

## Laparoscopic Appendectomy Versus Open Appendectomy: A Prospective Assessment

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### Abstract

**Aim:** To compare laparoscopic appendectomy versus open appendectomy.

**Methods:** This study was carried out in Nalanda Medical College and Hospital, Patna, Bihar, India over a period of two years, with a sample size of 180 cases of acute appendicitis above 16 years of age without co morbidities. The purpose of the study explained to patients. Informed written consents were taken prior to actual participation of patient into the study, patient information sheet and informed consent form includes all necessary information to conduct the study.

**Results:** Mean age of study sample was 27.21 years with standard deviation of 8.17 years, with the highest 65 years and lowest 17 years. 36% samples were from 31-40 year age group followed by 49% subjects in years 21-30 age group. Abdominal pain was the most common complaint and was present in all 100 (100%) subjects followed by fever in 79 (43.8%) subjects, nausea and/or vomiting in 58 (32.2%) subjects. Other complaints like weight loss, constipation, abdominal distension, sleep disturbance, etc., were also noted among study samples.

**Conclusions:** Laparoscopic appendectomy had advantages like better cosmesis, shorter duration of procedure and hospital stay, fewer post-operative complications and early return to work with disadvantage of steep learning curve, while open appendectomy, does not require special instruments, and is performed under direct three-dimensional vision.

**Keywords:** Acute appendicitis, Open appendectomy, Laparoscopic appendectomy

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### Introduction

This underdeveloped residuum of the caecum has no known function and is commonly termed as a 'vestigial' organ, yet diseases of the appendix loom large in surgical practice; and appendicitis continues to be the most common acute

abdominal condition that requires immediate surgical treatment. [1]

Appendicitis is one of the best known medical entities and yet may be one of the most difficult diagnostic problems; to confront in an emergency, often requiring

removal of the inflamed appendix.[2,3] Appendectomy has been one of the commonest emergency procedures in surgery. Appendectomy may be performed as a laparoscopic or as an open operation. Open appendectomy (OA) through laparotomy has been the gold standard for more than a century as far as surgical removal of appendix is concerned.[4]

For more than a century, open appendectomy remained the gold standard for the treatment of acute appendicitis. Laparoscopic appendectomy was first performed by Semm in 1983 in Germany and continued to evolve at such a rapid pace that it is now time to recommend this minimal access technique in the treatment of acute appendicitis, especially in the obese and when the diagnosis is uncertain.[5] Laparoscopic appendectomy gives a better evaluation of the peritoneal cavity than that obtained by open approach and also facilitates other differential diagnosis. Advantages of laparoscopic approach include less operative time, less postoperative pain, reduced analgesia, and less surgery associated complications, shorter hospital stay, faster recovery, reduced wound infection and minimal scarring. Disadvantages of the laparoscopic operation are a steep learning curve, difficult hand eye coordination, 2-dimensional vision, limited freedom of movements and higher cost.[6]

Computed tomography scan is more sensitive (94%) and specific (95%) than ultrasonography (86%, 81% respectively) for its diagnosis.[7] The Alvarado score is useful but not accurate.[8] Appendicitis mostly occurs between 5-40 years of age with a median of 28 years.[9] Males, higher socioeconomic status and rural population have been found to have a greater incidence of appendicitis.[10]

Thus, we aim to compare laparoscopic appendectomy versus open appendectomy.

### **Materials and Methods:**

A prospective cohort study was carried out in Nalanda Medica College and Hospital, Patna, Bihar, India over a period of two years, with a sample size of 180 cases of acute appendicitis above 16 years of age without co morbidities. The purpose of the study explained to patients. Informed written consents were taken prior to actual participation of patient into the study, patient information sheet and informed consent form includes all necessary information to conduct the study.

Thorough history was taken, all patients were clinically examined and findings recorded. Patient were equally random allocated in the two groups, one of laparoscopy (Group A) and the other of open (Group B). Institute Ethical committee approval was taken prior to the study and consent of patients was taken only after giving full information about study.

All patients were kept nil by mouth overnight, prior to surgery and were given antibiotic prophylactically. All patients were asked to empty urinary bladder prior to surgery and nasogastric tube (Ryle's tube) was inserted if necessary. All laparoscopic surgeries were performed under general anesthesia and open appendectomies under spinal anesthesia, by the same surgical team, intra operative findings and post-operative data were all recorded. Patients asked to follow up in outpatient department. 1 week, 2 weeks and 12 weeks after surgery, or in between if needed. Patients were allowed to leave the study anytime during the course of study if he/she wished to do so.

