-Emotion dysregulation-fMRI-BPD

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P40: Survey of Awareness of Medical Students About Medical Imaging Procedure in Kermanshah University of Medical Sciences in 2010

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Abstract

All the world's creatures are irradiated by ionizing radiation and 18% of radiation come from human resources.

Radiation especially ionization radiation are used in the diagnosis and treatment of disease. The doctors are first one ordered to do imaging that if they have enough awareness of medical imaging techniques, characteristics and condition do they are considered, as the factor in protecting society unnecessary radiation. This study has been designed to assess awareness of medical students about methods of imaging and radiation in Kermanshah University of Medical Sciences in 2010. This study is descriptive – sectional and 175 medical student in grades Sonicstage and Internship was measured by constructive questionnaire with reliability R = 84% that demographic data and four field include: awareness of radiation, methods of imaging, protection against radiation and the risks of radiation at last data was analyzed by using the software Spss16. Results showed that awareness levels of Internship and Sonicstage sections students was 64%. The most information about the Internship students is 69% in general, awareness of these two groups of students is 48% radiation, imaging techniques 65/6%, protection against radiation 62/5% and risks of radiation 64/4%. The results of this study indicate that awareness of medical students is not desirable. Considering that these students are in the section bottom educated it is required to control the amount of risks and reduce to the lowest by the revision and increase educational courses in this regard by promoting knowledge and awareness of students in understanding various imaging techniques and scientific principles and regulations to protect.

Keywords: awareness, medical students, imaging procedure.

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P41: Probing Targets for Antipsychotic Drug Action with PET and SPET Receptor Imaging

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Abstract

The use of in vivo receptor imaging by positron emission tomography (PET) and single photon emission tomography (SPET) has permitted exploration of targets for antipsychotic drug action in living patients. Early PET and SPET studies focused on striatal D2 dopamine receptors. There is broad agreement that unwanted extrapyramidal (parkinsonian) side effects of antipsychotic drugs result from high striatal dopamine D2/D3 receptor blockade by these drugs. The dopamine hypothesis of antipsychotic drug action suggests that clinical response is directly related to the level of striatal D2/D3 receptor occupancy of antipsychotic drugs. This may be true for classical antipsychotic drugs, but recent evidence suggests that novel, atypical antipsychotic drugs produce efficacy in association with modest and transient striatal D2/D3 receptor occupancy levels. Furthermore, atypical antipsychotic drugs appear to show preferential occupancy of limbic cortical dopamine D2 receptors. Cortical dopamine D2/D2-like receptors may be a common site of action for all antipsychotic drugs. Data from receptor challenge paradigms has highlighted the need to explore the neurotransmitter systems involved in regulating or stabilising dopamine transmission, either via dopamine autoreceptors or non-dopaminergic pathways. These may be promising targets for drug development. In vivo PET and SPET imaging has produced unique data contributing to the design of better, less toxic drugs for schizophrenia

Keywords: Probing, PET, SPET

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P42: Role of Digital Filters in Enhancement of Spatial Resolution in SPECT Equipped with LEGP Collimator Instead of LEHR Collimator

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Abstract

Single-photon emission computed tomography (SPECT) is a non-invasive imaging technique that is used to generate cross-sectionals images of a three dimensional object without superimposing tissues. Image quality in SPECT is limited physically by the spatial resolution of imaging systems, random noise inherent in the radioactive decay process and less available photon statistics in the acquired image. One way to improve image quality and noise suppression are through the low-pass digital filters designed to suppress high spatial frequencies where noise dominates the signal. Imaging was performed using a double-head ADAC EPIC Vertex model SPECT camera. At first, a line source containing 99mTc fixed in the center of SPECT system. All the SPECT studies were reconstructed by FBP technique with a Ramp filter; Parzen, Hanning, Hamming, Gaussian filter and Butterworth filter (with different filter parameters). In the next step, two resemble sources, similar to the previous step, were prepared and same protocols were selected for imaging. In the third step, we use of (low-energy general purpose) LEGP collimator other than (low-energy high resolution) LEHR collimator and same processing has been repeated. Comparison of results show that whole result obtained by use of LEHR collimator is much better than the result of obtained by use of LEGP collimator in specific value for cut-off frequency. In all situations, the values of the FWHM usually are improved with increasing of the cut-off frequency. Results show that the best result for image quality a line source is achievable by Gaussian filter for both collimators. Remarkable point for this study is that the value of FWHM image acquired with SPECT system equipped with LEGP collimator under implementation of Gaussian filter is better than the value of FWHM image acquired with SPECT system equipped with LEHR collimator under implementation of Parzen or Hamming filters, in other word, degradation of spatial resolution of image obtained by SPECT system equipped with general purpose collimator was compensated with software methods.

Keywords: SPECT, LEHR collimator, LEGP collimator, Filter

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P43: Utilizing Computed Tomography Bone Imaging as Measuring and Screening Tool for Bone Mineral Density of Sample Iraqi Women Population.

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Abstract

Osteoporosis is a bone disease characterized by decreased Bone Mineral Density (BMD) leading to increase risk of fracture. CT scanners display X-ray attenuation data of bone in Hounsfield units (Hu) which can be converted to bone density in units of mg/cm3 or mg/cm2. The aim of this work is: (1) establish the technical background for implementing Computed Tomography Bone Imaging technique for BMD measurement; and (2) apply the technique on sample Iraqi women population. A total of 56 patients presented for CT scan examination (with no bone complaint) were randomly selected covering 30-70y age. BMD was measured using helical CT (Siemens AG/Emotion/EN60825;2002) with a single energy beam of 110KvP; 140 mAs, K=1139. Slices with thickness (x) of 0.8cm were selected at the mid-vertebral level of L1, L2, L3, and L4; Rt and Lt femurs trabecular bone bodies. Hu number of ROI was determined by taking the average of three readings. Sample was divided into four groups: (30-39)y, (40-49)y, (50-59)y, and (60-70)y. Excel sheet was compiled for calculation and analysis of Arial BMD based on the developed equation: ABMD(mg/cm2)=(xμlw/Kμm)(Hu+K)=0.6764*Hu+770.42, where μlw is water linear attenuation coefficient and μm is bone mass attenuation coefficient (Hubbell tables). T-score and Z-score values were determined employing NHANES total hip data, and results showed that: (1) young adults average femur ABMD of 0.95g/cm2 was identical to published data; while average lumbar ABMD of 0.94g/cm2

was lower, (2) CT diagnostic values: 90 >Hu> -180 for osteopenia and Hu≤ -180 for osteoporosis, (3) T-score

values were: +0.0276, -0.3691, -0.7781 and -0.9496, respectively, and (4) Z-score values were: +0.1031, -0.0765, -0.1201, and +0.2086 respectively. In conclusion: (1) CT scanners can be utilized for ABMD measurements in the absence of DXA, and computer software can be built in for this purpose, (2) the relatively high T-score and Z-score values could be attributed to type of nutrition, environment and life style. A larger Iraqi women sample is planned for future work.

Keywords: Bone Mineral Density; Osteoporosis; Osteopenia, Computed Tomography, Bone Imaging, Bone Disease.

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P44: The Effect of Optical Blurring on Visual Cortex Activity: An FMRI Study

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Abstract

Myopia blurs retinal images and in turn can change neural signals transferred from retina to visual cortex. The purpose of this study is to evaluate the effect of induced myopia on occipital visual cortex activity by fMRI results. BOLD fMRI was performed in 13 emmetropic volunteers with normal visual acuity, good binocular vision and no history of neurologic illness. Visual stimulus was counterphasing vertical luminance sinusodial grating with spatiotemporal frequency of 1.84cpd /8Hz and contrast of 60%. The functional images were acquired in block design, during normal refractive state and induced myopic states of 1D, 3D, 5D using EPI gradient echo sequence in 1.5T MRI scanner. fMRI data were processed using FSL software. fMRI responses to visual stimuli demonstrated that percentage BOLD signal change within occipital visual cortex reduced remarkably in induced myopic states of 1D, 3D, 5D in comparison with normal refractive state; but the results did not show a significant and regular decreasing trend in BOLD signal change in these three different values of induced myopia. The findings suggest that induced myopia has a considerable effect on visual cortex activity; accordingly it is essential to correct myopia before fMRI clinical examinations and distinguish its effect from other effective factors on visual cortex activity.

Keywords: fMRI, visual cortex, induced myopia

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P45: Metal Radionuclide's for PET Imaging

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Abstract

Although the majority of PET radiopharmaceuticals in clinical and research use are labeled with the four common PET radionuclide's, 15O, 13N, 11C and 18F.a number of metal radionuclide's have been studied. 68Ga produced from a 68Ge/68Ga generator, was initially used for brain imaging. The 82Sr/82Rb generator was originally developed by researchers at the Squibb Institute for Medical Research. Over the past several years, there has been increasing interest in other metal-based radionuclide, particularly nuclides of copper, 66Ga and 86Y. Several of these nuclides can be distributed from a central production site and thereby have the potential for use in PET centers without a cyclotron. There are many possible metal-based positron-emitting radionuclides that can be utilized in positron tomography. At the present time, the most promising nuclides are copper, gallium, and yttrium. For example Copper has two natural occurring isotopes, 63Cu (69.2%) and 65Cu (30.8%). Several radionuclide can be

produced for use in PET imaging, 60Cu, 61Cu, 62Cu and 64Cu, with 67Cu and 64Cu used for therapeutic purposes. It is highly likely that radiopharmaceuticals labeled with these nuclides will be generally utilized in clinical practice over the next several years.

Keywords: Medicinal Imaging, Nuclear Medicine, PET, Radionuclide's for PET, Metal Radionuclide's.

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P46: Positron Emission Tomography in Brain Tumors

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Abstract

Positron emission tomography (PET) is a minimally invasive nuclear medicine imaging technique that uses short-lived radiopharmaceuticals to detect and assess perfusion and metabolic activity in various organ systems. It provides information about function and metabolism that is complementary to the structural information provided by conventional imaging techniques such as x-ray computed tomography (CT). This study is restricted to assess of PET in brain tumors.

PET in Brain Tumors has roles such as to display "Differentiation between malignant and benign lesion"," Grading brain tumors", "Guidance for biopsy site", "Delineation of the extension of brain tumors", "Therapy monitoring", "Diagnosis of recurrence"..In this study, we explain this function and compare those in the PET and other modalities.

Keywords: Medicinal Imaging,PET, Radionuclide's for PET, Metal Radionuclide's,

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P47: Numerical Simulation of Penetration of Rib Cortical Bone Struck By Projectiles with Different Nose Shapes

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Abstract

Thorax is one of the most critical body parts whose main duty is to protect heart. Therefore, any thoracic injuries might put body health at serious risk. It is important to develop a method to reduce these injuries. This requires investigation of injury mechanisms to predict human body response to impact. Nowadays, numerical methods are used to investigate the impact and penetration phenomena. LS-DYNA is one of the most important software packages based on Finite Element Method. In this paper, the penetration of projectiles with different nose shapes into cortical bone is simulated using LS-DYNA. Two rigid cylindrical projectiles with flat and semi-spherical noses are used. The cortical bone is modeled as a cylinder with isotropic properties. Impact velocity is within the ballistic velocity limit and perpendicular to the impact surface. Simulation results showed that for two projectiles with the same mass and density, the ballistic velocity limit of the semi-spherical-nosed projectile was 30% less than that of the flat-nosed projectile. Also, the depth of penetration of the semi-spherical-nosed projectile was 25% more than

that of the flat-nosed projectile. The effect of impact angle is also investigated with the flat-nosed projectile. It was observed that, with an impact angle of 60˚, both the depth of penetration and the ballistic velocity limit were lower compared to the normal impact case.

Keywords: cortical bone, Thorax, penetration, numerical method

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P48: Malignancy Determination of Tumors Using Perfusion MRI

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Abstract

Perfusion MRI images are effective tools for diagnosing brain disorders and monitoring response to tumor treatment. The main purpose of this research is to find a proper solution for analyzing perfusion images taken by magnetic resonance to determine the rate of malignancy of carcinoma tissue since the tissue's perfusion depends on the rate of malignancy. The significance of conducting this research is the lack of existence of any accurate method for this case.

The clinical images used belong to 10 patients for whom Glioblostoma (GBM) has been diagnosed, and the cerebral perfusion images have been taken in Henry Ford Health System. Cerebral perfusion images taken from each patient almost includes image with N=90 and the resolution of 128x128.

By doing ICA and deconvolution analyses on perfusion images related to each patient, different areas with varied perfusion were separated and by considering each area as ROI, the related perfusion specifications have been obtained and having the pathology and response to treatment for each patient, the correlation between perfusion specifications and response to treatment have been obtained by using statistical methods. The results indicate that the relation of rMTT factor with response to treatment is very good and statistically significant ($R2 = 0.9$, $P<0/00005$), therefore MTT can be considered as a good factor in relation with response: since in medicine we always seek to find which tumor response to treatment better, whether it is better that the patient goes through radiotherapy or not, therefore so many patients go through radiotherapy to find out how is their response to treatment. As a result, considering the relation between MTT and response one can almost give comment on the patient's response to treatment and determining the rate of malignancy based on MTT factor, before the treatment is done.

Keywords: Tumors, Perfusion MRI, Glioblostoma

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P49: Development of Intensity Spatial Distribution in Homogenous Turbid Media Using Green's Function In Fluorescence Molecular Tomography Imaging

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Abstract

Optical imaging is established as one of the modalities applied to molecular imaging studies. Molecular imaging can be used to visualization of molecular events in the cellular or subcellular level. One of the main goals in optical imaging is giving source distribution. The forward problem seeks to determine the photon density on the surface of the subject. Among the different method, Green's functions provide a fast method for modeling the diffusion. Depending on source shape, set up and geometry, Green functions are different. In this study a new optical set up was implemented in the cylindrical geometry. The software is developed and written in Matlab to estimate the intensity on the object's surface. The algorithm is based on diffusion approximation and evaluated by phantom experiment. The phantom experiment is performed to take the images by the optical imaging system. The results showed that the algorithm has accuracy of 98% and used to development of the inverse problem.

Keywords: Fluorescence Molecular Tomography, Forward problem, Born approximation, Kirchhoff approximation

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P50: Monte Carlo Method in Depth Determination of Fluorescent Sources in Biological Tissue

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Abstract

Depth and variation of size determination of the tumor in the flow up a study is extremely important in the clinical study. The photon in biological tissue can be traced to achievement these quantities with some numerically methods. Therefore, Photon transport in biological tissue can be simulated by the Monte Carlo method. In this study, Monte Carlo was used for determination depth and size of the point source as a fluorescent source. So, photons of a point source were traced till they receive to surface. Then, intensity of each photon was recorded in a matrix on the surface. To achievement to an image one million photons was applied to the algorithm and traced till surface. Point source was located in distinct depth from 2–3.5 millimeters with 0.5 steps. The image of each location of point source was obtained. The profile of each image was calculated and size and depth of sources was determined. There isn't significant error in this method to determination size and depth($p<=0.5$).

Keywords: Mont Carlo method, Fluorescent, Depth, Size.

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P51: Increasing Depth of Light Penetration In Fluorescence Molecular Imaging Using Fluorescence Resonance Energy Transfer

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Abstract

Optical imaging is an imaging technique that uses quantum dotes Optical imaging systems may be divided into diffusive and ballistic imaging. Due to limitations of defusing in depth, this method has confronted some problems. Fluorescence Resonance Energy Transfer can increase the penetration. FRET allows separation between fluorescent molecules to be made with Angstrom resolution. A donor molecule absorbs light at some frequency that temporarily places that molecule into a higher energetic electronic state. Donor gives up its energy emitted wavelength. For this objective one can use quantum dotes. We have developed the tomography imaging system which include three lasers and a CCD camera. The FRET method was used to take images of deep seated legend. The result showed that the penetration was increased 10%. FRET can be used to detect cells in depth of tissue therefore Fluorescence Molecular Tomography system can be used for early diagnosis of cancer cells.

Keywords: Molecular imaging, Quantum dotes, Fluorescence Resonance Energy Transfer

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P52: Evaluation Of Accuracy Of High Order Optical Aberration Using Shack-Hartmann Aberrometer By Orthogonal Series

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Abstract

Optical aberration is an imperfection in image formation by an optical system. Eye is a complex optical system which has sorts of optical aberration which has destructive effects on visual aquity. A Hartmann-Shack wave-front sensor is used to measure the wave aberrations of the human eye by sensing the wave front emerging from the eye produced by the retinal reflection of a focused light spot on the fovea. The measurement is based on estimating of Zernike Polynomials which has limitations in estimating high order aberration. Since the test involves the measurements of the local slopes of the wave front, the actual wave front is reconstructed by the use of wave-front estimation with Zernike polynomials. From the estimated Zernike coefficients of the tested wave front the aberrations of the eye are evaluated and converted to Fourier coefficients. The results have shown that the accuracy of Fourier polynomial reconstruction algoritm in describing simulated wavefront data is more accurate than Zernike polynomial in estimating the high order aberrations.

Keywords: Eye aberration, Shack hartmann aberrometer, Zywave aberrometer, Zernike polynomial, Fourier polynomial, High order aberration

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P53: Introduction of New MRI Contrast Agent to Enhance Detection

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Abstract

Magnetoliposomes (MLs) are utilised as contrast agents for targeted molecular MRI. we have used Gd2O3 as magnetic core with size of ~ 40 nm. Liposomes were prepared by a mixture of lipids made of DSPC:cholesterol:DOPE dissolved in Methanol Chloroform and evaporated to dryness. The dry lipid film was hydrated with a buffered aqueous solution of different concentration of DEG containing Gd2O3. MLs were centrifuged Immediately to remove excess DEG containing Gd2O3.The mean particles diameter was determine by DLS and TEM. The absolute amount of gadolinium in MLs was determined using Inductively coupled plasma. MRI were performed to evaluate the intensity of the contrast agent on T1 and T2 relaxation time. In vivo, the biodistribution and the cleareance of the particles over time were studied in mice. MLs had high positive and negative enhancement in MRI T1W and T2W respectively hence they will be modified for non invasive diagnosis of Liver cancer by targeted molecular imaging.

Keywords: MRI, Molecular imaging, Contrast agent, Gadolinium,Manetoliposome, Liver cancer.

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P54: Design a Novel Optical Biosensor for Troponin I Enzyme Detection Based On Surface-Enhanced Raman Spectroscopy

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Abstract

Optical technique, including Raman Spectroscopy was made relevant to detect biomolecules by the discovery and development of surface-enhanced Raman spectroscopy (SERS). SERS is a promising tool in analytical science, because it can provide high sensitivity without the labeling process required by fluorescence detection. In this study, we demonstrate a composite system of Au-nanoparticles and optical microsphere resonator based on SERS technique. This technique consists of locating the target analyte on nanometer range of roughed Au-nanoparticles. The presence of the metal nanoparticles provide a tremendous enhancement to the resulting Raman signal through an electromagnetic enhancement of both the laser excitation light and stokes-shifted light by five or six orders of magnitudes. Surface enhanced Raman spectroscopy gives the possibility to create a spectroscopic device which can act as highly sensitive molecular detector using Raman signal as a fingerprint of the analyte.

Keywords: analytes, microsphere, surface-enhanced Raman Scattering

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P55: An Overview on Common Digital Radiology Detectors

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Abstract

Introduce: Recently digital imaging systems according to timing, accuracy, quality, costs and … are replacing analog systems. In digital imaging system X-rays after creating photons converted to electrical signals to processing by computer, which it gives us a high quality image with low range of noise.

Purpose: The purpose of this study is an interview on common digital radiology detectors to introduce the different aspects to physicians which they could have sight in choosing a imaging system. Support: Most medical digital X-ray detectors are configured from two main components:

1.In this group, the incident X-rays are absorbed by a phosphor that has the ability to store the image information as a latent image. These systems are known as storage phosphor or computed radiography (CR) systems and are typically characterized by this two-stage expose and read process.

2. The second group of digital X-ray detectors (also known as digital radiography detectors or DR) is characterized by a ‘‘fast’’ electrical readout of the image information acquired by the secondary quantum detector.

Comparative Assessment of Detectors: Systems based on a-Si:H flat-panel detectors are providing the highest levels of image quality in applications ranging from mammography. A compare between analog and digital detectors these type of detectors reduce costs and increase the power (image quality). these new digital systems will allow a much more specific optimization of patient exposure consistent with the image quality requirements of the particular clinical task at hand. In a traditional powdered phosphor screen-film system, most of which use gadolinium oxysulphide (GdO2S:Tb) This can lower the effective packing density of the layer by as much as 50% which reduces the X-ray absorption. A more sophisticated method of controlling the light spreading within the phosphor layer is by the use of phosphors that grow in columnar structures such as CsI. CsI has been used for many years in medical image intensifire systems. The introduction of a-Si:H flat-panel detectors and other electronic secondary quantum detectors has provided an opportunity to introduce a similar material, CsI, into the static projection radiography environment. The use of columnar CsI also seems to provide better uniformity of the conversion and escape efficiency of the secondary quanta than powdered phosphors. Recent developments in X-ray converters have tended to concentrate on new photoconductors such as PbI, HgI and PbO while other materials such as TlBr CdTe and CdZnTe have been reported. Conclusion: In a comparative assessment on flat-panel detectors a-se:H has provided the highest image quality among other. Thus new studies on phosphor applications will presented soon.

Keywords: Radiology, digital, detectors, a-Se, phosphor

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P56: Metal Artifact Correction in CT Images by a New Algorithm

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Abstract

Metal artifact is one of the major problems in CT imaging. The main idea is to fill in the incomplete projection data resulted from metal attenuation. The recent suggested methods have some shortcomings in duration time of

processing, reproduction of new artifacts, reducing the contrast and reduction the visibility of edges in the image. In this research work we have suggested a new algorithm to reduce some of the above mentioned shortcomings. The suggested algorithm has five steps means: a) extraction the metal region from the image, b) Filtration the extracted metallic region, c) segmentation and accurate extraction of metallic pieces by FCM (Fuzzy C Means) method, d) using the interpolation on the sinogram and finally e) insert the corrected metallic section of image to the original image. Our results showed, by using this new algorithm the output image has better contrast, signal to noise ratio and visibility with much less consumed time than the other reported methods.

Keywords: metal artifact, computed tomography imaging, image processing.

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P57: Segmentation of Microarray Images

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Abstract

DNA chips (i.e., microarrays) biotechnology is a hybridization (i.e., matching of pairs of DNA)-based process that makes possible to quantify the relative abundance of mRNA of two distinct samples by analyzing their fluorescence signals. Inner holes, artifacts and blank spots are common in microarray images. Spot segmentation is a critical step in microarray gene expression data analysis. This paper describes statistical methods for estimate foreground and background intensities. First we start with gridding method, and then clustering to the distribution of pixel intensities, at last step finding the large spatially connected components in each cluster of pixels. All these steps have done using matlab soft ware.

Keywords: DNA chips, Microarray Image, Statistical methods

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P58: RADIATION DURING CARDIOVASCULAR IMAGING

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Abstract

Several imaging modalities are available for the optimal management of patients with cardiovascular disease. When assessing any imaging technique, the radiation dose must be considered along with the value of the imaging technique. In this article, we summarise the radiation doses associated with cardiovascular imaging techniques, such as heart catheterisation, nuclear medicine and multi-slice computed tomography. The effective dose of the dual isotope scan, an image modality frequently used in cardiac patients, is higher (~25 mSv) than cardiac computed tomography (~10 mSv) or diagnostic heart catheterisation (~5 mSv). The physician should weigh carefully which test to recommend in each patient.

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P59: Prospects in Medical Ultrasound Beam Forming

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Abstract

Ultrasound as medical imaging modality enjoys wide spread usage due to its portability, low cost and the expanding imaging information it provides. More recently significant efforts are being made to move ultrasound from being qualitative imaging tool toward being quantitative in areas like backscatter and attenuation estimates. The 2D

arrays technology is in process of displacing 1D arrays. Both of these trends push for more innovative and faster beam forming

The classic approach of building images line by line is found to be too slow for the new 2D arrays. Several technologies in form of image acquisition strategies as well as hardware developments are being investigated to increase the speed to make real time volumetric imaging viable. The presentation will go through some emerging directions.

In another front, variability in the classic beam forming process could hinder quantitative imaging. The wave front relative strength, attenuation effects as well as speed of sound should all be revisited within beam forming process. Some technologies developed metrics to guide the process parameters. The lecture will address some fundamental issues as well as attempted solutions.

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P60: Comparison of FFT and DWT Pre-Processing Techniques and Different Training Algorithms for ANN-Based EEG Signal Analysis for Detection of Drowsiness

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Abstract

A feed-forward Artificial Neural Network (ANN) was utilised to analyse EEG signals of non-sleep-deprived subjects. The aim of this study was to assess the effect of (i) the pre-processing techniques of Fast Fourier Transform (FFT), and Discrete Wavelet Transform (DWT) (ii) the training algorithms of Bayesian Regularisation (BR), Levenberg-Marquardt (LM) and gradient descent method with momentum and adaptive learning rate (GDX) and (iii) the network training goal value.

This study has shown that the neural network approach can be successfully adopted to recognise patterns of drowsiness in EEG signals with a mean for success rate for all the variations used in this study of 95.4□0.2%.

It was shown that (i) the DWT approach was a significantly better pre-processing technique ($p<0.001$) for EEG signal pre-processing and feature extraction than the FFT technique (ii) although the difference between the GDX and BR training algorithms were statistically insignificant, there was smaller spread in the BR outcomes which may be considered advantageous for automatic vigilance monitoring systems.

Keywords: Artificial Neural Network, Fast Fourier Transform, Discrete Wavelet transform, Bayesian Regularisation, Drowsiness

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P61: Effect of K-Shell Absorption Edge Filters on Image Quality and Radiation Exposure in Intra Oral Radiography

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Abstract

There are two categories of filters, conventional and K-shell absorption edge filters.The first category comprises filters of low atomic number like aluminum (Al, K-shell binding energy 1.54 keV). aluminum is used in 1 to 3 mm thicknesses to absorb low-energy photons. Further aluminum thickness increases Compton scattering that removes

significant numbers of high-energy photons from the x-ray spectrum and extends exposure times. In the second category, K-edge filters absorb photons with energies just above the K-shell binding energy of the filter element.

K-edge filters are customarily added to the Aluminum. Many K-edge filters: samarium (Sm), yttrium (Y), erbium (Er), gadolinium (Gd), Gd oxysulfide and cerium (CE) have been studied in intraoral radiography. Although all studies report reductions in surface radiation exposures, the effects on image quality differ among the studies. Added Gd, Y, Er, and Gd-oxysulfide decreased image contrast resulting in images less preferred by clinicians than those obtained with Aluminum filtration alone. On the other hand, Sm, Er, and Gd-oxysulfide did not affect diagnostic image quality, but Sm heightened image contrast. These K-edge filters increase average beam energies measured by increased half-value layers (HVL) of aluminum and at the same time increased exposure times because of the significant removal of photons from the x-ray beam.

Conclusion: The use of rare earth and K-shell absorption edge filters in intraoral radiography has been investigated by dental researchers. in an effort to increase or maintain adequate diagnostic quality with reduced patient exposure.

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P62: A New Technique to Automated Detection of Capillary Non-Perfusion in Fundus Fluorescein Angiogram

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Abstract

Capillary Non-perfusion (CNP) is a condition in diabetic retinopathy where blood stops to flow to certain parts of the retina, potentially leading to blindness. This paper presents a new method for automated detecting of non-perfused regions from fundus fluorescein angiogram (FFA).While major vessels appear as ridges, non-perfused area are seen as pond that surrounded by healthy capillaries. These lesions are seen as smoothed regions with very high uniformity and low entropy and eventually small variation in intensity in FFA images. The strategy we have adopted is screening the whole image with determine window size which is small enough to enclosed areas with these mentioned topographic characteristics. In order to reject false candidates, we also need to perform a thresholding operation on the screen and marked images.The proposed algorithm has been tested on 41 FFA images and certifies against clinician observer marked that is opinion truth. Results have been reported by sensitivity 81% and specificity 78% from the ideal opinion. This method could form part of an automated system to detect non-perfusion lesions in FFA images showing either any diabetic retinopathy or referable diabetic retinopathy.

Keywords: Non-perfusion area, Diabetic Retinopathy, Fluorescein angiography, image processing

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P63: Computed Tomographic Based Finite Element Analysis Can Predict Fracture Initiation Locus in Human Vertebrae Affected by Tumors

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Abstract

The aim of this study was to present an effective specimen-specific approach for predicting failure initiation load and location in cadaveric vertebrae. Nine thoraco-lumbar vertebrae excised from three cadavers were used as the samples in this study. The samples were then scanned using the QCT and their sectional images were segmented and converted into 3D voxel based finite element models. Then, a large deformation nonlinear analysis was carried out. The equivalent plastic strain was then obtained and used to predict the load and locations of the failure initiation in each vertebra. Subsequently, all the samples were tested under the uniaxial compression condition and their experimental load displacement diagrams were also obtained. Results showed that in the samples, the failure is initiated and occurred at the loads below the ultimate strength of the samples. The radiographic images showed that the failure initiation happens in the same portion of the vertebral bodies as predicted by the QCT voxel based FEM. The method developed and verified in this study can be regarded as a valuable tool for predicting vertebral failure load.

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MPE

P1: Present Status and Future Development of Medical Physicists in Bangladesh

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Abstract

Purpose: The purpose of this study is to discuss the current status and future development of medical physics education, clinical training and professional development for medical physicists in Bangladesh.

Methods: In Bangladesh previously cancer management were carried out by Cobalt-60 teletherapy machines and due to lack of medical physicist cancer patients were treated by the radiation oncologist and technologist in conventional way. Now the cancer management is entering a new era that means in conformal radiotherapy where medical physicist is badly needed. As a result in 2000 a full fledged "Department of Medical Physics and Biomedical Engineering (MPBME)" was founded at Gono Bishwabidyalay (university), in Dhaka, Bangladesh. A collaboration program between Gono University and Heidelberg University along with the cooperation of the German Cancer Research Centre (DKFZ) was implemented between 2002 and 2006 under the German Academic Exchange Service (DAAD). The department now offers both Master course (2 years) and Bachelor course (4 years) on Medical Physics. At present the total number of students is 70 in the department which is gradually increasing every year. Presently there are 18 radiotherapy departments and 20 numbers of medical physicists in Bangladesh which will be increased to about 30 and 50 respectively within 2015.

Results: Although the quantitative needs for medical physicists in Bangladesh are increasing, but the situation is very far from the goal with pros and cons; till now the department of MPBME is the only department in Bangladesh from where medical physicists are coming out, lack of proper clinical training for medical physicists, no position in the government hospitals. To improve the status of medical physicists, a goal-oriented action plans is required: especially, strengthening the medical physics education, training and professional development of medical physicists, and promoting good relations and the exchange of information with other international related organizations. With that aim, Bangladesh Medical Physics Society (BMPS) has been formed. Presently BMPS is strongly trying to get the professional registration number and make position for medical physicists into government hospitals.

Conclusion: To meet up the requirement of medical physicists in future the other universities should come forward to build up more manpower in this subject. An urgent crash program is already started for clinical training for the existing manpower in radiotherapy with the collaboration of Germany. Within this program 2 medical physicist, 3 radiation oncologists have already finished their training and very soon more physicists and radiation oncologists

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P2: Evaluation of Medical Physics Education and Training Programs in Iranian Universities and Clinics

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Abstract

According the recent announcement of ministry of health, about 70000-90000 Iranian people are involved with cancer per year. Regarding this raw information, Iranian health system requires at least 60 linear accelerators to present routine conventional radiotherapy treatment. Adding, other routine facilities including CT simulators, Brachytherapy suits, as well as involvement with training and research programs, at least 150 - 200 full time expert clinical Medical Physicists are required.

The responsibilities of the "Clinical Medical Physicist" are generally related to the safe and assured dose delivery for diagnostic or therapeutic purposes. In detail, a range of duties such as equipment maintenance, establishment, commissioning and routine periodical quality control tests, periodical audits are likely defined as their tasks.

The Current study compares the scheduled efforts for Australia as a comprehensive program to describe the clinical Medical Physicists responsibilities, tasks and trainings with those carried out in Iran.

The comparisons show that the Medical Physicists' associations role is one of the main reasons for development of job improvement. The relevant associations and organizations have prepared several regulations and plans to legislate the Medical Physicists roles and positions. They are categorized based on their qualifications, clinical/educational expertise and their sub-specialties. In order to do these, several residency/registration programs are planned to improve the level of the knowledge for Medical Physicists. Today, the main concentration is the training several Medical Physicist either for routine demands such as Radiation Therapy, Medical Imaging, Radiation Protection or a comprehensive long term trainings (at least two years for relevant qualified graduates and up to a 5 year for non-relevant qualifications). The Medical Physicist are recommended to be assessed prior the starting the job as an independent and responsible staff. A plan is required to assess and award an accreditation or qualification, as an official recognition of a minimum quality level.

Although, Iranian Medical Universities offer Medical Physics postgraduate degrees, as literature indicates, at the moment, there is no plan for clinical Medical Physicist training and routine tasks in Radiation Therapy and Imaging departments. This is strictly recommended to be commenced due to the long-term response.

Keywords: Accreditation, Education, Medical Physics, Training.

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P3: Medical Physics at Royal Hospital, Organized Efforts and Scientific Contributions to Achieve Professional Impact

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Abstract

Oman is the second largest country in GCC world with a population 3Million, and large geographic spread. The country has high potential for development, as a WHO recognized best maintained ministry of health services.

Therefore growth in medical physics is expected to greatly benefit the state in terms of diagnostic and therapy services, teaching and research components. Thanks to IOMP for formation of its middle east wing, Middle East Federation of Organizations of Medical Physics and

Oman as one of the member states, and IAEA for their mission with primary attention to bring up medical physics infrastructure in Oman. Though a professional association of medical physics is yet to be formed, being one of a senior medical physicist, I take an opportunity to briefly review of the existing status.

Medical physicist positions are available at Radiation Protection Advisory Cell (RPA, DGEA,MOH), Royal Hospital (RH), and Sultan Qaboos University Hospital(SQUH), with total number medical physics positions 13 (with 6 PhDs, 4 M.Scs and 3 BScqualifications, out of them 5 senior physicists are ex-patriates). Projections have been made in MOH, for need for medical physicists in major diagnostic radiology centres. In RH medical physics positions in radiation therapy were first filled during 2003. One senior physicist visit nuclear medicine 2 days in a week on part-time basis. FRCR residency programme in Diagnostic Radiology exist from 2005 and physics classes are conducted by Faculty from MOH, RH and SQUH.

Table 1: indicate delegations of senior medical physicists in the past, which helped in achieving latest international co-operation in this field in appraising professional impact.

Table 1: Delegations of senior medical physicists in the past

Visited on	Visited Dignitary	Country	Mission
Feb, 2007	Dr. Slozarek	Curie Centre, Poland	Validate IMRT Process
Mar, 2009	Prof. P. Andreo	Karolinska, Sweden	IAEA (Radiation Safety)
Dec, 2009	Dr. Dale Bailey	Royal North Shore, Australia	IAEA (PET-CT Expertise)
Feb, 2009	Dr. Jake Van Dyk	London Regional Health, Canada	Medical Physics (RT/TBI)
Mar, 2010	Dr. William Parker	Mc Gill University, Canada	IAEA (Med.Phys. HRD)
Mar, 2010	Dr. Jan Seuntjens	Mc Gill University, Canada	IAEA (Sec.Std.Dosim.Lab)
Feb, 2011	Dr. Fridtjof Nuesslin (IOMP President)	Editor in Chief, Physica Medica, Munich, Germany	Recent Advances in RT

From medical physics unit of RH there were 23 publications (8 Dosimetry and QA, 3 Nuclear Medicine, 9 Radiotherapy, 3 Radiation Safety) and 56 Scientific Presentations (11Dosimetry and QA, Nuclear Medicine 5, Radiotherapy 24, Radiation Safety 16). Formation of medical physics society, recognition to have secondary standards laboratory, formation of departments to help further growth in this field, training, residency and certification programmes will be only pathways to obtain professional status on a long run. Quality services in medical physics will be achieved by having more number of medical physicists in different applications of physics in health care, for which planned strategies are need of the hour. Regional co-operation will go a long way in achieving high standards. The presentation will discuss details of medical physics scientific contributions from Royal Hospital in the past.

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NONIONIZING RADIATION

O1: Modeling of Heat Distribution and Thermal Damage Pattern Diode Hair Removal Lasers for Various Skin Types: a Novel Method for Optimizing Treatment Process

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Abstract

Background: Recently, the concept of tissue damage time as a reference for pulse duration has become a subject of debate.

Objective: We simulated the heat distribution and thermal damage patterns of diode hair removal lasers for different spot sizes, pulse durations and fluences as a guide for optimization.

Methods: LITCIT was used for the simulations. Skin was modeled as 2 homogenous layers of epidermis/dermis and 2 coaxial cylinders as the hair shaft/ follicle. Opto-thermal coefficients of the components and the radiant parameters of the laser (diode, 810 nm) were defined.

Results: At constant fluences and pulse durations, the damage occurred deeper using larger spot sizes. At constant pulse duration, high fluences caused significant damage to the hair follicle and epidermis. By using longer pulse durations (≤400 ms) at constant fluences, there was more effective damage to the hair follicle while sparing the adjacent epidermis and dermis. Due to the time-dependent temperature profiles, increased pulse duration creates a moderate, gradual rise in the target's temperature. Pulse durations longer than 400 ms are accompanied by unwanted dermis damage.

Conclusions: Our results show that using very long pulse durations near the tissue damage time (≤400 ms) creates better efficacy in treating unwanted hairs while avoiding unwanted damage.

Keywords: Hair removal, LITCIT, Simulation, Thermal Damage, 810-nm Diode Laser

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O2: Direct Additional Acceleration of Relativistic Electron and Generation of Electron Irradiationin Vacuum Bycombination Intense Short Pulse Lasers TEM*(0,1) Doughnut Mode and TEM(0, 0) Mode

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Abstract

Electron irradiation uses electrons accelerated in a velocity close to the speed of light to destroy microorganisms, bacteria, viruses, or insects that might be present in the food (Cold pasteurization). we investigate increase energy of electrons in interaction, by two femtosecond Pulse Lasers with intensity I0=4.19E+020 w/cm2, wavelength λ=0.8µm, spot size W0=100µm, pulse time duration tp=100fs in doughnut mode (TEM*(0,1)) and TEM(0,0) for Capture and Acceleration Scenario(CAS) in vacuum employed and the suppression mechanism of transverse electron scattering by using a linear combination of lasers intensity via three-dimensional test particle simulation, numerical analysis and uses Ponderomotive potential model(PPM) as the theoretical model for description electron acceleration. ponderomotive force traps the electrons by the potential well of TEM*(0,1) near the laser central axis and are accelerated by the TEM(0,0) longitudinally. Electrons access energy from 0.58Mev to above 2.5Gev in optimal status.

Keywords: Capture and Acceleration Scenario (CAS), doughnut mode, Electron irradiation, Intense Short Laser Pulse, Ponderomotive Potential Model (PPM)

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O3: Numerical Simulation of Human Eye: New Insights in Glaucoma

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Abstract

Glaucoma is the second leading cause of blindness all over the world; nevertheless, neither the general population nor health professionals have adequate knowledge of this disease. Obviously, it is crucial to improve our knowledge of optic nerve head (ONH) biomechanics in the study of Glaucoma. In this paper, the Finite Element Modeling of the human eye was performed to obtain stress-strain analysis in the sclera. It was concluded that stress in the ONH region is greater than other parts of the sclera. Increasing stress in the cornea and sclera may result in closure in blood vessels and perfusion problems in the ONH which consequently leads to Glaucoma.

Keywords: Glaucoma, Optic Nerve Head, Biomechanics, Finite Element Modeling

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O4: Effects of MRI on Sex Hormones and Other Fertility PARAMETERS OF ADULT MALE RATS

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Abstract

MRI (Magnetic Resonance Imaging) is one of the best diagnostic technique in medicine. In this study,we examined the effects of MRI on the sex hormones and other fertility of adult male rats. 40 adult male Wistar rats (220±10 g) were randomly divided into two protocols.Each protocol contained two groups: exposed (10 rats) and control (10 rats). Exposed groups were placed in MRI for 25 minutes. After MRI, The animals of the first protocol were placed in the holder and scrotal skin temperatures were obtained by the thermometere. These animals were anaesthetized and serum samples were stored, then the weights of paired tests were excised and recorded. After 96 hours, these experiments were repeated for the animals of second protocol. Testosterone, FSH and LH hormones were measured by RIA method. Our results for the first protocol (after MRI) indicated that there were no significant effects on the testes weight, scrotal skin temperatures and serum levels of LH in exposed rats. However, the serum level of testosterone was reduced (P<0.005(and serum level of FSH was increased (P<0.005(. About second protocol (96 hours after MRI), only increase of FSH in the exposed rats such as first protocol was observed (P<0.05(. Our results suggest that MRI cause dysfunction in the secretion of some sex hormones in the adult male rats.

Keywords: MRI, Testosterone, FSH, LH, Fertility

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O5: Effect of Polarized Visible Laser Radiation on Viscoelastic Behavior of Soft Tissue

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Abstract

Background: In this work, we have investigated the effect of radiating polarized laser beam on the viscoelastic tissue properties.

Methods: The samples are divided in three groups. Group is irradiated by the polarized laser beam with direction of polarization, perpendicular to the tissue stress direction, group is irradiated by the polarized laser beam with direction of polarization, parallel to the tissue stress direction and the third group, R is not irradiated at all. The stress-strain curve is plotted for these three groups when stretched, before and after the radiation of the laser beam. The viscoelasticity dependence to the laser polarization is concluded, comparing the differences between the slope of these curves, before and after the radiation of the laser beam. By performing Anova analysis on the slope of the curves, we've found that the maximum variation of viscoelasticity is attained in group.

Result: Therefore the optimised direction of radiating laser polarization to get maximum increase in tissue viscoelasticity is parallel to the tissue stretch vector. The effect of irradiation time on viscoelasitic behavior is also investigated here.

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O6: Therapeutic Effects of Acoustic Cavitation in the Presence of Gold Nanoparticles and Intense Pulsed Light on a Colon Tumor Model

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Abstract

Ultrasound can interact with biologic tissues through various mechanisms. Acoustic cavitation is believed to be the most important effect. There are two types of cavitation activities. Transient cavitation can be fatal to cells and is utilized to destroy cancer tumors. The particles in a liquid decrease the ultrasonic intensity threshold needed for onset of cavitation. Bubbles generation from intense pulsed light (IPL)-irradiated gold nanoparticles have been investigated as a means of providing nucleation sites for acoustic cavitation in cancer tissues. This study was conducted on colon carcinoma tumor in Balb/c mice.The tumor-bearing mice were randomly divided into 7 groups (each containing 10 mice): (1) control group, (2) GNP, (3) IPL, (4) IPL+GNP, (5) US, (6) US+GNP and (7) IPL+US+GNP. Antitumor effects were estimated by evaluation of relative tumor volume, doubling time (T2) and five folding time (T5) of the tumors after treatment. The cumulative survival fraction (CSF) of the mice and percentage of the lost tissue volume (treated) were also assessed in different groups. There was a significant difference in the average relative volume of tumors 10 days after treatment between IPL+US+GNP group and the other groups. The longest T2 and T5 were observed in IPL+US+GNP group.

Keywords: Acoustic cavitation; Gold nanoparticle; intense pulsed light

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O7: Ultra-Sensitive Optical DNA and Peptide Biosensor

Based on Whispering Gallery Mode

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Abstract

Spherical micro resonators are frequently used in optical sensor systems due to their small size, narrow resonance bandwidth, high energy storage capability and high quality factor. One can name the optical micro biosensor whose behavior is based on resonance mode characteristics of a microsphere. These systems can quantify the biological materials in nano scale without any beforehand labeling. This article investigates the so called whispering gallery modes of microspheres and introduces an ultra-sensitive biosensor for nano scale measurement of DNA and peptides. In this respect, the various physical and vital parameters of the biosensor together with their sensitivity will be discussed.

Keywords: Micro biosensor, Resonance frequency shift, Micro sphere

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O8: Spectral Optical Imaging in the Eye Using Scanning Laser System

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Abstract

Optical imaging technique using light of laser sources in medical sciences offers the potential for early diagnosis and effective therapeutics for diseases. This method has the ability to produce quick and non-invasive real time images at low intensity using light of definite wavelengths. The possibility to image using a number of different wavelengths simultaneously offers the potential for in vivo spectral imaging of the human tissue such as retina in order to reveal the early changes in tissue perfusion. Here, we have a review in some potential scanning laser ophthalmoscope in retina imaging that has been undergoing of development in department of Biomedical Physics, at University of Aberdeen. We achieved a new spectral optical imaging technique using scanning laser ophthalmoscope which developed and adapted to detect early changes in tissue perfusion to indicate the starting of retinal disease in the eye. A summary of the technique and the results with healthy and retinopathy patients' eyes will be presented. There is good potential that angiography be replaced in some eye imaging fields by this new method, to help DR patients.

Keywords: Optical imaging, Biomedical optics, Scanning laser ophthalmoscope, Retina imaging, Spectral imaging

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O9: An Invivo Study on Photobleaching in the Presence of 5-Aminolevulinic Acid (5ALA) Conjugated Gold Nanoparticles(GNPs) During Photodynamic Therapy(PDT)

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Abstract

PDT is based on light activation of photosensitizing agents that is preferentially localized in tumor. Reactive oxygen species(ROS) are the main cytotoxic substances which can irreversibly damage the target tissues and singlet oxygen is the primary cytotoxic agent responsible for inducing the photobiological damage. Nowadays, use of GNPs are highlighted as an efficient drug delivery system.

One of the challenges in PDT is photobleaching process. The term of photobleaching is widely used and is defined as the loss of absorption coefficient caused during light exposure. Also, evaluation of photobleaching rate can be an index in PDT efficacy monitoring. In this study to estimate the photobleaching and efficiency of treatment, biocompatible GNPs were intratumorally injected as a vehicle to deliver 5ALA in order to provide a selective and efficient treatment of CT26 tumor models by a spectrometer equipped with a cooled CCD. Elevated formation of ROS and more efficient treatment was achieved using 5ALA conjugated GNPs than that of 5ALA alone. 5ALA conjugated gold GNPs offer a new modality for efficient destruction of tumour cells in PDT.

Keywords: Photodynamic therapy, 5-ALA-conjugated gold nanoparticles, Photobleaching, CT26 tumor model

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O10: Mobile Phone Radiation Exposure Effects on Apoptosis Genes Expression in Hippocampal Formation of Mice Brain

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Abstract

The increasing use of electromagnetic field producers in our daily living in one hand and the contradictory reports on the effects of their waves on public health on the other hand encourages scientist to do more and more research work in this field. One of the most important topic is the study of gene defect due to microwave radiation. In this study, 24 Balb/c adult (8-9 weeks old) male mouse were randomly divided into 3 groups; two of which as test (exposure) groups and the third as the control group. The mouse in the test groups were exposed to 900 &1800 MHz (which are commonly used in mobile telecommunication). Microwaves produced by a Mobile waves generator were induced on the mouse for 30 minutes and one hour twice a day. Control groups were kept in the same temperature and light conditions as test groups. After 30 days, hippocampus was separated and the total RNA isolation and cDNA synthesis was carried out. Bax and Bcl2 genes expression was quantified by Real-Time RT-PCR. Results showed significant changes in Bax gene expression in one of the experimental groups (1h exposure) compare to the control group ($p<0/05$), but no significant changes were observed when Bcl2 gene was studied ($p>0/05$).We concluded that microwave radiation (900&1800MHz) may cause expression changes of Bax gene in hippocampal

formation of Balb/c mouse brain. Effect of longer exposure time (2h×2, 4h×2 and 4h) is under investigation and will be reported elsewhere.

