ORIGINAL ARTICLE

Efficacy and Safety of Laparoscopic Appendectomy for Complicated Appendicitis in Children in Tertiary Care Hospital

Md.Anisuzzaman[1], ASM Anwarul Kabir[2], Md. Atiqur rahman Ibne Sadiq[3], Md. Abdul Matin[4], Imtiaz Ahmed[5],Md.Burhan Uddin Khan[6], Tahir Hossain[7]

Abstract:

Laparoscopic appendectomy for uncomplicated appendicitis is associated with good outcomes but the role of laparoscopy in complicated appendicitis is more controversial because of high incidence of infectious complications. The aim of this current study is to evaluate the efficacy and safety of laparoscopic appendectomy in complicated appendicitis in children.This interventional study was carried out during the period from January 2015 to May 2018 in Holy Family Red Crescent Medical College Hospital.The study included 43 patients, age ranges from 3 years to 15 years who underwent laparoscopic appendectomy for complicated acute appendicitis. The following variables were analyzed : age, sex, operative findings, operative time, return of bowel function, resumption of oral feeds, length of hospital stay, postoperative complications such as ileus, wound infection and intraabdominal abscess etc. The mean age of studied cases was 7.1 years. In 41 patients (95.3%) the procedure was completed laparoscopically. Two (4.7%) patients required conversion to open appendectomy. The operative time was 83.5±25.8 minutes. Two patients (4.6%) had post-operative ileus. Four patients (9.7%) developed superficial wound infection.Three patients (7.3%) developed intra-abdominal collections. One (2.4%) patients were readmitted because of recurrent abdominal pain One patients(2.4%) developed postoperative pyrexia due to pneumonitis and Three patients (7.3) developed gastroenteritis. The mean length of hospital stay was 5.8±2.1 days. No mortality was recorded.Laparoscopic appendectomy can be the first choice for cases of complicated appendicitis in children. It is a feasible, safe procedure and is associated with acceptable post-operative morbidity with rapid recovery and better cosmetic results.

1. Associate Professor and Head, Department of Paediatric surgery, Holy family Red Crescent medical College Hospital, Dhaka
2. Registrar, Department of Surgery, Holy family Red Crescent medical College and Hospital, Dhaka
3. Assistant Professor, Department of Paediatric surgery, Holy family Red Crescent medical College and Hospital, Dhaka
4. Associate Professor, Department of Anesthesiology, Holy family Red Crescent medical College and Hospital, Dhaka
5. Professor, Department of Surgery, Holy family Red Crescent medical College and Hospital, Dhaka
6. Professor, Department of Surgery, Holy family Red Crescent medical College and Hospital, Dhaka
7. Medical Officer, Department of Surgery, Holy family Red Crescent medical College Hospital, Dhaka

Introduction:

Childhood acute appendicitis is one of the most common conditions that pediatric general surgeons treat[2.3.4.7-11,16]. About one third of appendicitis cases in children younger than 18 involve a perforated or ruptured appendix [2,4,5,7,9,13]. That causes fluid to spill into the peritoneal cavity, increasing risk for infection and other complications. With a perforated appendix, the perforation isn't the problem. It's all the spillage that has spread around the peritoneal cavity. It is generally accepted that younger ages are more susceptible to complications[1,3,5]. The high frequency of complications (perforation,gangrene,abscess formation,pelvic abscess formation) is essentially due to recurrent delayed diagnosis in young children because of their inability to communicate and the high rate of benign pediatric digestive disorders[2,3,7].For a long time, open appendectomy (OA) was the conventional procedure for appendicitis but laparoscopic appendectomy (LA) has gained popularity among pediatric surgeons since its introduction in 1992 [3,4,7,8,9]. Many published series have reported that LA is superior to OA in uncomplicated appendicitis,especially in terms of reduced postoperative pain, short hospital stay, rapid return to physical activity, better cosmetic results, and lesser incidence of wound complications[4–9].Several studies in the past have assessed the role of laparoscopy in complicated appendicitis but the results are controversial. Moreover, compared with OA, LA needs higher technical skills, longer operative time,and is associated with a higher incidence of intra-abdominal collections [10–13]. More recent studies have reported the safety and feasibility of this pro-cedure in complicated appendicitis, with low incidence of infectious complications[14,15,16].The aim of current study was to evaluate the efficacy and the safety of LA regarding postoperative morbidity in children age ranges from 3 to 15years with complicated appendicitis.

