



The efficiency of laparoscopy in patients with complicated appendicitis

Ali Kocatas¹, Erdem Kinaci², Mehmet Abdussamet Bozkurt¹, Eyup Gemici³, Cevher Akarsu¹, Osman Kones¹, Murat Gonenc¹, Halil Alis¹

¹Dr. Sadi Konuk Training and Research Hospital, Department of General Surgery, Istanbul, Turkey

²Istanbul Training and Research Hospital, Department of General Surgery, Istanbul, Turkey

³Boyabat 75. Yil State Hospital, Sinop, Turkey

Abstract

Aim: Laparoscopic approach for complicated appendicitis (CA) is a controversial issue. Although it has been generally recommended, conflicting results have been reported in literature. The aim of this study is to obtain the current results regarding laparoscopic surgery for CA.

Material and Methods: Patients who underwent surgery for acute appendicitis between July 2009 and January 2011 in Dr Sadi Konuk Training and Research Hospital were retrospectively analyzed. Appendicitis was considered as CA when there were one of the following criteria; existence of accompanying intra-abdominal abscess, peritonitis, gangrene or perforation confirmed by a histopathological examination. The patients with CA were divided into two groups, laparoscopic appendectomy (LA) group and open appendectomy (OA) group. Demographics, perioperative findings and postoperative course were compared.

Results: 846 patients with the diagnosis of appendicitis underwent surgery at our center. Of these, 124 cases were complicated appendicitis. Eighty-five (68.5%) and 39 (31.5%) patients underwent to LA and OA, respectively. The mean ages in two groups were compatible ($p=0.224$). The mean body mass index was significantly higher in LA group. Presence of accompanying abscess and use of intra-abdominal drain were similar in both groups ($p>0.05$). Duration of operation was significantly higher in LA group (76.133.7 vs 57.8 22.5) ($p=0.001$). Although postoperative intra-abdominal abscess formation was slightly higher in LA groups (7 cases vs 1 case), there was no difference in postoperative complication between two groups. Length of hospitalization was also not different in both groups. Time to oral feeding was significantly earlier in LA group.

Conclusion: Laparoscopy in complicated appendicitis can be the first choice with no increase in postoperative complications. However, the longer operation time is still a problem for laparoscopic technique despite increasing experience. According to us, future studies should be focused on this problem.

Keywords: Laparoscopy; Appendectomy; Appendicectomy; Complicated; Complication.

INTRODUCTION

After the first description of laparoscopic appendectomy (LA) 30 years ago, it has gained popularity (1). After that, the advantages of this technique, such as better cosmetic results, less postoperative pain, faster recovery and early discharge have been reported by several authors, especially for uncomplicated appendicitis (2,3). Currently, the application of the procedure has been extended to complicated appendicitis (CA). In the current literature, CA is defined as a perforated acute appendicitis accompanying purulent peritoneal collection, abscess formation, and generalized peritonitis (4).

Received: 19.09.2016

Accepted: 07.11.2016

Corresponding Author

Ali Kocatas

Dr. Sadi Konuk Training and Research Hospital,

Department of General Surgery, Istanbul, Turkey

E-mail: erdemkinaci@gmail.com

There are evidences supporting the use of the laparoscopic technique in the management of CA, therefore LA is now considered as an alternative procedure to an open appendectomy (OA) (5-9).

In the treatment of CA, despite the increasing reliance on laparoscopic technique, some concerns still continue about operation time, possibility of conversion to OA, and postoperative septic complications, including wound infection and intra-abdominal abscess formation (5). The aim of this study is to compare safety and efficiency of laparoscopic and open appendectomy for complicated appendicitis at a single center.

MATERIALS and METHODS

Patients underwent surgery for acute appendicitis between July 2009 and January 2011 in the Dr Sadi Konuk Training and Research Hospital were retrospectively analyzed, after approval by ethic committee of our institution. Appendicitis with the

existence of accompanying intra-abdominal abscess, peritonitis, gangrene or perforation confirmed by a histopathological examination was accepted as CA. The patients considered as CA were divided into two groups, LA and OA. Then the groups were compared.

