

## Original Research Article

# Comparative study and outcome of open versus laparoscopic appendectomy: case series of 60 patients

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### ABSTRACT

**Background:** Laparoscopic appendectomy combines the advantages of diagnosis and treatment in one procedure with least morbidity. Patients are likely to have less postoperative pain and to be discharged from hospital and return to activities of daily living sooner than those who have undergone open appendectomy.

**Methods:** This prospective study was carried out in the Department of Surgery, Heritage IMS, Varanasi, from May 2016 to May 2017. All the patients were randomly divided into two groups, Group I (Lap App) and Group II (Open App). All quantitative data was compared by independent sample test. All qualitative data was compared by chi-square test. A p-value <0.05 was considered statistically significant.

**Results:** In present study 19 (63%) patients of open appendectomy and 19 (63%) patients of laparoscopic appendectomy were males. 11 (36%) patients of open appendectomy and 11 (36%) laparoscopic appendectomy were females.

**Conclusions:** This study from May 2016 to April 2017 was done on 60 (30 lap and 30 open) patients with clinical diagnosis of acute appendicitis admitted in surgical wards of Heritage Institute of Medical Sciences. In spite of drawback of the increase in duration of surgery, we conclude that laparoscopic appendectomy is better than the open method for acute appendicitis, with less post-operative pain and reduced duration of analgesics used, with lesser incidences of post-operative complications, shorter duration of hospital stays, early return to normal work.

**Keywords:** Appendectomy, Laparoscopic, Postoperative, Pain, Wound infection

### INTRODUCTION

Appendicitis is the most common intra-abdominal condition requiring emergency surgery, with a lifetime risk of 6%.<sup>1</sup> Appendectomy continues to be one of the commonest procedures in general surgery, accounts for approximately 1% of all surgical operation.<sup>2</sup> Laparoscopic appendectomy combines the advantages of diagnosis and treatment in one procedure with least morbidity.<sup>2,3</sup> Patients are likely to have less postoperative pain and to be discharged from hospital and return to activities of daily living sooner than those who have undergone open appendectomy. The other advantages include decreased wound infection, better cosmetics,

ability to explore the entire peritoneal cavity for diagnosis of other conditions and effective peritoneal toileting without the need for extending the incision.<sup>3</sup> The laparoscopic appendectomy is increasingly employed, particularly in young women of child bearing age in whom the differential diagnosis of right lower quadrant pain is extensive and includes gynaecologic pathology.<sup>4</sup> The modern era of laparoscopic surgery has evoked remarkable changes in approaches to surgical diseases. That trend towards minimally invasive surgery has prompted general surgeons to scrutinize nearly all operations per possible conversion to laparoscopic techniques.<sup>13</sup> The present study was designed to compare the advantages of laparoscopic appendectomy over

conventional open appendectomy, with review of literature.<sup>12</sup>

**METHODS**

This prospective study was carried out in the Department of Surgery, Heritage IMS, Varanasi, from May 2016 to May 2017. One hundred ten patients of the age range 18-50 years, with symptoms that were suggestive of acute appendicitis were included in the study. Patients who were excluded from the study were; appendicular mass, perforation peritonitis, abscess previous abdominal surgery. A detailed history of the patients was taken and physical examination, routine blood investigations, and ultrasound was performed in all cases. An informed consent was taken from all patients and was explained about the risks and benefits of the procedures. All the patients were randomly divided into two groups, Group I (Lap App) and Group II (Open App). The patients were operated by two consultant surgeons, who had sufficient capability of performing the two procedures, under spinal anaesthesia. General anaesthesia was reserved for uncooperative patients.

Laparoscopic appendectomy (LA) was performed through 3 port technique, carbon dioxide used to create pneumoperitoneum.<sup>7</sup> Veress needle was used to create pneumoperitoneum, followed by 10 mm trocar insertion at infraumbilical site, and the other two 5 mm ports placed at both sides of the lower abdomen preferably just above pubic bone. The dissection was carried out at base of appendix, the mesoappendix coagulated with bipolar forceps and divided.<sup>8</sup> An endloop was passed around the base of appendix and it was tied.<sup>10</sup> The appendix was

divided at the base between two endloops. Resected appendix was retrieved through umbilical port and sent for histopathological examination.

Open appendectomy (OA), was performed through a Mcburney’s or Lanz incision.<sup>9</sup> The peritoneum was accessed through muscle splitting incision and appendix was brought out and removed in the usual manner. We recorded the operative time for both the procedures starting from incision of skin up to its closure. Postoperatively, pain score was assessed by visual analogue scale four hours after surgery, duration of analgesia was recorded, days of hospital stay, and days after which patient returned to normal work. All quantitative data was compared by independent sample test. All qualitative data was compared by chi-square test. A p-value <0.05 was considered statistically significant.

