



# COMPLICATED APPENDICITIS; TO COMPARE LAPAROSCOPIC APPENDECTOMY AND OPEN APPENDECTOMY AS TREATMENT OF COMPLICATED APPENDICITIS

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**ABSTRACT...** Appendectomy is the most common surgical procedure performed in surgical emergency. The advent of minimal invasive surgery has massively influenced the field of surgery. Laparoscopic surgery might offer clinical benefits in perforated and complicated appendicitis. **Objective:** To compare laparoscopic appendectomy and open appendectomy as treatment of complicated appendicitis in terms of mean requirement of post-operative analgesia, operative time and hospital stay. **Study design:** Randomized control trial. **Setting:** All subjects for the study were recruited from Department of Surgery, Independent University Hospital, Faisalabad. **Duration:** The duration of study was of 6 months duration from February 2012 to august 2012. **Results:** In this study the divided into two groups, group A for open appendectomy (OA) and group B for Laparoscopic Appendectomy (LA). Both groups had 43 patients each. The operating time for open appendectomy group A had mean operating time 37.21 minutes .The hospital stay in OA group was 2.63 days. The mean dosage of analgesia requirement was 258 mg of diclofenac. The operating time for open appendectomy group A had mean operating time 39.16 minutes. The hospital stay in OA group was 2.95 days. The mean dosage of was 258.14 mg of diclofenac. **Conclusion:** Our study concludes that both approaches laparoscopic and open approach have proved to be similar in terms of post-operative hospital stay, operating time and analgesia requirement. Where as LA is superior in terms of cosmesis and surgical site infection. Further studies with more number of patients are recommended to assess the benefits of laparoscopic approach in complicated appendicitis.

**Key words:** Appendectomy, complicated appendicitis, Postoperative pain, operating time

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## INTRODUCTION

Approximately 6% of population develops acute appendicitis in their life time, with highest incidence between ages of 10 and 30 years.<sup>1</sup> Traditionally acute appendicitis is diagnosed clinically and treated with surgical removal of appendix.

Acute Appendicitis is acute inflammation of the appendix, usually resulting from bacterial infection, which may be precipitated by obstruction of the lumen by a fecolith; variable symptoms often consisting of peri-umbilical, colicky pain and vomiting may be followed by fever, leukocytosis, persistent pain and signs of peritoneal inflammation in the right lower quadrant of the abdomen.

Appendectomy is the most common surgical procedure performed in surgical emergency. The advent of minimal invasive surgery has massively influenced the field of surgery. In 1894 Charles MacBurney first performed open appendectomy, for a century open appendectomy was gold standard treatment of acute appendicitis.<sup>3</sup>

Complicated appendicitis is defined as acute inflammation of appendix associated with perforation or with purulent peritoneal collection of abscess formation and generalized peritonitis. It comprises 20% to 30% of all cases of acute appendicitis.<sup>2</sup> It is suspected clinically when the patients are more sick or toxic with more marked symptoms or signs. An abdominal ultrasound or CT abdomen may help in its diagnosis but complicated appendicitis is confirmed

intra operatively. It has been associated with a significant risk of post-operative septic complications including wound infections and intra-abdominal abscess formation.

Appendectomy outcomes differ considerably secondary to patient illness severity and diagnosis of either complicated or uncomplicated appendicitis. Despite conflicting results several studies have demonstrated the superiority of laparoscopic approach in uncomplicated appendicitis<sup>4</sup>. However, the clinical benefit of laparoscopy as either a diagnostic or therapeutic modality in the management of complicated or perforated appendicitis is still undefined. Surprisingly, in contrast to such consideration, laparoscopic surgery might offer clinical benefits in perforated and complicated appendicitis. In fact shorter hospital stay, less analgesia and avoidance of extensive laparotomy would be an advantage particularly in complicated appendicitis. A laparoscopic appendectomy has emerged as a safe procedure, however despite of numerous trials laparoscopic appendectomy has yet to become gold standard in treatment of acute appendicitis, higher cost have been a major obstacle in the process of global acceptance.<sup>5</sup> Laparoscopic appendectomy has many benefits over open appendectomy however lacking evidence in treatment of complicated appendicitis, is considered to be the major obstacle in a way of global acceptance of laparoscopic appendectomy for complicated appendicitis.

## OBJECTIVE

To compare laparoscopic appendectomy and open appendectomy as treatment of complicated appendicitis in terms of mean requirement of post-operative analgesia, operative time and hospital stay.

## OPERATIONAL DEFINITION

Complicated appendicitis is acute inflammation of appendix associated with perforation or with purulent collection or abscess and erythema of peritoneum as visualized preoperatively.

## Duration of hospital stay

This was calculated from day of surgery to day of discharge.<sup>8</sup>

## Amount of postoperative analgesia

The amount of analgesia required was recorded in terms of no. of doses of diclofenac sodium by parenteral route in 24 hours. (one dose =75 mg of diclofenac sodium). Analgesia will be given only on request of the patient.

