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Original Article

The safety of laparoscopic appendectomy in complicated appendicitis in children

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ABSTRACT

Background: Laparoscopic Appendectomy (LA) is no longer a new procedure in pediatric surgery. In many pediatric surgery centers, laparoscopic management of acute appendicitis is practiced but we have observed that most of them performed laparoscopic appendectomy for simple straight forward appendicitis. It is generally considered that complicated appendicitis is better managed by an open procedure. The objective of this study was to establish safety of laparoscopic appendectomy in complicated appendicitis in children.

Methods: Research was conducted at the Department of Pediatric Surgery, Shifa International Hospital Islamabad. Duration of study was 3 years after due approval from the ethical and research review board. Medical records of 42 patients who were operated on for complicated appendicitis laparoscopically at Shifa International Hospital, Islamabad from January 2018 to December 2020 was reviewed. All patients were enrolled from the emergency department. Clinical assessment of the patients was done in a routine way by history and physical examination. Investigations included complete blood count, C reactive protein and ultrasound abdomen and pelvis. Patients who had simple uncomplicated appendicitis, who had open appendectomy, and those who had laparotomy for other reasons were excluded from the study. All those patients who had complicated appendicitis like perforation, abscess, mass, or gangrene were included in the study. Variables observed in this study were age, gender, operative findings, operative time, hospital stay and postoperative complications.

Results: The mean age of the patients was 9.95 ±3.22 years. Of 42 patients, 32 (76%) patients were male and 10 (24%) were female. Mean operative time was 42.5 ±20.03 minutes. Mean hospital stay was 2.23 ±1.55 days. Out of 42 patients, 20 (48%) had perforated appendicitis, 9 (21%) patients had appendicular mass, 12 (29%) patients had appendicular abscess, and 1 (2%) patient had gangrenous appendicitis. Postoperatively, one patient of perforated appendicitis had trocar site infection. One patient who had appendicular mass developed urinary retention with periorbital puffiness postoperatively. Two patients of appendicular mass had transaction of appendicular base due to perforated and sloughed appendicular base. One patient with an appendicular abscess had a large collection in the right paracolic gutter. One patient of appendicular abscess developed peritonitis with abscess formation secondary to cecal perforation.

Conclusion: Laparoscopy for complicated appendicitis is safe in children with only fewer complications. Despite our limited experience of laparoscopic appendectomy, we believe that laparoscopy may safely be done as a first choice in all patients with appendicitis, whether simple or complicated.

Keywords: Laparoscopic appendectomy, Open appendectomy, Postoperative complications, Complicated appendicitis

INTRODUCTION

Acute appendicitis is one of the most common surgical emergencies in the pediatric age group. [1] A conventional approach for complicated appendicitis (CA) is open appendectomy. Semm was the first surgeon who managed acute appendicitis through a laparoscopic approach in 1983 and since then many studies are being conducted comparing laparoscopic and open appendectomy. [2-7] The idea behind laparoscopy was short hospital stay, less per-operative and postoperative complications, and better cosmesis. Laparoscopy offers detailed and magnified visualization and better access to the abdominal cavity through a small incision. [8]

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Currently in many centers, laparoscopic appendectomy is the first choice of treatment for complicated appendicitis. [9] The established efficacy and usefulness of laparoscopic appendectomy in complicated appendicitis in children is still controversial because of a limited number of studies conducted. This study was conducted with an aim of describing our 3-year experience of laparoscopic appendectomy in cases of complicated appendicitis and with an objective to show its feasibility, complications, and management potential in these cases.

METHODS

This is a case series of 42 patients with complicated appendicitis who were operated laparoscopically at Shifa International Hospital, Islamabad from January 2018 to December 2020.

After approval from the hospital ethics committee with IRB number 337-21, study was initiated.

