

Comparative Evaluation of Laparoscopic with Open Appendectomy among Patients of Appendectomy - A Prospective Study

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DOI: <http://dx.doi.org/10.21276/ijcmsr.2019.4.3.4>

How to cite this article: Burra Viswa Chaitanya, Rama Chandra Mohan Mallapragada. Comparative evaluation of laparoscopic with open appendectomy among patients of appendectomy - a prospective study. International Journal of Contemporary Medicine Surgery and Radiology. 2019;4(3):C18-C22.

A B S T R A C T

Introduction: Appendectomy is the treatment of choice for acute appendicitis and is by far the most commonly performed emergency abdominal operation. It has been found that open appendectomy is also a safe and effective operation for acute appendicitis with low morbidity, but found to be associated with potential disadvantages like post-operative pain, wound sepsis and complications like intestinal obstruction which may delay recovery. With the emergence of laparoscopic technique, it has become a good option for both diagnosis and treatment of acute appendicitis. Therefore, the aim of the current study was to compare the laparoscopic with open appendectomy among patients of appendicitis.

Material and Methods: The present study was a prospective study with total 140 patients admitted with clinical diagnosis of acute or recurrent appendicitis. The patients with severe medical disease (, chronic medical, hemodynamic instability or psychiatric illness, cirrhosis, coagulation disorders) requiring intensive care and pregnant women were excluded from the study. They were divided into two groups: open appendectomy (OA) group with 70 patients in each) and laparoscopic appendectomy (LA) group (70 patients in each). OA was performed through standard Mc Burney incision. A standard 3-port technique was used in this study for the laparoscopic procedure.

Results: It is found that laparoscopic appendectomy is as safe and effective as the open procedure. The pain score was reduced in laparoscopic which is 3.4 ± 1.8 and in open 4.2 ± 1.4 . This difference was found to be statistically significant at p value of 0.05. The duration of analgesics was also reduced in laparoscopic with mean value of 4.81 ± 3.6 and 10.32 ± 4.2 and this difference was found to be statistically significant at p value of 0.05.

Conclusion: The laparoscopic procedure is a safe and efficient in appendectomy with clinically beneficial advantages over open method.s

Keywords: Laparoscopic appendectomy, open appendectomy, appendicitis, prospective

INTRODUCTION

In the sixteenth century, appendicitis was considered as a disease entity and was known as perityphlitis. In 1889, these clinical findings were noted first by McBurney. Useful surgical technique which has been proved is minimal access surgery. For various indications new standards have been made. In 21st century, the greater consideration is given to patient's comfort. This choice is because of the acquisition of recent technology and skills for the better mode of surgery.¹ The most common cause of surgical abdomen is appendicitis affecting all the age groups. The maximum incidence is documented to be about 7-10 % of the general population in the second and third decades of life. Appendectomy is the operation which is most commonly performed by the general surgeons. The diagnosis of acute appendicitis is often difficult, and challenging. An accepted negative appendectomy rate for presumed appendicitis ranges from 15% to 20%, even

higher in women of childbearing age ranging from 20% to 30%.^{2,3}

The Laparoscopic appendectomy was first performed by Semm K, German Gynaecologist. It has gained acceptance with the technological advances of the past two to three decades as a diagnostic and treatment method for acute appendicitis. From that time, this procedure has been used widely. In spite of its wide acceptance, there remains a continuing debate in the literature related to the most appropriate way of removing the inflamed appendix.⁴

This method is regarded as safe and effective for suspected appendicitis. In recent years, it has gained attention is regarded as most widely used procedures throughout the world. However, it was still not considered as gold standard for acute appendicitis as laparoscopic cholecystectomy has become for acute cholecystitis. It was due to the emergency nature of disease often operated by junior staff in odd hours

when laparoscopic equipment, trained staff and supervision may not be available in all hospitals.^{5,6}

It has been found from the literature that open appendectomy is regarded as the gold standard for treating patients with acute appendicitis. It has been noted that this is due to the minimal surgical trauma through laparoscopic approach which resulted in significant shorter hospital stay, less postoperative pain and faster return to daily activities in several settings related with gastrointestinal surgery.

