Original Research Article

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Comparative evaluation of laparoscopic versus open appendicectomy in cases of acute appendicitis

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ABSTRACT

Background: Conventional open appendicectomy is a common emergency surgical procedure being used for more than a century. Despite continuously increasing popularity of minimal access surgery, laparoscopic appendicectomy has not gained enough popularity.

Methods: A prospective randomized study to compare laparoscopic and open appendicectomy for the treatment of appendicitis was carried out from April 2015 to October 2016. Thirty patients each were randomized to two groups. Decision to operate was taken on clinical grounds.

Results: Twenty-five patients in each group were confirmed to be suffering from appendicitis. While alternative diagnosis could be established in 4 out of remaining 5 patients in laparoscopic group, in only 1 out of 5 patients from open appendicectomy definitive diagnosis for pain could be established. There was no significant difference in operative time between two groups. Patients in laparoscopic group had lesser postoperative pain scores and wound complications. They also got discharged and returned to normal activity earlier than those in open appendicectomy group.

Conclusions: Laparoscopic appendicectomy has lesser postoperative morbidity and improves diagnosis in nonappendicitis patients.

Keywords: Appendicitis, Laparoscopic appendicectomy, Open appendicectomy

INTRODUCTION

Appendicitis is a common surgical emergency. Appendicectomy is standard treatment for appendicitis. Since its introduction by McBurney in 1894 open appendectomy has been a safe and reliable surgical technique to treat acute appendicitis.¹

Laparoscopic appendicectomy was first described by Semm K.² First large study of laparoscopic appendectomies was reported by Pier et al.³ Laparoscopic appendicectomy was described earlier than Laparoscopic

cholecystectomy, still it did not get the same widespread acceptance. Role of laparoscopic appendicectomy for the treatment of acute appendicitis is still not clearly defined. Studies done so far have given mixed results. some favouring one or the other technique. A study at Israeli Hospital favoured open appendicectomy over laparoscopic approach but another study published in American journal of surgery is in favour of laparoscopic approach.^{4,5}

The aim of this study was to evaluate comparatively laparoscopic and conventional "open" appendectomy in

the treatment of acute appendicitis regarding various intra operative and post-operative parameters.

METHODS

With the aim of evaluating comparatively laparoscopic and conventional "open" appendectomy in the treatment of acute appendicitis this prospective randomized study was carried out. This study was carried out in Department of Surgery. Santosh Medical College during the period of April 2015 to October 2016. Total of 60 patients were randomized to open or laparoscopic appendicectomy, 30 in each group. Randomization was carried out by picking the sealed envelope. Patients between 18 to 60 years of age who were clinically diagnosed to be suffering from acute appendicitis & planned to undergo appendicectomy were included in the study. Informed consent was taken from all patients. Patients with generalized peritonitis, more than three days old history, appendicular lump, unfit to undergo laparoscopic procedure due to cardiorespiratory illness were excluded from the study.

Various parameters studied for comparative evaluation included;

• Intra operative parameters like duration of surgery, complications, difficulties, ability to diagnose other conditions

• Post-operative parameters like pain, requirement of pain medications, wound complications, hospital stay, any other complications, cosmetic outcome.

All the data was noted as per the detailed proforma designed for the purpose. This data was entered in MS (excel) and analysis was carried out using SPSS 17. Students t test and chi square tests were used.

Open appendicectomy was carried out through Grid iron or Rutherford Morrison incision as per requirement. Laparoscopic appendicectomy was carried out using three ports i.e. umbilicus, suprapubic and right iliac fossa. Camera was placed through suprapubic port.

RESULTS

Majority of patients in both groups were in 15-25-years age group. There was no significant difference between patients in two groups regarding age and gender distribution. 76.7% (23/30) patients in open and 63.3% (19/30) patients in laparoscopic group had modified Alvarado score \geq 7. Decision to operate was made on the basis of clinical grounds. USG was used according to the need and availability at that time. Twenty-one patients in open and twenty-two patients in laparoscopic group underwent preoperative USG of abdomen.

Table 1	l: Comparative	evaluation of	intraoperative	parameters i	n two groups.

