



## Short-term Outcome of Open Appendectomy in Southern Iran: A Single Center Experience

Shahram Paydar<sup>1</sup>, Parisa Javidi Parsijani<sup>1</sup>, Armin Akbarzadeh<sup>2\*</sup>, Alireza Manafi<sup>3</sup>, Fariborz Ghaffarpassand<sup>1</sup>, Hamid Reza Abbasi<sup>1</sup>, Shahram Bolandparvaz<sup>1</sup>

<sup>1</sup>Trauma Research Center of Shiraz University of Medical Sciences, Shiraz, Iran.

<sup>2</sup>Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran.

<sup>3</sup>Student Research Committee, Fasa University of Medical Sciences, Fasa, Iran

**Corresponding author:** Armin Akbarzadeh

Address: Student Research Committee, Neshat Street, Shiraz, Iran.

Postal Code: 71348-43638 Tel/Fax: +98-711-2122970

e-mail: armin.akbarzadeh@gmail.com

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### ► ABSTRACT

**Objectives:** To evaluate the short-term outcome of open appendectomy, the rate of negative appendectomy as well as pathology reports after surgery in patients with suspected acute appendicitis.

**Methods:** This was a retrospective cross-sectional study being performed in Nemazee hospital affiliated with Shiraz University of Medical Science during a 2-year period between 2008 and 2010. The medical records of all consecutive patients who underwent open appendectomy in our center due to acute appendicitis were included in the study. The elective and laparoscopic appendectomies were excluded. The demographic information, clinical findings, laboratory investigations and the histopathological examination of the appendix were recorded and reported.

**Results:** A total of 337 patient including 137 (36.4%) females, and 240 (63.6%) males with the mean age of 16.26 ± 9.81 (range 3 to 76) years were studied. Anorexia (64.7%) and fever (20.7%) were more prevalent symptoms. The mean duration between pain initiation and operation ranged from 0 to 14 days with mean 1.88 ± 1.63 days. Right lower quadrant (RLQ), periumbilical, epigastria, left lower quadrant (LLQ), and Right upper quadrant (RUQ), pain were manifest in 78.8%, 41.6%, 12.2%, 3.2%, and 1.3% of patients, respectively. Pathological evaluation of the appendix showed appendicitis in 70.4% of patients.

**Conclusion:** The higher rate of negative appendectomy accounts for wasteful tapping of medical resources and causing further complication in patients. Therefore it is essential to conduct more accurate studies to detect the root cause of the disease. This would help improve the management of appendicitis which is an emergency condition with high incidence.

**Keywords:** Acute appendicitis; Open appendectomy; Short-term outcome, Iran.

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### Introduction

Acute appendicitis is one of the most common intra-abdominal emergencies with an approximately high lifetime risk in the world [1-3]. Suspected appendicitis remains a diagnostic challenge because it simulates symptoms of other gynecologic, gastrointestinal, and nonspecific functional diseases. Even recent attempts to improve the diagnostic workup, such as computed tomography, ultrasound, and diagnostic scoring systems, have not gained broad

acceptance [4-7]. Macburny in 1894 introduced the open surgical appendectomy (OA) which remained the gold standard for the treatment of acute appendicitis for more than a century [8,9].

The chance of undergoing appendectomy during a lifetime is 23.1% in females and 12% in males [10]. Approximately 20% of appendectomies are superfluous. This is due to the fact that either they have not been supported by any pathological findings at operation [11-13], or involved mistaken diagnosis.

Mortality after appendectomy is low (0-0.24 %) and is greatly related to the severity of peritonitis present at the time of initial operation [14-17]. Also morbidity following appendectomy is low (5.2- 11.3 %), which correlates with the severity of peritonitis and presence of perforation detected at operation [15-17]. The high rate of negative appendectomies is the most important disadvantage of routine open appendectomy (OA) following suspected acute appendicitis. This negative point is more prominent (19-34%) even in recent studies of some patients such as women of childbearing age [10-12,18]. The study of complications showed that the mean hospital stay, rate of infections, gastrointestinal complications, duration of analgesic use and overall complications are significantly much lower in OA patients than in laparoscopy appendectomy (LA) group. However, OA patients had higher rates of routine discharge and delayed return to daily activities [19-21].