However, several retrospective studies, randomized trials and meta-analysis have compared laparoscopic with open appendectomy and showed conflicting results. Various studies have showed better outcomes clinically with the help of laparoscopic approach.^{7,8} Some authors consider emergency laparoscopy as a promising tool for the treatment of abdominal emergencies which is able to decrease the cost and invasiveness by increasing the patient's comfort and outcomes. Many studies have shown promising results with fewer wound complications in laparoscopic appendectomy and results in a faster return to daily activities.

Various authors have challenged these clinical findings by various authors who supported no significant difference in the outcome between the two procedures, and moreover noted higher costs with laparoscopic appendectomy. This modern time of laparoscopic surgery has revealed remarkable changes in surgical diseases. General surgeons have changed the trend towards minimally invasive surgery to analyse every operations possible to convert into laparoscopic techniques.^{9,10} Hence, the aim of the present study was to compare the laparoscopic with open appendectomy among patients of appendicitis.

MATERIAL AND METHODS

The present study was a prospective study with patients admitted to a surgical ward from a period between September 2018 and September 2019. The protocol of the study was approved by the Institutional Review Board and the Ethical Committee of the college. Written informed consent from patient and their relatives was obtained prior to the beginning of the study.

Those with clinical diagnosis of acute or recurrent appendicitis were included in the study. Those with severe medical diseases (hemodynamic instability, chronic medical or psychiatric illness, cirrhosis, coagulation disorders) with intensive care were excluded from this study. According to the preference and experience of the surgical team on duty, the decision about the type of the operation was made. Clinically, the diagnosis was made with history (right iliac fossa or periumbilical pain, nausea/vomiting), physical examination (tenderness or guarding in right iliac fossa).

Total 140 patients that met the inclusion criteria and their clinical data and hospital costs were included in the study. The patients were divided into two groups: open appendectomy group (70 patients each) and laparoscopic appendectomy group (70 patients each). The data was collected related to demographic details, co-morbidities, initial laboratory findings, operation time, intraoperative findings (acute, gangrenous or perforated appendix), time to soft diet, postoperative hospital stay, amount of analgesics

and postoperative complications.

Imaging studies such as abdominal ultrasound or CT were performed in patients where a clinical diagnosis is not possible. As part of the protocol, both the groups of patients were given a prophylactic dose of third-generation cephalosporin and metronidazole at induction of the general anaesthesia. Open Appendectomy was done with the help of standard Mc Burney incision. After the incision, peritoneum was accessed and opened to deliver the appendix, which was removed in the usual manner.

A standard 3-port technique was used for laparoscopic group. Pneumoperitoneum was generated by a continuous pressure of 12–14 mmHg of carbon dioxide *via* a verres canula, positioned in infraumbilical site. The patient was placed in a trendelenburg position, with a slight rotation to the left. The abdominal cavity was inspected in order to exclude other intrabdominal or pelvic pathology.

Until they were recovered fully from anaesthesia, the patients were not provided with oral feed and had their bowel sounds returned when clear fluids were started. When the patients tolerated the liquid diet and had passed flatus soft diet was introduced. Patients were discharged once they were able to take regular diet and had good control of pain.

Wound infection is defined as pus discharge which requires surgical drainage. Intra-abdominal abscess is defined as a fluid collection diagnosed at Ultrasonography or computed tomography which contained pus at ultrasonographically guided aspiration. Various parameters were recorded during follow up in comparison between two procedures, using a visual analogue pain scale, post-operative pain was measured and duration of analgesic was recorded in number of days. Various post-operative complications like vomiting, ileus, abdominal abscess and wound infection were also recorded. Patients in both study groups were discharged as soon as possible and duration of stay after surgery and duration of analgesics used after surgery in number of days was also noted.

