

**Laparoscopic Versus Open Appendectomy: A Comparative Prospective at a Tertiary Hospital of North India**Girish Pandey<sup>1</sup>, Rajeev Ranjan<sup>2</sup><sup>1</sup>Associate Professor, Department of General Surgery, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh, India<sup>2</sup>Assistant Professor, Department of Surgery, Netaji Subhas Medical College & Hospital, Bihta, Patna, Bihar, India

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Conflict of interest: Nil

**Abstract:**

**Background:** Laparoscopic appendectomy is becoming more common, especially in young, childbearing women whose right lower quadrant pain has a wide range of differential diagnoses, including gynaecologic pathology. Approaches to surgical disorders have undergone notable alterations as a result of the modern development of laparoscopic surgery. As there is paucity of the studies comparing the outcome of laparoscopic appendectomy with open appendectomy, so we conducted this study with an aim to compare the postoperative outcome of the laparoscopic appendectomy procedure with open appendectomy technique.

**Methods:** The present study was conducted in the Department of General Surgery, at a tertiary care hospital among patients admitted with clinical diagnosis of acute or recurrent during 1 year of study period. For the enrolled patients, they underwent a thorough clinical examination and history taking. In our study, made two groups laparoscopic appendectomy group and open appendectomy group and, the enrolled the patients, were randomly allocated to the both groups using random number table. A pretested proforma was used to collect the patients details. The collected data was entered in the MS excel sheet. The association between independent and dependent variables was carried out using Chi-square test and independent T- test.

**Results:** In our study, a total of 130 patients underwent appendectomy (65 patients underwent laparoscopic approach and 65 patients underwent open approach). In our study, the abdominal pain and tenderness as the presenting symptoms and signs in all patients in laparoscopic appendectomy group and open appendectomy group. In our study among patients in laparoscopic appendectomy group wound infection rate was in 7.7%, and intraabdominal abscess was seen in 4.6% patients, whereas, wound infection rate was in 10.8%, and intraabdominal abscess was seen in 12.3% patients. In our study, the return to the normal daily life activities by the patients was earlier among laparoscopic appendectomy group (5.86±1.92 days) as compared to open appendectomy group (9.62±1.73 days).

**Conclusion:** Laparoscopic appendectomy's duration of operation was also lesser. In selected patients with acute or recurrent appendicitis, laparoscopic appendectomy is generally superior to open appendectomy. For performing an appendectomy, the laparoscopic approach is safe, effective, and has advantages over the open method that are clinically advantageous.

**Keywords:** appendicitis, VAS, cosmesis, open appendectomy, laparoscopic appendectomy,

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**Introduction**

With a 6% lifetime risk, appendicitis is the most prevalent intra-abdominal disease needing emergency surgery. With about 1% of all surgical operations, appendectomy remains one of the most common procedures in general surgery. Even though modern diagnostic tools, surgical techniques, fluids, and antibiotic therapy have reduced mortality from 50% (before 1925) to less than 1 per 1 lakh population, the morbidity rate is still ranging between 5-8%, with wound infections accounting for the majority of it due to delayed diagnosis and treatment. [1,2,3]

With the least amount of morbidity, laparoscopic appendectomy combines the benefits of diagnostic and therapy in one step. In comparison to patients who underwent open appendectomy, patients are more likely to experience less postoperative pain, be discharged from the hospital sooner, and resume their normal activities of daily living. The ability to examine the entire peritoneal cavity for the identification of other disorders, improved cosmesis, and efficient peritoneal toileting without the need to expand the incision are among the additional benefits. [4,5]

Laparoscopic appendicectomy is becoming more common, especially in young, childbearing women whose right lower quadrant pain has a wide range of differential diagnoses, including gynaecologic pathology. Approaches to surgical disorders have undergone notable alterations as a result of the modern development of laparoscopic surgery. General surgeons have been prompted to consider nearly all surgeries for potential conversion to laparoscopic techniques due to the shift towards minimally invasive surgery. [6,7]

As there is paucity of the studies comparing the outcome of laparoscopic appendicectomy with open appendicectomy, so we conducted this study with an aim to compare the postoperative outcome (duration of surgery, postoperative pain, cosmesis, complications and return to the normal daily life activities) of the laparoscopic appendicectomy procedure with open appendicectomy technique.

