

Comparison of Laparoscopic versus Open Appendicectomy

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Abstract

Introduction: The advent of laparoscopic surgery has dramatically changed the field of surgery. With improvements in the equipment and increasing clinical experience it is now possible to perform almost any kind of procedure under laparoscopic visualization. The idea of minimal surgical trauma, resulting in significantly shorter hospital stay, less postoperative pain, faster return to daily activities, and better cosmetic outcome have made laparoscopic surgery for acute appendicitis very attractive.

Objective: The aim of the present study was to compare the laparoscopic approach and the conventional technique in the treatment of acute appendicitis.

Method: This prospective randomized clinical trial was conducted at CMH, Savar Cantonment and Navy Hospital, BNS Patenga, Chittagong. A total of 86 patients who underwent appendicectomy during December 2009 to March 2011 were included in this study. A total of 40 patients had laparoscopic appendicectomy and 46 underwent open procedure. Clinical outcome measures were compared between the two groups with respect to several variables.

Results: Among the study population, the operating time was shorter for the OA patients than for the LA patients (LA, 35 min vs. OA, 30 min; p value 0.33), which is not statistically significant. The differences in hospital stay of 4 days for the LA group and 8 days for the OA group and p value 0.01 which is statistically significant. Return to oral diet was same in both groups with no statistical difference LA, 20 h vs. OA, 22 h; return to work LA was 14 days vs. OA 18 days. Although the rate for overall complications was lower in the LA group 5% vs. 18% in OA; p value 0.001 which is statistically significant.

Conclusion: The laparoscopic approach to appendicectomy in patients with acute appendicitis does offer a significant advantage over the open approach in terms of length of hospital stay, postoperative complications, or quality of life, which are considered as the major advantages of minimally invasive surgery.

Key-words: Acute appendicitis, Laparoscopic appendicectomy (LA), Open appendicectomy (OA).

Introduction

Acute appendicitis is a common surgical emergency requiring rapid intervention; with a lifetime risk of 6%-7%¹. The introduction of laparoscopic surgery has dramatically changed the field of surgery. Initially, laparoscopy was performed only for diagnostic purpose but with improved technology and increasing clinical experience it is now possible to perform almost any kind of operation by laparoscopy. Although more than a century has elapsed since McBurney first performed open appendicectomy, this procedure remains the treatment of choice for acute appendicitis for many surgeons. In 1983, Semm performed the first laparoscopic appendicectomy².

This is in contrast to laparoscopic cholecystectomy, which has promptly become the gold standard for gallstone disease despite little scientific challenge³. Open appendicectomy (OA) has withstood the test of time for more than a century: the procedure is standardized among surgeons and unlike cholecystectomy, OA is typically completed using a small right lower quadrant incision and postoperative recovery is usually uneventful. It is the second most common general surgical procedure performed in the United States after laparoscopic cholecystectomy and the most common intra-abdominal surgical emergency.

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The overall mortality of OA is around 0.3%; and morbidity, about 11%⁴. Given the large number of procedures done annually, the validation of a minimally invasive technique that would improve outcomes may have a direct impact on patient management and possibly an indirect effect on the economics of health care.

The idea of minimal surgical trauma, resulting in significantly shorter hospital stay, less postoperative pain, faster return to daily activities, and better cosmetic outcome has made laparoscopic surgery for acute appendicitis very attractive. However, several retrospective studies⁵ and meta-analyses⁶ comparing laparoscopic with open appendicectomy have provided conflicting results. At present, although there is no consensus regarding the superiority of the laparoscopic approach over the conventional technique, there is trend towards greater utilization of laparoscopic appendicectomy⁷. The main aim of this study was to compare between open and laparoscopic appendicectomy in the management of acute appendicitis.