Keywords: Electro magnetic waves, cell phone, mice, Apoptosis, Bax and Bcl2 Genes, hippocampus, gene expression changes, Real Time-PCR, brain

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O11: Category Subcategory Effect of Ultrasound on Peripheral Nerve Repair in Rats

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Abstract

Effect of ultrasound on peripheral nerve repair in Rats abstract Several methods have been presented to reduce the essential time for nerve repair. One of them is ultrasound exposure. In this article, by use of animal model of rat crush injury, we evaluated the effect of ultrasound on nerve repair. The quantity of healing was shown by sfi parameter exploited from paw trace dimension. 20 rats were randomly placed in 3 test and 1 control groups. Their sciatic nerve below sciatic notch was crushed. Every test group were exposed by ultrasound with special characteristics and control group received sham expose. Finally one of test groups that had received continuous wave with frequency of 1 MHz, intensity of 0.2 w/cm^2 and 2 min/day, 3 times each weeks for 4 weeks, initiated 72h after surgery, exhibited meaningful difference with control group. So according to these results, ultrasound with proper characteristics can accelerate peripheral nerve repair.

Keywords: ultrasound, nerve repair, crush, sciatic

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O12: A Microsphere Stimulated Raman Spectroscopy for the Measurement of Glucose in Aqueous Solution

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Abstract

Field enhancement due to the resonance condition of high quality microsphere causes to reduce the spontaneous and stimulated Raman scattering thresholds of its surrounding media. In this paper it is proposed to employ the pump-probe microsphere stimulated Raman spectroscopy technique for the measurement of glucose below the biological level in aqueous solution.

Keywords: Aqueous Solution, Glucose, Micro-Sphere, Stimulated Raman Scattering, Steady State

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O13: Disturbed Spatial Learning in Rats Following Exposure to Electromagnetic Fields Generated by Cathode Ray Tubes

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Abstract

A growing body of evidence suggests that exposure of humans or laboratory animals to electromagnetic fields (EMFs) affects brain functions. Computer and television screens which use cathode ray tubes (CRTs) generate intermediate frequency fields. This study aimed to evaluate the possible bio-effects of CRT radiations on spatial learning and memory in rats. Twenty eight male adult Wistar rats (200-250g) were randomly divided into 4 groups of 7 animals. The animals in the 1st, 2nd and3rd group exposed to EMFs generated by commonly used CRT-based monitors. Five identical 15 inch monitors were positioned back to back in a circle. Magnetic field intensities at different points were measured by a calibrated EMF tester. Animals were kept in a cage at the center of the circle of monitors, where the magnetic fields strength was up to 0.99 micro Tesla. Animals in the first, second and third groups were exposed to EMFs 7 hours, 14 hours and 20 hours per day for 2 weeks, respectively. In this study, we used standard Barnes maze to study spatial learning and memory in rats. This maze investigates the ability of animal to learn and remember the location of escape box using various visual cues placed around the maze. At day 15, training of the rats was started. The acquisition session was started 24 h later and continued for 4 days (2 trials per day). The time elapsed for reaching the escape box was recorded. Results obtained in this study indicate that animals exposed to CRT-generated EMFs spent more time for finding the space box. The mean time elapsed for reaching the escape box in control rats was 12.84 ±10.87 seconds while this time in animals exposed to EMFs for 7, 14 and 20 hours/day was 35.77 ±51.40, 34.44 ±51.07 and 21.27 ±37.14 seconds, respectively. ANOVA test showed a statistically significant difference among these groups (p=0.013). Overall, these findings provide supporting evidence that exposure to EMFs may deteriorate spatial learning and memory. Further studies are needed to clarify if these detrimental effects are dependent on the factors such as the strength of CRT-generated EMFs, manufacturer and size of monitors.

Keywords: Cathode Ray Tube (CRT), Monitor, Electromagnetic Field (EMF), Spatial Learning, Memory, Rat, Barnes Maze.

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O14: Examination of Some Physiotherapy Methods for the Selection of the Best One in the Treatment of Each Type of Hip Joint Injury.

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Abstract

Background: Range of motion(ROM)is adscription of how much movement exists at a joint.Rotation is the typical movement that called angular movement; the unit degree is used when measuring range of motion. Range of motion can be measured either active or passive. Active range of motion created by patient, passive range of motion created with equipment. Passive range of motion is always greater than active range of motion.

Objective: This study was investigated different range of motion of hip joint, the effect of age and sex of a patients treated with microwave, infrared, and paraffin wax have disorders in their hip.

Methods: Participants were 60 patients have diseases in their hip joint, 20 of them treated with microwave,20 treated with infrared and 20 patients treated with paraffin wax for 12 weeks,three times weekly. By using Gonio-metric measurements every two weeks for hip (flexion, extension, abduction, adduction, internal rotation, external

rotation) joint. Before physiotherapy(control) we take 360 measurements for hip, and 2160 measurements after 12 weeks for hip

Results: The final results showed that microwave more effective than infrared and paraffin wax in hip joint. The patients who referred early and regular in physiotherapy have increased in range of motion. From data females have decreased range of motion than males. The conclusion of research measurements should be taken by the same therapist on the same position to decrease error in measurements.

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P1: Addressing a Critical Problem: How Safe Is the Use of 2 3D Wire Panels for Reducing the Magnetic Flux Density in Homes Near High Tension Power Lines?

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Abstract

Background: In Larestan, a city in Fars province in south Iran, due to insufficient land,somehouses are being constructed in close vicinity of high tension power lines. AC power lines which employ voltages ranging 66 kilovolts to several hundred thousand kilovolts are the only high voltage transmission lines in cities and have led to great concerns regarding the biological effects of power line induced- high intensity electromagnetic fields. It has been usually accepted that the easiest intervention forreducing the magnetic flux density levels to residents of the houses which are constructed near power lines is to install a grounded, metallic, mesh screen on the roof and in the walls of the dwellings.

Objective: The aim of this study was to assess if the mesh wireroutinely used in 3D panels can minimize the magnetic flux density levels inside the houses.

Methods: A 50× 50× 50 cm model house was built from conventional 3D wire panel. This panel is constructed from a central foamed polystyrene insulating layer sandwiched by two steel wire truss coated with zinc. The magnetic flux density levels outside and inside the houses was measured by 2 calibrated Gauss meters under a230 kV high tension power line. The overall magnetic field intensity was measured as the square root of the sum of the squares of magnetic field intensity in x, y and z planes.To minimize random errors, each measurement was repeated 5 times, and the mean was used.

Results: At a distance of 20 m from the powerline, the mean+/-SD magnetic flux density levels, outside the model housethat was placed at the ground level along the x, y and z axes were 5.77 +/- 0.12, 1.6 +/- 0.1 and 10.67 +/- 0.15 mG, respectively. On the other hand, flux density levels, inside the model house along the x, y and z axes were 5.55 +/- 0.07, 1.55 +/- 0.07 and 10.45 +/- 0.21 mG, respectively. The overall magnetic field intensity that was measured as the square root of the sum of the squares of magnetic field intensity in x, y and z planes for outside and inside were 12.24 and11.93mG, respectively. The difference between the magnetic flux density levels outside and inside the model house was not statistically significant. While the 3D panel was unable of blocking the power line induced magnetic fields, it significantly blocked both the FM radio waves and 900 MHz GSM signals.

Conclusions: Based on the findings obtained in our study,3D wire panels cannot serve as the metallic mesh screens for protecting the residents of these dwellings against high intensity electromagnetic fields. In this light, it can be concluded that scientists should encourage the authorities and policy makers to make legislations thatabsolutely prohibitthe construction of homes near transmission lines.

Keywords: 3D Wire Panel, Home Construction, Electromagnetic Field, Larestan

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P3: Do Acute and Chronic Exposures to Electromagnetic Fields Emitted by Mobile Phones Alter Computer-Assisted Visual Reaction Time?

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Abstract

Background: The worldwide dramatic increase in mobile phone use has generated great concerns about the detrimental effects of microwave radiations emitted by these communication devices. Reaction time plays a critical role in performing tasks necessary to avoid hazards. As far as we know, this study is the first survey of the effects of exposure to radiations emitted by a high specific absorption rate mobile phone on human reaction time. It is also the first study in which previous history of mobile phone use is taken in to account.

Objective: The aim of this study was to assess both the acute and chronic effects of electromagnetic fields emitted by mobile phones on reaction time in university students.

Methods: Visual reaction time (VRT) of young university students was recorded with a simple blind computer-assisted-visual reaction time test, before and after a 10 minute real/sham exposure to electromagnetic fields of mobile phones. Participants were 50 right-handed university students aged 18-30. To assess the effect of chronic exposures, the reaction time in sham exposed phases were compared among low level, moderate and frequent users of mobile phones.

Results: The mean+/-SD reaction time after real exposure and sham exposure were 292.51 +/- 55.73 seconds and 294.21 +/- 54.36 seconds, respectively. The age of students did not significantly alter the reaction time but gender significantly affected the reaction time. The mean reaction time in male students was than that of females.

Conclusions: The students' visual reaction time was not affected by exposure to electromagnetic fields emitted by a mobile phone. It can be concluded that these exposures do not cause increased reaction time to different hazards that might lead to higher chances of human errors and fatal accidents.

Keywords: Reaction time, Mobile phone, Electromagnetic Field, University Students

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P4: A Survey of the Magnitude of Magnetic Fields Produced by Some Commonly Used Cathode Ray Tube-Based Video Display Terminals

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Abstract

Background: Cathode ray tube-based video display terminals are believed to produce a wide variety of emissions in electromagnetic radiation range such as extremely low frequency, radiofrequency, infrared, ultraviolet and

X- rays. However, the levels of these radiations are usually lower than the relevant commonly accepted exposure limits. In this light, if we keep these emissions much less than the current limits, the use of video display terminals will not be a hazard for operators or female operators' fetuses.

Methods: In this study, magnetic fields produced by 14, 15 or 17 inch monitors manufactured by three different companies (Samsung, LG and BenQ) were measured by two recently calibrated Gauss meters. The overall magnetic field intensity was measured as the square root of the sum of the squares of magnetic field intensity in x, y and z planes at a distance of 10 cm away from different points on the surface of each monitor.

Results: The mean magnetic intensities in the front, back and sides of monitors were 3.06± 1.42, 4.24± 0.88, and 7.26± 2.96 mG (mean± SD), respectively. The observed differences were statistically significant (p=0.0004). The difference between the strength of magnetic field in monitors with different display size made by the same manufacturer was not statistically different (6.26± 1.84 and 5.28± 3.34 mG for 15 and 17 inch LG monitors, respectively). The overall magnetic intensities (back, front and sides) of 17 inch monitors made by Samsung and LG were 4.49± 3.05, and 5.28± 3.43 mG, respectively. This difference was not statistically significant (p=0.61).

Conclusion: The strength of magnetic field on the sides of cathode ray tubes are significantly higher than those of the front and back regions. This strong field seems to be due to the deflecting coils which move the electron beam across the screen. Size of the display and the brand of monitor (manufacturer) had no effect on the magnitude of the magnetic field.

Keywords: Magnetic Fields, Video Display Terminals (VDT), Cathode Ray Tubes (CRT), Monitors

P5: Surface Decontamination by Non-Thermal Plasma (DBD)

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Abstract

Surface decontamination is an important issue in different areas like medicine and food industry. Traditional methods of sterilization have disadvantages as thermal effect, producing toxic chemical residues. In our research we have presented an applicable and outstanding device for surface sterilization. Cold atmospheric plasma method is suitable for the treatment of heat sensitive and the objects that are vulnerable to vacuum.

The dielectric barrier discharge (DBD) is a low temperature plasma source that is created between two conductive electrodes connected to an ac power supply and at least one of DBD electrodes is covered by dielectric layer. The results of DBD plasma treatment of B.subtilis show that complete sterilization is occurred only after 5 second of exposure time without any thermal effect.DBD plasma is generated at 10kV voltage and 10 kHz frequency. This fast non-thermal and non-destructive method could be useful for inactivation of bacteria and hospital infection agents.

Keywords: Non-thermal plasma, DBD, Sterilization, Bacillus Subtilis.

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P6: Measurement of Microwave Oven Leakage

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Abstract

Microwaves are a part of the electromagnetic radiation spectrum that has high frequency and short wavelength. The purpose of this study is to determine of electromagnetic radiation from household and restaurant microwaves oven.The survey was carried out for 45 ovens used in households and restaurants. Electromagnetic radiation from different brands of microwave ovens available in Iranian market was investigated by microwave leakage detector model HI-1501. The total average measured leakage was 1.11±1.3 mW/cm^2 with water load test while average measured leakage for household and restaurant user type were 1.1±1.7 and 1.1±1.2 mW/cm^2, respectively. In 86.66% of the household ovens, only 25.2% emitted radiation was more than 1 mW/cm^2. Ovens surveyed in households were elder than restaurant user type (2.3 ±1.3 VS 2.1 ± 1.5). The maximum leakage was found at the door key (8.1 mW/cm^2) of the surveyed ovens. Three-way ANOVA to evaluate oven age, type of user and place of measuring on the leakage rate showed that there was not relationship between the quantity of radiation leakage and type of user but oven age and place of measuring were effective on the microwave leakage. 70.4% of the ovens emitted radiation was less than the public exposure limit (1 mW/cm^2) and none of them emitted more than the occupational exposure limit of 5 mW/cm^2. Based on the findings in this study, no detrimental health effects are expected from microwave ovens in our study.

Keywords: microwave ovens, Electromagnetic Wave Leakage, detector model HI-1501, Domestic and Restaurant microwave ovens, oven emission limits.

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P7: Detection of PSMA-Expressing Prostate Cancer by J591 MAb-Conjugated SPIONs Using MR Imaging

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Abstract

Carcinoma of the prostate is the most frequent diagnosed cancer in men. The objective of the present study is using nanoparticles conjugated monoclonal antibodies as new MR imaging contrast agents as targeted prostate cancer cells. The advantage of the fact that many types of prostate cancer cells express high levels of prostate specific membrane antigen (PSMA) on their cell surface, The imaging strategy is to use superparamagnetic iron oxide nanoparticles (SPIONs), which attached to J591 mAb that binds to the extracellular domain of PSMA. synthesised nano-probes characters were investigated using both FT-IR, TEM and Zeta-sizer. Proton relaxation times were measured.To determination of fabricated nanoprobe efficiency, MRI signal intensity between different cell lines investigated by determination of ROIs and using Image J software.The synthsised nanoprobe using J591 Mab conjugated to SPIONs demonstrated in vitro specificity of PSMA-expressing prostate cancer cells

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P8: Eye Modeling with ZEMAX and Determining Its Aberration by Using a Shack Hartmann Aberrometer

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Abstract

Aberrometers measure the aberrations of the eye and can show the result as the topographic map of the refractive aberrations of the patients' eye or as Zernike coefficients to demonstrate order of aberration. Conventional methods are routinely measure the defocus, astigmatism and prismatic errors of central vision, even normal eyes may suffer from higher order aberrations (e.g., coma, spherical aberration) that can have a profound effect on retinal image quality and visual performance. But now new technologies and methods allows us to know more about the complicated eye aberrations in high order. Because the correction of higher order aberrations requires a precise knowledge of its relevance, aberrometers which allows to measure wavefront aberrations become more essential. Shack Hartmann wavefront sensor is mostly used sensor in Astronomy for measuring the optical aberration of the atmosphere and now has more advantage in optometry. It's possible to determine high order eye aberration by using of shack Hartmann more precisely. In other hand it's repeatable and consistent with the result obtained with the psychophysical techniques. In this paper we will model a simple eye with its more important optical elements such as retina, cornea, lens, sclera outer, sclera inner, iris and …etc in Zemax. In the next step it's possible to consider eye with more details and then studying their effects on the optical imaging of the eye. Shack Hartmann wavefront sensor on the suitable optical setup for wavefront sensing of the stimulated normal and abnormal eye also will be modeled. Supposed optical set up contains the Shack Hartmann Wavefront sensor with the modeled eye. All simulation and modeling was held on ZEMAX. ZEMAX is the most powerful software in optical simulation. This modeling will make more useful information about the eye and its performance on the existing disease and also using of contact lens as a solution. This information is useful for designing experimental setup for the real eye optometry.

Keywords: Shack Hartmann wavefront sensor, Optometry, Eye modeling, Zemax, Wavefront sensing

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P9: Evaluate the Effect of Low Power Ultrasound Waves on Bone Growth Into Titanium Implant Channel

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Abstract

Low Power Ultrasound as an effective factor in improving bone fracture in clinical and animal studies is discussed. In this experimental study that was done, in terms of low power ultrasound waves on the acceleration of bone growth into punching Aymplanthay was studied in rabbits. Was designed and built in invivo and in bone Ti-6Al-4V implant study 20 the number of sex with Ron dimension 20 adult female rabbits were planted. Two rabbits in four groups divided the total number of eight numbers as groups 3 and 4 weeks, 2, 3 and 4 weeks and 4 Group 3 Total 12 Total number of teeth as treatment groups 1, 2, 1 control groups. In group therapy, each rabbit after the implant surgery and implant, ultrasound waves with 0 W cm for 20 minutes a day irradiated MHz frequency and intensity were nominal. Based on the results of research on low power ultrasound waves accelerate bone growth into titanium Aymplanthay was effective and the impact of the end of the second week of treatment, had the highest rate so that in the control group and 52% / 1 ± 4 / 66 in the treatment group percent compared to the amount of time or 23% dispersion of calcium in the control group was treated group compared with 61% percent of the amount of phosphorus distribution statistically significant difference is

Keywords: Ultrasound retarded - titanium implant - bone growth

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P10: Theoretical Explanation of the Failure Akhtlalal Hyperactivity: Behavioral Inhibition Pattern and Nature of Restraint

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Abstract

1997 in their a, b target article reviewed current pattern of behavior inhibition and control functions of the executive Berkeley and its application to explain hyperactivity disorder is the failure. This pattern is called a disorder caused by the failure is caused by the inhibition of behavior. This theoretical model, to prevent nerve function with four related Executive psychological knows. These four functions include a) working memory, (b) autonomy, (c) inner speech making, and (d reconstruction. Model states that behavioral inhibition disorder secondary consequence of the failure in four motor function and control is mentioned. pattern of behavioral inhibition in failure, failure in the form of time non-Ahsa Q obvious but essential AD account of the impact is significant on working memory and thus the strength and stability of such behavior and the affects. thoughtful evaluation and treatment-related According to the mentioned model has been discussed.

Keywords: L La Akht failure Tvj E / B Shfaly, inhibition, executive functions, time, motion control

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P11: Bactericidal Effect Investigation of Different Wavelength Illumination on Helicobacter Pylori Based on Absorption Spectra

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Abstract

Helicobacter pylori (H. pylori) is a gram negative bacterium associated with duodenal and gastric ulcers and, possibly, gastric cancer. Due to the occurrence of antibiotic resistance and consequent treatment failure, novel antimicrobial approaches are investigated. According to some studies blue light phototherapy may represent a new method to eradication of H. pylori, especially in patients who have failed standard antibiotic treatment. We have studied the bactericidal effect of different wavelengths at low doses of illumination. The selected wavelengths are those that H. pylori has the most intensified absorption near them and has been cheesed from absorption spectra in UV-Visible spectroscopy. The bacterial suspension was illuminated by LED sources and laser diode with different fluencies in different time. The suspension was subjected to 6 serial twofold dilutions in PBS for quantitative analysis. The results show illumination in 403nm and 520 nm, at low doses (2000 Lux) are more effective than the others and the survival fraction of bacteria decreases significantly. This result is in convenience with the strong absorption intensity of mentioned wavelength. It is noticeable that absorption intensity of H. pylori is stronger surrounding of 405 nm than 520 nm. The different spectra of bacteria, before and after illumination revealed that a component with strong absorption surrounding 400 nm has been consumed. According to several literatures it could be protoporphyrin IX which is present in heme biosynthesis in some bacteria. These results show that we could use some wavelengths which are far from UV region and so, are less harmful.

Keywords: Phototherapy, Absorption spectra, Inactivation of H.pylori

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P12: Comparison of Electroretinogram Characteristics in Retinitis Pigmentosa and Normal Subjects in Frequency Domain

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Abstract

Background: Electroretinogram (ERG) may be used for Retinitis pigmentosa (RP) evaluation. Time domain (amplitude and implicit time) is a routine procedure but, frequency domain evaluation is considered in this study.

Methods: Five basic recording procedures of ERG according to the ISCEV (International Society of Clinical Electrophysiology of Vision) protocol were carried on for normal subjects and patients that clinically diagnosed as the RP. Frequency domain analysis was considered by MATLAB software. Different parameters of frequency domain were compared in two groups.

Results: Peak frequency (Fmod) of rod, flicker and Oscillatory responses of RP patients showed a significant ($p<0.0001$) high pass response. But peak frequency (Fmod) of other responses of both groups showed no significant difference.

Conclusions: In addition to the conventional ERG time domain methods for RP diagnosis, frequency domain may be useful. Oscillatory and flicker responses may be analyzed in frequency domain. Fast Fourier transform of these responses may reveal two distinct high pass (frequency shift to the higher frequencies) appearance of Fmod. Time and frequency domain analysis may be done in many modern ERG recording machines. Therefore, simultaneous analysis of ERG may be recommended.

Keywords: electroretinogram (ERG); Retinitis pigmentosa (RP); Fast Fourier Transformation (FFT), Fmod

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P13: Effect of Chemical and Physical Parameters on Nickel Adsorption by Magnetite Nanoparticles Using Prevent Related Diseases

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Abstract

Small amount of nickel should be present in food animals and nickel in the short term does not cause problems, but heavy metals such as nickel accumulation in living organisms, such organisms, causing environmental risk and long-term increase chances of lung cancer, nasal cancer, larynx cancer and prostate cancer, lung embolism, respiratory problems, reduced reproductive capacity, asthma and chronic bronchitis, allergies such as itchy skin and heart failure are. Eating food containing nickel main sources of water pollution are human because nickel ions influence the process, are to enter groundwater and eventually they accumulate in the soil. Today, using magnetic particles

intend to remove these materials from nature we are. In this regard, during this paper, the magnetite nanoparticles were synthesized by coprecipitation of Fe (II) and Fe (III) ions in presence of ammonia. The conditions of solution pH, the time, the dose of nanoparticles are investigated. The incremental increase of solution pH from 2 to 12 resulted in increases of the adsorption percentage from 15 to nearly 100 and the majority of adsorption percentage done in initial 10 minutes. By increasing the dose of nanoparticles from 2g/l to 5g/l, the percent of adsorption arise from 50% to 99.98%. And the kinematic equations solved for this project that show this project was two level of absorb.

Keywords: Heavy metals, nickel ions, absorption, magnetic particles, magnetite;

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P14: Change of Cortisol Concentration in Rats Exposed to Magnetic Resonance Imaging

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Abstract

During an MRI examination, three types of field are employed to produce images.Various experimental studies have been performed about effects of each single type of field but only few studies are available on their combination to generate MRI. The main objective of this research work is to study the effects of MRI on the secretion of cortisol. 40 adult Wistar rats (220±10g) were randomly divided into two groups: exposed (20 rats) and control (20 rats). Exposed group was placed in MRI for 25 minutes. After MRI, these animals were anaesthetized and serum samples were stored. cortisol hormone was measured by RIA method Our results indicated that the serum level of cortisol was significantly reduced (P<0.005(Our findings suggest that MRI cause profound changes in the secretion of cortisol in the rats.

Keywords: MRI, cortisol, rat changes in the secretion of cortisol in the rats

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P15: Study of Size Lenses Difference of Left and Right Eyes in Two Different Fish Species

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Abstract

Fish eye structure is similar to other vertebrates. In terrestrial vertebrates the focus of images on the retina is done due to the change of the curvature and the bending of the lens, but in fish eye seeing objects is done by moving lens of the eye to front and back. Survey on the fish eye lens shows that the lens on both sides of their eyes are the same according to lens curvature radius and bigness of lens which causes focal length be the same on both sides the eye. Previous studies indicate differences in some species of fish. In this research 50 ear type fish and 50 Chengu fish was studied. In 50% of the ear fish there was a meaningful difference between the size of lens of the left and right eye. In these fish both eyes are not located at the same direction, but the eye with smaller lens is located in the lower level. To explain this issue two possible reasons can be mentioned: First, the eye in a lower level (smaller lens) is placed under the lower light and gradually causes the lens to get smaller and laziness during evolution course. The second reason is the choroid layer of these fish. This layer contains TamtumLucidium (reflective layer), which is made of reflective crystals and increases visual sensitivity in low lighting conditions. To prove this in other fish species more extensive studies is needed to be conducted on a wider level.

Keywords: Fish eye, Chengu, Lens

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P16: Directivity Pattern Measurement of Piezoelectric Transducers

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Abstract

To utilize ultrasonic equipment in medical diagnostic and therapeutic application, it is necessary to have an understanding about directivity pattern of transducer to find suitable ultrasonic probe. Since each piezoelectric transducer has its own beam pattern, it is needed to determine directivity pattern. It is intended to analyze directivity pattern parameters theoretically and compare them to the experimental values which are measured practically. Immersion technique using with 3 pairs of circular probe to measure directivity pattern, thorough transmission method using with 3 different resonance frequencies; 2, 4 and 5MHz was applied. Based on the test result and voltage values of received signals, if resonant frequency is increased, directivity pattern will be narrower and penetration depth will be smaller. This test consequence shows that using high frequency transducers is more suitable to have images with more sensitivity in surface tissues of human body

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P17: Optical Fibers for Medical Diagnosis

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Abstract

Optical fibers are widely used in medical fields. Intrinsic physical characteristics of optical fibers make them suitable candidates for imaging and biomedical sensing applications.

Here we review medical applications of optical fibers. We introduce different types of optical fibers which are used in medical applications and their guiding mechanism will be discussed too.

Keywords: Optical fiber, medical imaging, biomedical sensing, review

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P18: A Study of Tapered Optical Fibers as Biosensors

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Abstract

Tapering a fiber enhances the magnitude and penetration of the evanescent field thus increases the sensitivity of the optical fiber. The interaction of light with external environment causes change in the transmitted power of the fiber and this forms the basis of sensing in tapered fiber-optic biosensors (TFOBS).

There are different detection principles in tapered fiber sensing which the appropriate one must be chosen depending on the target sample and the application of the sensor.

Here we review different sensing principles in tapered fiber sensing. We also study physics of sensing in tapered fibers.

Keywords: Tapered optical fiber, biosensor, sensing principles, review

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P19: A Theoretical Study of Ultrasonic Wave Propagation in an Elastic Multi-Layer Plate: as a Model for Bone.

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Abstract

Guided wave propagation has recently drawn significant interest in the ultrasonic characterization of bone. In this work, we present a two-dimensional computational study of ultrasound propagation in plate. In particular, we address the effect of fluid loading boundary conditions on the characteristics of guided wave propagation. In the first case, the bone modeled as a linear elastic isotropic plate. In the second case, the bone model was assumed to have the upper surface loaded by a layer of fluid e.g. tissue or blood.

In the present study, the dispersion of guided modes which propagate either in a free plate or in a plate with upper surface loaded by fluid, is described by the corresponding transcendental dispersion equation. This characteristic equation is obtained by solving the partial differential equations of motion and imposing the appropriate boundary conditions on the plate surfaces, then the numerical method was developed in order to plot the dispersion curves including frequency spectrum, phase velocity, group velocity and displacement curves for ultrasonic lamb wave, propagated in either case 1 and case 2. The results clearly indicate that boundary conditions has a significant effect on the dispersion of guided waves when compared to simplified models in which the bone's surfaces are assumed free.

Keywords: ultrasonic wave, dispersion curve, bone, phase velocity, group velocity

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P20: Copper Nanoparticles: Antibacterial Effects and Cytotoxicity

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Abstract

Nanotechnology is currently employed as a tool to explore the darkest avenues of medical sciences in several ways like imaging, sensing, targeted drug delivery, gene delivery systems and artificial implants. Hence, nanosized organic and inorganic particles are finding increasing attention in medical applications. In the present study, we reported the preparation of copper nanoparticles in the range of 90-110 nm and present the antibacterial effect of

them on E. coli, Staphylococcus arouse and Helicobacter pylori.Monodispersed metallic copper nanoparticles have been prepared by adding hydrazine monohydrate to the aqueous solution of copper (II) sulfate and E.G. at ambient atmosphere. The size, size distribution, phase composition and crystallinity of the synthesized copper particles were investigated by using Scanning Electron Microscopy (SEM) an X-ray Diffractometer (XRD). The X-ray diffraction patterns revealed the crystalline face-centered-cubic (fcc) structure without any impurity. Various concentrations of nanoparticles (1%, 5%, 10%, and 20%) have been used to investigate their antibacterial effects. Results revealed that copper nanoparticles were antibacterial (depend on their concentration) for three genuses of bacteria and could inactivate their growth. Although, copper nanoparticles could inactivate the Helicobacter Pylori growth, unfortunately they lysis the blood cells in blood agar. Therefore, it could be deducted that copper nanoparticles are cytotoxic. It could be proposed that strong tendency of copper particles to react with oxygen molecules causes their interference in bacterial electron transfer cycle and resulting in bacterial inactivation.

Keywords: Copper nanoparticles, Antibacterial effect, Cytotoxicity, Staphylococcus arouse, E. coli, Helicobacter pylori

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P21: Laser Soldering of Skin Using Diode Laser and ICG -Gold Nanoshells Combination as Solder

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Abstract

Nanoshells are currently being used for a variety of biomedical applications and have been shown to be non toxic and highly biocompatible. The use of nanoshells has several advantages over ICG. The average diameter of nanoshells is about 100 nm so that reduced diffusion from the site of treatment and concentrating heating at the interface is avoided, which should in effect the minimize damage to surrounding tissue. Hence another advantage of nanoshells is that they are more photo-stable since their absorption properties are determined by their physical structure. Additionally, nanoshells are more strongly absorbing than ICG on a per particle or molecule basis. The purpose of this study is to evaluate the effect of combination of ICG and different concentrations of gold nanoshells and laser processing parameters on the quality of repaired skin.

A 40×50 cm2 fresh depilated piece of sheep skin was cut into pieces of 4×5 cm2. After preparation, a full thickness cut of 2×20 mm2 was made on the skin surface using 11" blades. Protein solder solution was prepared with using 25% BSA (Sigma Chemical Co.) 0.25mg ICG and two different concentrations of gold nanoshells mixed in HPLC grade water.

For each combination of ICG and gold nanoshells the solder (50µl) was applied to the cut edges, and the edges were brought into contact with one another and then irradiated with different power densities in the dynamic mode. The temperature rise at the skin during the irradiation was measured with a digital thermometer. The laser beam moved from one place to the next, along the cut line, so that each line slightly overlapped the previous one. Tensile strength measurements were performed to test the integrity of the resultant repairs immediately following the laser procedure using a load machine (Zwick/Roell, HCT 25/400 series).

The results showed at constant laser power density (I), σt of repaired incisions increases by increasing the concentration of gold nanoshells in solder, Ns and decreasing Vs. It is therefore important to consider the tradeoff between the scan velocity and the surface temperature for achieving an optimum operating condition. In our case this corresponds to σt =1800 gr/cm^2 at I~ 47 Wcm-2, T ~ 85 ºC, Ns =10 and Vs=0.3 mms-1.

Keywords: Tissue soldering, Gold nanoshells, Indocyanine green, Combination, Tensile strength

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P22: Single and Double Mutants of Human Potassium Channel HKv1.3 Highlight the Role of Sterically

Constrained Beta-Branched Residues

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Abstract

The Shaker-related voltage-gated human potassium channel hKv1.3 plays a role in multiple sclerosis and autoimmune diseases due to its effect on T-lymphocytes, and like most voltage-gated potassium channels, is composed of four subunits, which are symmetrically arranged around the central pore with the selctivity filter on top of the ion permeation module. Cysteine-scanning mutagenesis implicates pore helix residue Val388 in inactivation of hKv1.3, enabling partial reactivation by scorpio toxin in whole-cell patch-clamp recordings. The second-site mutation His399Thr just beyond the selectivity filter reverts the Val388Cys mutant to a wildtype-like inactivation profile. We report computational modeling, molecular dynamics simulations of the tetrameric channel embedded in a POPC membrane,and charybdotoxin docking, a scorpio toxin belonging to the α-KTX family. Our simulations reveal that Val388, but not Cys388, locks the Trp384 sidechain in a conformation compatible with hydrogen bonding to Asp397 of the selectivity filter. This constraint reflects the fact that beta-branched sidechains are confined to a single rotamer when the backbone is in helical conformation. On the other hand, although residue 399 is not in a helical segment, beta-branched Thr399 but not His399 is constrained by steric crowding with the adjacent Pro400, limiting Asp397 to a conformation that enforces its hydrogen bonding with Trp384. These results suggest that the inherent steric limitations of beta-branched residues, which are parodoxically abundant in the transmembrane helical segments of many proteins, play an important role in channel properties.

Keywords: voltage-gated potassium channels, molecular dynamics simulations, homology modeling, computational docking, scorpio toxin, beta-branched residues

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P23: Preparation of Titanium Nitride Thin Films by Reactive DC Magnetron Sputtering Method and Investigating Their Crystal Structure

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Abstract

TiN thin films were deposited by DC magnetron sputtering method in Ar + N2 atmosphere. The reactive sputter gas was a mixture of Ar (99.999%) and N2 (99.999%) with the ratio Ar (97%) and N2 (3%) by volume and effect of temperature on the structural properties of the films was investigated. Topography and atomic structure were investigated by atomic force microscopy (AFM) and X-ray diffraction (XRD), respectively. XRD showed that TiN nanocrystal is formed on these films. Average particle size nanoparticles that were estimated by Scherre formola were compared with AFM images.

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P24: Design and Manufacture Care System of Circulation at Under Pressure Tissue with Optical Method for Diagnose of Bedsore

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Abstract

Reduced blood flow due to obstruction in most cases is as a primary factor in pressure ulcer formation and creates of bedsore. The aim of this study is design and manufactures a care system tissue under pressure based on variation blood flow at different depths in the tissue. In manufacture of system two infrared light transmitter were located between of 5 and 10 mm receivers to measurement of blood flow at two different depths in the under pressure heel tissue. Also blood flow was evaluated in unload condition and after loading with 30 mmHg respectively 60.0 mmHg. 15 participates with mean age 50 were evaluated. 9 (60%) were men and 6 (40%) of them were women. Primary measurement results had shown different individual differences in variation blood flow tissue. To study signal amplitude changes significantly influenced by external pressure PPG, P-value was measured. There is significant changes in PPG signal amplitude during loading both pressure 30 and 60 mmHg. Development of this system would be possible with increases flexibility probe and using potent optical receiver and transmitter to access more depth

Keywords: Pressure ulcers, Bed sore, blood flow, Photoplethysmography

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P25: An Assessment of Effect of Hyperthermia in a Tissue Equivalent Phantom in the Presence of Gold Nanoshells

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Abstract

Hyperthermia is a type of adjuvant cancer treatment in which the cancerous tissue is heated to a high temperature (up to 45 °C) and expedites the process of cancer cells destruction. This modality is applied in combination with other treatments such as chemotherapy and radiation therapy. Moreover, hyperthermia makes cancer cells more sensitive to radiation or other treatment approaches. On the other hand, nanotechnology considers to the engineering of functional systems at the nano scale and nowadays metal nanoparticles play significant roles in medicine. Among these, gold nanoshells (GNS) -assisted photothermal therapy has emerged as a viable method for selective killing of cancer cells.

This study has assessed temperature variations into an optical gel phantom GNS distributed homogeneously in the different spaces in two horizontal and vertical dimensions. The phantom was illuminated with a millisecond pulsed diode laser (800nm) in the presence and absence of GNSs. the temperature variations was recorded by a digital thermometer (Waterproof super-fast needle probe, T/C and K Type, Testo 735-2) equipped with four sensors,

simultaneously.

Our findings have estimated that Gold nanoshells' synergism with laser pulses can be utilized to induce an increased temperature in a target region with minimizing surrounding tissue damage.

Keywords: Hyperthermia, Gold nanoshell, Diode Laser, Phantom

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P26: Sonochemical Activation of Protoporphyrin IX Conjugated to Gold Nanoparticles

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Abstract

When a liquid is irradiated with high intensities (>1 W) and low frequencies (≤1 MHz) ultrasound, acoustic cavitation occurs. Acoustic cavitation can be occurred as stable and transient modes. Transient cavitation can be fatal to cells and is utilized to destroy cancer tumors.The particles in a liquid decrease the ultrasonic intensity threshold needed for onset of cavitation. The nonradiative relaxation time of Protoporphyrine (PpIX) in the presence of gold nanoparticles (GNP) is longer than the similar time without GNP. In this study, Au-PpIX was used as nucleation sites for cavitation. The acoustic cavitation activity was investigated via recording of integrated sonoluminescence signal in the wavelength range of 220-700 nm over a gel phantom by a cooled charge coupled device (CCD) spectrometer at different intensities of 1MHz ultrasound. Recorded sonoluminescence over gel containing Au-PpIX was higher than the other gels and PpIX has produced a higher signal. Therefore, we anticipate PpIX can be efficient as a sonoluminescent agent and Au-PpIX increases cavitation activity of ultrasound.

Keywords: Acoustic cavitation; Sonoluminescence; Chemical dosimetry; Protoporphyrin IX; Gold nanoparticle

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P27: The Role Of Ultrasound In Detecting Down Syndrome And The Other TrisomiesIn Pregnancy

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Abstract

Aim: The aim of this study was to review the role of ultrasound in diagnosis related to trisomy disorders during pregnancy.

Methods: In this narrative review study, the related articles from Pubmed and Google scholar were evaluated.

Results: The recent literatures show that new approach is an ultrasound measurement of subcutaneous thickness of fetal neck that called nuchal translucency. At the same time a test that can measure maternal blood levels of a protein known as PAPP-A and a hormone called human chorionic gonadotropin at weeks 11 of pregnancy has sensitivity to detect 87% of cases. In case of positive test, amniocentesis will be done for getting a definitive diagnosis.

Conclusion: With doing the two mentioned methods 85% of Down syndrome will be discovered.

Keywords: Ultrasound, Trisomy, Down syndrome, Diagnosis

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P28: Place the Laser in Dentistry

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Abstract

Over the decades-old technology using lasers in dentistry is not happening. According to the laser application development, this study was to review the benefits of lasers in dentistry took place. In soft tissue surgery, laser, like a knife, with the advantage that the cutting path, the conclusion provides for patients with clotting problems is useful. Also closing lymphatic vessels, lower inflammation caused by the surgical area and surgical repair is faster. Laser cutting can be very tiny, precise and controlled cutting time and had a few millionths of a second pulsed lasers can be reduced. This advantage helps to surgeons, oral soft tissue surgery in the microscopic level, have better maneuverability. When cutting tooth milling, lathe filing of the smear layer reduced the bond strength of tooth-colored restorative materials Cutting eaten. While the laser, this layer is not improved dental materials to be sticking. Also like rotten tissue by laser cutting with Frz•hay way other than the usual interaction between a dentist and Fvtvably-shn Fvtvtrmal more tooth tissue will be preserved. Impact milling cause tiny microscopic cracks on the enamel, but no such complications lasers

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P29: Simulation of the Relationship Between Electromagnetic Waves of Cell Phone and the Prevalence of the Neuroma Acoustic

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Abstract

Now a day advances in cell phone communication has led people to take advantages of these technological achievements. It is estimated that the cell phone users in the world in 2009 is about 3 billions sets.

This in turn has been the most important anxiousness of people about the electromagnetic radiation effects of these devices on the human body.

This is, why, the malignant and oncogenic side effects of EM Radiation of these devices on human tissues and cell's such as DNA, and proteins and other organelles have been the central parts of researches in many countries all over the world.

Our paper is a Meta Analysis of the effects of electromagnetic waves of these devices collected from the medical data bases for simulation procedure, resulted in the from of equations and figures for the prevalence of neuroma acoustic and influences of cell phone electromagnetic radiation.

Keywords: Simulation, Electromagnetic Waves, Cell Phone, ear Tumor, neuroma acoustic

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P30: Doppler Waveform Indices of Fetal Middle Cerebral Artery in Normal 20 to 40 Weeks Pregnancies

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Abstract

Background: One of the main methods for evaluation of fetal well-being is analysis of Doppler flow velocity waveform of fetal vessels. Evaluation of Doppler wave of the middle cerebral artery can predict most of the at-risk fetuses in high-risk pregnancies. In this study, we tried to determine the normal ranges and their trends during pregnancy of Doppler flow velocity indices (resistive index, pulsatility index, systolic-to-diastolic ratio, and peak systolic velocity) of middle cerebral artery in 20 - 40 weeks normal pregnancies in Iranians.

Methods: In this cross-sectional study, 1037 women with normal pregnancy and gestational age of 20 to 40 weeks were investigated for fetal middle cerebral artery Doppler examination.

Results: Resistive index, pulsatility index, and systolic-to-diastolic ratio values of middle cerebral artery decreased in a parabolic pattern while the peak systolic velocity value increased linearly with progression of the gestational age. These changes were statistically significant ($P<0.001$ for all four variables) and were more characteristic during late weeks of pregnancy. The mean fetal heart rate was also significantly ($P<0.001$) reduced in correlation with the gestational age.

Conclusions: Doppler waveform indices of fetal middle cerebral artery are useful means for determining fetal well-being. Herewith, the normal ranges of Doppler waveform indices for an Iranian population are presented.

Keywords: Doppler waveform, Middle cerebral artery, pulsatility index, systolic-to-diastolic ratio, resistive index.

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P31: Doppler Ultrasonographic Results After Renal Transplantation and Vascular Complication

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Abstract

Objective: Vascular complications are common after renal transplantation. In this study we correlated Doppler sonographic indices and transplant kidney function.

Methods: We reviewed data on 244 renal transplant patients. Doppler ultrasonographic evaluation was performed during the first 2 weeks after renal transplantation. We determined resistive index (RI) and pulsatility index (PI) in the interlobar arteries and thrombosis of renal and lower limb veins. Serum creatinine (Cr) and cyclosporine levels were evaluated prior to sonographic assessment.

Results: The mean age of the 142 male and 102 female patients was 36.31 +/- 3.30 years. Prevalence of real artery stenosis was 9.5%. In these patients the mean serum Cr level (2.21 +/- 1.83 mg/dL) was significantly higher than among patients with patent renovascular tributary (1.49 +/- 1.00 mg/dL; P=.03). RI and PI were also significantly correlated with serum Cr(P=.05 and.001, respectively). There was no relationship between cyclosporine level or panel-reactive antibody with RI and PI. Retransplant patients showed higher RI than first renal allograft recipients (0.72 +/- 0.16 vs 0.63 +/- 0.11; P=.006). Serum Cr level was higher among renal allograft recipients with Doppler evidence of thrombosis of the lower limb veins (3.1 +/- 0.98 mg/dL versus 1.56 +/- 1.13 mg/dL; P=.04).

Conclusions: RI and PI are two valuable Doppler ultrasonographic markers to determine renal allograft function and related vascular complications.

Keywords: Vascular complication, Doppler ultrasonographic, Resistive Index, Pulsatility Index, interlobar arteries.

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P32: Adaptive Band-Pass Filter for Frequency Estimation of Tremor

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Abstract

Tremor is defined as rhythmical, involuntary and roughly sinusoidal movement that affects the daily living of patient. Tremor itself is not a disease and is side-effect of another one, like Parkinson. With respect to the disease, the frequency of tremor is different. So, estimation of tremor frequency can be used to diagnose the disease. Also, estimation of tremor frequency is needed in tremor attenuation techniques.

In this article we used adaptive band-pass filter to separate tremor and voluntary movement. In first stage, tremor and voluntary movement are separated by a band-pass filter. Tremor signal is used in a feedback loop and with the use of a half-period calculation block, frequency is extracted. Calculated frequency goes through a damping block to limit the unwanted changes due to noise and other frequency elements. The estimated frequency fed back to the band-pass filter and precision of estimation is improved.

To test the method, two synthetic signals were used. Both of them lasted for 10 seconds. The first one is a variable frequency sine with 4 and 7 Hz elements. Changes between these two frequencies are linear. This signal is modulated with a 0.5 Hz sinusoidal and then augmented with white noise. Synthetic signal 2 was generated as a constant frequency sine (5 Hz) that augmented with two 4 Hz disturbances at 2 and 6 seconds of the signal. The second sine wave was followed by 2 seconds of test signal attenuation to 20% of initial amplitude. This signal models tremor with two disruptions, first one is due to cable movement and the second one is due to volitional movement initiation.

For the first synthetic signal, maximum error was 1.5 Hz (when the filter starts to work) and after 0.9 seconds error reached 0.2. After that, error was at most 0.5 Hz. Mean error which was calculated by difference between the estimated frequency and actual frequency, was 0.13 Hz. For the second synthetic signal, maximum error was 1 Hz and happened when second sine augmented the signal. Besides that, error was at most 0.4 Hz. Mean error which was calculated by difference between the estimated frequency and actual frequency, was 0.04 Hz.

Keywords: Frequency Estimation, Adaptive Filter, Tremor

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P33: Effect of Mobile Phone Radiation Leakage on Hematological Parameters of Mice

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Abstract

Due to the widespread use of Mobile Phone in the world generally and in our country, specially, the biological effects of mobile phone waves have been a great concern for scientists. It is believed that this part of EM spectrum may increase the risk of hematological problems. In this study, 40 Balb/c adult (2 months old and 30-35gr weight) male mouse were randomly divided into 5 groups; four of which as test (exposure) groups and one as the control group. The mouse in the test groups were exposed to 900 &1800 MHz (which are commonly used in mobile telecommunication) for 30 minutes, one hour, two hours and four hours twice a day. The control group was kept in similar environmental and physiological conditions as the test groups. After 30 consecutive days, blood samples were taken by heart puncture and hematological parameters including MCHC, MCH, MCV, HCT, HGB, MCH, RBC, WBC and PLT were measured. The means of hematological parameters were compared by T-test. Results showed a significant increase in MCHC and MCH count in some test groups compare to the control group; while MCV, RBC and platelet count increased ($P<0.05$). The MCV, HCT, HGB, MCH, RBC, WBC and PLT count no significant difference showed in test groups compare to control group ($P>0.05$). Exposure to microwaves of Mobile Phone significantly affects hematological parameters in mouse only in MCHC and MCH count, which maybe due to direct effect of microwaves on blood.

Keywords: Microwaves, Hematological Parameters, cell phone, mice

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P34: Effet of Exteremely Low Frequency Electromagnetic Field on Pc12 Cells

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Abstract

Now a days Extremely low frequency (ELF) electromagnetic fields are generated and propagated by power lines and various electric appliances worldwide.Human beings are in close relationship with electromagnetic field in everyday life.There is a question if effect of electromagnetic field is beneficial or disastrouse.Based on such an idea in this study,derived cell line PC12 (pheochromocytoma of rat adrenal medulla) were exposed to extremely low frequency electromagnetic field.(ELF) -50 hz,0.4 mT-in different periods of time (24.h-48.h-72.h) cells differentiation induced by Nerve growth factor(NGF)was studied, axoniogenesis of cells was measured by sigma-sacn program and their viability were tested via MTT test.cells morphology and proliferation rate were also staudied before and after exposure.in order to make sure the effect of this frequency (50 Hz) tubulin protein extracted from sheep was exposured by ELF(50.HZ,0.2 m.T)and its proliferation was measured. The results indicated that 50 hz exposure in a longer time course had a significant effect on cells viability but not on membrance structure observable by optical microscope

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P35: An Overview of Medical Applications of Magnetic Nanoparticles in Modern Medicine

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Abstract

Here, we offer an overview of the latest applications of magnetic nanoparticles into the modern medicine. Biocompatibility, high-level accumulation in the target tissue or organ and non-toxicity of such interesting nano-materials are what make them quite suitable to be considered as state-of-the-art technology in medicine.

