

## A Comparative Study of Laparoscopic Versus Open Appendectomy

Basher A. Abdul- Hassan

### ABSTRACT:

#### BACKGROUND:

Laparoscopic appendectomy has gained popularity in recent years and has become one of the most widely performed procedures. However, it is not the universal gold standard as laparoscopic cholecystectomy for acute cholecystitis. This is, perhaps, 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

#### OBJECTIVE:

To compare the results of open with laparoscopic appendectomy in terms of postoperative pain, rate of wound infection and hospital stay.

#### PATIENTS & METHODS:

This study was conducted in Al- Kadhmyia teaching hospital, over a period of six months from the 1<sup>st</sup> of October 2009 to the 1<sup>st</sup> of April 2010. Patients undergoing surgery for acute appendicitis were randomly assigned into one of the two groups (A or B) after obtaining written and informed consent. In Group-A patients underwent open appendectomy and in Group B laparoscopic appendectomy was performed. Post operatively pain chart, days of hospital stay and wound infection was recorded.

#### RESULT:

Sixty patients (38 male, 22 female), with clinical diagnosis of acute appendicitis based on Alvarado score of six and above, were included in the study. They were randomized into 2 groups of A and B with 30 patients in each group. Group-A comprised open appendectomy procedure and Group-B comprised laparoscopic appendectomy. Comparison of postoperative pain by visual analogue scale was significantly low in Group B, compared with Group A, on day 0, 1 and 2. Number of days in Hospital was  $4.1 \pm 0.8$  days in Group A and  $1.5 \pm 0.06$  days in Group B. None of the patients in Group B, while 8 (26.67%) patients in-Group A, developed postoperative wound infection at 1 week follow up.

#### CONCLUSION:

Laparoscopic appendectomy is safe and effective. Postoperative pain, hospital stay and wound infection were significantly lower after this mode of surgery.

**KEY WORDS :** laparoscopic appendectomy, open appendectomy, post-operative pain , post-operative wound infection.

### INTRODUCTION:

Appendectomy is one of the commonly performed procedures in General surgery. McBurney described the operative technique for right iliac fossa pain using Gridiron incision in 1894. This remained the technique for appendicectomy and did not change much until almost a century later, when in 1983, Semm described the first Laparoscopic appendectomy. (1, 5).

Laparoscopic appendectomy for suspected appendicitis is considered safe and effective.<sup>(6,7)</sup> It has gained popularity in recent years and has become one of the most widely performed

procedures using the laparoscope globally.<sup>(8)</sup> However, it has not become the universal gold standard for acute appendicitis as laparoscopic cholecystectomy has become for acute cholecystitis. This is, perhaps, mainly 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. In the third world countries, cost of equipment is an additional factor among those mentioned above.

This prospective study was conducted to compare the results of open appendectomy with laparoscopic appendectomy in terms of postoperative pain, rate of wound infection and hospital stay, reflecting on early return to work,

Department of General Surgery, Al-Nahrain University, College of Medicine.

## LAPAROSCOPIC VERSUS OPEN APPENDECTOMY

---

to justify the increase in apparent cost of procedure.

### **PATIENTS AND METHODS:**

Between 1<sup>st</sup> October 2009 and 1<sup>st</sup> April 2010 (six months) all patients admitted in the surgical unit with right lower quadrant pain were evaluated with the Alvarado score for appendicitis. Those who scored six or above were diagnosed as acute appendicitis, consented for enrollment in the study and were alternatively assigned to group A or B. Group A comprised of patients that underwent open appendectomy while Group B included laparoscopic appendectomy. All patients were informed about the nature of the study and the possibility of conversion to open in case of laparoscopic group. Patients who did not want to undergo the procedure assigned to them were excluded from the enrolment process. Also, the patients whose diagnosis was unclear had a palpable lump in abdomen and /or Alvarado score at admission was less than 6 were not included.

Same surgical team performed the procedures and maximum precaution was taken to use similar techniques in all patients within each group. Use of analgesia, general and local anesthetic agents was also kept similar for all patients.

Antibiotics were given according to the department protocol (Cefotaxime sodium 1gm and Metronidazole 500mg intravenous in single preoperative and two postoperative doses). Patients found to have gangrenous or perforated appendicitis during surgery were treated with continuation of antibiotics for 5days.

