



COMPARATIVE STUDY OF LAPAROSCOPIC APPENDICECTOMY VERSUS OPEN APPENDICECTOMY

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ABSTRACT

Background: Appendicectomy for appendicitis is one of the most frequently performed procedure by the general surgeon among both sexes. Advantage of Laparoscopic Appendicectomy over open appendicectomy is of having less postoperative pain, less requirement of analgesics, less hospital stay, better cosmetics and also good **Method:** This is a comparative study of 50 cases of appendicitis divided equally into two groups 25 in open and 25 in the laparoscopic, which were randomly selected and operated in the department of general surgery, Madhav Surgical Hospital, Rajkot. **Results:** In present study pain score was 2.90 ± 0.8 for open group as compared to 1.50 ± 0.6 in lap group ($p < 0.03$) because of longer incision stretch of muscles and wound infection. Post operative complications like vomiting was lower in laparoscopic group with 16% as compared with 48% in open group ($p < 0.05$) and ileus was lower in lap group with 26 ± 4.2 and for open group 30 ± 5.2 with $p < 0.05$ which were significant. There is significant reduction in incidence of post operative wound infection in lap group 0% as compared to open group 28% ($p < 0.05$). Duration of postoperative hospital stay was significantly low for lap group 2 ± 0.70 as compared to open group 7 ± 0.80 . The return to normal activity was low for lap group 12 ± 2.08 days as compared to open group 18.00 ± 3.2 days. Duration of surgery for open appendicectomy was 50 ± 17 mins and for lap appendicectomy was 55 ± 10 mins. **Conclusions:** Laparoscopic appendicectomy is better & much beneficial & convenient as well diagnostic than open appendectomy in selected patients with acute or recurrent appendicitis. It has its own value as diagnostic tool & needs lesser postoperative rest and early resume to routine work among patients.

KEYWORDS : Appendicectomy, Laparoscopic appendicectomy, Open appendicectomy

INTRODUCTION

Appendicitis for acute or recurrent appendicitis is one of the most common diseases treated by the surgeon among both sexes. It is the most common urgent or emergency general surgical operation performed worldwide. Its early diagnosis and prompt timely treatment is as very important for better outcome & to prevent major complications. About 6 to 7% of the general population will develop appendicitis during their lifetime, with the higher incidence of acute appendicitis is found in the second decade of life.²

Despite its high prevalence, the diagnosis of acute appendicitis can be challenging in few cases and requires a high index of suspicion on the part of the examining surgeon to facilitate prompt treatment of this condition, thereby avoiding the substantial morbidity (and even mortality) associated with delayed diagnosis and subsequent perforation.³

Appendicitis is very rare in infants and becomes so inversely common in childhood and early adult life reaching peak incidence in teens and early twenties. After middle age incidence of developing appendicitis becomes quite less. Incidence of appendicitis is equal among male and females before puberty. In teenagers and young adults, male to female ratio is 3:2 at age 25. Thereafter the greater incidence in male declines.⁴ In the past 30 years, the incidence has fallen dramatically such that lifetime risk of appendicectomy is 8.6% and 6.7% among males and females respectively.⁴

Despite availability of modern diagnostic facilities, surgery skills & medical therapy have brought down the mortality from 50% to less than 1/100000 still morbidity is more than 5-8% mainly due to delayed diagnosis and treatment.⁵

Initial acceptance of Laparoscopic appendicectomy was limited due to a low prevalence of surgical skills, but when increasing experience for this procedure, it has given so many benefits for the patient. Laparoscopic appendicectomy has opened door to surgeon to the diagnosis & treatment of appendicitis. Laparoscopic appendicectomy combines the advantages of diagnosis & treatment as well in one procedure with least morbidity.⁵ In the field of laparoscopy, As use of Laparoscopic cholecystectomy became more common simplified its expansion & use in other other procedures like

appendicectomy has also increased. Laparoscopic appendicectomy is associated with less post operative pain & so reduced requirement of analgesics, lesser postoperative hospital stay and early return to normal activity than those who have gone for open appendicectomy. It has also improved diagnostic accuracy of appendicitis, The modern era of laparoscopic surgery has opened many approaches for diagnosis as well therapeutic way for treating surgical abdominal diseases.

Aim and Objective

Aim and objectives were to perform a comparative study between laparoscopic appendicectomy and open appendicectomy with respect to operative duration, post operative pain and requirement of analgesics, post operative complications, duration of hospital stay, time taken to return to resume normal work.

