

A Comparative Study on Laparoscopic and Open Appendectomy Among Patients Attending a Tertiary Care Center of Bihar

Vishwa Prakash Jha¹, Pavan Kumar^{2*}, Mohammed Tarique³

¹Assistant Professor, Department of General Surgery, Madhubani Medical Collage and Hospital, Bihar India

²Assistant Professor, Department of General Surgery, Madhubani Medical Collage and Hospital, Bihar, India

³Professor, Department of General Surgery, Madhubani Medical Collage and Hospital, Bihar, India

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Abstract

Introduction: Approximately 7–10 % of the general population develops acute appendicitis with the maximal incidence being in the second and third decades of life. Open appendectomy has been the gold standard for treating patients with acute appendicitis for more than a century, but the efficiency and superiority of laparoscopic approach compared to the open technique is the subject of much debate nowadays. The aim of this study was to compare the clinical outcomes (hospital stay, operating time, postoperative complications, analgesia requirement, and time to oral intake and to resume normal activity) between open appendectomy and laparoscopic appendectomy. **Methodology:** An observational study of patients admitted to Department of General Surgery, Madhubani Medical College & hospital, Bihar, India between January 2021 to November 2021 with the diagnosis of appendicitis was conducted. We analyzed 100 patients that met the inclusion criteria and their clinical data. The patients were divided into two groups: open appendectomy (OA) group and laparoscopic appendectomy (LA) group. OA was performed through standard McBurney incision. After the incision, peritoneum was accessed and opened to deliver the appendix, which was removed in the usual manner. A standard 3-port technique was used for laparoscopic group. The study protocol was received and approved by the Institutional Ethics Committee. Informed consent from each patient was obtained. **Results:** Out of the total 50 open procedures, majority (36/50) were performed for uncomplicated appendicitis and rest for complicated disease including appendiceal perforation with local or widespread peritonitis. In the laparoscopic group, 44/50 procedures involved uncomplicated disease. In our study, the mean± standard deviation (SD) operative time of 56.4±15.2 min for the LA group was longer than the mean operative time of 33.8±10.2 min for open appendectomy ($P<0.05$). **Conclusion:** Our results showed the advantages of the laparoscopic approach over open appendectomy including shorter hospital stay, decreased need for postoperative analgesia, early food tolerance, earlier return to work and lower rate of wound infection.

Key Words: Comparative Study, Laparoscopic And Open Appendectomy.

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Introduction

Appendicitis is the most common cause of surgical abdomen in all age groups [1, 2]. Approximately 7–10 % of the general population develops acute appendicitis with the maximal incidence being in the second and third decades of life [3]. Open appendectomy has been the gold standard for treating patients with acute appendicitis for more than a century, but the efficiency and superiority of laparoscopic approach compared to the open technique is the subject of much debate nowadays [3–5]. There is evidence that minimal surgical trauma through laparoscopic approach resulted in significant shorter hospital stay, less postoperative pain, faster return to daily activities in several settings related with gastrointestinal surgery [6, 7]. However, several retrospective studies [3, 8–14], several randomized trials [15–20] and meta-analyses [21, 22] comparing laparoscopic with open appendectomy have provided conflicting results. Some of these studies have demonstrated better clinical outcomes with the laparoscopic approach [15–17, 20, 23], while other studies have shown marginal or no clinical benefits [18, 19, 24–26] and higher surgical costs [4, 19, 24, 25]. Bearing in mind that laparoscopic appendectomy, unlike other laparoscopic procedures [27], has not been found superior to open surgery for acute appendicitis, we designed the present study to determine any possible benefits of the laparoscopic approach. The aim of this study was to compare the clinical outcomes (hospital stay, operating time, postoperative complications, analgesia requirement,

and time to oral intake and to resume normal activity) between open appendectomy and laparoscopic appendectomy.

Methodology

An observational study of patients admitted to Department of General Surgery, Madhubani Medical College & hospital, Bihar, India between January 2021 to November 2021 with the diagnosis of appendicitis was conducted. Pregnant women and patients with severe medical disease (hemodynamic instability, chronic medical or psychiatric illness, cirrhosis, coagulation disorders) requiring intensive care were excluded. The decision about the type of the operation was made according to the preference and experience of the surgical team on duty. We analyzed 100 patients that met the inclusion criteria and their clinical data. The patients were divided into two groups: open appendectomy (OA) group and laparoscopic appendectomy (LA) group. The collected clinical data included demographic data, co-morbidities, initial laboratory findings, operation time, intraoperative findings (acute, gangrenous or perforated appendix), time to soft diet, postoperative hospital stay, amount of analgesics and postoperative complications. The diagnosis was made clinically with history (right iliac fossa or periumbilical pain, nausea/vomiting), physical examination (tenderness or guarding in right iliac fossa). In patients where a clinical diagnosis could not be established, imaging studies such as abdominal ultrasound or CT were performed. Both groups of patients were given a prophylactic dose of third-generation cephalosporin and metronidazole at induction of the general anesthesia as part of the protocol.