More recently, magnetic nanoparticles have been used to develop some smart systems in Magnetic Drug Targeting (MDT) methods. Bio-separation using magnetic nanoparticles and appropriate external magnetic field is another attractive application of such nano-materials. Moreover, magnetic nanoparticles can be utilized as contrast agents in Magnetic Resonance Imaging (MRI) in medicine. Magnetic nanoparticles have also hold great potentials as exogenous agents in hyperthermia for abnormal cells. These nanoparticles can induce heat to their surrounding medium if they are exposed to an alternative external magnetic field. Finally, different applications of magnetic nanoparticles and our latest results were discussed in this review.

Keywords: Magnetic nanoparticle; Magnetic resonance imaging; hyperthermia; Magnetic drug targeting, Bio-separation

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P36: The Synthesis of Novel Quinazoline Derivatives Using Highly Efficient, One Pot, Solvent and Catalyst Free Method Under Ultrasonic Irradiation and Their Vasorelaxant Activities

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Abstract

Quinazolines have a wide range of biological activities such as antiepileptic, analgesic, anti-inflammatory, antihypertensive and vasorelaxant effects. Several methods have been developed for the synthesis 3-substituted 2-methyl quinazoline-4(3H)-one system. The most common methods for the preparation of quinazolinones are amidation of anthranilonitrile, anthranilic acid, or anthranilamide followed by cyclization. However, most of these multi-step procedures have significant drawbacks such as long reaction times (several hours), low yield of the products, harsh reaction conditions, difficult work-up, time-consuming purification, and the use of expensive and environmentally toxic catalysts and reagents. Therefore, development of simple and efficient methods for the synthesis of 3-substituted 2-methyl quinazoline-4(3H)-ones is desirable. The purpose of this study was to investigate an alternative protocol for the synthesis of 4(3H)-quinazoline derivatives. The synthesis of 3-substituted -2-methyl quinazolin-4(3H)-one was performed by the reactions of anthranilic acid, acetic anhydride with selected aromatic/aliphatic primary amines under ultrasonic irradiation in one pot. In vitro vasorelaxant activities of the synthesized compounds were also investigated on rat thoracic aorta. The IC50 (concentration that caused 50% relaxation) and maximal relaxation response achieved for each compound was compared with that of standard vasorelaxant (acetylcholine). The yield of this reaction was high at Room temperature, catalyst and solvent free. Elemental analysis, IR, 1H NMR, 13C NMR and mass spectral data elucidated the structures of all newly synthesized compounds. From 17 synthesized quinazoline derivatives, 14 compounds did have comparable maximal response -but not IC50- to that of Ach (85.31±5.32).

The findings of the study suggest that this method provides several advantages such as operational simplicity, higher yield, safety, taking very short time and environment friendly protocols. They also showed that the vasorelaxant activities of some compounds were comparable to that of acetylcholine.

Keywords: Quinazoline, Ultrasound, vasorelaxant

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P37: Effect of Ultrasound Irradiation on Membrane Filtration: A Review

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Abstract

Filtration of solutions by membrane is the effective technique to remove organic or inorganic micro-pollutants. Membrane clogging and accumulation layers deposited near the surface are the main problems in membrane filtration leading to decline and thereby reducing filtration efficiency for different filters in industry and medicine. The use of auxiliary forces to aid filtration has gained much attention in recent years. Ultrasound plays an important role in membrane cleaning by disrupt linkages between the pollution and the membrane surface to clean the polluted membrane easily. This article, reviews the effect of various parameters relating to ultrasound such as transducer type, frequency and intensity and other factors such as membrane properties, feed liquid properties, temperature and pressure on membrane filtration rate that have examined in previous studies.

Keywords: Ultrasound, Fouling, Membrane Filtration, Transducer.

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P38: The Application of Excimer Laser in Refractive Errors Correction and Compared with Glasses and Contact Lenses

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Abstract

Introduction: One of the most significant application of laser in medicine is laser in situ keratomileusis (LASIK) surgery that has influenced the other refractive errors correction methods, including glasses and contact lenses. In this essay, the application of excimer laser for correcting of refractive errors is investigated and compared whit other common methods.

Methods: In this essay, by reviewing the performed studies on LASIK surgery, glasses and contact lenses, the advantages and disadvantages of each method are evaluated. Findings: The glasses can correct myopia and hyperopia, astigmatism and presbyopia. One of the most important advantages of this method is correct of phorias and tropias. using limitation in the reasons of cosmetic and occupation is the main disadvantage. The contact lenses are used to correct myopia and hyperopia, astigmatism and keratoconus and divided into two soft and hard lenses. Their complications are including dry eye syndrome, infection, and cornea vascularization. LASIK cause to correct myopia and hyperopia, and astigmatism and is a standard cure for myopic astigmatism in the range of -1 to -14 dioptery. Fast improvement, correction an extended range of myopia and repeatability are the advantages and regression, under correction and over correction, causing a new regular and irregular astigmatism are some complications of such surgery.

Conclusion: LASIK has not the limitation as the glasses (cosmetic and movement limitations) and as the lenses (infection, scratch in cornea) and modifies the eye physiology Permanently. Regarding the advantages and disadvantages, all methods of refractive errors correction including glasses, lenses, and LASIK surgery must be selected in according to the physician's recommendation, the patient's social and economic conditions and the culture of society.

Keywords: Refractive errors, LASIK, glasses, lenses

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P39: Category Subcategory Sonoporation and It's Role on Injured Peripheral Nerve Repair

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Abstract

Sonoporation is employing the acoustic energy to change the permeability of cell membrane that is used to transmit molecules such as DNA into the cells in molecular biology and gene therapy. Ultrasound-induced microbubble vibration, produce nonspecific and transient pores in cell membrane. Because ultrasound is nonioizer and noninvasive, we can transmit different substances and genes into the cells in a safe manner. One applications of ultrasound therapy is in injured peripheral nerve repair. That it's reason is not clear yet. But one of it's probable reasons, is the effect of ultrasound on cell membrane permeability and so entry of effective substance on nerve repair into the cells. In this paper, after evaluation of available researches about sonoporation, we will analyze the role of sonoporation in injured nerve therapy by use of ultrasound according to real experiment results.

Keywords: Ultrasound, Sonoporation, Microbubble, Cell membrane, Peripheral nerve

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P40: Medical Ultrasound

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Abstract

Medical sonography (ultrasonography) is an ultrasound-based diagnostic medical imaging technique used to visualize muscles, tendons, and many internal organs, to capture their size, structure and any pathological lesions with real time tomographic images. Ultrasound has been used by radiologists and sonographers to image the human body for at least 50 years and has become one of the most widely used diagnostic tools in modern medicine. The technology is relatively inexpensive and portable, especially when compared with other techniques, such as magnetic resonance imaging (MRI) and computed tomography (CT). Ultrasound is also used to visualize fetuses during routine and emergency prenatal care. Such diagnostic applications used during pregnancy are referred to as obstetric sonography.

As currently applied in the medical field, properly performed ultrasound poses no known risks to the patient.[4] Sonography is generally described as a "safe test" because it does not use mutagenic ionizing radiation, which can pose hazards such as chromosome breakage and cancer development. However, ultrasonic energy has two potential physiological effects: it enhances inflammatory response; and it can heat soft tissue. Ultrasound energy produces a mechanical pressure wave through soft tissue. This pressure wave may cause microscopic bubbles in living tissues and distortion of the cell membrane, influencing ion fluxes and intracellular activity. When ultrasound enters the body, it causes molecular friction and heats the tissues slightly. This effect is typically very minor as normal tissue perfusion dissipates most of the heat, but with high intensity, it can also cause small pockets of gas in body fluids or tissues to expand and contract/collapse in a phenomenon called cavitation; however this is not known to occur at

diagnostic power levels used by modern diagnostic ultrasound units.

Obstetric ultrasound can be used to identify many conditions that would be harmful to the mother and the baby. Many health care professionals consider the risk of leaving these conditions undiagnosed to be much greater than the very small risk, if any, associated with undergoing an ultrasound scan. According to Cochrane Review, routine ultrasound in early pregnancy (less than 24 weeks) appears to enable better gestational age assessment, earlier detection of multiple pregnancies and earlier detection of clinically unsuspected fetal malformation at a time when termination of pregnancy is possible.

Obstetrics is not the only use of ultrasound. Soft tissue imaging of many other parts of the body is conducted with ultrasound. Other scans routinely conducted are cardiac, renal, liver and gallbladder (hepatic). Other common applications include musculo-skeletal imaging of muscles, ligaments and tendons, ophthalmic ultrasound (eye) scans and superficial structures such as testicle, thyroid, salivary glands and lymph nodes. Because of the real time nature of ultrasound, it is often used to guide interventional procedures such as fine needle aspiration FNA or biopsy of masses for cytology or histology testing in the breast, thyroid, liver, kidney, lymph nodes, muscles and joints.

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P41: A Study of Prevalence of Congenital Red-Green Color Blindness in Yazd Shahid Sadoughi University Students.

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Abstract

Purpose: color blindness is one of the common genetic disorders in all human communities. As color-deficient people can see a limited number of colors, their ability to differentiate by color is restricted. Most cases of congenital color vision deficiency characterized by a red-green deficiency. A population-based study was conduced to determine the prevalence of red-green deficiencies at Shahid Sadoughi University students.

Methods: A total of 2833 students (1006 males, 1827 females) were examined with Ishihara color plate test consists of 38 color plates and the city university test (Third edition).

Results: In the study population Ishihara test 90 cases of defective color vision were detected, including 79 (7.85%) males and 11 (0.60%) females. 79 of male subjects showed color blindness, 42 cases (4.17%) deuteranomaly, 17 (1.68%) deuteranopia, 1 (0.09%) protanomaly and 9 (0.89%) protanopia. 11 female cases involved 7 (0.38%) deuteranomaly, 1 (0.05%) deuteranopia, 2 (0.11%) protanomaly and 1 (0.05%) protanopia. All of them were also examined with university test. It showed defective color vision in 72 male cases (7.16%), 50 cases (4.97%) involved deutan (deuteranomaly or deuteranopia), 22(2.18%) protan (protanomaly or protanopia). Beside so 9 females cases showed defective color vision, 7 of them (0.38%) involved deutan and 2 (0.11%) protan.

Conclusion: In this research, the results of Ishihara test and university test were found to have losignificant difference between males (p=0.55) and females. (p = 0.65)

Keywords: color blindness – Ishihara – university – test

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P42: Adverse Health Effects of Occupational Exposure to Pulsed Microwave Radiation in Military Radar Personnel

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Abstract

Radio Detection And Ranging (Radar) workers are routinely exposed to pulsed high frequency electromagnetic fields which are produced to locate and identify the presence, direction or range of airplanes, ships, control towers or other, usually moving objects. Nowadays, radar systems which operate at radio frequencies (RF) between 300 MHz and 15 GHz, are widely used for navigation, aviation, national defense, weather forecasting and even speed control (hand-held police radars). As radiations emitted by radar systems must travel long distances in order to detect objects, the power must be relatively high at transmission site. Radiofrequency radiations emitted by radar systems in the range of 1 MHz to 10 GHz are capable of pentrating human tissues. Absorption of energy in tissues may cause a wide variety of adverse health effects. In this study, health effects of this radiations in personnel who routinely work with radar systems are investigated. After obtaining informed consent, 100 workers (mean age of 33.42±6.87 years, ranged 24-50 years) including 91 males and 9 females, participated in the study. Seventy one percent of these workers had university degrees (BScand M.Sc). A previously approved questionnaire including personal information, job status, possibility of exposure to other sources of electromagnetic fields (Mobile phones, CRTs, etc) and adverse health symptoms (self reported) was used and blood samples were obtained. The 28-item General Health Questionnaire (GHQ) containing questions in four areas of depression, anxiety, somatization and social dysfunction which was validated for Farsi-speaking population was used as a self-administered tool for assessment of general mental health and mental distress. Analysis of the self-reported symptoms by using chi-square test showed a statistically significant relationship between itching, dehydrated skin, sleep disorders, cardiovascular disorders and concentration problems with the number of work hours per day (Lowest thru 8 hours and more than 8 hours). Also a statistically significant relationship was found between itching, tinnitus and vertigo with the number of work days per week (Lowest thru 5 days and more than 5 days). On the other hand analysis of the GHQ, showed a statistically significant relationship between answers to questions regarding feeling nervousness and strung-up (Question#14) and thinking of the possibility that someone might make away with himself/herself (Question#25) with the number of working hours per day. The responses to the question 24 (feeling that life isn't worth living) showed a statistically significant relationship with the number of work days per week. Satisfaction with the way someone carried out his/her task, feeling that someone is playing a useful part in things, thinking of oneself as a worthless person and feeling that life is entirely hopeless (Questions #18, 19, 22 and 23) were significantly different in workers with different employment history. Altogether these results indicate that occupational exposure to radar microwave radiations may be linked to some adverse health effects. In this light attempts for reducing exposure of radar workers to radiofrequencies generated by radar systems, should be considered as a critical goal.

Keywords: Radar, occupational exposure, radiofrequency, microwave, health effects.

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P43: Effects of Combined Magnetic Fields on Human Sperm Parameters

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Abstract

In previous investigations, it has been clarified that electromagnetic fields (ELF) can cause some changes in cellular behavior. The aim of this prospective study was to investigate the effect of magnetic field (MF) on human sperm

parameters of motility, morphology, and viability.Semen samples were collected from 12 fertile men, and each sample was then divided into two aliquots. The experimental samples were placed in the ELF, while the control one was left intact. The applied fields were pulsed with distance of 6 m/ sec and effective intensity of 1mT and different frequencies of 10, 25 and 45 Hz at different time intervals. The constant field intensity was 1mT in all experiments.

This study reports the existence of certain frequency windows for the resonance of the effects of the MF on human spermatozoa. Rapid motility was significantly affected by exposure of spermatozoa to MF, but sperm structural parameter remained intact.

Keywords: Combined electromagnetic fields; spermatozoa parameters; semen; human.

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P44: Laser Mole Removal: Analytical Model and Laser Suitability

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Abstract

Nowadays laser mole and nevus removal is of great importance in dermatology and plastic surgery. One of the essential factors in these types of operations is the temperature distribution of the mole upon irradiating by laser beams. Moreover, the temperature of the contact point between the mole and the skin is vital, since redness, pain, and even nerve damage can occur if large amount of heat is delivered to the contact point. This work presents a comprehensive physical model which not only predicts the temperature distribution of the mole, but also reports the minimum temperature difference of the contact point required for less harmful and less painful mole removal. The results show that the temperature difference of 3-5 degrees Celsius can be achieved depending on different laser beams of Alexandrite, Nd:YAG and various rare-earth doped lasers.

Keywords: Mole and Nevus, Temperature distributions, Laser beam.

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RADIATION PROTECTION & DOSIMETRY

01: Designing and Optimization of Neutron Dosimeter

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Abstract

Low energy neutrons produce harmful biological effect in human body, although applying a neutron dosimeter can't determine the absolute received dose but it can be useful in warning at infected situation. Designing a device to approximate the received dose is the purpose of this research. 3He used as a sphere thermal neutron detector with

a radius of 5 cm encircled by a 10 cm radius of paraffin sphere.

In order to estimate the received dose, after measuring the detector counts, the paraffin sphere replaced with ICRU one which contains soft tissues and dose equivalent determined as a desired output.

The quantity that is measurable for neutron dosimeter is counts, so the necessity of finding an appropriate relation between counts and equivalent dose is obvious. Results on the energies below 1 MeV demonstrated the similarity of changing process of these two quantities, so they could be related to each other with an adequate factor.

To find the best fit different factors considered and the smallest χ^2 (goodness of fit) was 162533 due to a factor of about 7.5e8. To improve χ^2 two covers of cadmium and gadolinium, separately, put around the detector and χ^2 resulted from the new simulations were 32568 for cadmium cover and 4238 for gadolinium due to factors of 136388900 and 1.75e7, respectively. Then, gadolinium cover fits the curves of counts and equivalent dose in best way, so applying a simple detector lead us to estimate whole body equivalent dose.

Keywords: Neutron dosimeter, Counts, Equivalent dose, χ^2

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O2: Resistive Plate Chambers (RPC) in Radiation Medical Applications

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Abstract

In this study, Applications of the resistive plate chambers in PET systems is reviewed. RPCs are gaseous type detectors with very good spatial resolution, excellent time resolution, high efficiency and low cost. These detectors consist of glasses or metal electrodes are the exact distances have been together. The PET-RPC systems are composed of two heads, capable of detecting the photons interaction in two directions, transaxial plane and depth of interaction (DOI). Each heads of system containing 16 single-gap RPC detectors. These researches used Geant simulation toolkit for simulation. Result of small animal PET-RPC prototype systems using 22Na point-like source with spatial resolution 0.6 mm FWHM free of parallax error and time resolution below 50 ps FWHM with efficiency above 99%. With this interpretation, application of low cost RPC technology in PET systems with providing spatial and time resolution and high efficiency will be convenient and effective.

Keywords: RPC, PET, Geant4, Spatial resolution, Time resolution

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O3: A Beamline for Medical Imaging and Therapy at SESAME Synchrotron

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Abstract

Whether for diagnosis or therapeutic purposes, X-rays have many applications in medicine. Synchrotron Radiation sources open new perspectives. This has already been the case for a number of years in molecular and cellular biology where the scope of absorption and diffraction work has been greatly extended. This could also be the case for medical imaging and radiotherapy where the characteristics of the beam (collimation, stability, flux) allow new approaches in the energy range of radiological X-rays. Such a source is built today in Jordan; known as SESAME synchrotron facility. The design of the SESAME light source is based on an electron storage ring with maximum energy of 2.5 GeV and a beam current of 400 mA. A beamline dedicated to medical imaging and therapy is pro-

posed to be built at SESAME facility.

This beamline will cover medical imaging (angiography, tomodensitometry, microtomography, X-ray microscopy) as well as radiotherapy. One of the most important factors for the design is the high photon flux required for the various medical applications. This can be achieved through the combination of the storage ring and a superconducting multipole wiggler. Special windows and apertures, mirrors and monochromators are also required to produce beam with high "cross-sectional" uniformity. This talk includes a description of the design features of the beamline as well as the insertion device. Some applications that can be performed at this beamline will be discussed. Experimental techniques proposed to be used in these applications will be also introduced in more detail and some recent results will be presented.

Moreover the talk will show the efforts done by the Jordanian Association of the Medical Physics (JAMP) and the Jordanian medical physicists to support building-up this beamline. All the aforementioned points make clear that the "medical Imaging and therapy" beamline at SESAME synchrotron facility will be of great use to the medical sciences and will lead to valuable advances in medical imaging and therapy technologies. Furthermore the beamline will give a major boost to Jordanian's medical cience community.

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O4: Determination of the Effective Point of Measurement for Cylindrical Ion Chamber in Mega Voltage Photon Beams

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Abstract

Introduction: For measuring dose in Mega voltage photon beams, ionization chamber will be placed in a phantom but the chamber will displace a certain volume of the phantom medium. Even if the chamber wall is medium equivalent, the effect of volume occupied by the air cavity is not negligible. So the result of measurement must be corrected with correction factor known as displacement perturbation factor (Pdis) which will be less than unity. In general Pdis depends on depth of measurement, radiation quality and the physical dimensions of the air cavity. In this study the effective point of cylindrical chamber has been calculated with a new method.

Methods: In order to calculate the effective point of cylindrical chamber, PDDs in water phantom for high energy photon beams (6MV, 18MV clinac) was measured with two types of different chambers (cylindrical and plane parallel). The effective point of measurement of plane parallel chamber for measuring PDD in central axis is recommended by IAEA technical reports (TRS 398 and277) and that is assumed on the inner surface of the window at its center. So with measuring data for chambers, comparing the readings and by using dosimetry, mathematical and statistical consideration, the effective point for cylindrical chamber was calculated.

Results and Conclusion: Results show that a fix value for effective point of measurement that recommended in available dosimetry protocols such as IAEA TRS 398 (upstream of 0.6r) for all high energy photon beams is not suitable for accurate PDD measurements. using 0.6r shift for PDD measurement will causes uncertainty on SDR more than 3% for depths between (0 to 5 cm),0.5% at 10cm and 1% for depths greater than 15 cm.

Keywords: Effective point of measurement, cylindrical chamber, plane parallel chamber, standard dosimetry protocols

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O5: ^{220}Rn in Indoor Environment of India: A Review

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Abstract

Data for 220Rn in indoors and workplace environment is scare due to the general perception that its levels are negligible due to its shorter half life, and subsequently its contribution to the total inhalation dose is ignored, in the presence of other significant sources of natural radiation. The Bhabha Atomic Research Center (BARC), Mumbai, India has completed a countrywide monitoring program of 220Rn along with 222Rn in the dwellings using 222Rn/220Rn discriminating Solid State Nuclear Track Detector (SSNTD) based dosimeter systems with large participation of research groups from different parts of the country. Details about measurement, standardization of dosimeters and evaluation of the inhalation dose is given. Results are compared with the values reported in literature for dwellings as well as in high background radiation areas.

Keywords: Background radiation, Radon, thoron, dose rate.

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O6: Development and Characterization of Radiological Water Equivalence Formulation of PRESAGE Dosimeter

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Abstract

PRESAGE dosimeter has been introduced recently. In a previous study, it has been shown that PRESAGE demonstrates different characteristics due to its water content especially for low energy photons. In this study, a novel and more water equivalent formulation of PRESAGE dosimeter suitable for radiotherapy applications has been introduced and its radiological water equivalency has been investigated. In addition, the radiological properties of the novel PRESAGE have been compared with another existing PRESAGE formulation over an energy range from 10 keV to 20 MeV. The radiological properties investigated include the effective atomic number, effective electron density, mass attenuation coefficient, mass energy absorption coefficient and total stopping power. The Monte Carlo simulation of depth dose profiles for both of the PRESAGE formulations has been done for two different photon energies (140 KVP and 6MV) using the MCNP4C code. The characteristics of the novel PRESAGE dosimeter were closer to water than the current PRESAGE. More agreement was found when Monte Carlo simulation of the depth dose of the novel PRESAGE formulation was compared with that of the water at the kilovolt energy. The results showed that the novel PRESAGE formulation is more water equivalent than the current PRESAGE especially for low photon energy beams.

Keywords: dosimetry, PRESAGE, water equivalency, radiotherapy

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O7: Application of Electronic Personal Dosimeters to Estimate Radiation Dose of Interventional Cardiologists

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Abstract

Several studies have revealed that interventional fluoroscopy procedures performed in cardiology departments are high dose techniques. In addition to patients, staffs are also susceptible to receiving high radiation dose too. Occupational dose of radiation workers is measured by different dosimeters, but it is mostly expressed in terms of personal dose equivalent Hp(10) that is measured in Sivert (Sv).

The aim of this study primarily was to evaluate application of an electronic personal dosimeter (EPD) to estimate radiation absorbed dose per coronary angiography (CA) or percutaneous transluminal coronary angiography (PTCA) procedures. And secondly estimate effective dose per CA or PTCA procedures to assess annual effective dose for radiation protection purposes.

33 cardiologists were asked to wear an EPD type (Rados-60). They performed 250 procedures (150 CAs and 100 PTCAs) over a period of 6 months. To estimate their effective dose single dosimetry algorithm suggested by Huyskens et al was used.

Mean cardiologists effective doses E per procedure was found to be 2.7μSv for CA (Maximum=71.4μSv, Minimum=1.7μSv) and 6.1μSv for PTCA (Maximum=137.6μSv, Minimum=6.4μSv). We found that EPDs provide a real-time way of monitoring and controling exposure of cardiologists.

Keywords: Dosimetry, Interventional Cardiology, Radiation Protection, Effective Dose

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O8: A Novel Design for Production of Efficient Flexible Shields Against X-Ray Photons in Diagnostic Energy Range

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Abstract

Background: Lead-based radiation shields are widely used in radiology departments to protect both workers and patients from any unnecessary exposure to ionizing radiation. Recently there has been a great deal of concern expressed about the toxicity of lead. Human lead toxicity is well documented. In this light, production of lead free radiation shields which are environmentally friendly and at the same time provide less weight compared to conventional lead-based shields, is a challenging issue.

Objective: The aim of this study was to design lead free flexible radiation shields for protection against x and gamma rays.

Methods: In this investigation, a wide range of metallic compounds which potentially could be appropriate radiation shields, were studied. The Monte Carlo code MCNP4C was used to model the attenuation of x-ray photons in shields with different design. Besides simulation, experimental measurements were carried out to assess the attenuation properties of each shielding design. On the other hand, major mechanical properties of this shield such as tensile strength, modulus and elongation at break were investigated.

Results: Among different metals, tungsten and tin were the two most appropriate candidates for radiation shields in diagnostic photon energy range. A combination of tungsten (45%) and Tin (55%) provided the best protection in both simulation and experiments. In the next stage, attempts were made to produce appropriate Tungsten-tin-filled polymers which could be used for production of shielding garments. The density of this tungsten-tin-filled polymer was 4.45 g cm-3. The MCNP simulation and experimental measurements for HVL values of this shield at 100 kVp were 0.346 and 0.296 mm, respectively. On the other hand, this novel shield provides considerable mechanical properties and is highly resistant to chemicals.

Conclusions: The cost-effective lead-free flexible radiation shield produced in this study offers effective radiation protection in diagnostic energy range. This environmentally-friendly shield may replace the traditional lead-based shielding garments.

Keywords: Radiation Protection, Lead-free Shields, Non-Lead Shielding Garments, Tungsten, Tin, X-rays, Diagnostic Energy

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O9: Optimization of Body Composition Analyzer Facility, Considering Operator Dosimetry

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Abstract

Measurement of body composition by total body in vivo neutron activation analysis is providing a valuable tool for clinical research in many areas of study. Changes in body composition may be diagnostic for the progression of disease or the results of therapy. Prompt γ-rays in vivo neutron activation analysis (IVNAA) has been widely used in recent years. Three major factors in this method are: 1) proper detection which leads to an accurate measurement 2) receiving low dose by the patient and 3) safety of facility for operator. As neutron sources are mostly mixed with γ-rays and these particles are very penetrating, the leakage is remarkable without proper shields. Thus, one of the important features in this method is optimization of shields to reduce operator receiving dose. Not only, must an appropriate shield reduce the operator receiving dose, but also it must have the less effect on detected spectrum. Because all parts of setup can be activated, the emitted γ-rays may be counted in detectors and increase background. So the selected shields may affect on gamma spectrum. In this research, several shields have been considered for an IVNAA setup. It has been tried to choose the best shield which have a low effect on detector spectrum and cause lower dose for operator. Four different shields (concrete, Epoxy colemanite resin, paraffin borated with Bismuth layer (PE-Bi layer) and paraffin borated with fine pieces of Bismuth (PE-Bi)) have been simulated by MCNPX code. The PE-Bi shield decreased the absorbed dose to 86% in compare with no shield state and 81% in compare to concrete. Also the rate of equivalent dose is reduced 97% in contrast to no shield and 94% to colemanite. The annual equivalent dose for an operator who works 8-hour a day, would be 4.04 mSv. The neutron flux decreases 100 times in the presence of PE-Bi while it has the lowest background in γ-spectrum among other suggested shields.

Keywords: IVNAA- MCNPX code - operator shield- absorbed dose- equivalent dose

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O10: The Study of Population Dosimetry in Highest Lung Cancer Occurrence Area in India.

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Abstract

Introduction: Among the population exposure due to natural background radiation 54% is contributed due to radon, thoron and their progenies The effect of radon, thoron and their progenies on human population has been well- established and radiation damage to bronchial cells eventually can be the second leading cause of lung cancer next to smoking which is mainly due to the inhalation of these gases and the effects due to their progenies. The concentration of indoor radon may vary with place, time, height above the ground and the meteorological conditions. It is also influenced by ventilation pattern, architectural style of building and heating system. The exposure due to natural gamma radiation is also an important factor in population dosimetry especially in High Background Radiation Areas. Sources of natural gamma radiations are mainly due to terrestrial and cosmic origins and there is an inter-linkage between terrestrial gamma and radon,thoron as they have the same parent nuclei sources. Population Based Cancer Registry Report, India (PBCR), (2008) indicates that the lung cancer occupies the second position next to stomach while it is second position next to Cervix Uteri for women in Aizawl district, Mizoram. The study also indicated that Lung cancer among males and females in Aizawl district is the highest in Age Adjusted Rate (AAR) respectively throughout India. The hospital-based case-control study blames the food habit in this region and also the influence of tobacco and its by-products to cause high occurrence of stomach cancer which is also applicable to lung cancer.

The population dosimetry has not been well establish in this region and this report aims to provide the data for possible lung cancer due to radon, thoron and their progenies. However, to determine exactly the effect of these gases in causing lung cancer in this region, a case-control study is essential which will require further observations. In the light of WHO view on lung cancer due to radon, one cannot discard any small amount of concentration of these gases in causing lung cancer. Hence this report is intended to indicate the background level of concentration of natural radiations which are responsible for the occurrence of Lung cancer in this region.

Methods: A time integrated Solid State Nuclear Track Detector (SSNTD) based dosimeters developed by BARC were used for Radon/Thoron measurement in the dwellings.These dosimeters were suspended over bed Rooms or living Rooms having more occupancy in the selected houses. The dosimeters were deployed for a period of about 120 days at a time. After the desired period of exposure, the detectors were retrieved and chemically etched which were then counted by using a spark counter. The recorded nuclear tract densities are then converted into air concentrations of Radon and Thoron.

A Micro-R Survey Meter was used for measurement of Gamma Background Radiation level which gives the dose rate in the unit of μR/h. Measurements of dose rate were done on ground level as well as at 1m height from the ground both indoor and outdoor in the vicinity of the dwellings selected for deployment of dosimeters.

Results: Investigation has been carried out by monitoring the seasonal variation of the indwell concentration of radon/ thoron Aizawl district for the year 2008-2009 in various type f houses, viz. RCC., houses with bamboo or asbests wall, etc. Simultaneously, the background gamma radiation, indoor and outdoor in the vicinity of the dwellings was also measured where radon monitoring was done. It was found that the radon (thoron) concentration has its maximum value of 130.80(136.68) Bq/m3 in a concreted house during winter season. The maximum value of background gamma level throughout the season was 24 μR/h and the G.M value being 16.2 μR/h.

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Keywords: Background gamma radiation, lung cancer, Natural radiations, progenies, radon, SSNTD, survey-meter, thoron.

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O11: Quality Control of 191Os/191mIr Generator

Produced by Tehran Research Reactor.

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Abstract

191Os is a parent radionuclide with 15.4 d half-life and 191mIr is daughter radionuclide with 4.96 s half-life. It decays by isometric transition to stable 191Ir, emitting a 129-keV gamma photon. In addition, Iridium x-ray at about 65 keV are emitted, as a result of internal conversion, from the 129-keV excited state. The half life of 191Os is sufficiently long to facilitate transportation, generator construction, quality control, and clinical use.

The production of 191Os by thermal neutron irradiation of natural osmium has been evaluated at neutron flux (4×1013 ncm-2s-1) in Tehran Research Reactor. Oxide sample followed by fusion with KOH and KNO3 in acidic media. then 191Os is loaded on an anion-exchange column and 191mIr eluted with normal salin.

In this research quality control of 191Os/191mIr generator was investigated. one of the important radionuclide impurities is 192Ir that produced with 191Os in reactor. Sepration this impurity from 191Os is developed by a new performance in this research and the total recovery yield of 191Os is about 99% and the total time required for completion the procedure is about 30 min. This method improved the yield, time of performance and useful for experimental work (a little values of 191Os) in comparison with published literatures. To improve the yield and decrease the breakthrough of this generator, eluation characteristics and properties of column were investigated. The yield of generator was assessed for two weeks. 191mIr yield is 9 to 12% and 191Os breakthrough is about 2×10-5 to 2×10-4.

Keywords: Generator, Osmium-191, Iridium-191m, Yield, Breakthrough.

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O12: Quality Assurance Survey of X-Ray Machines and Patient Doses During Various Radiological Procedures

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Abstract

Amongst the man made ionising radiation, X – ray diagnostic procedures contribute the highest per capita radiation dose to population over and above the natural background radiation. Although the X – ray diagnostic procedures have revolutionised the medical diagnosis and treatment of many diseases, it is many a times being overused as a ritual routine diagnostic procedure. The patient receives radiation dose in excess due to bad practice and bad equipment and hence every X – ray machine should be subjected to periodic quality assurance (QA) test. Moreover the knowledge of radiation doses received by the patients during radiological procedure is necessary and all efforts must be made to keep the radiation dose to minimum level

We have carried out extensive radiation protection survey and quality assurance (QA) tests of 190 X – ray installations and measured radiation dose to patients during various radiological procedures using CaSO4: Dy thermo luminescence dosimeter. We have observed that the kVp calibration was within limit in only 43.6 % of the surveyed units. Similarly the mA linearity was within the prescribed limit in 22.9 % of the units. Out of 190 X – ray machines, 97 (51 %) were more than 10 years old and were never subjected QA test after installation. The detailed results of beam alignment test, congruency of optical and radiation field, kVp linearity, timer linearity and availability of radiation protection equipments such as lead barrier, lead apron and radiation doses during various radiological procedures will be discussed in the present communication.

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O13: Active Personal Dosimeter in a Nuclear Medicine

Center in Yazd City, Iran

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Abstract

Introduction: Active personal dosimeters (APDs) are well accepted as useful and reliable instruments for individual dosimetry measurements. APDs have many advantages compared with passive dosimeters for individual external radiation dose assessments. In routine monitoring, occupational exposure is carried out for verification and demonstration of compliance with the regulatory dose limits. So, it is one of the most important tools in order to achieve or demonstrate the level of radiation protection.

Methods: Yazd province has only one private nuclear medicine (NM) center. In this center, two NM technologists exposed by radioactive patients and during radiopharmacuticals preparation were monitored. NM technologists have to be close to the patient during radiopharmaceutical injection and patient positioning on the gamma camera table. An electronic personal dosimeter DKG-21 Ecotest made in Ukraine which records the ambient dose equivalent rate and equivalent dose was used to monitor the radiation exposure of technologist and to record the accumulation dose in mSv throughout a working day. This study was accomplished between the time periods of January to June 2011. The dosimeter is designed to measure individual equivalent dose Hp(10). The dose range of gamma radiation was 0.01mSv to 1 Sv and the energy range 0.05 to 6 MeV which was suitable for NM procedures. The planar and tomography NM images were performed by 2 technologists in morning and afternoon shifts.

Results: The average monthly occupational dose of each technologist was approximately 0.6 mSv. Their annual doses were 6.6 and 8.8 mSv, respectively. They were lower than the maximum permissible dose of 20 mSv/y. Total number of NM procedures performed in this NM center during June 2010 to June 2011 was 3265.

Conclusion: The use of APD for monitoring the NM technologist is a useful tool to check compliance with regulatory dose limits and radiation protection principals.

Keywords: Active personal dosimeter, Occupational dose, Nuclear medicine, Yazd, Radiation protection

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O14: A Novel Method for Removing I-131, Tc-99m and Lu-177 Radionuclides From Aqueous Solutions Using Montmorillonite Nanoclay

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Abstract

Background: Montmorillonite, the principal constituent of bentonite, is composed of hydrous aluminum silicates in the form of extremely small particles that swell in water and shows high cation-exchange capacities. Due to their economical advantages, much attention has been given to the use of clays as adsorbents over the past years. I-131 enters water from medical waste and nuclear accidents. After Fukushima nuclear disaster in Japan, tap water from some areas was tested positive for radioactive iodine. On the other hand, Radionuclidic contamination (iodine or technetium) in nuclear medicine departments is not a rare event.

Objectives: The aim of this study was to investigate the efficiency of montmorillonite nanoclay and common

zeolite and bentonite minerals (micrometer-sized) to adsorb three radionuclides, namely Iodine-131, Tc-99m and Lu-177 from aqueous solutions.

Methods: Iodine-131, Tc-99m and Lu-177 solutions with an initial activity of 0.1 mCi were mixed with 9 cc of distilled water in a test tube. About 0.4 g of nano-montmorillonite, bentonite or zeolite was added to half of the I-131, Tc-99m or Lu-177 test tubes. Remaining tubes did not receive any adsorbing agent. Tubes were gently shaken for 2 minutes and then were left still for the following 118 minutes. Then 0.9 cc of the solution was taken out from the mid part of the test tubes. Activities of these samples were measured using a Vinten Isocal II radioisotope calibrator (Vinten Instruments Ltd, UK) dose calibrator.

Results: For I-131 and Tc-99m the activity of the solution in test tubes treated with montmorillonite nanoclay was 0 mCi, while in control test tubes the mean (±SD) activities were 0.009 ± 0.0004 and 0.006 ± 0.0004 mCi respectively. Activity in the tubes containing bentonite and zeolite showed no significant difference with those of control samples. In case of Lu-177, the activity of the solution in test tubes treated with montmorillonite nanoclay was 0.001 ± 0.0007 mCi, while in control test tubes the mean (±SD) activity was 0.009 ± 0.0007 mCi.

Conclusions: The results of this study prove the powerful ability of montmorillonite nanoclay in removing I-131, Tc-99m and Lu-177 from aqueous solutions. These findings may be used for waste water filtration in nuclear medicine departments and even for production of cost-effective I-131 water filtration devices after a nuclear accident.

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O15: Patient Dose Reduction in Some Routine Radiographic Examinations in Iran

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ABSTRACT

The use of X-rays in medical radiography has continued to increase despite technological advances in other modern imaging techniques. In many countries, especially in developing countries, conventional radiography is still a dominant diagnostic tool in comparison with other imaging techniques such as CT, digital radiography, or MRI. The purpose of this study was to survey image quality and the entrance surface air kerma for patients in radiographic examinations and to perform comparisons with diagnostic reference levels.

In this study, image quality and patient radiation doses were surveyed in 35 hospitals. The rate of unsatisfactory images and image quality grade were noted, and causes for poor image quality were investigated. The entrance surface doses for adult patients were determined in terms of the entrance surface air kerma on the basis of X-ray tube output measurements and X-ray exposure parameters. Comparison of dose levels with diagnostic reference levels was performed.

The fraction of images rated as poor was as high as 45%. The image quality improved up to 10 percentage points in different hospitals after implementation of a quality control (QC) program. Patient doses varied by a factor of up to 22, although the majority of doses were below diagnostic reference levels. The mean entrance surface air kerma values in mGy before QC were 0.48 (chest, posterior-anterior), 3.4 (lumbar spine, anterior-posterior(AP)), 8.81 (lumbar spine, lateral), 3.56 (abdomen, AP), 2.79 (pelvis, AP), 2.27 (skull, AP) and 1.5 (skull, lateral) and after QC were 0.37 (chest, AP), 3.13 (lumbar spine,AP), 7.56 (lumbar spine, lateral), 3.34 (abdomen, AP), 2.71 (pelvis, AP), 2.1 (skull, AP) and 1.43 (skull, lateral). Patient doses were found to be similar to doses in developed countries and patient dose reductions ranging from 3% to 23% were achieved. Poor image quality constitutes a major source of unnecessary radiation to patients in developing countries. Comparison with other surveys indicates that patient dose levels in these hospitals are not higher than those in developed countries.

Keywords: Diagnostic radiology, Entrance skin air kerma, patient radiation doses, Image quality.

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P1: Natural Radioactivity Determination in Drinking Water of Drilled Wells in Zanjan,Iran

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Abstract

The water pathways are usually included in radiological assessments. The radio nuclides can enter the human food chain if the contaminated water is used as drinking water or for irrigation purposes. The 82% of drinking water in Zanjan city (in north-west of Iran) comes from drilled wells. The aim of this study was to estimate the annual effective dose due to the 226Ra and 40K in drilled wells in Zanjan. The Radioactivity measurements were performed by γ ray spectrometry. The results showed that the mean concentrations for 226Ra and 40K were 32 Bq/l and 20 Bq/l respectively. The annual effective dose of Zanjan residents due to the intake of radio nuclides from water of drilled wells was calculated 4.5 and 7.1 mSv/y for adults (≥17 year) and children (2-7 year), respectively. These values are considerably higher than the ICRP limits (1 mSv/y).

Keywords: Natural radioactivity,Drinking water, Zanjan-Iran

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P2: Measurement of Critical Organ Dose (COD) in Some Common Medical X-Ray Examinations on Rando Phantom

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Abstract

The anatomical position and radio-sensitivity of the thyroid, testis and lens make them as critical organs concern in medical radiography. This article presents results of lens, thyroid and testis absorbed dose in some common general x-ray examinations including chest x-ray(PA & Lat), cervical (AP & Lat), thoracic(AP & Lat), skull(PA & Lat), lumbar(AP & Lat), abdomen(AP) and pelvis(AP). The doses were measured on Rando phantom undergoing 12 common x-ray examinations on one x-ray machine. LiF: Mg, Ti, thermo luminescent dosimeter (TLD 100) was used for absorbed dose measurement. The highest and lowest measured values for lens in these 12 x-ray examinations was 0.09 ± 0.04 mSv for skull (Lat) and 0.11 ± 0.02 mSv for Chest x-ray (PA). in thyroid gland was 0.68±0.03 for thoracic x-ray (AP) and 0.12±0.03 for chest x-ray (PA), and in testis was 1.89±0.01 for abdomen (AP) and 0.09±0.03 for chest x-ray (PA) respectively. These results enable us to propose the COD values for common general radiography procedures.

Keywords: lens, thyroid gland, testis, absorbed dose, radio-sensitivity, thermo luminescent, COD.

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P3: Determination of Ra-226 and Pb-210 in Different Bind of Edible Fishes and Sediments in Persian Gulf (Bushehr) by Sulfate Precipitation Method

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Abstract

Ra-226 and Pb-210 activity concentrations were determined in 10 fish flesh and 5 sediment samples. They were collected from Persian Gulf. In order to bring the cautions in aqueous phase, at first the samples were leached by HNO3, HClO4 and H2O2. Radium determination was performed using a method based on Micro-Co-precipitation of Radium and Barium sulfate and then alpha spectrometry system of the obtained source (filter paper). In case of lead determination, after separation and purification of lead as lead sulfate, it was counted by Liquid Scintillation counting system.

Quality assurance of the method was certified by using IAEA reference materials such as: IAEA-315 (marine sediment), IAEA-352 (Tuna fish), IAEA-307 (sea plant) and IAEA-308 (sea weed). The mean chemical recovery of Radium in the samples was about 50% and Ra-226 activity concentration for was varied from 15.0±3.2 to 82.0±18.1mBq.kg-1 in fish samples and from 9.3±0.9 to 14.9±1.6 Bq.kg-1 in sediment samples.The range of Pb-210 activity concentration was varied from 63.1±13.1 to 317.6±12.9 mBq.kg-1 in fish samples and from 35.3±12.3 to 141.6±11.2 Bq.kg-1 in sediment samples.

Keywords: Alfa Spectroscopy, Sediment, IAEA reference material, Bushehr

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P4: Calculation of Total Energy Deposition and Mean Glandular Dose in Breast From W/Rh Target-Filter X-Ray Spectrum

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Abstract

The new mammography imaging system of the Giotto Image SDL digital mammography unit manufactured by IMS in Italy uses Tungsten target with Rhodium filter to reach the better image quality and decrease mean absorbed dose to the breast. The x-ray spectra with 0.63 mm Be inherent filter and 50 µm Rh additional filter at 28kV have been calculated using the ring detector tally F5:p by MCNPX code. As well as, the transmission curve through aluminum filter for different tube voltages has been simulated and measured as an experimental test for validity of computational spectra. We have also computed the total energy deposition and Mean Glandular Dose (MGD) variation against to glandularity. The results show that Mean Glandular Dose (MGD) variation in 4cm thickness of breast phantom fitted well in a second order function of glandularity.

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P5: Measurement of Entrance Surface Dose (ESD) on Adult Patient in Routine X-Ray Examinations in Two Hospitals in Iran-Rafsanjan

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Abstract

There is not any recorded national Diagnostic Reference Levels (DRLs) in Iran and also Local Diagnostic Reference Levels (LDRL) for Rafsanjan city. Entrance surface dose (ESD) to adult patients undergoing Chest (PA and Lat), Skull (PA and Lat), Cervical spine (AP and Lat), Thoracic spine (AP and Lat), Lumbo sacral spine (AP and Lat), Abdomen (AP) and Pelvis (AP) were evaluated in two public hospitals in Iran-Rafsanjan. A total of 220 patients were examined in this study. The ESD values of X-ray examinations on Chest posterior-anterior (PA) and Lateral (Lat), Skull PA and Lat, Cervical spine anterior-posterior (AP) and Lat, Thoracic spine AP and Lat, Lumbo sacral spine AP and Lat, Abdomen AP, and Pelvis AP were found to be 0.28, 0.84, 1.56, 1.26, 0.85, 1.08, 4.35, 5.74, 3.95, 10.32, 4.47, and 3.52 mGy respectively. These values were compared with diagnostic reference levels (DRLs) that introduced by the International Atomic Energy Agency (IAEA, 1996) and National Radiological Protection Board (NRPB, 2000). Most of the mean entrance surface doses were found lower than Diagnostic Reference levels that are introduced by IAEA and NRPB. This values comparison mean that the radiation risk to an average patient in the hospitals included in this study is low and the risk to workers in the hospitals will be generally low, also the finding in this work shows that, there is a serious need for quality assurance program and monitoring aimed towards reducing patient dose in Rafsanjan.

Keywords: Entrance Surface Dose, Diagnostic Reference Level, Iran, Rafsanjan.

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P6: Comparison Radioactive Nanoparticles in Radioimmunotherapy with Nonuniform Distributions

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Abstract

In the context of radioimmunotherapy of cancer, there is a need for continued improvement of dosimetry of radionuclides localized in tumors. In this method, radioactive atoms are attached to monoclonal antibodies to be used in treating cancer while limiting radiation to healthy tissues. However, it has been shown that only one radioactive atom is linked to each antibody and the deposited dose is often insufficient to eradicate solid tumor. In recent years, there have been widely studies that radioactive nanoparticles have beneficial features. These nanoparticles have more surface area to accommodate a large number of different types of functional groups so that more than one antibody can be conjugated. The aim of this paper is to assess, by means of MCNPX simulations, the absorbed dose of radioactive nanoparticles around and throughout solid tumors. Spherical tumors evaluated with 1 and 0.1 cm diameters and we have also defined a model with nonuniform distribution of antibodies within solid tumors are taken into account. Microdosimetry calculations have been performed for the beta-emitting radioactive nanoparticles, including 32P, 67Cu, 90Y. Simulations with MCNPX showed that enough energy deposition can be delivered inside tumors by radioactive nanoparticles containing hundreds of radioactive atoms. In addition, for the radioactive nanoparticles distributions investigated, high energy beta emitters, such as 90Y, are most effective in treating large tumors and for small tumors (d=0.1cm) 67Cu are better suited.

Keywords: radioimmunotherapy; Monte Carlo; radioactive nanoparticles

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P7: Survey of Patient Dose in Computed Tomography in Syria 2009

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Abstract

The radiation doses to patient in computed tomography (CT) in Syria have been investigated and compared with similar studies in different countries. This work surveyed 30 CT scanners from six different manufacturers distributed all over Syria.