**RESULTS**

**Patients Demographics:**

The results of the analysis of data on 30 patients who underwent open appendectomy and another group of 30 patients, who were operated laparoscopically are as follows.

In present study 19 (63%) patients of open appendectomy and 19 (63%) patients of laparoscopic appendectomy were males. 11 (36%) patients of open appendectomy and 11 (36%) laparoscopic appendectomy were females. The mean age of the patients in two groups was 28.67 and 36.23 years, respectively.

**Table 1: Age distribution (Absolute value).**

Age distribution	Open Appendectomy	%	Laparoscopic Appendectomy	%	Combined	%
≤ 20 years	8	26.67	4	13.33	12	20.00
21-30 years	13	43.33	9	30.00	22	36.67
31-40 years	3	10.00	3	10.00	6	10.00
41-50 years	3	10.00	11	36.67	14	23.33
> 50 years	3	10.00	3	10.00	6	10.00
Total	30	100	30	100	60	100

**Table 2: Mean and standard deviation with p Value.**

Age distribution	Open Appendectomy	Laparoscopic Appendectomy	Combined
N	30	30	60
Mean	28.67	36.23	32.45
SD	12.77	13.13	13.40
P value unpaired t test	0.1274		

In present study 19 (63%) Patients in both group were males and 11 (36.6%) Patients in both group were Females. In open appendectomy, 14 cases (46.67%) had less than 7 days of stay, 13 cases (43.33%) had 8 to 14 days, 2 cases had 15 to 21 days and 1 case had more than

21 days of postoperative stay in the hospital. With a mean of 8±4.24. In lap appendectomy 21 (70%) cases had less than 7 days, 5 cases had 8 to 14 (16.67%) days, 1(3.33%)case had 15 to 21 days and 3 (10%) cases had more than 21 days of post-operative hospital stay. With a

mean of 12.33±23.39. Which shows that laparoscopic appendectomy significantly reduced the hospital stay (P <0.05).

**Table 3: Gender distribution.**

Gender Distribution	Open Appendectomy	%	Laparoscopic Appendectomy	%	Combined	%
Male	19	63.33	19	63.33	38	63.33
Female	11	36.67	11	36.67	22	36.67
Total	30	100	30	100	60	100
P value Chi squared test				1.0000		

**Table 4: Duration of hospital stay.**

Duration of Hospital Stay	Open Appendectomy	%	Laparoscopic Appendectomy	%	Combined	%
≤7 days	14	46.67	21	70.00	35	58.33
8-14 days	13	43.33	5	16.67	18	30.00
15-21 days	2	6.67	1	3.33	3	5.00
>21 days	1	3.33	3	10.00	4	6.67
Total	30	100	30	100	60	100

**Table 5: p Value comparing duration of hospital stay.**

Duration of Hospital Stay	Open Appendectomy	Laparoscopic Appendectomy	Combined
N	30	30	60
Mean	8.87	12.33	10.60
SD	4.24	23.39	16.76
P value unpaired t test		0.4306	

\* Unpaired student's test

**Table 6: Duration of analgesia.**

Duration of analgesia	Open Appendectomy	%	Laparoscopic Appendectomy	%	Combined	%
≤ 2 hours	0	0.00	7	23.33	7	11.67
3-5 hours	11	36.67	23	76.67	34	56.67
6-7 hours	13	43.33	0	0.00	13	21.67
8-9 hours	6	20.00	0	0.00	6	10.00
Total	30	100	30	100	60	100

**Table 7: p Value comparing duration of analgesia.**

Duration of Analgesia	Open Appendectomy	Laparoscopic Appendectomy	Combined
N	30	30	60
Mean	6.47	3.17	4.82
SD	1.63	1.02	2.14
P value Unpaired t Test		0.0001	

Duration of analgesics used parental and oral in days were on an average 6.47±1.63 and 3.17±1.02 for open and laparoscopic group respectively.

Again, this difference was significant (p <0.05). Above analysis revealed that both pain and analgesics used were significantly reduced in laparoscopic compared to open appendectomy. In present study, average pain score was 2.67±0.96 in open group as compared to 2.00±0.95) in laparoscopic group with p <0.05 which was significant.

In present study postoperative complications were analysed in detail: vomiting, intra-abdominal abscess, and wound infection. The incidence of vomiting was higher following open appendectomy 11 (36.37%) than laparoscopic 7(22.2%) which is significant with P<0.05. Wound infection was more common after open 9 (30%) than laparoscopic 1 (3.33%) and the difference was significant (P <0.05). Intra-abdominal abscesses developed in 1 (3.33%) of the open group and case in

laparoscopic group. However, this difference was not significant (P=0.23).

