

A COMPARATIVE STUDY ON THE OUTCOMES OF LAPAROSCOPIC APPENDICECTOMY VERSUS OPEN APPENDICECTOMY

Dr. Krithika F. Kiruba^{1*}, Dr. P. Padmapriya²

¹Assistant Professor; Department of General Surgery; Bhaarith Medical College and Hospital, Affiliated to Bharath Institute of Higher Education and Research (BIHER), Chennai, Tamilnadu, Mail Id: krithikakiruba@gmail.com

²PhD; Senior Scientific Research Officer; Department of Integrative Medical Research; Bhaarith Medical College and Hospital; Affiliated to Bharath Institute of Higher Education and Research (BIHER), Chennai, Tamilnadu, Mail Id: priyarun79@gmail.com

*Corresponding Author: Dr. Krithika F. Kiruba, Mail Id: krithikakiruba@gmail.com

ABSTRACT

Background: Acute appendicitis has been linked to a number of factors, including smoking, low dietary fibre, air pollution, mechanical obstruction, and genetic predisposition. Appendicectomy is the treatment of choice for appendicitis and the procedure can be carried out either as open or laparoscopic approach. Open appendicectomy has been the gold standard in treatment for acute appendicitis since McBurney introduced it in 1889. When in 1983, Semm performed laparoscopic appendectomy, it changed the surgical field dramatically and it was then widely used. The present study is to bring out the comparative outcomes of laparoscopic appendicectomy and open appendicectomy with regards to postoperative pain, duration of hospital stay, its complications, duration of analgesic use, secondary wound infection, and quality of life with respect to return to routine work.

Methods: The present study is a prospective, comparative hospital based study with a duration of 15 months.

Results and Conclusion: Laparoscopic appendectomy has the following advantages over open appendectomy in the following aspects; Postoperative pain and duration of hospital stay. Laparoscopic technology has advanced in the surgical world but laparoscopic appendicectomy has not had the same level of widespread acceptance as open appendicectomy. The main cause may be skepticism about its potential to outperform the conventional incision technique. Therefore, the goal of this study is to compare the results of laparoscopic and open appendicectomy in terms of postoperative pain, length of hospital stay, complications, length of analgesic use, secondary wound infection, and quality of life with regard to return to regular work.

KEYWORDS: Open Appendectomy Surgery, Laparoscopic Appendectomy Surgery, Minimally Invasive Surgery, Quality of life

INTRODUCTION

Acute appendicitis affects around 5.7 to 57 lakh individuals every year.(1,2) Multifactorial involvement has been predicted for the occurrence of acute appendicitis which involves air pollution, inadequate dietary fiber, smoking, mechanical obstruction and familial predisposition.(3,4) It has always been a challenge for surgeons in this era even with the advancement in diagnostic and therapeutic, for diagnosing acute appendicitis and with the patient complaining of pain in the right iliac fossa region. It is quite apparent from reviewing the boundless literature that existed on the diseases pertaining to appendix that it is very arduous to diagnosis appendicitis particularly in the young and geriatric population. Hence all age group of people should be carefully examined under intuition if reporting to a clinician.

The incidence of acute appendicitis is observed in high numbers during the second and third decades of life but occurrence is seen among all ages (3) It has been estimated that during their lifetime nearly 6% of the population suffer from acute appendicitis, hence most of the knowledge have been focused on early diagnosis and treatment. (4) Appendicectomy is the treatment of choice for appendicitis and the procedure can be carried out either as open or laparoscopic approach. Open appendicectomy has been the gold standard in treatment for acute appendicitis since McBurney introduced in 1889. In 1983, Semm performed the laparoscopic appendectomy, it changed the surgical field dramatically and it was then widely used. In comparison with open appendicectomy, laparoscopic appendicectomy has been safe and suitable.

In addition to its widespread utility in improving diagnostic precision, laparoscopic appendicectomy provide lesser degree of pain, it enhances quick wound healing and short duration of hospital stay. (5-7) Despite the advancement in the laparoscopic technology into the field of surgery, laparoscopic appendicectomy has not shared the privilege of wide acceptance for appendicectomy. The cardinal reason could be due to cynicism towards its ability to improve upon the traditional incision method. Hence, the present study is to bring out the comparative outcomes of laparoscopic appendicectomy and open appendicectomy with regards to postoperative pain, duration of hospital stay, its complications, duration of analgesic use, secondary wound infection, and quality of life with respect to return to routine work.

