

Original Article

Laparoscopic Versus Open Appendectomy: A Comparison of Primary Outcome

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Abstract:

Currently, laparoscopic appendectomy is widely practiced for the management of acute appendicitis. It is not clear whether open or laparoscopic appendectomy is more appropriate. Our aim was to compare the safety and the advantages of laparoscopic versus open appendectomy in a prospective study. 102 patients were participated in this study. The group 1 patients were subjected to laparoscopic appendectomy [LA], whereas the group 2 patients were subjected to open appendectomy [OA]. 46 patients included in LA group and 54 patients in OA group. The mean operative time for LA and OA was 84.4 (45-220) minutes and 59 (30-180) minutes respectively. Although LA was associated with a shorter hospital stay [LA-3.5 days versus OA-5 days] but duration of operation is prolong in LA than OA and the postoperative wound infection is significantly higher in OA than LA. LA is safe and superior to OA in respect to an early discharge, lesser postoperative pain; decreased post operative wound infection, early return to work and a better cosmetic scar.

Key words: Appendicitis, Appendectomy, Laparoscopy appendectomy, Open appendectomy.

Introduction:

Acute appendicitis is the most common indication for abdominal surgery with a life-time incidence between 7 to 9 percent^{1,2}. Appendectomy is one of the operations which are most commonly performed by the general surgeons. Open appendectomy (OA) has been the gold standard for the treatment of acute appendicitis since its introduction by Charles Mc Burney in 1894³. Unfortunately the diagnosis of acute appendicitis is often difficult, mainly clinical and always challenging. An accepted negative appendectomy rate for presumed appendicitis ranges from 15% to 20%, even higher in women of childbearing age (20% to 30%)^{4,5}.

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Laparoscopic appendectomy (LA) has evolved since the first performed by a German Gynaecologist Kurt Semm (1983)⁶. Laparoscopic appendectomy has gained acceptance as a diagnostic and treatment method for acute appendicitis with the technological advances of the past two to three decades. Since then, this procedure has been widely used. In spite of its wide acceptance, there remains a continuing controversy in the literature regarding the most appropriate way of removing the inflamed appendix.

Minimal access surgery has been proved to be a useful surgical technique. The application of the recent technology and skills can now provide a better and a cheaper choice of treatment. Despite a lot of randomized trials which have compared laparoscopic and open appendectomy, the indications for laparoscopy in patients with suspected appendicitis remains controversial and clinical trials comparing LA versus OA, a consensus concerning the relative advantages of each procedure has not yet been reached^{3,7-9}.

The present study was designed to compare the advantages of laparoscopic appendectomy over conventional open appendectomy. Regarding questions concerning the advantages and disadvantages of a laparoscopic approach in the treatment of acute appendicitis, establishing a comparative parallel study between laparoscopic and traditional appendectomy, giving priority to duration of surgery, post operative pain, morbidity and mortality evaluation and duration of hospital stay.

Materials and method:

This prospective study was conducted in the Department of Surgery, North East Medical College Hospital, Sylhet from March 2012 to February 2013. Patients age range from 18-60 years, with features which were suggestive of acute appendicitis, were included in the study. Patients with an appendix mass, peritonitis due to perforated appendix, abscess formation, previous lower abdominal surgery and associated large ventral hernia were excluded.

A detailed history of the patients was taken, and then physical examination, a complete blood count, urine examination and ultrasound of the whole abdomen were routinely performed in all the cases. The patients were explained about the risks and the benefits of the two procedures and their informed consent was obtained. All the patients were selected randomly divided into group 1 [LA] and group 2 [OA].

During the study period 150 patients were admitted with signs and symptoms of acute appendicitis and with indications for appendicectomy. From this 102 patients included into this study, 48 were assigned for laparoscopic approach; 54 were assigned for the traditional open technique; and 2 initially to the laparoscopic technique, were converted to the traditional open technique, due to the occurrence of adhesions, ruptured luetial cyst. Ultimately 46 patients included in LA and 56 in OA group. The patients were operated by two procedures, under general anaesthesia. Antibiotic prophylaxis consisted of ceftriaxone (1g) intravenously as a single dose at induction of anaesthesia and was utilized in both groups, continue postoperatively for one day then switch to oral cefixime (200 mg) continues as therapeutic purpose for 7 days in both group of patients.

