COMPARISON OF LAPAROSCOPIC VERSUS OPEN APPENDECTOMY

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ABSTRACT

Background: Acute appendicitis is the most frequent condition leading to emergency abdominal surgery. Open appendectomy (OA) has been the gold standard for the treatment for acute appendicitis for more than a century. Although it is safe, the incidence of post operative complications is 10% to 20%, with 0.3% overall mortality. Patients undergoing laparoscopic Appendectomy (LA) have less postoperative pain, less impairment of vital functions, and they resume usual activities more rapidly. **Objective:** To compare the outcomes of laparoscopic and open appendectomy in the treatment of acute appendicitis with regard to hospital stay, length of operation, return to normal activity and post operative pain. **Patients & Methods:** This experimental study was conducted at Department of Surgery, Bahawal Victoria Hospital from 1st November, 2011 to 30th June, 2012. A total of 112 patients with similar characteristics of appendicitis were selected. Patients of acute appendicitis were divided into two groups A and B comprising of 56 patients each. Open appendectomy was performed in group A and laparoscopic in group B. Sampling technique was purposive non probability sampling. Demographics, length of operation, post operative pain, hospital stay and return to normal activity were documented. Statistical Analysis was done with SPSS v 13. **Results:** A total of 56 patients were allocated to LA group while another 56 patients to OA group. There were no significant difference between the two groups with respect to mean age. Mean operative time was longer in LA than in OA group (P value: 0.028). Post operative pain was less in LA group, resulting in less use of analgesics; Hospital stay was shorter in LA group (p value <0.001). Return to normal activity was earlier in LA group (p value: 0.008). **Conclusion:** Laproscopic appendectomy has advantage over open appendectomy , in terms of its ability of lower post operative pain and reduced hospital stay. It is concluded that in clinical settings where laparoscopic surgical expertise and equipment are available and affordable, LA seems to be an effective and safe alternative to OA.

Key words: Appendicitis, Laparoscopy, Appendectomy.

INTRODUCTION

Acute appendicitis is the most common acute surgical condition of the abdomen. Approximately 7 percent of the population will have appendicitis in their life time, with the peak incidence occurring between 10 and 30 years.[1] Open appendectomy (OA) has been the gold standard for the treatment for acute appendicitis for more than a century. Although it is safe, the incidence of post operative complications is 10% to 20 % with 0.3% overall mortality.[2] However, in spite of high incidence of appendicitis, widespread employment of laparoscopic appendectomy (LA) has not been followed. [3] Lack of laparoscopic equipment, reluctance to create pneumo-peritonuem in patients with peritonitis, the use of small incisions for open appendectomy, and performance of appendectomy at nightly hours appear to have held back most surgeons from employing laparoscopic techniques in patients with appendicitis.[4] The goal of this study is to answer questions on the safety and superiority of laparoscopic appendectomy compared to open appendectomy.

The objective of our study was, to compare the outcomes of laparoscopic and open appendectomy in the treatment of acute appendicitis with regard to hospital stay, length of operation, return to normal activity and post operative pain.

PATIENTS AND METHODS

This study was conducted at Department of Surgery, Bahawal Victoria Hospital, Bahawalpur, which is a 1600 bedded tertiary care hospital affiliated with Quaid i Azam Medical College, Bahawalpur. This study was conducted from 1st November 2011 to 30th June 2012. Patients of acute appendicitis were divided into two groups A and B comprising of 56 patients each. Open appendectomy was performed in group A and laparoscopic in group B. The appropriate sample size for the study was based on an analysis of sample sizes for an $\alpha = 0.05$ and a power of 80% with the consideration of mean operative time in LA being 83.17 ± 25.13 minutes while in OA being 71.4 ± 18.07. [5,6] This was an experimental study with purposive non-probability sampling technique. Patients of both sex and age range from 12 to 70 years with the diagnosis of acute appendicitis were included in the study. The diagnosis of appendicitis was made on the following criteria: history of right

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lower quadrant pain or periumbilical pain migrating to the right lower quadrant with nausea and vomiting, fever of more than 38ºC or leukocytosis above 10,000 cells per mL, right lower quadrant guarding, and tenderness on physical examination.

