

Laparoscopic versus open appendectomy: A retrospective study in the Kingdom of Bahrain

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ABSTRACT

Background: Both open and laparoscopic appendectomies are commonly performed procedures. The aim of this study was to investigate the differences between open and laparoscopic appendectomy (LA) in the management of acute appendicitis.

Patients and Methods: This study was conducted at Bahrain Defence Force Hospital in the Kingdom of Bahrain. A total of 106 patients who underwent appendectomies in the year 2009 were included in the study. A total of 71 patients had laparoscopic appendectomies, while the remaining 35 underwent open procedures. Clinical outcome measures were compared between the two groups with respect to six variables.

Results: The study included 106 patients: 71 underwent LA while the remaining 35 underwent open appendectomy (OA). The operating time was shorter for the OA patients than for the LA patients (LA, 73.5 +/- 35 min vs. OA, 59.5 +/- 23 min; p value 0.033), which is statistically significant. The difference in hospital stay of 1.55 +/- 1.0 days for the LA group and 1.77 +/- 1.3 days for the OA group with P -value 0.323 was not statistically significant. Return to oral diet was the same in both groups with no statistical difference (LA, 14.4 +/- 7.6 h vs. OA, 15 +/- 7.9 h; $p = 0.720$), return to work (LA, 11 +/- 4.8 days vs. OA, 11 +/- 4.1 days; $p = 0.964$). Although the rate for overall complications was lower in the LA group (2.8% vs. 5.7% in OA), it was not statistically significant (p value = 0.452).

Conclusions: The overall results showed no significant difference between the laparoscopic and open appendectomies, except for the operating time that was significantly shorter in the OAs.

Key words: Acute appendicitis, appendectomy, laparoscopic appendectomy, open appendectomy

Introduction

Acute appendicitis is a common surgical emergency requiring rapid intervention, with a lifetime risk of 6%-7%.^[1] In 1983, Semm^[2] introduced the new laparoscopic technique which replaced the open procedure as the standard practice for a number of surgical procedures. With the

increased interest and fascination with this laparoscopic technique, researchers have been studying the outcomes of both the laparoscopic and open appendectomies in order to establish a comparison between the two techniques. The main aim of this study was to investigate the differences between open and laparoscopic appendectomy (LA) in the management of acute appendicitis.

Patients and Methods

This study was conducted at Bahrain Defence Force Hospital in the Kingdom of Bahrain. Data for all patients who underwent open or laparoscopic appendectomies between January 2009 and December 2009 were retrieved from the database. A total of 176 patients underwent appendectomies of which 126 were laparoscopic procedures, and the remaining 50 were open procedures. The decision of the method of appendectomy was entirely controlled by the operating surgeon's preference. The operating surgeons included in this study ranged from the junior residents to the consultants. Based on our inclusion and exclusion

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criteria, 106 patients met the inclusion criteria and were included in this study. Patients included in this study had a definitive clinical diagnosis of acute appendicitis, with an American Society of Anesthesiologists (ASA) score of 1, with no underlying comorbidities. On the contrary, a total of 28 cases were excluded from the study based on an ASA score of greater than 1, a negative diagnosis such as a ruptured ovarian cyst, and conversion of a laparoscopic procedure to an open one. A total of 32 files were not retrieved from the medical records due to technical difficulties. Finally, a total of 71 laparoscopic and 35 open appendectomies were included in the study. The six parameters measured in this study were 1) operative time 2) hospital stay, 3) postoperative complications, 4) analgesia use, 5) start of fluid diet, and 6) return to normal activity. The data were collected from the patient's progress sheets. The length of the operation was obtained from the operative notes. The days spent in the hospital postoperatively were calculated from the date of surgery until the date of discharge. All the patients included in the study were put on a regular dosage of similar oral analgesia postoperatively. Paracetamol and dextropropoxyphene hydrochloride (Distalgesic) were given orally as a first-line treatment. If the pain was persistent a parenteral analgesic, meperidine hydrochloride (pethidine), was given accordingly. The analgesia use was obtained from the patient's medication sheet, where the total number of patients receiving analgesia in each group was calculated as a percentage. The start of fluid intake after the surgery was recorded from the in-patient notes. Return to normal activity was documented according to the duration of sick leave given to each patient. Finally, the postoperative complications were obtained from the patient's progress notes. The mean was calculated for each of these parameters for both the laparoscopic and open procedures. Patients' records were retrieved from the medical records, following the approval of the ethical committee and the hospital administrator.