	Open Group (N=30)			Lap Group (N=30)			Devolue	
I/O findings	Number		%	Number		%	r value	
Acute Appendicitis	24	25	80.0	23	25	76.7		
A.A. + other diagnosis	1	23	3.3	2	23	6.67%	0.6 NS	
Alternative diagnosis	1	5	3.3	4	5	13.3		
No finding	4	3	13.4	1	3	3.3		
Intra-operative difficulty/	10		33.3	9		30.0	0.25NS	
adverse finding	10		55.5	/		50.0	0.23110	
Duration of Surgery	71 2+8 6		68.8±7.8			0.4 NS		
(in minute) Mean±SD	/1.2±0.0					0.4145		

Duration of surgery was calculated from the time of skin incision to closure of skin. Open appendicectomy took more time than laparoscopic appendicectomy but this small difference was statistically non-significant. Intraoperative difficulty/adverse findings i.e. presence of adhesions, edematous base, gangrenous appendix and inadequate space in laparoscopic cases were noted. Distribution of difficult cases regarding these findings was equitable in two groups. (Table 1) As is evident from Table 1 twenty-five cases in both groups were intraoperatively confirmed to have acute appendicitis alone or with additional diagnosis i.e. Meckel's diverticulum, significant mesenteric lymphadenopathy. Patients in laparoscopic group had significantly less pain in post-operative period than those in open group although there was no significant difference in need of extra analgesic (Table 2). Patients in laparoscopic group had shorter hospital stay, moved bowels earlier and resumed normal work earlier than open group. Wound complications were significantly less in laparoscopic group compared to open group. There was no significant difference between the groups regarding other complications. One patient in open appendicectomy group developed intraabdominal collection postoperatively which was treated with parenteral antimicrobial therapy.

None of the patient in either group required reexploration. At 12 weeks follow up patients were asked to grade the cosmetic outcome of their surgery. Patients in laparoscopic group graded it better than those in open group.

		Open grou	ıp (N=30)	Lap group	• (N=30)	P value
	DOS*	7.0±1.1		6.0±1.1		0.001
Post-op pain VAS score (Mean±SD)	POD [#] 1	3.9±1.0		3.0±1.3		0.003
	POD [#] 2	1.7±0.9		1.4±0.9		0.02
Duration of hospital stay (Mean±SD)	In days	3.1±0.5		1.9 ± 0.8		0.05
Return to normal activity (Mean±SD)	In days	16.1±4.2		9.5±2.1		0.01
		Number	Percentage	Number	Percentage	
Post operative howel motion	1-2 days	22	73.3	28	93.3	0.03
Post-operative bower motion	>2 days	8	26.7	2	6.7	
Requirement of extra analgesic	Yes	7	23.3	3	10.0	0.29
Post-op complication	All (Wound)	11 (6)	36.7 (20.0)	5 (2)	16.7 (6.7)	0.04
	Very good	9	30.0	23	76.7	0.002
Post on according (at 12 weaks)	Good	13	43.4	4	13.4	
Post-op cosmesis (at 12 weeks)	Satisfactory	6	20.0	2	6.6	
	Poor	2	6.6	1	3.3	

*DOS - Day of surgery, #POD - Post-operative day

DISCUSSION

Around 60% participants in both groups were in 15 to 25 years age range which shows that study involved more participants from younger age group. This data concurs with well accepted fact that appendicitis is the disease of young age group. Distribution of patients regarding age and gender was equitable in both groups.

Decision making in patients with acute appendicitis poses a diagnostic challenge. Globally accepted treatment of acute appendicitis is surgical i.e. appendicectomy, which can be difficult to differentiate from many conditions amenable to non-surgical treatment. In the present era of evidence based medicine this fact makes it important to try to make correct diagnosis of acute appendicitis as much correctly as possible. Many scoring systems have been described for making diagnosis of acute appendicitis.⁶ We used Modified Alvarado scoring system. 76.7% of open and 63.3% laparoscopic appendicectomy group of patients had Modified Alvarado Score (MAS) \geq 7.

Literature is divided over efficacy of these scoring systems, some studies found them very accurate while others found them ineffective.^{7,8} But these scoring systems are only helpful aids especially in typical cases. But in atypical cases and young females (with high possibility of confounding pelvic pathology) additional measures i.e. USG and laparoscopy have been suggested. USG also has limitations like operator dependence, availability and technique related inherent limitations. In this study, also 9 and 8 patients respectively in open and

laparoscopic group did not undergo pre-operative USG abdomen.