### **Results:**

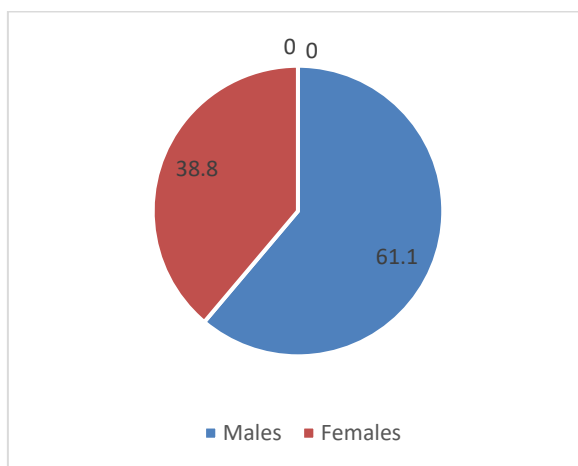
**Table 1: Age wise distribution of study sample**

Age groups	Gender			
	Males N=110	%	Females N=70	%
11-20	10	9.1	22	31.43
21-30	40	36	37	52.86
31-40	54	49	11	15.71
41-50	2	1.8	0	0
51-60	0	0	0	0
61-70	5	4.5	0	0

Mean age of study sample was 27.21 years with standard deviation of 8.17 years, with the highest 65 years and lowest 17 years.

36% samples were from 31-40 years age group followed by 49% subjects in years 21-30 age group.

**Figure 1: Gender wise distribution of study sample.**



There were 110 (61.1%) males and 70 (38.8%) females in the study.

**Figure 2: Severity of appendicitis and total leukocyte count.**

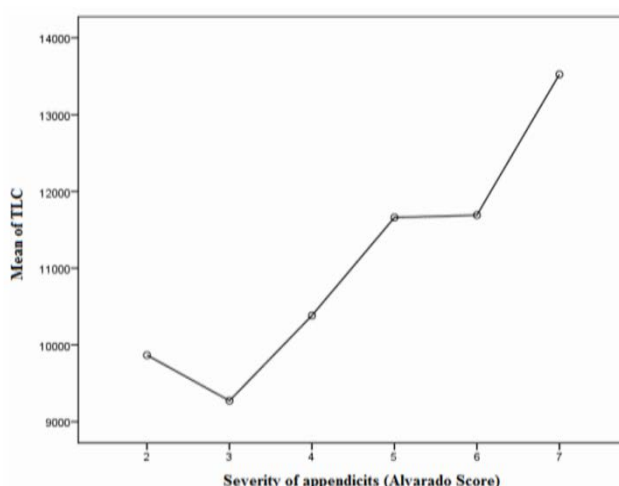
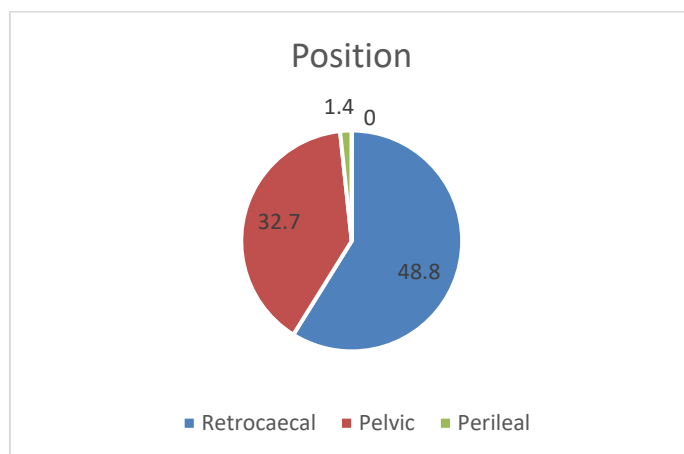


Figure 2 shows that as severity of appendicitis (Alvarado score) increases total leucocytes count increases among

study subjects. (Spearman’s rho=0.702; p=0.00).

**Figure 3: Position of appendix.**



Retrocaecal (48.8%) was the most common position of appendix found during surgery, followed by preileal (32.7%) and pelvic (1.4%).

**Table 2: Complaints among study sample**

Complaints	Number of Patients	%
Reduced appetite	32	17.7
Disturbed sleep	28	15.5
Constipation	10	5.5
Abd. Distension	0	0
Weight loss	19	10.5
Nausea	58	32.2
Abd. Pain	180	100
Fever	79	43.8

Abdominal pain was the most common complaint and was present in all 180 (100%) subjects followed by fever in 79 (43.8%) subjects, nausea and/or vomiting

in 58 (32.2%) subjects. Other complaints like weight loss, constipation, abdominal distension, sleep disturbance, etc., were also noted among study samples.