Materials and methods:

This study was carried out during the period from January 2015 to May 2018 in single medical institutions.(Holy Family red crescent Medical College Hospital)

The study included 43 patients age ranges from 3 years to 15 years who were admitted to the paediatric surgery department and underwent LA for complicated acute appendicitis. Surgical consent was taken from all parents of patients before undergoing LA.Complicated appendicitis in this study was defined as acute appendicitis in which perforation and or gangrene formation with purulence or fecalith in the abdominal cavity or an intra-abdominal or pelic abscess was needed. We identified the complicated cases on the basis of operative findings. Patients with noncomplicated appendicitis and appendiceal masses confirmed on imaging or peroperative findings were excluded from the study.All patients received preoperative intravenous

anti-biotics (cephalosporin,Metronidazole and amikacin). All cases made LA under general anesthesia, with endotraceal intubation. A Foley catheter and a nasogastric tube were used but not routinely in all childrens.LA was performed using a two-handed, three-trocar technique. The 10 mm umbilical port was introduced using the open technique. The CO2 insufflation was initiated at a pressure of 8–10 mmHg. Two 5-mm trocars were then placed in the lower-left quadrant and suprapubically under direct vision. The appendix was dissected and the mesoappendix cauterized using a bipolarpolar diathermy attached to either a hook or grasping forceps. The appendicular base was ligated using a pretied handmade Vicryl 2/0 suture in an extracorporeal or clipped by haemolock. The appendix was divided above the knot and

extracted immediately through the port in the left quadrant. Interloop adhesions were released and the pus cavity was drained when encountered. Suction/irrigation was carried out using sufficient saline solution till the aspirate became clear.Closed tube drain was not routinely used and was placed only when deemed necessary. All appendix specimens were sent for histopathological examinations.After surgery, intravenous antibiotics (cefotaxime 100 mg/kg/24 h and metronidazole 30 mg/kg/24 h,amikacin 15 mg/kg/24 h) were given. Analgesia was achieved with intravenous/ rectal paracetamol for the first and second postoperative days. Oral intake was started as soon as patients could tolerate it and when the bowel function was restored .Patients were discharged after remaining afebrile for 24 hand after they could tolerated normal diet and exhibited a decrease in the white blood cell count to the normal level.The patients were followed up in the outpatient clinic at 1 week, 2 weeks, and at 1 month intervals for 3 months.

Postoperative complications were recorded during hospitalization and the follow-up period. Post-operative ileus was defined as a delay in return of bowel function of more than 48 h. Surgical site infection, erythema, or localized wound collection were treated by antibiotics or surgical drainage. Intra-abdominal collections following appendectomy were diagnosed by using abdominal ultrasound. Patients with collections less than 3 cm were managed conservatively with intravenous antibiotics.The data were collected, organized, and tabulated,with particular reference to patients demographics,operative findings, operative time, return of bowel function, resumption of oral feeds, length of hospital stay, and postoperative complications such as ileus, wound infection, and intra-abdominal abscess etc.

Results:

During the period from May 2015 to May 2018, 43 patients with complicated acute appendicitis under went LA. Twenty one (48.7%) patients were boys and 20(41.3%) were girls. Their ages ranged from 3 to 15 years(mean: 7.1 years).

Table I:
Analyses of clinical data of patients in Laparoscopic appendectomy.(LA)

Variable	LA	Other studied (LA)
Male	21 (48.7%)	
Famale	20(41.3%)	
Mean age	7.1 years	
Operative time	83.5±25.8 min	45.7±14.9 [14]
1st oral intake time	2.1±0.5 days	1.8±0.6 (Wang etal.[14])
Mean hospital stay	5.8±2.1 days	6.5±2.2 (Wang etal.[14])
Convertion rate	4.7%	0% (Vahdad etal.) 24% Wang[14]etal.

In 41 (95.3%) patients the procedure was completed laparoscopically; however, in two (4.7%) patients,conversion was mandatory because appendices were extremely friable upto its base. The operative time was 83.5±25.8 min.

Table 2 : complications after Lap appendectomy(LA) and open appendectomy(OA)

Complications(LA)	Nunber	%	Complications after OA in other studies
Superficial wound infection	4	9.7	12.5[14],15.7[10],17.2[11]
Intraabdominal collecton	3	7.3	7.8[24],18[2], 11.3[4],16.5[5] , 19.1[6],4.3[7]
Paralytic ileus	2	4.8	7.1[11], 12.4[14],6.9,[8] ,9.2[9]
Recurrent abdominal pain	2	4.8	12.1[2] ,14.6[11] ,
Pneumonitis	1	2.4	4.2[24] ,5.1[24]
Gastroenteritis	3	7.3	6.1[11] ,8.3[21]
Peroprative urinary bladder injury	2	4.8	
Postoperative recurrent abdominal pain	1	2.4	6.3[11], 8.1[9], 4.9[21]
Total Number of Patients 41			

The children were able to resume oral intake within 2.1±0.5 days. Two (4.8%) patients experienced postoperative ileus.Four (9.7%) patient developed superficial wound infection in port site incision,which was treated conservatively with dressing and antibiotics. Three (9.7%) patients developed intra-abdominal collections and were treated successfully with intravenous antibiotics only (third-generation cephalosporin).One (2.4%) patients were readmitted because of recurrent abdominal pain.No relevant cause was detected and they were discharged and followed up in the outpatient clinic. One patients(2.4%) developed postoperative pyrexia due to pneumonitis and Three patients (7.3) developed gastroenteritis.All are treated conservatively with antibiotics and supportive therapy.In two(4.8%)patients urinary bladder wall was injured with leakage of urine from bladder during peroperative trocer incertion which were treated conservatively with catheterization of patients for upto seven postoperative day. All were doing well with no more symptoms.The mean length of hospital stay was 5.8±2.1 days. No mortality was recorded

