

Comparative Study to evaluate the open Appendectomy Versus Laparoscopic Appendectomy

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Abstract

Original Research Article

Introduction: Acute appendicitis is the most common intra-abdominal condition which requires emergency surgery in children. Open Appendectomy (OA) and Laparoscopic Appendectomy (LA) can be used for the intervention. **Material and Methods:** This is prospective, comparative, single centre and descriptive study conducted in the Department of General Surgery, Surabhi Institute of Medical Sciences over a period of 1 year after approval of ethical clearance. The patients were divided into two groups: open appendectomy (OA) group and laparoscopic appendectomy (LA) group. 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. **Results:** In our study, duration of the operation time ranged from 30-95 min in Laparoscopic appendectomy (Mean±SD 53.3±3.1) and 25 to 60 min (Mean±SD: 31.2±2.7) in Open appendectomy. Mean duration of post-operative pain was 17.48±3.4 hours in Laparoscopic appendectomy and 30.54±3.45 hours in Open appendectomy (p<0.001). The mean duration of hospital was 2.03±0.12 days in Laparoscopic appendectomy and 5.23±0.57 days in Open appendectomy (p<0.05). **Conclusion:** Laparoscopic appendectomy becomes more minimal with the one-port technique. Operative time has been reduced after training. It is less painful; it has less wound infections and postoperative ileus. Other complications have the same rate as OA. Hospital stay is shorter, return to a normal diet and activity is faster.

Keywords: Open Appendectomy, Laparoscopic Appendectomy, Appendicitis.

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INTRODUCTION

Appendicitis is the inflammation of the vermiform appendix [1]. Acute appendicitis is the most common abdominal emergency worldwide, and it is the most common cause of abdominal surgeries in all the age groups. Acute appendicitis is the most common intra-abdominal condition which requires emergency surgery in children [2]. It has a life-time incidence between 7% and 9%. Of all the patients presenting with acute appendicitis, 13% to 20% have a perforated appendix. Men have a greater risk of perforation of the appendix (18%) than do women (13%) [3].

Open Appendectomy (OA) was first described in 1894 and was performed through the right lower quadrant incision. Since its description by McBurney, open appendectomy has become the procedure of choice for acute appendicitis [4]. It remained the golden standard until the introduction of Laparoscopic Appendectomy (LA) by Semm in 1983 [5]. Laparoscopic appendectomy was first introduced by Semm. It has gained much popularity among surgeons

because of the use of minimally invasive techniques, but some remain skeptical about its use instead of open appendectomy [6]. Those who criticize laparoscopic appendectomy cite the increased operative costs of using disposable instruments. Other criticisms of laparoscopic appendectomy target the increased operating time and increased incidence of intra-abdominal abscesses, particularly in cases of a perforated appendix [7]. Proponents of laparoscopic appendectomy claim the procedure yields improved wound healing, reduced postoperative pain, and earlier discharge from the hospital, with an earlier return to normal activities [8].

There is a lot of discussion among surgeons over the benefits of each technique. As advantages of LA have been proposed a better wound healing, reduced postoperative pain, faster recovery, and earlier resumption of diet, earlier discharge from hospital, and finally, a better cosmetic result [9]. Disadvantages of LA compared to OA are considered the increased operative time, the cost of the operation and a higher

incidence of intra-abdominal abscesses, especially in case of a perforated appendicitis [10]. The aim of our study is to search in the in order to find evidence concerning the benefits of each technique in patients.

MATERIAL AND METHODS

This is prospective, comparative, single centre and descriptive study conducted in the Department of General Surgery, Surabhi Institute of Medical Sciences over a period of 1 year after approval of ethical clearance.

INCLUSION CRITERIA

All patients included above 18 years of age and either gender with appendicitis was included in the study. Patient willing to give informed written consent. The diagnosis of appendicitis was made on the following criteria: History of right lower quadrant pain or periumbilical 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.