Postoperative pain control for both groups was achieved by, NSAIDS (Diclofenac sodium suppository 50mg ) at the end of procedure followed by oral analgesic (Mefinemic acid). Intravenous or intramuscular analgesics were used if needed. Hours before oral intake of liquids and solids were initiated were also noted. Total number of days in Hospital was calculated and patients received verbal instructions to return to normal activity after discharge. First follow-up was done on seventh postoperative day for suture removal and wound assessment.

### *Statistical Analysis*

Frequency and percentage were computed for categorical variables like sex, operative finding

of appendix, postoperative pain and wound infection for Group A and B.

Mean and standard deviation were estimated for quantitative variables like age, duration of surgery, postoperative oral intake of liquid and solid diet, pain score on visual analogue scale (VAS) and number of days in Hospital.

Independent sample t-test was applied to compare mean difference between group A and B for age, time of surgery, postoperative intake, pain score (VAS) and hospital stay.

Chi square test was used to compare proportion difference between group A and for wound infection. P-value of less than 0.05 was considered significant for the difference.

Patients were informed about the study prior to commencing data collection and their approval to participate was taken.

### **RESULTS:**

Sixty patients with clinical diagnosis of acute appendicitis were randomized into groups A and B, with 30 patients in each group. Group-A patients underwent open appendectomy while patients in Group-B had laparoscopic appendectomy. Patients in the two groups were comparable with regard to their age, sex and clinical features of acute appendicitis (Tables-1). Migratory right iliac fossa pain and tenderness were common clinical features, followed by anorexia; nausea and elevated temperature (83%, 100%, 66%, 61%, 60% subsequently).

The mean operative time in Group A was significantly shorter ( $P=0.0001$ ) than Group B patients (Table-1). Oral liquids were started after  $10.4\pm 2.3$  hours of surgery in open group which was significantly longer ( $P=0.001$ ) than the laparoscopic group ( $6.6\pm 1.3$  hours). Similarly, the laparoscopic group initiated solid diet much earlier than the open group.

Use of postoperative analgesics, both injectable as well as oral, and antibiotics was significantly less in the laparoscopic group (Table 1). Comparison of postoperative pain by visual analogue scale, was significantly low in Group B, compared with Group A, on day 0, 1 and 2 (Table-2).

The hospital stay was  $4.1\pm 0.8$  days in Group A and  $1.5\pm 0.06$  days in Group B ( $P=0.001$ ). None of the patients in Group B while, 8 (26.67%) patients in Group A developed postoperative wound infection at 1 week follow up.

## LAPAROSCOPIC VERSUS OPEN APPENDECTOMY

**Table 1: Variables in groups A & B with p-values**

	Open Group A n = 30	Laparoscopic Group B n = 30	P - value
Age Distribution (years) Mean $\pm$ SD	25.8 $\pm$ 3.5	26.5 $\pm$ 4.2	P=0.485*
Sex Distribution			
Male	20	18	0.75
Female	10	12	0.67
Duration of Surgery (minutes) Mean $\pm$ SD	39.6 $\pm$ 5.6	51.8 $\pm$ 7.8	0.0001
Initiation of post-op. liquid intake (hours) Mean $\pm$ SD	10.4 $\pm$ 2.3	6.6 $\pm$ 1.3	0.001*
Initiation of post-op. solid intake (hours) Mean $\pm$ SD	15.4 $\pm$ 1.8	8.8 $\pm$ 1.9	0.02*
Intravenous analgesics (no. of doses) Mean $\pm$ SD	2.8 $\pm$ 1.2	1.5 $\pm$ 0.4	0.0001
Oral analgesics (no. of doses) Mean $\pm$ SD	5.9 $\pm$ 1.3	2.7 $\pm$ 0.7	0.0001
Antibiotics	6 post-op. Doses	2 post-op. doses	
Hospital stay (days) Mean $\pm$ SD	4.1 $\pm$ 0.8	1.5 $\pm$ 0.06	0.001