appendicectomy Many cases with negative go undiagnosed even after surgery due to limited area of exploration in conventional open appendicectomy. In our study five patients in each group underwent negative appendicectomy. While in 80% (4/5) of these patients in laparoscopic group an alternative diagnosis was established, in contrast only 20% (1/5) of these patients in open appendicectomy group could be definitely diagnosed. Another patient in laparoscopic group was found to be suffering from tuberculosis. In this patient peritoneal biopsy only was taken. Since no appendicectomy was performed, this patient was excluded from the study and another patient was enrolled to laparoscopic group. This young girl was saved from an unnecessary incision of open appendicectomy and a definite diagnosis of abdominal tuberculosis was established. Ability to explore whole abdomen and make a definite diagnosis by laparoscopy is a significant advantage in a condition like appendicectomy, in which as high as 20-40% negative appendicectomy rates have been described.⁹ Laine et al in a study in young fertile women were able to obtain a definite diagnosis in 96% of patients undergoing laparoscopic appendicectomy compared with only 72% of those undergoing open procedures.10

In this study, there was no significant difference in duration of surgery by open and laparoscopic technique. This observation is consistent with an Italian study by Minutolo et al.¹¹ Although some studies have reported longer time taken by laparoscopic technique.¹²

Patients in laparoscopic group had significantly lesser pain on all observed days in post-operative period. Shaikh et al, reported lesser analgesic requirement following laparoscopic appendicectomy.¹³ Li et al in a meta-analysis also reported similar findings. Subgroup analysis by them revealed decreasing difference between post laparoscopic and open appendicectomy pain in studies after year 2000 as compared to pre-2000 era. They attributed this finding to trend of using smaller incision for open appendicectomy resulting in lesser abdominal wall trauma.¹⁴

In present study patients in laparoscopic appendicectomy group moved bowels earlier, returned to their normal activity earlier and stayed in hospital for shorter duration postoperatively as compared to open appendicectomy group. All these differences were statistically significant. Literature is divided about effect of laparocopic appendicectomy on these parameters. Islam and Pasha et al in a Bangladeshi study of 763 appendicectomies also noted these advantages of laparoscopic appendicectomy over open appendicectomy.¹⁵ A retrospective analysis by Biondi et al noted similar beneficial effects of laparoscopic appendicectomy.¹⁶ A large meta-analysis of 7618 laparoscopic 43757 open appendicectomies also shorter hospital stay after laparoscopic found appendicectomy.¹⁷ But an Indian study in 2016 and an American study of 2005 found no advantages of Laparoscopic appendicectomy regarding these factors.^{18,19} This non-consistent beneficial effect of laparoscopy appendicitis in in contrast to cholecystectomy could be due to the fact that appendicitis is an acute abdominal illness with varying degrees of severity ranging from just mucosal inflammation to gangrenous, perforated appendix with peritonitis. Thus, recovery from surgery as well as postoperative pain is only partly dependent on trauma inflicted by surgical process. Disease related inflammatory process also having significant effect on these parameters depending on severity. Laparoscopy can only decrease surgical trauma thus likely to have more apparent beneficial effect in mild appendicitis. Since our sample size was small we did not do separate analysis of severe cases.

Study noted much more postoperative complications in open appendicectomy group than laparoscopic group. This difference was mainly due to much higher rate of wound infection (6/30) in open appendicectomy group than in laparoscopic appendicectomy (2/30) group. Postoperative complications in this study were mostly minor complications, none requiring reoperation. Only one patient in open appendicectomy group developed pelvic collection which was managed by readmission and parenteral antibiotics. Study finding of higher wound infection rate in open appendicectomy is consistent with many other studies.^{17,20-23} Larger surgical wound and inflamed appendix being removed directly through wound may be responsible for higher wound infection rate in open appendicectomy. Many studies however found no difference in wound infection rate between two modalities.^{24,25} Study did not notice any significant postoperative intraabdominal collections. Only one such case was in open appendicectomy group. Use of adequate saline irrigation and suction in severe cases of laparoscopic appendicectomy may be helpful in reducing incidence of postoperative collections.

Patients undergoing laparoscopic appendicectomy in our study reported cosmetic outcome of their surgery much better than those who underwent open appendicectomy. Better cosmetic outcome is important as appendicitis is predominantly disease of young.

CONCLUSION

Laparoscopic appendicectomy is associated with lesser postoperative pain, earlier return to activity, shorter hospital stays, decreased rate of wound infections. Due to wider abdominal exploration provided it improves rate of definitive diagnosis and should be preferred modality especially in young females and where diagnosis is doubtful.