Discussion:

The first report of LA in children goes back to 1991,when Ure et al2 presented a small prospective series of 43 patients,concluding that it was a safe procedure.Then many reports published worldwide.Some studies suggested a lack of good evidence supporting laparoscopic approach for complicated appendicitis [10–13]. However,Many others concluded that LA for complicated appendicitis is better than is open OA [14–17]. They repored, in complicated appendicitis, especially in children, LA can benefit a patient compared with OA because it minimizes the tissues trauma, allows better visualization of abdominal spaces and meticulous peritoneal irrigation,avoids large wound incision and extension,improved cosmesis,shorter hospital stay,decreased rate of misdiagnosis,better pain control,earlier return to normal activities and is associated with less exposure of wound surface area to contaminated fluids[2,3,5,7,8,9,11,13,14,17].Taking in consideration the above-mentioned debate, the aim of our study was

to evaluate the efficacy and safety of LA in children with complicated appendicitis in our institutions.In their study, Wang etal[14]. reported that the operative time in LA is significantly longer than that in OA. This longer duration is due to the fact that the manipulation of inflamed tissues with laparoscopic instruments is more difficult, making the dissection slower, to avoid the risk of visceral injury and operative time can be reduced with the increase of surgeon's experience [14].

The mean operative time in our study was 83.5±25.8 min. Other studies have reported a longer or shorter operative time [17–19]. This difference could be attributed to the

difference in the level of laparoscopist's skills.In this study, the conversion rate was 4.7%, which nearly matches that reported in other studies 20. On the other hand, Vahdad etal.21 observed a higher conversion rate 24%, whereas Wang etal[14].reported no conversion in their study. We believe that the surgeon's experience plays an important role in determining the rate of conversion.

Twenty one (48.7%) patients were boys and 20(41.3%) were girls.This male preponderance was also noted by other authors [6, 8, 9, 12, 15,] .The high incidence in male is probably because males are more exposed to environmental and dietary changes than females.Our patients were able to start oral intake within2.1±0.5 days, and stayed in hospital for 5.8±2.1 days.These results are in agreement with the results of Wang etal.14 in their study the duration of restarting oral intake was 1.8±0.6 days and the length of hospital stay was 6.5±2.2 days.Several studies have shown that younger-aged children with appendicitis usually have higher rates of perforation and greater risk for developing complications because of delayed diagnosis [12,14.17,21,22]. This could be explained by the fact that many nonsurgical conditions such as constipation, gastroenteritis, and mesenteric adenitis may mimic appendicitis, as well as the lack of verbal communication skills [2,5,7,8,9,11].

Many studies found that LA markedly reduced the postoperative wound infection rate when compared with OA (1.3 vs. 12.5%) [14,16,21]. The rate of wound infection in our study was 9.7%. This low rate of postoperative wound infection could be explained by fact that in LA the

incisions are small and limited to the trocar entry sites and the perforated appendix is extracted within a retrieval bag.There is always a concern about the high risk for postoperative intra-abdominal collection in complicated appendicitis. In our study, the postoperative intra-abdominal collection was observed in three (7.3%) patients. Menezes etal [23]. published a retrospective study of 118 children with complicated appendicitis:they stated that the incidence of intra-abdominal collection in LA was lower than that in OA (5.5 and 7.8%, respectively). Similarly, Kwok etal[24]. found a similar incidence (5.7 vs. 4.3%). This may be due to the fact that laparoscopy gives the surgeon the privilege to explore the whole intra-abdominal recesses and to irrigate with normal saline and aspirate any visible collection. The mortality rate was found to be zero percent in the present series, it has been stated that the risk of death from complicated appendicitis should be the risk of death from general anaesthesia. However, the mortality rate appears higher in newborn or premature infants who develop perforated appendicitis. Also, factors contributing to the death of children may include delay in diagnosis, inadequate fluid replacement, immunotheraphy and postoperative infection or vascular complications[3,7,11,12,17].

Conclusion:

The benefits of treating complicated acute appendicitis with LA include wide inspection of the peritoneal cavity,debridement, irrigation, and lavage under direct visualiza-tion, avoidance of large abdominal incisions, acceptable postoperative other morbidity, rapid recovery,shorter hospital stay,better pain control,better cosmetic results,lower pulmonary and wound complications and altimately earlier return to normal activities[2,3,4,5,6,7,8,11,13].Another benefit of LA is that diagnostic laparoscopy can be performed before the actual open appendectomy in doubtful cases and thus decreases rate of misdiagnosis[4,7,9]. Our study demonstrated that using LA to treat complicated acute appendicitis was not associated with additional surgical complications when compared with those who had open appendectomy for complicated acute appendicitis. Therefore, it seems feasible to use LA as the first-choice treatment for both uncomplicated and complicated acute appendicitis.

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