**Table 2: Postoperative pain between open and laparoscopic appendectomy.**

Days	Time	Open Appendectomy (group A) n=30	Laparoscopic Appendectomy (group B) n=30	P-Values
		Pain score (VAS) Mean $\pm$ SD (Range)	Pain score (VAS) Mean $\pm$ SD (Range)	
Day 0	0900 hrs	-	-	-
	1300 hrs	-	-	-
	1800 hrs	7.5 $\pm$ 2.4 (6-9)	5.6 $\pm$ 2.1 (5-8)	0.0018
Day 1	0900 hrs	6.4 $\pm$ 1.3 (7-May)	4.5 $\pm$ 1.8 (4-6)	0.0001
	1300 hrs	5.8 $\pm$ 0.8 (4-6)	3.2 $\pm$ 0.6 (2-5)	0.0001
	1800 hrs	4.8 $\pm$ 0.6 (4-5)	3.1 $\pm$ 0.4 (3-4)	0.0001
Day 2	0900 hrs	4.6 $\pm$ 0.8 (4-5)	1.5 $\pm$ 0.6 (1-2)	0.0001
	1300 hrs	4.0 $\pm$ 0.9 (3-5)	0.8 $\pm$ 0.2 (0-1)	0.0001
	1800 hrs	2.3 $\pm$ 0.5 (2-3)	0.24 $\pm$ 0.03 (0-1)	0.0001

### DISCUSSION:

Appendectomy is the treatment of choice for acute appendicitis<sup>(9)</sup> and is by far the most commonly performed emergency abdominal operation.<sup>10</sup> Although, open appendectomy is considered a safe and effective operation for acute appendicitis with low morbidity, however, variability in the inflammatory process and the location of appendix at times causes operative difficulties. It has also been associated with potential disadvantages like post operative pain, wound sepsis & complications like intestinal obstruction which may delay recovery.<sup>(11)</sup> With the development of laparoscopic technique, it has emerged as a modus operandi for both diagnosis and treatment of acute appendicitis.<sup>(12)</sup> Studies have shown the procedure to be effective and

with improved cosmesis, reduced postoperative pain, days of hospitalization & early return to work.<sup>(13,17)</sup> Laparoscopic appendectomy was first reported in 1983 and has since been considered safe with high accuracy and complication rates as low as zero to 1.4%.<sup>(18,19)</sup> Besides, laparoscopy preserves the option of leaving a macroscopically normal appendix safely in place, it also allows localization of the area of inflammation, making it possible to plan an incision if converting to open appendectomy, gives a better view to examine other peritoneal and pelvic organs, minimizing the chances of negative appendicectomy and missing other pathologies.<sup>(20)</sup>

Laparoscopic appendectomy has shown to be

## LAPAROSCOPIC VERSUS OPEN APPENDECTOMY

both feasible & safe in randomized comparisons with open appendectomy<sup>(21)</sup>. One published report from Pakistan reviewed 20 patients undergoing the procedure & compared their results with same number of patients operated with open technique, they showed similar results as we have in our series<sup>(22)</sup>.

Analgesia requirement in the laparoscopic group was much less than in open group which is in line with studies performed in other setups<sup>(18,20)</sup>. There was significantly less number of postoperative complications in the laparoscopy group in this study. Others have reported infective complications after laparoscopic appendectomy to be around 20 % for gangrenous or perforated cases and 10% in simple acute appendicitis<sup>(6)</sup>.

Mean hospital stay was significantly less ( $1.5 \pm 0.06$  days) for laparoscopic group compared to open ( $4.1 \pm 0.8$  days) ( $P < 0.01$ ). The extended hospital stay in the open group may be attributed to delay in mobilization, initiation of oral diet and the psychological effect of having an incision. Other workers have not shown this difference.<sup>(22,23)</sup> The significant difference in our study can be an unintentional bias in favour of laparoscopic group.

A difference in the proportion of patients with perforated and gangrenous appendix in open group (3 of each in open while one of each in laparoscopic group) and a higher rate of postoperative complications, like wound infection that could be attributed to the bad condition of appendix to start with, in this group was noted. There is a possibility that since patients with unclear history and those who presented with generalized peritonitis were not included in the study, the sample of patients in this study has relatively less number of gangrenous and perforated cases compared to classical acute ones. This can be considered as a weakness of this study.

### CONCLUSION:

The data from our study shows that laparoscopic appendectomy is as safe and effective as open appendectomy with lesser postoperative analgesia requirement, hospital stay and wound infections.