STATISTICAL ANALYSIS

The data collected was recorded in Microsoft excel sheet which was analyzed with the help of SPSS software version 21. The inferential statistics was used to categorize data with the help of chi-square test. The parametric and non-parametric data was analyzed with the help of t-test and Mann-whitney 'U' test and data was presented as mean and standard deviation. A p- value of 0.05 was considered to be statistically significant.

RESULTS

In the present study, Table no. 1 and 2 shows that out of 140 patients, 54.2% were males and 45.7% were females in open appendectomy and about 42.8% males and 57.1% were

Treatment Procedure	Open		Laparoscopic	
	No.	%	No.	%
Gender				
Male	38	54.2	30	42.8
Female	32	45.7	40	57.1

Table-1: Shows the distribution of data based on gender among the two groups

females. About 48.5% were from the age group 10-20 years and 40% from the age group 21-30 years with 5.7% from the age group 31-40 years and 41-50 years in the treatment procedure of open appendectomy whereas in laparoscopic 45.7% were from the age group 10-20 years followed by

42.8% from 21-30 years with 8.5% from the age groups 31-40 years and 2.8% from the age group 41-50 years.

It is found from the Table no. 3 and 4 that the most common presenting symptoms were abdominal pain in open and laparoscopic type of procedure (100%) followed by nausea, vomiting (80%) in open and 91.4% in laparoscopic

Treatment Procedure	Open		Laparoscopic	
	No.	%	No.	%
Age				
10-20 years	34	48.5	32	45.7
21-30 years	28	40	30	42.8
31-40 years	4	5.7	2	2.8
41-50 years	4	5.7	6	8.5

Table-2: Shows the distribution of data based on age among the two groups

Treatment Procedure	Open		Laparoscopic	
	No.	%	No.	%
Presenting Symptoms				
Abdominal Pain	70	100	70	100
Nausea/Vomiting	56	80	64	91.4
Fever	30	42.8	22	31.4

Table-3: Shows the distribution of data based on presenting symptoms pre-operatively among the two groups

Treatment Procedure	Open		Laparoscopic	
	No.	%	No.	%
Past History				
Episode of Pain	20	28.5%	24	34.2%

Table-4: Shows the distribution of data based on past history among the two groups

Treatment Procedure	Open		Laparoscopic	
	No.	%	No.	%
Findings				
Tenderness				
Present	70	100	70	100
Absent	0	0	0	0
Guarding/ Rigidity				
Present	58	82.8	62	88.5
Absent	12	17.14	8	11.4
Report				
Normal	8	11.4	18	25.7
Abnormal Pathology Needed	62	88.57	52	74.2

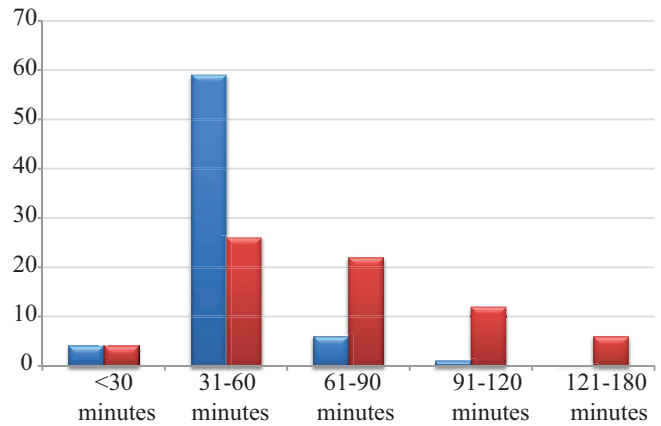
Table-5: Shows the distribution of data based on tenderness, rigidity and pathology report among the two groups

Treatment Procedure	Open		Laparoscopic	
	No.	%	No.	%
Mean	14220		13940	
SD	±4562		±4876	
Differential count with shift to left				
Present	64	91.4	58	82.8
Absent	6	8.5	12	17.14