**Table 8: Pain score.**

Pain Score	Open Appendectomy	%	Laparoscopic Appendectomy	%	Combined	%
≤ 2 hours	3	21.67	10	10.00	13	33.33
3-5 hours	11	40.00	13	36.67	24	43.33
6-7 hours	9	21.67	4	30.00	13	13.33
8-9 hours	7	16.67	3	23.33	10	10.00
Total	30	100	30	100	60	100

**Table 9: p Value comparing pain score.**

Pain Score	Open Appendectomy	Laparoscopic Appendectomy	Combined
N	30	30	60
Mean	2.67	2.00	2.33
SD	0.96	0.95	1.00
P value unpaired t test	0.0088		

\* Unpaired t test

**Table 10: Postoperative complications.**

Postoperative complications	Open Appendectomy	%	Laparoscopic Appendectomy	%	Combined	%	P value Fishers Exact test
Abdominal abscess	1	3.33	0	0.00	1	1.67	0.9999
Wound discharge	9	30.00	1	3.33	10	16.67	0.0065
Vomiting	11	36.67	7	23.33	18	30.00	0.2763

\*Fisher's Exact test \*\*'t' test

**Table 11: Duration of surgery.**

Duration of Surgery	Open Appendectomy	%	Laparoscopic Appendectomy	%	Combined	%
≤ 30 minutes	5	16.67	0	0.00	5	8.33
31-60 minutes	20	66.67	7	23.33	27	45.00
61-90 minutes	3	10.00	16	53.33	19	31.67
91-120 minutes	2	6.67	5	16.67	7	11.67
> 120 minutes	0	0.00	2	6.67	2	3.33
Total	30	100	30	100	60	100

**Table 12: p Value comparing duration of surgery.**

Duration of Surgery	Open Appendectomy	Laparoscopic Appendectomy	Combined
N	30	30	60
Mean	55.00	85.67	70.33
SD	23.96	27.66	29.96
P value unpaired t test	0.0001		

In the present study for open appendectomy <30 minutes 5 cases were operated, 30 to 60 minutes; 20 cases, 61 to 90 minutes; 3 cases, 91 to 120 min; 2 cases were operated. The mean duration was 55±23.96 minutes. For lap appendectomy <30 minutes 0 cases, 31 to 60 minutes; 7 cases, 61 to 90; 16 cases, 91 to 120 minutes; 5 cases and 121 to 180 minutes; 2 cases were operated. Mean duration of surgery was 85.67±27.66 minutes. So open

appendectomy is less time consuming than laparoscopic appendectomy. In present study, for open appendectomy 17 patients had taken 8 to 14 days, 12 cases had taken 15 to 21 days, 1 patient had taken more than 28 days of time to return to their routine work. With a mean of 14.85±4.67. In lap appendectomy 6 cases had taken less than 7 days, 23 cases had taken 8 to 14 days, 1 patient had taken 15 to 21 days and 1 cases had taken more than

28 days to return to their routine work. With a mean of 10.33±2.66.

Again, this difference was significant (P <0.05).

**Table 13: Routine work return time.**

Routine work return time	Open appendectomy	%	Laparoscopic appendectomy	%	Combined	%
≤ 7 days	0	0.00	6	20.00	6	10.00
8-14 days	17	56.67	23	76.67	40	66.67
15-21 days	12	40.00	1	3.33	13	21.67
22-28 days	0	0.00	0	0.00	0	0.00
> 28 days	1	3.33	0	0.00	1	1.67
Total	30	100	30	100	60	100

**DISCUSSION**

Laparoscopic surgery is a major surgical advancement that has enabled the general surgeon to stretch his hands in super specialty era. The controversy that currently exists over the potential benefits of laparoscopic appendectomy motivated us to analyse our experience with this procedure. The relative advantages of laparoscopic and open appendectomy are measured primarily in terms of post-operative pain score and duration of analgesics used in days. Post-operative complications like vomiting ileus, intraabdominal abscess, wound infection, post-operative recovery in the form of post-operative duration of stay, and return to normal work were assessed.

In the study comparison with respect to duration of surgery, laparoscopic appendectomy has taken a mean of 85.62±27.66 minutes and open appendectomy has taken a mean of 55±23.96 minutes (p<0.00001). Similar observations have also been reported by other studies. In almost all the literature the operating time of laparoscopic appendectomy was found to be more than that of open appendectomy. In considering operating time, the exact identification of the timing of the start of the procedure and its conclusion vary. In general, the time should be calculated from the insertion of first trocar to the end of skin suturing.

A prospective randomized trial comparing laparoscopic appendectomy with open appendectomy was conducted in 158 patients by Hansen et al.<sup>1</sup> They reported that despite of longer operating time, (63 versus 40 minutes) the advantages of laparoscopy (such as fewer wound infection and earlier return to normal activity) make it a worthwhile alternative for patients with a clinical diagnosis of acute appendicitis. In present study pain score was 2.00±0.95 for open group as compared to 2.67±0.96 in laparoscopic group (P<0.05) because of longer incision stretch of muscles and wound infection. Similar observations have also been reported by other authors. Thus, the post-operative analgesic required was more in open group as compared to laparoscopic group.

