

## Original Research Article

# Comparison of open versus laparoscopic appendectomy

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### ABSTRACT

**Background:** Although laparoscopic cholecystectomy has now considered the gold standard for the management of gall stone disease, laparoscopic appendectomy has not attained the same degree of popularity and acceptance. Aim of this study is to assess and compare the role of laparoscopic appendectomy with open appendectomy in acute appendicitis as well as in the patients planned for interval appendectomy.

**Methods:** Total number of fifty cases over the age of 12 years were studied prospectively. Out of 50 number of total cases, 20 cases were those who have been operated laparoscopically while 30 cases were of open appendectomy group. The two groups were compared with respect to operative time, length of hospital stay, post-operative pain and nausea, complication rate and time to return to normal activity.

**Results:** The mean age was  $22.8 \pm 2(6.83)$  and  $26.7 \pm 2(9.22)$  years in the laparoscopic and open groups respectively, with the range of 14 to 42 in the laparoscopic group and 13 to 50 years in the open group. The Average operating time was more in the laparoscopic appendectomy as compared to the time taken in performing open appendectomy. However, this was not statistically significant with  $p < 0.05$ . Overall, there was no significant difference in the incidence of complications between open and laparoscopic groups.

**Conclusions:** The laparoscopic appendectomy is safe, simple and efficient technique for treatment of acute appendicitis with result comparable to the open appendectomy, if not better.

**Keywords:** Appendectomy, Acute appendicitis, Appendicular lump, Interval appendectomy, Laparoscopic appendectomy

### INTRODUCTION

Appendicitis is one of the most common acute surgical disease. Appendectomy is the treatment of choice for appendicitis in all its forms. The first appendectomy was performed by Claudius Amyand in 1736. Appendectomy is done as emergency procedure wherever possible, the only exceptions are poor general condition of the patients, attack has already resolved or formation of appendicular mass without any general peritonitis. In these cases, appendectomy is performed as elective procedure.<sup>1</sup>

Currently, 84 percent of all appendectomies are performed for acute pathology. However, at operation fewer than 70% of the patients with right lower quadrant pain actually have some form of appendiceal disease warranting removal, 15% have no obvious pathology and another 15% have another pathology that does not always require surgical treatment.<sup>2</sup>

For more than a century open appendectomy has been the gold standard for acute appendicitis.<sup>[2]</sup> It is considered safe and effective procedure for acute appendicitis with low morbidity, short hospitalisation and minimal post-operative discomfort. Variability in the inflammatory

process and in the location of appendix are the main causes of operative difficulties in open appendectomy, besides providing only a limited space for abdominal exploration.

Introduction of minimal invasive surgical technique in the form of laparoscopic surgery revolutionised the way surgeries are being performed today. As it offers not only through visualization of the abdominal cavity which helps in finding even ectopic appendix and facilitating other differential diagnosis but also reduces post-op pain, early mobility and better cosmesis.<sup>2</sup> Laparoscopic appendectomy was first described by Semm in 1983 in Germany.

Although laparoscopic cholecystectomy is now the procedure of choice in the management of gall stone disease, laparoscopic appendectomy has not attained the same degree of popularity and acceptance. Since the introduction of laparoscopic cholecystectomy and many trials and studies on this topic, controversy still exists that whether open or laparoscopic appendectomy is preferable. Main reason for this is because traditional open appendectomy is already a minimally invasive procedure performed through a small incision with overall low morbidity and short hospital stay.

Authors planned this study to find out if the laparoscopic approach was theoretically capable of any amelioration in diagnostic and the operative difficulties encounter during open appendectomy. So, aim of this study is to assess and compare the role of laparoscopic appendectomy with open appendectomy in acute appendicitis as well as in the patients planned for interval appendectomy.

**METHODS**

The study was conducted in the department of General surgery of Dr B. S. A. hospital, Rohini New Delhi. Total number of fifty cases over the age of 12 years were studied prospectively. Out of 50 number of total cases, 20 cases were those who have been operated laparoscopically while 30 cases were of open appendectomy group. The two groups were compared with respect to operative time, length of hospital stay, post-operative pain and nausea, complication rate and time to return to normal activity.

Inclusion criteria was all patients of age 12 years or above of both sexes with clinical diagnosis of acute appendicitis in case of emergency appendectomy or patients planned for interval appendectomy. Exclusion criteria was presence of generalised peritonitis, pregnancy, Shock on admission, known coagulation disorders, any associated co-morbid condition and history of chemo or radiotherapy.

Proper history, examination findings, all routine laboratory and radiological investigations and all other pre-op, intra-op and post-op events were recorded in both

group. All patients were given prophylactic antibiotics in the form of Inj. Ceftriaxone 1gm and Metronidazole 500mg intravenously and continued for three more doses postoperatively. Most cases of open appendectomy were performed under regional anaesthesia while all cases of laparoscopic appendectomy were performed under general anaesthesia. Standard universal operative technique was followed in both group of patients. Foley’s catheter was routinely placed in all cases of laparoscopic appendectomy. Operating time was considered as the time from the point of making an incision to the time of closure of wound.