## Operative time

The operative time was calculated from time of knife to, skin to skin closure in minutes.<sup>9,10,11</sup>

## HYPOTHESIS

Laparoscopic appendectomy for complicated appendicitis has shorter mean operative time, no of doses of analgesia and duration of stay in hospital, as compared to open appendectomy.

## MATERIAL AND METHODS

### Study design

Randomized control trial.

### Setting

All subjects for the study were recruited from Department of Surgery, Independent University Hospital, Faisalabad.

### Duration

The duration of study was of 6 months duration from February 2012 to august 2012.

### Sampling technique

The consecutive non probability Sampling was adopted for recruitment of subjects.

### Inclusion criteria

All patients between age of 15 and 85 years of age, either gender undergoing appendectomy and having per-operative findings of acute inflammation of appendix associated with perforation or abscess formation and erythema of peritoneum.

**Exclusion criteria**

Following patients were excluded from the study:

- Patients with per operative pathology other than appendicitis
- Patients with per-operative normal appendix or uncomplicated appendicitis

Patients were randomly assigned to either laparoscopic appendectomy (LA) or open appendectomy (OA) by lottery method.

**STATISTICAL ANALYSIS**

The data was analysed with statistical programme version 11.0. Frequencies and percentages of categorical variables like gender were calculated. Mean±SD was calculated for quantitative variables like age, operative time, hospital stay and dosage of analgesia. Independent samples t-test was used to compare mean operative time, hospital stay and dosage of analgesia in two groups. P < 0.05 was considered statistically significant.

**RESULTS**

In this study 86 subjects recruited for the study were randomly divided into two groups, group A for open appendectomy (OA) and group B for Laparoscopic Appendectomy (LA). Both groups had 43 patients each. All patients who did not have features of complicated appendicitis were excluded from the study.

The gender distribution in group A of open appendectomy (OA) total number of cases was 43 with 29 (67.4%) female and 14(32.6%) male. In group B of laparoscopic appendectomy (LA) total number of cases was 43 with 24(55%) male and 19(44.2%) female. (LA) (Table I)

gender	OA group		LA group	
	Frequency	Percentage	Frequency	percentage
Female	29	67.4	19	44.2
Male	14	32.6	24	55.8
Total	43	100.0	43	100.0

**Table-I. Gender distribution for OA group and LA group**

The mean age in OA group was 31.09±13.200

years with range from 13 to 75 years and the mean age in LA group was 29.19±8.948 years with range from 16 to 52 years. (Table II). The P-value is 0.453 which is not significant.

	OA group	LA group
Mean Age(years)	31.09	29.19
Median	30.00	27.00
Std. Deviation	13.200	8.948
Range	62	36
Minimum	13	16
Maximum	75	52
P-value 0.453		

**Table-II. Age distribution in OA group and LA group**

The patients of open appendectomy (OA) had complicated appendicitis and the mean total leucocyte count was 10545.24±2570.584 and laparoscopic appendectomy (LA) patients had complicated appendicitis and the mean total leucocyte count was 10725.58±2698.420 (Table III). The P-value is 0.753 on comparison of mean WCC (white cell count).

	OA group	LA group
Mean( total leucocyte count)	10545.24	10725.58
Median	10300.00	10700.00
Std. Deviation	2570.584	2698.420
Range	13000	11300
Minimum	6000	6700
Maximum	19000	18000
P-value 0.753		

**Table-III. Total leucocyte count for OA group and LA group**

The mean operating time was little less in operating group which is understandable because laparoscopic approach is more time consuming. The dosage of analgesia in first 24 hours after surgery for OA group and LA group was almost similar. The duration of hospital stay was also evaluated and no benefit was observed in laparoscopic approach for appendectomy in complicated appendicitis. In OA group the mean stay was almost similar in both groups.

The operating time for open appendectomy (OA)

ranged between 13 and 75 minutes with mean operating time  $37.21 \pm 13.417$  minutes and the operating time for laparoscopic appendectomy (LA) ranged between 20 and 73 minutes with mean operating time  $39.16 \pm 12.073$  minutes. The p-value is 0.480. (Table IV).

	OA group	LA group
Mean Operating time (minutes)	37.21	39.16
Median	35.00	36.00
Std. Deviation	13.417	12.073
Range	69	53
Minimum	21	20
Maximum	90	73
	P-value 0.480	

**Table-IV. Operating time for OA group and LA group**

The hospital stay in open appendectomy (OA) group was  $2.63 \pm 1.155$  days with maximum stay 6 days the hospital stay in laparoscopic appendectomy (LA) group was  $2.95 \pm 1.396$  days with maximum stay 8 days. The p-value is 0.242 (table V).

	OA group	LA group
Mean (duration of stay in days)	2.63	2.95
Median	2.00	3.00
Std. Deviation	1.155	1.396
Range	5	7
Minimum	1	1
Maximum	6	8
	P-value 0.242	

**Table-V. Duration of Stay for OA group and LA group**

The mean dosage of analgesia requirement in first 24 hours after surgery for open appendectomy (OA) group was  $258 \pm 105.181$  mg of diclofenac given parenterally and for laparoscopic appendectomy group the mean dosage of analgesia requirement in first 24 hours after surgery was  $258.14 \pm 105.181$  mg of diclofenac given parenterally. The maximum dose for both groups was 450mg and minimum requirement was 150mg. The p-value is 0.480 (table VI).

