

Comparative study of Laparoscopic Appendectomy and Open Appendectomy in a Tertiary Care Hospital in South Karnataka, India

SUNIL KUMAR B.B., BASAVAPRABHU ACHAPPA, SOUNDARYA MAHALINGAM

ABSTRACT

Introduction: Appendicitis is a common cause of acute abdomen and appendectomy is the treatment of choice, which can be done either by open or laparoscopic approach. Controversies still exist as to which is the better choice among the two surgical procedures for treating appendicitis. So, this study was conducted to compare the laparoscopic appendectomy with open appendectomy.

Materials and Methods: This study was done in a tertiary care medical hospital in South Karnataka. 100 consecutive patients who were diagnosed to have appendicitis and requiring surgical intervention were selected after obtaining their informed consent to participate in the study. 50 patients each were randomly chosen to undergo either open or laparoscopic appendectomy. Data was collected from each patient on the basis of clinical, preoperative findings as well

as postoperative recovery and follow up. Statistical analysis was done using SPSS Version 14.0.

Results: 59% of patients were male and 60% were under 25 years of age. Nausea and vomiting were the common symptoms. Laparoscopic appendectomy took more time than open appendectomy (42.8 mins Vs 54.3 mins). Pain was significantly lower in laparoscopic appendectomy compared to open appendectomy. Post operative complications, length of stay, time to return back to work were all lesser among patients who underwent laparoscopic appendectomy.

Conclusion: The laparoscopic appendectomy was better than open appendectomy with respect to wound infection rate, pain score, lesser use of antibiotics and analgesics, duration of postoperative hospital stay and return to normal activity.

Key Words: Appendicitis, Laparoscopy appendectomy, Iliac fossa, tertiary care

INTRODUCTION

Appendicitis is a common, sometimes confusing and often treacherous cause of acute abdomen at all ages, which requires utmost skill and care of the attending surgeon besides good clinical evaluation [1].

Approximately 6% of the population suffers from acute appendicitis during their lifetime; therefore much effort has been directed towards early diagnosis and treatment [2]. In appendicitis, appendectomy is the treatment of choice, which can be done either by open or laparoscopic approach.

Conventional appendectomy is a highly effective procedure, but despite its success there have been numerous attempts to improve the diagnostic accuracy and outcome of patients with acute appendicitis because the negative appendectomy rate in most series is still in the range of 25-30%. Laparoscopic appendectomy is nowadays the best studied procedure;

perhaps the most scrutinized surgical procedure ever [3].

In cholecystitis, laparoscopic cholecystectomy has emerged as the gold standard, but in appendectomy it is still controversial.

The objective of this study is therefore, to clear some of the issue. So this study was conducted with the aim of comparing patient's duration of postoperative hospital stay, pain, recovery, complications between open and laparoscopic appendectomy.

MATERIALS AND METHODS

The study subjects consisted of 100 patients, who underwent appendectomy at a tertiary care hospital in Karnataka, India for appendicitis. These patients were divided into two groups of 50 each on random basis, Open or Conventional appendectomy (OA) and Laparoscopic appendectomy (LA).

Informed consent was taken from all patients.

Approval was obtained from the institutional ethics committee before commencing the study

Diagnosis of appendicitis was based on clinical findings, blood counts and ultrasonography.

Data was collected from each patient on the basis of clinical, preoperative findings as well as postoperative recovery and follow up.

After ruling out other differential diagnosis and concluding preoperatively as appendicitis, treatment was planned. Pre-operative preparation consisted of bed rest, nil per oral, intravenous fluids, and preoperative dose of antibiotics.

Anaesthesia was either general or spinal.

In open appendectomies, abdomen was opened either by Mcburney's or Lanz incision or occasionally by right paramedian incision. In some cases appendicular stump was ligated and invaginated and in some others stump was ligated alone.

In laparoscopic appendectomies base of appendix was ligated using end loop (catgut) and the specimen delivered out using endobag.