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REFERENCES

- 1. McBurney C. The incision made in the abdominal wall in cases of appendictis, with a description of a new method of operating. Ann Surg. 1994;20:38-43.
- 2. Semm K. Endoscopic appendectomy. Endoscop. 1983;15:59-64.
- 3. Pier A, Gotz F, Bacher C. Laparoscopic appendectomy in 625 cases: from innovation to routine. Surg Laparosc Endosc. 1991;1:8-13.
- Khalil J, Muqim R, Rafique M, Khan M. Laparoscopic versus open appendectomy: A comparison of primary outcome measures. Saudi J Gastroenterol. 2011;17:236-40.
- Ortega AE, Hunter JG, Peters JH, Swanstrom LL, Schirmer B. Laparoscopic appendectomy study group. A prospective, randomized comparison of laparoscopic appendectomy with open appendectomy. Am J Surg. 1995;169(2):208-13.
- 6. Ohmann C, Yang Q, Franke C. Diagnostic scores for acute appendicitis. Abdominal pain study group. Eur J Surg. 1995;161:273-81.
- Macklin CP, Radcliffe GS, Mere JM, Stringer MD. A prospective evaluation of the modified Alvarado score for acute appendicitis in children. Ann R Coll Surg Engl. 1997;79:203-5.
- 8. Kanumba ES, Mabula JB, Rambau P, Chalya PL. Modified alvarado scoring system as a diagnostic

tool for acute appendicitis at Bugando Medical Centre, Mwanza, Tanzania. BMC Surg. 2011;11:4.

- Van Randen A, Bipat S, Zwinderman AH, Ubbink DT, Stoker J, Boermeester MA. Acute appendicitis: meta-analysis of diagnostic performance of CT and graded compression US related to prevalence of disease. Radiol. 2008;249:97-106.
- Laine S, Rantala A, Gullichsen R, Ovaska J. Laparoscopic appendectomy: is it worthwhile? A prospective, randomized study in young women. Surg Endosc. 1997;11:95-7.
- 11. Minutolo V, Licciardello M, Stefano BD, Arena M, Arena G, Antonacci V. Outcomes and cost analysis of laparoscopic versus open appendectomy for treatment of acute appendicitis: 4-years' experience in a district hospital. BMC Surg. 2014;14:14.
- 12. Katkhouda N, Mason RJ, Towfigh S, Gevorgyan A, Essani R. Laparoscopic versus open appendectomy a prospective randomized double-blind study. Ann Surg. 2005;242:439-50.
- Shaikh AR, Sangrasi AK, Shaikh GA. Clinical outcomes of laparoscopic versus open appendectomy. JSLS. 2009;13:574-80.
- Li X, Zhang J, Sang L, Zhang W, Chu Z, Li X, et al. Laparoscopic versus conventional appendectomy- a meta-analysis of randomized controlled trials. BMC Gastroenterol. 2010;10:129.
- Islam SR, Pasha K, Rahman S, Nasir E, Hanif E, Barman A. Laparoscopic vs open appendectomy: a comparative study. Bangladesh J Endosurg. 2014;2(1):5-8.
- Biondi A, Stefano CD, Ferrara F, Bellia A, Vacante M, Piazza L. Laparoscopic versus open appendectomy: a retrospective cohort study assessing outcomes and cost-effectiveness. World J Emerg Surg. 2016;11:44.
- 17. Guller U, Hervey S, Purves H, Muhlbaier LH, Peterson ED, Eubanks S, et al. Laparoscopic versus open appendectomy outcomes comparison based on

a large administrative database. Ann Surg. 2004;239(1):43-52.

- Karatparambil A, Kummankandath SA, Mannarakkal R, Nalakath MR, Babu D. Laparoscopic versus open appendicectomy: a comparative study. Int Surg J. 2016;3(1):128-34.
- 19. Katkhouda N, Mason RJ, Towfigh S, Gevorgyan A, Essani R. Laparoscopic versus open appendectomy a prospective randomized double-blind study. Ann Surg. 2005;242:439-50.
- 20. Sauerland S, Lefering R, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database Syst Rev. 2004;18:CD001546.
- Khan MN, Fayyad T, Cecil TD, Moran BJ. Laparoscopic versus open appendectomy: the risk of postoperative infectious complications. JSLS. 2007;11:363-7.
- 22. Merhoff AM, Merhoff GC, Franklin ME. Laparoscopic versus open appendectomy. Am J Surg. 2000;179:375-8.
- Golub R, Siddiqui F, Pohl D. Laparoscopic versus open appendectomy: a meta-analysis. J Am Coll Surg. 1998;186:545-53.
- 24. Klingler A, Henle KP, Beller S. Laparoscopic appendectomy does not change the incidence of postoperative infectious complications. Am J Surg. 1998;175:232-5.
- 25. Temple LK, Litwin DE, Mcleod RS. A metaanalysis of laparoscopic versus open appendectomy in patients suspected of having acute appendicitis. Can J Surg. 1999;42:377-83.

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