Some of the results in this paper were part of a project launched by the International Atomic Energy Agency in different regions of the world covering Asia, Africa and Eastern Europe. The dose quantities covered are CT dose index (CTDIw), dose-length product (DLP), effective dose (E) and collective dose. It was found that most CTDIw and DLP values were similar to the European reference levels and in line with the results of similar surveys in the world. The results were in good agreement with the UNSCEAR Report 2007. This study concluded a recommendation for national diagnostic reference level for the most common CT protocols in Syria. The results can be used as a base for future optimisation studies in the country.

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P8: Calculations of Shielding in Diagnostic X-Ray Departments

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Abstract

The "Calculations of Shielding in Diagnostic X-ray Departments" talked about radiation protection survey is an on-site evaluation of the X-ray facility performed by or under the direction of a qualified expert. It is typically performed after the facility is completed, although some components may be conducted prior to the completion of construction. The purpose of the survey is to ensure the protection of employees and members of the public. The survey consists of two basic elements:

An inspection to verify that barriers are properly placed, contiguous and free of avoids or defects; and An evaluation of shielding adequacy to verify that barriers adequately attenuate exposures in nearby occupied areas to the relevant shielding design goal divided by the appropriate occupancy factor (P/T). Approval or disapproval by the qualified expert shall be based on compliance with the recommendations of this report and any other applicable federal, state and local regulations. If the survey reveals deficiencies, additional shielding or modifications of equipment and procedures are required. If supplementary shielding is required, a survey shall be performed after its installations. In addition, a survey shall also be made after any change that might significantly reduce the level of radiation protection, and about Calculation of the walls in this facilities.

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P9: Evaluation of a New Ionization Chamber Fabricated with Carbon Nanotubes

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Abstract

Ionization chambers are the most practical and important radiation measurement devices due to their high sensitivity and relatively constant response with wide range of applied potential. In this work, a new plane-parallel Ionization chamber is proposed using carbon nanotubes (CNTs) as sensing electrodes. Some characteristics of the new chamber such as cable effect, leakage current and reproducibility are investigated. The polarization effects, besides voltage effect and linearity are also verified. All tests are performed using a 60Co gamma radiation source. The obtained results are compared with that of a standard Ionization chamber (PTW Roos W34001 plane-parallel ion chamber) and international code of practice on dosimetry (i.e. IAEA TRS No. 381).

Keywords: Radiation Dosimetry, Ionization chamber, Carbon nanotubes

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P10: An Assessment of Radiation Dose of Patients and Physicians Emerging From Diagnostic and Therapeutic ERCP Procedures.

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Abstract

Endoscopic retrograde cholangiopancreatography (ERCP) is an interventional technique in which, when performed many digital x-ray images are recorded. Consequently patients and physicians are exposed to a high quantity of radiation.

There are only a few reports of patient and physician doses arising from these procedures. In Iran this subject has not been studied so far.

The purpose of this study was to estimate both patient and endoscopist organs doses and patient effective dose arising from diagnostic and therapeutic ERCP procedures in Imam Reza teaching hospital of Mashhad-Iran.

For 30 patients thyroid, gonad, lens of eyes and effective doses as well as entrance surface dose (ESD) were measured by TLD. Effective dose was estimated by employing DAP values. For endoscopist doses of organs of interest were also measured by TLDs. To assess the protective effectiveness of a lead cloth which encircled the tube head, ERCP procedures were performed with and without the lead cloth, when a Rando Phantom was placed in the same position as the endoscopist. Organs doses of the phantom were measured in both conditions.

Average DAP meter readings were 4.09 and 7.60 Gy.cm2 respectively arising from diagnostic and therapeutic procedures corresponding to the average fluoroscopy times were 0.54 and 1.27 min respectively. Effective dose of patients following to undertaking one diagnostic or therapeutic procedure were also 1.32 and 2.45 mSv respectively.

The results of this study show that therapeutic ERCP deliver on average higher doses to patients than diagnostic ERCPs. In this study the DAP values and fluoroscopy time are significantly lower than the corresponding values suggested by other researchers elsewhere.

Keywords: TLD, DAP, ERCP

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P11: Annual Background Radiation in Safeen& Hassan

Beg Mountains in Kurdistan Region/Iraq

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Abstract

Introduction: Natural radiation is the major source of human exposure to ionisingradiation,and its largest contributing component to effective dose arises from inhalationof 222Rn and its radioactive progeny. Measurement of background radiation is very important from different location of the world especially for human health. The aim of this survey was focused on determining the current background radiation in two of the highest altitude regions (Safeen & Hassan beg) mountains in north of Iraqi Kurdistan Region.

Methods: The outdoors-environmental monitoring exposure rate of radiation was measured in 300 randomly chosen regions using portable PalmRAD 907 Nuclear Radiation Meter and Contamination Monitor CoMo 170. Multiple measurements were made for each region and an average value was used to calculate the exposure rate from natural background radiation.

Results: The exposure dose rate in Hassan beg mountains was 0.26 µSv/ hr in altitude 1900 m (0.131 µSv/ hr in altitude 1000m) and in Safeen mountains was 0.20 µSv/ hr in altitude1450 m (0.125 µSv/ hr in altitude 1135 m).

Conclusion: An acceptable correlation between the altitude and the exposure rate was observed, as the higher altitude regions have higher natural background radiation levels in Safeen Mountains but in Hassan beg is randomly.

Keywords: Background radiation, annual effective dose, radiation dosimeters & altitude.

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P12: Radiation of Artificial Radionuclide and Its Hardness in Drinking Water

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Abstract

Radioactivity was absorbed by the body, through alpha emission or beta emission as internal way by drinking or eating; external way of gamma radiation during disintegration of radionuclide. The aim of this research was radioactivity changes in drinking water and its hardness. The method of research was consisted of heating the various drinking water sub-samples and adding radio iodine 125 to case and control sub-sample and waiting for 24 hour and stirring them by magnet set. Gamma emission was detected by detector machine with the characteristics: Automatic Gamma Counting system model name, Serial No.GM1 8335 S 307, KONTRON Manufacturer name, Switzerland Location and its hardness was determined after heating the drinking water. The results showed that radiation of drinking water depend upon the hardness of drinking water which drinking water was related to hardness indirectly. The difference mean of drinking water and hardness confirmed it. (P-value=5%).

Keywords: radioactivity, radiation, protection, hardness, drinking water

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P13: A GEANT4 Based Utility Software for Gamma Ray Shielding Calculations

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Abstract

In this paper, we propose software to simplify access to required data for gamma ray shielding calculations. This software is based on GEANT4 simulation toolkit and only needs.NET Framework 1.1 to run. Duo to a user-friendly GUI, no programming experience or any knowledge of GEANT4 is needed to use of it. Our software offers a lot of features such as: a built-in data base with 98 elements and 181 standard NIST materials, a tiny material builder for building user customized composites and mixtures, a μ calculator which reproduces photon cross section tables for standard or user defined materials at energies from 1 keV to 100 GeV, a simple geometry designer to setup geometry of absorber slabs, an easy to use Monte Carlo transmission calculator which calculates the fraction of transmitted photons for loaded geometry and a Build-up factor calculator. The validation of this is software presented here. The results showed the competence of this software.

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P14: Astronaut Protection From Cosmic Rays by Dietary Manipulations

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Abstract

Astronauts beyond the Earth's orbit are exposed to high-energy cosmic-ray nuclei with high values of linear energy transfer, resulting in much more biological damage than from x, y-rays and may result in mutations and cancer induction. There are three forms of radiation risk management including operations strategies, spacecraft shielding and biological management such as medication consisting of radical scavengers, cytokines, cell transplants and anti-oxidant consumption or dietary manipulations. Maintaining rats on a diet containing strawberry and blueberry extract can prevent the disruption in motor behavior, amphetamine-induced taste aversion learning, spatial learning and operant responding and significantly reduced the occurrence of radiation-induced tumors. By reducing oxidative stress and the generation of Reactive Oxygen Species, diets containing blueberry or strawberry extract may provide a significant level of radiation protection in space missions.

Keywords: Radiation damage, Antioxidant, Oxidative stress, Diet, Radiation protection

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P15: MCNP Dose Calculation to Aim of Dose Assessment in Industrial Radiography Accidents

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Abstract

For doing the correct and right action in industrial radiography accidents, an accurate dose assessment is essential to make the best decision to prevent radiobiological hazards. In this study Monte Carlo code has been used to

simulate one the main and prominent radiography accident happened in Iran. On 24 July 1996 a serious accident occurred at the Gilan combined cycle fossil fuel power plant in the Islamic Republic of Iran, when a 33 years old worker who was moving thermal insulation materials around the plant noticed a shiny, pencil sized metal object lying in a trench and put it in his pocket. He was unaware that the metal object was a 192Ir source used for industrial radiography. Based on IAEA report No: STI/PUB/1123 in 2002, in this critical accident he received an average whole body dose was by 2 Gy. Accordingly based on Monte Carlo code and the data a simulation was done for this accident and investigate in which positional conditions the worker could be received 2 Gy as whole body dose.

Keywords: MCNP, Industrial Radiography, Accident, Whole body Dose, Tissue Weighting Factor, ICRP

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P16: Establishment of Local Dose Reference Levels (DRLs) for Intra Oral Dental Practices at Dubai Area.

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Abstract

This Diagnostic Reference Levels (DRLs) study is considered the first survey carried out to evaluate patients doses incurred during dental radiology examinations within the Emirate of Dubai. The dose survey covered 44 Intra Oral systems (23 Conventional Film Based and 21 Digital units) at Dubai area. Radiation exposures were measured using UNFORS ThinX Intra and Multi-O-Meter electronic dosimeters. The exposures were measured in air at the end of the spacer cone; this estimated as the Entrance Surface Dose (ESD). Exposure parameters implemented in this work were reflecting those used in the clinical situations.

The 3rd quartile pediatric ESDs for all views for film based and digital intraoral systems were 2.697 mGy and 0.453 mGy, respectively. The 3rd quartile adult ESDs for all views for film based and digital units were 4.084 mGy and 0.597 mGy, respectively. The pediatric ESDs ranges were 0.693-4.75 mGy in the film based systems and in the digital systems were 0.030- 0.746 mGy. The adult ESDs ranges were 1.08-7.48 mGy in the film based systems and in the digital systems were 0.062- 1.121 mGy. ESDs were also evaluated for the common image views in the dental radiology.

Recent developments in dental digital image receptors have contributed significantly in patient dose reduction. Patient doses incurred in the intraoral practices at Dubai area is comparable to the accepted level stated by the International Atomic Energy Agency and the European Commission. Development of national intraoral DRLs for all dental imaging modalities is proposed to be considered in the future.

Keywords: DRL, Dosimetry, Patient Dose, Dental Radiology Intraoral

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P17: Analitical Approach for Determination of Effective Point of Measurement for Clyndrical Ionization Chamber

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Abstract

Background and Objective: Clyndrical ionization chamber is used for measurements of patient dose in radiation therapy. Therefore, determination of its effective point of measurement in finding dose distribution in tumor volume is important.

Methods: In this study a CC13 ionization chamber is used for dose measurement of 6 and 18 photon beams of Variant accelerator in different field sizes, 5*5 cm2 up to 35*35cm2. Measuremets is done in blue phantom, up to 5cm depth and data fit software is used for evaluation of experimental datas.

Results: PDD curves ara plotted seperatly for all treatment photon fields. Critical points of these curves is calculated and considered as displacement perturbation factor (Pdis)

Conclusion: The first critical point of each curve is caused by changing environment from air to water (phantom) during measuring of ionization. In fact we can consider critical point as effective point of measurement of ionization chamber. Consideration shows that any increasing in field size, decrease and increasing of energy increase the depth of this critical point.

Keywords: Effective point of measurement, clyndrical ionization chamber, Percent Depth Ddose curves

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P18: Which Body Model Is More Suitable for Dosimetry Calculations?

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Abstract

Computational phantom(three dimension computer models of human body) are essential in estimating organ doses from various occupational radiation exposures and medical procedures. Mathematical phantoms use mathematical equations to describe the organs and tissues of human body and voxel phantoms are human models based on CT or MRI obtained from high resolution continuous scans of a single individual. Voxel phantoms are exactly matches with individual so obtained results on these phantoms are accurate while mathematical phantoms are most general and covering a range of age.

In this study were investigated the effect of phantom type on neutron absorbed doses and neutron effective doses. For this aim, we compared the calculated results on ORNL adult phantom (Mathematical phantom) with VIPMAN (voxel phantom) for absorbed doses on 26 organs in monoenergetic neutron beams under six irradiation conditions: AP-PA-RLAT-LLAT-ROT and ISO. In addition, the obtained effective dose results compared with Asian voxel phantoms: TARO and HANAKO and also VIPMAN for whole body. MCNPX Monte Carlo code was used for this simulation.

The results of this study indicates that influence of phantom type (mathematical or voxel models) are not important on the absorbed dose and the effective dose values. But the size of the phantom (VIPMAN versus ORNL) significantly affected on absorbed and effective doses in all irradiation geometries. These results are important because working with mathematical phantoms is simpler and much easier than the complex voxel phantoms.

Keywords: Mathematical phantom, Voxel phantom, Monte Carlo Code, Effective dose

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P19: Reducing the Effective Dose Equivalent on 5 Year-Old ORNL Phantom by the Use of Γ-Shields on in Vivo BCA Facility

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Abstract

Body Composition analysis (BCA) by in vivo elemental measurement has proved considerable value to clinicians over the last forty years. Most of the works in this field has been performed by Prompt γ-rays in vivo neutron activation analysis (IVNAA) technique due to its "gold standard" to determine certain chemical body elements. The IVNAA facilities have produced a significant amount of knowledge in studying diseases, such as osteoporosis, obesity, AIDS, cancer, anorexia, renal disorders, and aging. To prevent receiving the dose from γ-rays produced in system by patient, an efficient strategy is to apply γ-shield. In previous publication, absorbed dose, dose equivalent and sensitivity factor were considered for cubic water phantom.The Monte Carlo simulation of BCA facility using MCNPX 2.4.0 code was performed. The results determine the optimum thickness and γ-shield composition. In this study, the γ-shield is described in three separate positions: 1) top & bottom of the patient, 2) around the 241Am-Be neutron sources and 3) latter item together with covers surrounding inner collimator walls. Then its influence on reducing effective dose equivalent is examined for 5 year old ORNL phantom. With regard to effective dose equivalent, the optimum position is 6cm thick tungsten layer on top & bottom of the patient. Gall bladder has a maximum amount of dose equivalent among all tissues in no shield state and then breasts and lungs receives maximum dose equivalent. However, when the W shield is added to free shield IVNAA facility, breasts and lungs receives maximum dose equivalent and gall bladder is in second order. However, as the importance of received dose of radiation to make the most common cancers, we are considered to the percentage of reduction of dose equivalent in lungs, gonads, bone marrow and bone surface. Decreasing dose equivalent on these organs with optimum shield is 66.47%, 65.83%, 65.57% and 65.48% rather than without it, respectively.

Finally, total effective dose equivalent in no shield state is 3.17×10-2 ± 2.14×10-4 mSv/min. This parameter decreases about 66.25% in comparison with no shield state.

Keywords: IVNAA facility, γ-Shield, Effective dose equivalent, dose equivalent, ORNL phantom

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P20: Organ and Effective Doses of Patients Arising From Some Common X-Ray Eaminations by PCXMC Software in Sabzevar County-Iran

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Abstract

The purpose of this study was to estimate organ and effective radiation dose of patients undergoing common x-ray examinations. The effective dose is one of the best parameters for describing the amount of radiation dose received by a patient undergoing any diagnostic x-ray examination. In order to determine the stochastic risk of an x-ray examination, it is necessary to know the absorbed dose in each susceptible organ together with the risk per absorbed dose associated with irradiation of that organ. The organ or tissue dose in a patient resulting from a radiological procedure depends on the amount of incident radiation, i.e. the entrance surface dose (ESD) value and the location and direction of the incident beam.

This work was carried out in eight radiology center in the Sabzevar province of Iran. Eleven x-ray units and 485 patients were included in this study. Eight typical x-ray examinations included in this work are as follows: chest PA, chest AP, lumbar spine AP, lumbar spine LAT, pelvis AP, abdomen AP, cervical AP and LAT.

Organ/tissue dose and effective dose were calculated by employing PCXMC software based on Monte Carlo method. PCXMC calculates the mean values of absorbed doses averaged over the organ volume.

Mean effective doses obtained in this work are compared with similar results reported by other workers. The

methods used for different studies are the main factors which influence the values of effective doses.

The methods used for computing effective dose and radiographic parameters applied to the examinations performed in different studies are the main factors which influence the values of effective doses without having access to details of the relevant factors it is difficult to draw an analytical conclusion. In the below table average effective dose of patients obtained in this study are compared with the corresponding values reported by two other researchers.

Keywords: effective dose, organ dose, diagnostic x-ray, PCXMC software

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P21: In Vivo Dosimetry Evaluation for External Photon Treatments of Brain, Pelvis and Breast Cancers with Diode Dosimeters

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Abstract

Quantitative verification of the prescribed daily dose is important in external radiotherapy to ensure precision in patient set-up accuracy in dose delivery. Diode in vivo dosimetry is widely considered to be an important tool for quality improvement of patient care in external radiotherapy. Uncertainty in dose delivery should fall within 5% of the prescribed dose as recommended by ICRU. In vivo dosimetry was implemented for treatments of 36 pelvis and 38 breast cancer patients which were treated by 60Co photon irradiation and 38 brain cancer patients which were treated by 6MV photon irradiation. The diode dosimeters that were used in this study were two different models of PTW products, T60010L model was used for 60Co photon beam and T60010M model was used for 6MV photon beams. During treatment, entrance and exit doses were measured for each patient and midline dose values were estimated by our new formula. The frequency histograms of the relative difference between the expected and measured doses at breast, pelvis and brain treatments, have mean values and standard deviations of -1.21% (7.01%), -0.44% (4.06%) and -1.32% (5.08%), respectively. Our study showed that the accurate prediction of the dose value at breast cancer treatment is harder than that at brain and pelvis cancers treatment and requires an estimation of the lack of scatter due to missing tissue.

Keywords: External radiotherapy, In vivo dosimetry, Diode dosimeter.

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P22: Comparison of Dosimetry Parameters of Commercially Available Iodine Brachytherapy Seed (125IrSeed) Obtained Using EBT Radiochomic Film and TL Dosimeters

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Abstract

Low energy photon emitter brachytherapy sources are being used with increasing frequency for interstitial implants in tumor sites, especially the prostate. Recently, several new designs of 125 I and 103Pd sources have become commercially available for clinical applications. Dosimetric characteristics of 125I seed (4.7mm length) brachytherapy source have been determined. In present work the characteristics were measured based on the protocol introduced by the radiation therapy committee of the American Association of Physicists in Medicine (AAPM) Task Group 43U1. Quantities such as radial dose function, g(r), and anisotropy function, F(r,θ), were experimentally determined and the geometry function, G(r, θ), was calculated. TLD measurements were made in a Polymethyl methacrylate (PMMA) phantom of dimensions 30cm × 30cm × 14.6 cm by means of EBT radiochromic film and LiF:Mg,Ti (TLD-100h) dosimeters for distances of 0.5-7cm for g(r), and the same distances at angles of 0-180° for F(r,θ).

Keywords: 125I; Dosimetry; Brachytherapy; TLD; EBT radiochromic film

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P23: Assessment of Organs and Effective Doses in Pediatric Radiology Examinations

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Abstract

Optimization of patient dose is particularly important for pediatric X-ray examinations, as the risk of cancer induction following to exposure to ionizing radiation is much higher for children. The aim of this work was to assess organs and effective doses for three age groups, arising from chest and abdomen X-ray examinations in Khorasan Razavi province. Entrance surface doses (ESD) received by patients were measured by thermoluminescene dosimeters. Organ and effective doses and risk of radiation induced cancer death have been estimated by employing PCXMC, a Monte Carlo based software. Based on average ESD arising from chest exams for all three age groups; breasts, clavicles and ribs incurred maximum dose. Maximum dose from abdomen examination was delivered to stomach, bladder and pelvis bones. Maximum effective dose (41 μSv) were emerged when abdomen radiography were carried out for children of 5 years age group. Risk of radiation induced cancer death from chest examination (1.43×10-5) for zero age group were higher than risk values computed for other groups. Careful collimation and proper positioning of patients are also of crucial factors.

Keywords: paediatric radiology, organs and effective doses, Khorasan Razavi province

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P24: An Introduction to a New Algorithm for in Vivo Dosimetry Evaluation Using Diode Dosimeters for Off-Axis Wedged Beams in External Radiotherapy

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Abstract

An in vivo dosimetry system using p-type diode detectors was characterized for clinical use on treatment machines ranging in megavoltage energies. This paper investigates two different models of diodes for externally wedged beams and explains a new algorithm for the calculation of the target dose at desirable depth of tissue in external radiotherapy. The values of off-axis wedge correction factors were determined at two different positions in the wedged direction (toward the thick and thin edges) and in the nonwedged direction on entrance and exit surfaces of polystyrene phantom for 60Co and 6MV photon beams. Depth transmission was defined on the entrance and exit surfaces to obtain off-axis wedge correction factor at any depth. As the sensitivity of the diodes depends on physical situations (field size, SSD, thickness, backscatter), correction factors were applied to the diode reading when measuring conditions differ from calibration situations. The results indicate that needful correction factors for 60Co wedged photons are usually larger than that for 6MV wedged photon beams. In vivo dosimetry performed with proposed algorithm at externally wedged beams has negligible probable errors (less than o.5%) and it is a reliable method for dose control process.

Keywords: External radiotherapy; In vivo dosimetry; Off-axis wedge correction factor; Diode dosimeter; Ionization chamber.

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P25: Assessment of Doses Due to Inhalation of 222Rn and Its Progeny in Representative Houses in the Vicinity of Gold and Uranium Mining Operations

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Abstract

Radon is a radioactive gas which contributes significantly to the natural radiation background. For this reason it is important to estimate doses to representative persons of the public especially in areas with an elevated concentration of naturally occurring radionuclides e.g. the Witwatersrand Basin. This paper presents the results of Radon monitoring carried out in selected houses close to the gold and uranium mining operations in South Africa. Monitoring of radon and its progeny was performed inside these houses, that were built about 100 years ago, using a calibrated AlphaGuard PQ2000PRO instrument and the interpretation of the results took into consideration metrological parameters, which are critical for evaluating radon concentrations. The results obtained by AlphaGuard were compared with long-term measurements performed in the same locations using RGM (Radiation Gas Monitor) caps manufactured in SA. Indoor monitoring of radon and its progeny was supplemented by additional monitoring outdoors, around the experimental houses, slime dams and in several selected locations close to mining operations. Assessment of doses due to inhalation of air contaminated by radon and its progeny was based on the obtained results of radon monitoring and the doses were compared to internationally accepted intervention and action levels established by ICRP and various regulatory authorities in the world.

The values of the indoor Radon concentration will be compared with the international recommendations, and since the metrological parameters are critical for analysing the radon concentration, an effort has been made to find a possible correlation between them and indoor radon concentration.

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P26: Dubai Experience in Evaluation of Average Glandular Doses

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Abstract

Introduction: In the UAE, the number of mammography examinations has been rising steadily owing to the rapid growth of the health sector. At present, there is a growing concern about patient doses in mammography. For this reason, the UAE has joined the IAEA/Task4 program to undertake a survey of patient exposure in mammography. As a first step, four hospitals were selected to participate to this survey. The objective of this work was to determine the Average Glandular Dose (DG) resulting cranio-caudal projections while the ultimate aim of the project remains the establishment of Dose Reference Levels (DRL). IAEA guidance was used for measuring the Entrance Surface Air Kerma (Ka,e) and EUREF guidelines DG calculations

Methods: The number of the hospitals participated to this survey were 20, we started on March 2009. In this study, the 45 mm thick ACR accreditation phantom and Leeds Test Object (TORMAX) were used for image quality. The measurement of Ka,e was accomplished in two steps. First, the ACR phantom was exposed X-ray beams in the automatic mode and kVp, mAs, and target/filter combination were recorded. Then, the phantom was removed and a similar exposure was performed in manual mode with no phantom. Dedicated ionization chambers fitted to suitable Multimeters were utilized to measure the Incident Air Kerma. Ka,e is deduced after correction for backscattering. The AGD is calculated as: DG= Ka,e. g. c. s The Contrast-to-Noise Ratio (CNR) was measured using the method described in IAEA guidance.

Results: The Image parameters of all machines were found within acceptable standards for all hospitals, the values using the TORMAX were put as a base line for their machines. Table 1 below shows some of the results obtained for the machines Hospital 1 Hospital 2 Hosp. 3 Hosp. 4 A/F comb. Mo/Mo M o/Rh Mo/Mo Mo/Rh Mo/Mo Mo/Rh CNR 2.87 6.68 5.5 4.93 5.23 -AGD, mGy 2.33 1.66 1.28 1.21 1.9 4.86

Conclusions: The results show that AGD values for hospitals 1, 2, and 3 are acceptable, while in Hospital 4 it was much higher, requiring action to reduce it to less than 2.5 mGy, as recommended by EUREF

Keywords: Patient dosimetry; Average Glandular Dose; Radiation Protection; Entrance Skin Air Kerma

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P27: Evaluation of Radioactivity in Water of River Ganges and Its Infuence on Ecobiotic System

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Abstract

Evaluation of radioactive elements at designated locations and their effects on sensitive aquatic ecosystems have acquired increasing significance for health and environmental perspectives. Fluctuations in level of radioactive elements at diverse locations in the flow route of river Ganges has been of concern to ecological and life science researchers for the past some years. Present study focuses on developing a critical examination of available data and design a further research plans to undertake investigations for quantification of measured data from the viewpoint of effects on biotic and abiotic species. It has been known that long term variations in aquatic and climatic parameters have had a subtle way to influence species migrations in invertebrates particularly hitherto unknown parasitic invasions in habitats. It seems important to develop indicators of effects produced by radiation emitted from radioactive elements to measure direct influence on physiology of organisms under environmental stressors. The influence on radiobiological determinants by potential radioactive stressors combined with pollutants on the dynamics of parasitic infections in fishes may form a rational approach to determine effects of radiation within the water bodies in

the natural environment. The variations in minerals and salts in water may alter the biological response parameters of living organisms. This paper will present a review of current status of radioactive levels in river Ganges scientific analysis of available data with the formulation of further research to evaluate possible impacts on health and environment

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P28: Calculation of Neutron Beam Characteristics in Beam Tubes of Tehran Reactor by MCNP4C for BNCT in 5 Mega Watt Power

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Abstract

Boron neutron capture therapy (BNCT) is a new experimental form of radiotherapy that uses a neutron beam that interacts with boron injected into a patient to treatment disease such as brain tumor and skin cancer. It depends on the interaction of epithermal neutrons with boron-10 to produce alpha particles and lithium nuclei, without producing other types of ionizing radiation.

In order to using the T.R.R beam tubes in BNCT, it is necessary to select the proper north beam tube. It should have more flux and spectrum. After simulation of the last configuration of reactor's core by MCNP4C code, the neutron flux and spectrum were calculated at the start, middle, and end of each three north beam tubes. This calculation has been done in three different situations of reactor's core. The analyses of results showed that the neutron spectrum is almost the same in all of the beam tubes, but the neutron flux in northwest beam tube is better than the others.so, this beam tube is more proper to be used in BNCT.

Keywords: BNCT, Tehran Research Reactor (TRR), MCNP4C, Beam Tube, neutron Flux

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P29: Measurement of the Radon Concentration of Air Samples in Houses in the SARI City

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Abstract

Background and Purpose: Overall,a completed radon remediation programme of the type implemented in Northampton shire is most cost-effective for an Action Level between 200 and 300 Bq m−3.The implications for future health policy are discussed.

Methods:There are some requirements concerning the used Radon monitor (SARAD GmbH) which have to be taken in account.

Results: Air-Volume Sensitivity of the Radon monitor Sampling Interval Detection Limit (2-Sigma) ml ml cpm/(kBq/m³)min Bq/l 500 130 3 5 0.096-500 380 3 30 0.033- 500 1200 5 5 0.315-100 1200 5 30 0.244.

Conclusion:Radon in Air Concentration" is equal to the detection limit of the Air measurement. More detailed information about the detection limit, statistical error and test planning you will find in the application note AN-002 ("Measuring principals-decay statistics - test planning

Keywords: 1Indoor radon,1exposure,1etching,1inhalation dose.

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P30: Assessment of Occupational Exposure in Coronary Angiography at Aria Hospital in Rasht

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Abstract

Angiography and interventional radiology are becoming substantial contributors to collective dose due to their increasing rate of application. Special arrangements in these practices frequently give rise to higher scattered dose rates within the operating Room. Assessment of such dose rated is considered to be the first step in applying dose-reduction strategies. This study has been devoted to measurement of occupational effective dose received during coronary angiography at Cardiac Catheterization Laboratory of the Cardiology Clinic at Aria Hospital in Rasht using thermoluminescent dosimeters (TLDs). The Niklason technique recommended by ICRP is applied employing two TLD badges: one worn on the trunk of the body inside the apron and the other worn outside the apron at the level of the collar or the left shoulder. Evaluation of dosimeters is already completed and results obtained are going to be used to estimate the occupational effective doses, which will be presented at the conference.

Keywords: Occupational Exposure, Coronary Angiography, Effective Dose, Thermoluminescent Dosimeter (TLD).

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P31: Study of Attention to Radiation Protection During the Past Two Years in Radiology Centers in Tabriz

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Abstract

Nowadays, Radiology and radiotherapy are accompanied for diagnosis and cure of patients. In this study we have investigated knowledge and attitude of radiologist technologist which believed are important factors in radiation protection for personal and patient in radiology centers. A comparison of quality control of radiology equipments during 2 years ago did not have c and was in 58.5%. Using of gonad shields in abdomen exam showed an increasing from 38% to 61%. Exciting of radiation protection equipments in radiology also had an increasing from 21% to 37%. In conclusion promotion of knowledge and attitude of radiologist technologist are presented but problem of quality control due to absent of a member of medical physics position in hospitals are remained

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P32: Evaluation of the Radiation Dose From Radon Ingestion and Inhalation in Drinking Water, Rivers, Wells and Springs of Ramsar in Iran

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Abstract

Radon and its radioactive progenies in indoor places are recognized as the main sources of public exposure from the natural radioactive sources. Radon is produced from the decay of uranium and can enter to the body via respiring, drinking and eating. Radon and its decay products emit alpha particles that lead to increase the absorbed dose in respiratory and digestion systems, which may cause cancers. In this study, the concentration of radon in water sources of Ramsar with using PRASSI system is measured. Total 77 samples including 46 samples of drinking water, 13 river samples, 11 well samples and 7 samples of spring water have been tested. A total of 7 samples have radon concentration higher than 11 Bq/l, the normal level set by the EPA. Also, the annual effective dose in stomach and lung per person has been evaluated in this research. According to the advice of WHO and EU Council, just 2 samples induced the total annual effective dose greater than 0.1 mSv/y.

Keywords: Radon, Effective dose, Drinking water, PRASSI system, Ramsar city

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P33: Evaluation of the Radiation Dose From Radon Ingestion and Inhalation in Water Supplies of Sadatshahr and Javaherdeh in Iran

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Abstract

Radon is a radioactive gas which naturally occurring through decay of Uranium series. Chronic exposure to elevated radon (222Rn) decay products concentrations is recognized as health risk. EPA (Environmental Protection Agency) estimates that radon in drinking water causes cancer death: lung cancer caused by breathing released to the indoor air and stomach cancer caused by consuming water containing radon. The aim of this study is to determine radon concentration in sadatshahr and javaherdeh water in order to estimate the radiation dose received by residents. In this study radon concentration of the 43 water samples have been measured by PRASSI system. The mean radon concentration for samples is 4.183 Bq/L and 4 samples have radon concentration higher than 11Bq/l as normal level set by the EPA.

Similarly, the annual effective dose in stomach and lung per person has been evaluated in this research. According to the advised of WHO and the EU Council none of the samples induced the total annual effective dose greater than 0.1 mSv/y.

Keywords: Radon, Effective dose, Drinking water, PRASSI system, Sadatshahr and Javaherdeh Regions

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P34: Background Measurement Using TLD-100H and TLD-200 in Gamma Spectrometry Laboratory

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Abstract

The responses of the two types of thermoluminescence dosimeters (TLD-200 and TLD-100H) were measured(with Harshaw TLD reader model 4500) for Gamma spectrometry laboratory background dose. The results of the two different types of TLDs with each other.The final results show that “because of it’s high sensitivity” the TLD-100H is more applicable than the TLD-200 for background dosimetry.

Keywords: thermoluminescence dosimeter (TLD), Harshaw TLD reader model4500, Gamma spectrometry laboratory.

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P35: Annual Radiation Background in the Hamadan Province

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Abstract

Introduction: General population, everywhere in the world, is exposed to a small dose of ionizing radiation from natural sources. Stochastic effects such as cancer and genetic disorders are caused when living creatures are exposed to low doses. In Iran, it is measured in some cities especially in high background areas such as Ramsar, but so far there is not any measurement in Hamadan province. Hamadan is located at center of Iran.

Methods: Measurements were performed using RDS-110 survey meter, CaSO4:Dy TLDs and Harshaw 4000 TLD reader. To estimate dose rate at outdoors, four stations in the length of main directions and one in the center of each town were selected.

Results: Mean annual equivalent dose in Hamadan province are 1.12±0.22 mSv and 1.66±0.07 mSv which related to RDS-110 survey meter and TLDs measurements, respectively. Maximum and minimum of outdoor environmental background radiation is related to Hamadan and Kaboudar-Ahang towns, respectively.

Discussion: According to the results of the study, it does not seem that the annual equivalent dose in Hamadan province exceeded the global mean amounts by the UNSCEAR. So, not worry about natural background radiation of ionizing radiation in Hamadan province.

Keywords: Gamma ray – Equivalent Dose – Background Radiation – Natural radiation - TLD

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P36: Advantages and Limitations of NIPAM Polymer Gel Dosimeter

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Abstract

At present polymer gel dosimeter is considered the best possible dosimeter for measuring 3-dimesional radiation dose distribution in radiotherapy. These gels are normally toxic,therefore manufacturing and handling the gel requires special attention. In order to find less toxic recipe recently NIPAM gel was introduced. In this study some features of basic properties of the gel will be discussed. NEPTON linear accelerator was used for irradiation and 1.5T MR scanner employed for imaging. Currently the result indicated there is no reproducibility in NIPAM gel but there should be some influencing factor which may have strong effect on the gel response. The work is in progress to investigate these factors and they will be discussed together with some practical remarks by the time of conference.

Keywords: Polymer gel dosimetry, NIPAM, MR.

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P37: EBT GAFCHROMIC Film Dosimetry in Compensator Based IMRT

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Abstract

Compensators to deliver IMRT are known to change the beam energy spectrum; therefore the accuracy of EBT film in compensator-based IMRT (C-IMRT) should be investigated. PDDs and beam profiles were measured using EBT films at both 6 and 18 MV for different compensator thicknesses and field sizes in solid phantom. The same measurements were implemented using ion chamber in water and also MCNP simulation. The mean energy of photons was increased in comparison with open fields at both 6 and 18 MV. For the 20×20 cm2 field size and 6.0 cm block thickness, due to beam hardening at 6MV, surface dose decreased about 12% and PDD increased up to 3% at 30.0 cm depth. In contrast, at 18 MV, the surface dose increased about 8% and depth dose reduced by 3% at 30.0 cm depth. The EBT film results were in good agreement with the ionization chamber and MCNP dose profiles. The EBT films can be accurately used as a 2D dose detector for dose verification and QA of C-IMRT in many circumstances.

Keywords: EBT GAFCHROMIC, Compensator, Monte carlo simulation, Beam hardening

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P38: Measurement of the Radon Concentration of Air Samples and Annual Effective Dose in Houses in the SARI City

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Abstract

Indoor air samples taken in buildings throughout the SARI city provinces of Mazandaran, Iran.Measurements were made during the years 2009-2010. The geometrical mean indoor concentration was 21.85 Bq m(-3). An estimated annual effective dose of 0.057 μSv y (-1) was calculated for residents, assuming an equilibrium factor of 0.4 and an occupancy factor of 0.8. The relative importance of the principal variables that condition radon concentrations inside buildings was also delimited experimentally. These were: soil type, construction materials used, the height of the Room above ground level, and the degree of ventilation.

Keywords: Indoor radon; effective dose; Sari

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P39: Comparison of the Gamma Dosimetry of Radon (^{222}Rn) and Theron (^{220}Rn) in the Environment Using ORNL Phantom

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Abstract

Radon is a radioactive transformation product of 238U, 235U, and 232Th, and it exists in various concentrations in all soils, minerals, grownd water, material buildings and air.

the half-life of 222Rn (3.82-day) is long enough for it to diffuse into and build up in homes and Inhalation of-radoncancauselung cancer.220Rn, or thoron from the 232Th series, and 219Rn from 235U have very short-lives (55.6s and 3.96s, respectively) and they are of minor significance compared to 222Rn in 238U series. But These sources such as thoron can be important in the minerals.

Thoron,(220Rn) decays by emission of an alpha particle with energy of 6.29 MeV and 212Pb and 212Bi are short-lived thoron progeny, which decay by emitting beta particles accompanied by gamma radiation.

Gamma dosimetry was performed using modified ORNL adult male phantom and MCNP code after inhalation. the comparision of the radon gamma dosimetry and thoron gamma dosimetry was performed. The results showed that the absorbed dose is the largest in the lung. Thymus and the heart are recived largest absorbed dose respectly after lungs according to ICRP103 Publication. the absorbed dose from thoron is quite large in comparision to radon. Becausetherearemorehigh-energyparticlesthan theradon in the spectrum.

Keywords: 222Rn, gamma dosimetry, ORNL phantom, Toron,220Rn

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P40: Indoor 222Rn and 220Rn Variations: Evidence for Boyle's Law

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Abstract

The 222Rn and 220Rn levels in dwellings of different volumes at Bangalore Metropolitan, India are measured and reported. Integrated and long duration measurements of radon were carried out using twin cup dosimeters with Solid State Nuclear Track Detector technique. Results show that the concentrations of 222Rn, 220Rn, their progenies and dose rates in dwellings decreases with increasing in volume. The annual effective inhalation dose due to 222Rn, 220Rn and their progenies from the study ranged between 0.2 – 4.4 with an arithmetic mean of 1.7 ± 1.1 mSv y-1. The dwellers of lower volumes are posed to high dose rates. The variation of concentration of radon/thoron with volume suggests that the Boyle's law is valid for the variation of this gas too.

Keywords: Radon, thoron, Room volume, dose rate, Boyle's law.

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P41: Determination of the Effective Atomic and Mass Numbers for Mixture and Compound Materials in High Energy Photon Interactions

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Abstract

In consideration the radiological properties of materials and studying the scattering processes in atomic and nuclear physics, the effective atomic number and effective mass numbers are widely employed. In this investigation these numbers have been calculated for some mixture or composite materials in interaction with high energy photons (for example Linac in radiation therapy). A pair equation in terms of these numbers is obtained. The first equation has been derived from the conservation of mass energy law and the second by minimizing the binding energy from the semiempirical mass formula(Myers and Swiatecki formula) that gives a relation between atomic and mass numbers for stable nuclei approximately. By these equations one can obtain the effective atomic and mass numbers for any compound or mixed materials uniquely. In this paper these numbers are calculated with the new method for some materials and compared with the other studies.

Keywords: Effective atomic number, effective mass number, radiation therapy, phantom material, semiempirical mass formula, pair production

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P42: Radiation Dosimetry Using the Fricke Xylenol Gel Dosimeter

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Abstract

The increased intricacy of Intensity-Modulated-Radiation-Therapy (IMRT) delivery has created the need for a high-resolution 3D-dosimetry (three-dimensional) system capable of measuring and verifying the complex delivery. Gel dosimetry is an attractive option for such use and realizing a tissue-equivalent, 3D dose verification tool with high resolution readout capabilities. The Fricke Xylenol Gel (FXG) dosimeter is a ferrous sulfate aqueous solution that, when irradiated or subject to heat, oxygen and light, oxidizes the Fe2+ ions to Fe3+ and this new type of ion, together with xylenol orange corant form the Fe3+-Xylenol complex. This new concentration, generally determined through spectrophotometry, is directly proportional to absorbed dose. In this study, the absorbance measurements were accomplished with a UV–visible spectrophotometer (Spectronic 2OD) at the wavelength of 585 nm, where the FXG spectrum has its highest absorbance peak. The reagents used to prepare the FXG dosimeter were: Triple distilled and deionised high purity water, commercial gelatin gel powder, ferrous ammonium sulfate, xylenol orange and sulfuric acid. Prepared gels were irradiated to a beam of Co-60 gamma rays by Theratron Phoenix unit. Although FXG gel dosimeter demonstrated reproducible linear dose response and gel preparation is inexpensive, oxidation processes continue post-irradiation, affecting the response of this dosimetry system and also storage conditions such as temperature, light and time play important role.

Keywords: FXG gel, Optical absorbance measurement, Radiation dosimetry

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P43: Old and New Symbol Warns of Radiation

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Abstract

The black-and- yellow trefoil symbol is the accepted label for denoting radioactive material and it's hoped that the new symbol will alert more people to the potential dangers of large sources of ionizing radiation and save lives. It has radiating waves, a skull and crossbones and a running person, a new ionizing radiation warning symbol. It launched by the IAEA and ISO to help reduce needless deaths and serious injuries from accidental exposure to large radioactive sources. The new symbol is aimed at alerting anyone, anywhere to the potential dangers of being close to a large source of ionizing radiation, the result of a five-year project conducted in 11 countries. We have to remember that we can´t teach the world about radiation but we can warn people about it!

Keywords: Symbol, Warning, ionizing radiation

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P44: 252Cf Source Shielding Design by Using MCNP Code

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Abstract

Nowadays the use of neutron provides a vast field of research in industries and medical applications. On the other hand, considering the harmful effects due to the interaction of neutrons with living cells (human), dealing with these sources without any consideration, will be dangerous. So it is necessary to think about the safety against working with neutrons. This paper, reports the design and simulation of a container for carrying a 1mg 252Cf neutron source (which produces 2.3E9 n/s). For simulation, MCNP code was used. Designed container is a cube with 80cm dimensions and with pure iron, and polyethylene as its constituents. Calculated Neutron and gamma dose rate escaping from the container is about 1.2805E-4 msv/s. Comparing this amount with allowable annual effective absorbed dose of stuffs, one can conclude that stuffs can use this container for carrying the specified source during a year, for ~15.62E4s or 17.83 hours.

Keywords: 252Cf, Neutron shielding, MCNP code, Polyethylene, Absorbed dose

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P45: Development of an Algorithm to Calculate the Dose Under Cerrobend Blocked Area

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Abstract

In radiation therapy, to spare normal surrounding tissues, either Multi-leaf collimators or Cerrobend blocks are used. The current work focuses on the dose distribution under the protected areas using Cerrobend blocks in different situations. Several physical characteristics including attenuation coefficient, effective penumbra width and isodose curves undulation for clinical situation were assessed. Consequently, an algorithm was developed to estimate the dose distribution for a range of Cerrobend blocks utilized for clinical purposes.

A dual energy linear accelerator as well as a Cobalt-60 machine was utilized as radiation sources. Several Cerrobend blocks were designed and fabricated using commercial materials used for blockings. The dose distribution was then evaluated using Extended Dose range (EDR2) films. After conversion of optical density into dose values, the dose distribution in region of interests was extracted using in-house codes written in MATLAB.

The results showed that the attenuation coefficient was found to be 0.4475 and 0.4276 cm-1 for photon beams 6MV and 15 MV, respectively and a potential air bubble with diameter larger than 3 mm affects beam attenuation significantly. The optimum Cerrobend block width was found to be around 16 mm. The isodose curves scalloping were also the same achieved for secondary collimator jaws.

If Cerrobend blocks are used as a basic method to protect normal tissues, its physical characteristics is recommended to be taken into account comprehensively. The increase of Cerrobend block from 8 cm to 9.5 cm decreases the dose in protected area significantly. The increase of the block width as well as photon beam energy decreases the dose deposition on the protected area. However, neutron contamination should also be taken into considerations for high energy photons. The current study also indicated that the dose distribution under the protected area strongly depends on the width, height of Cerrobend blocks, the incident photon beam energy and the Source to Surface Distance (SSD).

Keywords: Cerrobend blocks, Dose distribution, Film dosimetry

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P46: TEDE Assessment of Radioactive Molybdenum Discharge From the 5MW Tehran Research Reactor After Hypothetical Nuclear Accident

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Abstract

The assessment of the total effective doses equivalent (TEDE) received to public around the reactors site is urgent for safety for nuclear reactors. The TEDE assessment onto environment for Molybdenum discharge from the 5MW Tehran Research Reactor (TRR) after the hypothetical nuclear accident was simulated. The total activity of Molybdenum was 1.48 × 1011 Bq that was produced by thermal neutron bombardment on 98MoO3 natural target. The release was assumed to occur with loss of filtration of ventilation system and the whole radioactivity of 99Mo was released to the environment with average wind speed 2 m/s through the reactor stack at 57 m height above the ground level. The TEDE to public around the TRR site was calculated for various atmospheric stability classes (A-F) using health physics HOTSPOT 2.07 code. The Maximum value TEDE was 0.293 µSv at distance of 0.48 km from the reactor stack for A class (Very unstable), which was lower than the permissible effective dose for the public.

Keywords: TEDE, Nuclear Accident, Tehran Reactor Research, HOTSPOT Code.

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P47: Assessment of Indoor and Outdoor Natural Gamma

Dose Rates in 49 Cities of Guilan Province of IRAN

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Abstract

The exposure of human beings to ionizing radiation from natural sources is a continuing and inescapable feature of life on earth. This study assesses the indoor and outdoor gamma dose levels in air of the 49 cities of Guilan province of Iran. The measurements were taken from 260 different sample points by a Geiger-Muller dosemeter. The results showed that the maximum and minimum values due to indoor radiations are 138 ± 21 and 82 ± 10 nSv/h in Lavandevil and Vajargah, respectively. The average indoor dose rates were determined as 109 ± 25 nSv/h. The maximum and minimum dose rates due to outdoor radiations are 127 ± 28 and 65 ± 13 nSv/h in Masuleh and Kalachay, respectively. The average outdoor gamma dose rates were determined as 94 ± 24 nSv/h.

Keywords: Background Radiation, Geiger-Muller Detector, Guilan-Iran.

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P48: Calculation of Absorbed Does in Human Body Produced by PET Machine Using MCNP Code

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Abstract

In this paper the gamma absorbed does in a simulated phantom of adult human body is calculated. The 0.511 MeV gamma rays are produced in positron annihilation process in PET device. A certain amount of 18F-FDG drag is injected in human body to positron emission by 18F isotope and gamma production in organs body. The MCNP code is used for phantom and radiation simulation. The good results are obtained and compared with other works.

Keywords: PET-Phantom-18F-FDG-Dosimetry-MCNP code.

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P49: Patient Doses Reduction in Busy Radiology Departments

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Abstract

Purpose: To reduce entrance surface air Kerma (ESAK) of routine radiological examinations in some heavy loaded radiology departments using proper equipments and training.

Methods: ESAK for 12 routine radiographic examinations has been measured in 20 high loaded radiology de-

partments after quality control for x_ray units and proper training for all radiographers of each departments to use proper technical charts for each Room, mainly according to EUR 16260 and optimized exposure factors. The ESAK were measured according to X-ray tube output, optimized exposure parameters including tube potential(kVp), tube current (mA), focus to skin distance (FSD) for each technique.