### Materials and Methods

The present hospital based comparative prospective observational study was conducted in the Department of General Surgery, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh after obtaining the ethical approval from ethics review committee. The study was conducted among patients (>10 years of age) admitted with clinical diagnosis of acute or recurrent appendicitis after taking informed written consent during 1 year of study period (June 2021 to May 2022). The pregnant women and cases of complicated appendicitis were excluded from the study.

For the enrolled patients, they underwent a thorough clinical examination and history taking. The required laboratory investigations were done. The USG abdomen was also done for the patients. In our study, made two groups laparoscopic appendicectomy group and open appendicectomy group and, the enrolled the patients, were randomly allocated to the both groups using random number

table. So, during the study period, an equal number of patients were allocated to the both groups.

A pretested proforma was used to collect the patients details such as baseline characteristics (age, gender), clinical history, clinical signs and symptoms, laboratory parameters, Ultrasonography (USG) abdomen findings, intraoperative findings, duration of surgery, postoperative complications (wound infection, intrabdominal abscess), pain, cosmesis, and return to the normal daily life activities. Wound infection was defined as discharge of pus that required surgical drainage. Intrabdominal abscess was defined as a fluid collection diagnosed at USG/Computed Tomography (CT) which contained pus at USG guided aspiration. The postoperative pain was assessed using the Visual Analogue Scale (VAS) and the cosmesis score was assessed using the Scar Cosmesis Assessment and Rating (SCAR) scale.

The collected data was entered in the MS excel sheet. The continuous variables were presented as mean and SD, whereas discrete variables were presented as number and percentages. The analysis was carried in the MS excel and the association between independent and dependent variables was carried out using Chi-square test (for discrete variables) and independent T-test (for continuous variables). A p value <0.05 was considered as statistically significant.

### Results

In our study, a total of 130 patients underwent appendicectomy (65 patients underwent laparoscopic approach and 65 patients underwent open approach). The mean age of patients in laparoscopic appendicectomy group (42.21±11.34 years) and open appendicectomy group (41.23±12.03 years) were comparable. The males predominated as patients in both open appendicectomy group (82.5%) and laparoscopic appendicectomy group (77.5%) (Table 1).

**Table 1: Comparison of baseline characteristics of the patients**

Variables	Number (%) / Mean ± SD		P value
	Laparoscopic (n=65)	Open (n=65)	
Age (in years)	42.21±11.34	41.23±12.03	0.633
Gender			
Female	15 (22.5)	11 (17.5)	0.380
Male	50 (77.5)	54 (82.5)	

In our study, at the time of presentation to the hospital, the sign, symptoms of patients were noted and laboratory investigation including USG abdomen was done. The abdominal pain and tenderness as the presenting symptoms and signs in all patients in laparoscopic appendicectomy group and open appendicectomy group. On examination

guarding or rigidity was noticed in 90.8% of patients in laparoscopic appendicectomy group and 78.5% of open appendicectomy group. Total leukocyte count and differential count with shift to left were comparable in both laparoscopic appendicectomy group patients and open appendicectomy group patients (Table 2).

