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Laparoscopic versus Open Appendectomy in Children with Complicated Appendicitis

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Introduction

Acute appendicitis is one of the most common surgical emergencies in childhood. Its incidence peaks between the ages of 11 to 12, and has a lifetime risk of 7% to 9% [1]. Since Semm performed the first laparoscopic appendectomy (LA) in 1983, this approach had gained popularity in the treatment of acute appendicitis over the last decades [2, 3]. However the use of LA as the first choice in the treatment of acute appendicitis is still debated due to longer operative time, higher risk of intraabdominal abscesses postoperatively and of course higher costs [4, 5]. Also, the role of LA in the management of complicated appendicitis in children remains controversial [6]. Several studies disapproved the concerns about increased postoperative complications in complicated appendicitis operated laproscopically; with some demonstrating lower complications rates and shorter hospital stay [7 -9]. In this study we compared between LA and conventional open appendectomy (COA) in the management of acute complicated appendicitis in children.

Patients and Methods

During the period from October 2012 to October 2015, 390 children presented with acute complicated appendicitis were operated. All children were diagnosed on clinical bases and this was followed by laboratory investigation in the form of total leukocytic count and C-reactive protein also abdominal ultra sound was performed to all cases. We excluded cases with severe chest or cardiac troubles and cases of catarrhal appendicitis and cases presented with appendicular masses or abscesses.LA was performed for 200 cases (group A) and COA was performed for 190 cases (group B).

All operations were performed under general anesthesia. The patients received third generation cephalosporin and metronidazole with the induction. In group Awe used three ports to operate. First port at the umbilicus 10 mm for telescope and two other ports 5 mm one at the Rt mid clavicular line at the level of umbilicus and the other at midway between umbilicus and symphysis pubis in the mid line. Exploration of the peritoneal cavity is done as the first step that was followed by identification of the appendix. Then we started to secure the mesoappendix using electro cautery close to the appendiceal wall. After that we secured the base of the appendix with two successive ties of Vicryl 2/0 through extracorporeal way that be pushed through the port between umbilicus and symphysis pubis using knot pusher. Then resection of the appendix was done and it was extracted through the umbilical port. Peritoneal lavage and suction of any exudates were done as expected in complicated cases.

Drains were used in all cases. The wounds were closed. In group B classic McBurny approach was done and appendectomy was performed according to the usual steps. Also drains were inserted in all cases and wound was closed in layers. Data collected included demographic records, TLC, duration of symptoms before admission, operative time, intraoperative problems or difficulties, length of hospital stay, and complications occurred in both groups. Degree of satisfaction of parents or child himself about the procedure was obtained. Return to normal life activity.

Results

During the period of our work we operated 390 children presented with symptoms and signs of acute complicated appendicitis. Diagnosis was accomplished with laboratory investigation (leukocytic count and C- reactive protein)and pelviabdominal ultrasound imaging as a routine. Boys were 260 while girls were 130. The mean age was 12.04 years in group A and 12.2 in group B. The mean duration of symptoms and signs in the preoperative period was 3.82 days in group A and 3.79 days in group B. The mean leukocytic count was 15.500 in group A and 15.700 in group B. C-reactive protein was positive in all cases and ranged from 6 to 160 IU with mean value of 60 in both groups. Ultrasound could detect the inflamed appendix in 195 cases and free fluid in pelvis and right iliac fossa in 120 cases. Also Ultrasound excluded other problems related to urinary tract or reproductive system in female children (Table 1).

Table 1: Demographic and preoperative data:

	Group A	Group B
No. of cases	200	190
Sex - Girls - boys	 60 140	 70 120
age	12.04	12.23
Weight (mean Kg)	28	28.5
Duration of Symptoms and signs(mean in days)	3.82	3.79
TLC	15.75	15.73
CRP	60	60
Ultrasound - inflamed appendix - free fluid	 100 50	 95 70

TLC: total leukocytic count, CRP: C- reactive protein

Operative and Postoperative Results: Tables 2 and 3

Group A:

The mean operative time was 56.41 minutes. No caseswere converted to open technique and the procedure was completed laparoscopically. In 50 cases there were mental adhesions with the appendix which need meticulous dissection. Localized turbid fluid collection at the right iliac fossa and free fluid in pelvis were found in 55 cases thatwas aspirated and lavage done. The appendix was gangrenous in 75 cases, supportive in 20 cases and perforated in 105 cases. No accidental visceral or vascular injuries occurred. The drains were inserted in all cases. The mean length of hospital stay was 2.7 days. Wound infection occurred 38 cases at the umbilical wound responding to conservative measures. Fourteen cases had postoperative pelvic collections that were in need to admission as there was fever and other constitutional symptoms. They were treated by ultrasound guided drainage and parental antibiotics at hospital and discharged after improvement. Patients received NSAIDs for three days post-operative. No cases had postoperative port site hernias. The children of that group return to normal activity in a mean period of 8.8 days. All parents and children were satisfied with the end result of operation.