MATERIALS AND METHODS

Study Population: All patients diagnosed with Acute Appendicitis undergoing either Laparoscopic Appendicectomy or Open Appendicectomy in BMCH.

Study Design: Prospective, comparative hospital based study.

Study Duration: 15 months (May 2025-June 2026)

Sample size: 100

Inclusion criteria: All patients diagnosed as Acute Appendicitis undergoing either Laparoscopic Appendicectomy or Open Appendicectomy and those who gave informed consent to be part of the study

Exclusion criteria: Children <9 years, pregnant women, patients with appendicular mass on clinical examination, patients undergoing appendicectomy as a part of other procedures, those who refused informed consent, perforated or gangrenous appendix.

Study procedure:

100 cases of Acute Appendicitis patients were taken up for the current study. After obtaining a well-informed written consent and ethical clearance, including a detailed history of the patient, presenting complaints general examination and detailed clinical examination was done. Basic biochemical and hematological investigations were also noted. Cases which underwent Laparoscopic Appendicectomy and those which underwent Open Appendicectomy were grouped separately. Both groups were assessed for post-operative pain using visual analogue scale, length of hospital stay, in-hospital complications and rate of routine discharge and quality of life with respect to return to routine work. The patients were followed up daily till discharge and then weekly for 4 weeks, in outpatient department. Wound complications such as seroma formation, pus discharge, abscess and wound dehiscence in need for secondary suturing will be assessed. Postoperative pain will be assessed using visual pain analogue scale.

RESULTS

Totally one hundred patients were included in this study conducted in the department of General Surgery, Bhaarath Medical College and Hospital.

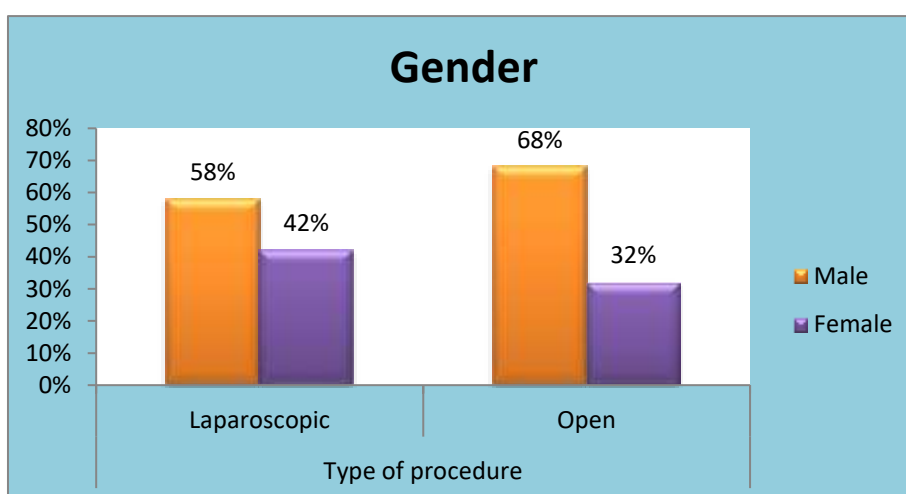


Figure 1: Gender distribution of patients according to type of procedure



Figure:2

Table 1: Type of occupation of patients according to type of procedure

Occupation	Type of Procedure		Total
	Laparoscopic	Open	
Unemployed	25 (50%)	27 (54%)	52 (52%)
Unskilled/Skilled labor	25 (50%)	22 (44%)	47 (47%)
Clerical	0 (0%)	1 (2%)	1 (1%)

Table 2: Co-morbidities of patients according to type of procedure

Co-morbidities		Type of Procedure		Total
		Laparoscopic	Open	
Diabetes mellitus	Present	11 (58%)	9 (18%)	20 (20%)
	Absent	39 (78%)	41 (82%)	80 (80%)
Hypertension	Present	6 (12%)	5 (10%)	11 (11%)
	Absent	44 (88%)	45 (90%)	89 (89%)
Bronchial asthma	Present	0 (0%)	1 (2%)	1 (1%)
	Absent	50 (100%)	49 (98%)	99 (99%)
Tuberculosis	Present	0(0%)	0(0%)	0(0%)
	Absent	50 (100%)	50 (100%)	100 (100%)

Table 3: Post-operative complication among patients according to type of procedure

Postoperative complications		Type of procedure		P-value
		Laparoscopic	Open	
Postoperative infection	Yes	8%	2%	0.169
	No	92%	98%	
Fever	Yes	58%	50%	0.422
	No	42%	50%	
Postoperative pain	Yes	14%	82%	<0.001