Results: The mean reduced ESAK values after optimization of exposure parameters for abdomen, AP and lateral cervical spine, PA and lateral chest, AP and lateral lumbar spine, pelvis, PA and lateral skull, AP and lateral thoracic spine were reduced significantly. The reduction percent in ESAK were between of 28% - 62% for above mentioned techniques. Mean, median, first and third quartile of values of ESAK are reported.

Conclusion: Significant dose reduction was achieved with proper and simple training and without considerable change in repeat and reject analysis. This reasonable outcome will lead us to establish optimized National Diagnostic Reference Levels (NDRLs).

Keywords: Radiology, patient dose reduction, ESAK, NDRL

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P50: Utilize TLD Chips and Monte Carlo Method for Evaluation of Absorbed Dose of Human Tissues in BMD Scan

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Abstract

Osteoporosis is a major public health problem. The purpose of this research is to estimate patients' organs doses during BMD scan by TLDs chips (experimental) and Monte Carlo method (simulation). In the simulation study, the Hologic Explorer BMD system, X-ray source, the patient body and its radiosensitive tissues were simulated by Monte Carlo method. In the experiment stage, surface dose of cervix, kidney, abdomen region and thyroid were measured by placing chips (TLD-GR 200) at various organs locations. For spine (femur) BMD scan in simulation of Hologic Explorer, the absorbed dose of cervix, kidney, abdomen and thyroid were 4.19 (5.88), 175 (3.68), 8.71(3.27) and 1.8 (μGy) respectively. For spine (femur) BMD scan by using TLDs, the absorbed dose of cervix, kidney, abdomen and thyroid were 4.5 (5.64), 162.17 (3.99), 8.45 (3.55) and 1.95 (μGy) respectively. There was a very good agreement between results of simulation and experimental, as the relative error was less than 8%. Moreover, the results of this study showed considerable dose in Kidney and Abdomen region during spine scan and also significant dose in Cervix during hip scan.

Keywords: Osteoporosis, Absorbed dose, Monte Carlo method, BMD

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P51: Dosimetric Evaluation of Linac Photon Small Fields Using MAGIC Polymer Gels

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Abstract

Radiotherapy techniques are continuously employing smaller and smaller field sizes to deliver tighter radiation doses with higher therapeutic ratios, generating interest among researchers to provide reliable dosimetry for beams and treatment plans collimated to small field sizes. In this study, the dosimetry of this fields was evaluated for clinical mode by using polymer gel dosimetry. MAGIC polymer gels was used in this study. the gel samples were manufactured and poured into phantoms and calibration vials and were irradiated with a 6MV x-ray beam, the R2 maps of dose distribution obtained by using the gel MR images. The depth dose distributions and dose profile measurements were measured in the fields different by using gel at depth of 5cm, and were compared against other the techniques such as pinpoint chambers. The comparison of the results of gel and pinpoint chamber showed biggest difference between the dose profile measurements in the within the low dose regions (near the edges). In this region the pinpoint measured penumbra width was utmost 3.2 mm wider than MAGIC polymer gel dosimeters. For 30 x 30 mm2 field maximum difference between gel and pinpoint chamber was measured 2 mm at depth of maximum dose region, and were obtained 2, 3 and 2 mm for 20 x 20, 10 x 10 and 5 x 5 mm2 fields, respectively. The maximum difference at the build up region was obtained 9% for 30 x 30 mm2 field and for 20 x 20, 10 x 10 and 5 x 5 mm2 were obtained 4.5%, 2% and 9%, respectively. The differences in the depth dose distributions and dose profile measurements between MAGIC polymer gels and pinpoint chambers attributable to different factors. The dosimetry of this fields by using ionization chambers has limitations in uncertaintly. Pinpoint chambers for small photon fields are often large and smaller dosimeters should be used. Due to the relatively large sizes of ionization chambers with respect to the small field sizes and the lack of charge equilibrium under such small fields. Of course this limitations in the dosimetry of this small fields is very smaller by using polymer gel dosimeters. Hence polymer gel dosimeters are suitable for dosimetry of photon small fields.

Keywords: Dosimetry, Small field, MAGIC gel dosimeter, MRI-based polymer gel dosimetry

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P52: Matching of High Energy Electron Beams Penumbra By Film and Semiconductor

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Abstract

The penumbra for electron beams is defined either in terms of the distance between two isodose values on a beam profile at the depth of maximum dose (or at the standard measurement depth), or indirectly in terms of distances between specified isodoses and the geometric field edge under stated conditions as above.

Many solutions have been proposed to solve the problem of `hot' and `cold' spots in the junction between abutting electron fields. Although some of these methods have proved satisfactory, the designs of the modifications to the applicators are generally applicator dependent and involve measuring data for individual fields. An idea which was originally proposed as a solution to a different problem is resurrected here because it happens to solve the beam-matching problem and because it is very simple to apply.

In this work the use of GafChromic EBT radiochromic film to measure beam penumbra. Results show that The 80-20% beam penumbra were found to be 1.8 ± 0.11 mm along the

leaf side and 2.05 ± 0.11 mm along the leaf end using square field sizes ranging from 2.6 to1.8 cm. These measurements are in agreement with those reported in the literature using different radiation detectors.

The results on this work show that 80-20% beam penumbra were found to be 3.3 Up 3.7 Measure with Semiconductor.

Keywords: radiotherapy, 3D Treatment Planning, High Energy Electron, Penumbra

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P53: Dosimetry in Computed Tomography

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Abstract

Among artificial radiation sources, medical practices have an important contribution to public exposure. Computed tomography (CT), which made a revolution in quality of diagnostic imaging since 1972, is the most important exposure source among clinical practices. Generally the dose received to the patients during CT is much higher than conventional X-ray examination. Although CT accounts for less than 5% of all X-ray experiments, but it contributes up to 40% of the resultant collective dose from diagnostic radiology in some countries.

Computed Tomography Dose Index (CTDI) is a physical parameter for measurement of radiation exposure due to single-slice CT scanners and is an important criterion for evaluation of patient's dose in CT examinations.

The purpose of this study is determination of CTDI and then patient's dose in brain and thorax CT scans by the application of LiF:Mg:Cu:P Thermoluminecence dosimeters (TLDs). The real situation simulated using cylindrical tissue equivalent phantom.

Keywords: Radiation Protection, Computed tomography Dose Index, Dosimetry

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P54: Development of a Radionuclide Generator by Sn-Phytate with 191Os for Radiosynovectomy

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Abstract

191Os is a parent radionuclide of 191Os/191mIr generator with 15.4 d half-life and decays by beta emission to 191mIr, which is a radionuclide with 4.96s half-life. It decays by isometric transition to stable 191Ir, emitting a 129-kev gamma photon. In this study Sn-phytate was labeled with 191Os-K2OsCl6 and the prepared complex solution (100 µCi/50 µl) was injected intraarticularly to rat knee joints, its distribution and stability was determined. The complex was obtained at the pH=5.5 in normal saline at Room temperture in 10 minutes. (Radio-TLC showed an overall radiochemical yield of 95-98%, radio-chemical purity>98%). Approximately all of the injected dose had remained in the injection site 3 days after injection.The complex was proved to be a feasible agent for cavital radiotherapy in oncology and rheumatology.

Keywords: Radiosynovectomy, Sn-Phytate, Osmium-191, Biodistribution.

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P55: Can We Dispose Off Low Activity Solid Wastes Per Patient in a Nuclear Medicine Center as Ordinary Hospital Wastes?

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Abstract

During the last decades, radionuclides have been rapidly used in nuclear medicine. Undoubtedly, several problems have been caused due to the application of unsealed radioactive materials in nuclear medicine centers. Since, contamination to radionuclides in nuclear medicine centers causes health problems, and also, because of workers and patient's exposure reduction in nuclear medicine centers, informing of internal and external sources seems to be necessary. Therefore, in this study level of solid radioactive waste and radiation contamination per patient with respect to the contamination radiation sources in nuclear medicine center of Shafa Kerman hospital were measured.

In this study, after initial studies of imaging devices, type and level of radionuclide and number of patients per day in Shafa nuclear medicine center, radiation contamination with respect to contamination sources has been investigated. To this end, all of radiation contamination sources (waste) including, injection siring, disposable glove, alcoholic cotton and vial have been determined and level of radiation contamination of each waste per patient, immediately after injection, has been measured using gamma counter (Dose Calibrator).

In this study 2, 14, 28, 13 and 44 patients have been checked up for liver-spleen, renal, bone, lung and cardiac scans, respectively. Average radiation contamination of injection siring, alcoholic cotton, disposable glove and vial per patient were respectively 0.60±0.14, 0.00, 0.00 and 4.40±2.96 millecurie for liver-spleen scan, 0.25±0.12, 0.00, 0.00 and 2.64±3.23 millecurie for renal scan, 0.49±0.18, 0.0057±0.020, 0.00 and 1.12±0.97 millecurie for bone scan, 0.32±0.19, 0.00, 0.00 and 2.18±2.52 millecurie for lung scan, 0.48±0.35, 0.00, 0.00 and 0.69±0.46 millecurie for cardiac scan.

According to the results, the average level of radioactive waste per patient for liver-spleen, renal, bone, lung and cardiac scans was in the range of acceptable limitation and there are no necessary additional radiation protection criteria for disposing off the radioactive wastes.

Keywords: Low Activity, Solid Waste, Nuclear Medicine

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P56: Evaluation of the Personal Lead Shields in Selected Radiology Departments

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Abstract

The protective clothes provide protection against harmful effects of ionizing radiation in radiology departments. They should be tested annually or as required under quality control programs, and when they are suspected to physical damages. In this study, the lead equivalent thicknesses of the personal shields have determined using transmission factor at 70 and 100 kVp, also the protective shields were screened using a fluoroscopic unit, and any cracks or holes were demonstrated by the radiograph Images. The magnification factor was used to determine the actual sizes of defects.

Regarding total defects to the personal shields and available standards, our observations show some protective clothes should be dismissed from services and replace by adequate shields.

Keywords: Exposure Rate, Personal Shield, Diagnosis Radiology, apron

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P57: Relationship Between Prevalence of Depression and Low-Longitudinal Dose in X–Ray Among Diagnosis Radiology Workers

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Abstract

Ionizing radiation used in medical imaging are the largest source of artificial exposure and according to dose and rate they have different effects.

Stochastic and deterministic effects of high dose ionizing radiation is almost known But the effects of low dose in along term and their biological responses to these dose are unclear.

Several studies also have shown there is a relationship between the amount of exposure and some trace elements like zinc and copper in the body and according to The impact of these two elements and their importance in depression ;this possibility is suggested that this radiation in radiation worker like radiology technician group causes some mental problems like depression.

This survey is a case control study that is done in hospitals of Mashhad University of Medical Sciences. In this project, people working in the radiology departments of hospitals with five years experience and their annual dose they have been received is less than 20 mSv were case group and other hospital staff were control group. Depression prevalence in case and control group determine by Beck depression inventory. According to survey 20 radiation workers and 40 people of other staff there was no significant difference between case and control groups. By considering gender as interference agent a significant difference with P-values 0/037 was shown between case and control group.

Keywords: depression, low dose, longitudinal dose, diagnosis and therapeutics Radiation workers.

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P58: Annual Dose Calculation of the Human Body Organs in a Neutron Field Using MCNP Code in Different Geometries

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Abstract

In this paper Monte Carlo method, simulated phantom adult human body with the code MCNP, the effective dose equivalent to organs in the light of making employment is calculated. Effective dose equivalent of taking four beam geometry, AP, PA, LLAT, RLAT, for organs according to the weight coefficients of radiation and the tissue weight factor in the journal 60, ICRP has, been calculated. and what the results of calculations with the Commission as the ICRP effective dose equivalent is recommended occupational exposures were compared.

Keywords: Montcarlo, phantom,Effective dose

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P59: A Dosimetric Study of Electron Small Fields Using Monte Carlo Simulation and Practical Measurement.

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Abstract

Small fields are defined as those fields that have not exceeded LSE and this causes the dose to be dependent on the field size as well as the energy and SSD. The dose distribution can vary significantly with the field sizes. Thus predicting the dose becomes impossible and causes major problems in the calculation of monitor units. The dosimetry of small fields is challenging due to nonequilibrium conditions created as a consequence of the secondary electron track lengths and the source size projected through the collimating system that are comparable to the treatment field size. Also, radiation detectors introduced in to such fields usually perturb the level of disequilibrium. Hence, the dosimetric accuracy previously achieved for standard radiotherapy applications is at risk for both absolute and relative dose determination. To simulate precisely the dose distribution owing to electrons using Monte Carlo is a difficult task because of the tremendous number of scattering events between electrons and matters.The statistic uncertainty becomes even worse when the simulation is performed in extremely small voxels. It is also expected that the Monte Carlo techniques will increasingly be used in assessing the calculations of detectors used in small field. Two major approaches including simulation and measurement were used to evaluate the feasibility of applying electron beams. These simulations and measurements were taken in five different fields (10×10 cm2,6×6 cm2,3×3 cm2,2×2 cm2,1×1 cm2) and with two different energies (9 MeV and 16 MeV). A PTW Semiflex chamber in a PTW-MP3 water tank, a PTW pinpoint chamber type 31014 were used to measure PDDs, lateral beam profiles for either optimizing parameters of Monte Carlo simulation or to verify Monte Carlo simulation in small fields.for simulation of treatment head,water phantom,electron applicator and cutouts uses MCNP4C code.

The results showed good agreement between calculated and measured depth dose and lateral dose profile in standard electron fields(10×10,6×6 cm2). In all of measured field, for depth dose curves and lateral dose profile (except 1×1 cm2)differences between calculation and measurement were lower than 5%. The simulation model of the linac developed in this study is capable of computing electron beam data in water phantom for different field sizes and the resulting data can be used to predict the dose distributions in other complex geometries.In larger field, chamber have a good agreement by simulation.

Keywords: Dosimetry, small field, PDD, Profile, LSE

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P60: Activation of Trace Elements in Concrete Walls of the Solid Target Room at Cyclotron Accelerator at NRCAM

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Abstract

Concrete as a construction material is used widely in nuclear facilities. The walls of the solid target Room of cyclotron accelerator at Nuclear Research Center for Agriculture and Medicine (NRCAM) are made of concrete with mass density of 2.3 g/cm3.

In routine production of radiopharmaceuticals 201Tl and 67Ga at Cyclotron Dept. at NRCAM, which are, respectively, based on the 203Tl (p,3n) 201Pb 201Tl and 68Zn(p,2n) 67Ga nuclear reactions, in addition to the main products 201Pb and 67Ga, a number of neutrons are also produced as a by-product. The collision of emitted neutrons with the equipments and concrete walls of the target Room can cause them to become activated. In this paper the neutron-induced activity of the elements in the concrete, with a reasonable half life, after a period of 30 years of cyclotron operation were investigated. Among the elements constituting the concrete, the isotopes 151Eu, 59Co, 153Eu, 133Cs, and 40Ca which turn respectively to the radioisotopes 152Eu, 60Co, 154Eu, 134Cs and 41Ca were

considered. Our calculations show that the estimated specific activity of the above mentioned radioisotopes, after 30 years of cyclotron operation are 1.06 × 10-2 Bq/kg, 2.44 × 10-3 Bq/kg, 2.35 × 10-4 Bq/kg, 1.51 × 10-4 Bq/kg and 2.41 × 10-5 Bq/kg respectively.

Keywords: Activity, Trace Elements, Concrete, Cyclotron, Radiopharmaceutical.

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P61: Study of Personnel Radiation Doses in Nuclear Medicine Clinics of Guilan

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Abstract

Radioisotope application in nuclear medicine for diagnostic and therapeutic purposes has been widely increased in recent years. Such an increase without considering proper radiation protection measures could be harmful to the society. So, it is necessary to keep exposures to patients as well as radiation workers as low as reasonably achievable (ALARA).

In this study, on the basis of collected information through a specially designed questioner, the present situation of nuclear medicine clinics in Guilan was evaluated with respect to qualification of personnel, protective equipments, monitors and imaging systems. Following a survey of personal dosimetry methods, personnel radiation doses were measured in three clinics by thermoluminescent dosimetry technique using LiF: MCP chips. Annual absorbed doses are estimated in the range of 0.94-14.6 mGy with an average of 2.2 mGy

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P62: Comparison of Dosimetric Parameteres Between Dynamic and Physical Wedges by Film Dosimetry in the 6 MV X-Ray Fields in Thorax Phantom.

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Abstract

Wedges are nowadays considered as an effective tool in order to obtain desirable isodose curve at breast cancer treatments. Because of individual advantages of dynamic wedge as reduced treatment time, absent of beam hardening, ease of using, increased in the number of wedge angles it is necessary to replace physical wedges with them. In this study, In order to implement dynamic wedge for conformal radiotherapy, dosimetric parameters of dynamic wedge field as well as physical wedge are measured and compared at lung inhomogeneous phantom which simulates tangential breast cancer situation. For this purpose, utilizing EDR2 film at inhomogeneous chest wall phantom was used. Beam data from a Varian 2100C linear accelerator with photon energy of 6 MV at 15, 30, 46 and 60 wedge angles were collected for both dynamic and physical wedge. After processing and scanning of films, generated digitized images were analyzed with Matlab program. Percentage depth dose, profile and isodose curves of both wedge fields were compared at similar wedge angles through DTA and DD. The result of this comparisons

shows good agreement for DTA (3 mm) and DD (3%) which is within acceptable range. So by considering advantages of DW over PW and good agreement obtained between dosimetric parameters of them, dynamic wedge is recommended as an effective tool for chest wall treatments.

Keywords: Physical Wedge, dynamic wedge, dosimetry,EDR2 Film.

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P63: Methods of Tc-99m Production

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Abstract

Although production technologies for the most widely used medical isotope Technetium-99 (Tc-99m) that is used for imaging technologies and derived from parent isotope Molybdenum-99 (Mo-99) is performed in a nuclear research reactor, use of non-reactor produced is possible and necessary because of the wide requirement and increasing use of alternative imaging technologies. In this article perform research about methods that will be used in future which can be grouped in different ways, we can checked them in categories of accelerators base, reactors base, ADS (Accelerator Driven System) base, also in short term, mid-term, long term groups. This article represents methods and their advantages, disadvantages, estimate costs and time for design and construction. briefly, these methods are: Proton Activation, Photo-Neutron, Photo-fission, Neutron-fission process with LEU targets, Neutron-fission process in smaller reactors, Neutron activation, Solution Reactors, Accelerator Driven Systems.

Keywords: Technetium-99, Molybdenum-99, Accelerators, Accelerator Driven Systems, Nuclear reactors

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P64: Why Radiation Protection … IS IMPORTANT?

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Abstract

The use of ionizing radiation in medical diagnosis and treatment continues to grow rapidly worldwide. The exposure of patients to radiation requires that the procedure is justified and optimized so that the radiation dose delivered to the patient is not greater than the dose necessary to achieve the clinical objective of the exposure. In the case of diagnostic procedures the radiation dose should be the minimum required to provide the diagnostic information and in therapy the prescribed radiation dose should be delivered to the target tissue with a minimum exposure of non-target tissue. Radiation protection of the patient, occupationally exposed staff and the general public are key requirements in the optimal use of ionizing radiation in medicine.

Radiation Protection Program in the Medical Applications of Ionizing Radiation establishes the regulatory requirements for the use of ionizing radiation in medicine.

The Radiation Protection Program also requires that a Qualified Expert is available for consultation and advice, and for calibration, dosimetry and quality assurance in radiation therapy. A central feature of the program is the requirement that the Responsible Person ensures that a Radiation Management Plan is developed, implemented and regularly reviewed.

Objectives: The Radiation Protection Program establishes:

(a) The regulatory requirements for the use of ionizing radiation in medicine that will, in the context of good practice, ensure that the risks associated with radiation exposure to the patient are optimized and those to staff and other persons are as low as reasonably achievable.

(b) The radiation protection principles;

(c) A requirement for the preparation of a comprehensive Radiation Management Plan addressing the radiation protection principles;

(d) The specific roles and responsibilities of the following:

• The Responsible Person, being the person who has the overall management responsibility of the radioactive source, radiation-producing equipment or medical practice;

• The radiation medical practitioner, being the person responsible for the justification and optimization of the procedure involving the exposure of the patient to ionizing radiation, either for each individual patient or by way of protocols specific for the procedure; and

• The operator who exposes the patient to ionizing radiation, and

(e) the management and reporting of radiation incidents.

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P65: RADAR Calculated Vs. TLD Effective Doses to Family Members of Hyperthyroid Patients Treated with Iodine 131

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Abstract

Introduction: Patients who receive therapeutic amount of radioactive iodine 131 are a potentially significant source of radiation to their family members, members of the public and others. The situation can be overcome by imposing restrictions on the behavior of the patient to minimize the effective dose to close relatives and not to exceed the proposed dose limits by the International Commission of Radiation Protection and Basic Safety Standards from the International Atomic Energy Agency.

Aim: The aim of this study was to evaluate effective dose to family members of hyperthyroid patients treated with radioiodine 131 and to compare with dose constraints proposed by International Commission on Radiological Protection and IAEA (BSS).

Methods: We used thermoluminiscent dosimeters (TLD 100) and RADAR (Radiation Dose Assessment Resource) software for estimation of effective doses at thirty family members of the same number of hyperthyroid patients treated with radioiodine 131.

Results: The mean value of effective dose to relatives of hyperthyroid patients was 0.87 mSv. The estimated value of RADAR calculated effective doses for the distance of 0.25, 0.5 m, 1.0 m, 2.0 m were 23 mSv, 5.90 mSv, 1.48 mSv and 0.37 mSv respectively for mean administered activity of 683 MBq.

Conclusion: Estimated effective doses were well below recommended dose limits except in some cases. RADAR calculated doses were higher than estimated doses with TLD. Hyperthyroid patients should continue to be treated on out – patient basis but they should be well informed for their further behaviour to be sure that they will represent minimal radiation hazard for the people in their environment.

Keywords: hyperthyroid, relatives, radioiodine, TLD, RADAR software

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P66: Estimation of Human Effective Absorbed Dose of 67Ga-DTPA-Gonadorelin Based on Biodistribution Data in Rats

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Abstract

Background: In this investigation, we estimated the effective absorbed dose to human organs, following i.v. administration of 67Ga-labeled gonadorelin -one of the gonadotropin releasing hormone (GnRH) agonists- using biodistribution data from injected normal rats.

Methods: Four rats were sacrificed at exact time intervals (0.25, 0.5, 1, 2, 4, 24 and 48 hour post injections) and the percentage of injected dose per gram of each organ was measured by direct counting from rat data. The Medical Internal Radiation Dose (MIRD) formulation was applied to extrapolate from rat to human and to project the absorbed radiation dose for various organs in the human.

Results: From rat data we estimate that a 185-MBq injection of 67Ga-cDTPA-GnRH into the human might resulted in an estimated absorbed dose of 5.26 mGy to the whole body and the highest effective absorbed dose was in lung with 2.73 mSv and the organs received the next highest doses were the bladder wall 1.59 mSv, liver 0.80 mSv and Bone marrow 0.52 mSv.

Conclusion: The biodistribution of 67Ga-cDTPA-GnRH in rats showed high breast uptake and low muscle and blood uptake. These results suggest that it should be possible to perform early imaging of the breast anomalies and GnRH receptors indicating potential malignant lesions.

Keywords: MIRD protocol, internal dosimetry, breast cancer, 67Ga

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P67: Measuring Radon and Radium Concentrations in 50 Samples of Drinking Water Sources of Mashhad

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Abstract

Radon and its radioactive progenies in indoor places are recognized as the main sources of public exposure from the natural radioactive sources. In the present research data on radon concentrations in the water samples of Mashhad city has provided. Water samples were collected from various places and supplies of public water used in Mashhad. Then radon concentration has been measured by PRASSI system tree times for each sample in this research.

Result shows about 75% of water samples have radon concentration gather than 10Bq/L which advised EPA as a normal level. The radon and radium concentrations in drinking water samples actually used by people in Mashhad in some regions are not low enough and below the EPA proposed limits.

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P68: Validation of the GATE Monte Carlo Code for Internal Radiation Dosimetry by Using the MCNP Data

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Abstract

GATE, has been designed as upper layer of the GEANT4 toolkit for nuclear medicine application including internal dosimetry. However, its results have not been fully compared to the well-developed codes and anthropomorphic voxel phantoms have never been used with GATE for internal dosimetry. The aim of present study was to compare the internal dose calculated by GATE with the MCNP4B published data.

The Zubal anthropomorphic phantom was used to model a typical adult male. Activity was assumed uniformly distributed in source organs. GATE4.0.0 Monte Carlo package was used for estimation of doses in the phantom. Simulations were performed for photon energy of 0.01-1 MeV and mono-energetic electrons of 935 keV. Specific absorbed fractions for photons and S-factors for electrons were calculated.

On average, GATE produces higher photon SAF (Specific Absorbed Fraction) values (+2.7%) for self-absorption and lower values (-2.9%) for cross-absorption. The difference was higher for paired organs particularly lungs. Moreover the photon SAF values for lungs as source organ at the energy of 200 and 500 keV was considerably higher with MCNP4B compared to GATE.

Despite of differences between the GATE4 and MCNP4B, the results can be considered ensuring. This may be considered as validation of GATE as a proprietary code in nuclear medicine for radionuclide dosimetry applications.

Keywords: Monte Carlo, GATE, Voxel Phantom, Radionuclide Dosimetry

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P69: CT Dose Index in Abdominal-Pelvic MultiSlice CT with Automatic Exposure Control

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Abstract

CT has become an important and very powerful tool for the accurate and effective diagnosis for various conditions. CT scanning is widely used for abdominal-pelvis imaging therefore the dose assessment in abdomen and pelvis is very important. So the aim of this study is to determine the effective dose in abdomen and pelvis and compare their results to European Guidelines (EG).

Data were collected from 30 patients under abdominal-pelvis CT-Scanning in CT department of Khatam-al-Anbia hospital in Tehran. The CT-Scanner used in this department was MDCT Somatom Emation 6, SIEMENS. Imaging data such as pitch, kV, mAs, CTDIvol are recorded for each patient. Finally we compared these CTDI to reference CTDI of European Guidelines.

The CTDIvol values had a range of 3.36-8.1 mGy and the mean value of them was 5.63± 1.22mGy mGy in Abdomen and pelvis examinations. The corresponding CTDIW is in range of 4.03-10.94 mGy and their mean value was 7.56 mGy ± 1.8 mGy for the same patients.

Results show that abdomen-pelvis dose in various patient consist of almost a short range of data and therefore has not vary infinitely in different patients.

Mean weighted computed tomography dose index (CTDI w) in this study (7.56 mGy) was very lower compared to European Guidelines (EG) mean values (35 mGy). It can be due to different situation for abdomen-pelvis imaging in our study and European guideline. These parameters may be: kV, mAs, pitch, FOV, Rotation time, … that significantly affects on the CTDI.

Keywords: MultiSlice CT, CTDI, Abdominal-Pelvis

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P70: Radiation Dose to the Lens of Eye in Different Types of Maxillofacial Imaging

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Abstract

The dose of radiation received by patients during dental radiology is considered low when compared with the dose received by patients undergoing other medical radiological paocedures, but the International Commission on Radiological Protection (ICRP) recommended attention to the stochastic effect of radiation exposure in critical organs of the oral and maxillofacial region. The eye lens is one of the critical organs related to cataracts, then special care must be exerted in radiological examinations.

In this study the dose to eye lens were measured with a phantom under routin conditions used in clinical examinations. Two thermoluminescent dosemeters type TLD-100 (LiF: Mg, Ti) chips were positioned at the surface of eyes in a Rando phantom.

The mean doses of right and lef eyes were obtained as: 23.39 µGy in panoramic (66 kVp, 10mAs, 18s), 95.35 µGy in waters (80 kVp, 12mAs, 2.3s), 174.55 µGy in caldwell (76 kVp, 6mAs, 1s) and 248.41 µGy in normal resolution cone beam computed radiography (CBCT) (80kVp, 8mAs, 12s).

The results show that the doses to the eye lens are significantly lower in the panoramic radiography. Although the highest dosees is belong to CBCT is in this study but is significantly lower than conventional CT.

Keywords: Radiation dose, maxillofacial imaging, thermoluminescent dosemeters

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P71: The Fundamental Safety Objectives

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Abstract

The fundamental safety objective of protecting people- individually and collectively and the environment has to be achieved without unduly limiting the operation of facilites or the conduct of activities that give rise to radiation risks. To ensure that facilites are operated and activities conducted so as to achieve the highest standards of safety that can reasonably be achieved, measures have to be taken:

1.To control the radiation exposure of people and the release of radioactive material to the environment;

2.To restrict the likelihood of events that might lead to a loss of control over a nuclear reactor core, nuclear chain reaction, radioactive sources or any other source of radiation;

3. To mitigate the consequences of such events if they were occure.

The fundamental safety objective applies for all facilities and activities and for all stages over the lifetime of a facility or radiation source, including planning, sitting, design, manufacturing, construction, commissioning, and operation as well as decommissioning and closure. This includes the associated transport of radioactive material and management of radioactive waste. Ten safety principles have been formulated, on the basis of which safety requirements are developed and safety measures are to be implemented in order to achieve the fundamental safety objective. The safety principles form the set that is applicable in its entirety; although in practice different principles may be more or less important in relation in particular circumstances, the appropriate application of all relevant principles is required.

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P72: Investigation and Determination of Diagnostic

Reference Levels in Fars Province and Comparing Them to Other International and National Guidance Levels

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Abstract

The different radiation protection commissions have introduced the reference levels of diagnostic radiology for optimization and control of patients dose. These guidance levels are determined by measurement of the radiation dose to the patients undergoing diagnostic radiology in different regions, and determining the 75th percentile of the dose level. Determining these levels in a region is not only useful in obtaining the unusual high and low amounts of doses, but also in comparing the results of dosimetry in that region with those in other countries and professional regulatories.

The most important advantage of the guidance levels is that the periodic dose measurements in the radiology centers would lead to reduction of the difference in dose ranges for different patients and improvement and modification of the radiography protocols used by the technologists to obtain images with low doses, while maintaining the image quality.

This investigation has been performed for measurement and determination of the guidance level in diagnostic radiology in Fars province. The Entrance surface dose (ESD) and dose area product (DAP) values per x-ray unit were evaluated for a minimum of 10 patients, preferably with (70±5) kg, using thermoluminecence dosimeters (TLD-100) and a DAPmeter, respectively.

According to the results of this study, the ESD values of DRL for most common radiographies were comparable with the values of other investigations, except the chest radiography which showed the value was 10%, 136%, 65% higher than European commission DRL (1999), UK DRL (2005) and Australian DRL (2009) respectively.

The DAP values of DRL were also comparable with other investigations, except in chest radiography with the value much higher than the other investigations (2.5 times), which could be due to the technical conditions (low kVp), and incorrect collimation.

The results obtained in this study show that the radiography protocols which used for the chest imaging in Fars province should be further revised.

Keywords: DRL, patient dose, ESD, DAP

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P73: Photoneutron Production and Backscattering in High Density Concretes Used for Radiation Therapy Shielding

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Abstract

In the current study, the effect of high density concretes on photoneutron productions in radiation therapy was studied using Monte Carlo simulations. The photon and neutron spectra of a 18 MeV photon beam of the Varian

linac head were used for all simulations. Ordinary and five high density concretes made of high density elements were simulated. The studied concretes consisted of Magnetite, Datolite-Galena, Magnetite-steel, limonite-steel, and Serpentine. Our results showed that photoneutron production in these concrete walls differs considerably with their composition. It seems that application of high density atoms such as Fe and Pb which have higher probability for photoneutron production in concrete composition increases photoneutron production in concrete walls. Further studies on the effect of concrete composition on photoneutrons in radiation therapy Room are recommended.

Keywords: Photoneutron, high density concrete, radiation therapy shielding, Monte Carlo simulation

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P74: Architecture-Based Interventions for Reducing Indoor Levels of Radioactive Radon Gas: Design, Implementation and Utilization

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Abstract

According to U.S. Environmental Protection Agency (EPA) estimates Radon is the first leading cause of lung cancer among non-smokers. On the other hand, direct and indirect radon-induced lung cancer health care costs the USA over 2 billion dollars annually. Although radon reduction systems including architectural considerations can reduce radon levels in buildings by up to 99 percent, architectures are often unaware of the risk of radon inhalation and how to reduce radon levels. Furthermore, In IR Iran, radon considerations are not implemented in construction methods, construction materials and building utilization by regulatory authorities. This article intends to introduce methods for decreasing radon level in the interiors of buildings ranging from design and implementation phases to alterations in utilization. In this article, radon reduction systems which are compatible with local architectural design in Iran are discussed. Considering the glorious history of natural ventilation techniques in Iranian traditional architecture,this article specially focuses on natural ventilation strategies adapted with environments potentials.

Keywords: Radon, Radioactivity, Architecture, Buildings, Indoor, Natural Radioactivity

RADIOBIOLOGY

O1: EGFR Directed Radiolabled-C225: Binding Kinetics, Specificity and Radiosensitization

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Abstract

Radiolabeled-C225, an antibody against epidermal growth factor receptor (EGFR), has been introduced as an interesting candidate in the field of cancer diagnostic and therapy. In the present study using human head and neck squamus carcinoma cell lines, UT5 and SAS, the cellular and molecular effects of C225 (cetuximab) and conjugated C225 with DTPA (DTPA-C225) were compared. Cellular effects of 90Y-DTPA-C225 were analyzed with respect to binding kinetics and specificity, retention and radiotoxicity in combination with external beam irradiation. In UT5 cells C225 and conjugated C225 with DTPA (DTPA-C225) inhibited proliferation efficiently at the concentrations of 20, and 50 nM. In combination with external beam single dose irradiation of 0, 2, 3, and 4 Gy DTPA-C225 radiosensitized UT5-cells to a similar degree as non-conjugated C225. In contrast, in SAS-cells neither

proliferation nor radiation sensitivity were affected by C225 as well as DTPA-C225. 90Y-DTPA-C225 did bind to EGFR in both cell lines specifically in a time-dependent manner and retained activity was about 90% measured 24 h after treatment with 90Y-DTPA-C225. At the molecular level, both C225 and DTPA-C225 had similar effects on EGF-induced activation of EGFR and its downstream pathway components, Akt and ERK1/2. In combination with external beam irradiation, the radiosensitizing effect of 90Y-DTPA-C225 was significantly higher than the effect observed by normal C225. In conclusion, conjugation of C225 with DTPA does not interfere with the cellular and biological function of C225. Thus, radiolabeling of C225 due to its specific binding to EGFR and its radiosensitization efficacy in combination with external beam irradiation may provide effective strategy to overcome radioresistance of human solid tumors.

Keywords: EGFR, C225, 90Yittrium, Head and Neck cancers, 90Y-DTPA-C225

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O2: A Kinetic Model for 153Sm-[Tris (1,10-Phenanthroline) Samarium (III)] Trithiocyanate in Normal Mice

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Abstract

The use of compartmental analysis allows the mathematical separation of tissues and organs to determine the concentration of activity in each fraction of interest. A pharmacokinetic model was developed for the new liver accumulating therapeutic agent 153Sm-[Tris(1,10-phenanthroline) Samarium(III)]trithiocyanate in normal and tumor-bearing mice to analyze the behavior of complex. Biodistribution studies are expensive and difficult to carry out in humans, but such data can be obtained easily in rodents. We have developed a physiologically based pharmacokinetic model for scaling up data from mice to humans. The mathematical model uses physiological parameters including organ volumes, blood flow rates, and vascular permabilities; the compartments are connected anatomically. This allows the use of scale-up techniques to predict complex distribution in humans. in each organ. Uptake of tumor was maximum and increased post injection of 153Sm-TPTTC for first 48 hours and then decreased.

Keywords: Biokinetic model, Samarium-153, compartmental analysis, 153Sm-TPTTC

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O3: Production and Tracer Studies of Cost-Effective Agents of Ethylene Diamine Tetra Methylene Phosphonic Acid (EDTMP) Ligand for Bone Pain Palliation in Normal Wild-Type Rats

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Abstract

The surface bone-seeking radiopharmaceuticals 153Sm-EDTMP, 166Ho-EDTMP and 177Lu-EDTMP were investigated among vital rat organs. 153Sm (T1/2 = 46.27 h, Eβmax= 810 keV), 166Ho (T1/2 = 26.8 d, Eβmax= 1.85 MeV) and 177Lu (T1/2 = 6.71 d, Eβmax= 497 keV) were used as the radioisotopes that produced in the 5MW Tehran Research Reactor (TRR). The radiochemical purity of complexes was checked by instant thin layer chromatography (ITLC). For comparative biodistribution studies, 153Sm-EDTMP, 166Ho-EDTMP and 177Lu-EDTMP were injected into wild-type rats through tail vein. The radiochemical purity results of were showed high purity of more than 98% for the radiopharmaceuticals under optimized reaction conditions. High bone uptakes of the 153Sm-EDTMP, 166Ho-EDTMP and 177Lu-EDTMP were: 1.77, 3.19 and 3.18 %ID/g at 4 hr, respectively; and 1.59, 2.1 and 2.33 %ID/g at 24hr, respectively. 153Sm-EDTMP, 166Ho-EDTMP and 177Lu-EDTMP were found to have high potential as bone pain palliation agents.

Keywords: Radiopharmaceutical, EDTMP, Biodistribution, Uptake

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O4: Estimation of Beta Radiation Absorbed Dose in Human Based on Distribution Data in Rats

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Abstract

The absorbed radiation dose to human organs has been estimated, following intravenous administration of 90Y-labelled DTPA-Rituximab using distribution data from injected normal rats. Five rats were sacrificed at exact time intervals (2, 24, 48, 72) and the percentage of injected dose per gram of each organ was measured by direct counting from rat data. The Medical Internal Radiation Dose (MIRD) formulation was applied to extrapolate from rat to human and to project the absorbed radiation dose for various organs in a human. From rat data, it is estimated that a 74-MBq injection of 90Y-DTPA-Rituximab into a human might result in an estimated absorbed dose of 7.5mGy to the whole body; the highest absorbed dose was in the Spleen with 110.86 mGy and the organs that received the next highest doses were the lungs 41.91, liver 35.15 mGy. The results demonstrated the usefulness of using animal distribution as a model for absorbed dose estimations in humans.

Keywords: absorbed radiation, Medical Internal Radiation Dose (MIRD), Yttrium-90, intravenous, distribution

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O5: Radiolabeling of Magnetic Nanoparticles with 177Lu for Local Drug Delivery

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Abstract

Magnetic nanoparticles (MNPs) have been explored for various biomedical applications. MNPs have been

actively investigated as the next generation of targeted drug delivery for more than thirty years. The importance of targeted drug delivery and targeted drug therapy is to transport a drug directly to the centre of the disease under various conditions and thereby treat it deliberately, with no effects on the body. In this study, we synthesized and radiolabeled manganese ferrite nanoparticle with 177Lutetium to produce a new radiopharmaceutical agent for local drug delivery.

Manganese ferrite nanoparticles were prepared using co-precipitation method. Lutetium-177 was produced by bombarding 176Lu2O3 at a flux of 2.6×1014 n.Cm-2.S-1 for 10 days. 177Lu- manganese ferrite nanoparticles was synthesized and all the quality control tests such as hydrodynamic and core size of nanoparticles, magnetization, stability up to 10 days radiolabeling yield, radiolabeling stability and cell toxicity was determined.

The mean hydrodynamic size of the nanoparticles was 190±23 nm and the average core size was 150±15 nm. The Labeling yield was calculated 71±2%. On the average 87±5% of 177lu- manganese ferrite nanoparticles were stable in up to 10 days and no meaning changes were seen in nanoparticles size. This conjugation showed very good cytotoxcicity on cancer cells. The good invitro results indicated that 177Lu-iron oxide nanoparticles have good potentials for using in drug delivery that needs more investigations.

Keywords: magnetic nanoparticles, 177Lutetium, biodistribution, drug delivery, manganese ferrite nanoparticles

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O6: Using Magnetic Nanoparticle to Increase the Therapeutic Efficacy of Herceptin Antibody

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Abstract

Magnetic nanoparticles are good candidates used for the targeted delivery of anti-tumor agents. Herceptin is a humanized expensive antibody used for treatment of the early-stage breast cancers. This antibody can make cardiotoxicity in some patients. To decreasing the side effects of Herceptin, we synthesized Herceptin loaded iron oxide nanoparticles(HMNs) and accumulated it in mice tumor with a permanent magnet as targeted cancer therapy. HMNs were synthesized and all the in vitro characteristics such as particle size, zeta potential, magnetization, stability, antibody loading and releasing were measured. Biodistribution study was checked in mice bearing breast tumor with and without a permanent magnet on the position of tumor. Therapeutic effects of HMNs was considered at this conditions. The good results in mice indicated that Herceptin loaded iron oxide nanoparticles have good potentials for using probably in human as targeted drug delivery that needs more investigations.

Keywords: targeted cancer therapy, drug delivery, magnetic nanoparticles, Herceptin

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O7: DNA Damage Induced in Glioblastoma Cells by I-131: Experimental Data and Monte Carlo Simulation

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Abstract

In this study, in order to compare experimental and theoretical methods of determination of DNA strand breaks, direct damages of DNA, in radiation field of beta particle of 131I were determined and compared to Monte Carlo simulation.Glioblastoma cells were exposed to 10 mci of 131I in order to absorb dose of 2 Gy. Amount of SSB and DSB in DNA of cells were evaluated quantitatively by Fast Micromethod assay. Then energy spectrum of electrons

released in cells were obtained by MCNP Monte Carlo code and used as input of MCDS Monte Carlo code and the percentage of damages induced in cells were calculated.The significant reduction ($p<0.05$) in fluorescence intensity in irradiated cells compared to control cells, that was determined by Fast Micromethod assay, represents induced damages of DSB and SSB in DNA of irradiated cells. By comparing the experimental and theoretical results, the difference between percentage of single and double stranded breaks per Gy respectively is about 7.4% and 1%.The differences in experimental and theoretical results may be due to the algorithm of applied codes. Since the Fast Micromethod and other experimental techniques don't provide information about the amount of detailed and complex damages of DNA like base damages, thus the applied Monte Carlo codes, due to their capability to prospect the amount of detailed damages occur in the DNA of irradiated cells, can be used in in vitro experiments and radiation protection areas.

Keywords: Glioblastoma, Monte Carlo simulation, 131I, DNA damage

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O8: Air Sterilization by Dielectric Barrier Discharge Plasma

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Abstract

Improvement of the indoor air quality and elimination of microorganisms is always a challenge in hospitals and storage spaces. The recent studies try to present an efficient method to inactivate the air biological contaminations. Dielectric barrier discharge(DBD) has attracted great attention because of the fast and effective inactivation of bacteria. It is generated between two ac powered electrodes which at least one of them is covered with a dielectric. It is a cold plasma which includes antibacterial agents like UV radiation, ozone and energetic charged particles. In this study we investigated the sterilization effect of DBD plasma on the contaminated air. E. coli bacteria were sprayed in the air and forced to pass through the DBD plasma by a fan.The DBD plasma is created between some parallel rods separated by 1mm and covered by quartz tubes alternately. It runs at 10kV. The results show the DBD plasma can inactivate the bacteria which pass through the plasma and sterilize the air.

Keywords: Dielectric barrier discharge, air, sterilization

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P1: Evaluation of Pederin and Gama Radiation Combined Effect on HeLa Cells Survival Curve

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Abstract

Introduction: Cervical cancer is the second most common neoplasm in women and the second leading cause of cancer death in women.The most important fact about this cancer in its invasive and metastatic nature.sometimes substances named radiosensitizer is used in cancer treatment.They enhance the effect of radiation on tumor cells significantly.There is a natural product, named Pederin that is found in homolymph of most of staphylinid bittles. Many species of this insect exist in moist habits(such as north of Iran).Although Pederin activity as inhibitor of DNA synthesis and blocker of mitosis in cancer cells was administered,radio sensitizing effect of this substance have not been investigated.Therefore,this study investigates Pederin and Gama radiation combined effect on HeLa cells survival curve. If this substance is proved as radio sensitizer, we can use it for cancer treatment in future.

Methods: Four groups of HeLa cells in In-Vitro condition will be tested: Group 1, cells that will receive different doses of Gama radiation with same dose rates. Group2, cells that will receive different concentrations of Pederin substance. Group3, cells that will receive Gama radiation and Pederin substance. Group 4, sham group that only tolerate experiment,s stresses but will not receive any Gama radiation or Pederin substance.In each of groups viable cells will be counted and D and n values will be calculated and survival curve for evaluation of Pederin and Gama radiation effect separately and also their combined effect will be drawn.

Result: By counting of viable cells and calculation of D0 and n values,Pederin and Gama radiation combined effect on HeLa cells survival curve and finally radio sensitizing effect of Pederin will be determined.

Keywords: Radiosensitizer, Pederin, Gama radiation,Cervix cancer

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P2: Radioprotective Effects of Garlic Extract Against Gamma- Irradiation in Mice

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Abstract

It has been hypothesized that both radiation injury and oxygen poisoning occur through the formation of reactive oxygen species (ORS). So antioxidants like sulfhydryl agents and garlic that was richen of these compounds must show protection against ionizing radiation, in this study we study this potential of garlic

Freshly prepared aqueous extract of garlic glands were investigate in Swiss albino mice at a dose of 3Gy gamma irradiation (γ -ray). For this purpose, adult mice were irradiated with 3Gy γ–ray in the presence (experimental) and absence (control) of garlic (5 gm/kg body wt.). These animals were necropsied and glutathione of their liver were determined at days 2, 5, 7, 10, 20 and 30, 3Gy γ-ray post–irradiation.

A significant decrease in glutathione level was observed in control group while in garlic pre-treated group a decrease was shown but in 10-20 day interval it reaches to normal level and even more than it at 30 day.

The present study suggests the possible radio protective ability of garlic gland aqueous extract.

Keywords: gamma ray, glutathione, garlic, ionizing radiation, radio protective

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P3: 2 - Deoxy - D - Glucose and Ionizing Radiation Responses of T47D and SKBR3 Breast Cancer Cells

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Abstract

Breast cancer is the most common malignancy and the major cause of cancer-related deaths of women worldwide. Breast cancer treatment involves surgery, chemotherapy, radiation therapy, or combination therapy. Novel strategies are needed to enhance the successful treatment rates of the cancer. The goal of this study is to evaluate the effect of 2-deox -D-glucose (2DG) along with radiation on inducing cell death, apoptosis, in T47D and SKBR3 breast cancer cells. The cell lines classified in two parallel groups as test, treated separately with a 0.5mM 2DG and 1,1.5,2 Gy doses of gamma radiation and also combined, and control. The groups are analyzed for frequencies of apoptosis and viability by ELISA and MTT assay methods. Expression levels of apoptosis related genes, PTEN and P53, are analyzed by QPCR and measurement of CT. Increased levels of apoptosis by combined therapy could provide a possibility of reducing conventional treatment doses for each method and therefore reducing related side effects.