Patients were excluded if the diagnosis of appendicitis was not clinically established and if they had a history of symptoms for more than 5 days or a palpable mass in the right lower quadrant, suggesting an appendiceal abscess treated with antibiotics and possible percutaneous drainage. Patients with the following conditions were also excluded: history of cirrhosis and coagulation disorders, generalized peritonitis, shock on admission, obesity, absolute contraindication to laparoscopic surgery (large ventral hernia, history of laparotomies for small bowel obstruction, ascites with abdominal distension), contraindication to general anesthesia (severe cardiac and/or pulmonary disease), inability to give informed consent due to mental disability, and pregnancy.

Surgery was done under general anesthesia. All patients received 1 g cefotaxime and 500 mg metronidazole intravenously at the time of induction. Patients received 750 mg cefuroxime per 6 h and 500 mg metronidazole per 8 h intravenously until temperature remained below 37.5° C for 48 h, with a maximum of 5 days.

All open or laparoscopic surgery was performed or supervised by surgeons or surgical trainees with experience of more than 15 open and laparoscopic appendectomies.

Open appendectomy: Open surgery was done through McBurney muscle-splitting incision in the right lower quadrant. The appendix was removed with ligation of the stump with an absorbable suture; the appendiceal stump was not buried routinely. The incision was extended if necessary. A normal appendix was always removed at open surgery. An attempt was made to visualize the right ovary and right fallopian tube in women and the distal 100 cm of ileum to detect a possible Meckel's diverticula. Saline lavage was not performed routinely. Drainage tubes were not left in the abdominal cavity. The skin incision was closed with 2-0 Silk suture unless a perforated appendicitis was found, in which case the skin wound was left open.

Laparoscopic appendectomy: For LA the patient was in a supine position, with both surgeon and assistant on the left side and video monitor on the right side of the patient. The CO_2 pneumoperitoneum was established by use of an open technique and a Hasson's trocar. A 30° laparoscope was inserted at the umbilicus and two reusable canulas were introduced under direct vision: one 10 mm trocar in the left lower quadrant laterally to the rectus muscle and one 5-mm trocar in the midline just above the pubic bone. The operation was performed with the operating table in Trendelenburg position, tilted 10-20° to the left. The abdominal cavity was explored, and after the diagnosis of acute appendicitis had been confirmed or other diagnoses had been excluded, appendectomy was begun by dissection and division of the appendicular artery between clips or by electrocautery. The appendix stump was secured after division of the mesentery and divided between Vicryl sutures (Roeder knot). If the base of the appendix was heavily inflamed, an endoscopic linear stapling device (Endo-GIA-30) was applied over the base of the caecum to resect the appendix safely. The stump of the appendix was not buried. The appendix was retrieved through the canula in the left lower quadrant or by use of a plastic bag. A normal appendix was always removed; unless a definite other diagnosis responsible for the patient's clinical course was found on laparoscopic exploration of the abdominal cavity. Lavage was performed routinely using one litre of 0.9% saline solution if blood or purulent material was left after appendectomy or if blood obscured adequate vision. Drainage tubes were not left in the abdominal cavity. The skin incisions were closed in every case using 2-0 Silk suture. Operative time was taken as the time between the first incision and application of dressings to the wounds. Extension of the incision in open surgery or conversion from laparoscopic to open surgery was left at the surgeon's discretion. All removed appendices were sent for histological examination.

All the patients with diagnosis of acute appendicitis fulfilling the inclusion criteria were included in the study after informed written consent and approval from the hospital ethics committee was sought. Computer-generated random numbers were used to assign the type of surgery (laparoscopic or open). All the relevant information was filled on predesigned Performa. Age and sex was recorded at the time of admission in surgical unit. Operative time and hospital stay was noted by the surgeon performing

the surgery; return to normal activity was recorded in the post-operative clinic when the patients returned for follow-up. Post operative pain was noted at 24 hours after surgery in the ward. Postoperative pain was assessed postoperatively on a visual analogue scale (VAS) consisting of a 10-cm-long horizontal line without graduations varying from "no pain at all" on the left side to "unbearable pain" on the right side. Afterward, the VAS was scored by measuring the length in millimeters left of the patient's mark. Hospital stay was recorded and defined as the number of postoperative days spent in hospital, including days spent in hospital after possible readmission because of causes related to the initial operation. Day 1 was defined as the day of operation. Patients were discharged home once they were afebrile, had good pain control and tolerated soft diet. Postoperative complications were recorded both in the hospital and at follow-up.

