Published online 2018 December 3.

**Case Report** 

# Strangulated Small Bowel Obstruction in Paracecal Hernia and Laparoscopic Approach: A Case Report and Review of Literature

Stefano Mandalà<sup>1,\*</sup>, Antonino Mirabella<sup>2</sup>, Massimo Lupo<sup>2</sup>, Massimo Branca<sup>2</sup>, Camillo La Barbera<sup>3</sup>, Carlo Szokoll<sup>2</sup> and Vincenzo Mandalà<sup>3,\*\*</sup>

<sup>1</sup>ARNAS Civico Hospital, Palermo, Italy <sup>2</sup>Villa Sofia-Cervello Hospital, Palermo, Italy <sup>3</sup>Buccheri La Ferla Hospital, Palermo, Italy

. Corresponding author: ARNAS Civico Hospital, Palermo, Italy. Tel: +39-3423194239, Email: stefano.mandala@gmail.com "Corresponding author: Buccheri La Ferla Hospital, Palermo, Italy. Tel: +39-3295820146, Email: mandalachir@tiscali.it

Received 2018 August 22; Accepted 2018 October 14.

## Abstract

Internal hernia (IH) is an infrequent cause of small bowel obstruction, and paracecal hernia (PH) is very rare. The etiology is related to congenital or acquired causes. The current report was on the case of a 67-year-old male admitted to surgical emergency department for a small bowel obstruction due to a PH. The patient was taken to theatre and underwent a laparoscopic-assisted procedure of small bowel resection for strangulation. The postoperative course was uneventful. As demonstrated in literature, the most important diagnostic tool is contrast-enhanced computed tomography(CT) (when possible with reformatted images). Early diagnosis and prompt surgical intervention is paramount to achieve a good outcome. Laparoscopic approach seems to have an interesting role in such conditions. A further review of literature was performed to highlight the current "state of art" in diagnostic and therapeutic management, especially with regard to laparoscopic approach, of this rare disease.

Keywords: Paracecal Hernia, Internal Hernia, Small Bowel Obstruction, Strangulation, Laparoscopy

## 1. Introduction

An internal hernia (IH) is an infrequent cause of small bowel obstruction (SBO) (0.6% - 5.8%) (1-9) and paracecal hernia (PH) is still rarer constituting 6% - 13% of all cases of internal abdominal herniation (9-14). PH is congenital or acquired (15-17). The preoperative diagnosis is very difficult and contrast enhanced computed tomography (CT), preferably with reformatted images (MDCT), represents the diagnostic tool of choice (9, 13). Prompt immediate surgery is necessary to reduce morbidity and mortality rates (16). The surgery, in such cases, frequently represents the last diagnostic tool and the first therapeutic modality, considering that in several cases the diagnosis is intraoperative (18). To date, there are few cases in the literature about laparoscopic surgery (16, 18-27) and the current case tried to show the advantages of minimally invasive approach with "less impact" on the patient, also in acute onset of SBO. In the current case, the surgical procedure was performed by laparoscopic-assisted approach and the postoperative course was uneventful.

## 2. Case Presentation

A 67-year-old male was admitted to the emergency department for abdominal pain with nausea and vomiting. The symptoms started 10 hours before the admission. He had no previous surgery. His medical history revealed hepatitis C virus (HCV)-related liver disease, ischemic heart disease, and Parkinson disease.

Physical examination revealed abdominal tenderness and pain at the right lower quadrant without guarding or rebound.

Laboratory data showed a hyperglycemia (168 mg/dL) and a neutrophilia (87.4%), the remaining parameters were normal.

The plain abdominal X-ray showed air-fluid levels in a dilated small bowel. Ultrasound examination showed no abnormalities. Abdominal CT revealed a cluster of fluid-filled and dilated bowel loops in ileocecal region (Figure 1). It also showed a beaked appearance and tethering of the proximal small bowel loop at the transition zone.

The patient was transferred to the operating room. Diagnostic laparoscopy with three trocars was performed on him; the setup was equal to that of appendectomy, which

Copyright © 2018, Annals of Colorectal Research. This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (http://creativecommons.org/licenses/by-nc/4.0/) which permits copy and redistribute the material just in noncommercial usages, provided the original work is properly cited.