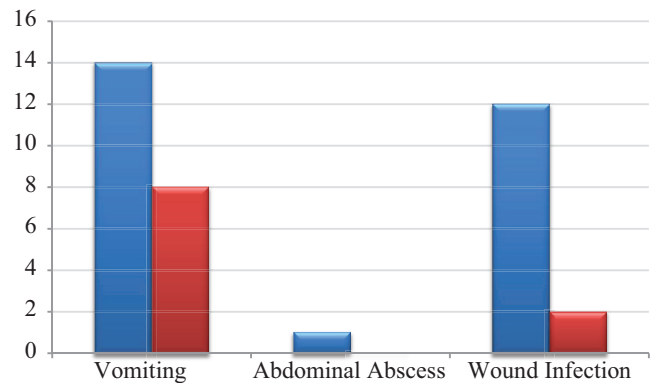
Table-6: Shows the distribution of data based on differential count among the two groups

Treatment Procedure	Open	Laparoscopic	t-value	p-value
Pain score(0-4)	4.2±1.4	3.4±1.8	7.26	<0.05
Duration of Analgesics used	10.32±4.2	4.81±3.6	9.42	<0.05

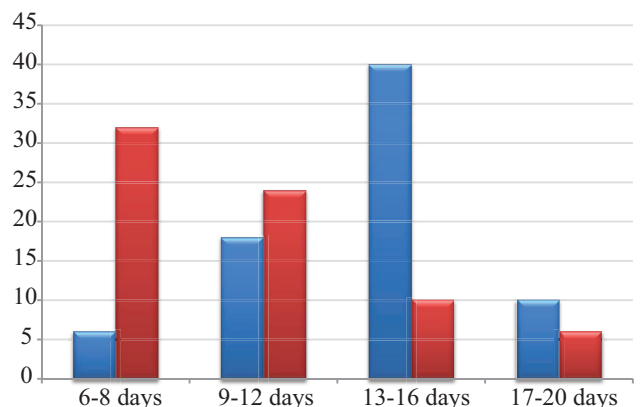
Table-7: Shows the distribution of data based on pain score and duration of analgesics among the two groups



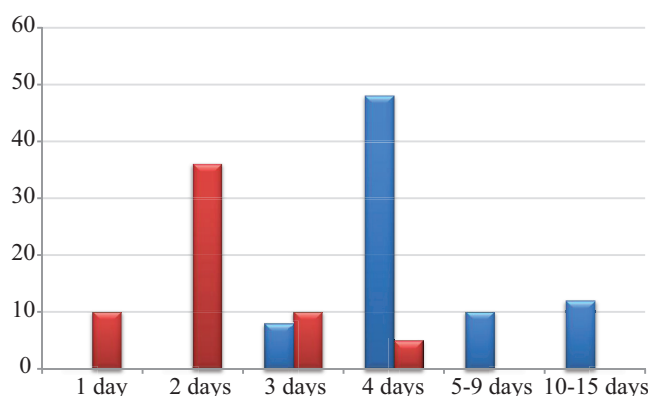
Graph-1: shows the distribution of data based on duration of surgery among the two groups



Graph-2: shows the distribution of data based on post-operative complications among the two groups



Graph-3: shows the distribution of data based on days of recovery after surgery among the two groups



Graph-4: shows the distribution of data based on duration of hospital stay after surgery among the two groups

appendectomy with fever in 42.8% of patients in open and 31.4% in laparoscopic procedures. Patients with past history with episodes of pain is more (34.2%) seen in laparoscopic than open (28.5%).

It is seen that tenderness was maximum present in both open and laparoscopic procedures. Rigidity was present in 82.8% patients in open procedure and 88.5% in laparoscopic procedure whereas absent in 17.14% in open and 11.4% in laparoscopic. The normal findings of the pathology report were seen in 25.7% in laparoscopic and 11.4% in open procedures. The abnormal report of the pathology was more seen in open i.e. in 88.57% than 74.2% in laparoscopic procedure. (Table no. 5).

In Table no. 6 and 7, it is found that the differential count with shift to left was most commonly present in 91.4% of the patients in open appendectomy than laparoscopic in 82.8% of the patients. The pain score was reduced in laparoscopic which is 3.4 ± 1.8 and in open 4.2 ± 1.4 . This difference is found to be statistically significant at p value of 0.05. The duration of analgesics was also reduced in laparoscopic with mean value of 4.81 ± 3.6 and 10.32 ± 4.2 and this difference is found to be statistically significant at p value of 0.05.