### REFERENCES:

1. McBurney CN. The incision Made in the Abdominal Wall in Cases of Appendicitis, with a Description of a New Method of Operating. *Ann Surg* 1894;20:38-43.
2. Samelson SL, Reyes HM. Management of perforated appendicitis in children-revisited. *Arch Surg* 1987;122:691-6.
3. Editorial. A sound approach to the diagnosis of acute appendicitis. *Lancet* 1987;198:200.
4. Semm K. Endoscopic appendectomy. *Endoscopy* 1983;15:59-64.
5. Moberg AC, Berndrem F, Palmquist I, Petersson T, Resch T, Montgomery A. Randomised clinical trial of laparoscopic versus open appendectomy for confirmed appendicitis. *Br J Surg* 2005;92: 298-304.
6. Harrell AG, Licourt AE, Novitsky YW, Rosen MJ, Kuwada TS, Kercher KW, et al. Advantages of laparoscopic appendectomy in the elderly. *Am Surg* 2006;72:474-80.
7. Young JL, Law CM, Lo CY, Cam CM. A comparative study of routine laparoscopic versus open appendectomy. *JLS* 2006;10:188-92.
8. Sweeney KJ, Keane FB. Moving from open to laparoscopic appendectomy. *Br J Surg* 2003;20: 257-8.
9. Amir M, Raja MH. Timings for surgery of acute appendicitis. *J Coll Physicians Surg Pak* 2000; 10:295-7.
10. Fingerhut A, Millat B, Borrie F. Laparoscopic versus open appendectomy: time to decide. *World J Surg* 1999;23:835-45.
11. Hellberg A, Rudberg C, Kullman E, Enochrson L, Fenyog G, Graffner H, et al. Prospective randomized multicenteric study of laparoscopic versus open appendectomy. *Br J Surg* 1999;86: 48-53.
12. Seymour I, Schwartz editor, principles of surgery, 7th ed. United State of America: Mc graw hill 1999:1386.
13. Lin HF, Wu JM, Tseng LM, Chen K, Huang SH, Lai LR. Laparoscopic versus open appendectomy for perforated appendicitis. *J Gastrointest surg* 2006; 10: 906-10.
14. Manicini GJ, Mancini ML, Nelson HS Jr. Efficiency of laparoscopic appendectomy in appendicitis with peritonitis. *Am Surg* 2005; 71: 1-4.
15. Navarra G, Ascanelli S, Turini A, Carsoforo P, Tonini G, puzza E. Laparoscopic appendectomy versus open appendectomy in suspected acute appendicitis in female patients. *Ann Ital Chir* 2002; 73:59-63.
16. Utpal D. Laparoscopic versus open appendectomy in west Bengal, India. *Chin J Dig Dis* 2005; 6: 165-9.
17. Kamran H, Naveed D, Nazir A, Hameed M, Ahmed M, Khan U. The role of total leukocyte count in the diagnosis of acute appendicitis. *J Ayub Med Coll Abbottabad* 2008;20:70-1.

## LAPAROSCOPIC VERSUS OPEN APPENDECTOMY

---

18. Marzouk M, Khater M, Elsedak M, Abdelmoghny A. Laparoscopic versus open appendicectomy:a prospective comparative study of 227 patients. *Surg Endosc* 2003;17:721-4.
19. Nguyen NT, Zainabadi K , Mavandadi S, Paya M , Stevens C M, Root J, et al. Trends in utilization and outcomes of laparoscopic versus open appendectomy. *Am J Surg* 2004;188: 813-20.
20. Cox MR, McCall JL, Toouli J, Padbury RT, Wiison TG, Wattchon DA, et al. Prospective randomized comparision of open versus laparoscopic appendectomy in men. *World J Surg* 1996; 20:263-6.
21. Khalid K, Ahmad N, Farooq O, Anjum I, Sial GA. Acute appendicitis laboratory dependence can be misleading audit of 211 cases. *J Coll Physician Surg Pak* 2001;11:434-7.
22. Parveen S, Sarwar G, Saeed N, Channa GA .Laparoscopic versus open Appendectomy as an elective procedure. *Med Channel* 2007;13:18-20.
23. Utpal D. Laparoscopic versus open appendectomy: An Indian perspective. *J Minimal Access Surg* 2005;1:15-20.