Figure 1. Coronal CT scan: Cluster of fluid-filled and dilated bowel loops in ileocecal region (white arrow)

is the same method employed in the case of laparoscopic approach for the SBO, as highlighted in the literature (with the possible addition of other trocars). A strangulated PH was observed with the peritoneal hole located in paracolic sulci; the small bowel was reduced and the orifice was enlarged (Figures 2-4). The reduced small bowel was necrotic and not viable; therefore, an intestinal resection was performed via mini-laparotomy. The postoperative course was uneventful and the patient was discharged on postoperative day 11.

# 3. Discussion

IH is a rare condition defined as the protrusion of abdominal viscera into one of the fossae, foramina, recesses, or congenital defects within the abdominal and pelvic cavity (11, 28). IH is an infrequent cause of SBO (0.6% - 5.8%)(1-9), with a reported autopsy incidence of 0.2% to 0.9% (4), and PH is still rarer constituting 6% - 13% of all cases of internal abdominal herniation (9-14).

The etiology of this rare disease is congenital or acquired. In the first case, it is important from the embryological viewpoint: Completion of the midgut rotation, fixation of the cecum in the right colic fossa, and resorption of the peritoneal surfaces occur in the 5th fetal month in a sequential order (2, 6, 9, 11, 13, 29). Therefore, the pericecal area (and its recesses), formed by fusion and resorption of



Figure 2. Intraoperative view: Reduction of ischemic small bowel



Figure 3. Intraoperative view: Defect in paracolic sulci

the peritoneal surfaces, is generally classified in four subtypes (Figure 5): Superior ileocecal recess, inferior ileocecal recess, retrocecal recess, and paracolic sulci (9, 11, 30, 31). An excellent classification for boundaries of hernias in the ileocecal region was formulated by Meyer (15, 17, 30) that described six types: Paracecal sulci, cecal fossa, cecal recess, superior ileocecal recess, inferior ileocecal recess, and retrocecal recess.

In the current case, the hernia was located in paracolic sulci. These latter are lateral depressions of the peritoneum investing the cecum. These recesses may be absent or rarely extend posterior to the cecum, forming pockets large enough to admit several fingers (13, 30).

Tissue fragility due to aging, pressure elevation of the inner abdomen, and retroperitoneal adhesion can be the



Figure 4. Intraoperative view: Enlarged defect

causes of the acquired conditions (15-17). They mainly occur postoperatively; i.e., after appendectomy (9) and trauma (32), or following infective, inflammatory, and vascular diseases. In a postoperative case, an adhesion band was reported between the appendiceal stump and the omentum; a segment of the small bowel herniated through the acquired defect and incarcerated in the right paracolic gutter (9).

MEDLINE and PubMed were searched for studies published in English, using the following keywords: "Paracecal Hernia", "Retrocecal Hernia", "Pericecal Hernia", "Internal Hernia", and "Small Bowel Obstruction". several case reports were found about this rare disease treated by laparotomy, as well as small case series and articles about radiological findings. In a second time, another keyword was added "Laparoscopic Surgery". Moreover, relevant articles were searched from references of the selected reports. Only a few articles describe the laparoscopic approach and, to the authors' best knowledge, there are only 11 reports in English (16, 18-27). These reports are summarized in Table 1.

IHs are difficult to diagnose preoperatively due to nonspecific symptoms; therefore, the diagnosis is often uncertain until surgical exploration.

Patients can be asymptomatic or have non-specific symptoms including abdominal discomfort, chronic abdominal pain, and intermittent abdominal pain with feelings of distension, nausea, and vomiting after large meals (33), chronic intermittent partial obstruction (6), until they present with features of acute bowel obstruction (5, 12, 34), and other complications such as strangulation and peritonitis.