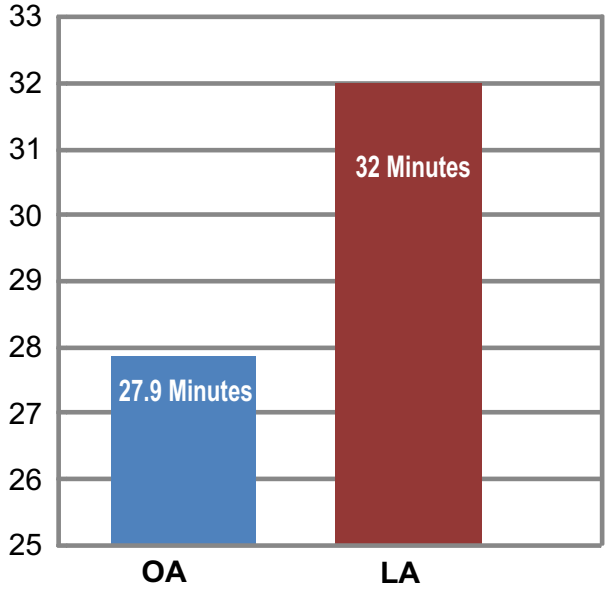
The data was entered into SPSS version 13. The variables were: age, sex, operative time, hospital stay and return to normal activity (days), post operative pain. Independent t-test was applied to compare the mean for age, operative time, hospital stay and return to normal activity between the two groups. Chi square test was applied to compare the proportion of post operative pain. P value <0.05 was considered as significant.

RESULTS

We enrolled 112 patients diagnosed as cases suffering from acute appendicitis from Surgical Units of Bahawal Victoria Hospital, Bahawalpur. A total of 56 patients were treated by open appendectomy while another 56 patients were treated with laparoscopic appendectomy. The mean age of study patients was 27.4 ± 9.55 years. In A group (OA), mean age (years) was 27.27±10.02. In B group (LA) mean age (years) was 27.54±9.15 years. In this study, age distribution is such that mean age is not too much different in both groups (p=0.317) when age is considered as variable.

Study results showed that sex distribution has no effect over the study results as the p-value is more than 0.05(p=0.843). In group A, there were 36 male (64.3%) and 20 (35.7%) female patients, while in group B, there were 37 male (66.1%) and 19(33.9%) female patients. Mean operative time of the study was 30.02±8.78 minutes. The minimum operative time was 18 minutes while the maximum time was 60 minutes. In group A, the mean operative time was 27.95±8.95 while in group B, it was 32.09±8.18 minutes. Operative time between the two groups was significantly different. (P=0.028) (Fig. I)

Figure I: Mean operative time in open (OA) and Laparoscopic appendectomy (LA)



Pain was recorded by VAS on clinical performa. Significant difference was observed in postoperative pain, the mean VAS being 4.68 ± 1.34 in the A group and 3.25 ± 1.19 in the B group during first 24 hours. In group A, 13 (23.2%) patients observed pain of mild intensity (VAS 1 to 3), 40 (71.4%) patients had moderate intensity (VAS 4-7) while 3 (5.4%) patients had severe pain (VAS 8-10). In group B, 41 (73.2%) patients observed pain of mild intensity (VAS 1 to 3), 15 (26.8%) patients had moderate intensity (VAS 4-7) while no patient had severe pain (VAS 8-10). (P<0.001) this difference is statistically significant. It means OA patients had increased pain sensation postoperatively as compared to B group (LA). Mean stay in group A was 2.29± 1.25 while in group B, it was 1.41±0.85 days. (P<0.001) In group A, the mean return to activity was 6.29±1.44 days whereas in group B, it was 5.29±1.30 days. The difference between the two groups was statistically significant (p = 0.008). During the time of surgery, no mortality was reported in either group of patients. Also, there was not a single case of conversion to open procedure.