Results

A total of 106 patients underwent appendectomy during the study period. Of these surgeries, 71 were performed laparoscopically and 35 by open surgery based on the operating surgeon's preference. Average age and male:female ratios were similar in both groups [Table 1]. The average body mass index (BMI) was higher in the laparoscopic group [LA 26 kg/m², open appendectomy (OA); 22 kg/m²]. The mean duration of surgery was 73.5 min in the laparoscopic group and 59.5 min in the OA.

No statistical difference was noted in the length of

hospitalization 36 h in LA compared to 43 h in OA [Figure 1]. Return to oral diet was the same in both groups with no statistical difference (LA, 14.4 +/- 7.6 h vs. OA, 15 +/- 7.9 h; *p* = 0.720). Return to work was of no statistical difference in the two groups (LA, 11 +/- 4.8 days vs. OA, 11 +/- 4.1 days; *p* = 0.964).

Of those who underwent LA, 53.5% required additional anesthesia, while 48.5% of the patients in the open group needed further analgesia. As for the remaining patients, they required no further analgesia. In the laparoscopic group, two patients developed complications. One patient had an intrabdominal abscess formation, while the other patient developed a pelvic collection. In the open group, two patients also had postoperative complications. One had a liver abscess formation, while the other case developed a surgical site infection [Table 2].

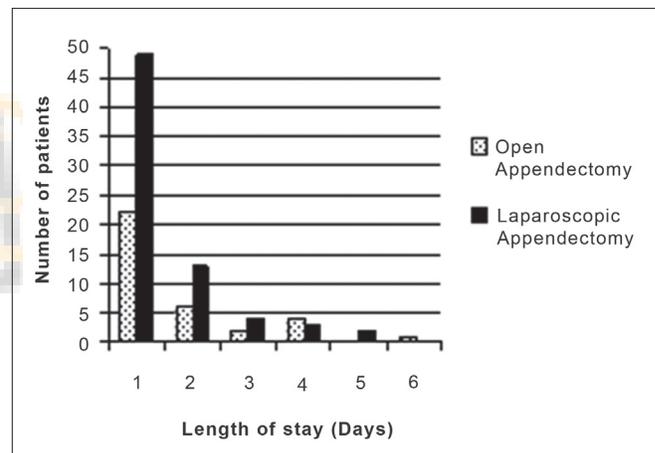


Figure 1: Length of hospital stay of patients after laparoscopic and open appendectomies

Table 1: Demographic profile of the patients

	Laparoscopic (n = 71)	Open (n = 35)
Average age (years)	28 (9-59)	17 (4-49)
Male: Female ratio	52:19	23:12
Body mass index	26 (19-45)	22 (13-38)

Table 2: Comparison of variables between the two groups

	Laparoscopic (n = 71)	Open (n = 35)
Mean operating time (min)	74 (25-220)	60 (20-130)
Hospitalization (days)	1.5 (1-5)	1.8 (16)
Time to oral intake (h)	14.3 (2-37)	14.9 (4-40)
Return to work (days)	10 (7-28)	11 (7-14)
Postoperative analgesia use (%)	53.5%	48.5%
Postoperative complications (%)	2.8%	5.7%

Discussion

It is generally believed that minimally invasive surgeries result in less postoperative pain, fewer complication rates, and shorter recovery periods in comparison to open procedures.^[1] Initially, with the introduction of laparoscopy in surgery, reports on the use of laparoscopy for appendicitis focused only on its efficacy as a diagnostic tool. The standard surgical technique for LA consists of three or four trocar techniques, where the base of the appendix can be ligated by intracorporeal or extracorporeal suturing, end loop placement, clip application, or stapling device.^[3,4] All the laparoscopic procedures in this study were performed using three trocars and chromic end loops or Endoscopic Gastrointestinal Anastomosis (GIA) to ligate the appendicular stump.