Today, the usefulness of CT is well highlighted in the literature (5, 13); indeed it is now considered the imaging modality of choice for the preoperative diagnosis of IH(13). In comparison to other methods such as plain films ab-

domen and enteroclysis or water-soluble contrast enema, CT, and contrast-enhanced CT (CE-CT) have superiority to reveal site, level, and cause of obstruction, and it is now considered the imaging modality of choice and useful to detect the possible underlying cause of SBO (9, 11, 13, 28, 35, 36).

Especially, multidetector CT (MDCT) with 3D reformatted images provides significant advantages to evaluate the small intestine and surrounding structures, and shows its superiority to identify site, level, and causes of SBO including IH and pathological conditions of the bowel wall, mesentery, and peritoneal cavity compared with conventional CT (6, 8, 9, 13, 37).

Several CT characteristics address PH: a cluster of encapsulated (sac-like masses) and fluid-filled dilated or edematous small bowel loops located in lateral and posterior to the displaced cecum and ascending colon, respectively, and the finding of a displaced, engorged, and stretched mesenteric vascular pedicle within the hernial sac. Other signs are a beaked appearance and tethering at the aperture of hernia and a dilation of small bowel loop with transition zone (2, 4, 6, 7, 9, 13, 33, 36-39) and "whirl sign" (28, 38, 40).

Statistically significant predictive CT features of intestinal strangulation are mesenteric fluid, mesenteric infiltrates, bowel-wall thickening, intramural hemorrhage, abnormal bowel-wall enhancement, and mesenteric vessel engorgement (41).

PH can be diagnosed preoperatively with high index of suspicion by CE-CT (2, 4, 6-9, 13, 37). In spite of that definitive diagnosis, most of the times, it requires direct visualization of the hernia by surgery (18). Delay in diagnosis increases the mortality rates up to 20% (40, 42).

In the past, laparoscopy was considered inappropriate and a contraindication due to the problems of working space and possibility of bowel injuries. Even today, the role of laparoscopic surgery is still debated in case of SBO and, even more, in case of incarcerated IH; there is no unanimous agreement on other acute abdominal disorders such as acute cholecystitis, acute appendicitis, and perforated gastroduodenal ulcer (43, 44).

This topic was treated in the consensus statement of the Italian Scientific Societies under the auspices of the European Association for Endoscopic Surgery (EAES) that concluded: "The laparoscopic repair of incarcerated IH may be performed, but further studies are necessary to validate this approach". Furthermore, "the potential role of laparoscopy in the diagnosis seems evident and would, at times, prevent unnecessary laparotomies". The level of evidence (LE) was low (45).

A recent systematic review (46) of over 2000 cases showed the already known advantages of laparoscopy



## Figure 5. Pericecal area and its recesses

Table 1. Summary of Laparoscopic Cases											
First Author's Name	Publication Year	Patient's Gender	Age, y	Preoperative Diagno- sis	History of Abdominal Surgery	Classification of Pericecal Hernia	Timing of Surgery	Surgical Approach	Sutured Fossa	Resection Yes/No	POD Dis- charge
Lindsey I. (19)	1997	F	86	SBO	None	Retrocecal	NA	Laparoscopy	No su- ture/enlarged	None	NA
Omori H. (20)	2003	F	90	SBO	None	Paracolic sulci	NA	Laparoscopy	Sutured	None	9
Hirokawa T. (21)	2007	М	74	SBO	Appendectomy	Retrocecal	Surgical emergency	Laparo-assisted	No su- ture/enlarged	None	24
Khalaileh A. (18)	2009	М	70	SBO	None	NA	NA	Laparoscopy	No su- ture/enlarged	None	6
Kabashima A. (16)	2010	F	43	SBO	Invagination	Retrocecal	NA	Laparoscopy	No su- ture/enlarged	None	8
Saygin H. (22)	2015	F	50	SBO	None	NA	NA	Laparoscopy	NA	None	NA
Ogami T. (23)	2016	М	92	SBO	Cholecystectomy	Retrocecal	NA	Laparoscopy	No su- ture/enlarged	None	10
Sasaki K. (24)	2016	М	65	SBO	None	Retrocecal	12th day of hospital stay	Laparoscopy	Sutured	None	7
Tayaran A. (25)	2017	F	75	SBO	None	Paracolic sulci	NA	Laparoscopy	Sutured	None	2
Otani H. (26)	2018	F	83	SBO	None	Paracolic sulci	Surgical emergency	Laparoscopy	No su- ture/enlarged	None	NA
Inukai K. (27)	2018	М	54	SBO	None	Paracolic sulci	Surgical emergency	Laparo-assisted	No su- ture/enlarged	Yes	17
Present case	2011 (year of surgery)	М	67	SBO	None	Paracolic sulci	Surgical emergency	Laparo-assisted	No su- ture/enlarged	Yes	11