Group B:

The mean operative time was 63.42 minutes. We found mental adhesions to the appendix in 43 cases. There was localized fluid collection which was turbid in right iliac fossa and fluid collection in the pelvis in 65 cases that was aspirated. The appendix was gangrenous in 66 cases, supportive in 32 cases and perforated in 92 cases. We need extension of the wound in 35 cases as the appendices were either high sub hepatic appendix or deeply seated appendix with mental adhesions. No accidental visceral injuries occurred. Drains were inserted in all cases. The mean hospital stay was 4.38 days. Wound infections occurred in 55 cases. Pelvic collections occurred in 54 cases that required readmission and US guided drainage was performed. One child had postoperative fecal fistula and required readmission and received total parental nutrition and antibiotics till the output decreased and child resumed oral intake 5 days later. Patients received NSAIDs for 5 days postoperative. They return to normal activity in a mean period of 12.39 days. In this group 120 parents were satisfied while of the rest got annoyed with the appearance of the wound.

Table 2: operative data

	Group A	Group B
Operative time (mean in minutes)	56.41	63.42
Omental adhesions(No. of cases)	50	43
Localized or free fluid collections	55	65
Pathological appearance of appendix: - Gangrenous - Perforated - Suppurative	 - 75 - 105 - 20	 - 66 - 92 - 32
Visceral injury	no	no
Conversion to open	no	----------
Need to extend the wound	----------	35
Drains(48 hours)	In all cases	In all cases

Table 3: postoperative data:

	LA	OCA
Hospital stay(mean days)	2.75	4.38
Postoperative duration of analgesics(NSAIDs)(mean days)	3	5
Wound infection	38	55
Pelvic collections	14	54
Port site hernia	no	----------
Incisional hernia	----------	no
Fecal fistula	no	No cases
Return to normal activity(mean days)	7	10
Parents' satisfaction	All satisfied	120 satisfied 70 fair

Discussion

Minimal access surgical procedures are being applied across a variety of surgical specialties. Increasing laparoscopic experience, improvement in surgical techniques and advances in technology have allowed for superior outcomes in these procedures when compared with conventional open procedures [6].

LA has intrinsic appeal shared all minimal invasive surgery. This may be due to reduced postoperative pain, early return to normal daily activity and of course superior cosmetic results. On the other hand several studies have detected that LA required longer operative time and had more postoperative complications than COA [2, 10].

The mean operative time for LA in complicated cases was 56.41 minutes while for OCA was 63.42 minutes.

This was very close to Li who reported mean operative time for LA 55.8 minutes and for OCA 57.94 minutes[11].

On the other hand Frauquzzmann showed that the mean operative time for laparoscopic group was 112 minutes and for conventional group was 72 minutes and he referred that to the need for meticulous dissection of complicated appendicitis during the laparoscopic procedure[12].

Different studies of Ikeda, Miyano and Wang reported mean operative time for LA ranged from 88 minutes to 111 minutes and mean operative time for conventional group of 71 minutes to 108 minutes[13 - 15].

This most likely reflects the technical challenges associated with the laparoscopic procedure in challenging cases[16].

Some studies have demonstrated that with increased experience, the operative time for the case of complicated appendicitis is similar for LA and OCA [17].

We noticedthat gross pathology of inflamed appendix was supportive, perforated or gangrenous.

Most other authors included only perforated appendicitis as the only type of complicated appendicitis during either laparoscopic or conventional procedures [13 - 15].

Menezes included both perforated and gangrenous appendicitis in his series for LA[17].

There was difference as regard hospital stay in both groups during our study. The mean postoperative hospital stay was 2.75 days in group A, and 4.38days in group B

Aziz showed that the length of hospital stay was significantly reduced in cases subjected to LA either complicated or uncomplicated and he assumed that these results may be related to the advantages of minimal invasive strategy of laparoscopic procedures which included reduced postoperative pain and early mobilization leading to early discharge[18].

So our results were near to the series of Jen who documented hospital stay for 5.2±3.2 days in LA and 5.5±3.4 days in COA[19].

Some authors as Ikeda, Miyano and Wang showed that the length of hospital stay was relatively long in both groups. It was ranged from 6.5 days to 14 days for LA and ranged from 7.8 days to 16 days for COA[13 - 15].

The incidence of wound infection was lesser in LA if compared to OCA in our work.

These results were confirmed by those of Yagmurlu who showed reduced incidence of wound infection in LA [20].

Pelvic collection occurred in 14 cases of LA and in 54 cases of OCA and these children required readmission and ultrasound guided drainage was performed for all cases and received antibiotics for one week and discharged when the collection completely disappeared.

The risk factors for development of intraabdominal collections remain controversial. Several reports suggested that the incidence of this complication is higher after laparoscopic appendectomy among patients with perforated appendicitis [21].

On the other hand Yagmurlu showed no significant increase in the incidence of postoperative intraadominal abscess after LA. He assumed that the use of stapler rather than an end loop reduce the risk of spillage[20].

Our patients in group A returned to normal daily activity within 8.98 days while those of group B returned after 12.93 days.

Marker showed that in pediatric population rapid return to normal activities might reduce the psychological effects of hospitalization, though solid evidence is lacking [22].

Also other studies didn't consider the degree of parents and children satisfaction as regard the final appearance of the wound. In group A all parents and children were satisfied with the end result of operation. While in group B, 120 parents were satisfied while of the rest got annoyed with the appearance of the wound. We think that point should be taken with great consideration.

Conclusion

We assumed that LA for complicated appendicitis in children should be the first choice for the pediatric surgeons as it safe, effective and associated with relatively accepted rate of postoperative complications.

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