OA was performed through standard McBurney incision. After the incision, peritoneum was accessed and opened to deliver the appendix, which was removed in the usual manner. A standard 3-port

*Correspondence

Dr. Pavan Kumar

Assistant Professor, Department of General Surgery, Madhubani Medical Collage and Hospital, Bihar, India.

E-mail: pavanbarh@rediffmail.com

technique was used for laparoscopic group. Pneumoperitoneum was produced by a continuous pressure of 12–14 mmHg of carbon dioxide *via* a Verres canula, positioned in infraumbilical site. The patient was placed in a Trendelenburg position, with a slight rotation to the left. The abdominal cavity was inspected in order to exclude other intrabdominal or pelvic pathology. After the mesoappendix was divided with bipolar forceps, the base of the appendix was secured with two legating loops, followed by dissection distal to the second loop. Then, the distal appendicular stump was closed to avoid the risk of enteric or purulent spillage. The specimen was placed in an end bag and was retrieved through a 10-mm infraumbilical port. All specimens were sent for histopathology. The patients were not given oral feed until they were fully recovered from anesthesia and had their bowel sounds returned when clear fluids were started. Soft diet was introduced when the patients tolerated the liquid diet and had passed flatus. Patients were discharged once they were able to take regular diet, a febrile, and had good pain control. The operative time (minutes) for both the procedures was counted from the skin incision to the last skin stitch applied. The length of hospital stay was determined as the number of nights spent at the hospital postoperatively. Wound infection was defined as redness or purulent or seropurulent discharge from the incision site. Seroma was defined as localized swelling without redness with ooze of clear fluid. Paralytic ileus was defined as failure of bowel sounds to return within 12 h postoperatively.

The study protocol was received and approved by the Institutional Ethics Committee. Informed consent from each patient was obtained. Categorical data were presented as frequencies and percentage and compared by the Chi-square test. A P-value of 0.05 was considered as significant. All calculations were performed by using the SPSS software package version 17.0 (SPSS Inc., Chicago, IL).

Results

Out of 100 patients with acute appendicitis, both the groups, OA and LA had 50 patients. Demographic data and preoperative clinical feature between OA group and LA group has been showed in Table 1.

Table 1: Table showing demographic and clinical characteristics of the study population

Characteristic	LA group (N = 50)	OA group (N = 50)
Gender		
Male	22	32
Female	28	18
Mean age (SD) in years	26.4 (16.2)	28.2 (11.5)
Mean WBC count per mm³ (SD)	13259 (5543)	15623 (5243)
Co-morbidities		
CAD	2	6
Hypertension	7	11
COPD	3	7
DM	2	8z

Discussion

Acute appendicitis is the most common intra-abdominal condition requiring emergency surgery[25]. The possibility of appendicitis must be considered in any patient presenting with an acute abdomen, and a certain preoperative diagnosis is still a challenge[28, 29]. Although 30 years have elapsed since the introduction of laparoscopic appendectomy (performed in 1983 by Semm, a gynecologist), open appendectomy is still the conventional technique. Some authors consider emergency laparoscopy as a promising tool for the treatment of abdominal emergencies able to decrease costs and invasiveness and maximize outcomes and patients' comfort[30, 31]. Several studies[4, 10, 13, 16, 18, 32–34] have shown that laparoscopic appendectomy is safe and results in a faster return to normal activities with fewer wound complications. These findings have been challenged by other authors who observed no significant difference in the outcome between the two procedures, and moreover noted higher costs with laparoscopic appendectomy[3, 19, 20, 33, 35]. Anyway, a recent systematic review of meta-analyses of randomized controlled trials comparing laparoscopic versus open appendectomy concluded

There were no significant differences with respect to age and associated co-morbidities. On the contrary, the difference in gender and in the white blood cell count at presentation was statistically significant.