compared with open surgery. In 1.3% of cases, IH was the cause of SBO. The authors concluded that laparoscopy was a feasible alternative to laparotomy for acute SBO when performed by experienced surgeons (46).

caused by IH in 1.3% of the cases. The authors concluded that laparoscopy was a safe and effective technique to manage SBO. They strongly recommended its use as the first line treatment by highly experienced surgeons (47).

Also, Kirshtein et al. (47) reported that the SBO was

There are only few case reports about laparoscopic ap-

proach in SBO and PH with a good outcome for the patient. It is believed that diagnostic and therapeutic laparoscopy can be useful and convenient for the patient; to achieve a great benefit for him/her, it is possible to complete the procedure or conduct a tailored mini-laparotomy, especially if the patient needs an intestinal resection.

Also, in the current case, a laparoscopic-assisted procedure was performed associated to a bowel resection for strangulation and small bowel ischemia and necrosis. The outcome of the patient was very good.

The timing of surgery is very important in such kind of diseases. As mentioned above, the risk of strangulation is high and as time goes on, the risk of perforation and peritonitis increases, which leads to a greater probability of intestinal resection, and proportionally to a worst postoperative outcome. Indeed, Akyildiz et al. reported (48) that in all patients that died there was a long period between the onset of symptoms and surgery; moreover, in univariate and multiple logistic regression analyses, delayed laparotomy and massive intestinal necrosis, in addition to other variables, were statistically significant for mortality (48).

# 5.1. Conclusions

PH is a very rare IH. The diagnosis is difficult due to nonspecific symptoms. The CT and MDCT play an important role to detect the disease, where possible, considering the most frequent clinical presentations such as SBO and the severity of its complications as strangulation, ischemic disorders, and peritonitis. Surgeons and radiologists should keep in mind the high index of suspicion in case of patients with SBO and virgin abdomen. The laparoscopic surgery and laparoscopic-assisted procedures remain a valid approach as diagnostic and therapeutic tools, as long as performed by experienced surgeons to achieve the advantages of this approach and good results.

## Footnotes

**Conflict of Interests:** Authors declared no conflict of interest.

**Ethical Approval:** The study procedure was approved by the Ethics Committee of the local university and was in accordance with the standards of the Declaration of Helsinki, version 2013.