Inclusion and exclusion criteria: Based on the selection criteria, patients were enrolled from the emergency, outpatient, and inpatient departments. Informed consent was taken from parents after explaining the possible outcomes and long-term effects. All those patients who had complicated appendicitis like perforated appendix, appendicular abscess, appendicular mass, or gangrenous appendix were included in the study.

The patients who were found to have acutely inflamed appendix, patients who underwent open appendectomy and those who had exploratory laparotomy for other reasons were excluded from this study.

All patients who met the inclusion criteria were enrolled from the emergency department. Clinical assessment of the patients was done in a routine way by history and physical examination. Investigations included complete blood count, C reactive protein and ultrasound abdomen and pelvis. CT scan was done in selected cases in which the diagnosis was not sure. After the pre-anesthesia assessment, patients were shifted to the operating room for laparoscopic appendectomy.

Laparoscopy was done in a standard way using the 3 ports technique. A 10mm port through the umbilicus for the camera through a smiley face infra-umbilical incision was inserted. A 5mm port was inserted through a stab incision in the suprapubic region and another 5mm port was inserted in the left lower quadrant. Any sample of pus retrieved was sent for culture and sensitivity test. The mesoappendix was divided either with ligasure (Covidien Force Triad Tm small) or with hook diathermy. The appendicular base was ligated with the help of endo-loop and divided between two ligatures. All specimens of the appendix were routinely sent for histopathology. Antibiotic prophylaxis/ treatment was administered as per international guidelines. Antibiotics were revised once culture and sensitivity reports were available. Local anesthesia (Bupivacaine) was administered to the port sites for post-operative analgesia. Patients were kept NPO for 12 hours after surgery and analgesia for the first 24 hours. All the patients were called for follow up after one week of surgery and final follow up was done after one month of surgery.

Variables observed in this study were age, gender, operative findings, operative time, hospital stay, and postoperative complications.

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 21. Mean and standard deviation were collected for continuous variables and frequency and proportion were calculated for categorical variables.

RESULTS

A total of 42 patients were enrolled in this study who underwent laparoscopic appendectomy for complicated appendicitis. The mean age of the patients was 9.95 years ± 3.22.

Of 42 patients in total, 32 (76%) patients were male and 10 (24%) were female. Mean operative time was 42.5minute ±20.03. Mean hospital stay time was 2.23 days with standard deviation of 1.55 (Table 1).

Table 1. Patient details and intraoperative findings

Age (years) (Mean ± SD)	9.95 ± 3.22
Sex (M/F)	32/10
Operative time (min) (Mean ± SD)	42.5 ± 20.03
Hospital stay (d) (Mean ± SD)	2.23 ± 1.55
Mass	9
Abscess	12
Perforated appendix	20
Gangrenous appendix	1
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Mass	9
Abscess	12
Perforated appendix	20
Gangrenous appendix	1

Out of total 42 patients, 20 (48%) had perforated appendicitis, 9 (21%) patients had appendicular mass, 12 (29%) patients had appendicular abscess, and 1 (2%) patient had gangrenous appendicitis (Table 1).

Postoperatively, one patient with perforated appendicitis developed trocar site infection which was managed conservatively. The same patient also developed left scrotal swelling on the 2nd postoperative day. Ultrasound scrotum shows epididymo-orchitis which was managed by intravenous antibiotics. One patient who had appendicular mass formation with partial obstruction, developed urinary retention with periorbital puffiness postoperatively which was managed by catheterization and injection Lasix. Two patients of appendicular mass had a transaction of appendicular base which was managed by intra-corporeal stitch (figure of 8). One patient of appendicular abscess had a large collection in the right paracolic gutter postoperatively which was managed by CT guided aspiration and drain placement after 5 days of surgery. One patient of appendicular abscess had perforated friable appendicular base which was repaired by intra-corporeal stitching. On the second postoperative day, that patient developed peritonitis with abscess formation secondary to cecal perforation for which open surgery with exploratory laparotomy with limited right hemicolectomy and ileocolic anastomosis were done (Table 2).

