

Original Article

Clinical results of laparoscopic appendectomy in patients with complicated and uncomplicated appendicitis

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Received July 28, 2014; Accepted September 20, 2014; Epub October 15, 2014; Published October 30, 2014

Abstract: Acute appendicitis is the most common surgical emergency. The aim of this study was to evaluate the clinical results of laparoscopic appendectomy (LA) for the treatment of uncomplicated and complicated appendicitis. A retrospective analysis was performed who had undergone laparoscopic appendectomy for complicated appendicitis between January 2010 to October 2013. The diagnosis of acute appendicitis was established with physical examination, laboratory tests, and ultrasound examination. The patients were analysed for age, sex, conversion rate, operation time, postoperative infectious complications and length of hospital stay. A total of 452 patients were operated with LA. There were 362 (80.1%) uncomplicated (Group I) and 90 (19.1%) complicated Group (II) appendicitis. The intraabdominal abscess rate was 14.35% in Group I and 19.5% in Group II. The wound infection and rate of incisional hernia were also higher in Group II. The postoperative complications including intraabdominal abscess, wound infection and incisional hernia after LA in complicated appendicitis found high. LA should be performed very carefully in complicated appendicitis.

Keywords: Complicated appendicitis, laparoscopic appendectomy

Introduction

Acute appendicitis is the most common emergent abdominal condition requiring surgical intervention. Perforated appendicitis may be seen in 20-30% of patients with acute appendicitis [1]. Perforation is associated with a high risk of postoperative complications, including wound infection and intra-abdominal abscess. Laparoscopic appendectomy (LA) has become a common intervention worldwide in recent years. The use of laparoscopic appendectomy for complicated appendicitis is controversial, especially with regard to the rate of postoperative infectious complications including wound infection and abscess formation in abdominal cavity [2-4]. The purpose of this study is to evaluate the outcome of laparoscopic appendectomy for the treatment of complicated appendicitis.

Material and method

A retrospective analysis of patients who had undergone laparoscopic appendectomy for

complicated appendicitis between January 2010 and October 2013 has been performed. The diagnosis of acute appendicitis was established with physical examination, laboratory tests and ultrasound examination. Abdominal computed tomography was used in selected patients.

Uncomplicated and complicated appendicitis were defined by both surgical and pathological findings. While uncomplicated appendicitis was characterized with any phlegmonous and catarrhal stage appendicitis without any serious periappendicular infection, complicated appendicitis has been defined as the presence of perforation, gangrene, serious periappendicular inflammation, mass formation (a plastron) or intra-abdominal abscess. National Nosocomial Infection Surveillance (NNIS) System Classification is used for the definition of wound infection and intra abdominal abscess [5]. The surgical operations were performed by a surgical team consisting of an experienced surgeon and a surgical trainee. Laparoscopic appendectomy

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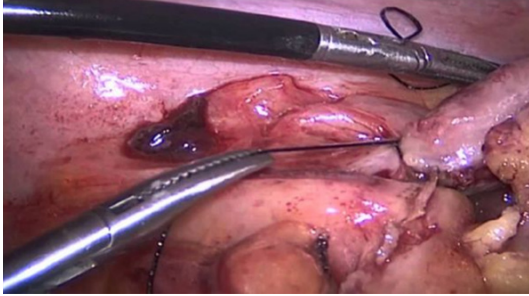


Figure 1. Ligation of appendix stump.

was performed under general anaesthesia and all patients received prophylactic antibiotics (Sephazolin Sodium 1 gram IV) preoperatively. Laparoscopic appendectomy was performed with 3 trocars; a 10-mm umbilical, a 5-mm suprapubic, and a 10-mm port in the right hypochondrium. An infraumbilical incision of 2-3 cm in length was performed. Intraabdominal pressure of approximately 12 mm-Hg was provided by CO₂ insufflation. A 10-mm optic trochar was placed through this port. The mesoappendix was divided using ligature. The root of the appendix was ligated twice with 2/0 prolene endo-loop or 2/0 vicryl sutures (**Figure 1**). The appendix was cut out with scissors or ligature. The appendix was removed from the abdominal cavity with a plastic bag through the 10-mm trochar site. Peritoneal irrigation and aspiration with normal saline solution was performed in every patient with intraabdominal purulent fluid including perforated and abscess cases (**Figure 2**).

Statistical analysis

The patients were analyzed for age, sex, conversion rate, operation time, postoperative infectious complications and length of hospital stay. All tissues from appendectomy were examined histopathologically. Statistical analysis was performed by SPSS. Statistical software version 17.0 (SPSS Inc., Chicago, IL, USA). All continuous data were expressed as mean \pm Standard Deviation (SD).