Standard analgesia was prescribed in the all patients as inj. Diclofenec 75mg i.m. 8hrly four three doses and thereafter on demand. A wound complication means redness or discharge from wound site. Duration of hospital stay was considered as the number of days after surgery (day 0 being the day of operation) spent in the ward. Return to normal activity was taken as the ability to pursue daily activity at the same level of intensity, duration and frequency as in the preoperative period.

**RESULTS**

Most of the patients were of less than 30 years of age at presentation. The mean age was 22.8±2(6.83) and 26.7±2(9.22) years in the laparoscopic and open groups respectively, with the range of 14 to 42 in the laparoscopic group and 13 to 50 years in the open group. The significance of the difference between the two means as calculated by the Z test is 1.716 (p<0.05) so the difference is significant (Table 1).

**Table 1: Age distribution.**

Age (years)	Laparoscopic appendectomy		Open appendectomy	
	Emergency	Interval	Emergency	Interval
12-20	5	4	7	1
21-30	3	6	11	4
31-40	0	1	3	1
41-50	1	0	1	2
Total	9	11	22	8
Mean±2(SD)	22.8±2(6.83)		26.7±2(9.22)	
Z-value	1.716			

The Male to female ratio in the laparoscopic appendectomy was 1.5:1 and in the open appendectomy group was 1.7:1. The difference between the two proportions is statistically insignificant with Z-value of 0.23. Hence the patient’s population characteristics did not differ between the laparoscopic and open appendectomy groups for age and sex (Table 2).

The Average operating time was more in the laparoscopic appendectomy as compared to the time taken in performing open appendectomy. However, this was not statistically significant with p<0,05. About 20% (10%

each in emergency and interval surgery) of patients of laparoscopic appendectomy had to be converted to open surgery due to abnormal location and dense adhesion. The cases which were converted would not be considered for subsequent analysis (Table 3).

**Table 2: Sex distribution.**

Sex	Laparoscopic appendectomy		Open appendectomy	
	Emergency	Interval	Emergency	Open
Male	5	7	15	4
Female	4	4	7	4
Total	9	11	22	8
Z-value	0.23			

**Table 3: Operation time.**

Operation Time(min)	Laparoscopic appendectomy		Open appendectomy	
	N	Percentage	N	Percentage
21-40	3	15	13	43.33
41-60	9	45	12	40
61-80	3	15	3	10
81-100	3	15	2	6.66
101-120	1	5	0	0
>120	1	5	0	0
Total	20	100	30	100
Mean±2(SD)	54.18±2(15.87)		46.43±2(17.76)	
Z-value	1.51			

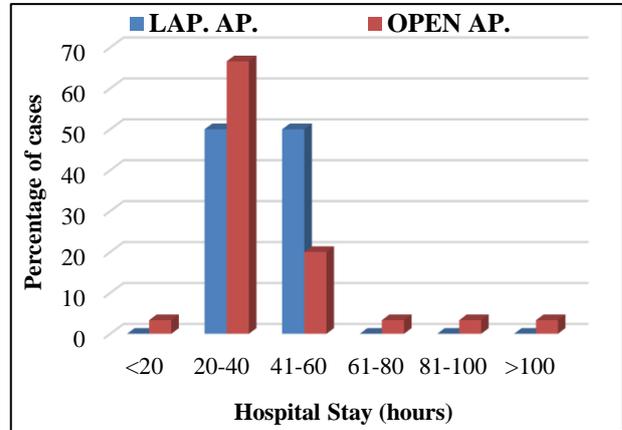
Mean pain/nausea score for emergency appendectomy was 3/0.3 and 4.6/0.125 for the laparoscopic and open approach respectively. Similarly, mean pain/nausea score for interval appendectomy was 3.4/1 and 4.05/0.18 for the laparoscopic and open approach respectively. So, post-op pain was more intense in open group while nausea was more pronounced in the laparoscopic group.

**Table 4: Complications.**

Complications	Laparoscopic appendectomy		Open appendectomy	
	N	Percentage	N	Percentage
Wound infection	2	12.5	2	6.66
Fever	1	6.25	0	0
Loose stool	1	6.25	0	0
Mortality	0	0	0	0
No complication	13	81.25	28	93.33
Total	16	100	30	100
Z-value	1.122			

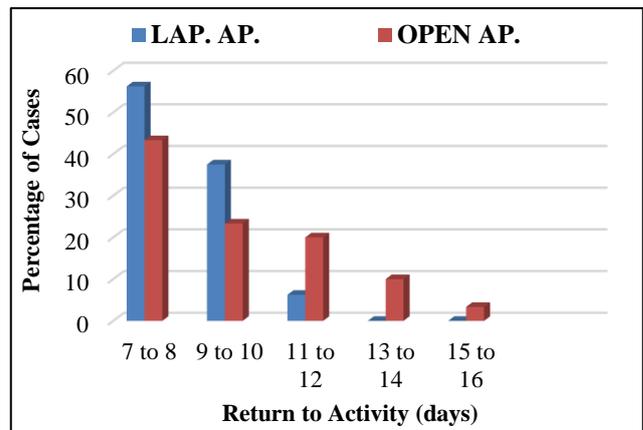
Overall, there was no significant difference in the incidence of complications between open and laparoscopic groups. 3 out of 16 (18.75%) patients had complications in the laparoscopic group while 2 out of 30 (6.66%) had complications in the open appendectomy group. All other details mentioned in Table 4.