Table 4: Postoperative complication among patients according to weeks

Postoperative complications according to weeks		Type of procedure		P-value
		Laparoscopic	Open	
Week 1	Complications	6%	18%	0.065
	No complications	94%	82%	
Week 2	Complications	4%	18%	0.025
	No complications	96%	82%	
Week 3	Complications	2%	12%	0.049
	No complications	98%	88%	
Week 4	Complications	6%	18%	0.065
	No complications	94%	82%	
3rd month	Complications	6%	18%	0.065

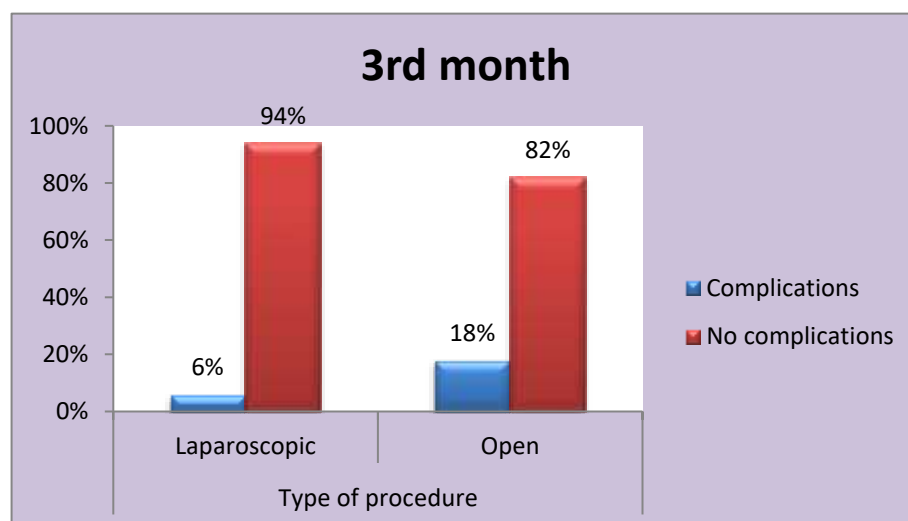
**Figure 3: Postoperative complications during third month**

Table 5: Association between variables in regard to duration of stay, duration of procedure, duration of hospital stays and Alvarado score

Variable	Type of procedure	Mean	SD	Median	p-value
Age	Lap	28.86	11.15	28	0.017
	Open	23.46	11.85	24	
Duration (in days)	Lap	2.18	0.72	2	0.969
	Open	2.18	0.63	2	
Duration of fever (in days)	Lap	1.3	1.09	2	0.35
	Open	1.08	1.08	1.5	
Body weight	Lap	64.78	8.17	65.5	0.08
	Open	58.78	14.08	60.5	
PR	Lap	84.16	6.7	83	0.721
	Open	85.02	7.52	84.5	
Temp	Lap	98.42	1.39	98	0.37
	Open	98.74	0.83	99	
SBP	Lap	125.8	7.02	130	0.149
	Open	127.6	6.25	130	
DBP	Lap	78	7.82	80	0.109
	Open	80.4	6.05	80	
Alvarado Score	Lap	7.5	0.81	8	0.555
	Open	7.62	0.73	8	
Duration of procedure(in hours)	Lap	1.7	0.51	2	< .001
	Open	1.16	0.37	1	
Pain Score	Lap	1.08	1.08	2	< .001
	Open	5	1.2	5	
Duration of hospital stay	Lap	2.26	0.44	2	< .001
	Open	5.34	1.26	5	

DISCUSSION

Worldwide many prospective randomized studies were conducted to evaluate the effectiveness between conventional open appendectomy and laparoscopic appendectomy. Despite many evidences conducted all over the world by medical centers, laparoscopic procedure has an edge over conventional open procedure is still debatable. Even though patients undergoing laparoscopic appendectomy are comparatively lesser when compared to open appendectomy, laparoscopic appendectomy has two main advantages (Figure1). Firstly, laparoscopic approach provides a greater diagnostic approach and secondly laparoscopic approach provides better postoperative recovery.

Numerous studies have been found to show statistically significance results in laparoscopic procedures after the employment of antibiotic prophylaxis in patients and decreased number of postoperative wound infections. Additionally, laparoscopic surgeries have found to be cosmetically better when compared to open surgeries. Though wound complications that are minimal with laparoscopic procedures that minimizes the cost, laparoscopic procedures tend to be costlier than conventional open surgery. But the operating time tends to be longer compared to open procedure which in reality is of little significance (Figure2).

