

Laparoscopic Management of Complicated Appendicitis

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ABSTRACT

Background: Complicated appendicitis is associated with a significant risk of postoperative morbidity, making the value of the minimally invasive approach controversial.

Methods: From January 2000 to October 2004, 42 patients with complicated appendicitis were categorized into 3 groups: Group 1—perforation, Group 2—abscess formation, and Group 3—generalized peritonitis. The conversion rate, the operative time, the mean hospital stay, the postoperative abdominal and wound infections, the return to oral intake, and the late obstructive complications were analyzed in relation to clinicopathological subgroupings.

Results: Conversion was needed in 2 patients (4.8%) due to adenocarcinoma (Group 2) and technical difficulties (Group 1). Mean operative time was 67 minutes (range, 48 to 88), and mean hospital stay was 3.2 days (range, 2 to 5). No postoperative wound infection or intraabdominal abscess was encountered. A clear liquid diet was instituted at the first postoperative 24 hours, and the mean time of flatus passage was 26.5 hours (range, 19 to 31). No statistically significant differences in operative time ($P=0.13$) and flatus passage ($P=0.18$) were found among the 3 groups. Two cases of late intestinal obstruction were treated successfully with conservative measures.

Conclusions: Laparoscopic appendectomy is a safe, feasible treatment option in complicated appendicitis. It is not associated with increased risk of septic postoperative complications including wound infections and intraabdominal abscess formation.

Key Words: Laparoscopic appendectomy, Appendicitis, Complicated appendicitis, Peritonitis.

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INTRODUCTION

Complicated appendicitis, (defined by perforation with purulent peritoneal collection, abscess formation, and generalized peritonitis), comprises 20% to 30% of all cases of appendicitis. It has been associated with a significant risk of postoperative septic complications, including wound infections and intraabdominal abscess formation.¹ The feasibility and validity of the laparoscopic approach has caused significant controversy mainly due to early reports of the increased incidence of intraabdominal abscess rates.^{2–6} Conversely, several more recent trials^{7–11} have found a statistically significant reduction in early postoperative complications with the laparoscopic approach to the point that it has actually been proposed as the method of choice for complicated appendicitis.

The aim of this study was to retrospectively assess the results of laparoscopic appendectomy for complicated appendicitis at a single surgical center.

METHODS

A retrospective analysis was performed of 42 adult patients with complicated appendicitis from January 2000 to October 2004. These patients were further classified into 3 groups according to operative findings: Group 1—perforation and/or purulent peritoneal fluid collection, Group 2—abscess formation, and Group 3—generalized peritonitis.

Elements of the laparoscopic operative technique included the insertion of 3 trocars. More specifically, after the induction of general anesthesia and the insertion of a urinary catheter, pneumoperitoneum was accomplished with the introduction of a 10-mm trocar with the open technique at the umbilicus. A 5-mm trocar was then inserted at the right subcostal area, and finally a 12-mm trocar was inserted at the left lower fossa. The mesoappendix and the appendix were divided by using multiple firings of an endo-GIA stapler. Copious amounts of warmed saline were used for peritoneal lavage. Drains were used only in the 3 cases with abscess formation.

Analgesics were given regularly during the hospital stay, and a clear liquid diet was instituted after the first 24 hours

with gradual advancement according to bowel movements. Antibiotic administration (Ciprofloxacin-Metronidazole and occasionally Amicasin) was given for 7 days in most patients and for 10 days in a few patients.

The patients were followed up for 1 year postoperatively.

Statistical Analysis

The medical records of the patients in the 3 groups were reviewed and compared regarding conversion rate, operative time, mean hospital stay, postoperative abdominal and wound infections, mean time of flatus passage/return of oral intake, and late obstructive complications by using the χ^2 test and the Wilcoxon rank sum test. Statistical significance was reached at $P < 0.05$.

RESULTS

Forty-two patients, 31 males and 11 females, mean age 42.3 yrs (range, 21 to 85), were diagnosed with complicated appendicitis. Patient data regarding demographics, operative time, and conversion correlated with the clinicopathologic subgroupings are presented in **Table 1**. There was no statistically significant difference in operative time among the 3 groups. Conversion to open appendectomy was needed in 2 patients (4.8%): the first patient had a ruptured adenocarcinoma (considered as Group 2 patient), whereas, the second patient (Group 1) exhibited major technical difficulties mainly due to multiple adhesions in the area. Mean operative time for the whole series was 67 minutes (range, 48 to 88). No statistically significant differences occurred in operative time ($P = 0.13$) and flatus passage ($P = 0.18$) among the 3 groups.