Mean post-op stay in the hospital in the laparoscopic and open groups was 39.06 and 43.8 hours respectively, but the difference was not statistically significant. Range of stay was 24 to 80 hours in the laparoscopic group. The skewed value of 80 hours was seen in the case where a paracecal drain was put (Figure 1).



**Figure 1: Hospital stay.**

Mean number of days for return to normal activity was significantly higher in open appendectomy group as compared to the laparoscopic group (Figure 2).



**Figure 2: Return to activity.**

**DISCUSSION**

Since the introduction of minimally invasive technique, Laparoscopic and open appendectomy have been compared several times. While for the gall stone disease laparoscopic cholecystectomy has become gold standard but till date it is not a case with laparoscopic appendectomy. Our study compared a total of 50 cases (30 open and 20 laparoscopic appendectomies) to evaluate the safety and efficacy of the laparoscopic appendectomy and to evaluate our results in comparison with those of other reported series.

Although at least 11 scores have been proposed to diagnose and rates the severity of attack, we used the

Alvarado scale of appendicitis to define the presence of appendicitis in each case.<sup>3</sup> Out of total twenty laparoscopic appendectomy, in one case appendix was looking normal but we still performed appendectomy and biopsy turned out to mild appendicitis. This incidence rate of 5% where a laparoscopic surgery could have avoided the non-therapeutic laparotomy was quite comparable to the one shown by Majewski et al.<sup>4</sup> In this context laparoscopic surgery has gained upper hand over open appendectomy and should be recommended. However, laparoscopy is associated with risks of general anaesthesia and complications related to laparoscopy.

As far as epidemiological profile of the patients in this study is concerned, it was in line with other studies and is universally look like more or less same.<sup>5-7</sup> The definition of operating times in the various randomized controlled trials done so far have been highly variable.<sup>8</sup> In this study, Laparoscopic appendectomy was relatively more time consuming and mean time difference between open and laparoscopic appendectomy was 7.75 minutes. But this difference was not statistically significant ( $p < 0.05$ ). Overall, in this study mean operating time for lap/open appendectomy was 52.2/46.4. In comparison, the various studies under review had shown a mean operating time as varying as 102/81.7 to 43/40.<sup>8,9</sup>

The difference in the degree of pain between laparoscopy and open procedure was not significant ( $Z$ -value = 1.574) in this study. This is not in consistency with the results of some other studies where laparoscopy is said to cause significantly less pain to the patients as compared to the open procedure.<sup>6,8,10,11</sup>

In this study, postoperative stay for open appendectomy patients were more than laparoscopic group. The difference in the postoperative stay in the hospital was 4.74 hours ( $Z$ -value = 0.934) and it was statistically significant. Minne et al, reported a median hospital stay of laparoscopic appendectomy 1.1 vs 1.2 days compared with means of 5.3 vs 7.6 days for Hebebrand et al, in Germany and 5.3 vs 4.9 for Mutter et al in France.<sup>12-14</sup> One of my patient in the laparoscopic group which was converted to open surgery, took 80 hours for postoperative stay. This was because a pelvic drain was put in the case due to gross contamination and uncertainty about injury to cecum. This proves that hospital stay is related to severity rather than type of procedure.<sup>15</sup>

Authors found no significant difference in the post-operative complications between the lap and open appendectomy. Most of the study also reported that postoperative complications are more related to severity of underlying pathology than the type of procedure.<sup>9,16</sup>

The results demonstrate a significantly earlier return to full activity for laparoscopic than open appendectomy. This is parallel with the results shown by other research worker in most of the studies.<sup>6,11,12,17-20</sup>

An overall look at the various studies done so far, and in confirmation with our results, it is clearly appreciated that the more severe the appendicitis, the less often laparoscopic appendectomy is of benefit. Another important point noted here, that in so many cases, surgical treatment is not necessary and may subside with antibiotics.<sup>21,22</sup> So, in the absence of signs or symptoms of true acute appendicitis the “wait and see” attitude is neither shameful nor dangerous.<sup>23</sup>

## CONCLUSION

No significant difference was found between laparoscopic and open appendectomy in respect to the mean operative time as well as postoperative pain, nausea and other complications. The laparoscopic appendectomy is thus safe, simple and efficient technique for treatment of acute appendicitis with result comparable to the open appendectomy, if not better.

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