Materials and Methods

The study was designed as a prospective randomized clinical trial. It was conducted at Combined Military Hospital, Savar Cantonment and Navy Hospital, BNS Patenga, Chittagong. Data for all patients who underwent open or laparoscopic appendicectomies between December 2009 and March 2011 were retrieved from the database. A total of 86 patients underwent appendicectomy of which 40 were laparoscopic procedures, and the remaining 46 were open procedures. The decision for the method of appendicectomy was controlled by the operating surgeon's and patient's preference. The operating surgeons included in this study ranged from the Graded specialists to classified specialists. All of the patients were given detailed information about the study and provided with signed informed consent forms. The patients were divided into two randomized groups: Group-1 underwent laparoscopic appendicectomy, whereas Group-2 underwent open appendicectomy. Patients with acute appendicitis were included in the study. The diagnosis of appendicitis was made on the following criteria: history of right lower quadrant pain or peri-umbilical pain migrating to the right lower quadrant with nausea and/or vomiting, fever of more

than 38°C and/or leukocytosis above 10,000 cells per mL, right lower quadrant guarding, and tenderness on physical examination.

Results

Table-I shows, average age of patients in laparoscopic appendicectomy was 18 years and for open appendicectomy 20 years; p value 0.35. Male: Female ratio was 2:1 and p value 0.30. The difference was not statistically significant ($p>0.05$) between two groups.

Table- I: Demographic profile of patients.

	Laparoscopic appendicectomy (n=40)	Open appendicectomy (n=46)	P value
Average age (yrs)	18(15-47)	Average age (yrs) 20(15-50)	0.35
Male: Female	25:15	Male:Female 29:17	0.30

Table-II shows, mean operating time in LA was 35 min and in OA 30 min with p value of 0.33 which is not statistically significant ($p>0.05$). Post operative analgesia was used in LA 51% and OA 55%, p value 0.32 which is not statistically significant ($p>0.05$). Time before oral intake in LA 20 hours and OA 22 hours; p value 0.43 which is not statistically significant ($p>0.05$). Post operative complications in LA 2 and OA 9, p value 0.001 which is statistically significant ($p<0.05$). Hospitalization in LA 4 days and OA 8 days, p value 0.01 which is statistically significant ($p<0.05$). Return to work in LA 14 days and OA 18 days; p value 0.02 which is also statistically significant ($p<0.05$).

Table-II: Comparison of variables between the two groups.

	Laparoscopic appendicectomy (n=40)		Open appendicectomy (n=46)		P value
	Average	Range	Average	Range	
Mean operating time(min)	35	30-45	30	25-40	0.33
Postoperative analgesia use (%)	51%		55%		0.32
Time to oral intake (hours)	20	18-26	22	20-28	0.43
Postoperative complications (%)	2	5%	9	18%	0.001
Hospitalization (days)	4	3-7	8	6-10	0.01
Return to work (days)	14	13-20	18	17-25	0.02

Table-III shows, normal appendix in LA 3 and OA 8, p value 0.02 which is statistically significant ($p<0.05$). Acute appendicitis in LA 30 and OA 28, p value 0.45 which is not statistically significant ($p>0.05$). Gangrenous appendicitis in LA 7 and OA 10, p value 0.34 which is not statistically significant ($p>0.05$).

Table-III: Intra-operative variables.

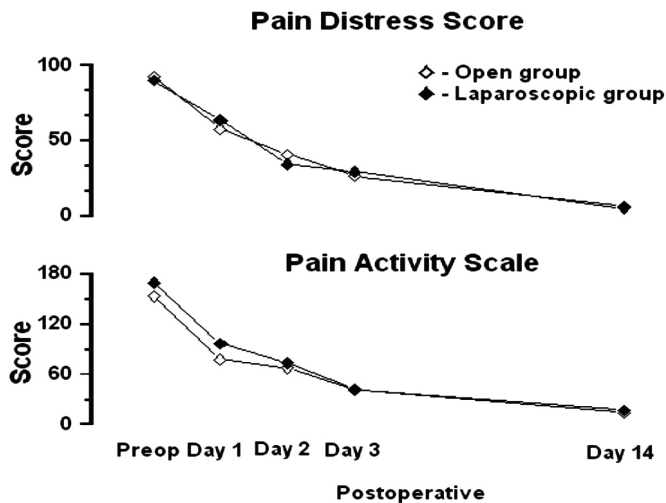
	Laparoscopic appendicectomy (n=40)		Open appendicectomy (n=46)		p value
Normal appendix	3	7.5%	8	15.55%	0.02
Acute appendicitis	30	75%	28	62.22%	0.45
Gangrenous appendicitis	7	17.5%	10	22.22%	0.342

Table-IV shows, wound infection in LA 2 and OA 8, p value 0.001 which is statistically significant ($p < 0.05$). One case of bowel obstruction found in OA.

