



Laparoscopic Appendectomy with Endo Stapler Method

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Abstract

Background: *In problematic patients, especially those with appendix base necrosis or perforation, the technique for stump closure is debatable.*

Aim: *To evaluate the efficacy and safety of Laparoscopic appendectomy with an endostapler in patients with appendix base necrosis or perforation.*

Material and Methods: *Forty patients who underwent laparoscopic appendectomy due to appendix base necrosis or perforation between 2020 to 2023 were retrospectively analyzed. In acute complicated appendicitis with appendiceal base necrosis or perforation, it was performed by laparoscopic appendectomy using an endostapler within a safe surgical margin. Demographic characteristics, duration of operation, days of hospital stay, and intra- and post-operative complications were evaluated. SPSS was used for analysis.*

Results: *The mean age of the patients is 42.62 ± 16.89 , female/male ratio was 21/19 (52.8%/47.2%). No intraoperative complications developed. Mean operative time and hospital stay were 104.75 ± 34.96 , 4.58 ± 2.82 days, respectively. Post-operative complications developed in 5 (13.7%) patients. One of them was wound infection (2.7%), 2 of them were ileus (5.5%) and 2 patients had an intraabdominal abscess (5.5%). Stapler line leak was not observed in any of the patients.*

Conclusions: *The use of an endostapler in laparoscopic appendectomy is a safe and effective technique in cases where appendix base necrosis, appendix perforation or severe inflammation affects the base of the cecum.*

Key words: *Laparoscopic appendectomy, Acute complicated appendicitis, Partial cecum resection, Endostaples.*

Introduction

The most frequent emergency surgical condition is acute appendicitis (AA), with a reported lifetime prevalence of 8%. In contrast to an open appendicitis better diagnostic precision, reduced analgesic usage, a shorter hospital stay, earlier return to daily activities, and a decreased rate of wound infection are all benefits of laparoscopic appendectomy (LA) over open appendectomy (OA) [1-4]. Due to the greater incidence of surgical complications, there is disputed evidence about the laparoscopic technique in patients with complex acute appendicitis [3, 4]. Extensive peritoneal cavity evaluation, debridement, irrigation, and lavage performed under direct visibility, avoidance of significant abdominal incisions, and less pulmonary sequelae are all advantages of treating acute appendicitis complicated by LA [5]. There are numerous research on the removal of the appendix stump in both simple and complex appendicitis, however there is little agreement in the literature regarding the relative merits of the various procedures other [4,5]. In complicated appendicitis, the literature reports the use of metal clips, hem-o-lock clips, endoloops, intracorporeal knots, and endostaplers to close the appendix stump [5]. This study was planned to to evaluate the efficacy and reliability of laparoscopic appendectomy with endostapler in patients with appendiceal base necrosis or perforation.

Materials and Methods

It was a retrospective record based study done for a period of 3 years from January 2020 to January 2023 in department of surgery in a tertiary care hospital. The diagnosis of appendix base necrosis or perforation a total of 40 patients who underwent laparoscopic appendectomy was reviewed. Appendix base necrosis was evaluated according to the laparoscopic staging of acute appendicitis disease described by Gomes et al. [6] Patients with complicated acute appendicitis aged 18–80 years with peri-operative Gomes Stage 3B were included in the study. Patients with uncomplicated appendicitis, incomplete clinical-demographic data, incompatible with treatment and inability to follow up were excluded from the study. Informed consent forms were obtained from all patients. Approval from institutional ethics committee was obtained.

Methodology

In all patients, an abdominal computed tomography (CT) scan was used to make the preoperative diagnosis. Age and other demographic details of the patients. The following information was gathered: gender, body mass index (BMI), ASA ratings, preoperative white blood cell (WBC), and C-reactive

protein (CRP) readings. The length of the procedure, the number of days spent in the hospital, and the post-operative problems were assessed. The time (min) from the skin incision to the skin closure was used to calculate the operation's duration. Iatrogenic injury and hemorrhage were classified as intra-operative complications. The duration of the operation, the rate of conversion to open surgery, duration of hospital stay, intraoperative complications, and stump leakage were used to evaluate the safety and efficacy of this technique. Operations were performed by surgeons who performed 50 or more laparoscopic appendectomies per year.

Surgical Technique

After general anesthesia, 1 g of ceftriaxone prophylaxis was given to all patients. For all patients, Foley and orogastric catheters were placed. A 12 mm Hg CO₂ pneumoperitoneum was produced with a Veress needle and a 10 mm trocar was placed following a 1 cm skin incision under the umbilicus. After investigation, 15 mm from the left lower quadrant and 5 mm from the suprapubic region were introduced through the umbilical trocar using a 30-degree camera under direct observation. The patient was positioned in a Trendelenburg posture with a left lateral tilt of 15 degrees. It was decided to do partial cecum excision with an endostapler in complex acute appendicitis cases with necrosis and perforation in the proximal region of the appendix and the base of the cecum as seen in figure 1 (A, B). Appendectomy was performed as in the laparoscopic technique. All patients were started orally at the 4th hour post-operatively.

Statistical Analysis

The statistical analysis was performed using SPSS for windows version 22.0 software (Mac, and Linux). The findings were present in number and percentage analyzed by frequency, percent, and Chi-squared test. Chi-squared test was used to find the association among variables. The critical value of P indicating the probability of significant difference was taken as <0.05 for comparison.