Surgical procedures: After taken informed consent, patients were undergone to either LA or OA under general anesthesia. OA was performed by using the traditional method which has not significantly changed in last 120 years (10,11). LA was performed by surgeon who had experienced in laparoscopic surgery. A one-cm incision was performed just below the umbilicus, and the abdominal wall was lifted and a 10 mm trocar was inserted. Intra-abdominal space was inflated with carbon dioxide (CO₂) up to 12 mmHg. A laparoscopic camera was passed through this trocar into the intra-abdominal space. Then two 5 mm trocars were inserted from suprapubic area and left lower quadrant. Patients were positioned at 20 degrees of the Trendelenburg position and tilted to the left side about 15 degrees. Appendiceal stump was closed with hemoclips or by intracorporeal knotting and then cut by using monopolar scissors, according to the surgeon's preference. Specimens were retrieved through the trocar located in the left lower abdominal quadrant without using a laparoscopic specimen retrieval system. Copious amount of warmed saline was used to provide the peritoneal decontamination. A drain was placed in some cases with discretion of the surgeons.

Postoperative follow up: Analgesics were given regularly during the hospital stay in all patients according to the patients' compliant. Liquid diet was initiated after 24 hours. Intravenous infusion of second generation cephalosporin was continued for three days, followed by oral administration of first generation cephalosporin for

four days. For patients with a gangrenous appendicitis, metronidazole was administered additionally. Surgical site infection, formation of intra-abdominal abscess, and postoperative mechanical intestinal obstruction (MIO) were assessed as postoperative surgical complications.

Recorded parameters: Demography, preoperative white blood cell (WBC) count, ultrasonographic findings, body mass index (BMI), duration of surgery, perioperative findings, method for appendiceal stump closure, need for placement of a drain, time to start oral intake, length of hospital stay and development of postoperative surgical complications were recorded for each patient. In addition, conversion of open surgery was also recorded for LA group.

Statistical analysis: The data of all patients, including demographics, perioperative details, postoperative complications were collected prospectively and maintained in a computer database using SPSS software (SPSS for Windows 11.5; SPSS, Chicago, IL). Normally distributed continuous variables were expressed as mean (±SD) and compared by using a t-test. Nominal data were expressed as case numbers and percentages, and were compared using Fisher's exact test. All tests were two-sided. P<0.05 was recognized as statistically significant.

RESULTS

In the aforementioned date range, 846 patients with the diagnosis of appendicitis underwent surgery at our center. Of these, 124 cases were complicated appendicitis. Eighty-five (68.5%) and 39 (31.5%) patients underwent to LA and OA, respectively. Demography of the patients are shown in table 1. The mean BMI was significantly higher in LA group (p=0.001).

Table 1. Demography of Patients

	All	LA	OA	Pvalue
(n / %)	(124 / 100)	(85 / 68.5)	(39 / 31.5)	
Mean age (years±SD)	34.6 ± 14.2	35.9 ±14.3	32.5 ± 14.4	0.224
Gender n (%)				
Male	82 (66.1)	47 (55.3)	38 (89.7)	0.001
Female	42 (33.9)	38 (44.7)	4 (10.3)	
Mean BMI (kg/m ² ±SD)	25.3 ± 4.2	26.2 ± 4.5	23.4 ± 2.9	0.001

Perioperative findings are shown in table 2. The mean WBC count, presence of abscess and need for placement of intra-abdominal drain were similar in both groups. Mean operation time was significantly higher in LA group (p=0.001). In six patients (15.3%) in OA group, the procedure was started with laparoscopy but was converted to open procedure according to surgeon's discretion. The calculated operation time for these cases included times for both laparoscopic and open part of surgery. In LA group, appendiceal stump was closed with hemoclips in 50 (59%) patients and by intracorporeal knotting in 35 (41%) patients.

Postoperative findings are shown in table 3. Time to start soft diet was significantly less in LA group (p=0.001). Length of hospital stay was not different in

both groups (p=0.521). The overall complication rate was 12.9%. There was no statistically significant difference among postoperative surgical complications in two groups. Enterocutaneous fistula was observed in one patient in OA group. Spontaneous closure of the fistula was waited without surgical intervention up to the 20th postoperative day. Postoperative mechanical intestinal obstruction was observed in one patient in LA group and was not required surgical intervention.

Although postoperative intra-abdominal abscess was more common in LA group (8.2% versus 2.6%), it was not statistically significant (p=0.233). All patients with postoperative intra-abdominal abscess were treated with percutaneous drainage successfully. There was no mortality during the study period.