**Funding/Support:** There was no funding/grant for the current study.

## References

1. Ghahremani GG. Internal abdominal hernias. *Surg Clin North Am*. 1984;**64**(2):393-406. [PubMed: 6729672].

- Lu HC, Wang J, Tsang YM, Tseng HS, Li YW. Case report: Pericecal hernia: A report of two cases and survey of the literature. *Clin Radiol.* 2002;57(9):855-8. [PubMed: 12384115].
- Blachar A, Federle MP. Internal hernia: An increasingly common cause of small bowel obstruction. Semin Ultrasound CT MR. 2002;23(2):174–83. [PubMed: 11996230].
- Osadchy A, Keidar A, Zissin R. Small bowel obstruction due to a paracecal hernia: Computerized tomography diagnosis. *Emerg Radiol.* 2005;11(4):239–41. doi: 10.1007/s10140-004-0397-5. [PubMed: 16133614].
- Martin LC, Merkle EM, Thompson WM. Review of internal hernias: Radiographic and clinical findings. *AJR Am J Roentgenol.* 2006;**186**(3):703–17. doi: 10.2214/AJR.05.0644. [PubMed: 16498098].
- Fu CY, Chang WC, Lu HE, Su CJ, Tan KH. Pericecal hernia of the inferior ileocecal recess: CT findings. *Abdom Imaging*. 2007;**32**(1):81–3. doi: 10.1007/s00261-006-9083-2. [PubMed: 16947070].
- Choh NA, Rasheed M, Jehangir M. The computed tomography diagnosis of paracecal hernia. *Hernia*. 2010;14(5):527–9. doi: 10.1007/s10029-009-0572-4. [PubMed: 19830508].
- Jang EJ, Cho SH, Kim DD. A case of small bowel obstruction due to a paracecal hernia. *J Korean Soc Coloproctol*. 2011;**27**(1):41-3. doi: 10.3393/jksc.2011.27.1.41. [PubMed: 21431096]. [PubMed Central: PMC3053502].
- 9. Hsiao CP, Yeung KW. Evaluation of acquired pericecal hernia using computed tomography: A case report. *J Radiol Sci.* 2013;**38**:101–3.
- Rosen L, Woldenberg D, Friedman IH. Small-bowel obstruction secondary to pericecal hernia. *Dis Colon Rectum*. 1981;24(1):45–6. [PubMed: 7472102].
- Rivkind AI, Shiloni E, Muggia-Sullam M, Weiss Y, Lax E, Freund HR. Paracecal hernia: A cause of intestinal obstruction. *Dis Colon Rectum*. 1986;**29**(11):752–4. [PubMed: 3769694].
- Pessaux P, Tuech JJ, Derouet N, Du Plessis R, Ronceray J, Arnaud JP. [Internal hernia: A rare cause of intestinal obstruction. Apropos of 14 cases]. Ann Chir. 1999;53(9):870–3. French. [PubMed: 10633934].
- Takeyama N, Gokan T, Ohgiya Y, Satoh S, Hashizume T, Hataya K, et al. CT of internal hernias. *Radiographics*. 2005;25(4):997-1015. doi: 10.1148/rg.254045035. [PubMed: 16009820].
- Nishi T, Tanaka Y, Kure T. A case of pericecal hernia with a hernial orifice located on the lateral side of the cecum. *Tokai J Exp Clin Med*. 2011;36(3):71–4. [PubMed: 21932187].
- Meyer A, Nowotny K, Poeschl M. [Internal hernias of the ileocecal region]. *Ergeb Chir Orthop.* 1963;44:176–204. German. [PubMed: 14283496].
- Kabashima A, Ueda N, Yonemura Y, Mashino K, Fujii K, Ikeda T, et al. Laparoscopic surgery for the diagnosis and treatment of a paracecal hernia repair: Report of a case. *Surg Today*. 2010;**40**(4):373–5. doi: 10.1007/s00595-009-4039-0. [PubMed: 20339994].
- 17. Bendjaballah A, Taieb M, Oudjit MR, Ammari S, Rabehi H, Nait Slimane N, et al. Retrocaecal hernia causing small bowel obstruction. A case report with review of literature. *IOSR-JDMS*. 2016. p. 79–83.
- Khalaileh A, Adileh M, Schlager A, Abu-Gazala S, Mintz Y, Rivkind Al, et al. Image of the month. Incarcerated paracecal hernia. *Arch Surg.* 2009;**144**(10):975–6. doi: 10.1001/archsurg.2009.171-a. [PubMed: 19841369].
- Lindsey I, Nottle PD. Laparoscopic management of small bowel obstruction caused by a retrocaecal hernia. *Surg Laparosc Endosc*. 1997;7(4):349–50. [PubMed: 9282771].
- Omori H, Asahi H, Inoue Y, Irinoda T, Saito K. Laparoscopic paracecal hernia repair. J Laparoendosc Adv Surg Tech A. 2003;13(1):55-7. doi: 10.1089/109264203321235494. [PubMed: 12676024].
- Hirokawa T, Hayakawa T, Tanaka M, Sawai H, Okada Y, Takeyama H, et al. Laparoscopic surgery for diagnosis and treatment of bowel obstruction: Case report of paracecal hernia. *Med Sci Monitor*. 2007;**13**(7):CS79–82. [PubMed: 17599030].
- Saygin H, Kara K, Sari S, Sucullu I, Sonmez G. Education and imaging. Gastrointestinal: A rare cause of small bowel obstruction, paracecal hernia. *J Gastroenterol Hepatol*. 2015;**30**(3):437. doi: 10.1111/jgh.12817. [PubMed: 25707789].