Results

Parameter	Value
Age	42.62 ±16.79 (range: 18-82)
Gender, <i>n</i> (%):	
Female	21 (52.8)
Male	19 (47.2)
BMI [kg/m ²]	26.23 ±4.09
ASA score, <i>n</i> (%):	
1	8 (22.2)
2	28 (66.7)
3	3 (8.3)
4	1 (2.8)
WBC [$\times 10^3/\text{mm}^3$]	18.814 ±43.27
CRP [mg/l]	9.55 ±5.13

Table 1- Demographic and Clinical details of study participants

As per table 1 the mean age of the patients is 42.62 ±16.79 years (range: 18–82). Mean BMI was 26.23 ±4.09 kg/m². The female/male ratio was 21/19 (52.8%/47.2%). Eight (22.2%) patients were ASA 1, 28 (66.7%) patients were ASA 2, 3 (8.3%) patients were ASA 3 and 1 (2.8%) patient was ASA 4.



Figure 1 (A) Application for Endostapler for resection **(B)** View of stapler line (White arrow) after resection

Variable	N	%
Conversion to open	2	5.5
Complication:	5	13.7
Wound infection	1	2.7
Ileus	2	5.5
Intraabdominal abscess	2	5.5
Stump leakage	0	0
Hospital stay [days]	4.58 ±2.82	
Operation time [min]	104.75 ±34.96	

Table 2- Surgical results after resection

As per table 2 Two (5.5%) patients were converted to open appendectomy because of difficulty in exploration; no intraoperative complications developed. While the mean operative time was 104.75 ±34.96 min but it was not significant ($p>0.05$), post-operative complications developed in 5 (13.7%) patients. One of them was wound infection (2.7%), 2 of them were ileus (5.5%), and 2 (5.5%) patients had an intraabdominal abscess. While 1 (2.7%) patient with an intra-abdominal abscess was treated with surgical drainage on the post-operative fourth day, other patients who developed complications were treated medically. Mean hospital stay was 4.58 ±2.82 days, while stapler line leak was not observed in any of the patients.

Discussion

Complicated appendicitis is defined as gangrenous and/or perforated appendicitis that results in intraabdominal abscesses or peritonitis [4,5]. As stated by Gomes et al system, appendicitis in Stages 3A (segmental necrosis/perforation), 3B (base necrosis/perforation), 4A (abscess), 4B (local peritonitis), and 5 (generalized peritonitis) is categorized as complex [6]. Perforated appendicitis manifests in 20–30% of instances of acute appendicitis [5,6]. Treatment for severe appendicitis by laparoscopic surgery is secure and successful [7,8]. In severe appendicitis, stump closure technique is directly connected to post-operative problems. It is apparent that with a secure stump closure procedure, the morbidity will reduce. Because of this, there are several studies in the literature to establish the appropriate and efficient technique.

Methods include the use of metal clips, hemo-lock clips, endoloops, intracorporeal knots, extracorporeal knots, and endostaplers extensively used and compared [8–10]. Although there are studies demonstrating the effectiveness and safety of titanium or polymeric clips in closing the appendix stump, these studies have not been carried out in instances of severe appendicitis [9,10]. In a retrospective analysis comparing stump closure methods, Matyja et al. [11] concluded that the use of staplers might be preferable in some circumstances, such as base necrosis discovered beforehand. Although there are a wide variety of stump closure techniques in complicated appendicitis, the two most common methods are endoloop and stapler [6,12] Taguchi et al. used a stapler as a method for closing the appendix stump in the laparoscopy group [13]. They thought that they avoided ligation in fragile and necrotic tissue in complicated appendicitis, and that the use of a stapler could decrease the rate of stump leakage.

Stump leakage is one of the most important factors determining the success of the operation after appendectomy. Considering that all patients included in our study had appendix base necrosis or perforation, no stump leakage was observed in any of our patients. Also, we did not experience any intraoperative complications. In our study, due to difficulty in exploration, 2 (5.5%) patients were switched to open technique. Our success rate with laparoscopic technique was determined as 94.4%. Comparing the most commonly used endoloop and stapler techniques, there are publications stating that the use of a stapler has a significantly shorter operation time [8,9], whereas others found that the endoloop has a significantly shorter operation time [6, 7]. Hospital stay in complicated appendicitis in the literature is reported by Talha et al. as 6.2 ± 1.6 [14], by Taguchi et al. as 11.4 ± 8.57 [13]. In our study, the duration of hospital stay was 4.58 ± 2.82 days and was found to be shorter when compared with the literature. We think that it would be correct to explain this by our low rate of post-operative complications and, consequently, that patients can return to their daily lives after being discharged in a short time.

We believe that the use of staplers will shorten the operation time in complicated appendicitis. In our study, the mean operation time was found to be 104.75 ± 34.96 min, In addition, in a clinical study published by Kim et al., they emphasized that laparoscopic endostapler repair is a safe and effective method in iatrogenic colon perforations occurring during colonoscopy [15].

Conclusion

We believe that using a stapler in situations involving appendix base necrosis, perforation, or severe inflammation in the base of the cecum is also impacted by the appendix. After the safe stump closure approach, we anticipate fewer post-operative problems, shorter hospital stays, and lower overall costs.

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