Table 2. Perioperative findings

	All (124 / 100)	LA (85 / 68.5)	OA (39 / 31.5)	P value
USG findings n (%)				0.002
Normal	30 (24.2)	24 (28.2)	6 (15.4)	
Acute appendicitis	67 (54)	50 (58.8)	17 (43.6)	
Perforation	27 (21.8)	11 (13)	16 (41)	
WBC levels (X10 ³ ±SD)	15.5±4	15.1±3.7	16.8±4	0.064
Presence of abscess (%)	32.3	29.4	38.5	0.317
Duration of operation (min±SD)	70.2±31.7	76.1±33.7	57.8 ±22.5	0.001
Drains (%)	48.5	49.4	46.2	0.170

Table 3. Postoperative complications

	All (124 / 100)	LA (85 / 68.5)	OA (39 / 31.5)	P value
Number of cases (%)				
Complications n (%)				
None	108 (87.1)	75 (88.2)	33 (84.6)	
Intraabdominal abscess	8 (6.5)	7 (8.2)	1 (2.6)	0.233
Surgical site infection	6 (4.8)	2 (2.4)	4 (10.3)	0.061
MIO	1 (0.8)	1 (1.2)	0	0.496
Enterocutaneous fistula	1(0.8)	0	1 (2.6)	0.138
Length of hospital stay (day) (median – range)	3 (1-20)	2.5 (1-9)	5.5 (2-20)	0.171
Time to start oral feeding (day±SD)	2.5±1.3	2.1 ± 1.2	3.5 ± 1.5	0.001

DISCUSSION

The feasibility and validity of the laparoscopic approach has caused significant controversy due to the early reports of the increased incidence of intra-abdominal abscess rates (2-4). It had been adopted that complicated appendicitis was associated with a higher risk of post-operative complications and had been considered as a relative contraindication for laparoscopy (2,3,5). Conversely, several more recent trials have found a statistically significant reduction in early postoperative complications in laparoscopic approach (5-9).

In this study, there was no significant difference in postoperative complications between LA and OA. Postoperative intra-abdominal abscess formation rate was slightly higher in LA group but it was not statistically significant. However, the rate of existence of accompanying intra-abdominal abscess in peroperative period was lower in LA group. Therefore, it should be considered that, the reported rate of postoperative intra-abdominal abscess complication belonged to the group of patients with high rate of peroperative abscess. Although it was not statistically significant (p=0.171), the length of hospital stay was shorter in LA group. Time to start for oral feeding was earlier in LA group. One retrospective study of 214 patients who underwent laparoscopic appendectomy (n=132) and open appendectomy (n=82) found that analgesic use, length of hospital stay, duration of abdominal drainage, incidence of wound infection was less in the laparoscopic technique than in open appendectomy (7). In the same study, the complication rate in the laparoscopic group was significantly lower. Therefore, it was concluded that LA should be the initial choice for all patients with complicated appendicitis. In another study on a series of 404 patients, no difference was observed in development of postoperative complications and mortality between those underwent to laparoscopic

appendectomy compared to those that underwent to open surgery (8). Similarly, it was concluded that laparoscopic operation should be considered as a treatment of choice in CA.

In this study, operation time was significantly longer in LA group. Lin et al compared 19 patients with CA and 75 with non-complicated appendicitis and reported that length of operation and duration of hospitalization were longer in CA cases (6). Cash et al compared 50 cases of CA underwent LA in 2009 and 34 cases of CA underwent LA with less experience and the older technology in 1995. They reported that operative time was similar in the two groups and length of hospital stay and wound infection is more advantageous in 2009 (12). Although shorter operative time in LA was reported in some studies (7, 13, 14), longer operating time was also reported in many older meta-analysis (9, 15, 16, 17). It appears that longer operation time is still a challenge for LA in CA. It can be due to that although laparoscopy for appendicitis can be learned quickly by surgeons, OA is a basic handicraft for them.

In this study, laparoscopy was performed by surgeon experienced in laparoscopic approaches. A meta-analysis compared open and laparoscopic approach in complicated appendicitis; depending on the surgeon's experience there is no differences between laparoscopic and open approach but in developing countries due to lack of laparoscopic instruments and surgical experience adequate open procedure stated to be the method of choice (9).

In conclusion, LA in CA can be the first choice with no increase in postoperative complications. However, the longer operation time is still a problem for laparoscopic technique despite the surgeons' increasing experience. According to us, future studies should be focused on this problem.

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