Keywords: Breast cancer, radiation, 2DG, cell line, combined therapy

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P4: Doxorubicin and Ionizing Radiation Responses of T47D and SKBR3 Breast Cancer Cells

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Abstract

Cancer is still one of the leading causes of death worldwide. Breast cancer is the most common malignancy of women. The cancer treatment involves surgery, chemotherapy, radiation therapy, or combination therapy. Radiotherapy consists one of the cornerstones in the treatment of patients with breast cancer but related side effects and different radiation responses are limiting factors in a successful treatment. In the present study, we are studied the effect of radiation along with Doxorubicin (DOX) on inducing cell death, apoptosis, in T47D and SKBR3 breast cancer cells. The cell lines classified in two parallel groups as test, treated separately with a 0.001mM DOX and 1,1.5,2 Gy doses of gamma radiation and also combined, and control. The groups are analyzed for frequencies of apoptosis and also viability by ELISA and MTT assay methods. Expression levels of apoptosis related genes, PTEN and P53, are analyzed by QPCR and measurement of CT. Increased levels of apoptosis by combined therapy could provide a possibility of reducing conventional treatment doses for each method and therefore reducing related side effects.

Keywords: DOX, breast cancer, radiation, cell line, combined therapy

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P5: Early Apoptotic Response of Ionizing Radiation

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Abstract

Molecular mechanisms of ionizing radiation interaction with living organisms is not yet well understood. this is particularly true when low doses of radiation is involved. It has been reported that following to exposure to ionizing radiation, gene expression of the affected cells would be modified. The aim of this study was to evaluate the effect of ionizing radiation on the apoptotic genes expression level. Whole blood samples were collected from four healthy donors. Lymphocytes were extracted and were exposed to 2, 5 and 10 cGY of gamma rays from a cobalt-60 source of 1.3789 cGY. min-1. specific activity. Two apoptotic genes bax (pro-apoptotic)and bcl-2 (anti-apoptotic) were examined for 4 hours following to irradiation. gene expression level of irradiated and control lymphocytes were compared by Real time quantitative relative PCR. From our results it is evident that down-regulation is induced for bax gene and up-regulation for bcl-2 gene when lymphocytes are irradiated by 2, 5 and 10cGY and The correlation between dose and relative expression of bcl-2 gene was significant at the 0.05 confidence level. It is suggested that these two genes may be used as an indicator of absorbance doses, Further investigations are required to assess the effect of the elapsed time following to irradiation.

Keywords: ionizing radiation, low dose, biodosimetry, gene expression, apoptose

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P6: Radiation- Induced Apoptosis InThe Rats Spinal Cord Is Associated with TNF-A Gene Expression

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Abstract

The CNS is one of the major dose-limiting organs in clinical radiotherapy. Radiation exposure leads to oxidative stress and necrosis in many cell types including neurons. Radiation – induced apoptosis has also been observed in animal models. The exact mechanism and the genes that are activated in the process of radiation- induced apoptosis has not established yet. However many events that occur at the cell surface and intracellular during apoptosis in the nervous system have been reported. The aim of this study was to assess changes in TNF- α gene expression and its relationship with apoptosis after irradiation in the rat's spinal cord.

Sixty adult wistar rats were divided equally into three groups. A sham radiation was performed on the rats in group 1 as a control group. To characterize radiation- induced apoptosis in the rat's spinal cord, the cervical segment of the spinal cord of group 2 and group 3 were given a single dose of 8 and 22 Gy respectively. At different time point after irradiation, apoptosis was assessed using the terminal dUTP nicked end labeling (TUNEL) assay. Changes in TNF- α gene expression were assessed using Real time RT- PCR. There was no evidence of apoptosis in the non irradiated rat's spinal cord. Apoptosis and TNF- α gene expression were observed after both 8 and 22 Gy irradiation. Within 3 weeks after irradiation, highly significant expression of TNF- α gene in both irradiated groups was noted when compared to control. There was no significant difference between 8Gy group and 22 GyGy group. TNF- α gene expression returned to control level 4 week after irradiation. There was a good correlation between TNF gene expression and apoptotic cells at three weeks after irradiation in the irradiated groups. We conclude that the TNF- α pathway maybe a mechanism through which DNA damage induce apoptosis in the rats spinal cord.

Keywords: TNF-α, CNS, Radiation

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P7: Evaluation of the Effect of Light Guide Thickness on the Linearity of Gamma Camera: a GEANT4 Based Monte Carlo Simulation with Optical Photon Tracking

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Abstract

The aim of this study is to assess the effect of light guide thickness on the linearity of gamma camera response. For this propose, a GE DST-Xli camera with optical photon tracking was simulated using GEANT4 Monte Carlo toolkit. We considered three camera configurations with T/R values of 0, 0.5 and 1. Where T is the light guide thickness and R is the effective radius of a photomultiplier tube (PMT). For each camera configuration, the normalized map of differences between true and estimated positions of scintillation events was calculated. Without light guide, 67.12% of camera surface has non-linearity index greater than 50%. This portion is 42.78% for the camera with no proper light guide thickness (T/R=0.5) and 2.58% for the camera with optimum light guide thickness (T/R=1). This study showed that the linearity of gamma camera response depends strongly on the thickness of light guide. As previously shown by Baker, the camera with T/R=1 affords the best linearity.

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P8: Radioprotective Effect of Polysorbate 20 Against Whole Body Gamma Radiation in Balb/C Mice

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Abstract

Polysorbate 20 (Polyoxy ethylene sorbiton monolaurate), a nonionic amphipathic surfactant administered i.p at nontoxic doses of 1.83 and 3.66 mgr/kg one hour before whole body lethal dose of 6.1,10 Gy gamma irradiation was examined for radioprotective efficacy toward 30 days survival and endogenous colony forming unit (CFU) in Balb/C mice spleen. 30 days after receiving lethal dose of 6.1,the mice survival were 41.93% and by 10 Gy lethal dose, none of the mice were survived 10 days post irradiation. However these survival percentage were changed to 72.41% and 6.25% for 6.1 and 10 Gy doses respectively by injection of 1.83 mgr/kgr polysorbate 20 one hour before irradiation. The 10 Gy lethal dose but Injection of 3.66 mgr/kgr was increased the survival to 9.37%. In group treated with 1.83 mgr/kg polysorbate 20, one hour prior to 6 Gy radiation, the CFU counts was found significantly ($p<0.008$) higher than corresponding groups of mice, which only irradiated by gamma radiation and in group which treated the same amount of polysorbate 20 but exposed with 8 Gy gamma irradiation, the CFU counts was significantly higher than group with only exposed by 8 Gy gamma radiation ($p<0.001$). Previous studies depict that polysorbate 20 has autoxidation property with hydrogen atom abstraction, and it may exert its autoxidation property through radical chain reactions. These findings show that the radioprotective effect of polysorbate 20 is realized through its influence on free radical scavenging and acceleration of stem cell proliferation in mice.

Keywords: Chemical Radioprotection, Polysorbate 20, Gamma Radiation, Lethal Dose, Colony Formation Unit, Mice

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P9: Neuroprotective Effects of Concurrent Treatment of Vitamin C and the Adenosine A1 Receptor Agonist on Hippocampus in Animal Model of Brain Radiotherapy

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Abstract

Introduction: Radiotherapy is a common therapeutic approach in most cancers including brain cancers. But the vulnerability of normal cells can prevent application of more effective high doses irradiation. Hippocampus is a structure near the inferior horn of brain ventricle in which new memory is formed and spatial information is processed. It is one of the first areas of the brain that is affected by degenerative disease and environmental stresses. Adenosine receptors are belonging to a large family of adrenergic receptors located in the cell membrane. They can increase cell resistance against stresses by preventing cell damage and subsequent cell death. Vitamin C is known as a potent antioxidant and also is an anti-cancer substance.

Objective: In the present work we studied the protective role of concurrent and separate treatment of Vitamin C and Adenosine receptor agonist on hippocampus of mice.

Methods: For this study, 9 groups were designed. In each group, the mice, exposed to 6 Gray radiations for a week. Then drugs applied daily by intrapritoneal injection for a week. Y-maze and shuttle box memory tests were applied to each group to scale memory. For histologic study, the mice perfused intracadially and the brains were removed and fixed by Paraformaldehyde. Nissl staining used for cell counting and TUNEL kit utilized to assess apoptotic cell death.

Results: Our finding revealed that the short-term memory scores is improved after treatment with vitamin C and the agonist of A1 Adenosine receptor. Cell counting and TUNEL staining displayed a significant protective role of both factors.

Conclusion: Concurrent usage of Vitamin C and the Agonist of A1 adenosine receptor can be considered as an effective pharmaceutical approach to reduce hippocampal neuron damages following the radiation therapy of brain cancers.

Keywords: Vitamin C, Adenosine receptor, Antioxidant, Cancer, Hippocampus, Neuron, Brain, Neuroprotection

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P10: Simulation of DNA Strand Breaks Due to the Direct and Indirect Effects of the Incorporated ^{123}I Using Geant4 Computer Code

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Abstract

Different DNA models and codes have been used to calculate DNA strand breaks due to irradiation. In this study we have investigated 123I Auger electrons effects on DNA. A simple DNA geometrical model has been used for simulating a 41 base pair DNA. In our model 123I has been located on the 21st base pair. In order to count DNA Single Strand Breaks (SSB) and Double Strand Breaks (DSB) due to 123I Auger electrons, Geant4 Monte Carlo code (version 9.3) has been applied in this work. Our calculations have been performed for both direct and indirect hits, and a new method has been applied for estimating indirect hits. The results of our model have been compared with the results of Pomplun. In Pomplun's work MOCA8 computer code of Paretzke was used, but in this work Geant4 code has been applied using G4EMLOW6.9 cross section data library. Pomplun used a threshold value of 10.0 eV and 17.0 eV for direct and indirect breaks, respectively, but we have used a threshold value of 10.79 eV for direct breaks and the indirect breaks have been identified according to the required energy for formation of various radicals from several possible excitation and ionization channels of the water molecule. The results of our calculations are in agreement with the Pomplun's and show that the most effective Auger electrons in producing DNA strand breaks are electrons with energies of E 500> eV.

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P11: The Histopathological Evaluation of Melatonin Effect As a Radioprotector Against Radiation Pneumonia in Gamma Irradiated Rats

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Abstract

Introduction: Low LET radiation such as gamma and x-rays act by generating free radicals and reactive oxygen species. the free radicals can interact with critical bimolecules such as DNA and can induced chromosomal damage and genetic insults. antioxidants and radical scavenging with reduction in density of free radicals prevent in cellular compenstate. Melatonin is an endogenous compounds synthesized by pineal gland in brain.it is a new radioprotector agent against whole-body irradiation.in addition to its direct free radical scavenging action, it can increase the activity of some important antioxidant enzymes at molecular level. Due to inclusion of healthy lung tissue into radiation field is inevitable during radiotherapy in patients with breast,lung, laryngeal malignancy, these patients are at risk for radiation lung pneumonitis and fibrosis. This study will be evaluated radioprotectory effect of melatonin in prevention of radiation pneumonia using histopathological study.

Methods: In this study,32 male wistar rats (200-250g)will be divided into four group of 6-8 animals: group1,will receive no melatonin and undergo radiation therapy(single dose 12 Gy –whole lung radiation).Group 2,will receive 100 mg/kg intraoral melatonin (at a concentration of 1% with dissolution in ethanol and 0.9% sodium chloride)30 minutes before RT and undergo radiotherapy (single dose 22 Gy-whole lung radiation). Group3,will receive the same dose of melatonin and undergo SHAM radiotherapy, Group4,will receive no melatonin and undergo SHAM

radiotherapy. They will be killed 8-10 week after radiotherapy and samples of lung will be prepare, fix, stain and histopathological changes will be evaluated.

Results: By histopathological study, radioprotector effect of melatonin in prevention of radiation pneumonitis will be determined

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P12: An in Vitro Study on Photosensitivity of 5-Aminolevulinic Acid (5ALA) Conjugated Gold Nanoparticle (GNPs)

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Abstract

Introduction: Photodynamic therapy (PDT) is based on the administration of photosensitisers compound and irradiation with light of an appropriate wavelength leading to damage of the treated tissue. Recently nanoparticles have been used as an efficient drug delivery system. In this study, photosensitivity of 5ALA conjugated GNPs(conjugate) has been investigated on MeL-Rm cell line.

Methods: First, toxicity of every drug and the appropriate incubation time was determined. Then photosensitivity of conjugate was performed in optical doses of 20, 40, 60 and 80 J/cm2 while irradiated by a He-Ne laser.

Results: a four hour period as an optimum incubation time for 5ALA and conjugate. Cells' uptake from PpIX represented a significant increase after incubation with conjugate in comparison with 5ALA alone. Also the conjugate causes cell death more than twice 5ALA alone.

Conclusion: the conjugate can be used as an appropriate delivery agent for 5ALA and provide the efficient destruction during PDT.

Keywords: 5-aminolevulinic acid, gold nanoparticle, photodynamic therapy (PDT), protoporphyrin IX, Mel-Rm cell line.

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P13: Betulinic Acid Confers Radiosensitizing Effect on Breast Cancer Cell Lines Which Was Reversed by Tocopherol

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Abstract

Betulinic acid (BA) is known to induce apoptosis in melanoma, neuroectodermal and malignant brain cancer cell lines. Present report aim to evaluate the radiosensitizing potential of BA on two human breast cancer lines differing in their p53 status and their modification with tocopherol. BA induced loss of cell proliferation was determined by MTT assay. BA inhibited the clonogenic growth of MCF-7 and T47D cells which was not recovered by pifithrin-α, the p53 inhibitor. The apoptotic parameters were analyzed using FACS analysis of propidium iodide (PI) stained nuclei and PS externalization using Annexin-V assay. Changes in mitochondrial membrane potential were monitored by fluorescent dye DiOC6 and JC-1. Cells treated with BA showed Annexin-V positivity and an increase in the propidium iodide (PI) uptake in dose dependent manner, which was concomitant with the loss of mitochondrial membrane potential. Exogenous addition of tocopherol to cell cultures 1-h prior to the treatment with BA abolished all the effects of BA-induced loss of cell proliferation and apoptosis in both MCF-7 and T47D. BA was also found to induce dose and time dependent increase in intracellular reactive oxygen species in both the cell lines. These in vitro studies suggest that BA induced cytotoxicity is not dependent on p53 status of cells. Inhibition of antiproliferative ability of BA by toccopherol suggests that BA initiates events at membrane level leading to induction of apoptosis

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P14: The Effects of Ionizing Radiation on the Body Physiology

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Abstract

Ionizing radiation consists of particles that are energetic detach electrons from atoms. Ionization from the single particles or photons free, which are atoms containing unpaired electrons. The degree of ionization depends on the energy of the individual particles, not on their number. ionizing particles are alpha and beta, neutrons and cosmic rays. The ability of an electromagnetic wave to ionize an atom depends on its frequency particle. Radiation on the short-wavelength end of the electromagnetic spectrum high-frequency ultraviolet, X-rays, and gamma rays is ionizing, due to its composition of high-energy photons. Lower-energy radiation, such as visible light, infrared, microwaves, and radio waves aren't ionizing. damage done by ionizing radiation produces free radicals, are primary basis for danger to biological systems that is far smaller than needed to produce heating. Free radicals directly damage DNA and RNA strands.

Discussion: Injury to tissue results from the transfer of energy to atoms in the cellular. Ionizing radiation causes atoms to become excited. Excitation can produce free radicals, break chemical bonds, and unregulated vital cell processes(DNA and RNA), reproductive organs, skin, bones, teeth, GI tract and nervous system.

Conclusion: Three ways limit protection: a) limiting the exposure time b) distance radiation c) biomedical engineering, that is a application of principles design to medicine & biology. There are engineering designs with medical sciences to diagnosis, monitor and treatment. Nowday, it's need that biomedical engineering specialists be able to make manufacture component of the radiation protection insert cells for safety and health.

Keywords: ionizing radiation - body physiology- Biomedical protection components

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P15: Oleic Acid Protects Normal Cells Exposed to Irradiated Cell Conditioned Medium (ICCM)

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Abstract

The Bystander effect has been defined as a biological response to radiation resulting in the damage to cells that had not themselves been traversed by a track of ionizing radiation. It has been established that cells exposed to low-LET γ radiation release a cytotoxic factor(s) into the medium that can be transferred to unirradiated cells. A significant reduction in clonogenic survival has been demonstrated in unirradiated cells exposed to irradiated (0.5 Gy) cell conditioned medium (ICCM). Our preliminary results have demonstrated that 10 mM of oleic acid can protect human keratinocyte (HaCaT) clonogenic survival against the ICCM factors by almost 9 % compared to the control. What we do know is that reactive oxygen species, including hydroxyl radicals and superoxide anions, have been implicated in various medium mediated bystander responses using a variety of endpoints Since almost all reactive oxygen species have relatively short half-lives, in order for them to be relevant it is likely that they are generated either very close to the target sites or are produced through a continuous cascade of events. There is evidence that the radical-generating scheme of NADPH oxidase is involved in the bystander response Furthermore, these short-lived, highly reactive radical species have been postulated to be important in the secondary generation of long-lived organic radicals that cause mutations and transformation in human cells The role of reactive nitrogen species, particularly NO, in the bystander response has been investigated extensively using a variety of endpoints. Studies by Matsumoto and colleagues have shown that X-irradiation activates iNOS as early as 3 h post-irradiation and results in an increase in radioresistance among bystander cells (Matsumoto et al 2001). In bystander cells treated with the NO scavenger 2-(4-carboxyphenyl)-4,4, 5, 5-tetramethylimidazoline-1-oxyl-3-oxide (c-PTIO), the induction of micronuclei and g H2AX foci was significantly reduced, suggesting the role of NO, particularly the constitutive form, in mediating bystander effects. Oleic acid is known to inhibit iNOS levels intrinsically so there is a possibility that this could be a reason as to its protective effect against the bystander factors however more research need to be conducted to elucidate its protective mechanism, but nevertheless it is noteworthy wherein diets rich in polyunsaturated fatty acids such as oleic acid could protect people from accidental exposures to low dose radiation.

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P16: The Importance of Time in Low Dose Radiobiology Phenomena

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Abstract

Time, the first and last dimension of biological effects of radiation, is a main factor in radiobiological studies. In addition to its importance in dose rate effect on biological systems, the role of time in biophysical, biochemical, and biological events after irradiation is very important. In low dose radiobiology phenomena, including adaptive response, bystander effect, genomic instability, low-dose hypersensitivity and hormesis, time is determinant factor. Speaking generally, time interval between adaptive and challenge doses, the time required for gene expression, cytokines, growth factors and proteins release by irradiated tissues and the activation time of repair and survivor mechanisms, time of other immunological mediators recruitment, the half-life of released materials in the cells, required time to stimulate other cells to produce a biologic response, time for occurrence of genomic instability, time of hermetic effect of low dose radiation and many important time dependent events after a biologic system exposed, demonstrate time is a vital factor in these phenomena. In the other hand, much time is required to see real effects of low dose radiation. In fact, most of low dose radiobiological studies are invitro and so, it is necessary to investigate long term studies invivo to understand real effects of low dose radiation.

Keywords: time, low dose radiation, radiobiology phenomena

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P17: Mitoxantrone as a Prospective Sensitizer for Photodynamic Therapy of Breast Cancer

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Abstract

In recent years, the search to obtain more effective and less toxic photosentisizers used in photodynamic therapy have been raised. The purpose of this study was to assess the effects of photodynamic therapy in combination with mitoxantrone, a chemotherapeutic agent, as a photosentisizer on MCF-7 human breast cancer cell line. Cytotoxicity was evaluated for different concentrations of mitoxantrone and to assess the photosensitivity a non-coherent light source was used. The percentage of the cell survival after 24 hours was investigated using MTT test. Results showed that mitoxantrone is a remarkably efficient photosensitizer and could mediate killing of MCF-7 cells at the low concentration of 5 μM with modest exposure to light

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P18: Protecting Aainst Rays, One Usage of Drugs

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Abstract

Introduction: Nowadays, the usage and role of the ionizing rays in diagnosing and therapy of diseases is clear to everyone. But the other side of the coin is that, unwanted exposure to rays can be severely harmful, even can cause death, because of their high energy levels. So beside the beneficial usage of rays, people should be protected against their harmful effects. Because of importance of this case, this study is about protecting drugs or radioprotectors.

Results: Radioprotecting drugs are divided into two groups of natural and synthetic based on their origins, and are divided as antioxidant or immune system stimuli according to their mechanism. Sulfur containing drugs are of the first group which reduces and eliminates the produced free radicals by trapping them. Amifostine with trade name of Ethyol is in this group and is the most effective drug for protecting against rays which is used clinically and for humans, but its usage is constrained because of its side effects. As a result, studying and searching for drugs with fewer side effects, is needed. In Iran, there are some research cases on radioprotector drugs such as oxymetholone and synthetic compositions containing thyol and herbal compositions such as sour orange (narenj,citrus) skin, red hawthorn fruit, hesperidins, and chlorogenic acid. The results showed that these compositions had good protecting effects against rays on animals. Even limited clinical researches showed that extract of the hawthorn red fruit plant and hesperidins had protecting effects on genetic effects of rays on the blood lymphocytes. There is a need for complementary researches for their human usage approvals.

Conclusion: Drugs, especially natural drugs, have good potentials to protect people and personnel against rays. There is a few researches on this field in Iran and vast researches are needed according to importance of this field.

Keywords: Ionizing rays, Radioprotectors, Protection against Ray

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P19: Protective Effect of Vitamin C and the

A1Adenosine Receptor Agonist on Cortical Neurons Following Irradiation in Mice

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Abstract

Nowadays radiotherapy is a common method in treatment of various cancers. Prevention of the side effects raised from radiation therapy has always been among the main concerns of researchers. Cell death and organ dysfunction are part of these side effects. The brain cortex, is one of the important parts of the brain that is affected by irradiation causing irreversible damages. The main brain disorders in cortical area are caused by damage to the pyramidal neurons. A1 Adenosine receptor is located in the cell membrane and is found in high density in the brain neurons. It is known that activation of A1 receptors may increase the cell resistance to the environmental stresses and following the critical situations by preventing cell necrosis and apoptosis. Nowadays, the role of vitamin c is recognized in cancer treatment. As a strong antioxidant, it can prevent cell damage by clearing the free radicals from cellular environment.

In this study, the effect of separate and combined usage of these substances on the lesions to the normal cells raised from irradiation was evaluated. For this purpose, nine groups of mice was considered. Seven groups were exposed to 6 Gray dose of radiation and after a week, the treatment groups received medication daily for a week. Samples were fixed by intracardiac perfusion of paraformaldehyde and then were prepared for light microscopic study, including nissl staining methods to cell count. TUNEL test was performed to measure apoptotic cell death. The results showed that, applied dose of radiation caused sever damages and treatment of these drugs significantly reduced these side effects. Concurrent usage of Vitamin C and A1 adenosine receptor Agonist may be considered as an effective pharmaceutical approach to reduce Hippocampal neuron damages following the radiation therapy of brain cancers. The side effects raised from radiation in cancer therapy can be diminished by mixed treatment with vitamin C and the agonist of Adenosine A1 receptor

Keywords: Adenosine receptor, Vitamin c, Neurons, Cortex, Brain, Antioxidant, Neuroprotection.

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P20: Detection of Individual Differences in Radiation-Induced Apoptosis of Peripheral Blood Lymphocytes in Normal Individuals and Breast Cancer Patients Using Neutral Comet Assay.

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Abstract

Quantification of radiation-induced apoptosis in peripheral blood lymphocytes (PBLs) has been proposed as a possible screening test for cancer-prone individuals and also for the prediction of normal tissue responses after radiotherapy. In this study we compared the radiation sensitivity of breast cancer patients and healthy volunteers by measuring the levels of basal and induced apoptosis in peripheral blood leukocytes. We have used the neutral version of the comet assay (single-cell alkaline gel electrophoresis) 24, 48, 72 h after irradiation with 8 Gy gamma

rays to assess inter-individual differences in radiation-induced apoptosis in peripheral blood leucocytes between a panel of 30 normal individuals, and 30 breast cancer patients who hadn't received radiotherapy or chemotherapy. Comets were assessed using visual and computer analysis after staining the slides with ethidium bromide. With this protocol, we show clear differences in radiation-induced apoptosis between individuals, and good reproducibility in the assay. The levels of baseline and induced apoptosis were higher in breast cancer patients compared to normal individuals. Although, both these levels were higher in young breast cancer patients, the results showed that age did not have a significant effect on the level of apoptosis both in cancer cases and controls.

Our results show that induction of apoptosis in leukocytes from the breast cancer patients is higher in all incubation times compared to that of healthy subjects. The increased rate of apoptosis observed in the breast cancer cases may be associated to repair deficient mechanisms. This study might indicate that apoptosis has some potential as a predictive assay; however, large intra-individual variation exists. More studies are required to investigate the causes of intra-individual variation and how it might be minimized.

Keywords: Breast Cancer, Radiosensitivity, Apoptosis, Comet assay

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P21: Effect Of Low-Dose Exposure Of Gamma Radiation On Apoptotic Genes Expression In Human Peripheral Blood Lymphocytes

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Abstract

Low dose exposure of gamma and X rays account for most occupational and medical irradiations. Genomic instability has been reported following to exposure to ionizing radiation, but molecular mechanisms of ionizing radiation interactions with living organisms is not yet well understood. This is particularly true when low doses of radiation is involved. The primary aim of this study was to evaluate the effect of ionizing radiation on the apoptotic genes expression level and the secondary goal was to evaluate of time effect on the modified genes expression in human peripheral blood lymphocytes caused by low doses of ionizing radiation. Whole blood samples were collected from four healthy donors. Lymphocytes were extracted and were exposed to 2, 5 and 10 cGy of gamma rays from a cobalt-60 source of 1.3789 cGy. Min-1. specific activity. Two apoptotic genes bax (pro-apoptotic) and bcl-2 (anti-apoptotic) were examined for expression level 4h (immediately) and 24h (early time) following to irradiation. Gene expression level of irradiated and control lymphocytes were measured and compared by quantitative real-time PCR. From our results it is evident that down-regulation is induced for bax gene and up-regulation for bcl-2 gene when lymphocytes are irradiated by 2, 5 and 10cGy. The correlation between dose and relative expression of bcl-2 gene 4 and 24 hours following to irradiation was significant at the 0.01 confidence level. The correlation between 4 and 24 hours post-irradiation of relative expression of bcl-2 gene was significant at the 0.05 confidence level. Therefor it is suggested that these expression level of these two genes may be used as an indicator of absorbed dose. Further investigations are required to assess the effect of the elapsed time following to irradiation especially when immediately, early and late post-irradiation time are examined.

Keywords: ionizing radiation, low dose, biodosimetry, gene expression, apoptose

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P22: Past, Present and Future: Radiobiological Modeling in Radiotherapy

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Abstract

All the tumors are not treated with same time dose fractionation schedule and all radiotherapists do not treat similar tumors with schedules followed by others. Many fractionation schedules followed by others. Many fractionation schedules encounter gaps, planned or unplanned and many tumors are treated by altered fractionation schedules, combination of brachytherapy and teletherapy is choice of treatment in few malignancies. Since treatment schedules are numerous and different from each other it is rather difficult to intercompare them unless they can be reduced to preferably a single number.

One of the fundamental tools in radiation biology is formalism describing time – dose relationship. Various concepts of time, dose and fractionation were introduced in 1950's to correlate the biological effectiveness of different time, dose factors. Many empirical models such as NSD, CRE, TDF and TSD were put forth and were used despite of their many drawbacks.

The main limitation of all these time dose models is that they are too simple, so that they could never be expected to accurately represent the highly complex effects occurring in irradiated tissues.

The need for reliable dose effect relationship in fractionated radiotherapy has increased significantly in recent years with the advent of a variety of innovative fractionation techniques such as hyper fractionation, high dose rate fractionated remote after loading, single fraction intraoperative radiotherapy, stereotactic radio surgery (SRS), intensity modulated radiotherapy (IMRT), intended inhomogeneous dose distribution in PTV, biological isodose planning and many other forms of dynamic fractionation.

The linear quadratic model was originally proposed by Kellerer and Rossi [1972] as consequence of the micro dosimetry of radiation induced cellular lesions. The linear term results from interaction of lesions that occur along a single ionising track while the quadratic term results from the interaction of lesions occurring along two different particle tracks. The fact that the LQ model could be used to obtain isoeffect relations for normal tissue damage was noted by Douglas and Fowler [1976].

In addition to LQ model there are few other biological models reported in literature such as Lyman – Kutcher-Burman [LKB] model which describes dose- volume relationship, Kallman k- and s- model which describes the relationship between Normal Tissue Complication Probability [NTCP] from whole and partial volume irradiation, Yaes- Kalend- Fenwick model. In this communication evolution of empirical time- dose fractionation models and the recent radiobiological models will be discussed in detail along with their advantages, drawbacks and applicability to various situations.

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P23: The Study of Synergic Effect of Vitamin C & Adaptive Dose on Human Lymphocyte

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Abstract

Introduction: Radiotherapy is the most common modality for treating human cancers. In order to obtain better tumor control with a higher dose, the normal tissues should be protected against radiation injury. Thus, the role of radio protective compounds is very important in clinical radiotherapy. Radio-Adaptive Response referred

to the phenomenon by which cells irradiated with very low doses of ionizing radiation become less susceptible to the effect of a subsequent high challenge dose of radiation or chemicals. The main goal of this study will be the investigation of the combined effects of radio-protection and radio- adaptation on peripheral blood lymphocytes to be possibly able to protect normal cells which is exposed to the radiation while treatment of tumors in radiotherapy.

Methods: 7 mL of Peripheral venous blood samples of 30 healthy volunteers divided to 7 identical parts (1 ml). The first part just will receive vitamin C, the second part will receives adaptive dose (5 CGy), the third part will expose to 2 Gy CO-60 gamma rays, the fourth part will receive dose of 5cGy and 2cGy together, the fifth part will receive dose of 2CGy and vitamin C, the sixth part will expose to all of above mentioned, and the last part is the sham group. Lymphocytes will be cultured in standard media and cytokines will block to score micronuclei in bi-nucleated cells.

Result: Through micro-nuclear assay, combined effects of vitamin C and adaptive dose will be investigated

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P24: A Mathematical Model of In Vitro Cancer Cell and Treatment with Antimitotic Agent by Cellular Automata

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Abstract

A mathematical model of cancer cell growth and response to treatment with experimental chemotherapic agent cisplatin is presented. In vitro growth studies, MCF-7 breast carcinoma was cultured in RPMI 1640 containing 10% fetal bovine serume, at 37C in a 5% CO2, humidified incubator. Cells were seed in well plate of growth medium for 72 h to allow attachment and grow.Cancer cells were treated with cisplatin. Adherent cells were dispered with trypsin, centrifuged, resuspended and counted by trypan blue. Cell counting was countiued in 3 day. Our model of in vitro cancer growth and drug intraction has been presented and adapted to growth and treatment of MCF-7 cancer cell line

Keywords: Mathematical modeling, cisplatin, MCF-7 cancer cell

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P25: Evaluation of Combination Effects of 2-Methoxyestradiol and Methoxyamine on IUdR-Induced Radiosensitization in Glioma Spheroids

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Abstract

Glioblastoma is the most common and most malignant cancer of central nervous system. Targeting radiotherapy is an effective method toward its treatment. Iododeoxyuridine (IUdR) is a halogenated thymidine analogue known to be effective as a radiosensitizer in human cancer therapy. Methoxyamine (MX) is an inhibitor of base excision repair (BER) pathway that potentiates IUdR-induced radiosensitization in human glioblastoma spheroids. As we

shown previously DNA strand breaks decrease in large spheroid volume due to failing of IUdR uptake in Go arrested cells presented in large spheroids. Hypoxia-inducible factor-1α (HIF-1α) is a heterodimaric transcriptional factor that is responsible for cell cycle arrest of endothelial cells at Go/G1 phase in tumor cells. It is currently being founded that activation of HIF-1α can be inhibited by 2-Methoxyestradiol (2ME2) resulting inhibition of cell cycle arrest. In this study we have evaluated the combination effects of 2-Methoxyestradiol and Methoxyamine on radiosensitization of IUdR in glioblastoma spheroid culture. The cytotoxic damages of DNA in U87MG cell line were compared using colony formation assay. Experiments were performed in large spheroids diameter (350μm). Evaluation of the effects of IUdR with 2ME2 and MX pretreatment on spheroid cultured cell followed by ionizing irradiation showed more enhancemented ($p \leq 0.001$) IUdR induced-radiosensitization. These results introduce a key role for 2ME2 in IUdR related studies. Pretreatment of tumor cells with IUdR, MX and 2ME2 before irradiation enhances tumor radiosensitization and may improve therapeutic index for IUdR and 2ME2.

Keywords: Hypoxia-inducible factor-1α, 2-Methoxyestradiol, Radiosensitization, Methoxyamine, IUdR, Spheroid

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P26: Impact of Radioprotectory of Sulfur Soluble in Ramsar Mineral Water

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Abstract

Ramsar, a city in the north of Iran, has the highest level of natural background radiation in the world and the reported maximum dose is about 260 mSv in Ramsar per year. Radioprotector protects biological tissue from ionizing radiation by reduction radiation effects. Some tissues are shielded by creating hypoxia and decrease of oxygen and some tissues are protected by mechanism to indirectly increase the immune ability antioxidant and swept the free radicals produced. Data indicate there is no significant different between rate of cancer between normal inhabitants of background radiation and inhabitant coastal city in northern Iran that has the highest level of natural radiation. This study will be evaluated that the sulfur soluble in Ramsar water omits newly established tumors by eliminating free radicals. In this study will be worked on 65 male mice (wistar) that divide into 4 parts. First group will be sham-control. The second one will be given water and exposed 2, 4 Gy with Co 60. The third part will be given Ramsar mineral water and exposed 2,4 Gy with Co 60.The last group will be given Ramsar water that omit sulfur and exposed 2,4 Gy Co60.48 and 72 hours after exposing, will be scarified mice and bring out their femurs,extract bone marrow and make suspension with FBS.Then centrifuge it and omit serum. The rest of that will compound with PBS and drop on watch glass. Will be permitted to dry for 24 hours, then will be dyed with GIMSA and MAYGRUNWALD.Poly chromatic erythrocyte cells (PCEs) will be dark blue and normocromatic erythrocyte cells (NCEs) will be yellow orange. For each mouse will be counted PCE and NCE and PCE including micronuclei (MNCPE). Will be expected that reduce the amount of MNCPCE and increase ratio of PCEs/PCEs+NCEs

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P27: Does Specific Absorption Rate of GSM Mobile Phones Affect the Magnitude of Induced Radioresistance to Lethal Doses of Gamma Rays?

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Abstract

We have recently reported that exposure to electromagnetic radiations emitted by GSM mobile phones may induce survival adaptive response in the form of increased resistance to subsequent challenge doses of gamma radiation. The aim of this study is to investigate the effect of the specefic absorption rate (SAR) of the mobile phones on the induction of adaptive response to a subsequent lethal dose of gamma rays. In this phase of the study, 100 male BALB/c mice were randomly divided into 5 groups. The animals in the 1st group were exposed to a challenge dose of 8.8 Gy gamma rays without any preirradiation to electromagnetic fields (EMFs). The 2nd, 3rd and 4th groups were firstly exposed to EMFs emitted by a low, intermediate and high SAR mobile phone, repectively, and then received the challenge dose. The exposure protocol used in this study was 6 hours of microwave exposure per day for 5 days. On day 6, all animals in the 1st to 4th groups were whole-body irradiated with the challenge dose. The 5th group were only exposed to EMFs emitted by a high SAR mobile phone, without receiving the challenge dose. Although the survival rates in groups pre-irradiated with microwave before receiving the challenge dose were significantly higher than that of the group only receiving the challenge dose (P = 0), survival rates in these groups were not statistically different. These results clearly indicate that the SAR of mobile phones does not play any role in the magnitude of the induced radioresistance to subsequent lethal doses of gamma rays.

Keywords: Survival adaptive response, Electromagnetic fields, Mobile phones, Gamma rays

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RADIOTHERAPY

01: A Novel Four-Dimensional Method of Organ Dosimetry in Prostate Brachytherapy

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Abstract

Low dose rate brachytherapy with I-125 or Pd-103 seeds is a well recognized treatment for patients with early stage prostate cancer. In prostate brachytherapy, a steep dose gradient between prostate and organs at risk (rectum, urethra and penile bulb) is desirable. Prostate shape and position relative to neighboring structures (as influenced by levels of bladder and rectal filling) are among the factors affecting the dose to organs at risk and possibly prostate dose homogeneity, so accurate seed arrangement and precise dosimetry play a critical role in the outcome of this treatment modality. The aim of this study was to introduce a novel 4 dimensional [4D] (x, y, z, motion) dosimetry method that can be employed for dosimetry purposes in prostate brachytherapy. This study presents a 4D computational dosimetry method for prostate and its neighboring organs by (i) using biomechanical Finite Element (FE) modeling to predict the displacements of the pelvic organs encountered in practice after implant and (ii) using Monte Carlo (MC) radiation transport codes (MCNP4C2, MCNP5 and MCNPX) to calculate dosimetric changes as

defined by American Association of Physicists in Medicine protocols. For three patients with different prostate sizes ranging 32-71 g, supine and left decubitus MR images were acquired at different stages of bladder and rectal filling. To perform FE modeling, the geometry was constructed using supine patient images, then imported to ABAQUS v.6.8.1 software. Two common brachytherapy sources, Best double-wall Model 2335 103Pd and EchoSeed Model 6733 125I seeds, were used for dosimetric calculation using MC codes following FE modeling. MR imaging showed that, bladder filling, rectal distension and also change of patient position resulted in significant displacements of prostate and its neighboring organs. The consequent FE model was in good agreement with the MR images (differences between 1.1 and 3.6 mm). MC simulation showed that these displacements can cause significant changes in the organ dose (up to 40%). Using a 4D dosimetry method for prostate brachytherapy is recommended for clinical applications of this treatment modality.

Keywords: 4D dosimetry, Prostate brachytherapy, Finite Element modeling, Monte Carlo

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O2: An Innovative Monitor System for Centro Nazionale Di Adroterapia Oncologica (CNAO) in Pavia (Italy)

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Abstract

Protons and light ions are advantageous because of three physical properties. Firstly, they penetrate the patient practically without diffusion. Secondly, they deposit their maximum energy density abruptly at the end of their range. Thirdly, being charged, they can easily be formed as narrow focused and scanned pencil beams of variable penetration depth and any part of tumor can be accurately and rapidly irradiated. Hence, hadrontherapy is effectively used to treat tumors that are located between or nearby vital organs at risk.

The Centro Nazionale di Adroterapia Oncologica (CNAO) is the first Italian center for deep hadrontherapy that is presently under construction in Pavia, Italy. It is equipped with three treatment Rooms and a synchrotron capable to accelerate both Protons with the energy range 60-250 MeV/u and Carbon ions between 120-400MeV/u. The accelerator has been designed to be flexible and capable to easily switch from ion to protons and vice-versa depending on the clinical needs. The dose distribution is based on an active Beam Delivery System (BDS) and monitor system has been designed, developed, and constructed in a collaboration between CNAO Foundation, Istituto Nazionale di Fisica Nucleare (INFN) and University of Torino.

The main BDS functionalities are the measurement of the beam fluency and of the beam position (X, Y) coordinates. The target tumor is divided into slices at different depths and a magnetic deflection system is used to paint each slice till the volume is completely covered. The BDS includes several elements between the scanning magnets and the patient: nozzle, monitor system, passive filters. It also includes the electronics and software interface to control the delivery of beam during the treatment.

The monitor system consists of five ionization chambers (two integral chambers, two strip chambers and one pixel chamber). The electronic readout is based on microelectronics recycling integrators (TERA chips) which allow a large dynamic range at high convertor frequency and without dead time. A fast and high-power supply has been developed in order to achieve the high scanning speed (for Protons and Carbon ions) and accuracy required for the beam positioning.

The whole architecture will be described, together with results of the commissioning of the system at present under way.

Keywords: hadrontherapy, particle radiotherapy, Beam Delivery System, monitor system.

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O3: An Optimization Algorithm for Beam Angle, Beam Weight and Wedge Angle in Forward Treatment Planning of External-Beam Radiotherapy Based on an Integer-Representation Adaptive Mutation Probability Genetic Algorithm

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Abstract

Purpose: To present the development of an optimization algorithm for beam angle, beam weight and wedge angle in forward treatment planning of external-beam radiotherapy using a genetic algorithm (GA).

Methods: An adaptive mutation probability (AMP) integer-representation GA was applied for this optimization process in the MATLAB programming environment. The code allows various user-defined limits and starting points as well as comprehensive searches. We used an integer representation for all variables in the chromosomes pool for encoding the steps, because wedge angles often take discrete values (i.e. 0, 15, 30, 45 and 60 degrees). To improve performance, we designed a dynamic mutation probability assignment code in each generation so that the algorithm automatically adapts the mutation probability using the standard deviation of fitness values of the population at each generation. If the fitness diversity is great enough, a low mutation probability will be applied, and if the fitness values have low diversity, a high mutation probability will be applied. A dose calculation program using correction-based techniques and the CT images of the patient was also written within the same software. The GA code was tested using a standard test function both with AMP and with a constant mutation probability across all GA generations. Convergence of beam angle, beam weight and wedge angle was also investigated.

Results: With the AMP technique, the GA maintained the population diversity in the chromosomes pool to avoid premature convergence into a local minimum. Test results showed that the algorithm with AMP (run time of 5 min for a simple standard test function) is more robust compared to the conventional method.

Conclusions: This algorithm is a feasible and promising tool for optimization of treatment planning parameters with an acceptable computation time. Testing the algorithm against experienced treatment planners will be performed next.

Keywords: Genetic algorithm, Adaptive mutation probability, Radiotherapy treatment planning

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O4: Introducing a Complementary Treatment Planning Software for GZP6 High Dose Rate (HDR) Brachytherapy System

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Abstract

Objective: Although not as widespread as 192Ir, 60Co is a comparable source for high dose rate (HDR)

brachytherapy. The GZP6 remote afterloader (Nuclear Power Institute of China) is a widespread system, specifically in developing countries, which the low cost made it noteworthy among the full option and newer systems. It is especially used for intracavitary treatments for gynecological cancer. The system has some deficiencies including lack of a comprehensive treatment planning software for non-predefined cases which causes some problems for treatment of uncommon anatomies, lack of ability to define the measured dosimetric variables, and using the point source estimation in dose calculation. The current work introduces new complementary software to overcome the existing program shortcomings.

Methods: The GZP6 remote afterloader (Nuclear Power Institute of China) incorporates six braid type 60Co HDR sources. First, the TG-43 protocol parameters of channels 3, 4 and 6, which are used in intracavitary treatments, were obtained using Monte Carlo method. Then a graphical user interface (GUI) was designed to facilitate the user interaction with the program. It consists of three constituents including: a) feeding the patient radiology film data in and determining the dosimetric important points, b) specifying the dwell position steps and corresponding dwell times for channel 6, the only programmable channel, and c) calculating and showing the isodose distribution on radiology pictures and individually on coordinate axes and the absolute values in a table.

Results: The obtained parameters of GZP6 sources have an average uncertainty about 1% and in a good agreement with other 60Co HDR systems. They were used to calculate the dose distribution. The user-friendly GUI has been converted to an executable file capable of being installed on any computer and operating system. The program has some other advantages including the automatic reference point (A and B) determination without human based errors, obviation the need to digitize special source dwell positions on the films because of automatic interpolation capability and showing the isodose distribution on radiology photos which simplifies its interpretation by oncology physicians.

Conclusion: Because there is continuous use of this brachytherapy system in spite of not enough accuracy, specifically in special cases, a need to complementary software to improve the present one is undeniable. The introduced program can overcome the existing treatment planning software deficiencies. Also, the extracted TG-43 parameters and the "along and away" dose rate tables can be used for the existing software evaluation and verification.

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O5: The New Advanced Radiotherapy Techniques... Challenge of Quality Insurance –OBI Experience

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Abstract

Implementing new technologies into the clinic is challenging on many levels. The use of this new technology necessitates a comprehensive quality assurance (QA) program to maintain and monitor system performance characteristics, which have been established at the time of commissioning. Currently, there have been no published recommendations and guidelines for a QA program to verify the functionality, accuracy, stability, and image quality of the radiographic mode of this device. This paper evaluates a comprehensive QA program for the OBI system.

To generate and run a quality assurance QA program for the On-Board Imager OBI system and to summarize the results of these QA tests over extended periods from two ROV centers after implementing two new Rapid Arc machines with OBI capability. The radiographic mode of operation has been evaluated.

The QA programs from the two centers have been generated through series of tests for evaluating the performance of the On-Board Imager.

Safety and functionality tests evaluate the functionality of safety features and the clinical operation of the entire system during the tube warm-up as show in the QA form. Geometry QA verifies the geometric accuracy and stability of the OBI hardware/software. Image quality QA monitors spatial resolution and contrast sensitivity of the radiographic images see Figs. 1 & 2. All safety and functionality tests passed on a daily basis. Measurements of geometry QA tests showed stable results within tolerance throughout the test periods. Use of the tests over extended periods show that the OBI system has reliable mechanical accuracy and stable image quality. In this article

we describe the procedures of test items included in the QA program and present the results of measurements over extended periods from the two ROV centers.

Results: Use of the tests over extended periods show that the OBI system has reliable mechanical accuracy and stable image quality. In this article we describe the procedures of test items included in the QA program and present the results of measurements over more than 12 months extended period from the two ROV centers.

Conclusion: International program of Quality assurance need to establish for maintaining of quality for OBI system.

Primary focus on geometric accuracy and precision, secondary focus on dose and image quality. An integrated daily check should be implemented into routine clinical use with a 15 minute time penalty.

Training for the staff is required to achieve the benefits of the new technology and grantee the proper use on time.

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O6: Influence of Shield Tray on Reducing the Neutron Dose Equivalent From Linac Head

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Abstract

High-energy x-ray beams (e.g., >10 MV) are contaminated with neutrons. These are produced by high-energy photons and electrons incident on the various materials of target, flattening filter, collimators and other shielding components. The cross-sections for (e,n) reactions are smaller by a factor of about 10 than those for (γ,n) reactions. Because of this, the neutron production during electron beam therapy mode is quite small compared with that during the x-ray mode. These contaminated neutrons, cause a fault in treatment planning process. In this work, the Monte Carlo code, Fluka, was used to simulate the photoneutron production in the linear accelerator Varian Clinac 2100C/D after simulation of Linac head. We made a study on 18 MV photon energy mode. The field size was 20 × 20 cm2 and source couch table distance equal to 100 cm and measurements were done and simulated for 4 points (0,10,50,100 cm on the treatment couch field center). For evaluating block tray effect on neutron dose equivalent from center of field dosimetry was done by CR-39 thin films with thickness of 700 μm and simulated by Fluka code with and without block tray, made from plexiglass of 5mm thickness. This feature can lead to less neutron dose equivalent for patients treated with block tray in high-energy photon beams. The ratio of neutron dose equivalent to X-rays is decreased by ~ 21% after placing the shield tray into the path of the photon beam. There was a good agreement between the data calculated using simplified model in this study and measurements by CR39 samples ($p<0.05$).

Keywords: Clinac, Neutron dose equivalent, CR39, Fluka code, plexiglass shield

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O7: Evaluation of Accuracy and Performance of a Fast Monte Carlo Code for Dose Calculation in Proton Therapy

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Abstract

An accurate treatment planning is a substantial step in radiation therapy. Monte Carlo techniques, as the most accurate dose calculation method, attracted a growing interest in treatment planning. In this study, we evaluated a fast Monte Carlo treatment planning, and compared it to other algorithms.

Early versions of dose calculation algorithms used simple and fast methods like the pencil beam and analytical methods that simulate the particles as a group. Monte Carlo methods simulate and transport each particle individually. We used pre-calculated data, generated by a general purpose Monte Carlo code (MCNPX). A set of data including the track of the particle was produced in each particular material (water, air, lung, bone, tissues). This code is able to transport photons and electrons, as well as protons in wide range of energies (up to 200 MeV for proton).

