ORIGINAL ARTICLE

A Comparison of Laparoscopic Versus Open Appendectomy for Acute Appendicitis

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ABSTRACT

Introduction: Appendectomy is the most common emergency surgery. There are several studies being published providing conflicting results comparing laparoscopic appendectomy (LA) and open appendectomy (OA). The aim of the study was to compare the outcomes of LA and OA in terms of operative time, post-operative pain, analgesic required, length of post-operative hospital stay, and post-operative complication like wound infections.

Methods: Retrospective data from medical records of the patients who had undergone appendectomy for acute appendicitis in KIST Medical College from January 2016 to May 2018 were reviewed. Two groups LA and OA were analyzed and compared.

Results: Of 200 cases, 110 had undergone OA and 90 had undergone LA. The mean age of patients in OA group was 26.53 ± 8.26 years and 24.45 ± 9.27 years in LA group. The mean duration of operation was less in OA group than in LA group (47.25 ± 21.35 vs. 63.24 ± 23.78 min). The mean duration of post-operative hospital stay was 3.65 ± 1.23 days in OA group and 3.04 ± 1.78 days in LA group. There were 12 (10.9%) wound infection cases in OA group and 3 (3.3%) cases in LA group.

Conclusion: LA is safe and effective approach as compared to OA. It has advantages of shorter post-operative hospital stay, less post-operative pain, and earlier return to normal activities.

Key words: Acute appendicitis, appendectomy, laparoscopic appendectomy

INTRODUCTION

Acute appendicitis is the inflammatory condition of appendix. It is one of the most commonly presenting emergency conditions in hospital. According to the literature, the lifetime risk of appendicitis is 8.6% for males and 6.7% for females and the lifetime risk of appendectomy is 12% for males and 23% for females.[1] Age group of 10–19 years is the most common group that undergoes appendectomy.[1] The first surgery of appendix was dated back in 1735 A.D. by a French Surgeon, Claudius Amyand, who removed appendix from inguinal hernia sac that had been perforated by a pin.[2] McBurney, in 1894, added milestone in the surgical approach for open appendectomy (OA) by describing his classical muscle-splitting incision.[3] With the advancement in new surgical technique and more interest of surgeons toward minimal invasive techniques, laparoscopic appendectomy (LA) is being performed. Minimally invasive technique for appendectomy was first reported by Semm, in 1983.[4] LA has all the advantages of laparoscopic procedure of shorter operating time, shorter po st-operative hospital stay, lesser post-operative pain, earlier return to normal activities, and lesser wound infection rate.[5,6] There are several studies being published providing conflicting results comparing LA and OA. Some of the literatures have shown better clinical outcomes with the LA,[5-7] while others have shown marginal or no clinical benefits of LA over OA.[8,9]

The aim of this study was to compare the outcomes of LA and OA in terms of operative time, post-operative pain, analgesic required, length of post-operative hospital stay, and post-operative complication like wound infections.

METHODS

Retrospective data from medical records of the patients who had undergone appendectomy for acute appendicitis in KIST Medical College from January 2016 to May 2018 were reviewed. The patients meeting inclusion criteria were included in the study. Laparoscopically started and later converted to OA were not included in the study. Medical records of 250 patients were reviewed among which only 200 patients had met inclusion criteria who were included in the study. The decision about either laparoscopic or open approach was made according to the experience and preference of the surgical team on duty and choice of the patient. The patients were divided into two groups: OA group and LA group. Two groups were analyzed with respect to operation time, intraoperative

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findings, post-operative hospital stay, amount of analgesics required, and post-operative complications. The data were entered into Microsoft Excel and analyzed in SPSS 23. The Student's *t*-test and Chi-square test were used to compare related variables between two groups. $P < 0.05$ was considered statistically significant. Permission for this study was taken from the Hospital Ethical Review Committee.

RESULTS

Two hundred cases of appendectomy were included in the study, among which 110 had undergone OA and 90 had undergone LA. There were 63 (57%) males in open group and 53 (59%) in laparoscopic group, whereas females were 47 (43%) in open group and 37 (41%) in laparoscopic group. The mean age of the patients in OA group was 26.53 ± 8.26 years and 24.45 ± 9.27 years in LA group; however, this difference was not statistically significant ($P = 0.166$). The mean duration of symptom appearance to arrival in hospital time in OA group was found to be longer than in LA group (78.53 ± 9.24 h vs. 4.45 ± 9.27 h), but this difference was not found to be statistically significant ($P = 0.782$). The mean Alvarado score was 6.98 ± 1.26 in OA group and 6.12 ± 1.48 in LA group which was not significantly different ($P = 0.105$) [Table 1].