**Table 3: Complications, conversion and mortality**

Complications	Laparoscopic surgery	Open surgery
Fever	6	11
Seroma	0	8
Wound Gape	0	5
Nil	84	66
Total	90	90

Higher post-operative complications were recorded among subjects that underwent open appendectomy like fever, seroma and wound gape than the laparoscopic appendectomy group. Intra operative complications like bleeding, adhesions, etc., were observed in both groups. No

subject operated via laparoscopic method needed conversion to open appendectomy. No mortality was reported.

Post-operative complications like prolonged ileus, fever, intraabdominal abscess, intra-abdominal adhesions,

seroma, wound infection/gape and incisional hernia were significantly less in laproscopic appendectomy group as compared to open appendectomy group (Table 3). Wound infection was recognized by erythema, fluctuation and purulent drainage from port sites and managed conservatively. None of the

patients had leakage from the appendiceal stump. There was no case of postoperative adhesion in laproscopic appendectomy, though 8 cases developed intra-abdominal adhesions postoperatively in Open appendectomy and were managed conservatively.

**Table 4: Duration of hospital stay**

Duration	Laparoscopic appendectomy(Group A)	Open appendectomy (Group B)	P value
	Mean±SD	Mean±SD	
< 24 hours	1.52±0.79	3.19±1.75	0.05
>24 hours	2.4±0.44	3.2±1.38	0.672

The mean duration of hospital stay in Laparoscopic appendectomy group was 1.52±0.79 days and in open appendectomy group was 3.19±1.75 days and difference was statistically significant ( $p < 0.05$ ). Most of our patients in Laparoscopic appendectomy group were discharged after 24 hours.

#### Discussion:

Laparoscopic appendectomy is evolving as an operation of choice for acute appendicitis. Laparoscopy has enabled surgeons to decrease the rate of infection and complications that are often associated with the open procedure. This has been demonstrated in a number of studies [11-14]. The mean age of patients in the two groups follows similar pattern as reported by Chaudhari et al. [15].

Conversion to open surgery may be required in any laparoscopic procedure. In this study, only four patients (2%) were converted to open appendectomy, although some studies reported a rate of conversion from 10% to 39.7%. Conversion rate was 6% in a study by Utpal De [16]. There was no significant difference in the intra-operative complications between the two groups. Most of the studies also report that intra-operative complications are more related to severity of underlying pathology

than the type of procedure. Katkhouda, Mason et al. [17]

Retrocaecal (58%) was the commonest position of appendix found during surgery, while it was 46% in R Mishra, Goel et al.

Higher post-operative complications were recorded among open appendectomy than laparoscopic appendectomy group in this study, similarly Utpal found less overall complication rate following laparoscopic appendectomy. Statistically non-significant higher intra-abdominal abscess formation after laparoscopic surgery found in Aziz, Athanasiou et al. [45]. Katkhouda, Mason et al found similar complication rates, irrespective of the technique ( $p = 0.181$ ).

Many studies have shown that laparoscopic appendectomy costs higher than open appendectomy. The increase in cost of laparoscopic appendectomy is attributed to the higher cost of specialized instrumentation such as disposable trocars, laparoscopic endostaplers, metallic clips and tissue-sealing devices such as Ligasure and Harmonic scalpel and by the use of commercially available pre-tied endoloop ligature for securing the appendiceal stump [18, 19].

Laparoscopic appendectomy leads to fewer intra-abdominal adhesions, whereas in open surgery, the tissue trauma of the

incision increases the total inflammatory response, thereby inhibiting fibrinolysis and promoting fibroblast migration and collagen formation resulting into more adhesion formation. Garrard et al. [18] has also reported reduced adhesion formation after laparoscopic surgery like in our study. [20]

There was significant difference in the degree of pain between laparoscopic and open procedure in this study which was in consistence with the results of some other studies. Jaschinski, Mosch, Eikermann et al. and Rashid, Nazir et al. also found pain score following laparoscopic appendectomy to be lower as compared to open appendectomy [21-23]

Minne et al. reported a median hospital stay of 1.1 vs. 1.2 days in laparoscopic appendectomy vs. open appendectomy compared with means of 5.3 vs. 7.6 days for Hebebrand et al. [25] in Germany and 4.9 vs. 5.3 for Mutter et al. in France [24-28].

### Conclusion:

Most cases of acute appendicitis can be treated laparoscopically. Laparoscopic appendectomy is equally safe as open appendectomy and can provide less postoperative morbidity in experienced hands. Laparoscopic appendectomy is a useful method for reducing hospital stay, complications and early return to normal activity.

Both these techniques have brought about early return to preoperative status, because of the insignificant post-operative morbidity and discomfort. Laparoscopic technique, in addition to the above mentioned advantages has picked up dominance in view of the cosmetic desirability of the small scar.

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