- Ogami T, Honjo H, Kusanagi H. Pericecal hernia manifesting as a small bowel obstruction successfully treated with laparoscopic surgery. *J Surg Case Rep.* 2016;2016(3). doi: 10.1093/jscr/rjw020. [PubMed: 26933000]. [PubMed Central: PMC4772000].
- Sasaki K, Kawasaki H, Abe H, Nagai H, Yoshimi F. Retrocecal hernia successfully treated with laparoscopic surgery: A case report and literature review of 15 cases in Japan. *Int J Surg Case Rep.* 2016;**18**:45–7. doi: 10.1016/j.ijscr.2015.11.022. [PubMed: 26688512]. [PubMed Central: PMC4701871].
- Tayaran A, Abdulrasool H, Bui HT. Paracaecal hernia: A case report on the evolving role of laparoscopy. *Int J Surg Case Rep.* 2017;**32**:29–31. doi: 10.1016/j.ijscr.2017.01.024. [PubMed: 28214762]. [PubMed Central: PMC5312641].
- Otani H, Makihara S. Laparoscopic surgery for small bowel obstruction due to paracecal hernia. *Acta Med Okayama*. 2018;72(1):81–4. doi: 10.18926/AMO/55668. [PubMed: 29463944].
- Inukai K, Tsuji E, Uehara S. Paracecal hernia with intestinal ischemia treated with laparoscopic assisted surgery. *Int J Surg Case Rep.* 2018;44:20–3. doi: 10.1016/j.ijscr.2018.02.016. [PubMed: 29462753]. [PubMed Central: PMC5832674].
- Ozpolat C, Atalay HI, Ozkaya S, Adanc M, Denizbasi A, Onur O, et al. Internal hernias: Emergency department radiological dilemma. *Int J Case Rep Images (IJCRI)*. 2015;6(2):111–4. doi: 10.5348/ijcri-201522-CR-10483.
- Molto Aguado M, Gonzalez Valverde FM, Barreras Mateos JA, Vazquez Rojas JL. Small intestinal strangulation due to a primary internal paracecal hernia. *Hernia*. 2007;**11**(5):457–8. doi: 10.1007/s10029-007-0210-y. [PubMed: 17342384].
- Bass J Jr, Longley BJ. Paracecal hernia: Case report and review of the literature. Am Surg. 1976;42(4):285–8. [PubMed: 1267281].
- Selcuk D, Kantarci F, Ogut G, Korman U. Radiological evaluation of internal abdominal hernias. *Turk J Gastroenterol.* 2005;16(2):57-64. [PubMed: 16252193].
- Kulvatunyou N, Albrecht RM, Roberts P. An unusual case of intensive care unit ileus: A case of a posttraumatic pericecal herniation. *Am Surg.* 2009;**75**(2):179–81. [PubMed: 19280816].
- Kleyman S, Ashraf S, Daniel S, Ananthan D, Sanni A, Khan F. Pericecal hernia: A rare form of internal hernias. *J Surg Case Rep.* 2013;2013(2). doi: 10.1093/jscr/rjs021. [PubMed: 24964406]. [PubMed Central: PMC5912703].
- 34. John RJ, Ulahannan SE, Kurien JS, Joseph A, Kurien AS, Varghese SA, et al. Rare hernias presenting as acute abdomen. A case series. J Clin Diagn Res. 2016;10(3):PR01-4. doi: 10.7860/JCDR/2016/17356.7401. [PubMed: 27134943]. [PubMed Central: PMC4843328].
- Mathieu D, Luciani A, GERMAD Group . Internal abdominal herniations. *AJR Am J Roentgenol*. 2004;**183**(2):397-404. doi: 10.2214/ajr.183.2.1830397. [PubMed: 15269032].
- 36. Cho C, Govani D, Bako A, Dhawan V, Patel R. Post-operative obstructed internal paracecal hernia through congenital mesenteric defect pre-

senting after transvaginal surgery in an 83-year-old lady. Int J Adv Case Rep. 2015;2(1):32–6.