EXCLUSION CRITERIA

Patients with severe medical disease (hemodynamic instability, chronic medical or psychiatric illness, cirrhosis, coagulation disorders) requiring intensive care were excluded.

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). 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 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 endobag 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, afebrile, 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.

RESULTS

In our study, the most of the patients the age group of 21-40 years i.e., 31 out of 45 (68.8%), followed by 41-60 years, i.e., 12 out of 45 (26.6%) in Laparoscopic appendectomy. In Open appendectomy group the most of the patients the age group of 21-40 years i.e., 34 out of 45 (75.5%), followed by 41-60 years, i.e., 10 out of 45 (22.2%).

Table-1: Distribution of different age groups between two groups

Age in years	Laparoscopic appendectomy	Open appendectomy
21-40	31 (68.8%)	34 (75.5%)
41-60	12 (26.6%)	10 (22.2%)
>61	2 (4.4%)	1 (2.2%)
Total	45 (100%)	45 (%)

Table-2: Distribution of gender between two groups

Gender	Laparoscopic appendectomy	Open appendectomy
Male	29 (64.4%)	28 (62.2%)
Female	16 (35.5%)	17 (37.7%)
Total	45 (100%)	45 (100%)

In table 2, maximum number of patients were male 29 (64.4%) and female 16 (35.5%) in Laparoscopic appendectomy. In Open appendectomy

group, maximum number of patients were male 28 (62.2%) and female 17 (37.7%) in Laparoscopic appendectomy.

Table-3: Comparison of operation time between two groups

Operation	Operation time (minutes)	Mean±SD operation time (minutes)
Laparoscopic appendectomy	30-95	53.3±3.1
Open appendectomy	25-60	31.2±2.7

Duration of the operation time ranged from 30-95 min in Laparoscopic appendectomy

(Mean±SD 53.3±3.1) and 25 to 60 min (Mean±SD: 31.2±2.7) in Open appendectomy.

Table-4: Comparison of outcome variables between the two groups

Outcome variables	Laparoscopic appendectomy (Mean±SD)	Open appendectomy (Mean±SD)	p-value
Post- op pain (hours)	17.48±3.4	30.54±3.54	<0.001
Duration of hospital stay (days)	2.03±0.12	5.23±0.57	<0.05
Return to work (days)	3.01±0.35	5.45±0.63	<0.05

Mean duration of post-operative pain was 17.48±3.4 hours in Laparoscopic appendectomy and 30.54±3.45 hours in Open appendectomy (p<0.001).

The mean duration of hospital was 2.03±0.12 days in Laparoscopic appendectomy and 5.23±0.57 days in Open appendectomy (p<0.05).

Table-5: Complications in open and laparoscopic surgery in present study

Complications during hospital stay	Laparoscopic cholecystectomy	Open cholecystectomy
Wound infection	3	9
Vomiting	2	5
Postoperative ileus	1	2
Wound dehiscence	1	4
Intra-abdominal abscess	3	1

DISCUSSION

Acute appendicitis is the most common intra-abdominal condition requiring emergency surgery. The possibility of appendicitis must be considered in any patient presenting with an acute abdomen, and a certain preoperative diagnosis is still a challenge [11]. Although more than 20 years have elapsed since the introduction of laparoscopic appendectomy (performed in 1983 by Semm, a gynaecologist), 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 [12]. Several studies have shown that laparoscopic appendectomy is safe and results in a faster return to normal activities with fewer wound complications [13]. There is a lot of discussion over various parameters concerning the two techniques. We will examine each one separately.

Operative time

In our study, duration of the operation time ranged from 30-95 min in Laparoscopic appendectomy (Mean±SD 53.3±3.1) and 25 to 60 min (Mean±SD: 31.2±2.7) in Open appendectomy. Some authors find the LA takes much longer to perform [14]. This was normal in the beginning of the application of the

laparoscopic technique. The review and meta-analysis of previous studies demonstrated that there is not a significantly greater length of operation in the laparoscopic vs. the open group [15]. Pradeep K *et al.* after comparing 2,332 cases concluded that the median duration of surgery was 40 minutes for LA and 45 minutes for OA [16]. It is also important to mention that LA offered us new perceptions about the operative process. There is no longer necessary to perform a purse-string suture of the caecum, and the appendiceal stump can be treated only with coagulation of the mucosa and iodization, without invagination into the caecum [17].