The traditional (open) appendicectomy technique involved utilizing a McBurney's (grid iron) incision or a Lanz incision. Laparoscopic surgery was performed with standard three port technique placed (1) in the umbilical region with a (10 mm) optic, (2) in the left-side iliac fossa (10 mm), and (3) 2 cm above the pubis (5 mm), after having initiated pneumoperitoneum.

All the operative details were recorded. Per operative findings and other variables such as sex, age, duration of surgery, time of return of bowel sounds, peroperative and postoperative complications (wound infection, Seroma, paralytic ileus, post operative pain), and postoperative length of hospital stay were recorded. The data were analyzed by using the Statistical Package for Social Sciences (SPSS 16). Continuous variables such as age, hospital stay, and operative time were presented as mean \pm SD, while the categorical variables such as gender and post-operative complication were expressed as frequency and percentages by using a 90% confidence interval. The Student's t-test was used to compare the means of the continuous variables, while the categorical variables were compared by using the Chi-square or the Fisher's exact test as appropriate. A probability which was equal to or less than 0.05 [P<0.05] was considered as significant.

Results:

Base line characteristics of patients in both LA and OA group were similar (Table I). The mean operative time in LA group was 84.4 minutes; for the OA group, 59 minutes (p=0.039) operation times detected significant difference (Table II). There is significant difference between the open group and laparoscopic group in the incidence of acute appendicitis and but the findings of histologically normal appendix between two groups were insignificant (Table II). Post-operative pain analysis revealed that six hours after operation mean pain score is significantly higher in open group than laparoscopic group (p=0.037) (Table II). But pain score is insignificant after 12 and 18 hours after operation between OA and LA.

There is significant difference of return of bowel sound in first 12 and 24 hours following operation (Table II). Hospital stay was also significantly different in open versus laparoscopic group (Table II).

There were two intra-operative port site bleeding (right lower quadrant port) in the LA group, managed by diathermy coagulation and temporary all layers of abdominal wall suture. In LA group one patient developed mild surgical emphysema, resolved spontaneously. Wound or port site infection is significantly higher in open group (p=0.019). Mortality rate was "0" in both groups. Two patient in the LA group required conversion to open operation (Table IV).

Table-I: Base line characteristics of laparoscopic and open appendicectomy group

	Laparoscopic (No=46)	Open (No=56)	P value
Mean age (years)	29.8 \pm 5.2(18-55)	31.5 \pm 6.1(20-60)	0.245(n.s.)†
Male: female	17:29	35:21	<0.02(s)‡
Mean BMI	23.5 \pm 1.45		0.45(n.s.)†
ASA class			
I	38	50	>0.2 (n.s.) ‡
II	8	6	
No. attack			
Single	14	18	>0.2 (n.s.)‡
Multiple	32	38	
Preoperative WBC (thousand/cmm)	11.03 \pm 0.5		0.67 (n.s.)†

Values in the parentheses are range. \pm indicates standard deviation; n.s., not significant, s. significant, † student t test, ‡ chi square test.

Table II: Per-operative and post operative Clinical outcomes

Variables	Assigned LA	Assigned OA	P value
Mean operation time(min)	84.4 (45 -220)	59 (30 -180)	0.039(s)†
Preoperative pathology			
Acute appendicitis	37	49	0.004(s)‡
Alternate pathology	7	4	
Normal appendix	2	3	
Histologically normal appendix	9(19.5%)	7(12.5%)	0.2(n.s)‡
Postoperative pain score(mmVAS)			
6 hours after operation	32.57±7.55	36.25±9.25	0.037 (s)†
12 hours after operation	16.45±6.78	16.55±8.58	0.96(n.s)†
18 hours after operation	4.45±6.09	2.72±6.	0.11(n.s.)†
Bowel sound present			
12 hours after operation	39(85.9%)	28(50%)	0.0028(s)†
24 hours after operation	46(100%)	45(80%)	0.038(s)†
48 hours after operation	46 (100%)	56(100%)	0.0736(n.s.)†
Hospital stay(days)	3.9 (3 - 6)	5 (7 -14)	0.006(s)†