Postoperative results are presented in **Table 2**. Mean hospital stay for the whole series was 3.2 days (range, 2 to 5), whereas no single case of postoperative wound infection

or postoperative intraabdominal abscess occurred. A clear liquid diet was instituted at the first postoperative 24 hours, and the mean time of flatus passage was 26.5 hours (range, 19 to 31).

We had 2 cases of late intestinal obstruction (3 months and 7 months, postoperatively, in patients in groups 1 and 2, respectively) that both subsided with conservative management.

DISCUSSION

Our series demonstrates the feasibility and safety of the laparoscopic approach in perforated appendicitis. Postoperative septic complications were absent, and the convalescence for the whole series was excellent.

However, laparoscopic appendectomy has never gained a uniformly favorable reputation. Several metaanalyses and comparative studies,^{3,12,13} however, have shown that it retains the traditional advantages of the minimally invasive approach in terms of fewer wound infections, reduced postoperative pain, and shorter convalescence over open appendectomy.

A few clinical studies on laparoscopic appendectomy for complicated appendicitis have actually raised some serious questions.^{2,3,8-10} Early reports have shown an increase in postoperative intraabdominal abscess for perforated appendicitis using the laparoscopic technique. Establishment of pneumoperitoneum in a septic environment has been implicated; however, the effect of pneumoperitoneum on animal models regarding bacterial translocation has had controversial results.^{14,15} Surgical learning curve issues and increased manipulation of the appendix have also been implicated.

Nonetheless, more recent studies show no difference between

Table 1.
Demographics, Operative Time, and Conversion

	Total number	Group 1 (Perforation/Purulent Collection)	Group 2 (Abscess Formation)	Group 3 (Generalized Peritonitis)
Number of pts	42	26 (61.9%)	4 (9.5%)	12 (28.6%)
Age (median)-yrs	42.3	52.5	47	36
Sex	M: 31 F: 11	M: 19 F: 7	M: 3 F: 1	M: 9 F: 3
Operative time (min)	67	67.5	61.5	75
Conversion	2	1 M	1 F	—

Table 2.
Postoperative Results

	Total number	Group 1 (Perforation/Purulent Collection)	Group 2 (Abscess Formation)	Group 3 (Generalized Peritonitis)
Flatus Passage (hrs)	26.5	23.8	27.1	28.6
Hospital Stay (days)	3.2	2.8	3	3.8
Late Obstruction	2	1	1	–

laparoscopic and open approaches regarding intraabdominal or wound infection in complicated appendicitis.^{7,8–11}

This series demonstrates results consistent with the latter: there was not a single septic complication (intraabdominal abscess or wound infection) in any group. Our operative strategy includes:

- Suction of the inflammatory peritoneal exudation as the very first step;
- Minimal manipulation of the appendix;
- Aggressive lavage of the peritoneal cavity including the subdiaphragmatic spaces and pelvis, which can be successfully accomplished with the use of sophisticated (high-flow) irrigation-suction devices during various changes of patient’s position;
- Use of a plastic bag for the extraction of the appendix, a maneuver that prevents umbilical wound infection.

A noteworthy feature of this series is that no statistically significant differences occurred in operative time and postoperative convalescence between the groups. This finding implies that the laparoscopic approach achieves similar results regardless of the type of complicated appendicitis. The magnification offered by the laparoscopic view, the minimal manipulation of the peritoneal cavity contents and of the appendix and the ability to gain access to and thoroughly irrigate every intraperitoneal space contributes to the superiority of the minimally invasive approach over open surgery.

However, all laparoscopic appendectomies were performed by surgeons with learning curves well past the accreditation requirements. Additionally the same experienced nursing team supported the majority of these operations. We do feel that both played a key role in achieving these excellent clinical results.

Outstanding cosmesis proved to be another highly appreciated feature for our patients that compliments the success of laparoscopic surgery in these complicated cases.

CONCLUSION

Our series demonstrates the feasibility and safety of the laparoscopic approach in perforated appendicitis. Inflammatory complications, such as intraabdominal abscess or wound infection, were not associated with the laparoscopic method.

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