Out of the total 50 open procedures, majority (36/50) were performed for uncomplicated appendicitis and rest for complicated disease including appendiceal perforation with local or widespread peritonitis. In the laparoscopic group, 44/50 procedures involved uncomplicated disease.

In our study, the mean \pm standard deviation (SD) operative time of 56.4 \pm 15.2 min for the LA group was longer than the mean operative time of 33.8 \pm 10.2 min for open appendectomy ($P < 0.05$). The laparoscopic group required fewer doses of parenteral and oral analgesics in the operative and postoperative periods compared with the open appendectomy ($P < 0.05$). Bowel movements in the first postoperative day were observed in almost all patients subjected to laparoscopic appendectomy and 36/50 (72%) in the open group ($P < 0.001$). As a result, 88% patients in the laparoscopic group and 68% in the open group were able to tolerate a liquid diet within the first 24 postoperative hours ($P < 0.05$). Hospital stay was significantly shorter in the laparoscopic group with a mean \pm SD of 1.8 \pm 0.9 days compared with 3.2 \pm 2.1 of the open appendectomy group ($P < 0.05$). A highly significant difference existed between the 2 groups in time taken to return to routine daily activities, which was less in the laparoscopic group with a mean 12.1 \pm 3.6 days compared with mean 18.4 \pm 4.1 days in the open appendectomy group.

We observed a greater overall incidence of complications in open surgery than in laparoscopic surgery. A total of 4(8%) complications occurred in the laparoscopic group, while 9 (18%) complications occurred in the open appendectomy group. In the LA group 3 patients complained of vomiting and 1 had post-operative wound infection. None had major complication. In the OA group, 5 patients complained of vomiting and 3 had post-operative wound infection. Another 1 developed paralytic ileus. Out of 3 who had post-operative wound infection, one had wound dehiscence.

that both procedures are safe and effective for the treatment of acute appendicitis[36]. Total operative time in our series was significantly longer in the laparoscopic group than in open group. Generally, the lack of experience of surgeons in the laparoscopic approach may contribute to a longer duration of the operation. So, in our series the longer operation time in laparoscopic appendectomy may be due to additional steps like setup of instruments, insufflation, making ports under vision and a phase of diagnostic laparoscopy. Length of hospital stay represents a critical factor that directly influences the economy and the well-being of the patient. We found that hospital stay was significantly shorter in laparoscopic group with concomitant earlier bowel movements in patient managed laparoscopically, leading to earlier feeding and discharge from hospital. Our findings are in agreement with several studies that demonstrated a significantly short hospital stay for the laparoscopic approach[8, 22, 32, 33, 37]. In this series, parenteral and oral analgesic requirements were less in the laparoscopic group than in the open group and we found a statistically significant difference, in agreement with many other studies[15, 38, 39] that reported less pain in the laparoscopic group.

Several studies showed no difference between open and laparoscopic appendectomy with respect to early return to activity and performance of daily activities. However, this issue is still debated because of the different definitions and classifications of "activity" in such studies[20, 40–43]. The mortality rate was nil in our study. The low mortality rates reported in previous research (0.05 % and 0.3 % rate in laparoscopic and open groups[4] indicated that appendectomy, especially in absence of complicated disease, is a safe procedure regardless of the technique used[33]. In the present study, the overall complication rates were 18% and 8% for open and laparoscopic appendectomy respectively. Some studies have showed an increased risk of intra-abdominal abscess after laparoscopic appendectomy compared with open surgery[32, 33]. Several hypotheses have been suggested to find possible explanations: mechanical spread of bacteria in the peritoneal cavity promoted by carbon dioxide insufflation, especially in case of ruptured appendix[25,44–47], inadequate learning curve[32], the meticulous irrigation, instead of simple suctioning, of the infected area in severe peritonitis, that leads to contamination of the entire abdominal cavity, which is difficult to aspirate latter[35].

Conclusion

Our results showed the advantages of the laparoscopic approach over open appendectomy including shorter hospital stay, decreased need for postoperative analgesia, early food tolerance, earlier return to work and lower rate of wound infection. Provided that surgical experience and equipment are available, laparoscopy could be considered safe and equally efficient compared to open technique and should be undertaken as the initial procedure of choice for most case of suspected appendicitis. However, since there is no consensus to the best approach, both procedures (open and laparoscopic appendectomy) are still being practiced actively deferring the choice to the preference of surgeon and patients. In the future, laparoscopic appendectomy could represent the standard treatment for patients with appendicitis and undiagnosed abdominal pain.

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