Values in the parentheses are range and percentage. ± indicates standard deviation; n.s., not significant, s. significant, † student t test, ‡, chi square test

Table-III: Alternate pathology detected peroperatively

Alternate pathology	Assigned to LA	Assigned to OA
Rt. Ovarian cyst	2	1
Sulphingitis	2	2
Adhesion	1	0
Ruptured luetine cyst	2	1

Table-IV: Complications

Complications	Laparoscopic group (n=62)	Open group (n=58)	P value
Port site bleeding	1	Not applicable	
Port site infection	2	9	0.019(S) €
Subcutaneous			
Emphysema	1	Not applicable	
Mortality	0	0	
Conversion to open	2	Not applicable	

S indicates significant, € Fisher's Exact test.

Discussion:

Laparoscopic Appendectomy (LA) is relatively a new procedure as compared to laparoscopic Cholecystectomy (LC). A lot of analysis being performed throughout the world regarding laparoscopic versus open appendectomy. Unlike LC, LA has not universally accepted as "Gold standard" because of controversy regarding exact benefit. Despite the high success rate of conventional appendectomy, the most important drawback is negative appendectomy rate, still in the range of 20% to 30%^{4,10}. Base line characteristics in both groups were same except (Table-I) predominant female sex in LA group. This is probably due to more consciousness of female patients regarding cosmetics and less pain explained during taking of informed consent.

Considering the variable of "surgery duration," McAnena et al¹³ and Schroder et al¹⁴ demonstrated that there is no statistically significant difference between the duration of laparoscopic appendectomy and open surgery. Attwood et al¹⁵ showed that, on average, 51 minutes were needed to complete an open procedure, while 61 minutes were needed to complete the laparoscopic approach. Our results demonstrated that open surgery was faster when compared to laparoscopy (59 minutes vs. 84.4 minutes). The difference is significant (p=0.079) with confirmation that a longer operative time is a disadvantage of the laparoscopic method.

Alternate pathology 9 in laparoscopic group and 7 in open group were histologically normal appendix. So the negative diagnosis is higher in LA group (19.5% versus 12.5%) though not significant statistically, p=0.273. This is due to removal of normal appendix detected along with concomitant other pathologies. There is strong suspicion that undetected pathology along with normal appendix left out in OA group.

Post-operative pain 6 hours after operation is significantly low in laparoscopic group (32.57±7.55 versus 36.25±9.25, p=0.037). But after 12 and 18 hours pain score is insignificant in both groups. During open operation muscle splitting is responsible for more pain. The present result is comparable to the result of Van LV et al⁴

Time to return of bowel sound is significantly lower in laparoscopic group (Table-III) are consistent with many studies^{4,5,18,20}. In laparoscopic surgery gut are not exposed to the external environment, there are minimum handling, and are the cause of minimum impairment of gut function.

Hospital stay is significantly low in LA group [3.9 days (3-6) vs. 5 days (7-14) p= 0.006]. The length of

hospital stay in present study is short, is similar to many others studies^{8,16,19,20}. Overall complication and "0" mortality shown in Table IV are comparable to many studies^{4,17,18,20}. Significantly low incidence of wound infection in LA (p= 0.019) is one the most important point in favor of LA. In LA appendix always removed in canula sheath or endo-bag. There is no question of contamination of wound. But in OA whatever may be the level of care always there is chance of wound contamination.

Follow-up was limited to the first 4 week postoperatively. The aim was to detect pain after operation, concomitant findings and early postoperative complications after hospital discharge.