**Table 2: Comparison of preoperative findings of the patients**

Variables	Number (%) / Mean $\pm$ SD		P value
	Laparoscopic (n=65)	Open (n=65)	
Symptoms			
Abdominal pain	65 (100.0)	65 (100.0)	>0.05
Nausea/ vomiting	59 (90.8)	51 (78.5)	0.051
Fever	14 (21.5)	17 (26.2)	0.536
History of episode of pain	25 (38.5)	20 (30.8)	0.356
Signs			
Tenderness	65 (100.0)	65 (100.0)	>0.05
Guarding/Rigidity	59 (90.8)	48 (73.8)	0.011
Laboratory parameters			
TLC	10582 $\pm$ 2628	10923 $\pm$ 3487	0.530
DC with shift to left	51 (78.5)	56 (86.2)	0.250
USG abdomen			
Abnormal	48 (73.8)	59 (90.8)	0.011
Normal	17 (26.2)	6 (9.2)	

During intraoperative, the most common finding was inflamed appendix with omental adhesion both laparoscopic appendicectomy group patients (72.3%) and open appendicectomy group patients (63.1%). Only inflamed appendix was noticed in 4.6% of patients in laparoscopic appendicectomy group and 12.3% of patients in open appendicectomy group.

Although intraoperative findings were comparable in both laparoscopic appendicectomy group patients and open appendicectomy group patients, but the duration of surgery for patients was lesser for laparoscopic appendicectomy group (48.24 $\pm$ 12.44 minutes) when compared with the open appendicectomy group (68.53 $\pm$ 20.39 minutes)(Table 3).

**Table 3: Comparison of intraoperative findings of the patients**

Variables	Number (%) / Mean $\pm$ SD		P value
	Laparoscopic (n=65)	Open (n=65)	
Inflamed appendix with omental adhesion			
Yes	47 (72.3)	41 (63.1)	0.260
No	18 (27.7)	24 (36.9)	
Inflamed appendix			
Yes	3 (4.6)	8 (12.3)	0.115
No	62 (95.4)	57 (87.7)	
Enlarged appendix with dilated bowel loops			
Yes	5 (7.7)	7 (10.8)	0.544
No	60 (92.3)	58 (89.2)	
Inflamed appendix with bowel adhesion			
Yes	7 (10.8)	7 (10.8)	>0.05
No	58 (89.2)	58 (89.2)	
Inflamed appendix with periappendicular collection			
Yes	5 (7.7)	7 (10.8)	0.544
No	60 (92.3)	58 (89.2)	
Duration of surgery (in minutes)	48.24 $\pm$ 12.44	68.53 $\pm$ 20.39	< 0.0001

The rate of postoperative complications was lesser in patients in laparoscopic appendicectomy group as compared to the patients in the open appendicectomy group. The most common postoperative complication among patients in laparoscopic appendicectomy group was wound infection (7.7%), followed by intraabdominal abscess (4.6%), caecal leak (3.1%), and adhesive ileus (3.1%), whereas, the most common postoperative complication among patients in open appendicectomy group was intraabdominal abscess (12.3%), followed by wound infection (10.8%),

caecal leak (4.6%), and adhesive ileus (4.6%). The postoperative pain was assessed using Visual Analogue Scale (VAS) for patients in both groups and it was noticed that VAS was lesser among patients in laparoscopic appendicectomy group (3.21 $\pm$ 1.32) as compared to open appendicectomy group (6.49 $\pm$ 1.56). The Scar Cosmesis Assessment and Rating (SCAR) scale was assessed for patients in both groups and it was noticed that cosmesis score was more satisfactory among patients in laparoscopic appendicectomy group (1.34 $\pm$ 0.42) as compared to open appendicectomy group

(1.87±0.23). Apart from the lesser VAS and more satisfactory cosmesis in patients of laparoscopic appendicectomy group, the return to the normal daily life activities by the patients was earlier among

laparoscopic appendicectomy group (5.86±1.92 days) as compared to open appendicectomy group (9.62±1.73 days)(Table 4).