Table 2. Post-operative complications

Port site infection	1
Port site hernia	0
Intra-abdominal abscess	1
Peritonitis	1
Adhesive obstruction	0
Others	1
Mortality	0
Conversion to open	0
Port site infection	1

DISSCUSION

We have observed that regarding the management of acute appendicitis, pediatric surgeons are choosy in selecting patients for laparoscopy. It is commonly believed that laparoscopy is reserved for simple uncomplicated appendicitis, while complicated appendicitis is better managed by open approach due to fear of perioperative complications. [4] Complicated appendicitis includes perforation, abscess, mass, or gangrene. [3] There are still controversies whether to use laparoscopy in complicated appendicitis or not. Those in favor of an open approach are of the view that it takes less operative time, less chances of postoperative complications like abscess or bowel injury. [4] However, many studies support laparoscopy in complicated appendicitis. [6,7,8,10]

Our experience with laparoscopy in appendicitis revealed that for complicated appendicitis laparoscopy is very safe in children with only fewer complications. Although our sample size is small but in our last 3 years' experience, we learned that laparoscopy may safely be done as a first choice in all patients with appendicitis, whether simple or complicated. Our experience indicates that the apprehension amongst the treating surgeons is not very justified as we do laparoscopy in all patients with appendicitis (simple or complicated). Rather laparoscopy avoids large incisions and post-operative complications, short hospital stays and rapid recovery. We hardly do open appendectomy in children.

In our study the average operative time for laparoscopic appendectomy is 42.5 minutes which is quite less than as reported by Seqsaqa et al. [10] (85.17 ± 27.02 min) and Wang et al. [11] (88.5 ± 28.8 minutes). In comparison with open appendectomy, longer operating time are reported by various authors. [10-19] However, Yau et al. [20] documented shorter operative time in the laparoscopic group. The operative time depends on surgeon experience and expertise as well as assistant experience and facilities. We also notice that our mean operative time for LA is less as compared to other studies as our learning curve has improved much over these years.

The mean hospital stay in our study was 2.23 ± 1.55 days. This short hospital stay in laparoscopic appendectomy for complicated appendicitis is in concordance with many other studies. [12-19,21,22,23]

For perforated appendicitis, irrigation and suction and post-operative antibiotic cover according to culture and sensitivity report on the sample collected at the time of surgery is sufficient for treatment. Sometimes, in appendicular mass the base of appendix is very friable so there are chances of suture cut through or transection of the base as happened in two of our patients where we have done intra corporeal stitching. Appendicular abscess have higher chances of postoperative collection even after thorough peritoneal lavage. It can be managed by CT guided aspiration and drain placement as happened in one of our patients. This lower incidence of intra-abdominal abscess is in concordance with other studies. [24-27]

In our study the conversion to open was zero, whereas higher conversion rate is reported in the literature. [28,29] There was only one patient with appendicular abscess with friable perforated appendicular base which was repaired by intra-corporeal stitch and was discharged home on 4th postoperative day. He was readmitted with features of peritonitis. On open exploration he had cecal perforation and peritonitis. Limited right hemicolectomy and ileocolic anastomosis was performed. He remained well afterwards. Rasuli et al. [30] concluded that laparoscopy had less frequency of postoperative complications especially wound infection as compared to open appendectomy. Therefore, laparoscopic appendectomy should be done in all types of appendicitis.

The limitation of this study is that, since this is a descriptive study and the sample size is small. We

believe our study provided baseline local data on feasibility and complications of laparoscopic appendectomy in cases of complicated appendicitis. However, we recommend multicenter randomized controlled trials to generate higher scientific evidence on this aspect of care

CONCLUSION

In our study, Laparoscopy appears safe in children with complicated appendicitis having only fewer complications which are comparable to the open procedures on literature search. It may safely be done as a first choice in all patients with appendicitis. The apprehension amongst the treating surgeons is not very justified

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