Graph no. 1 shows that the duration of surgery (about 31-60 minutes) was seen in maximum number of patients in open appendectomy shown with the help of blue bars than laparoscopic appendectomy with the help of red bars. Graph no. 2 shows the most common post-operative complications was vomiting followed by wound infection which was more seen in open than laparoscopic procedure. Graph no. 3 shows that the maximum number of patients were recovered in 13-16 days with the help of open appendectomy whereas in laparoscopic about 6-8 days were taken by maximum number of patients. Graph no. 4 shows the duration of hospital stay of about 4 days after surgery was seen in maximum number of patients with open appendectomy and only 2 days with laparoscopic procedure.

DISCUSSION

Several studies have shown that laparoscopic appendectomy is safe and results in a faster return to normal activities with fewer wound complications and these findings are in consistent with the present findings. Length of hospital stay is an important factor that directly influences the economy and the well-being of the patient. It was found in the present

study that hospital stay was reduced in with the procedure of laparoscopic than open, leading to earlier feeding and discharge from hospital. This finding is in agreement with the various studies which revealed significantly decreased stay in the hospital for the laparoscopic approach.^{11,12,13}

Pain was assessed post-operatively subjectively with the help of visual analogue scale and objectively through the tabulation of use of the analgesics. In this present study, parenteral and oral analgesic requirements were less in the laparoscopic group i.e. 4.81 ± 3.6 and 10.32 ± 4.2 in open group and this difference was found to be statistically significant difference at $p < 0.05$ in agreement with many other studies that reported less pain in the laparoscopic group.

In this study, the days for recovery after surgery were found to be more in open group i.e. within 13-16 days and 6-8 days in laparoscopic group. The findings of this study results are in agreement with the study by Hellberg et al and also other randomized clinical trials and meta-analysis. The low mortality rates reported in previous research (0.05% and 0.3% rate in laparoscopic and open groups indicated that appendectomy, especially in absence of complicated disease, is a safe procedure regardless of the technique used.^{14,15,16}

Wound infection is usually seen among complicated appendicitis but necessarily does not represent a serious complication but has a strong impact on the patient's time and quality of life. It was more in open group than laparoscopic group. The presence of vomiting, fever and abdominal abscess was seen in open group post-operatively. The similar studies done showed the incidence of emesis lesser in laparoscopic group.¹⁷

In the current study, pain score was 10.32 ± 4.2 in open and 4.81 ± 3.6 in laparoscopic which was due to longer incision stretch of muscles and wound infection and this was found to be statistically significant at p value 0.05. These findings are in concordance with the studies done by many authors. Although classic open appendectomy is simple and effective, it has some drawbacks including wound sepsis, delayed recovery, and the possibility of unnecessary appendectomies.¹⁸ In this study, laparoscopic appendectomy significantly improved the postoperative wound infection rate which is in concordance with the study done by M. Marzouk et al where there was no wound infection in the laparoscopic group, whereas in open group the infection rate was 7.6%. This is because with laparoscopic approach, the inflamed appendix was dissected without direct contact with the trocar wounds.¹⁹

The complete removal of the appendix was done within the trocar sheath, and there was no direct contact with the port opening. When the appendix was too big to pass through the trocar sheath, it was removed in a plastic bag. In the case of a perforated appendix, the infected fluid was aspirated completely in the laparoscopic approach and did not soil the port sites. Also, in laparoscopic operations, we do not close the abdominal sheath in trocars up to 10 mm in size. This is in contrast to open surgery, in which sutures of the wound and collection of haematoma might be a media for infection.²⁰

CONCLUSION

Laparoscopic appendectomy is safe and effective procedure

than the open procedure. It significantly reduces the rate of postoperative wound infection, as compared with open surgery.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 16-05-2019; **Accepted:** 15-06-2019; **Published online:** 15-07-2019