METHOD

This study was a prospective study started after taking all necessary permissions from the institutional authority.

Study Subjects

A sample size of 50 were divided equally into two groups open (25) and laparoscopic appendicectomy (25) which were consecutively selected at Department of Surgery, Madhav Surgical Hospital.

Study Duration

The study was conducted from January 2021 to December 2022.

Inclusion Criteria

Patients with clinical diagnosis of acute, subacute & recurrent appendicitis with all necessary investigations.

Exclusion Criteria

Children below <13 years, pregnant women, clinically appendicular mass which requires interval appendicectomy later on.

Patients who presented with pain in Right iliac fossa, vomiting, fever, decreased appetite, nausea and on examination which tenderness in right iliac fossa over Macburney's point with or without guarding or rigidity, All patients were investigated

with necessary Blood Investigation , Ultrasonography & CT scan as per need . Patient was diagnosed acute or recurrent appendicitis.

Open appendicectomy was performed through a Gridiron incision in the right iliac fossa. The base of appendix was crushed & ligated with absorbable suture and the stump of appendix was not invaginated. Laparoscopic appendicectomy was done using a standardized approach involving trocar insertion and three ports technique. Appendix was ligated with absorbable suture with knot pusher & divided & removed.

Statistical Analysis
Descriptive Analysis

Data was made using mean ± standard deviation for continuous data and frequency as number as well as percentage.

Analytical Analysis

The basic parameters of the two categories were compared. Chi-square test was used for categorical variables. P=0.05 or less was considered for statistical significance.

In follow up , we studied the follow up , result & outcome in both the study groups. The collected data was compared between the two groups and displayed in tabular form after proper analysis. All the datas were compared with those of previous authentic study to come to a conclusion.

RESULTS

This study consists of a total of 50 patients of laparoscopic and open appendicectomy. It is a comparative study of two years of open versus laparoscopic appendicectomy from January 2021 to December 2022. The data is collected from the patients admitted in surgical wards. They were divided into two groups of 25 each of open and laparoscopic appendicectomy (Table 1).

In our study the mean duration of surgery in the open group was found to be 50.25 minutes and that in the laparoscopic group was found to be 55.30 minutes. P=0.740. This was not significant (Table 2).

In present study pain score 2.90±0.8 and 1.50±0.6 in open and laparoscopic group respectively. P=0.03 which was significant. Duration of analgesics 7.32±1.1 and 2.25±0.7 in open and laparoscopic group respectively. P=0.03 which was significant. Above study showed both pain score and duration of analgesics were significantly reduced in laparoscopic as compared to open appendicectomy (Table 3).

In present study post operative complications were analysed in terms of vomiting, abdominal abscess, wound infections, ileus. The incidence of vomiting was 12 (48%) and 4(16%) in the open and laparoscopic group. P=0.022 which was significant. Wound infections 7 (28%) in open and 0 (0%) in laparoscopic group. P=0.003 this difference was significant. Abdominal abscess was found to be 3 (12%) open and 0 (0%) laparoscopic group. P=0.072 which was significant. On an average postoperative ileus were 30±5.2 days and 26±4.2 days in open and laparoscopic respectively. P=0.017 was found to be significant.

Table 1: Mean Duration Of Surgery Using Independent T Test.

Groups	N	Minimum	Maximum	Mean	S. D.	Mean diff	P value
Open	25	35	95	50.25	15.390	-1.62	0.740
Laparoscopy	25	35	122	55.30	19.350		

Table 2: Comparison Of Mean Duration Of Analgesics Between The Using Independent T Test.

Groups	N	Minimum	Maximum	Mean	S. D.	P value
Open	25	1	4	2.90	0.792	0.030
Laparoscopy	25	1	3	1.50	0.710	

Table 3: Comparison Of The Mean Pain Score Between Groups Using Independent T Test.

Groups	N	Minimum	Maximum	Mean	S. D.	P value
Open	25	1	4	2.90	0.792	0.030
Laparoscopy	25	1	3	1.50	0.710	

Table 4: Distribution Of Subjects Based On Postoperative Complaints.

Variables	Groups		Total	Chi-square value	P value
	Open	Laparoscopy			
-	Count	12	4	16	
	%	48	16	32	
V				5.02	0.022*
-	Count	3	00	3	
	%	12	00	3	
Aa				3.15	0.072
-	Count	7	0	07	
	%	28	00	07	
WI				9.50	0.003*

Table 5: Mean Ileus Between Two Groups Using Independent T Test.