Intraoperative findings were noted down.

The final diagnosis of appendicitis was confirmed by histopathology report. The appendicular specimen was examined and reported by the pathologist.

Post operatively patients were managed as follows: parenteral antibiotic, intravenous fluids, analgesics, parenteral nutrition until bowel activity returned, monitoring of temperature, pulse, blood pressure and respiratory rate.

Operating time (time from initial incision to closure), intraoperative findings and complications were recorded.

Postoperative pain was quantified 24 hours after the surgical procedure using Visual Analogue Scale (VAS, 0 to 100, 0 being no pain and 100 unbearable pains).

Time of resuming oral feeds and length of postoperative hospital stay were recorded. Stitches were removed on 7th postoperative day. On discharge patients were advised for regular follow-up.

Time until return to work or normal activities was determined by the examination of the discharge summary sheet or outpatient cards and 3-4 weeks postoperative follow up.

STATISTICAL ANALYSIS

Following statistical methods were employed

- Frequencies/Descriptives

- Contingency coefficient (Cross Tabs)
- Independent samples 't' test

All the statistical calculations were done through SPSS (Statistical Presentation System Software) for Windows Version 14.0 Evaluation version (SPSS, 2005. SPSS Inc, New York).

RESULTS

In this study, as per [Table/Fig-1] attack of appendicitis was seen in patients aged less than 25 years constituting 60%.

Age Group (Years)	Method		Total
	OA	LA	
Below 15	8 (16.0%)	3 (6.0%)	11 (11.0%)
16-25	21 (42.0%)	28 (56.0%)	49 (49.0%)
26-35	9 (18.0%)	12 (24.0%)	21 (21.0%)
36-45	8 (16.0%)	4 (8.0%)	12 (12.0%)
46-55	4 (8.0%)	3 (6.0%)	7 (7.0%)
Total	50 (100.0%)	50 (100.0%)	100 (100.0%)

[Table/Fig-1]: Distribution of the sample by age
CC = 0.222; $p < 0.270$ (Not Significant)

In this study, the difference in incidence of appendicitis among male and female patients was not statistically significant, as shown in [Table/Fig-2]. Incidence was 59% in male patients and 41% in female patients.

Sex	Method		Total
	OA	LA	
Male	34(68.0%)	25(50.0%)	59(59.0%)
Female	16(32.0%)	25(50.0%)	41(41.0%)
Total	50(100.0%)	50(100.0%)	100(100.0%)

[Table/Fig-2]: Distribution of the sample by sex
CC = 0.180; $p < 0.067$ (Not Significant).

As per [Table/Fig-3], the mean age of male patients presenting with appendicitis is around 26 years and of the female patients is 23 years.

Method	Sex	Mean age (years)
OA	Male	26.21
	Female	24.94
LA	Male	27.52
	Female	22.68
Total	Male	26.76
	Female	23.56

[Table/Fig-3]: Description statistics for age of subjects

In the study conducted, presence of nausea or vomiting was found in 63% of patients. Nausea alone was a predominant symptom constituting 34% as mentioned in [Table/Fig-4].

	Method		Total
	OA	LA	
None	14(28.0%)	23(46.0%)	37(37%)
Nausea	19(38.0%)	15(30.0%)	34(34%)
Vomiting	17(34.0%)	12(24.0%)	29(29%)
Total	50(100.0%)	50(100.0%)	100(100%)

[Table/Fig-4]: Distribution of the sample by nausea or vomiting
CC=0.134; $p < 0.172$ (Not Significant).

At the time of surgery, the appendix appeared inflamed in 81% of patients, perforated in 11% and gangrenous in 5% of the patients. In 3% of patients, the appendix appeared normal as per [Table/Fig-5].