Results

A total of 452 patients were operated with LA. There were 362 (80.9%) uncomplicated (Group I) and 90 (19.1%) complicated (Group II) appendicitis cases. The demographic characteristics of patients were shown in **Table 1**. Majority of

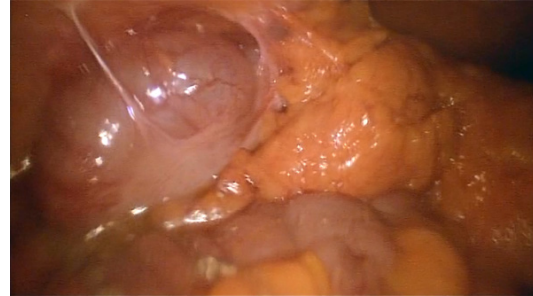


Figure 2. Perforated appendicitis in laparoscopy.

the patients with complicated appendicitis were male. This difference was statistically significant ($p < 0.05$). 288 patients (63.7%) were discharged from the hospital in the first postoperative day, 96 patients (21.2%) in the second, and 68 patients (15.1%) in the third day. The operation times were shown in **Table 1**. Postoperative complications were shown in **Table 2**. Pathological results of appendiceal specimens were shown in **Table 3**.

Discussion

Acute appendicitis is a common surgical emergency with an incidence of 1.17 patients per 1,000 and a lifetime risk of 6.7% and 8.6% in males and females respectively [6, 7]. Open appendectomy has been the treatment of choice before laparoscopy. The first laparoscopic appendectomy was performed by Semm in 1983 [8]. LA has benefits including decreased need for analgesics, shorter hospital stay, early return to work, better cosmetic results and lower rate of wound infection [9, 10]. Laparoscopic technique also provides a clear view of the whole abdominal cavity in case of acute abdomen; pelvic organs in female patients for an example. Although LA has become a common procedure for the treatment of acute appendicitis in recent years, its role in patients with complicated appendicitis is controversial. Some reports claimed that performing LA in complicated appendicitis may be associated with higher rates of intraabdominal infections [11-14]. Many mechanisms have been suggested for the occurrence of intraabdominal abscess formation after LA. In one theory, pneumoperitoneum may cause dissemination of infected material within the peritoneal cavity. Manipulation of appendix for a long time in LA can also be another factor for the increased

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Table 1. Comparison of uncomplicated appendicitis and complicated appendicitis

Parameters	Uncomplicated (Mean ± SD)	Complicated (Mean ± SD)
Age	19.1 ± 8.13	20.4 ± 11.52
Gender	218 males/144 females	74 males/16 females
WBC	11.85 ± 5.3	19.5 ± 3.1
CRP	2.35 ± 0.5	7.5 ± 3.1
Operation time		
45-60 minutes	192 (53%) patients	33 (36.6%) patients
60-90 minutes	116 (32%) patients	15 (16.7%) patients
90-120	54 (15%) patients	15 (16.7%) patients
<120	-	27 (30%) patients

Table 2. Postoperative complications

Parameters	Uncomplicated (Mean ± SD)	Complicated (Mean ± SD)
Intra-abdominal abscess	14.35 ± 3.3	19.5 ± 3.1
Wound infection	10.35 ± 3.3	29.5 ± 3.1
Incisional hernia	1.35 ± 0.5	5.5 ± 1.1
Ileus	6 ± 1.65	3 ± 3.4

Table 3. Pathologic results of the appendiceal specimen

Appendicitis	No. Cases	(%)
Catarrhal	236	52.2%
Phlegmonous	91	20.1%
Gangrenous	41	9.2%
Perforated	49	10.8%
Normal appendix	35	7.7%

rate of intraabdominal infection. Carbon dioxide used for pneumoperitoneum may ease the growth of anaerobic microorganisms. Ferranti et al. compared the laparoscopic and open techniques in patients with perforated appendicitis [15]. The occurrence rate of postoperative intraabdominal abscess was found 16.6% and 5% respectively. They concluded that LA should be used very carefully due to higher rate of abscess formation. Pokala et al. also reported an intraabdominal abscess formation rate of 14% after LA and 0% after conventional surgery [4]. In a recent study by Chang, the intraabdominal abscess rate was found 3% in children with perforated appendicitis and treated with LA [16]. The intraabdominal abscess rate was 2% in open group. Wound infection and long term intestinal obstruction rates were higher in patients treated with open surgery.

They concluded that LA is feasible surgical choice in children with perforated appendicitis.

The incidence of postoperative intraabdominal abscess formation was higher in complicated appendicitis in this series. Intraabdominal abscess rate was 19.5 ± 3.1 in our patients with complicated appendicitis. Wound infection and incisional hernia were also more common in complicated

appendicitis. All of the patients with abscess were treated with percutaneous drainage without any further surgical intervention. Most of our patients with complicated appendicitis were discharged from the hospital 2 or 3 days after appendectomy. Early discharge with short term intravenous antibiotherapy may be associated with high rates of intraabdominal abscess.

In conclusion, the role of LA in complicated appendectomy is controversial. All patients with complicated appendicitis were treated with LA in this series. The postoperative complications including intraabdominal abscess, wound infection and incisional hernia after LA in complicated appendicitis are found high. LA should be performed very cautiously in complicated appendicitis cases.

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