Table-IV: Postoperative complications.

	Laparoscopic appendicectomy (n=40)		Open appendicectomy (n=46)		P value
Wound infection	2	5%	8	16%	0.001
Bowel obstruction	0	00	1	2.22%	0.05

Bowel movements in the first postoperative day were observed in 85% patient's subjected to laparoscopic appendicectomy and 64% in the open group. As a result, 78% patients in the laparoscopic group and 51% in the open group were able to tolerate a liquid diet within the first 24 postoperative hours. The mean postoperative hospital stay was 4 days after laparoscopic appendicectomy and 8 days after open appendicectomy. Visual analogue pain scores were similar in the two groups for the first two postoperative days (Figure-1).



There was a significant decline after the first 3 postoperative hours to 48 h in both groups. There was no difference between open and laparoscopic groups with respect to either overall pain level or

degree of pain remission. Eventually, the need for analgesic medication usage for the control of postoperative pain was similar in the two groups.

Discussion

It is generally believed that minimally invasive surgery results in less postoperative pain, fewer complication rates, and shorter recovery periods in comparison to open procedures⁸. 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 device⁹. All the laparoscopic procedures in this study were performed using three trocars and vicryl end loops to ligate the appendicular stump.

The advantage of LA over the open procedure was supported by several studies^{10,11}. For instance, a meta analysis had shown that LA results in earlier resumption of normal activity, less postoperative complications and a longer operative time¹². Nowzaradan et al¹³ concluded that laparoscopic appendicectomy results 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 significant¹⁴. 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 co-morbidity. 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 average operative time in this study was longer in the laparoscopic (45 min) than in the open group (30 min). However, it is questionable whether the additional 14 min is of any clinical significance.

Finding of this study is in agreement with other studies showing similar operation times that are statistically significantly different^{15,16}. 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 this study, we quantified the postoperative analgesic doses required by individual patients to compare between the two groups. Patients who underwent LA were slightly in less pain compared to the patients who underwent OA. Only 55% of the patients requested for additional analgesia in the open group compared to 51% of the patients in the laparoscopic group. Two different analgesic medications were given to patients depending on the severity of their pain. Oral analgesia like Diclofenac sodium, and Ketorolac Tromethamine were given as a first-line treatment. If the pain was persistent a parenteral analgesic, meperidine hydrochloride (pethidine), was given accordingly. Finding of this study is in disagreement with conclusions in many other studies which have demonstrated less pain and less analgesic use in the laparoscopic groups¹⁷. Previous study compared the time for starting fluid and diet between the two groups, which showed significantly less time requirement to oral intake tolerance in the laparoscopic group^{18,19}. Findings in this study were similar in both groups with no statistical difference (20h in LA and 22 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^{20,21}. Outcomes in this study are consistent with previous studies, as the complication rate was 5% in the laparoscopic group and 18% in the open group. Wound infections are common complications, but they pose a major inconvenience for the patient. The majority of studies have shown that wound infection rates are lower following LA²².

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 procedural costs and we were able to minimize the operative costs, mainly by employing reusable laparoscopic instruments. In the present study, we were able to demonstrate the superiority of the laparoscopic approach in terms of hospital stay and wound infection.

Conclusion

Provided that surgical experience and equipments are available, laparoscopic appendectomy is safe and effective in the management of acute appendicitis. In this study, post operative pain was less, hospital stay was shorter, patient returned home early and wound infection was less in laparoscopic appendectomy than open appendectomy. So, it can be concluded that laparoscopic appendectomy is better than open appendectomy.

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