DISCUSSION

Laparoscopic techniques have revolutionized gallbladder surgery resulting in change of open cholecystectomy to laparoscopic surgery as the gold standard treatment. However, this has not been the case with regard to acute appendicitis. [5] Although a number of studies have shown advantages of laparoscopic appendectomy, the indication and outcome of this procedure is still being discussed controversially.[6,7,8] Less than half of the patients of acute appendicitis have laparoscopic appende-ctomies. Recently published, population-based analysis using national administrative data base showed that laparoscopic appendectomy has more than doubled in the past 5 years at academic medical centers and teaching hospitals around the world after subspecialist service reorganization. Analysis of data of patients showed an increase from 20% in 1999 to 43% in 2003 in USA.[3,9] A recent prospective randomized double-blind study found laparoscopic appendectomy to be associated with a shorter hospital stay and lower complication and 30-day readmission rates.[10] In agreement with the aforementioned study, LA, has been shown in several randomized, controlled trials to be superior as for as postoperative pain or use of analgesia, number of postoperative compli-cations, hospital stay and return to normal activities are concerned. [4,8,11] Despite this evidence, LA has not become the gold standard in treating acute appendicitis. This may be partly because appendectomy through a muscle-splitting incision is already considered minimally invasive surgery. Possibly the often-acute aspect of appendectomy, hampering surgical training and motivation of anaesthesiologists or even surgeons at night, might also contribute to the reluctance to introduce LA as therapy of first choice to treat acute appendicitis in all cases. [12]

In this study, it is shown that even with normal training practices continued during the study, important advantages can be achieved with reduced postoperative pain leading to less use of analgesics, shorter hospital stay and early return to normal activities. In the past, the Laparoscopic appendectomy was considered to take longer in the operating theatre, however with more frequent use of the procedure and more experience, the mean operative time of LA has decreased dramatically in the recent years.[13] The disadvantage for LA in our study was the statistically significant longer mean operative time for LA. Longer operative time may lead to possibly related higher operative costs. Interestingly, Sporne et al found the mean cost for laparoscopic appendectomy to be similar to that of open appendectomy.[3] An economic advantage for the hospital was found for open appendectomy, whereas the laparoscopic approach was more favorable for the patient.[14] However, at our institution, all kinds of treatment is provided free of cost to the patients by the Government. An earlier return to normal activities can also be translated into economic benefit to the patient and his family, as in our Pakistani society; there is usually one breadwinner for the whole family.[15] Laparoscopy has been advocated as a diagnostic tool to decrease the rate of negative appendectomies.[16] This could not be analyzed in this study because all appendices were removed in both groups. However, detecting all appendeceal pathology on the serosal side of the appendix can be difficult and laparoscopic examination of an appendix is affected by laparoscopic experience and quality of the video imaging system. In this study it is shown that even in a teaching hospital setting, LA can be performed safely and effectively, although both trainer and trainee should be aware of specific risks of minimally invasive surgery. Our results suggest that LA is superior over OA regarding postoperative pain and postoperative complications. Long-term follow-up studies are necessary to determine a possible decrease of late bowel obstruction. Because of the increased operative time and possibly related higher direct costs, LA might not be the best way to treat acute appendicitis for every doctor and every patient at every hospital, however it is recommended to pursue minimal invasive surgery at all teaching hospitals. However, all aspects of LA and OA must be compared, including wound infection, pelvic collections, patient's quality of life and long term complications. This study is only a first step towards this goal. Further studies are deemed necessary to define whether LA should be considered the treatment of choice for acute appendicitis.

CONCLUSION

This study showed that laparoscopic appendectomy is a safe and effective procedure as compared to open appendectomy. It decreases post operative pain, shortens hospital stay and results in earlier return to

normal activities however, it takes longer mean operative time to perform laparoscopic appendectomy.

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