Per op findings	Method		Total
	OA	LA	
Inflamed	34(68.0%)	47(94.0%)	81(81%)
Perforated	8(16.0%)	3(6.0%)	11(11%)
Gangrenous	5(10.0%)	-	5(5%)
Normal looking	3(6.0%)	-	3(3%)
Total	50(100.0%)	50(100.0%)	100(100%)

[Table/Fig-5]: Intraoperative Findings
CC=0.332; $p < 0.006$ (Significant).

As per [Table/Fig-6], histopathological examination of the appendiceal specimen showed evidence of inflammation in 87% of patients.

HPE	Method		Total
	OA	LA	
Absent	8 (16.0%)	5 (10.0%)	13 (13%)
Present	42 (84.0%)	45 (90.0%)	87 (87%)
Total	50 (100.0%)	50 (100.0%)	100 (100%)

[Table/Fig-6]: Histopathological Findings
CC=0.890; $p < 0.372$ (Not Significant).

As per [Table/Fig-7], the mean duration of surgery in open appendectomy was 42.80 min as compared to 54.30 min for laparoscopic appendectomy, which is highly significant ($p < 0.000$).

Method	N	Operation time (min)	Std. Deviation
OA	50	42.80	7.01
LA	50	54.30	13.02

[Table/Fig-7]: Mean duration of surgery
“t”test= -5.501; $p < 0.000$ (Highly Significant).

Pain score was 47.00 in the open group as compared to 39.50 for laparoscopic appendectomy that is highly significant

($p < 0.001$) as mentioned in [Table/Fig-8].

Method	N	Mean VAS	Std. Deviation
OA	50	47.00	13.40
LA	50	39.50	7.23

[Table/Fig-8]: Qualitative Pain Assessment (VAS) – Postoperative
“t”test=3.483; $p < 0.001$ (Highly Significant)

As per [Table/Fig-9], it took on an average of 2.12 days to start oral feeds in laparoscopic group as compared to 3.28 days in the open appendectomy group that is highly significant ($p < 0.000$).

Method	N	Mean FAS (days)	Std. Deviation
OA	50	3.28	1.07
LA	49	2.12	.63

[Table/Fig-9]: Start of oral feeds after surgery
“t”test=6.534; $p < 0.000$ (Highly Significant)

As per [Table/Fig-10], there were no postoperative complications in the laparoscopic group. Whereas 10% of the patients in open appendectomy group had postoperative complications all of which were wound infections.

Post-op complications	Method		Total
	OA	LA	
None	45 (90.0%)	50 (100.0%)	95 (95.0%)
Wound infection	5 (10.0%)	-	5 (5.0%)
Total	50 (100.0%)	50 (100.0%)	100 (100.0%)

[Table/Fig-10]: Postoperative Complications
CC=0.224; $p < 0.022$ (Significant).

The mean duration of postoperative hospital stay was 5.88 days in open group as compared to 3.62 days for laparoscopic group that is highly significant ($p < 0.000$) as shown in [Table/Fig-11].

Method	N	Mean Post op stay (Days)	Std. Deviation
OA	50	5.88	2.29
LA	50	3.62	.99

[Table/Fig-11]: Duration of postoperative hospital stay
“t”test=6.045; $p < 0.000$ (Highly Significant)

Return to normal work postoperatively was on an average 13.34 days in open group as compared to 8.02 days for the laparoscopic group, which is highly significant ($p < 0.000$) as shown in [Table/Fig-12].

Method	N	Mean (Days)	Std. Deviation
OA	50	13.34	2.32
LA	50	8.02	.89

[Table/Fig-12]: Return to Normal work
 "t"test=15.148; p<0.000(Highly Significant)

DISCUSSION

Laparoscopic surgery is a major surgical advance that has enabled the general surgeon to stretch his super specialty era. The controversy that currently exists over the potential benefits of laparoscopic appendectomy moderated us to analyse our experience with this procedure. The relative advantages and disadvantages of open and laparoscopic appendectomy are measured in terms of duration of surgery, need for conversion into open appendectomy, treatment of coexisting pathology, intraoperative and postoperative complications, postoperative pain assessment and recovery, return to normal work and cost factors involved in both groups are compared on random basis.