Hospital stays

In our study, the mean duration of hospital was 2.03±0.12 days in Laparoscopic appendectomy and 5.23±0.57 days in Open appendectomy (p<0.05). Most authors agree that the length of hospital stay is shorter for patients operated with laparoscopy [18]. Some report a median stay of 3 days in case of simple appendicitis and 5.2 days in case of peritonitis [19]. Those differences can be attributed to the experience and skills of the surgeons as well as the different discharge policies. The same studies demonstrated a median hospital stay of 4.3 days for OA in case of simple appendicitis and 8.3 days in case of peritonitis,

or a variety from 2.88 to 7.2 days [20]. This fact can be attributed to the minimal trauma and pain caused by the trocar incisions. Moreover, the minimal manipulation of caecum and ileus decreases the degree of postoperative a dynamic ileus resulting in a faster resumption of a normal diet [21].

Complications

In our study, wound infection is significantly lower in patients undergoing LA. If we examine those complications separately we will observe some important differences. Most authors report that wound infection is significantly lower in patients undergoing LA [22]. We can presume that this difference is attributed to the smaller incisions for the trocars compared to the OA incision, as well as the fact that in LA the appendix is delivered with a bag or *via* the port, while in OA it is delivered directly through the wound risking contamination. Postoperative ileus seems to be reduced in LA. (1.3% vs. 2.8% in OA) [23]. This may be due to reduced manipulation of the small and large bowel and earlier mobilization.

Postoperative pain is less after LA while Talha AI *et al.*, find no difference on postoperative days 1 and 7. Intraoperative bleeding has no statistically significant difference [24]. Laparoscopic approach offers some additional advantages. If the appendix is normal the surgeon can search for other anomalies that cause abdominal pain, helped by the accuracy and magnified view of the technique. It can also help with obese patients by offering an easier access [25]. Moreover, there is an easier treatment of an ectopic appendix, while the lavage of the peritoneum is more efficient [26]. The cosmetic result is improved in LA. Recently, there is a trend to minimize even further the laparoscopic technique by reducing the abdominal incisions to one (Single Incision Laparoscopic Appendectomy or SILA). Most authors agree that SILA is a feasible and reliable procedure with short-term results similar to the multiport technique [27]. It is recommended for uncomplicated appendicitis in order to avoid a potential wound infection caused by the extracorporeal appendectomy.

For others, there are some disadvantages such as the violations of the principles of laparoscopic surgery (lack of pneumoperitoneum, absence of triangulation), and the prolongation of the operative time until the proper training of the surgeon. Generally, it has no significant differences in the length of hospital stay, pain scores, or conversion and complication rates [28].

Most supporters of OA are focusing at the increased rate of Intra-Abdominal Abscess (IAA) after LA. In our study, we found various reports. Singh VK *et al.*, report a similar incidence between the two techniques (3.8% in LA vs. 3.4 in OA) [29]. Sunil K *et al.*, found laparoscopy associated with more abscesses

but the number of gangrenous and perforated appendices was greater. After adjustment, the difference failed to reach statistical significance. On the other side, there are also reports of increased IAA after LA [30].

CONCLUSION

There is still a debate among surgeons concerning the choice of the proper technique for appendectomy. Supporters of the open appendectomy find it easy and fast to perform. They use a small incision and consider that they have less IAA. Laparoscopic appendectomy becomes more minimal with the one-port technique. Operative time has been reduced after training. It is less painful; it has less wound infections and postoperative ileus. Other complications have the same rate as OA. Hospital stay is shorter, return to a normal diet and activity is faster. We recommend LA as a routine surgical approach for acute appendicitis.

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