	OA group	LA group
Mean dose of analgesia (mg/24hrs)	258.14	258.14
Median	300.00	300.00
Std. Deviation	105.181	105.181
Range	300	300
Minimum	150	150
Maximum	450	450
	P-value 0.480	

**Table-VI. Dosage of analgesia for OA group and LA group**

In group A of OA 10(23%) developed complications. Surgical site infection developed in 6 of 10 complications, 3 had pelvic abscess and 1 developed entero-cutaneous fistula.

In group B of LA 8(18.6%) developed complications. Surgical site infection developed in 2 of 8 complications, 2 cases developed post-operative pelvic abscess. In 4 cases surgery had been converted to open appendectomy due to different reasons.

In our study 3 variables (operating time, post operative analgesia and hospital stay), were found to be found statistically insignificant because in developed world the hospital stay is less because they have community health support. The operating time for surgery is less in places where better trained personnel are available to assist in laparoscopic surgery and better organization of theatre also have significant effect on mean operative time. These factors when removed will possibly make our results statistically significant.

### DISCUSSION

The LA was started by removing the uncomplicated appendicitis during the obstetrics and gynecology procedures. It was intermittently reported in the 1980's, and comparative research between the LA and the OA was actively conducted during the 1990's.<sup>13</sup> The initial research proved its safety and efficacy for simple appendicitis, but suggested that the LA was not suitable for Complicated appendicitis.<sup>14</sup> However, clinical research on LA for CA has continued over the years and it has been

performed in more and more cases as surgical techniques and devices have developed.<sup>15,16</sup>

The LA is generally agreed to have better aesthetic effects and shorter hospitalization as compared with the OA. On the other hand, the operative time, postoperative complications, and the conversion to OA during LA have been pointed out as potential drawbacks.

In this study the gender distribution of sample for laparoscopic appendectomy group is comparable with other studies which show 44% males and females 56%.<sup>17</sup>

In our study the mean operating time in OA and LA was 37.21 minutes and 39.16 minutes which is comparable with many other studies. In terms of operation time, the majority of the research reported that there was no difference between the LA and the OA that the LA took longer than the OA.<sup>18,19</sup> On the other hand, Yau et al.<sup>20</sup> reported that LA group had a shorter operative time (i.e., 55 minutes in the LA group and 70 minutes in the OA group;  $P < 0.001$ ). Park and Sul<sup>21,22,23</sup> reported the same result and explained that the LA had a better surgical field view that ultimately helped to detect adhesions or abscesses the conventional OA; this might contributed to the shorter operating time and the fewer postoperative complications.

However most studies show shorter hospital stay such as Tuggle et al.<sup>24</sup> analyzed National Surgical Quality Improvement Program (NSQIP) to evaluate the length of hospital stay, and it showed statistical significance (4.0 days in the LA group and 5.1 days in the OA group). Khiria et al.<sup>25</sup> evaluated the length of hospital stay for CA and reported a statistical difference between the two groups (5 days in the LA group and 9 days in the OA group).

In our study is duration of stay in hospital. In this study the OA group had mean hospital stay 2.63 days and LA group had 2.95 days which was not significant statistically.

In our study the dosage of analgesia in OA and LA was almost similar with no statistical significance

which is comparable with study by Lee et al which shows that amounts of intravenous analgesics of OA group was more than that of LA group ( $P < 0.0001$ ). The complication rate observed in LA group (10.87%) was slightly higher than that in OA group (6.99%), but there was no statistical difference.<sup>26</sup>

The morbidity rates, particularly for intra-abdominal abscesses and wound infection were less for laparoscopic appendectomy in complicated appendicitis than those reported in the literature for open appendectomy, whereas operating times and hospital stays were similar.<sup>27</sup>

The literature has shown that laparoscopic appendectomy is a safe and clinically beneficial operating procedure even in patients with peritonitis, perforation, and abscess.<sup>28</sup>

## CONCLUSION

In our study it concludes that laparoscopic approach for appendectomy in cases with complicated appendicitis is safe and with less complications, and superior to open appendectomy in terms of cosmesis and septic complications.

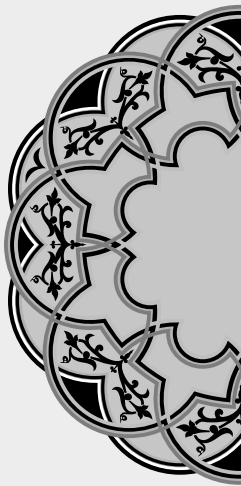
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*“A wise man gets more use from his enemies than a fool from his friends.”*

**Baltasar Gracian**

**AUTHORSHIP AND CONTRIBUTION DECLARATION**

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2	Professor M Ramzan	Literature search and analysis	
3	Dr. Nadia Sharif	Data collection, Result Review, Write up	