Groups	N	Minimum	Maximum	Mean	S. D.	P value
Open	25	22.0	38.0	30.06	5.42	0.017*
Laparoscopy	25	20.0	34.0	26.50	4.60	

Table 6: Comparison Of The Mean Duration Of Stay In Hospital And Time To Return To Normal Work.

Groups		N	Minimum	Maximum	Mean
	Open	25	5	8	7
DS	Laparoscopy	25	1	3	2
	Open	25	11	20	18
TI R	Laparoscopy	25	9	16	12

In our study the mean duration of stay in hospital for open and laparoscopic groups is 7 days and 2 days respectively. P<0.05 which was significant. Time to return to normal work was found to be 18 days in the open group and 12 days in the laparoscopic group. P<0.05 which was significant.

DISCUSSION

In this study, open and laparoscopic procedures were analyzed in terms of duration of surgery, post operative pain score duration of analgesia, postoperative complications, duration of postoperative stays in hospital, return to normal at general surgery department in Madhav Surgical Hospital. Advantages & disadvantages were analysed among both the procedures & compared with each other & also with past similar studies.

Duration of Surgery

In comparison with respect to duration of surgery, laparoscopic appendicectomy has taken a mean of 55±10 mins and open appendicectomy has taken a mean of 50±17 mins (p=0.740). Operating time was found to be shorter in open appendicectomy as compared to laparoscopic appendicectomy.

In Pradhan et al a prospective comparative study the mean operative time of surgery was found to be 37.9±9.8 in open surgery and in laparoscopy 42.8±10.8 minutes and p=0.86 which was not very significant even though laparoscopic operative is higher than open surgery.²⁰

In Wei et al a prospective randomised comparison operative time seemed to be shorter for open appendicectomy (28.7±16.3 mins) patients than for the laparoscopic patients (30±15.2 mins).¹⁸

Pain Score

In present study pain score 2.90±0.8 and 1.50±0.6 in open and laparoscopic group respectively. P=0.03

Because of long incisions on abdomen which stretches the

muscle and increases the chances of wound infections and post operative pain. In our study Wound infection & postoperative pain is much in open appendicectomy group than laparoscopic appendicectomy group.

In Ortega et al a prospective randomised comparison of laparoscopic appendicectomy with open appendicectomy postoperative pain on visual analogue revealed a significantly lower mean level among patients undergoing laparoscopic than open appendicectomy and $p=0.001$.¹⁸

In Alok et al prospective comparative study of laparoscopic appendicectomy versus open appendicectomy the average pain score was 2.7 ± 0.25 in the open group as compared to laparoscopic 1.5 ± 0.39 with $p < 0.05$ which was significant.²¹

In Pradhan et al laparoscopic versus open appendicectomy a prospective comparative study mean comparison of operative pain by visual analogue scale was low in laparoscopic compared to open $p=0.05$.²⁰

In Seeney et al results were significant pain score was low when compared to open.¹⁴

Post Operative Analgesic Requirements

The postoperative analgesic requirement was 7.32 ± 1.1 and 2.25 ± 0.7 in open and laparoscopic group respectively. $P=0.03$ which was significant was more in open group. Requirement of analgesics are shorter with Laparoscopic group as compared to open group.

In Frazee et al study a prospective randomised trial comparing open (8 days) versus laparoscopic appendicectomy (2 days) duration of both parenteral and oral analgesic use favoured laparoscopic group.¹⁰

In Geeta et al comparative study of clinical outcomes and cost analysis also reported to have lower duration of analgesic use in the laparoscopic group (3.31 days) than in the open group (7.05 days).²³

In Shaikh et al clinical outcomes of laparoscopic versus open appendicectomy a study of 100 patients showed significantly less use of analgesic in laparoscopic group (2.24 days) than in the open (7.25 days).¹⁶

Post Operative Complications

Postoperative complications like vomiting were found to be lower in laparoscopic group with 4(16%) as compared with 12 (48%) in open group ($p=0.022$) and ileus was lower in laparoscopic group with 26 ± 4.2 and for open group 30 ± 5.2 with $p=0.017$ which was significant. All over complications are less in Laparoscopic group comparing to open appendicectomy group.

In Sweeny et al moving from open to laparoscopic appendicectomy mean hours of ileus in open (33.3 days) and in laparoscopic (20.6 days).¹⁴

In Vellani et al evaluation of laparoscopic appendicectomy vs open appendicectomy in open (21 days) and laparoscopic (10.6 days).²²

Postoperative Wound Infections

In the present study there is significant reduction in incidence of postoperative wound infection in laparoscopic group 0 (0%) as compared to open group 7 (28%) ($p=0.03$). It might be due to long incision & contamination of Infected appendix with abdominal wall in Open Appendicectomy group.