The mean duration of surgery in the laparoscopic group was 54.30 minutes as compared to 42.80 minutes in the open group ($p < 0.000$). Similar observation of laparoscopic appendectomy taking more time have been reported by other studies [4-11]. (Tate J J et. al. [12], 67.03 v/s 46.5 min; Vallina et. al. [13] 61±41 min and 43±2.9 min for laparoscopic and open appendectomy respectively).

In the study, there was no conversion of laparoscopic appendectomy to open in contrast to higher conversion rate of Pendersen AG et.al.[14], (65 out of 282 patients) and 14(20%) reported by Tate JJ et. al.[12].

There was no coexisting pathology in the study series.

Wound infection rate in our study was 5(10%) in the open group and none in the laparoscopic group ($p < 0.022$), with no other intraoperative or postoperative complications. Austin et. al. [4] have reported infection rate of 11% in open and 4% in laparoscopic group. Higher wound infection has also been reported in open group by other [6,11,15-18].

Pain score (VAS) was 47.00 in open group as compared to 39.50 in laparoscopic appendectomy ($p < 0.001$), because of longer incision, stretching or cutting of muscles and wound infection. Similar observations have also been reported by other authors [8,19,20].

In postoperative recovery, oral feeds were resumed after surgery on an average of 3.28 days in open group compared to 2.12 days in laparoscopic group ($p = 0.000$).

Duration of postoperative hospital stay was 5.88 days v/s 3.62 days in open and laparoscopic group respectively (p

< 0.000). Austin et al [4] has reported mean postoperative stay as 4.8 days and 2.2 days for open and laparoscopic group respectively. Other workers [5,6,9,14,20-22] also have reported longer postoperative hospital stay in open group as compared to laparoscopic group

Return to normal activity was 13.34 days in open group as compared to 8.02 days in the laparoscopic group ($p < 0.000$). Pendersen AG et al [14] reported the median time to return to normal activity as 7 v/s 10 days in laparoscopic and open group respectively. Others [7,9,11,19,23] have also shown that laparoscopic group patients returned to normal work earlier.

CONCLUSION

On analyzing the data, we found a definite difference in outcome between conventional and laparoscopic appendectomy in properly selected patients. The laparoscopic appendectomy was better than open appendectomy with respect to wound infection rate, pain score, lesser use of antibiotics and analgesics, duration of postoperative hospital stay and return to normal activity.

REFERENCES

- [1] Richard A Williams, Paul Myers. MONOGRAPH – Pathology of Appendix. 1st ed. Chapman and Hall Inc; 1994.
- [2] Mohammed I Seleem and Ahmed M.AI. Hashemy. Diagnosis and management of acute appendicitis. *Journal of Royal College of Edinburgh* (Online). Jan 2004; 2(2).
- [3] Pradeep Kumar Chowbey. Laparoscopic Appendectomy: Minimal access surgery. July 2002: 79-80.
- [4] Lujan, Mompean JA. Laparoscopic versus open appendectomy: a prospective assessment. *Lancet*. 1993; 342: 633-37.
- [5] Laurence E, McCahill, Carlos A Pellegrini, Thomas Wiggins, Scothelton BSW. A clinical outcome and cost analysis of laparoscopic versus conventional appendectomy. *Am J Surg*. 1996; 171: 533-537.
- [6] Reiertson O, Larsen S, Trondsen E. Randomized controlled trial with sequential design of laparoscopic versus conventional appendectomy. *Br J Surg*. 1997; 84(6): 842-847.
- [7] Hay SA. Laparoscopic versus conventional appendectomy. *Paed Surg Int*. 1998; 13(1): 21-23.
- [8] Chung, Raphael S, Rowland, Douglas Y, Li Paul. A metaanalysis of randomized controlled trials of laparoscopic versus conventional appendectomy. *Am J Surg*. 1999; 177: 250-256.
- [9] Aaron M Merhoff, Graig G Merhoff, Morris E, Franklin Jr. Laparoscopic versus conventional appendectomy. *Am J Surg*. 2000; 179: 375-378.
- [10] Namir Katkhouda, Rodney J, Mason, Shirin Towfigh, Anna Gevorgyan and Rahila Essani. Laparoscopic versus open appendectomy: a prospective randomized double blind study. *Ann Surg*. 2005; 242(3): 439 – 448.
- [11] John Brendan Hansen, Bernard Mark Smithers, David Schache, Daryl Robert Wall, Brian John Miller, Betty Lynette Meizies. Laparoscopic versus open appendectomy : prospective randomized trail. *World J Surg*. 1996; 20: 17-21.
- [12] Tate JJT, Chung SCS, Dawson JW, Li AKC. Laparoscopic versus conventional appendectomy: a prospective randomized trial.