- Murali Appavoo Reddy UD, Dev B, Santosham R. Internal hernias: Surgeons dilemma-unravelled by imaging. *Indian J Surg.* 2014;**76**(4):323-8. doi: 10.1007/s12262-012-0620-7. [PubMed: 25278660]. [PubMed Central: PMC4175680].
- Ghiassi S, Nguyen SQ, Divino CM, Byrn JC, Schlager A. Internal hernias: Clinical findings, management, and outcomes in 49 nonbariatric cases. J Gastrointest Surg. 2007;11(3):291–5. doi: 10.1007/s11605-007-0086-2. [PubMed: 17458600].
- Kumar S, Dikshit P, Bhaduri S, Sattavan S. Gangrenous appendicitis: A rare presentation of pericecal hernia; case report and review of the literature. *Bull Emerg Trauma*. 2015;3(4):144–7. [PubMed: 27162920]. [PubMed Central: PMC4771309].
- Fan HP, Yang AD, Chang YJ, Juan CW, Wu HP. Clinical spectrum of internal hernia: A surgical emergency. *Surg Today*. 2008;**38**(10):899–904. doi: 10.1007/s00595-007-3756-5. [PubMed: 18820864].
- Yen CH, Chen JD, Tui CM, Chou YH, Lee CH, Chang CY, et al. Internal hernia: Computed tomography diagnosis and differentiation from adhesive small bowel obstruction. *J Chin Med Assoc.* 2005;68(1):21-8. doi: 10.1016/S1726-4901(09)70127-3. [PubMed: 15742859].
- 42. Erdemir A, Merkezi AS, Kihtir S, Hastane FN, Bilgel H, Aydıner Ö, et al. A rare cause of mechanic intestinal obstruction: Primary internal pericecal hernia. *CausaPedia*. 2014;**3**:726.
- 43. Mandala V, Mirabella A, Lupo M. *The role of laparoscopy in emergency abdominal surgery*. Springer Verlag Italia; 2011.
- Agresta F, Campanile FC, Anania G, Bergamini C. Emergency laparoscopy. Switzerland: Springer International Publishing; 2016.
- 45. Agresta F, Ansaloni L, Baiocchi GL, Bergamini C, Campanile FC, Carlucci M, et al. Laparoscopic approach to acute abdomen from the Consensus Development Conference of the Societa Italiana di Chirurgia Endoscopica e nuove tecnologie (SICE), Associazione Chirurghi Ospedalieri Italiani (ACOI), Societa Italiana di Chirurgia (SIC), Societa Italiana di Chirurgia d'Urgenza e del Trauma (SICUT), Societa Italiana di Chirurgia nell'Ospedalita Privata (SICOP), and the European Association for Endoscopic Surgery (EAES). Surg Endosc. 2012;26(8):2134–64. doi: 10.1007/s00464-012-2331-3. [PubMed: 22736283].
- O'Connor DB, Winter DC. The role of laparoscopy in the management of acute small-bowel obstruction: A review of over 2,000 cases. Surg Endosc. 2012;26(1):12–7. doi: 10.1007/s00464-011-1885-9. [PubMed: 21898013].
- Kirshtein B, Roy-Shapira A, Lantsberg L, Avinoach E, Mizrahi S. Laparoscopic management of acute small bowel obstruction. Surg Endosc. 2005;19(4):464–7. doi: 10.1007/s00464-004-9038-z. [PubMed: 15959710].
- Akyildiz H, Artis T, Sozuer E, Akcan A, Kucuk C, Sensoy E, et al. Internal hernia: Complex diagnostic and therapeutic problem. *Int J Surg.* 2009;7(4):334–7. doi: 10.1016/j.ijsu.2009.04.013. [PubMed: 19422936].