Conclusion:

LA is safe and superior to OA in respect to an early discharge, lesser postoperative pain; decreased post operative wound infection, early return to work and a better cosmetic scar. So laparoscopic appendectomy should be the procedure of choice.

References :

1. Samelson SL, Reyes HM. Management of perforated appendicitis in children-revisited. *Arch Surg.* 1987; 122:691-696.
2. Editorial. A sound approach to the diagnosis of acute appendicitis. *Lancet.* 1987; i:198-200.
3. McBurney C. 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.
4. Van LV, Jose MV. Laparoscopic Versus Conventional Appendectomy. *Ann Surg.* 1993; 218(5):685-692.
5. Nana AM, Ouandji CN, Simoens C, Smets D, Mendes da Costa P. Laparoscopic appendectomies: results of a monocentric prospective and non-randomized study. *Hepatogastroenterology.* 2007; Jun, 54(76):1146-52.
6. Semm K. Endoscopic appendectomy. *Endoscopy.* 1983; 15:59-64.
7. Long KH, Bannon MP, Zietlow SP, et al. A prospective randomized comparison of laparoscopic appendectomy with open appendectomy: clinical and economic analyses. *Surgery.* 2001; 129:390-400.
8. Martin LC, Puente I, Sosa JL, Bassin A, Breslaw R, McKenney MG, Ginzburg E, Sleeman D. Open versus laparoscopic appendectomy. A prospective randomized. *Ann Surg.* 1995 September; 222(3):256-262.
9. Guller LU, Hervey S, Purves H, Lawrence H. versus Open Appendectomy: Outcomes Comparison Based on a Large Administrative Database. *Ann Surg.* 2004; 239(1):43-52.
10. David RF, Arden M, Thomas K, Patchen D. Has Misdiagnosis of Appendicitis Decreased Over Time? *JAMA.* 2001;1748-1753.
11. Ates O, Hakgiider G, Olguner M, Akgiir FM. Single-port laparoscopic appendectomy conducted intracoreally with the aid of a transabdominal sling suture. *J Pediatr Surg.* 2007; Jun, 42(6):1071-4.
12. Konstadoulakis MM, Gomatos IP, Antonakis PT, Manouras A, Albanopoulos K, Nikitear N, Leandros E, Bramis J. Twotrocar laparoscopic-assisted appendectomy versus conventional laparoscopic appendectomy in patients with acute appendicitis. *J Laparoendosc Ady Surg Tech A.* 2006; Feb, 6(1):27-32.
13. McAnena OJ, Austin O, Fitzpatrick J. Laparoscopic vs open appendectomy: a prospective evaluation. *Br J Surg.* 1992; 79:818-820.
14. Schroder DM, Lathrop JC, Lloyd LR, et al. Laparoscopic appendectomy for acute appendicitis: is there really any benefit? *Am Surg.* 1993; 59:541-547.
15. Attwood SEA, Hill DK, Stephens RB. A prospective randomized trial of laparoscopic versus open appendectomy. *Surgery.* 1992; 112:497-501.
16. Omer A, Thanos A, Paris P, Sanjay P, James H, Vitali M, Paraskevas P, Ara D. Laparoscopic Versus Open Appendectomy in children- A Meta-Analysis. *Ann Surg.* 2006; January, 243(1): 17-27.
17. Utpal D. Laparoscopic versus open appendectomy in west Bengal, India. *Chinese Journal of Digestive Disease.* 2005; 6(4): 165-169.
18. Richard CF, John WR, Richard ES, Samuel KS, John CH, Randall WS, Monford DC, Blake H. A prospective Randomized trial Comparing Open Versus Laparoscopic Appendectomy. *Ann Surg.* 1994; 219(6):725-731.
19. Mutafa K, Khalid HQ. Laparoscopic versus open appendectomy. *Pakistan J. Med. Res.* 2003; 43(1):15-9.
20. Namir K, Rodney JM, ShirinT, Anna G, Rahila E. Laparoscopic versus Open Appendectomy A Prospective Randomized Double-Blind Study. *Ann Surg.* 2005; Sep, 242(3):439-450.