The validity of the fast Monte Carlo code is evaluated with data of the patients' CT scans. While analytical pencil beam algorithm transport shows great errors (up to 10%) near small high density heterogeneities, there was less than 2% deviation of experimental results in our dose calculation and isodose distribution. In terms of speed, the code runs 200 times faster than MCNPX.

Transition from Monte Carlo to fast Monte Carlo codes, can solve the slow calculation speed without missing the accuracy. At this time, it takes the system less than 2 minutes to calculate dose for each patient; thus it is suitable for practical use in treatment planning.

Keywords: Proton Therapy, Monte Carlo, Treatment Planning

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O8: Applicator Attenuation Effect to Dose Calculations in Esophageal HDR Barchytherapy

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Abstract

Effect of applicator attenuation is not considered in dose calculation method released by AAPM-TG43. In this study the esophageal applicator effect on dose distribution was assessed in HDR brachytherapy. A cylindrical PMMA phantom was built to be inserted for various sizes of esophageal applicators. EDR2 films were placed at 33 mm from Ir-192 source and irradiated with dose of 1.5 Gy after planning by treatment planning system (TPS) for all applicators. The results of film dosimetry for 6, 8, 10 and 20 mm applicators were 1.54, 1.53, 1.48 and 1.50 Gy, respectively. The difference between practical and TPS results was 0.0225 Gy (<2/7%), on average. Due to the similar practical results for different esophageal applicators, it can be concluded that wall attenuation doesn't have a significant effect in comparison to water equivalent material and then the Flexiplan TPS accuracy is further confirmed.

Keywords: esophagus brachytherapy, applicator attenuation, EDR2 film, Flexiplan treatment planning

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O9: Dosimetry Verification of Small Fields Used in Stereotactic Radiosurgery by Monte Carlo Simulation

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Abstract

The accuracy and precision of dose measurements in small fields suffer from lack of lateral electron equilibrium and size of detectors relative to radiation field size. To overcome these problems, several dosimetry methods have been proposed. Monte Carlo simulation is one of the most accurate methods to assess the detail of radiation transport and prediction of dose distribution in radiotherapy. In this study, the MCNP-4C Monte Carlo code was used to simulate the photon beam from medical linear accelerator. Upon getting a good agreement between the Monte Carlo simulated and measured dose distribution in conventional fields, the model was used to simulate the Stereotactic radiosurgery. The accelerator equipped with home-made radiosurgery hardware included 6 SRS collimators that provide treatment fields with diameters of 12.5, 15, 17.5, 20, 22.5, 25 mm. Depth dose, dose profile curves and output factors were calculated for each collimator and were compared with corresponding measured values. The measurements were carried out by a Scanditronix dose scanning system and 0.015 cm3 Pinpoint ionization chamber and diode dosimeters. The low-energy cut-off for photon and electron were 10 and 500 KeV, respectively. Our results demonstrated that the simulated model provides very good accuracy for dose calculations. The consistency between calculated and measured percent depth dose curves, dose profiles and output factors are generally better than 2% for all fields.

Keywords: Radiotherapy, Simulation, Stereotactic Radiosurgery, Monte Carlo

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O10: The Effect of Flattening Filter Removing on Radiosurgery Small Field Sizes Penumbra

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Abstract

In stereotactic radiosurgery, a narrow beam penumbra is often desired for producing steep dose fall-off between the target volume and adjacent critical structures. Therefore the penumbral width should be diminished to achieving a steep dose gradient. In this work the Varian Clinac 2100 linear accelerator equipped with in-house designed radiosurgical collimator was modeled for using the Monte Carlo BEAMnrc simulations and compared with the measurements. The 0.015 cm3 PinPoint chamber was used to measure the 6 MV photon beam characteristics and to benchmark Monte Carlo calculations. The effects of removing flatting filter on radiological penumbra were evaluated at 5cm depth in water for the small radiosurgery field sizes.

The 80-20% beam penumbra for the flattening filter free (FFF) linac was 4.28%, 5.8%, 7.16 and 3.46% smaller than standard linac for above field sizes respectively. It was found that the beam penumbra of small field sizes is decreased when FFF linac is used.

Keywords: Small field, Penumbra, Flatting filter, Monte Carlo

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O11: Increasing Active Tumor Targeting with 177Lu

Using Manganese Ferrite Nanoparticles

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Abstract

Active targeting is usually achieved by conjugating to the nanoparticle with a targeting component to provide preferential accumulation of nanoparticles in the tumor. We synthesized 177Lu-manganese ferrite nanoparticles(Lu-MFNs) and determined all the invitro charachteristics before. Now, the accumulation of Lu-MFNs in the mice with and without of an external magnetic field was considered.

Biodistribution study was performed in female mice(n=24). Before injection of Lu-MFNs, an external magnetic field(magnetic flux density:0.6 T) was positioned on the region of the tumor and it would persist in existence for 72 h. The mice were killed at 24, 48 and 72 h post-injection, tissues were removed and counted for 177Lu activities and iron concentration. This procedure was repeated without external magnetic field.

The results showed that Lu-MFNs accumulated in the tumor site more than other organs under the external magnetic field and the distribution of Lu-MFNs nanoparticles was different with and without using magnetic field. This results accented that Lu-MFNs nanoparticles may be considered for targeted cancer therapy that needs more investigations.

Keywords: manganese ferrite, 177Lutetium, biodistribution, drug delivery, targeted cancer

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O12: Optimization of 3D Planning Dosimetric in Breast Phantom for Match Region of Supraclavicular and Tangential Fields

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Abstract

Complexity of geometry breast and lung inhomogeneity in PTV causes perturbation in dose distribution. This problem can beget overdose or underdose in match region. The purpose of this study is to create dose homogeneity distribution in match region between SCF and tangential fields and utilizing Gafchromic EBT film dosimetry. In this study a slab phantom was designed with cork lung and heart part.Our measurements were carried out by Gafchromic EBT film Exposures were performed with Varian 2100 Clinac linear accelerator using 6MV photon beam and Rt dose plan software for three Dimensional (3D) calculations. Conventional method with SSD match and 3D method match combination of parameters such as gantry, collimator couch rotation, asymmetric fields were utilized. The results demonstrated differences between 3D and Conventional techniques. In asymmetric fields we had much better results in match region isocenters. asymmetric fields we had much better results in match region (i.e. maximum amount 0.43 cm2 area overlap, 3.55 cm depth overlap and an average width overlap of 0.75 cm was achieved). This study revealed that EBT film is a proper tool for 2D distribution dosimetry. The study shows difficulties to achieve homogenous dose in match region and difference between effects of alignment parameter in matching treatment fields.

Keywords: EBT film dosimetry, breast radiotherapy, dose inhomogenity, match region.

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O13: Development of a Method to Reduce Patient Positioning Errors During Prostate Cancer Treatment

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Abstract

Image Guided Radiation Therapy (IGRT) can be utilized in clinical trials to verify target positioning during treatment. Two- or three- dimensional images help to find un-predicted target displacements. Several methods are reported so far, to compare CT-CT images acquired during treatment planning and during treatment respectively.

CT images from several anonimous patients, involved with prostate cancer, were evaluated. Several CT slices, where PTV region observed, were selected as reference CT images. In order to produce modified images, the reference CT images were manipulated in transitional direction from 1 pixel to 5 pixels as well as an axial rotation was performed from 1 to 5 degrees. The difference in transition as well as the difference in rotation of the prostate body was evaluated through edge detection algorithms using an in-house code written in MATLAB.

Results of the current study show that 1 pixel difference in transition and 1 degree difference in rotation can be recognized provided that the prostate region is clear in CT images. Although, in some cases due to the lower contrast between prosate and bordering tissues the prostate region cannot be easily delineated, a significant variation was observed at the bony-soft tissue and air-soft tissue conjunction regions. The results obtained from the current study are comparable with those reported for Chamfer algorithm.

It is concluded that the current method, can be used to control patient positioning during radiotherapy sessions as a part of Image Guided Radiotherapy protocols.

Keywords: IGRT, Prostate cancer, Edge detection algorithms, MATLAB

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O14: Portal Dosimetry an Essential Stage for Adaptive Radiotherapy

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Abstract

Electronic Portal Imaging Devices (EPIDs) have been routinely developed for patient set-up verification and evaluation of organ motion during treatment. Another application for EPID is the application of Electronic Portal Images (EPIs) to verify the dose delivered during a treatment. A review in current Literature indicates that several approaches developed to use the EPID for dosimetric tasks. However, EPID calibration should be applied. Currently, only few departments employ dosimetric EPID methods in clinical activities as a routine task. The use of a scanning liquid ionization chamber electronic portal imaging device (SLIC-EPID) and an amorphous silicon EPID (aSi-EPID) for two-dimensional transmitted dosimetry were investigated and an empirical a calibration method was developed using a calibrated ionization chamber and extended dose range (EDR2) film.

In order to convert pixel value to dose, the acquired SLIC-EPID pixel values were calibrated using an ionization chamber on the central axis. For the aSi-EPID, a developed commercial software was used. The relationship between pixel values, dose rate and absorbed dose was identified for various linac output repetition rates. The transmitted dose distributions in the EPID detector layer were also modelled using a Pinnacle3 treatment planning system (TPS: Philips Radiation Oncology Systems, Milpitas, CA).

Typical MLC fields defined for prostate sIMRT were applied. The prostate treatment, used in this study, consisted

of five fields. Each field consisted of several segments/subfields (around 9–12 subfields per field). An anthropomorphic phantom was used for prostate sIMRT delivery and EPI acquisition. In addition, a typical sIMRT MLC sequence file for a head and neck treatment and an anthropomorphic Rando phantom were used. The head and neck sIMRT treatment also consisted of 5 fields. The minimum and maximum numbers of subfields used in the current study were 10 and 18.

The dose distributions measured using the SLIC–EPID and a-Si EPID were then compared with those calculated in the modelled EPID for each segment/subfield and also for the corresponding total fields using a gamma function algorithm with a distance to agreement and dose difference criteria of 2.54mm/ 3mm and 3%, respectively. Our results indicate that the calibration procedure proposed in the present study should be performed if SLIC-EPID is to be used as a reliable two-dimensional transmitted dosimeter for clinical purposes.

In conclusion, for two-dimensional dosimetric purposes, EPIDs must be calibrated using appropriate two-dimensional correction factors and (b) SLIC-EPIDs can be used to measure the transmitted dose with good accuracy which is a good approach for Adaptive Radiotherapy.

Keywords: EPID, Dosimetry, IMRT, Adaptive Radiotherapy

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O15: Development and Validation of a Monte Carlo Model of a Kilovoltage X-Ray Therapy Unit for Chest-Wall Irradiation

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Abstract

Purpose: Given the high local control rates observed in breast cancer patients undergoing chest-wall irradiation by kilovoltage x-rays, we aimed to revisit this treatment modality by accurate calculation of dose distributions using Monte Carlo simulation. We report on the development of a Monte Carlo model of the Siemens Stabilipan kilovoltage unit and its validation using various experimental measurements for chest wall irradiation.

Methods: The machine components including the housing, anode, filter, collimators, etc were simulated using the MCNP4C code. To validate the 120 kVp beam model, the 1st and 2nd half-value layers (HVLs) were first measured using high-purity Al foils and an ion chamber. The percentage depth doses (PDDs) and off-axis beam profiles (depths 2 and 5 cm) for beams normally incident on a water phantom were also measured using diode and ion chamber dosimeters. Finally, dose measurements were performed for a realistic situation of oblique incidence on the chest wall using 10 thermoluminescence dosimeters (TLDs) placed within the chest wall, heart and lung of an inhomogeneous Rando phantom. The results of the experimental measurements and MCNP simulations were then compared.

Results: The 1st and 2nd HVLs were 3.8 and 10.3 mmAl respectively, which were in close agreement with the values obtained by MCNP (3.8 and 10.6 mmAl). The differences between the measured and calculated PDDs and beam profiles in water were less than 2mm/2% for all data points. MCNP-calculated relative doses agreed with TLD measurements in the Rando phantom to within 4.5% of the prescription dose, the differences for majority of the data points being within 2%.

Conclusions: The acceptable agreement between the results of the simulations and the measurements validate the accuracy of the MCNP model for use in treatment planning studies of chest-wall irradiation using this kilovoltage beam.

Keywords: Monte Carlo modeling, Chest wall irradiation, TLD dosimetry

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O16: National Audit for Treatment Planning Systems in Iran

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Abstract

The purpose is to evaluate and verify current situation of radiation therapy treatment planning (TPS) process for external high-energy photon beams in radiotherapy centers in Iran. This is a part of an ongoing audit that will cover all the radiotherapy centers. Eight test cases of IAEA test package based on TRS 430 were planned on TPS using an IMRT thorax phantom and were measured with ion chamber. So far this methodology was tested in 8 different hospitals /linacs. The total number of 32 clinical test case data sets for different energies and calculation algorithms were produced. Dose differences up to 15% were discovered for some of the simple algorithms and high energy X-ray beams. The origin of systematic errors was analyzed and the source of the problems resolved after few repetitions. This work is an ongoing project to evaluate accuracy of treatment planning chain in radiotherapy centers to deliver treatments with less uncertainty and possibility of accidental exposure

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O17: A New Verification Phantom for GYN Brachytherapy Applicators

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Abstract

The purpose of this project was to use a new phantom for dosimetric verification in the vicinity of source applicators in gynecology brachytherapy.

A new phantom has been designed and fabricated from 90 slabs of 18x16x0.2 cm3 Perspex. Gafchromic films were chosen to be placed between thin perspex slabs for 3D dosimetry. Films were calibrated against external Cobalt 60 source for a dose range of 0.25 to 8 Gy. Two ovoid (3cm diameter) and one tandem applicators were selected for after-loading cobalt-60 HDR source from GZP6 brachytherapy system. After setup films were planned for a dose of 5 Gy to the anatomical points of "A". After irradiation films were scanned to obtain isodose lines. Dose distribution curves were compared between planning and film dosimetry data.

Result shows an excellent (within ±3%) agreement between dosimetry and planning. New phantom enabled us to confirm the accuracy of radiation delivery to the GYN patients and it can be a convenient tool for verification as well as training in Gynocologic brachytherapy.

Keywords: GYN brachytherapy phantom, dose gradient, film dosimetry

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O18: Results Following Gamma Knife Radiosurgical

Anterior Capsulotomies for Obsessive Compulsive Disorder.

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Abstract

Background: Obsessive compulsive disorder (OCD), in its severe form, can cause tremendous disability for affected patients.

Objective: To evaluate the results following bilateral radiosurgical anterior capsulotomy for severe medically refractory OCD.

Methods: We performed gamma knife anterior capsulotomy (GKAC) on 3 patients with extreme, medically intractable OCD. According to our protocol, all patients were evaluated by at least 2 psychiatrists who recommended surgery. The patient had to request the procedure, and had to have severe OCD according to the Yale-Brown Obsessive Compulsive Scale (YBOCS). Patient ages were 37, 55, and 40 years, and pre-radiosurgery YBOCS scores were 34/40, 39/40, and 39/40. Bilateral lesions were created with 2 4-mm isocenters to create an oval volume in the ventral internal capsule at the putaminal midpoint. A maximum dose of 140 or 150 Gy was used.

Results: There was no morbidity after the procedure, and all patients returned immediately to baseline function. All patients noted significant functional improvements, and reduction in OCD behavior. Follow-up was at 55, 42, and 28 months. The first patient reduced her YBOCS score from 34 to 24. One patient with compulsive skin picking and an open wound had later healing of the chronic wound and a reduction in the YBOCS score from 39 to 8. At 28 months, the third patient is living and working independently, and her YBOCS score is 18.

Conclusion: Within a strict protocol, gamma knife radiosurgery provided improvement of OCD behavior with no adverse effects. This technique should be evaluated further in patients with severe and disabling behavioral disorders

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O19: Production of 175Yb and Labeling by NHS-DTPA-Bevacizumab for Lung Cancer Treatment

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Abstract

The preparation of 175Yb-NHS-DTPA-Bevacizumab is described for possible use as an agent treatment of lung cancer. 175Yb was produced by thermal neutron irradiation of ytterbium-174 target at a flux of approximately 3×1013 n/cm2/s for 7 days. Specific activity of 38 mCi/mg and high radionuclide purity were obtained. NHS-DTPA-Bevacizumab could be labeled with 175Yb in high radiochemical purity (>90%) using 7cc of NHS-DTPA-Bevacizumab at pH 7-8. The complex was found to retain its stability at Room temperature even after 7 days. Biodistribution studies of the complex carried out in Wistar rats showed significant lung uptake at 2 h post-injection, rapid

clearance from blood and minimum uptake in soft tissues. These studies suggest that 175Yb complexes with the NHS-DTPA-Bevacizumab have potential for use in treatment of lung cancer.

Keywords: Lung cancer, Treatment, 175Yb, Bevacizumab.

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P1: Flatness, Symmetry and Penumbra Changes Due to Field Shaping Shields

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Abstract

As we know, the field shaping shields making some changes and effects on LINAC electron output parameters like: PDD, Output, Flatness and Symmetry. These changes in lateral scatter non-equilibrium condition are very significant. We have surveyed the effect of Cerrobend shields (cut-outs) for 14MeV electrons.

The LINAC machine is Siemens Primus and we have used Circle, Triangular, Quadrangular shapes and 5PCs cut-out size for each shape. Measurements has done in 50X50 water phantom at 100cm SSD condition by using Plate Parallel ion chamber. The applicator field is 10X10cm. Also the computation software was Mephysto mc2.

For 100% profile, the symmetry for circle and square approximately was constant (max 1% change). Due to the form of triangle, its symmetry increased and then decreased (max change was 112%).

The flatness for all shapes decreased while field size increased. Maximum changes belonging to triangle (118% for 4 cm and 5.4 cm field width).

Total penumbra at two side of 100% profile divided by field width and named as Penumbra Ratio. As the field width decreased, Penumbra Ratio is decreased. The maximum penumbra ratio is belonging to square with 2.6cm field width. Triangle has lesser penumbra ratio, in comparison with circle and square.

The reason of lesser penumbra for triangle is come from here: because geometric center of the triangle was on the central axis of the beam. Center of the triangle is the intersection of the medians that closer to the base of triangle, so due to the lesser distance between the central axis and the base, lesser penumbra will be produced. On the other hand, the base of triangle has more side width which decreases the penumbra.

Keywords: field shaping shields, Flatness, Symmetry, penumbra

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P2: Comparison of the Dose Distribution Curves of Cs-139, I-125 and Pd-103 Radioactive Sources Using in Prostate Brachytherapy.

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Abstract

Placing radioactive seeds within the prostate gland is one of the ways for controlling and treats prostate cancer. In this way, cancer cells are receiving a lot of radiation, so they wil be destroyed by radiation dose. Note that this method is important is that the irradiation of cancer cells should. The main point in this method is exposure of cancer cells in a short period till to eliminated them. In this article, we have compared the dose distribution curve of three radioactive sources (Cs-139 ، I-125and Pd-103) that use for prostate berachytherapy.

Keywords: Brachytherapy, Prostate cancer, dose distribution.

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P3: Study of Caesium-137 Intake by Using Two-Compartmental Model

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Abstract

Caesium-137 is one of the fission products that usually release to environment (soil, air and water) after nuclear accidents. According to IAEA reports, total release of Cs-137 in Fukushima accident was in an order of 1016 Bq (one-tenths of Chernobyl release). This contamination will remain in the environment for long times due to long half life of Cs-137 (30 years) Cs-137 can easily enter to food chain of human. Caesium and Potassium are chemically similar and in some respect are metabolized in the same way, therefore the caesium distributes homogeneously within the body after absorption by human body. In this study, the two-compartmental model was implemented to describe the path way of caesium distribution in body by using a differential equations system. The model is included two compartments, the first compartment is the blood and the second one is other tissues. The caesium activity in blood and other tissues was obtained by using analytical and numerical methods by considering food activity as input of equations. Also, transfer coefficients of the different tissues were obtained by solving the differential equations and ICRP-54 data. The transfer coefficients are in a very good consistency to the COMKAT software code results with the absolute difference in an order of 5.5X10-6.

Keywords: Caesium-137, Contamination, Two-compartmental model, Transfer factors, Analytical and numerical methods

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P4: Determination of the Equivalent Standard Fields for Rectangular Treatment Fields in Electron Beam Therapy

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Abstract

Background: Aim of this research is calculating the electron equivalent field

Methods: in this theoretical research, the electron lateral spread equation that have been predicted by Eges,have been modified and by means of equaling dose distribution equation of electron fields with different shape,dimension of equivalent field have been calculated.

Result: The dimensions of rectangular equivalent field have been calculated and tabulated for electron beam 6,9,12 and 15 Mev.

Conclusion: The computational results have been showed that broad fields have had same equivalent field and the dimensions of circular equivalent field is in good agreement with khan equation.

Keywords: equivalent field-dose distribution-electron-lateral spread

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P5: Radioimmunotherapy with Radioactive Gold Nanoparticles Functionalized with Gum Arabic Glycoprotein in Liver Cancer Therapy

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Abstract

The therapeutic property of radioactive gold 198-Au (βmax=0.96 MeV, t1/2=2.7 days) and target specific biomolecule to form a powerful radiopharmaceutical for targeted drug delivery. The pharmacokinetics and biodistribution studies of gum arabic (glycol protein) coated 198- gold nanoparticles in mice showed >80% uptake in liver with minimal accumulation in blood and other organs. In this paper we have modeled tumor and distribution of GA-198 gold nanoparticles with Monte Carlo simulation and we have calculated dose delivered throughout a solid tumor when the GA-198 gold nanoparticles linked to each cell. Gum arabic glycoprotein functionalized gold nanoparticles (AuNPs) possess optimized sizes (12- 18 nm core diameter and 85 nm hydrodynamic diameter) to target individual tumor cells. We simulate surface distribution to receive doses of up to 50Gy. Activities and absorbed doses by the tumors with 0.25cm and 0.5cm radius were 72 and 118 Gy and 187.9mCi and 300mCi respectively.

Keywords: radioimmunotherapy, radioactive nanoparticle, gum arabic, dose, Monte Carlo

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P6: Proton Radiotherapy

Arjomandy B

Abstract

In the past several decay since the first patient treated with proton beam in California, the proton therapy has become more popular modality as clinical data unfolds its advantages over conventional radiotherapy in tumor control. The proton beams have distinct characteristics that make them very unique compare to other modalities, which are used in radiotherapy. Optimal dose distribution is achievable with spot scanning and the intensity modulated proton radiotherapy, which in many cases by far superior to conventional radiotherapy. Substantial normal tissue sparing is achievable by using proton radiotherapy. For example, in treating posterior fossa and spine, the dose is reduced from 101.2% to 33.4% and to 2.4% to cochlea and from 72.2% to 29.5% and to 0.5% to heart for conventional X-ray, IMRT, and proton radiotherapy respectively

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P7: Evaluation of the Effect of Abdomen Thickness on Estimating Fetal Dose During Radiotherapy

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Abstract

In radiotherapy of pregnant patients, knowledge of the peripheral dose (PD) is necessary in order to estimate the fetal dose. The recommended reference depth for fetal dose measurement is 10 cm. However, the effect of increase in abdomen thickness (Abd-thick) on PD has not been considered. In this study the effect of Abd-thick on PD dis-

tribution was investigated. Measurements were done using the followings: 10MV photon, 30×30 cm2 field size, diodes, anthropomorphic phantoms, and an automatic water phantom as abdomen. The water level elevation relative to isocenter indicated the Abd-thick. The followings were measured using different water levels: 1- change in PD as a function of depth (PDD curves) at two distances from the field's edge and parallel to the beam's central axis, and 2- change in PD as a function of distance at selected depths and normal to the beam's central axis (profiles). Our results show an increase in PDD at small distances as Abd-thick increases. However, PD profiles do not show such dependency. It is concluded that measuring PD at the recommended reference depth (10 cm), without taking into account the Abd-thick, will not represent the max fetal dose.

Keywords: peripheral dose, fetus, pregnancy, radiotherapy

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P8: Dosimetry and Evaluation of Modified COMS Plaque for I-125 New Seed in Ocular Melanoma Brachytherapy

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Abstract

Plaque Radiotherapy using I-125 seed has become an established method for the treatment of ocular melanoma. Radioactive seeds are fixed in a plaque and the plaque is sutured to the sclera surface corresponding to the base of the intraocular tumor. The aim of this study is dosimetry of COMS plaque for I-125 new seeds in ocular melanoma Brachytherapy. In order to measure the absorbed dose within eye ball, a spherical resin acrylic phantom was designed. Three I-125 new seeds (IRseed) were used in the center of a 20 mm modified COMS plaque and a Gafchromic EBT film was used for dosimetry. The results of dosimetry for 2, 4, 6, 8, 10 and 12 mm along central axis from plaque surface, were 1.92, 0.663, 0.484, 3.04, 0.209, and 0.130 cGy/h, respectively. The results yielded by this work have a good agreement with results of Knutsen (8% difference on average). Therefore, it can be said that this modified plaque accompanied by this new seeds have potential of utilization in clinical purposes.

Keywords: Brachytherapy, Ocular melanoma, I-125 IRseed 2, COMS Plaque, Gafchromic EBT Film

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P9: Impact Assessment of Scattering Tissues Around Eye Ball in Brachytherapy of Eye Tumors

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Abstract

Factors such as radiation scattering from adjacent tissues of eye ball and plaque itself, can change dose distribution within tumor volume in radiotherapy of eye tumors with plaque. The aim of this study is impact assessment of scattering media around eye ball on absorbed dose along central axis of plaque. For doing this, a spherical resin

acrylic phantom was designed and for evaluation of scattering media effects a cubic phantom was applied. Three I-125 new seeds (IRseed2) were used in center of a modified COMS plaque. For dosimetry a Gafchromic EBT film was used. Dose rate was measured in the interval of 0.6 to 12 mm along central axis of plaque. The results showed that dose rate reduction ranges from 3% at 4 mm to 10% at 12 mm. therefore, the effect of scattering media in far distances from plaque is severer and there is no significant effect in closer distances. Regarding the increase in scatter volume and decrease in distance effect, it can be said that our results are reasonable.

Keywords: Brachytherapy, Eye Tumors, COMS plaque, Gafchromic EBT Film, I-125 IRseed2

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P10: Using the Eye Globe Instead of Water Phantom in Simulation of Ophthalmic Brachytherapy for Better Protection of Healthy Tissues

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Abstract

For better clinical analysis in ophthalmic brachytherapy dosimetry, there is a need for the dose determination in different parts of the eye, so simulating the eye and defining the material of any parts of that, is helpful for better investigating dosimetry in human eye. However in brachytherapy dosimetry, it is common to consider the water phantom as human eye globe. In this work, a full human eye is simulated with MCNP-4C code by considering all parts of the eye like; lens, cornea, retina, choroid, sclera, anterior chamber, optic nerve, bulk of the eye comprising vitreous body and tumour. The average dose in different parts of this full model of human eye is determined and the results are compared with the dose calculated in water phantom. The central axes depth dose and the dose in whole of the tumour for these two simulated eye model are calculated too, and the results are compared. At long last, as the aim of this work is comparing the result of investigating dosimetry between two water phantom as human eye and simulated eye globe, the ratios of the absorbed dose by the healthy tissues to the absorbed dose by the tumour are calculated in these simulations and the comparison between results is done eventually.

Keywords: MCNP-4C code, Dose calculation, Human eye, Brachytherapy, Tumour

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P11: Dynamic Wedge Preferences in Chest Wall Irradiation Technique

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Abstract

In this study the dosimetric parameters, advantages and disadvantages of physical and dynamic wedges were evaluated for two tangential opposed beams in chest wall radiotherapy.The monitor units of two opposed tangential 6MV photon beams were obtained for 300 physical and dynamic wedges. The EDR-2 films were sandwiched between layers of thorax IMRT slab phantom for each irradiation technique. Two dimensional dose distribution, beam profile and depth doses were derived using film dosimetry. Acceptance limits of 3mm and 4% were considered for distance to agreement and dose difference, respectively. Results: Findings showed acceptable agreement between dosimetric parameters of physical and dynamic wedges for chest wall irradiation technique. The mean of dose dif-

ferences between isodoses of physical and dynamic wedge was 2.19±0.96 % distance to agreement for penumbra region of beam profile in heal region of wedge was 0.8± 0.38 mm and in toe region of wedge was 0.68± 0.05, which are in the acceptance limits. Owing to the fact that wedge factor for dynamic wedge is almost one, the required MU to produce similar dose distribution using dynamic wedge is less than physical wedge. Therefore, according to our findings and potential benefits of dynamic wedges; in wedged techniques use of dynamic wedge is recommended specially for treatment planning systems that they don't consider the beam hardening and/or softening effects of physical wedges in their calculation algorithms

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P12: Evaluation Effect of Gold Nanoparticles (GNP) on Dose Enhancement in Radiotherapy (a Monte Carlo Study)

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Abstract

In the current study, dose enhancement effect of gold nanoparticles in tumor cells was evaluated using Monte Carlo (MC) simulation. A water phantom consisted of a tumor region loaded with gold nanoparticles with the size of 1-100 nm were simulated. Also, we simulated three radiation sources including a kilovoltage x-ray unit (energies from 20-200 keV), Cobalt-60 unit and 9 MV photon beam. After loading GNPs on tumor cells, they were irradiated and then tumor dose was calculated in a nano-scaled matrix. The major finding of this MC study was that the dose enhancement factor was seen for GNP loaded tumor cells and the macroscopic tumor dose enhancement was dependent on gold nanoparticle concentration within the tumor cells, size of the GNPs and the photon beam quality.

Keywords: Gold nanoparticle (GNP), Monte Carlo method, Dose enhancement factor

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P13: Light Element of Tissue Analysis System by Use of Neutron Activation Analysis (NAA) and Study Simulation with MCNP Code

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Abstract

Neutron activation analysis is effective methode in element analysis of matter. because the gamma ray in activation has enough energy for detection. There is light elements in every tissue. to study light elements distribution in different region of solid sample(body human) or fluids is competent method. and can earn operational parameter it be warranted for researchers. In this study, The system was designed and all components of system like collimator/ moderator/opening collimator length of collimator/detectors/distance source form sample and effect of source energy was explained and optimal point was earn. The optimization system was producted with simulation and examined conclusion by use of point detector (tally F5).

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P14: Introducing Neutron Source for Testing in BNCT and Creating Neutron Beam in 1keV Energy

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Abstract

This study Am- Be source is used as a neutron source with using substances such as Alumina oxide and graphite as moderator and cadmium and titanium as the absorbent material, filter is designed. Neutron filter passes neutron with energy 1keV that can be used in the BNCT experiments. According to data obtained from the implementation MCNP4C code, a peak is obtained in energy 1keV that indicate area under the flux 2.22E-05 n/cm2.s with error 0.0065 for a neutron. Flux obtained can be multiplied at the Am-Be source of power that is equal 108n/cm2.s until the total flux to be achieved. The total flux is obtained 2.22E+03n/cm2.s. Since the flux required for the BNCT experiments is 5*108n/cm2.s with using more Am-Be source (at least 3 Source) simultaneously and designing suitable reflector, this neutron flux will provide. In this study with using MCNP4C code, source and designed filter have been simulated.

Keywords: BNCT, Am-Be source, neutron filter, moderator and absorbent materials, MCNP4C code

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P15: The in Homogeneity Effect of Trachea on Dose Distribution in Esophageal HDR Barchytherapy

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Abstract

Dose calculation in HDR Brachytherapy esophageal treatment planning system (TPS) is based on AAPM-TG43 protocol in which all materials are considered to be water equivalent. The aim of this study is to assess the air effect in the trachea on dose calculation. We used a PMMA phantom consisting of two tubes for simulating esophagus at center and trachea at distance of 24 mm from center of phantom. Different sizes of esophageal brachytherapy applicators were inserted into esophageal tube and EDR2 films were placed for dosimetry at anterior and posterior walls of trachea mimicking tube. Differences between measurement and TPS results at different places were 5% and 10%, respectively ($p<0.02$). Results show a significant difference between dosimetry and TPS calculation. In conclusion, missing tracheal heterogeneity effect on dose distribution in Flexiplan TPS can affect the accuracy of dose delivery in terms of tumor control probability.

Keywords: esophagus brachytherapy, trachea effect, attenuation, EDR2 film

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P16: Effects of Body Angle to Source Position on Whole

Body Dose by MCNP Modeling

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Abstract

Industrial Radiography is one the most high risk procedure using ionizing radiation to examine the structural integrity of material non-destructively. Since Radiographers work with open sources in open area, measuring whole body dose for them is essential. There is several techniques to measure absorbed dose such as film badge, TLD and electronic dosimeters. In this study MCNP modeling is used to measure whole body dose of an industrial radiographer who works with 192Ir radioisotope and for doing the correct and right calculation, body angle related to source position has been considered. Evaluation was performed for 0 to 360 degrees. The study shows that the max absorbed dose is not received at zero degree which could be the result of some parameters mainly organs asymmetry and different tissue weighting factors.

Keywords: Industrial Radiography, Tissue Weighting Factor, body angle, whole body dose

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P17: A Dosimetric Comparison of Various 3-Dimensional Conformal Techniques for Parotid Cancer in Radiation Therapy.

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Abstract

The parotid gland tumors account for 1-3% of the head&neck malignancies. The general management includes excision followed by radiation therapy for unfavorable prognostic factors. In this work, the dosimetric characteristics of 4 different treatment techniques for unilateral treatment of parotid gland tumors were compared.

After careful contouring of the parotid and other critical organs such as spinal cord, in CT images of the patients by radiation oncologist, 4 techniques were applied using Treatment Planning System as follows: 1) An ipsilateral wedge pair technique using 6MV photons. 2) A 3-field AP(wedged) PA(wedged) and lateral portal technique using 6MV photons. 3) A mixed lateral beam technique using 6MV photons and 12 MeV electrons (1:4 weighting for photons:electrons). 4) A mixed lateral beam technique using 6MV photons and 16 MeV electrons (1:4 weighting for photons:electrons). These techniques are taken from reliable references. For comparison of these techniques, the same dose (60 Gy in 30 fractions) is prescribed and then the absorbed dose of parotid and other organs were compared.

The average dose (cGy) of various organs for techniques 1,2,3,4 were respectively: 5670,5890,5680,5830 for involved parotid, 57,1044,1460,1550 for contralateral (normal) parotid, and 1518,641,678,814 for spinal cord. The hot spots were almost similar in all techniques.

All techniques produced acceptable results, however in terms of more dose to involved parotid, and less doss to the spinal cord, the best technique was technique 2. In term of the less dose to the normal parotid, the technique 1 had better results, however this technique gave highest dose to the spinal cord.

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P18: Monte Carlo Simulation of 6 MV Photon Beam

From Siemens PRIMUS Linac

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Abstract

The Monte Carlo (MC) simulation of radiation transport is the most accurate method of calculating dose distributions and predicting other quantities of interest in radiation therapy. For a photon beam produced by a medical linear accelerator the primary radiation source is the electron beam with unknown parameters that impinges on the target. The fundamental step in Monte Carlo simulations is the commissioning process. The aim of this work was Monte Carlo simulation of Siemens PRIMUS linac in 6 MVphoton and comparing the measured and calculated data for validating of simulated model.

The 6MV photon beam of Siemens PRIMUS linac was simulated based on manufacturers provided information using the BEAMnrc Monte Carlo code. Central axis depth-dose curves and dose profiles of the 6MV photon beam were measured experimentally and also calculated with the DOSXYZnrc MC code for the reference field size (10×10 cm2) at 100 cm SSD.

For all the simulations, the energy cut-off for the particle transport was set at ECUT=0.521 MeV and PCUT=0.010 MeV. In order to validate the simulated model, the percent depth ose (PDD) and dose-profile values calculated with the MC were compared with those measured experimentally with water phantom.

Our results showed that the relative absorbed dose values calculated by the MC code matched well with the measured values and the difference less than 2% was observed. These results were acceptable according to the recommended criteria.

Considering the excellent agreement noted between the calculated and measured results in this study, it can be concluded the simulated linac machine and its associated data can be used to predict the dose distribution in other fields and conditions.

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P19: Evaluation of Dose Distributions Within Target Volume and Organs at Risk (OARs) in Radiotherapy of Lower Esophageal Cancers Using a 3D Treatment Planning System

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Abstract

The goal of radiotherapy is to maximize radiation dose to the tumor while keeping the dose to the surrounding normal tissues, especially organs at risk (OARs) below their respective tolerance doses. Thus, radiation dose distributions should be designed conforming to the entire lesion while sparing the normal tissues. Three-dimensional (3D) treatment planning systems have been demonstrated to improve tumor targeting and to reduce normal tissue

volume exposed. The purpose of our study was to evaluation dose distributions within target volume and organs at risk (OARs) in 3D radiotherapy of abdominal and lower thoracic esophageal regions.

A total of 17 patients (7 females and 10 males) of mean age 60.77±11.03 years were included in this study. All patients were examined with a 6-row spiral CT-scanner. After the acquisition of the CT, the images of CTs were transferred to a radiotherapy 3D treatment planning system (CorePLAN version 3.5) via DICOM format. Three 6 MV photon beams were designed and dose distribution analysis was edited to provide the best dose coverage to the planning target volume (PTV) while sparing OARs, especially spinal cord region using dose volume histograms (DVHs) of outlined structures. For all patients, the prescribed dose was 70 Gy at 2 Gy per fraction. Thus, the requirement Monitor units to deliver 200 cGy doses per fraction were calculated and dose of PTV and spinal cord as an OAR were evaluated. The gantry angles for each beam arrangement were 0o, 120o and 240o.

The results showed that the mean and standard deviation of doses to PTV and spinal cord calculated from treatment planning system were (59.27±3.32) and (33.77±2.24) respectively. The three beam plans were acceptable as their doses to spinal cord were lower than the tolerable dose 45 Gy. This study confirms that 3D radiotherapy is more effective in decreasing dose to normal tissue without compromising dose distribution.

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P20: Dose Calculation of Some Eye Plaques Using Eye Melanoma Treatment: A Monte Carlo Simulation

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Abstract

Ophthalmic plaque radiotherapy using I-125 radioactive seeds in removable episcleral plaques is often used in management of ophthalmic tumors. The goal of this study was to develop a Monte Carlo simulation method for treatment planning optimization of eye plaques. MCNP4C Monte Carlo Code was used to calculate the percent depth dose curves, dose profiles and isodose curves created by three different plaques. The plaques used were Collaborative Ocular Melanoma Study-12mm (COMS-12mm) with eight model 6702 seeds, COMS-20mm with three model 6711 seeds, and University of Southern California (USC) #9 with nine model 6711 seeds. Dosimetric characteristics of I-125 model 6702 and 671 seeds, were calculated according to recommendations of AAPM Task Group 43 protocol.

Then, the geometry of each plaque was simulated and dose calculations were performed using F6 tally card in a 12mm radius spherical water phantom. The comparison of calculated central axis depth doses to reported measured values, showed the deviation up to %10 for COMS- 12mm, %3 for COMS-20mm and %1 for USC#9. For off-axis dose profiles the deviation was up to %9 for COMS-12mm, at 7mm depth, %6 for COMS-20mm at 10mm depth and %1 for USC#9 at 17 mm depth.

Keywords: monte carlo, MCNP4C, eye plaque, COMS, Usc#9

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P21: A Geometrical Approach for Determination of Effective Source to Surface Distance in Electron Beam Therapy

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Abstract

Background: All types of treatment planning systems need some input measured beam data. Source to surface distance (SSD) is one of the important basic parameters to be used in both beam dosimetry and treatment planning. Treatment with electron beams at extended SSD can lead to uncertainties in the absolute dose delivered compared to treatment at nominal SSD (100cm).For correcting treatment planning parameters one can use the concept of effective source to surface distance (SSDeff).

Methods: In this study the SSDeff are evaluated for electron beams in the energy range 6-15 Mev and applicator size range from 6×6 to 25×25 cm2. A geometrical method using by isodose curves from dosimetry data is proposed to calculate SSDeff of a 2100c Varian linac.Output measurements were carried out using a 0.13cc ion chamber in scantronix water phantom.

Result: By Comparing results with those obtained by inverse slope method introduced by Khan et al. it was found that the deviation of SSDeff less than 2% for 6-15 Mev energy and 6×6 to 25×25cm2 applicator field sizes.

Conclusion: By this method one can determine the effective sourse to surface distance with better accuracy and estimate commissioning between dosimetry data and treatment planning index.

Keywords: effective source to surface distance, electron therapy, linear accelerator,dosimetry

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P22: Review on Fast Neutron Therapy

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Abstract

This study reviews neutron applications in therapy. Applications of neutrons have a long history in nuclear medicine and different therapy centers have started fast neutron treatment since 1976. This treatment is now routinely performed. The clinical results of fast neutron therapy have been shown that fast neutrons have many advantages as compared to other radiations for some cancers and tumors. Inoperable salivary gland tumors, paranasal sinuses, advanced squamous cell carcinomas of the head and neck, advanced prostate cancer, soft tissue sarcomas, melanomas and brain tumors are cases that treatments by fast neutrons were superior over usual low LET radiation. Since these tumors are resistant to low LET radiations. Furthermore, neutron brachytherapy is an effective treatment for cervix, prostate, skin and breast cancers and more suitable than radiotherapy for cervix ¬and prostate cancers using a californium-252 neutron source brachytherapy.

The required dose to kill the same number of cancerous cells by neutrons is about one third in comparison with photons. Clinical reports indicate that a full course of treatment with neutrons consists of 12 treatment sessions, three times a week for four weeks, compared to 30-40 treatments, five times a week for six weeks with photons or electrons.

The side effects for fast neutron treatment were similar to those of low LET treatment depending on the total dose transferred and the general health of the patients. Most of the more serious side effects are temporary and normal tissue recovery finally occurs. Fast neutron treatment in comparison with photon treatment has fewer local symptoms such as pain or bleeding.

Keywords: Fast Neutron therapy, Low LET radiation, 252Cf neutron source, Neutron applications

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P23: Monte Carlo and Dosimetric Evaluation of the Eye Shields Used in Electron Beam Treatment

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Abstract

When electron therapy is used to treat eyes tumor, in order to protect the patient vision and eye critical structure, a thin layer of shield is applied during the treatment to shield underlying critical tissue such as lens. So much that it can nearly stop the entire incident electron on the shield. Back scattered electrons from shield are well known to enhance the dose at the tissue- shield interface in the upstream direction of beam. Nepton 10 PC accelerator was simulated for 6, 8 and 10 MeV electron beams. by EGSnrc/BEAMnrc. Doses were calculated in the water phantom by DOSXYZnrc.EBF, PDD was calculated for Ti, W, Pb and Cerrobend. Depth dose curves of four materials showed tungsten had lower dose in the 1mm depth and also lower EBF.

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P24: α-Particle Usage for Targeted Radiotherapy: a Review

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Abstract

Among a lot of radionuclides usable for tumor therapy, alpha-particle emitters are characterized by very high linear energy transfer (LET) resulting in a larger number of ionizations cell diameter scale. Therefore, they can determine a stronger therapeutic effect in comparison to low LET beta-particle emitters, producing ionization in range of many a few millimeters. The short range of α-emitters makes them powerful tools especially when a therapeutic effect has to be reached in a restricted area. Therapeutic efficacy of α-emitter radionuclides has been proven in meny pre-clinical studies, but until today only three main human studies are reported, including the treatment of myeloid leukemia by an anti-CD33 monoclonal antibody labeled by bismuth-213 (213Bi), the therapy of patients with bone metastases from hormone-refractory prostate cancer by radium-223 (223Ra) and the loco-regional targeted radiotherapy with astatine-211(211At)-labeled monoclonal antibody in patients with recurrent malignant brain tumours. This article, reviews these human reported studies, evaluating perspectives, advantages and limitations of the targeted α-particle therapy.

Keywords: Radionuclide therapy, Alpha-particle, Astatine-211, Bismuth-213, Radium-223

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P25: Simulation Shield for Accelerator Based BNCT by MCNP Code

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Abstract

Introduction: BNCT (Boron neutron capture therapy) of a tumor therapy using neutron radiation to the tumor site and in boron neutron capture cancer cells is entered into.

Methods: In this work, by using MCNP code a neutron source in the epithermal energy range for Boron neutron capture therapy (BNCT), is simulated. The main source of neutrons is a proton cyclotron. The neutrons are produced via Li(p,n)Be interaction and thermalized by using poly tetra Flour Ethylene (PTFE) and Aluminum Oxide.

Then the system using different materials, is designed to shield the lead and the best materials with a concrete type compounds have been selected.

Results: Neutron flux at the head of the equivalent dose is obtained and passed to shield workers from the device reaches the standard dose of cholera calculated are compared.

Conclusion: the simulation results are taken from the neutron flux for BNCT accelerator suitable shield system can also be designed.

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P26: Determination of the Dosimetric Characteristics of IrSeed ^{125}I Brachytherapy Source

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Abstract

Background: low dose rate brachytherapy sources have been used widely for interstitial implants in tumor sites, particularly the prostate. Dosimetric characteristics of IrSeed 125I (4.7 mm length) brachytherapy source have been determined using the LiF TLD chips. Materials and methods: Dose distributions around the IrSeed 125I source were measured in a Plexiglass phantom using TLD-100 LiF thermoluminescent dosimeters (LiF:Mg,Ti, TLD-100, Harshaw). In this work a PMMA slab phantom of dimensions 30 cm × 30 cm × 7.3 cm was used to measure the dose distribution around the sources. Results: The dose rate constant, Λ, was measured to be 0.965±0.06 cGyh-1U-1 using LiF TLDs in Plexiglass phantom. And the radial dose function, g(r), of the IrSeed 125I source was measured at 0.5 cm increments from 0.5 to 1 cm and 1 cm increments for distance between 1 cm to 7 cm using the LiF TLDs chips. Conclusion: Basically, the dosimetric parameters that have presented for this new source, have many clinical and treatment planning applications. (Times New Roman 12)

Keywords: 125I; Dosimetry; Brachytherapy; TLD; EBT radiochromic film

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P27: Investigation of Monte Carlo Code Accuracy for Computing Dosimetric Parameters Used in Treatment Planning System in Open and Wedged Fields

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Abstract

At the present, radiotherapy treatment planning systems (TPS) use determinist correlation based on measurement

in water to evaluate absolute doses and dose distributions in the volume of interest. Nevertheless, it is well known that doses assigned with this TPS can be problematic. The present work has developed a computation model using the Monte Carlo (MC) code MCNP4C for the simulation of 6 MV and 18 MV photon beam emitted by Varian 2100C/D medical linear accelerator. The MC model includes the spectrum of beam energies, the water phantom and 15,30,45 and 60 degree wedges in the wedges filed. Calculation were performed for photon beams setting 5Cm×5cm and 10cm×10cm open and wedged fileds at 100Cm source to surface distance (SSD). The MC simulation is able to predict the absorbed dose distribution within the water phantom using the *F8 tally. These results have been compared with experimental values. The difference between calculation and measured have data have been obtained on dose difference (DD) in low dose gradient region and distance to agreement (DTA) in high dose gradient region. Dosimetric parameters (such as percentage depth doses and beam profiles) calculated by simulation at the water phantom and the same experimental measurements are agreed, with an average deviation region of 2%. Simulation results have been also compared with dose curves predicted by commercial TPS in the same irradiation conditions, focusing attention on the accuracy that both systems reach in the dose calculation at interphase zone. In contrast TPS result with a maximum deviation of 4% for the 18MV photon beam and filed size of 10cm × 10cm. We can conclude that the algorithms of computation of the TPS are not able to predict the variation of dose with the same accuracy as MC methods, since MCNP4C provides more trust worthy results and fits the experimental values.