In Yong et al a comparative study of routine laparoscopic versus open appendectomy in open (4 days) and laparoscopic (3 days).¹⁵

In Wei et al laparoscopic versus open appendicectomy: a prospective randomised comparison in open (7.2 days) and laparoscopic (4.1 days).¹⁸

In Geetha et al laparoscopic appendicectomy versus open appendicectomy: a comparative study of clinical outcomes and cost analysis- institutional experience in open (4.36 days) and laparoscopic (2 days).²³

Post Operative Hospital Stay

Duration of postoperative hospital stay was low for laparoscopic group 2 ± 0.70 as compared to open group 7 ± 0.80 ($p < 0.05$) which was found to be significant.

In Yong et al a comparative study of routine laparoscopic versus open appendectomy mean number of hospital days in open (4 days) as well as the laparoscopic (3 days).¹⁵

In Wei et al laparoscopic versus open appendicectomy: a prospective randomised comparison in open (7.2 days) and laparoscopic (4.1 days).¹⁸

In Geetha et al laparoscopic appendicectomy versus open appendicectomy: a comparative study of clinical outcomes and cost analysis institutional experience in open (4.36 days) and laparoscopic (3.31 days).²³

Time To Return To Normal Activity

The return to normal activity was early for laparoscopic group 12 ± 2.08 compared to open group 18 ± 3.2 value ($p < 0.05$) which was found to be significant. It might be due to small tiny incision in Laparoscopic appendicectomy as comparing to long incision with muscle stretching in Open appendicectomy group.

In Ortega et al study mean number of days to return to normal activity in open (14 days) and in laparoscopic (9 days).¹¹

In Pederson et al number of days were (26.5 days) in open and in laparoscopic (14 days).¹³

In Wei et al it was found that who underwent open (13.7 days) took longer time to return to normal work than laparoscopic surgery (9.1 days).

In Geetha et al study it was found that patients in open (21.7 days) took longer time than laparoscopic (13.5 days).²³

There are controversies among surgeons about the choice of open versus laparoscopic appendicectomy for the treatment of appendicitis. Laparoscopic appendicectomy had always pointed out increase cost of surgical equipment as a major disadvantage of laparoscopic procedures in past days. Although with the above concerns laparoscopic has become safe and popular procedures. Shorter duration of hospital stay and early recovery, less postoperative pain & less postoperative complications had made many surgeons to deepen their hands in this specialty area. Many benefits & advantages of laparoscopic surgery has driven us to analyze our experience with this procedure. Laparoscopic appendicectomy has added advantage of diagnosis as well therapy in single sitting over open appendicectomy.

In our study patients who successfully underwent laparoscopic appendicectomy have been proven remarkable advantages over open, in terms of post operative pain, use of analgesics, postoperative hospital stays and resume to normal work with added advantage of diagnostic laparoscopy. There was no laparoscopic to open conversion. laparoscopic group 2 ± 0.70 as compared to open group 7 ± 0.80 ($p < 0.05$) which was found to be significant.

In Yong et al a comparative study of routine laparoscopic

versus open appendectomy mean number of hospital days in open (4 days) as well as the laparoscopic (3 days).¹⁵

In Wei et al laparoscopic versus open appendectomy: a prospective randomised comparison in open (7.2 days) and laparoscopic (4.1 days).¹⁸

In Geetha et al laparoscopic appendectomy versus open appendectomy: a comparative study of clinical outcomes and cost analysis institutional experience

CONCLUSION

Laparoscopic appendectomy is a procedure of choice in both sexes who are suffering from acute or recurrent appendicitis. According to our study we came to an inference that laparoscopic surgery is more beneficial than open surgery. There was a definite upshot of laparoscopic surgery over open surgery in the selected patients. It has an added advantage of inspection of intraabdominal organs as diagnostic purpose. The laparoscopic surgery was better than open appendectomy with respect to post operative complications, pain and duration of analgesic usage, hospital stay and time to return to normal work. As the expertise in Laparoscopic surgery is increasing day by day, Laparoscopic appendectomy has set its value even in complicated appendicitis too.