In the present study, Occupation, postoperative pain, hospital stay after procedure and operating time has been found to be statistically significant during laparoscopic appendectomy; this is more similar with other studies globally. On the contrary there are many studies establishing the facts that open appendectomy is still the choice for many surgeons. Studies done by Lawrence et al (8), Namir et al (9) and Ignacio et al (10) all favored for open appendectomy surgery over laparoscopic appendectomy. Hanspal et al (11) observed in their nonrandomized longitudinal comparative study that laparoscopic appendectomy surgeries showed lesser postoperative pain than open appendectomy surgeries. Basavaprabhu et al (12) and Vishnu Kumar Patel (13) in their study found that post pain was minimal with laparoscopic procedure and a faster back to duty post operatively (Table 1).

Pain score was found to be lesser in the study conducted by Deshmukh (14) among laparoscopically operated patients for acute appendicitis compared to open appendectomy. Other studies conducted by Atul Kumar Gupta (15), Neeraj Sharma (16), Sivakumar (17), Adrian E Ortega (18), Hellberg (19) and Milewczysk (20) all proved to show that post-operative pain was comparatively minimal after laparoscopic surgery when compared to open appendectomy which was similar to the present study and is statistically significant. On the contrary there are many studies that did not show any decrease in postoperative pain following laparoscopic procedures compared to open appendectomy. A comparative study involving both the procedures done by Upendra Kumar (21) and Heikkinen (22) showed better quality of life after two weeks post operatively did not show any difference in decrease of pain. Postoperative pain and length of stay again did not have any significance according to Namir et al (23) in their prospective randomized double blinded study. Another prospective

randomized double blinded study conducted by Ignacio et al (10) did not prove any significant differences post operatively when pain parameter was taken into consideration (Table 2 & 3).

Though laparoscopic procedure has revolutionized the surgical field, one of the main drawback of laparoscopic procedures was that it exhausted longer time or in other words increased operating time during procedure which was similar to the present study where open appendectomy consumed lesser time than laparoscopic appendectomy (Table 4&5). According to the p-value, our study was found to be statistically significant. In studies done by Lawrence et al (8) and Namir et al (23) the operating time was still longer in laparoscopic appendectomy than open appendectomy. Peculiar studies by Basavaprabhu (12), Vishnu (13) and Atul (15) had lesser operating time during laparoscopic appendectomy while compared to open appendectomy. The main reason for lesser operating time during laparoscopic in the above mentioned studies may be justified by the availability of advanced facilities, complications encountered during surgery and skills of the operating surgeon which varies across the world (Figure 3).

This study was conducted to evaluate the outcomes between open appendectomy and laparoscopic appendectomy in the department of surgery at Bharath Medical College and Hospital and the following conclusion were drawn from the results. Laparoscopic appendectomy has been the safest surgical procedure compared to open appendectomy. The advantages over open appendectomy in the following aspects; postoperative pain and duration of hospital stay. The present study not only has health care indications on clinical patient care and their benefit, but also its implication on financial constraint during hospital stay. The benefits of laparoscopic appendectomy require the need for more comprehensive economic perusal to determine its ideal role in practice.