Despite the increasing use of ultrasonography, computed tomography (CT), and laparoscopy, the rate of misdiagnosis of appendicitis has remained constant (15.3%), as has the rate of appendiceal rupture [22,23]. Negative appendectomy is an important issue which is evaluated after surgery by pathology report, and varies in different operations such as 6% rate indicated by the study of Vriesman *et al.*, [24].

Since there is no precise study of open appendectomy and its complications in southern Iran, the present study was carried out to evaluate the short-term outcome of open appendectomy, the rate of negative appendectomy as well as pathology reports after surgery in patients with suspected acute appendicitis.

## Materials and Methods

### Study population

This was a retrospective cross-sectional study including all the consecutive patients with acute appendicitis undergoing open appendectomy in Nemazee hospital, a tertiary healthcare center affiliated with Shiraz University of Medical Sciences, Shiraz, Iran during a 2-year period from January 2007 to February 2009. We included those patients whose medical charts had required information and those who underwent emergency open appendectomy. We excluded those who underwent laparoscopic appendectomy and those who were scheduled for elective appendectomy. Incomplete profiles were excluded from our study. The study protocol was approved by the institutional review board (IRB) and ethics committee of Shiraz University of Medical Sciences. This study was exempt from human subjects review by agreement of the Shiraz University of

Medical Sciences Human Subject Review Committee. The database includes only anonymous data and is considered to be within the public domain.

### Study protocol

The medical charts of the patients; were reviewed and the data was entered into a computer database. The database contained demographic variables, clinical findings including anorexia, nausea and vomiting, right upper quadrant, epigastric and periumbilical pain and tenderness, the time between starting pain and operation, administrative details of admission and discharge, International Classification of Diseases, procedure and diagnostic codes. Also reports of appendix pathology after surgery were reviewed in order to evaluate the rate of gangrenous condition, lymphoid hyperplasia, mild inflammation, local perforation and perforated appendicitis in study population. The specific signs of appendicitis such as obturator, Rovsing and psoas signs were also recorded. The obturator sign, an indicator of irritation to the obturator internus muscle is found when acute appendicitis is suspected. Rovsing's sign which highlights appendicitis was investigated in conjunction with other signs and symptoms in all the patients.

### Statistical analysis

Data was analyzed by Statistical Package for the Social Sciences version 15.0 (SPSS Inc., Chicago, IL). Descriptive results are presented as mean  $\pm$  standard for 95% confidence interval (CI) or proportions wherever appropriate.

## Results

A total of 337 patient including 137 (36.4%) females, and 240 (63.6%) males with the mean age of  $16.26 \pm 9.81$  (range 3 to 76) years underwent open appendectomy operation. Anorexia (64.7%) and fever (20.7%) were more prevalent symptoms. The mean duration between pain initiation and operation ranged from 0 to 14 days with mean  $1.88 \pm 1.63$  days. Most patients referred immediately because of their progressive pain. Gastrointestinal manifestations were common. Only 4% and 1.6% of the patients had diarrhea and constipation respectively.

Pain was also one of the most common and inevitable symptoms. Right lower quadrant (RLQ), periumbilical, epigastria, left lower quadrant (LLQ), and Right upper quadrant (RUQ), pain were manifest in 78.8%, 41.6%, 12.2%, 3.2%, and 1.3% of patients, respectively. RLQ tenderness (89.7%) and RLQ Rebound Tenderness (70%) was common among patients. Periumbilical tenderness and RUQ

**Table 1.** Epidemiological characteristics, clinical signs, and complication of 377 patients undergoing open appendectomy.