The mean duration of operation was found to be less in OA group than in LA group (47.25 ± 21.35 vs. 63.24 ± 23.78 min) which was statistically significant ($P = 0.031$). The duration of resumption of diet and the duration of analgesic required were not found to have statistically significant difference between the two groups. The mean duration of post-operative hospital stay was 3.65 ± 1.23 days in OA group and 3.04 ± 1.78 days in LA group; however, this difference was not statistically significant ($P = 0.122$). There was 12 (10.9%) wound infection cases in OA group and 3 (3.3%) cases in LA group which was also not significantly different ($P = 0.119$). There was no mortality case within the study time period in both groups [Table 2].

Table 1: Demographic and pre-operative clinical data

	OA (*n*=110)	LA (*n*=90)	*P* value
Gender (%)			
Male	63 (57)	53 (59)	0.121
Female	47 (43)	37 (41)	
Age in years (Mean±SD)	26.53±8.26	24.45±9.27	0.166
Symptom to arrival time in hours (Mean±SD)	78.53±9.24	67.34±8.23	0.782
Alvarado score (Mean±SD)	6.98±1.26	6.12±1.48	0.105

LA: Laparoscopic appendectomy, OA: Open appendectomy, SD: Standard deviation

Intraoperative findings were almost similar in both groups [Table 3]. There were 60.9% uncomplicated acute appendicitis in OP group and 67.8% of cases in LA group. Gangrenous appendicitis was seen in 14.6% of cases in OA group and 13.4% of cases in LA group. There were 13.6% cases of appendicular abscess in OA group and 11.1% in LA group. Similarly, appendicular perforation was seen in 10.9% in OA group and 7.7% in LA group.

DISCUSSION

Since acute appendicitis is an infective condition and may lead to serious complications such as perforation and abscess formation, there is no doubt that surgical removal of appendix is the main modality of treatment. Only debate is in the different approaches for appendectomy. Initially, surgeons used to perform OA by muscle-splitting incision. Nowadays, with the advancement of minimally invasive surgery, more surgeons are performing LA because of more advantages of laparoscopic approach like better visualization of abdominal viscera including associated intra-abdominal abnormalities and diagnostic benefit in case of diagnostic dilemma.

In our study, wound infection rate was lower in LA group (3.3%) which was similar with another study.[5-7] Since there was no difference in the intraoperative findings between two groups, lower infection rate in laparoscopic group may be due to less tissue handling, small incision, and no contact of infected appendix with incision site as appendix was kept in plastic bag before it was removed from abdominal cavity.

The operative time was significantly longer in laparoscopic group in our study which was similar with some other

Table 2: Operative and post-operative clinical data

	OA (*n*=110)	LA (*n*=90)	*P*-value
Operative time (min) (Mean±SD)	47.25±21.35	63.24±23.78	0.031
Resumption of diet (h) (Mean±SD)	24.65±5.38	17.34±7.56	0.105
Analgesics required (days) (Mean±SD)	3.6±0.99	2.8±0.89	0.138
Post-operative hospital stay (days) (Mean±SD)	3.65±1.23	3.04±1.78	0.122
Wound infection (%)	12 (10.9)	3 (3.3)	0.119

LA: Laparoscopic appendectomy, OA: Open appendectomy, SD: Standard deviation

Table 3: Intraoperative findings

	OA (*n*=110)	LA (*n*=90)
Uncomplicated acute appendicitis	67 (60.9)	61 (67.8)
Gangrenous appendicitis	16 (14.6)	12 (13.4)
Appendiceal abscess	15 (13.6)	10 (11.1)
Appendicular perforation	12 (10.9)	7 (7.7)

LA: Laparoscopic appendectomy, OA: Open appendectomy

studies.[9,10] Longer operative time in LA group might be because most of the operations were done by the beginner surgeons who were in the initial learning curve.

We found that post-operative hospital stay was shorter for LA patients group which was similar with other studies.[11-14] This might be because of small incision, less post-operative pain, and earlier feeding with normal diet in LA group. There was less analgesic requirement and earlier resumption of diet in LA group as compared to OA group, but there was no statistically significant difference between two groups which was similar with other studies.[6,7,9,15]

The main concern of laparoscopic approach is its cost. Although exact economic impact of LA is difficult to assess, its operative cost can be compensated to some extent with shorter hospital stay and earlier return to activity.[16-18]

CONCLUSION

LA is safe and effective approach as compared to OA. It has advantages of shorter post-operative hospital stay, less post-operative pain, and earlier return to normal activities. Although both procedures are still being practiced according to the preference of surgeons and patient choice, in future, laparoscopic approach could be considered as standard approach in acute appendicitis and mainly in undiagnosed acute abdomen.

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