The advantage of LA over the open procedure was supported by several studies.^[5,6] For instance, a meta-analysis had shown that LA results in earlier resumption of normal activity, less postoperative complications, and a longer operative time.^[7,8] Nowzaradan *et al.*,^[9] concluded that laparoscopic appendectomies resulted in less postoperative pain, shorter hospitalization, and earlier return to normal activities. This conclusion was established following a retrospective review of 43 patients diagnosed with acute appendicitis that underwent LA. On the contrary, a number of other studies have shown that LA has marginal advantages, which are not statistically significant.^[3,10] As a result of this lack of consensus, this study was designed to compare the postoperative outcomes of both procedures in clinically diagnosed acute appendicitis.

Both patient groups were comparable with respect to age and male:female ratio. In addition, each of the patients had ASA I without any additional comorbidity. These characteristics were essential so that the results obtained reflect the effects of the two surgical techniques without any interference from the patient's health condition, which could have potentially changed the outcome. Total operative time in this study was longer in the laparoscopic (73.5 min) than in the open group (59.5 min). However, it is questionable whether the additional 14 min is of any clinical significance. Our finding is in agreement with other studies showing similar operation times that is statistically significantly different.^[11,12] The difference in time seen can be attributed to several factors. LA consists of additional steps of operation such as insufflation, setting up the instruments, and making ports under direct vision. Since laparoscopy is performed via ports, surgeons often need more time to grasp the abdominal organs and dissect the appendix as opposed to direct hand manipulation in the

open technique.

Total analgesic requirement is a quantitative method for assessing patient's pain levels after surgery. In our study, we quantified the postoperative analgesic doses required by individual patients to compare between the two groups. Patients who underwent OA were slightly in less pain compared to the patients who underwent LA. Only 48.5% of the patients requested for additional analgesia in the open group compared to 53.5% of the patients in the laparoscopic group. Two different analgesic medications were given to patients depending on the severity of their pain. Oral analgesia, paracetamol, and dextropropoxyphene hydrochloride (distalgesic) were given as a first-line treatment. If the pain was persistent a parenteral analgesic, meperidine hydrochloride (pethidine), was given accordingly. Our finding is in disagreement with conclusions in many other studies, which have demonstrated less pain and less analgesic use in the laparoscopic groups.^[11-13] One study compared the start of fluid diet between the two groups, which showed significantly less time to oral intake tolerance in the laparoscopic group.^[14,15] Our findings in this study are similar in both groups with no statistical difference (14.4 h in LA and 15 h in OA). In general, there is a higher expectation for people to resume work earlier after LA, and this makes sense, as it is a minimally invasive procedure followed by a short hospital stay and faster recovery. In this study, there was no statistical difference between both groups.

In many studies, LA has been attributed with a relatively low incidence of complications compared with OA.^[16,17] Outcomes in this study are consistent with these studies, as the complication rate was 2.8% in the laparoscopic group and 5.7% in the open group. In the laparoscopic group, two patients developed complications. One patient had an intraabdominal abscess formation, while the other patient developed a pelvic collection. In the open group, two patients also had postoperative complications. One had an intraabdominal abscess formation, while the other developed a wound infection. Wound infections are not serious complications, but they pose a major inconvenience for the patient. The majority of studies have shown that wound infection rates are lower following LA.^[14,18] On the contrary, intraabdominal abscess formation is a serious complication which can be life-threatening if not managed properly. In this study, one patient from each group developed an intraabdominal abscess and was treated accordingly. The cost was not included in this study, because this study was conducted in a military hospital, where subjects undergoing both procedures are exempted

from procedure costs.

The decision of the method of appendectomy was entirely controlled by the surgeon's preference. As noted in this study, about twice as many laparoscopic appendectomies were performed during the relevant year in comparison to open procedures (71 LA and 35 OA). This could be attributed to several factors. First, if the patient was thin with a low BMI (<20 kg/m²), OA was the surgery of choice. Overweight patients were more likely to undergo LA due to the easier access to the abdominal cavity, as opposed to the open procedure, which involves dissection through layers of adipose tissue requiring more time and effort. The surgeons in this study had a stronger preference for the laparoscopic technique due to its multiple advantages. They believe that laparoscopy serves as a diagnostic tool in addition to its therapeutic use. They also believe that LA has the advantage of identifying the position of the appendix with greater precision due to the better visualization of the abdominal contents. Also in case of spillage, wash and irrigation is more safe and simple in the laparoscopic procedure. In conclusion, the overall results showed no significant difference between the laparoscopic and OAs, except for the operating time that was significantly shorter in the OAs.

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