Similar results have also been found in the following study.

It can be concluded that laparoscopic procedures cause less postoperative pain than their conventional counterparts. In this study, none of the literature reviewed found more pain after laparoscopic procedure. The postoperative narcotic use is less after laparoscopic appendectomy. In one study done by Ortega et al, linear analogue pain scores were recorded in 135 patients blinded to the procedure of operation by special dressing and pain score was very less in laparoscopic group compared to open.<sup>10</sup> Another interesting observation has been the patient’s perception of pain after appendectomy. Those who underwent laparoscopic appendectomy were more vocal of pain although it was of a lower intensity. However, after 48 hours they had a better sense of well-being and showed earlier post-operative food intake, ambulation and return to work and sport. This could have arisen from the expectation that laparoscopic procedures are painless or a lower level of endorphins released or the peritoneal injury from the pneumoperitoneum. Post-operative complications like vomiting was lower in laparoscopic group with 23.33% as compared with 36.67% in open group (P <0.05) which was significant. The similar studies done showed the incidence of emesis was lesser and post-operative ileus lesser in laparoscopic group. In present study, there is significant reduction in incidence of post-operative wound infection in laparoscopic group 3.33% as compared to open group 30% (P<0.05). A similar study done by others has also shown a significant reduction in wound infection rate. Moreover, the small size of trocar incisions renders wound infections easier to manage, with prompter resolution than those following conventional appendectomy.

Similar results have also been found in the following study. Marzouk M et al, in 2003 showed laparoscopic appendectomy significantly improved the postoperative wound infection rate.<sup>14</sup> There was no wound infection in the laparoscopic group, whereas in open group the infection rate was 16.67%.<sup>16</sup> Duration of post-operative hospital stay was significantly low for laparoscopic group

5.50±3.85 as compared to open group 4.27±4.56. The longer hospital stays in open group compared to laparoscopic group also has been reported by others.

In Ray-Offor E et al, study stay was shorter for laparoscopic group (P<0.04).<sup>15</sup> Similar finding with 2.5 days versus 3.4 days were found for open and laparoscopic groups. In Chin J Dig Dis study reported the median length of stay was significantly shorter after laparoscopic appendectomy (3 days versus 5 days, P <0.0001) than after open appendectomy.<sup>7,9</sup> A Yong JL et al, study reported the median hospital stay for patients in laparoscopic group and open group were 3.0 days (range, 1 to 47) and 4.0 days (range, 1 to 47), respectively which were comparable.<sup>9</sup> The return to normal activity was early for laparoscopic group 8±3.15 days as compared to open group 13.7±3.15 days. Other studies have shown that laparoscopic group patients can return to normal work earlier. It has been shown that those patients who underwent successful laparoscopic appendectomy have a better postoperative recovery. The reduced trauma to the abdominal wall is a very significant factor in postsurgical discomfort. The better mobility of the abdominal musculature and the earlier ambulation, reduce the risk of the early postoperative complications of pneumonia and embolism.

## CONCLUSION

Appendicitis is the most common intra-abdominal condition requiring emergency surgery; with a lifetime risk of 6% and appendectomy is the commonest procedure in general surgery. This study from May 2016 to April 2017 was done on 60 (30 lap and 30 open) patients with clinical diagnosis of acute appendicitis admitted in surgical wards of Heritage Institute of Medical Sciences. The patients were consecutively selected. All patients were followed every day post-operative period till they were discharged and then later followed for period of 4 weeks in out-patients' department. The following parameters were observed during follow-up in comparison between two procedures with duration of surgery, post-operative pain and duration of analgesics used, post-operative complication, post-operative recovery and recorded in uniform proforma.

After analyzing the data using chi-square test and student 't' test it was noticed that, there are significant differences between the two procedures with laparoscopic appendectomy being better in respect to post-operative pain perception (2.00±0.95), duration of analgesics used in days (2.67±0.96), post-operative complications like vomiting (23.33%), wound infection (3.33%), post-operative duration of hospital stay days (5.50±3.85), and return to normal work in days (4.27±4.56), with P <0.05. No much significant difference was noted. Only duration of surgery is more among laparoscopic surgery 85.67±27.66 compared to open appendectomy 55.00±23.96. In spite of drawback of the increase in duration of surgery, we conclude that laparoscopic

appendectomy is better than the open method for acute appendicitis, with less post-operative pain and reduced duration of analgesics used, with lesser incidences of post-operative complications, shorter duration of hospital stay, early return to normal work.

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