REFERENCES

1. Wray CJ, Kao LS, Millas SG. Acute appendicitis: controversies in diagnosis and management. *Curr Probl Surg.* 2013;50:54-86.
2. Addiss DG, Shaffer N, Fowler BS. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol.* 1990;132:910-25.
3. Prystowsky JB, Pugh CM, Nagle AP. Current problems in surgery. Appendicitis. *Curr Probl Surg.* 2005;42:688-742.
4. McCASKIE AW, Sayers RD, O'Connell PR. The vermiform appendix, chapter 76 in short practice of surgery, bailey and love's 28th Edn, CRC press. 2023;1335-8.
5. Telfor G, Wallace J, "Appendix" chapter 13 in Oxford textbook of surgery, Morris PJ., Wood WC., Eds. Vol. 2, 2nd Edn, Oxford Medical Publications. 2000;180-9.
6. Palanivelu C. Laparoscopic appendectomy, chapter 53 in Text book of surgical laparoscopy, Shrinivas Fine Art Limited. 2002;411-24.
7. McAnena OJ, Austin O, O'Connell PR, Hederman WP, Gorey TF, Fitzpatrick J, "Laparoscopic versus open appendectomy: a prospective evaluation" *Br J Surg.* 1992;79:818-20.
8. Frazee RC, Robert JW, Symmonds RE, Snyder K, Hendricks JC, Smith RW et al. A prospective randomized trial comparing open versus laparoscopic appendectomy." *Ann Surg.* 1994; 219:725-31.
9. McAnena OJ, Austin O, O'Connell PR, Hederman WP, Gorey TF, Fitzpatrick J, "Laparoscopic versus open appendectomy: a prospective evaluation" *Br J Surg.* 1992;79:818-20.
10. Ortega AE, Hunter JG, Peters JH, Swanstrom LL, Schirmer B. A prospective randomized comparison of laparoscopic appendectomy with open appendectomy. *Am J Surg.* 1995;169:208-73.
11. Hansen J, Smithers B, Schache D. Laparoscopic versus Open Appendectomy: Prospective Randomized Trial. *World J Surg.* 1996;20:17-21.
12. Pedersen AG, Petersen OB, Wara P, Ronnning H, Qvist N, Laurberg S. Randomized clinical trial of laparoscopic versus open appendectomy. *Br J Surg.* 2001;88:200-20.
13. Seeney KJ, Keane FBV. Moving from open to laparoscopic appendectomy. *Br J Surg.* 2003;90:257-258.
14. Yong JL, Law WL, Lo CY, Lam CM. A comparative study of routine laparoscopic versus open appendectomy. *J Society Laparoendoscopic Surg.* 2006;10(2):188-92.
15. Shaikh AR, Sangrasi AK, Shaikh GA. Clinical outcomes of laparoscopic versus open appendectomy. *J Society Laparoendoscopic Surg.* 2009;13(4):574-80.
16. Li X, Zhang J, Sang L. Laparoscopic versus conventional appendectomy-a meta-analysis of randomized controlled trials. *BMC Gastroenterol.* 2010;10:129.
17. Hong-Bo W, Jiang-Long H, Zong-Heng Z, Bo W, Feng Z, Wan-Shou Q et al. Laparoscopic versus open appendectomy: a prospective randomized comparison. *Surgical Endoscopy.* 2010;24:266-9.
18. Kumar S, Jalan A, Patowary BN, Shrestha S. Laparoscopic appendectomy versus open appendectomy for acute appendicitis: a prospective comparative study. *Kathmandu Univ Med J.* 2016;14(55):244-8.
19. Pradhan S, Shakya YR, Batajoo H, Malla B, Joshi HN, Thapa LB et al. Laparoscopic versus open appendectomy: a prospective comparative study. *J Society Surgeons Nepal.* 2017;18(2):29-32.
20. Niranjana AK, Kumar S. Prospective comparative study of laparoscopic vs open appendectomy. *IJ Pharmaceutical Clin Res.* 2021;13(3):117-2
21. Vellami Y, Bhatti S, Shamsi G. Evaluation of Laparoscopic Appendectomy vs. Open Appendectomy: A Retrospective Study" at Aga Khan University Hospital, Karachi, Pakistan: *JSLC.* 2009;13(4):574-80.
22. Geetha KR, Kudva AB. Laparoscopic appendectomy versus open appendectomy: A comparative study of clinical outcome and cost analysis-Institutional experience. *Indian J Surg.* 2009;71:142-6.
23. Special problems in Laproscopic Surgery, Minimal access surgery part, Surgical clinics of North America, August 2000 Vol.80.