Keywords: Monte Carlo simulation code, wedge, treatment planning

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P28: Feasibility of Using Northwest Beam Tube Tehran Research Reactor in BNCT

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Abstract

For optimizing of neutron spectrum of Tehran Research Reactor, In order to get a proper neutron spectrum for BNCT ،a Configuration of Beam Shape Assembling(BSA) include moderator، reflector، thermal neutron shield and gamma shield must be set in front of Initial Neutron Beam by using MCNP4C code. Northwest Beam Tube of Reactor was selected and the BSA Parameters have been optimized during of four steps. The final result of these simulations show that the BSA must included of 78 cm Air as a empty space 40 cm Fe+52 cm D2O(Heavy Water) as moderator، 30 cm H2O or 90 cm Al2O3 as reflector ،1 mm 7Li as thermal neutron shield and 3 mm Bi as gamma shield. By using this Configuration we can approach to limits on parameters required for BNCT.

Keywords: BNCT, Tehran Research Reactor (TRR), MCNP4C, Beam Tube, neutron Flux

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P29: The Study of Effect Gold Nanoparticle on Dose Enhancement Inmegavoltage Radiation

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Abstract

The aim of this study is to understand the characteristics of secondary electrons generated from the interaction of gold nanoparticles GNPs with x-rays as a function of nanoparticle size and beam energy and thereby further the understanding of GNP-enhanced radiotherapy. The effective range, deflection angle, dose deposition, energy, and interaction processes of electrons produced from the interaction of x-rays with a GNP were calculated by Monte Carlo simulations. The MCNPX code was used to simulate and track electrons generated from 30 and 50 nm diameter GNP when it is irradiated with a cobalt-60 and 6 M V photon and electron beam in water. When a GNP was present, depending on the beam types used, secondary electron production was increased by 10- to 2000-fold compared to an absence of a GNP. GNPs with larger diam- eters also contributed more dose.

Keywords: MCNPX code, Megavoltage radiotherapy, gold nanoparticle, Dose Enhancement

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P30: Proton in Diagnosis and Treatment; Review

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Abstract

Proton imaging is not yet applied as a clinical routine, although its advantages have been demonstrated. In the context of quality assurance in proton images can be used to verify the correct positioning of the patient and to control the range of protons. Proton computed tomography (PCT) is a 3D imaging method appropriate for planning and verification of proton radiation treatments. Because it allows evaluating the distributions of proton stopping power within the tissues and can be directly utilized when the patient is in the actual treatment position. Proton imaging has been recognized to provide better image quality as well as lower dose patients compared with x-ray imaging. This study briefly reviewed the basic and principle of utilized of proton in proton imaging, proton radiography and CT in particular and performed a Monte Carlo study to investigate the features of proton imaging, including contrast, resolution and dose. In this study, the results of the Loma Linda University Medical Center (LLUMC) experiment which was a preliminary experiment at the 250 Mev proton synchrotron are reported and reconstruction of two phantoms is discussed.

Keywords: Proton radiation therapy, Proton imaging, Proton computed tomography (PCT)

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P31: Shielding Studies on a Total-Body Neutron Activation Facility

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Abstract

The PGNAA method can be used in medicine for chemical composition analysis. 252Cf and 241Am–Be neutron sources generate not only neutrons but also are intense gamma emitters.The sample in medical treatments is a human body, so it may be exposed to the bombardments of these gamma-rays. In order to remove these disadvantages in a practical way without being concerned about losing the thermal neutron flux, a gamma-ray filter made of Pb must be employed. The paper suggests a relatively safe body chemical composition analyser (BCCA) machine that uses a spherical Pb shield, enclosing the neutron source. Gamma-ray shielding effects and the optimum radius of the spherical Pb shield have been investigated, using theMCNP-4C code, and compared with the unfiltered case, the bare source. Finally, experimental results demonstrate that an optimised gamma-ray shield for the neutron source in a BCCA can reduce effectively the risk of exposure to the 252Cf and 241Am–Be sources.

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P32: Compartmental Analysis to Predict Biodistribution of ^{90}Y-Cetuximab in Radioimmunotherapy

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Abstract

The use of compartmental analysis allows the mathematical separation of tissues and organs to determinate the concentration of activity in each fraction of interest. The aim of this study was to develop a model, which describes distribution of labeled and unlabelled antibodies based on the tissue blood flow and the competing binding behaviour of the antibodies. Reaction constants and organ specific flow, antigen concentrations and distribution volumes were taken from the literature. The organ residence times were calculated for different amounts of given labeled and unlabelled antibodies and the time delay between their administrations. The biodistribution of labelled and unlabelled antibodies depends essentially on the specific blood flow to the organ and its antigen expression. The developed model qualitatively describes how a preload can considerably increase selectivity of RIT due to different blood flows and antigen distribution in relevant organs.

Keywords: compartmental analysis, 90Y-Cetuximab, RIT, blood flow

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P33: Absorbed Dose Measurement of Thyroid, Parathyroid, Lens and Gonads (Ovary and Testis) During Radiotherapy of Epithelial Tumors in Head and Neck Cancers with Thermoluminescent Dosimetry (TLD) Method

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Abstract

Considering the side effects of ionizing radiation on the organs which are inside or outside the treatment field during radiotherapy, knowing the absorbed dose of such organs and making efforts to reduce the absorbed dose seems a must. In this study absorbed dose of thyroid, parathyroid, lens and gonads during radiotherapy of epithelial tumors in head and neck cancers was measured and it was compared with their tolerance dose (TD5/5).The received dose in 2-D conventional treatment planning with 60-Co was measured in an anthropomorphic phantom and also 20 patients suffering from epithelial tumors in head and neck, using thermoluminescent dosimeter chips. The results showed that the absorbed dose in thyroid and parathyroid region in different depths did not show a significant difference (P-Value <0.05), However there was a significant difference in absorbed dose of different depths in ovary region (P-Value <0.05). Furthermore average absorbed dose in above mentioned organs was lower than their tolerance dose, but considering thyroid and parathyroid total absorbed dose in treatment fractions, second malignancy can be expected.

Keywords: Epithelial tumors, Thermoluminescence Dosimeter, Anthropomorphic Phantom, Tolerance Dose.

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P34: Proposed Mean Value of Recorded Counts Method in Desirable Energy Range Instead of DEWST Method to Compensate Compton Scattering Effect in SPECT Imaging

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Abstract

Production of 99mTc and development of Anger gamma camera caused single photon emission computed tomography (SPECT) imaging development and hence this type of imaging became one of the most important areas of nuclear medicine from 1970 onwards. Image obtained from the SPECT is not ideal. The most important factors in the SPECT image degradation are attenuation, scattering and limited and distance dependence spatial resolution of system. The scattering causes photons arouse from different areas affect other area projections and hence the final quantative parameters of image such as contrast, signal to noise ratio and the resolution degrade. At the photon energies of interest in SPECT imaging, Compton scattering is the dominant mode of the interactions. During Compton scattering, the photon is reduced in energy as well as deflected from its original path. Thus one can use energy loss and energy windowing to reduce the amount of scattered photons imaged. In this report, dual energy window subtraction method (DEWST) for a particular state (specific position and width of the window) using the simulation code MCNP has been reviewed, moreover, has been suggested that the mean value of recorded counts in the desirable energy range instead of dual energy window subtraction method used. Studies show the proposed method reduces relative error of the estimated scattering values than dual energy window subtraction method about 25 percent, averagely.

Keywords: Compton scattering, DEWST, SPECT, MCNP Code

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P35: Conformal Fields in Radiotherapy: A Comparison Between Measurement, Calculation and Simulation

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Abstract

Present comparative study is to evaluate the accuracy of a treatment planning system (TPS) in calculating the dose distribution parameters for conformal fields (CF). Dosimetric parameters of CF's were compared between measurement, Monte Carlo simulation (MCNP4C) and TPS calculation. Field analyzer water and solid phantoms were used for obtaining percentage depth dose (PDD) curves and beam profiles (BP). MCNP4C was used to model conformal

fields dose specification factors and head of linear accelerator Varian model 2100C/D. Results showed that the distance to agreement (DTA) and dose difference (DD) of our findings were well within the acceptance criteria of 3 mm and 3%, respectively. According to this study it can be revealed that TPS using ETAR calculation method is still convenient for dose prediction in non small conformal fields normally used in prostate radiotherapy. It was also showed that, since there is a close correlation with Monte Carlo simulation, measurements and TPS, Monte Carlo can be further confirmed for implementation and calculation dose distribution in non standard and complex conformal irradiation field for treatment planning systems.

Keywords: Treatment Planning System, Monte Carlo, conformal field, Distance to Agreement, Dose Difference

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P36: The Feasibility Study of the Use the Isfahan MNSR Reactor for BNCT

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Abstract

BNCT (Boron Neutron Capture Therapy) is a new method for treating brain tumours. This is very effective and promising method. The most important sources of neutron used in BNCT are nuclear reactors that have the extensive spectrum of neutron radiation. In this paper the feasibility of the use of the MNSR (Miniature Neutron Source Reactor) reactor studied for BNCT using MCNPX Code. The MNSR is a tank- in- pool 30 kW research reactor. The MNSR reactor is designed for the neutron activation analysis (NAA). For this purpose after the complete simulation of core by the code, the spectrum and flux of neutron computed in the inner and outer stands of the reactor. The results show that the flux of neutron in inner stands is more than outer stands and the flux of thermal, epithermal and fast neutron in inner stands are 2.71e11, 1.57e12 and 2.25e11 n/cm2 s respectively. These results indicate that in comparison with other reactors the MNSR reactor has usability in BNCT.

Keywords: MNSR, BNCT, flux neutron, nuclear reactors

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P37: Parametric Implementation of the Electron Flux Incident on a Target in the Linear Accelerator Using GEANT4 Code

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Abstract

Today, Monte Carlo simulation codes are used extensively in the radiotherapy. Various methods have been proposed to accelerate the run-time. In this research, the information about particle flux is stored in the histogram structures that are used in the implementation of electron and photon beams. The accelerator head of a Nepton 10 PC was implemented with GEANT4.9.0 to characterize of a 9 MV photon beam. To use visualiztion graphics, we used

the graphic packages that includes as DAWN, OpenScientist and WIRED. To extract data and histogram analysis, we used AIDA abstract interface. Initially, the components of LINAC were simulated. To define electron beams, we used two half-Gaussian in the energy spectrum. To ensure accuracy of the implementation of electron beam, we defined a cylindrical sensitive volume above the target and recorded the energy spectrum and spatial distribution of 1 million electrons passing through of it. Then we defined other sensitive volume above the secondary collimator and recorded the physical specifications of photons in the form of histograms. For it, the number of primary electrons was equal to 3 million. To ensure accuracy of the field size simulated, we defined a sensitive volume above water phantom. After excluding non-movable and fixed components LINAC system at the top of the secondary collimators, the absorbed dose distribution was calculated in the water phantom using histogrammic source. There was good agreement between the simulation results and practical dosimetry. We concluded that parametric implementation can improve the run-time of the Monte Carlo simulation.

Keywords: Monte Carlo Simulation, GEANT4, LINAC, Parametric implementation.

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P38: Dosimetry of High-Dose-Rate Intracavitary Brachytherapy with the MammoSite Applicator Using Mont Carlo Simulation

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Abstract

In the treatment of early stage breast cancer,MammoSite brachytherapy has been use as one of the partial breast irradiation techniques after breast surgery. The MammoSite applicator is a single catheter with an inflatable balloon at its distal end that can be placed in the resected cavity (tumor bed). The treatment is performed by delivering the Ir-192 high-dose-rate source through the center lumen of the catheter by a remote after loader while the balloon is inflated in the tumor bed cavity. The Monte Carlo MCNP-5 code use to simulate dose rate in the planning target volume(PTV) of a 1cm radius MammoSite balloon dose delivery system. The simulation carried out using an average female chest phantom and Ir-192 sourse for brachytherapy application.The balloon dose were found to be underestimated by PTV. The underestimation error from the treatment planning system will be less than +/- 2.0% & +/- 3.5% at the balloon surface and balloon PTV respectively, when comparing Mont Carlo results.

Keywords: Brachytherapy, MammoSite, Ir-192, Mont Carlo simulation

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P39: ^{125}I Versus ^{103}Pd for Prostate Brachytherapy: A Monte Carlo Dosimetric Study

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Abstract

Prostate seed brachytherapy using 125I and 103Pd is an attractive treatment option for low risk prostate cancer. The Best Double-Wall Model 2335 Palladium-103 and EchoSeed Model 6733 Iodine-125 are two commonly used sources for this purpose. To ensure accurate dosimetry, the AAPM Task Group 43 has recommended to standardize the required dosimetric data for each seed before clinical use. The aim of this study was to compare dosimetric characteristics of 125I, Model 6733 and 103Pd, Model 2335, using Monte Carlo simulations with two different MCNP versions, namely, MCNP4c2 and MCNP5. To the best of our knowledge, this is the first reported simulation of these seeds using MCNP codes. Seed geometries and chemical compositions together with published 125I and 103Pd spectra were used to perform dosimetric characterization of these sources as per the updated AAPM TG-43 protocol. The simulations were performed for liquid water material. The differences between tabulated data and fifth order polynomial coefficients for radial dose and anisotropy functions were also assessed. The results showed that both sources exhibit a significant dose variation in the emitted radiation pattern, particularly near the capsule. The simulated dose rate constants in liquid water using MCNP4c2 and MCNP5 were found to be 0.993 cGyh-1U-1 (±1.73%) and 0.965 cGyh-1U-1 (±1.68%), respectively for the 125I seed, while for the 103Pd seed they were 0.684 (± 2%) cGyh-1U-1 and 0.655 (± 2%) cGyh-1U-1, respectively. The anisotropy in dose distribution increased more rapidly along the source axis for 103Pd. The MCNP5-simulated radial dose and 2D anisotropy functions agreed better with published measured data than the MCNP4c-simulated data. Different dose distributions from these seeds may cause different clinical outcomes. The results of this work are recommended for clinical applications of these source models.

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P40: Monte Carlo Simulation of Varian Clinac 2100C Electron Beams

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Abstract

The purpose of this study was to investigate the application of the Monte Carlo technique to calculate and analysis of output factors for electron beams used in radiotherapy.This technique is based on statistical method and has a powerful role in different radiotherapy aspects.

The simulated medical linear accelerator is the Varian Clinac 2100C.The electron beams 6, 9, 12, 16 and 20 MeV were simulated by MCNP4C Monte Carlo code.The beam geometry was 10 × 10 cm2 applicator, 100 cm SSD on the surface of homogenous water phantom.Central-axis percentage depth dose (PDD) curves and dose profile (off axis ratio) were obtained. The comparisons between calculated and experimental results show good agreement (within %3). So, the MCNP4C code is a powerful tool for acquiring electron dosimetry results as well as other applications in radiotherapy.

Keywords: Monte Carlo Code, Simulation, Linear accelerator, Electron beams, MCNP4C, Radiotherapy

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P41: Development of an EPID-Based Method for Linear

Accelerators' Quality Assurance Tests

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Abstract

Although Electronic Portal imaging devices (EPIDs) have been developed for patient positioning verification during radiotherapy, they can also be utilized as a precise tool for Quality Assurance of the treatment machines.

A MATLAB code developed to import and analyse DICOM images acquired using an Amorphous-silicon electronic portal imaging device (a-Si EPID). At the first stage, image consistency and reproducibility were evaluated. The relationship between EPID image pixel values and dose delivered to the EPID sensitive layer were then investigated. After converting EPID image to dose, several factors including dose and dose rate dependency, dose linearity, radiation field size factor, field flatness and symmetry for a range of radiation fields were evaluated. Finally the linear accelerator isocentre stability was checked using different methods at different gantry angels.

Results showed that the developed code is a reliable tool to monitor radiation beam flatness and symmetry as a part of routine daily check. The code is also able to check MLC leaf positioning, using EPID images collected at 6 different gantry angels. MLC interleaf leakage can also be assessed using the code.

EPID can be used as a useful too for fast and reliable quality control checks.

Keywords: EPID, MATLAB, Quality Control, MLC

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P42: Dosimetric Characteristics of Electron Irregular Treatment Fields as a Function of Shape and Percentage of Blocking by Monte Carlo Simulations

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Abstract

Shaping fields in electron beam therapy is sometimes required. Lead sheets are placed directory on skin, when electron beam is defined using variable applicators. When shields are used to create irregular fields, dose distributions change relative to the square field measured distributions. When blocking reduces a large percentage of open field area, the entire isodose distribution and output factors may be affected. The goal of this research was to study the dosimetric characteristics of electron irregular treatment fields as a function of shape and percentage of blocking placed on skin by Monte Carlo simulations. The BEAMnrc and DOSXYZnrc codes were used to calculate output factors, precent depth dose and profile curves. The results can be used to optimize the treatment plan of patients using irregular electron fields.

Keywords: Monte Carlo, Irregular electron field, Dosimetry

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P43: Geometry Function Evaluation of High Dose Rate Ir-192 Flexi Source Based on Monte Carlo (MCNPX)

Simulation

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Abstract

According to TG-43U1 protocol, between the dosimetry parameters of brachytherapy source seed, geometry function is the only parameter that is determined by calculating method. Two approximations of point source and line source are considered in TG-43U1 protocol to calculate the geometry function. The accuracy in geometry function calculation provides more accuracy in the other TG-43U1 dosimetry parameter determination.

In this study, the accuracy of geometry function of these two approximation sources on the Ir-192 high dose rate Flexi source were evaluated by using nuclear calculating Monte Carlo MCNPX code. The geometry and component of Ir-192 seed were simulated for the calculation of the geometry function at various angles and distances from the source. Then, the results of calculating method and simulating method were compared.

The comparison of results shows that at angles close to the source axis, from θ=0 to 15° and θ=165 to 180°, the values evaluated from different methods are not in agreement with each other. The radial averaged difference between the MCNPX evaluation and point source approximation calculation for θ=0, 5, 10 and 15° are 0.24, 0.17, 0.09, and 0.08 respectively. The radial averaged difference between the MCNPX evaluation and line source approximation calculation for θ=0, 5, 10 and 15° are 0.29, 0.22, 0.13, and 0.09 respectively. The radial averaged difference of the source approximations and MCNPX in θ=165 to 180° is like the θ=0 to 15°. These results show that for the angle span up to the 15° from the source axis, the difference between the source approximations and MCNPX is high and the approximations are not valid enough. The findings also show that in this angle span, the point source approximation is better than line source approximation.

The comparison of the result for the other angle spans shows that for θ=15 to 60° and θ=120 to 165°, the radial averaged difference between the line approximation and MCNPX is from 0.04 to 0.012 and for point approximation is from 0.07 to 0.014. The comparison of the results for θ=60 to 120° which is near the perpendicular direction to the source axis, show the difference between 0.007 to 0.003 and 0.02 to 0.009 for line and point source approximation, respectively. The result for angle span θ=15 to 165° shows that the difference between the line and point approximations and MCNPX is acceptable and line approximation is much better than point approximation.

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P44: Optimization of Isfahan MNSR Reactor Neutron Spectrum for Use in Boron Neutron Capture Therapy

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Abstract

Boron Neutron Capture Therapy (BNCT) is a promising method to treat malignant brain tumors. The basic principle of the technique is to irradiate the boron-containing tumor with epithermal neutron beam, which are then captured according to 10B (n, alpha)7Li reaction. In order to optimize Isfahan MNSR reactor neutron spectrum for use in BNCT, a Beam Shaping Assembly (BSA) have been designed with MCNPX code. The BSA consists of moderators, reflectors, collimators and filters. In-air figure of merit have been calculated in each simulation. The optimal design consists of 69.3 cm Fluental alloy as moderator, 30 cm Pb as reflector, 2 mm 6Li as thermal neutron filter and 5 mm Pb as gamma filter. Neutron output of the BSA with the optimal conditions, is appropriate for treatment.

Keywords: MNSR, MCNPX, Boron Neutron Capture Therapy (BNCT), Beam Shaping Assembly (BSA),

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P45: Neutronics Design of a Hospital-Based Nuclear Reactor for Use in BNCT

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Abstract

Boron Neutron Capture Therapy (BNCT) is a promising method to treat malignant brain tumors. The basic principle of the technique is to irradiate the boron-containing tumor with epithermal neutron beam, which are then captured according to 10B (n, alpha)7Li reaction. Different neutron sources, including nuclear reactors are used in this method. The major problem of the reactors is lack of public acceptance. Patient transfer to the nuclear facilities has some problems. In this paper the calculation of a neutronic design of a small reactor that can be Installed in hospital, is performed using MCNPX code. For this purpose a triga reactor mark II is considered as basic neutronic design and the optimum core configuration is investigated to obtain the maximum neutron flux around the core

Keywords: neutronics design, BNCT, hospital-based nuclear reactor, MCNPX

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P46: Energy Spectrum Optimization of 2.45 MeV Neutrons by MCNP for a BNCT System

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Abstract

A system of beam shaping which consists of a moderator, reflector, thermal neutron filter, and gamma filter, for obtaining a suitable neutron beam (suitable with respect to BNCT systems), was designed by using MCNP code. Source neutrons were considered to be 2.45 MeV neutrons obtained from bombarding Li by 5 MeV protons. Calculations were performed for various candidated materials with different thicknesses and different setups. The optimum case consists of 70 cm \Fluental, 30 cm Pb, 2mm Li-6 and 2mm Pb as moderator, reflector, neutron filter and gamma filter, respectively. Outgoing neutrons of this setup has 10E+8 n/cm2-s flux and its energy is in the range of 1keV-7 keV which is suitable for BNCT

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P47: Preparation and Quality Control of ^{175}Yb-EDTMP as a Palliative Treatment of Bone Metastases

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Abstract

Designing ideal radiopharmaceuticals for use as bone pain palliatives require the use of a moderate energy β-emitter with a stable carrier molecule. Owing to its favorable decay characteristics can be regarded as a potential radionuclide for therapeutic applications. The 175Yb can be produced in moderate specific activity and good radionuclidic purity by thermal neutron bombardment of natural 174Yb target. The analysis of the neutron irradiated sample exhibited the presence of 96.2% 175Yb. The EDTMP ligand was synthesized and radiolabeled with 175Yb. Its potential for bone pain palliation could be seen from the biodistribution studies carried out in Wistar rats, wherein selective skeletal uptake (3.1% of injected activity per gram in tibia at 4 h post-injection) with rapid blood clearance and minimal uptake in any other organs was observed. These studies suggest that 175Yb-EDTMP complex have potential for use in palliative treatment of painful bone metastases.

Keywords: Bone pain palliation; Therapeutic radionuclide; 175Yb, EDTMP.

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P48: Development of ^{175}Yb-DOTMP for Bone Pain Palliation

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Abstract

175Yb (T1/2=4.2 d, Eβ(max)=480 keV) has radionuclidic properties suitable for use in palliative therapy of bone pain due to metastasis. 175Yb was produced in high-specific activity (38 mCi/mg) and excellent radionuclidic purity by thermal neutron bombardment of natural Yb target. 1, 4, 7, 10-tetraazacyclododecane-1, 4, 7, 10-tetramethylene-phosphonate ligand namely DOTMP is synthesized and labeled with 175Yb. The 175Yb-DOTMP complex was formed with very high yield (>98%) and showed excellent stability, up to 7 d at Room temperature. Biodistribution of 175Yb-DOTMP was carried out in Wistar rats (200-250 gr) and the complex showed significant bone uptake, rapid clearance from blood and minimum uptake in soft tissues. But among the soft tissue organs, only liver and spleen had a relatively high uptake.

Keywords: Bone pain, Treatment, 175Yb, DOTMP.

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P49: Determination of Midline Dose in External Beam Radiotherapy Using LiF:Mg;Cu;P Thermoluminescence

Dosimeters

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Abstract

Generally in radiation therapy there is a narrow relationship between probability of local tumor control, normal tissue injury and delivered dose. For this reason it is recommended to implement quality assurance programs in order to limit errors arise from treatment preparation and delivery.

This study is dedicated to evaluating treatment procedure in external beam radiotherapy. 178 treatment field (144 patients) were divided in two main groups: 1. Head and Neck (H&N), 2. Thorax, Abdomen and Pelvic (T&A&P). Combined entrance and exit dose measurement were carried out using LiF:Mg;Cu;P thermoluminescnce dosimeters. Also Midline dose and water equivalent thickness were evaluated for each field. Discrepancies were assessed as the percentage ratio of expected to measured values for each field.

The widest range of discrepancies in our center occurred in diameter measurement. It is much probable in H&N treatment where beside tissue inhomogeneities and organ curvature, large deviation in body shape has made it hard to find one exact value for patient diameter (treatment depth).

Diameter differences are not only related to contour inaccuracies but also to body shape and tissue inhomogeneities. According to our results effective diameter is evaluated on average $2-4$ percent larger than patient diameter. This excess value is reflected in midline dose which is on average $2-4$ percent less than prescribed dose.

Keywords: In vivo dosimetry, Radiotherapy, TLD, Quality control

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P50: Evolution of Cord Absorbed Dose During of Larynx Cancer Radiotherapy, With 3D Treatment Planning and Tissue Equivalent Phantom

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Abstract

Radiation doses to tissues and organs were measured using the anthropomorphic phantom as an equivalent to the human body. When high-energy X-rays are externally applied to treat laryngeal cancer, the absorbed dose at the laryngeal lumen is lower than given dose because of air space, which it should pass through, before reaching the lesion. Specially in case of high-energy X-rays, the loss of dose is considerable. Three-dimensional absorbed dose distributions have been computed for high-energy photon radiation therapy of laryngeal and hypopharyngeal cancers, using a 3D Treatment Planning.

All measurements were performed using a Primus linac (Siemens, Germany) established in the Mahdieh Radiotherapy and Oncology, Hamadan, Iran. The primus linac provides two low and high energy photon beams (6 and 15 MV) and a range of electron beams (5-12 MeV). The original fluence maps were manipulated for several transitional and rotational displacements. The results, as evaluated maps, were then compared with the original fluence maps, as reference maps. All of the current work procedures were performed using in-house codes written by MATLAB. Agreement between Cord absorbed dose calculated by COREPLAN and TLD & Film Dosimeter measurements was within 3% for 95% of all measurement points. COREPLAN does model relative increases/decreases in Cord absorbed dose due to different plans reasonably well, so IMRT optimization can be expected to be successful in reducing Cord absorbed dose. However, the use of an absolute goal for Cord absorbed dose should be considered with caution.

Keywords: Cord absorbed dose, larynx cancer,radiotherapy, 3D Treatment Planning

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P51: Reduction of Eye Lens Radiation Dose During Radiotherapy

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Abstract

Estimation of eye lens dose is very important for patients undergoing radiation therapy.The radiation dose to the eye lens of patients who underwent treatment with Radiotherapy have been measured with Thermoluminescence Dosimeters (TLD) and found to be below the deterministic levels. For transmission Factor Also common method of measuring the absorbed dose distribution and electron contamination in the build-up region of high-energy beams for radiation therapy is by means of parallel-plate Ionisation chambers.

All measurements were performed using a Primus linac (Siemens, Germany) established in the Mahdieh Radiotherapy and Oncology, Hamadan, Iran. The primus linac provides two low and high energy photon beams (6 and 15 MV) and a range of electron beams (5-12 MeV). Lithium florid (LiF) Thermoluminescent Dosimeters (TLD-100) chips (3.7mm*3.7mrn*0.9mm, manufactured by Harshaw, Solon, USA) were used for physical phantom measurements.

During radiotherapy treatment, critical organs are shielded using lead and cerrobend blocks.The eye lens dose received apparently shielded by cerrobend blocks was about 8cGy in 100cGy Expose three main contributions in the Absorbed Dose to EYE lens During whole Brain Radiotherapy:

1. Due to primary photon beam transmitted through the block: 4 percent for 8 cm cerrobend blocks

2&3. Due to scattered photons and contamination electrons: 3 up 4.5 percent, Dependent on cerrobend block Size,These two factors collectively cause the increase with increasing field size,

energy, and block size.

The use of aluminum and lead, together, on eye show that reduced the absorbed dose to the lens by 2 to 3 times;

Keywords: cerrobend blocks, radiation, lens,. Rando Phantom

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P52: Designing, Simulation and Developing of a Multi-Leaf Collimator

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Abstract

One of the methods of curing cancerous tumors is radiation therapy with variable intensity, in which the characteristic of target area is strictly important. This is done by Multi-Leaf Collimator (MLC). Furthermore, it facilitates treating the target in different views by rotation around the patient. Thus the patient's absorbed dose will decrease and the tumor will receive maximum dose.

In the present project, designing and developing of a 20 leaf collimator (10 pair leaves) with a field of view 12×16 cm and the capability of being used on radiation therapy for detection the exact shape of tumor by the leaves being demonstrated aimed. Utilizing the lead leaves with a proper thickness in order to attenuate and decrease initial radiation to lower than 10 percent of initial value, using of a proper mobility system, high accuracy (1mm), controlling precisely, and implicated in all aspects and angles with a high speed (2cm/sec) are some of advantages of this collimator which are compatible with other foreign systems.

Keywords: Multi-Leaf Collimator (MLC), IMRT, Radiation therapy

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P53: Dosimetry of a New ^{192}Ir PDR Brachytherapy Source

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Abstract

The PDR brachytherapy source, has got application in some cases of cancer treatment. According to the AAPM,determining of the dosimetry parameters of a new source, should be done by a qualified group. In this research, we study the functions related to the dosimetry of Ir 192 brachytherapy source, which includes 3mm length and 140mci activity, using experiment measurements in water equivalent phantom. The value of dose were measured using TLD dosimeter (LiF-100) with putting in to holes which were embedded in a Plexiglas phantom.The result of anisotropy function,the radial dose function and the dose rate constant with less than 5% error indicate that the new Ir192 PDR source is applicable in radiotherapy.

Keywords: Brachytherapy PDR, Anisotropy, Radial dose

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P54: Optimal Sensitometric and Isodose Curves of X-Omat V Film in Radiotherapy

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Abstract

Radiographic film is a popular dosimeter for determining the two-dimensional dose distribution. Kodak X-Omat V Film is a relatively low-speed film. It may be used for approximating patient dosage in radiation therapy procedure. Under normal viewing conditions the film can be used to record exit dosages to 175 cGy. The purpose of this study is to investigate the effectiveness of processing condition and field size on linearity of sensitometric curve and flatness of isodose curve in X-OMAT V Films. Sensitometric curve investigations were performed at depth of 5 cm in water phantom,with field sizes of 5x5, 10x10 and 15x15 cm2 and processing temperatures of 30, 32, 34 and 36 0C. Doses ranging from 20 to 160 cGy were used. Fatness of isodose curve investigations were analyzed at field sizes of 5x5, 10x10, 15x15 and 20x20 cm2 ; doses of 40 and 160 cGy, and 32 0C processing temperature. Most suitable results are obtained in low processing temperatures and small field sizes.

Keywords: Film dosimetry, X-omat V Film, Sensitometry, Temperature

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P55: Energy Spectrum Optimization of 1.06 MeV Neutrons by MCNP for a BNCT System

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Abstract

A system of beam shaping which consists of a moderator, reflector, thermal neutron filter, and gamma filter, for obtaining a suitable neutron beam (suitable with respect to BNCT systems), was designed by using MCNP code. Source neutrons were considered to be 1.06 MeV neutrons obtained from bombarding Be by 4 MeV protons. Calculations were performed for various candidated materials with different thicknesses and different setups. The optimum case consists of 60 cm MgF2, 35 cm Bi, 2mm Li-6 and 2mm Pb as moderator, reflector, neutron filter and gamma filter, respectively. Outgoing neutrons of this setup has 10E+8 n/cm2-s flux and its energy is in the range of 1keV-7keV which is suitable for BNCT

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P56: Dosimetry Calculations of Intravascular Brachytherapy For a 90Sr/90Y Source By Monte Carlo Simulation

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Abstract

Intravascular brachytherapy (IVBT) is used to prevent coronary artery restenosis. In this research, a Monte Carlo method was used to simulate the cardiovascular brachytherapy for a single 90Sr/90Y seed source. The dosimetry parameters such as 3-D dose distributions, radial dose functions, and 2-D anisotropy functions were calculated for various positions, corresponding to the suggested standards by AAPM TG No.149. The constant dose rate in our simulation was 1.097 Gy min-1mCi-1 which has a small difference 0.27% from the reference average value. Absolute dose rate in the transverse axis of the source was varied from 48.345 to 5.02×10-6 Gy min-1mCi-1 for the radial range of 0.1 to 14 mm. A good agreement was found between our results and published experimental data and other simulations. Finally, based on the ICRP103 report, our calculations showed if the coronary artery is near the sensitive tissues like breast and lymph nodes, it will increase the accidental risk for these tissues.

Keywords: Intravascular Brachytherapy, 90Sr/90Y Source, Monte Carlo simulation, Dosimetry

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P57: Evaluation of Absorbed Dose in Eye Proton Therapy by Monte Carlo Method

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Abstract

Nowadays proton therapy is used to treat the cancer in more sensitive tissues to radiation such as eye and brain. In this research work the dosimetry of normal and cancerous cells during treatment the eye cancer by proton therapy has been done by using the Monte Carlo method. For this purpose the proton therapy system, the nuzzle aperture, moderator, normal and cancerous cells regions in eye were simulated. The cancerous region was simulated inside the choroid and sclera regions of eye. The dosimetry was done for different diameter size of moderator from 0.5–3

cm. The results showed by changing the moderator diameter the Bragg peak and hence the absorbed dose change considerably in the range of 0.0341 to 22.4 and 0.585 to 22.6 MeV/g for normal and cancerous cells respectively. So to reduce the absorbed dose of normal cells in proton therapy the moderator size should be accurately calculated and it can be done by using the developed Monte Carlo simulation program in this research.

Keywords: Proton therapy, eye cancer, Monte Carlo simulation, Dosimetry

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P58: Photodynamic Therapy for Bladder Cancer: An Overview on the Preclinical and Clinical Experiences

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Abstract

Photodynamic therapy (PDT) is one of the most interesting methods in photo treatment. In general, PDT is a modality for treatment of superficial tumors. In many aspects PDT is very well suited in managing bladder cancer, as the bladder is accessible by endoscopy and the tumors are most often limited to the mucusa or submucusa. Considering that bladder cancer is the ninth most common cancer worldwide; it can be said that PDT is likely more useful for patients who have recurrence of superficial tumors after conventional therapies, as well as the patients with diffuse superficial bladder carcinoma that is refractory to standard treatments before commitment to radical extirpative surgery, particularly in patients at surgical high risk. The treatment of tumors with PDT includes three major parameters: presence of oxygen in tumor tissue, administration of a photosensitizer that selectively accumulates in the tumor, and subsequent exposure to light. The PDT mechanism relies on in situ generation of cytotoxic agents by the activation of a light sensitive drug, which in turn initiates a photochemical reaction that generates short-lived reactive oxygen species, resulting in cell death and tissue damage.

Assessing the risk-benefit of PDT and/or PDT-combined treatments require(s) more studies and investigation in order to establish these modalities as an alternative or first choice treatment for bladder cancer.

In this review, we present past to current advances in the use of PDT in urinary bladder cancer, as well as future hopes and plans in the light of utilizing this new modality for treatment of bladder cancer.

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P59: Improving the Accuracy of Focal Point in HIFU Treatment by Optimizing of the Shape of the Transducer Array in HIFU Probe

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Abstract

One of the effective ways to treat cancer is using high intensity focused ultrasound (HIFU). In this method ultrasound waves emitted from a HIFU probe, are focused on cancer tissue in a body in order to destroy cancer tissue by heating. The temperature on focal point is may be elevated to 90 degree. This paper aims at finding the optimized shape of the ultrasound transducer array in order to achieve more accurate focal point shape for better treatment. For this purpose the ultrasound equation is solved in the body by using FDTD method. Then the pennes equation is considered to obtain the temperature distribution in tissue.Results of the present work compared to those of medical experiments available in the literature and good agreement observed.The result of this simulation applicable for

getting the treatment under control.

Keywords: High intensity focused ultrasound (HIFU), Cancer treatment, Acoustic wave equations, Bio-heat equation, FDTD Method.

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P60: Introduce the Radioembolisation, an Effective and Novel Therapy for Treatment of Hepatocellular Carcinoma

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Abstract

Radioembolization is a combination of radiation therapy and a procedure called embolization to treat cancer of the liver. Embolization is a minimally invasive treatment in which blood vessels or malformations within blood vessels are occluded, or blocked off, to prevent blood flow. This method involves placing a radioactive material directly inside the body. This form of treatment is called internal radiation therapy in nuclear medicine.

An initial arteriogram is performed to visualize the upper abdominal arteries. At that time, arteries to areas of the stomach and duodenum which may have beads flow into them are closed with tiny coils of wire. At the end of the procedure, a bead with a nuclear medicine tracer on it is injected through the catheter to simulate the treatment. This will allow the interventional radiologist to calculate how much of the treatment dose can go to the lungs.

For patients with inoperable tumors, radioembolization can extend lives from months to years and improve quality of life. This procedure produces fewer side effects compared to standard radiation therapy.

Radioembolization with 90Y-microspheres is a new locoregional treatment of hepatic lesions, usually applied as single cycle. SPECT with integrated low-dose CT using 99mTc-MAA is beneficial in radioembolization with 90Y microspheres because it increases the sensitivity and specificity of 99mTc- MAA.

In conclusion according to some studies for many year experiences, 90Y radioembolization is a feasible and safe method to treat liver metastases with an acceptable level of complications and a good response rate.

Keywords: Radioembolisation, Hepatocellular Carcinoma, internal radiotherapy, nuclear medicine

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P61: Monte Carlo Modeling of a New Radiotherapy Linear Accelerator: Tuning and Validation

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Abstract

The importance of Monte Carlo modeling in radiotherapy dosimetry is well established. Accurate modeling of a linear accelerator (linac) is an essential part of Monte Carlo dose calculation in external-beam radiotherapy. This study presents the tuning and validation of an MCNP4C Monte Carlo model of the treatment head of the new Elekta CompactTM linac with 6 MV nominal energy. To the best of our knowledge, this is the first report of a Monte Carlo model of this linac. Modeling this accelerator's beams is of particular interest as it is the first Elekta linac with a standing-wave accelerator waveguide. The accelerator head was modeled in detail based on the manufacturer's supplied information. The experimental measurements were made using a photon diode dosimeter in a water phantom.

The model's parameters were tuned using dose profiles and central-axis percentage depth-dose (PDD) distributions at reference conditions: field size 10 × 10 cm2 at 100 cm source-to-surface distance. Subsequently, PDDs and profiles were measured and simulated for different square field sizes in the range 4 × 4 cm2 to 40 × 40 cm2. The results of the simulations and measurements were then compared. The agreement between the measured and simulated profiles and PDDs were within the acceptability criteria recommended by the International Atomic Energy Agency (IAEA) TECDOC-1583 (2% for PDD, 3% for off-axis profile, and 2 mm for penumbra). The model's acceptable accuracy paves the way for studies of dose distributions for this linac using the powerful technique of Monte Carlo modeling, within the range of machine parameters simulated in this study.

Keywords: Monte Carlo modeling, Tuning and validation, Compact linac, MCNP4C

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P62: Using Matrix Superposition Method for 3 Dimensional Dose Calculation in Brachytherapy

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Abstract

In this research, dose have been calculated around a brachytherapy source in a phantom using MCNP code and saved in a 3D matrix. Then the absorbed dose has been evaluated in any point due to some sources or one source which shifted in some places by matrix superposition summation. This method is very fast and well accurate to use in brachytherapy dose evaluation as well as for dose optimization. The results have been presented for Ir-192 source in a water cube phantom based on the matrix superposition method. Figure 1 shows the percentage deep dose (PDD) result for 10 sources and its corresponding isodose curves.

Figure 1: (a) The PDD result obtained from 10 sources; (b) the coresponding isodose curves.

Keywords: matrix superposition method, MCNP code, Dose distribution, Ir-192 brachytherapy source.

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P63: Evaluation of Effective Attenuation Coefficients for Compensator Based IMRT: Monte Carlo Simulation and Experimental Measurement

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Abstract

Application of Compensators to deliver IMRT, change the beam energy spectrum, therefore the effective attenuation coefficients (EAC) of compensators were investigated using MCNP5 Monte Carlo simulations and measurements. PDDs were calculated for variable thickness of various compensator materials, different field sizes at 6 and 18 MV energies. The calculated EACs were corresponding to measurements obtained from PTW ion chamber for Cerrobend, MCP96 and Tungsten. At 6 MV, due to beam hardening, EAC decreased with respect to depth of measurement, especially for lower thickness and smaller field sizes. In contrast, beam softening at 18 MV resulted in increasing of EAC as a function of compensator thickening and field size. In addition to beam energy and compensator material, the EACs were decreased with respect to field size increasing and compensator thickening for both of beam energies; hence these factors should be considered for establishing of EACs.

Keywords: Monte Carlo simulation, effective attenuation coefficient, compensator, IMRT

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P64: Monte Carlo Simulation of Stepping Source in Afterloading Intracavitary Brachytherapy for GZP6 Unit

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Abstract

Brachytherapy is a form of radiotherapy in which radioactive seeds are carefully placed inside or next to the cancerous tissue and positioned in a manner that will attack the cancer most efficiently. The clinical application of encapsulated radioactive sources in brachytherapy plays an important role in the treatment of malignancies. Although not as widespread as 192Ir, 60 Co is also available on afterloading equipment dedicated to HDR brachytherapy. Stepping source in brachytherapy systems is used to treat a target lesion longer than the effective treatment length of the source, such as cancerous lesions in cervix, esophagus and rectum. The 60Co stepping source (channel 6) of GZP6 afterloading intracavitary brachytherapy unit made by Nuclear Power Institute of China has been simulated using MCNPX code. The Mesh tally type 1 has been employed for the absorbed dose calculation in a cylindrical water phantom with length = 80 cm and diameter = 25 cm. The output of the Mesh tally was average energy deposition per unit volume for the photon. 500 million photons were run to acquire less than 0.2% statistical uncertainty in Monte Carlo calculation. The results show that Monte Carlo calculation is in good agreement with the treatment planning system calculation.

Keywords: HDR brachytherapy, Stepping source, Dose distribution, MCNPX code

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P65: Evaluating the Effect of Characteristics of Main Components of NEPTON Linac for Accurate Simulation with Monte Carlo Method.

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Abstract

There are many papers about the simulation of NEPTON linac with various Monte Carlo codes. However there is absence of consistency in the results of these papers. For example in 9MV photon mode, for energy of primary electron beam one group used 10.7MeV and another group used 9.8MeV with similar results. The aim of this paper is to evaluate the realistic characteristics of the main components of the linac. The importance of each component in dosimetric results is also evaluated.

Direct measurements were done for main components of the linac such as flattening filter, ionization chamber and the target. In this work we used BEAMnrc code for simulation of NEPTON 10PC linac and DOSXYZnrc code for comparison of PDD and profiles with measurements. Many possible configurations were simulated to get the best much between simulation and experiments. Effect and important of any part of components are evaluated in simulation accuracy.

As a result, the characteristics of primery electron beam hitting the target had very significant effect on the results. We had the best much between experimental results with energy of 9.5MeV for primary electron with Gaussian distribution and FWHM of 0.34cm. A small change in the target and flattening filter didn't have an important effect on PDD and dose profiles. The effect of the ionization chamber in also every small in the dose distribution and it can be negligible.

Keywords: Radiation Therapy, Monte Carlo, Photon Beam

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P66: Effect of Radiobiological Parameters of Highly Proliferative Tumours on Determining the Gap Compensation Method

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Abstract

When a prescribed course of radiotherapy is interrupted, the remaining treatment sessions must be altered. A number of compensation methods have been suggested in the literature. The goal of this research was to investigate how radiobiological parameters like α/β ratio (fractionation factor) and K (repopulation rate) affect the compensation method. We calculated biological effective dose (BED) and normal tissue complication probability (NTCP) of organs at risk (OAR) using the same tumour BED and tumour control probability (TCP) as the prescribed regimen. BED values were calculated using the linear quadratic model formalism. TCP and NTCP values were estimated using Tumourlet and Lyman-Kutcher-Burman models, respectively. Results indicate that for these tumours is best to compensate gap in the intended time and sessions with no or at least minimum changes in dose per fraction. For example, for head and neck, NTCP changes of OARs was 0-2.5%, while it was >3.8% for others. Tumours with relatively high α/β and K do not permit to prolong time and use large fractions for compensation.

Keywords: Radiotherapy, Gap compensation, Radiobiological parameters, LQ model

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P67: Optimization of Neutron Beam-Shaping Assembly for Boron Neutron Capture Therapy Using D-T Neutron Generators

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Abstract

Neutron therapy with boron (BNCT) is one of the modern methods in radio therapy for treating cancers, specially brain (glioblastoma multiforme) and skin (melanoma) cancers.

The method is based on 10B (n,α)7Li reaction, knowing the fact that 10B has a large neutron absorption cross section (for different energy range).

The drug containing 10B is injected through the patient`s vessel which reaches the tumor section by blood circulation.

The tumor site is bombarded by an appropriate neutron beam; so through 10B (n,α) 7Li, on capturing a neutron, the boron core converted to Li by emitting an α particle. The penetrating range of these particles is 4 to 7μm which may damage the cells through their energy transportation.

Various neutron sources are used for providing neutron flux. In these studies DT neutron source that produces 14.1mev neutrons. The appropriate energy for treatment is 0.5ev-10kev, and the least amount of epithermal neutron flux must be 109n/cm2.s.

A Beam Shaping Assembly (BSA) which includes a moderator, reflector, collimator, thermal neutron and a gamma shield has been designed to get the best energy and intensity.

For these purpose MCNP code is used. The final optimized states includes 50cm Ni and 40cm Fluental as moderator, 15cm Bi as reflector, 4mm Bi as gamma filter and 3mm Li as thermal neutron filter.

According to required neutron flux for treatment, neutron source must have 1013n/cm2.s production power per second.

Keywords: D-T neutron generator, BNCT, BSA, MCNP code

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P68: Developing a Verification and Training Phantom for Gyneocological Brachytherapy System

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Abstract

A plexiglass phantom was designed to serve as a Quality Assurance (QA) tool and a training aid in brachytherapy for a combination of ovoid and tandem gynaecological (Gyn) applicators. Manufacturing and application of this phantom is reported.

The phantom was made from 2mm thick Perspex slabs for medium size ovoid and 5 cm tandem applicators introduced by Flexitron brachytherapy system. Phantom consists of one stand and two slab containers. The main container represents pelvic cavity where Gyn applicators can be inserted in a hollow engraved by laser beam. Containers dimension are 17×14 ×10cm3(e.g. length×width×height). For testing the functionality of the phantom dosimetry films were sandwiched between slabs in vicinity of the applicators. After planning, a dose of 2 Gy delivered to the anatomical point “A” and dosimetry results were compared to planning data.

The brachytherapy solid phantom was constructed with slabs (Fig. 1). It is possible to insert tandem and ovoids and after load the brachytherapy radioactive source into these applicators.

Comparison between dosimetry and planning data showed no significant difference between the radial doses for “A” and other points ($p< 0.05$).

Phantom worked well for dose measurement and to practice for different source dwelling positions and times. It can be used for training whole clinical procedure of brachytherapy and it showed that it is a valuable tool for quality assurance program as well as verification of treatment planning system even for non standard condition.

Keywords: Gyn brachytherapy phantom, quality assurance, dosimetry, training

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