- Br J Surg.* 1993; 80(6): 761–764.
- [13] Vallina VL, Velaso JM, McCulloch CS. Laparoscopic versus conventional appendectomy. *Ann Surg.* 1993; 218: 685–692.
- [14] Pendersen AG, Petersen OB, Wara P. Randomized clinical trial of open versus laparoscopic appendectomy. *Br J Surg.* 2001; 88: 200–205.
- [15] Larry C Martin. Open versus laparoscopic appendectomy. *Ann surg.* 1995; 222: 256–262.
- [16] Ozmen MM., Zulfikaroglu B, Tanik A, Kale TT. Laparoscopic versus open appendectomy: prospective randomized trial. *Surg Lap Endo Percutaneous Technique.* 1999; 9(3): 187–189.
- [17] Azaro EM, Marsal PC. Laparoscopic versus open appendectomy: a comparative study. *JSLs.* 1999; 3(4): 279–283.
- [18] Robert Golub, Fazi Siddiqui, Dieter Pohn. Laparoscopic versus open appendectomy: a metaanalysis. *American College of Surgeons.* 1998; 186(5): 545–553.
- [19] Scott Conner, Terrence CEH, J Hall. Laparoscopic appendectomy. *Ann Surg.* 1992; 215(6): 660–667.
- [20] Lintula H, Kokki H, Vanamo K. Single blind randomized clinical trial of laparoscopic versus open appendectomy in children. *Br J Surg.* 2001; 88: 510–514.
- [21] Reiertsen O, Trondsen E. Prospective nonrandomized study of conventional versus laparoscopic appendectomy. *World J surg.* 1999; 18(3): 411–416.
- [22] Adrian E Ortega. A prospective randomized comparison of laparoscopic appendectomy with open appendectomy. *Am J surg.* 1995; 169: 208–213.
- [23] Hellberg A, Rudbery C, Kullman E, Enochsson L, Fenyo G, Graffner H et. al. Prospective randomized multicenter study of laparoscopic versus open appendectomy. *Br J Surg.* 1999; 86: 48–53.

AUTHOR(S):

1. Dr. Sunil Kumar B.B.
2. Dr. Basavaprabhu Achappa
3. Dr. Soundarya Mahalingam

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Surgical Gastroenterology, J S S Medical College, Mysore.
2. Associate Professor, Department of General Medicine, Kasturba Medical College, Mangalore (Affiliated to Manipal University).
3. Associate Professor, Department of Paediatrics, Kasturba Medical College, Mangalore (Affiliated to Manipal University).

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Basavaprabhu Achappa
Associate Professor,
Department of General Medicine,
Kasturba Medical College
Attavar, Mangalore - 575001.
Phone: 9980170480
E-mail: bachu1504@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Submission: **Mar 19, 2012**
Date of Peer Review: **Apr 15, 2012**
Date of Acceptance: **May 20, 2012**
Date of Publishing: **Jun 25, 2012**