**Table 4: Comparison of postoperative findings of the patients**

Variables	Number (%) / Mean ± SD		P value
	Laparoscopic (n=65)	Open (n=65)	
Complications			
Adhesive ileus	2 (3.1)	3 (4.6)	0.648
Wound infection	5 (7.7)	7 (10.8)	0.544
Caecal leak	2 (3.1)	3 (4.6)	0.648
Intra-abdominal abscess	3 (4.6)	8 (12.3)	0.115
Pain (Visual Analogue Scale)	3.21±1.32	6.49±1.56	< 0.0001
Cosmesis	1.34±0.42	1.87±0.23	< 0.0001
Hospital stays (in days)	2.92±0.87	4.36±2.78	< 0.0001
Normal daily activities (in days)	5.86±1.92	9.62±1.73	< 0.0001

### Discussion

The current standard of care for treating appendicitis is laparoscopic appendicectomy. When a patient is admitted to the hospital with appendicitis, antibiotics must first be given, and only then can the need for an appendectomy be determined. More attention is required when diagnosing appendicitis in young women because there are many other possible causes of right lower quadrant pain, including gynecologic pathology. Despite being a safe technique, laparoscopic appendicectomy requires careful attention to the locations of the incisions and the port placement. [8,9]

In our study, the abdominal pain and tenderness as the presenting symptoms and signs in all patients in laparoscopic appendicectomy group and open appendicectomy group. Similar findings were observed in the studies by Yakan et al., and Rangarajan et al. [10,11]

In our study, although intraoperative findings were comparable in both laparoscopic appendicectomy group patients and open appendicectomy group patients, but the duration of surgery for patients was lesser for laparoscopic appendicectomy group (48.24±12.44 minutes) when compared with the open appendicectomy group (68.53±20.39 minutes).

In our study the duration of hospital stay was lesser in patients in laparoscopic appendicectomy group (2.92±0.87 days) as compared to the patients in the open appendicectomy group (4.36±2.78 days). So, the length of hospital stay is significantly reduced if a laparoscopic appendicectomy was done as compared to the open method. The studies by Biondi et al., Rbihat et al., Ray-Offor et al., Vellani et al., and Pier et al., showed that the length of hospital stay was much shorter for the patients who underwent laparoscopic appendicectomy. [12,13,14,15,16]

In our study among patients in laparoscopic appendicectomy group wound infection rate was in 7.7%, and intraabdominal abscess was seen in 4.6%

patients, whereas, wound infection rate was in 10.8%, and intraabdominal abscess was seen in 12.3% patients. Studies by Marzouk et al., and Ortega et al., showed that the postoperative wound infection rate was much less in the laparoscopic method. [17,18]

In our study, the postoperative pain was assessed using Visual Analogue Scale (VAS) for patients in both groups and it was noticed that VAS was lesser among patients in laparoscopic appendicectomy group (3.21±1.32) as compared to open appendicectomy group (6.49±1.56). Study by Ortega et al., showed that the pain level was much less in the laparoscopic method as compared to the open method. [18] Shaikh et al., Biondi et al., and Pier et al., in their study showed that laparoscopic appendicectomy was associated with a less need for analgesia. [12,16,19] Li et al. also reported similar findings in their meta-analysis. [20]

In our study, the Scar Cosmesis Assessment and Rating (SCAR) scale was assessed for patients in both groups and it was noticed that cosmesis score was more satisfactory among patients in laparoscopic appendicectomy group (1.34±0.42) as compared to open appendicectomy group (1.87±0.23). Study by Kollmar et al., has shown to improve cosmesis in cases of laparoscopic appendicectomy. [21]

In our study, the return to the normal daily life activities by the patients was earlier among laparoscopic appendicectomy group (5.86±1.92 days) as compared to open appendicectomy group (9.62±1.73 days). Studies by Biondi et al., and Pier et al., showed that laparoscopic appendicectomy was associated with a faster return to daily activities. [12,16]

### Conclusion

In terms of pain score, analgesic use, and post-operative complications, the laparoscopic appendicectomy performed was better to the open

appendicectomy. The post-operative recovery went well in terms of hospital stay time and getting back to normal activities. Laparoscopic appendicectomy's duration of operation was also lesser. In selected patients with acute or recurrent appendicitis, laparoscopic appendicectomy is generally superior to open appendicectomy. For performing an appendectomy, the laparoscopic approach is safe, effective, and has advantages over the open method that are clinically advantageous.

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