Variable	Value
<b>Sex</b>	
Male (%)	242 (64.2%)
Female (%)	135 (35.8%)
<b>Age (years)</b>	16.24 ± 9.81
<b>Pain initiation to operation time (days)</b>	1.88 ± 1.63
<b>Clinical sign and symptoms</b>	
Anorexia (%)	244 (64.7%)
Leukocytosis (%)	207 (54.9%)
Diarrhea (%)	15 (4.0%)
Constipation (%)	6 (1.6%)
Fever (%)	78 (20.7%)
Pain (%)	
Right lower quadrant (%)	297 (78.8%)
Periumbilical (%)	157 (41.6%)
Epigastric (%)	46 (12.2%)
Left lower quadrant (%)	12 (3.2%)
Right upper quadrant (%)	5 (1.3%)
<b>Tenderness</b>	
Right lower quadrant (%)	338 (89.7%)
Right lower quadrant (Rebound) (%)	264 (70.0%)
Periumbilical (%)	33 (10.4%)
Right upper quadrant (%)	7 (1.9%)
<b>Signs</b>	
Cough sign (%)	59 (15.7%)
Rovsing's sign (%)	36 (9.6%)
Psoas sign (%)	11 (3.0%)
Obturator sign (%)	7 (1.9%)

tenderness was found in 10.4% and 1.9% of patients respectively. In spite of Rovsing's sign was found in 36 patients (9.6%), Obturator and Psoas signs were observed in only 1.9% and 3% of patients (Table 1). Pathological evaluation of the appendix showed appendicitis in 70.4% of patients. Appendicitis was local in 15.7% but perforated type was diagnosed in 1.9% of the patients. A total of 109 (29.1%) patients exhibited severe inflammation in their appendix. Suppurative condition was seen in 93 patients (28.5%) (Table 2).

## Discussion

The aim of this study was to investigate the outcomes, epidemiology and clinical characteristics of open appendectomy conducted in Nemazee hospital, southern Iran. The rate of negative appendectomy in the course of our study was 29.6% which was higher than 15.3% of misdiagnosed appendicitis [25]. The rate of open appendectomy was higher in men compared to women (64.2% vs. 35.8) but it is variably reported in different studies. The mean age

**Table 2.** The pathological findings of 377 patients after open appendectomy.

Variable	Incidence
<b>Appendicitis</b>	264 (70.4%)
Locally perforated (%)	59 (15.7%)
Perforated appendicitis (%)	7 (1.9%)
Suppuration (%)	93 (28.5%)
Lymphoid hyperplasia (%)	54 (14.4%)
Gangrenous (%)	45 (12%)
Inflammation (%)	
Severe (%)	109 (29.1%)
Moderate (%)	46 (12.2%)
Mild (%)	28 (7.4%)

of the patients undergoing surgical operation in our center was 16.26 years that was lower than the mean age of 25.5 years in other studies [14]. Anorexia, which nearly always accompanies appendicitis, was observed in 64.7% of our patients. Local pain and tenderness in right lower quadrante and umbilical region was common and similar to other studies [25]. Coughing and Rovsing's sign were more prevalent in patients with appendicitis, but Psoas sign (3.0%) and Obturator sign (1.9%) were infrequently seen in our patients. Leukocytosis was reported in 54.9% of the patients compared to 90% in other studies [14], and the higher leukocyte count raise the possibility of a perforated appendix. Pathological tests show that the number of locally perforated appendicitis was higher than complete perforation. Small number of the operated patients showed inflammation that may be due to the high rate of negative appendectomy in our center.

The high rate of misdiagnosed appendicitis occurred despite available diagnostic procedures such as ultrasonography and computed tomography (CT). This may be attributed to inappropriate use of available diagnostic devices, physicians' skills in accurate diagnosis of appendicitis, and high workload of the emergency department of the hospital that may adversely affect careful patients' management. Further prospective studies involving more patients are warranted to achieve more accurate assessment.

In conclusion, the higher rate of negative appendectomy accounts for wasteful tapping of medical resources and causing further complication in patients. Therefore it is essential to conduct more accurate studies to detect the root cause of the disease. This would help improve the management of appendicitis which is an emergency condition with high incidence.

**Conflict of Interest:** None declared.

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