REFERENCES

1. Gallerani M, Manfredini R, Ricci L, Grandi E, Cappato R, Calo G, et al. Sudden death from pulmonary thromboembolism: Chronobiological aspects. *Eur Heart J* 1992;13:661-5.
2. West RR, Roberts CJ. Some observations on the management of appendicitis in Wales. *Int J Epidemiol* 1974;3:351.
3. Noudeh YJ, Sadigh N, Ahmadnia AY. Epidemiologic features, seasonal variations and false positive rate of acute appendicitis in Shahr-e-Rey, Tehran. *Int J Surg* 2007;5:95-8.
4. Addis DG, Shaffer N, Fowler BS, Tauxe R. The epidemiology of Appendicitis and appendectomy in the United States. *Am J Epidemiol* 1990;132(5):910-25
5. Hardin DM. Acute Appendicitis: Review and update. *Am Fam Physician*.1999;60:2027-34
6. Cuschieri A. The small intestine and vermiform appendix; In: Cuschieri A, G R Giles, R Mossa.(ed). *Essential surgical practice*. 3rd ed. London: Butter worth Heinman. 1995;1325-8
7. Addis DG, Shaffer N, Fowler BS, Tauxe R. The epidemiology of Appendicitis and appendectomy in the United States. *Am J Epidemiol* 1990;132(5):910-25
8. Laurence E. McCahill, Carlos A. Pellegrini, Thomas Wiggins, W. Scott Helton. A clinical outcome and cost analysis of laparoscopic versus open appendectomy. *The American Journal of Surgery*.1996,Volume 171, Issue 5,Pages 533-537,
9. Katkhouda N, Mason RJ, Towfigh S, Gevorgyan A, Essani R. Laparoscopic versus open appendectomy: a prospective randomized double-blind study. *Ann Surg*. 2005 Sep;242(3):439-48; discussion 448-50. doi: 10.1097/01.sla.0000179648.75373.2f. PMID: 16135930; PMCID: PMC1357752.
10. Ignacio RC, Burke R, Spencer D, Bissell C, Dorsainvil C, Lucha PA. Laparoscopic versus open appendectomy: what is the real difference? Results of a prospective randomized double-blinded trial. *Surg Endosc*. 2004 Feb;18(2):334-7. doi: 10.1007/s00464-003-8927-x. Epub 2003 Dec 29. PMID: 14691696.
11. Hanspal S, Shah MY, Akhtar M. Laparoscopic versus open appendectomy: a nonrandomized comparative study. *Int Surg J* 2020;7:1925-9.
12. Basavaprabhu Achappa, et al., Comparative Study of Laparoscopic Appendectomy and Open Appendectomy. *International Journal of Anatomy Radiology and Surgery*. 2012-June, Vol-1(1): 12-16
13. Patel VK, Sharma S, Gaharwar APS, Gupta R. A Comparative Study Between Laparoscopic Appendectomy and Conventional Open Appendectomy. *IJSS Journal of Surgery* 2018;4(2):20-25.
14. Puli Vineela, Nikhil Deshmukh, Krishnamurthy Penugondla, Role of liver function tests to assess severity of acute appendicitis and predict complications, *International Surgery Journal*, 2021 Mar;8(3):885-888.
15. Gupta AK, Chawda V, Gupta S, Goel A, Bhagat TS, Agarwal A. Comparative evaluation of laparoscopic versus open appendectomy in cases of acute appendicitis. *Int Surg J* 2017;4:2637-41.
16. Sharma, N., Mishra, M., Tripathi, A., & Rai, V. Comparative study and outcome of open versus laparoscopic appendectomy: case series of 60 patients. *International Surgery Journal*.2017, 4(9), 3129-3135. doi: <http://dx.doi.org/10.18203/2349-2902.isj20173901>
17. Siva Kumar, Nagender Rao. Open VS Laparoscopic appendicetomy: A comparative study. *Int J Surg Sci* 2018;(2):19-22.
18. Adrian E. Ortega, John G. Hunter, Jeffrey H. Peters, Lee L. Swanstrom, Bruce Schirmer, A prospective, randomized comparison of laparoscopic appendectomy with open appendectomy. *The American Journal of Surgery*.1995.Volume 169, Issue 2,Pages 208-213
19. Hellberg A, Rudberg C, Kullman E, Enochsson L, Fenyö G, Graffner H, Hallerbäck B, Johansson B, Anderberg B, Wenner J, Ringqvist I, Sörensen S. Prospective randomized multicentre study of laparoscopic versus open appendectomy. *Br J Surg*. 1999 Jan;86(1):48-53. doi: 10.1046/j.1365-2168.1999.00971x. PMID: 10027359.
20. Milewczuk M, Michalik M, Ciesielski M. A prospective, randomized, unicenter study comparing laparoscopic and open treatments of acute appendicitis. *Surg Endosc*. 2003 Jul;17(7):1023-8. doi: 10.1007/s00464-002-9112-3. Epub 2003 May 6. PMID: 12728377.

21. Upendra Kumar.et.al. "A Comparitive Study of Safety and Benfits In Between Laparoscopic Appendicectomy versus Open Appendicectomy." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 19(1), 2020, pp 29-32.
22. Heikkinen TJ, Haukipuro K, Hulkko A. Cost-effective appendectomy. Open or laparoscopic? A prospective randomized study. Surg Endosc. 1998 Oct;12(10):1204-8. doi: 10.1007/s004649900821. PMID: 9745057
23. Katkhouda N, Mason RJ, Towfigh S, Gevorgyan A, Essani R. Laparoscopic versus open appendectomy: a prospective randomized double-blind study. Ann Surg. 2005 Sep;242(3):439-48; doi: 10.1097/01.sla.0000179648.75373.2f. PMID: 16135930; PMCID: PMC1357752.