

Appendicectomy for Complicated Appendicitis in Small Children-Open or Laparoscopic?

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ABSTRACT

Laparoscopy for complicated appendicitis is still controversial in small children. This article discusses about our approach of management of complicated appendicitis in small children followed by a review of literature, comparing open with laparoscopic appendicectomy for complicated appendicitis. This small case series discusses about our approach in management of these cases in terms of choosing the operative technique and short term results. A review of English literature is also presented in which the results of laparoscopic appendicectomy for complicated appendicectomy in children are compared with open appendicectomy.

Conclusion: laparoscopic appendicectomy should be considered for complicated appendicitis in small children, who has minimal abdominal distention, by an experienced laparoscopic surgeon if available.

Key words: Pediatric laparoscopy, complicated appendicitis, Laparoscopic appendicectomy.

Complicated appendicitis is defined as appendiceal phlegmon (simple inflammatory mass without pus located in bottom right of the appendix) or appendiceal abscess (pocket of pus surrounding an acutely inflamed and/or ruptured appendix).¹ The laparoscopic appendicectomy has been preferred means of management of complicated appendicitis, even in children.² However, because it is uncommon in children less than 5 years of age, most of the studies have been done in older children, with average age of 9- 10 years.³ It is expected that the small children, because of delayed diagnosis and unsuitable anatomy will have difficulty in performing laparoscopic appendicectomy for complicated cases.

Material and Methods

Case records of children with diagnosis of complicated appendicitis presented at Madhukar Rainbow children hospital, Delhi were reviewed. The review of the literature was performed in

February 2019 using the Medical Literature Analysis and Retrieval System Online (U.S. National Library of Medicine's life science database; MEDLINE), and Google© search. The MEDLINE search employed both "MeSH" (Medical Subject Heading) and "free text" protocols. Specifically, the MeSH search was conducted by combining the following terms retrieved from the MeSH browser provided by MEDLINE: Appendectomy/methods, Appendicitis/diagnostic imaging, Appendicitis/epidemiology, Appendicitis/physiopathology, Appendicitis/surgery. Multiple free-text searches were performed applying singularly or in combination the following terms through all the fields of the records: complicated appendicitis, laparoscopic appendicectomy, pediatric appendicectomy. The related articles related to these searches generated by MEDLINE were also reviewed. Subsequently, the searches were pooled and all articles dealing with comparison between open and laparoscopic appendicectomy for complicated appendicitis in children were included and duplicates were excluded. The authors individually reviewed all the abstracts of the retrieved studies in order to select the papers that were relevant to the review topic. In addition, the reference lists of the included

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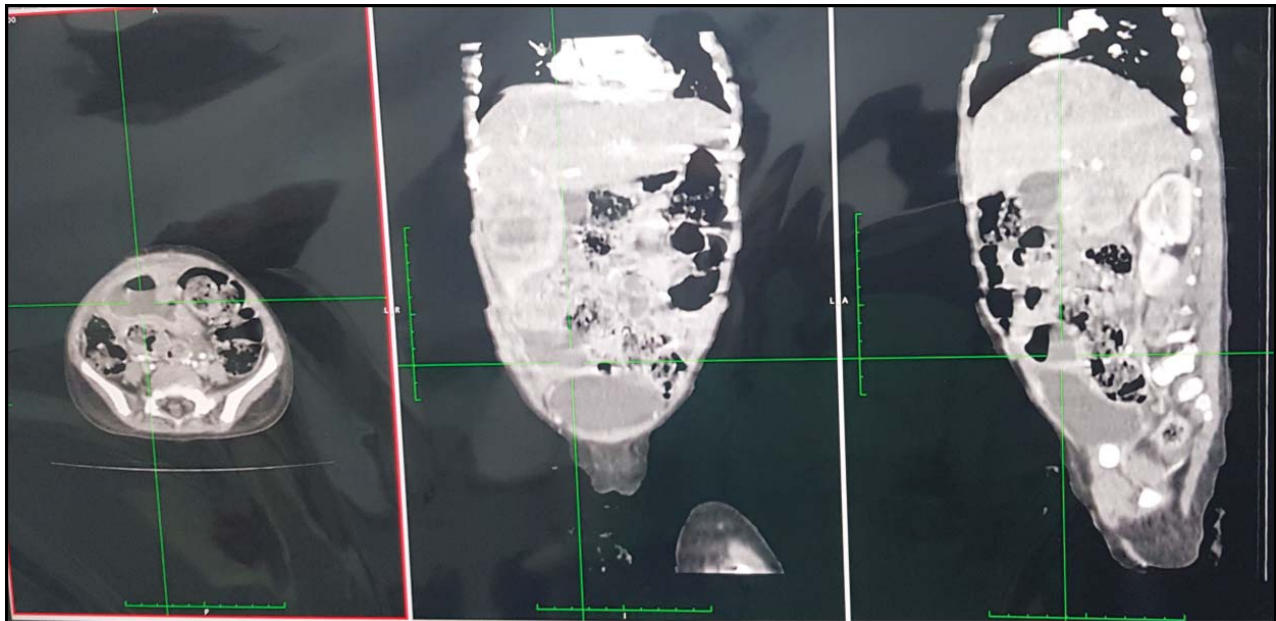


Figure 1: CECT showing collection in right iliac fossa with liver abscess.

papers were searched for any missing articles. After reviewing the studies, authors analyzed them for number of cases in each group, mean age in each group, conversion to open surgery, total complications, and intraabdominal abscess and wound related complications in each group. The short case summaries of cases are as follows:

Case 1

A 1 year 10 months female child was referred to us with complaints of fever, pain abdomen and abdominal distention not responding to antibiotics for last 10 days. Investigations done at our centre suggested liver abscess and small right iliac fossa collection. CECT suggested appendicular abscess with secondary liver abscess. (Figure 1). The decision was made for exploratory laparotomy, which showed dense adhesions of terminal ileal loop with appendix. Appendicectomy was done with lavage. The liver abscess was aspirated, which was solid and had minimal content. Post operative period was uneventful. Biopsy suggested complicated appendicitis. She was discharged on oral antibiotics after a week and she is doing well on approximately 6 month follow up.

Case 2

A 2 year male child presented with abdominal distention, fever and non passage of stool for 3 days.



Figure 2: Plain X-ray showing adhesive obstruction necessitating laparotomy.

X ray abdomen suggested terminal ileal pathology with dilated loops of intestine. A diagnosis of acute

Table 1: Comparative studies between open and laparoscopic appendicitis for complicated appendicitis in children

Authors with year of publication	No of patients		Mean age (years)		Conversion to open	Total complications		Intraabdominal abscess		Wound infection	
	LA	OA	LA	OA		LA	OA	LA	OA	LA	OA
Horwitz et al ⁵ ; 1997	34	22	10.3	8.1	7	15	4	11	2	4	1
Canty G et al ⁶ ;2000	301	86	NR	NR	10	33	8	19	5	0	1
Lintula H et al ⁷ ;2002	13	12	10	11	0	2	0	1	0	0	0
Meguerditchian AN et al ⁸ ;2002	31	59	11.9	9.6	2	NR	NR	2	6	3	6
Ikeda H et al ⁹ ; 2004	22	22	10*	9*	1	5	6	4	0	2	5
Menezes M et al ¹⁰ ; 2008	54	64	10.5	10.5	1	5	10	3	5	2	3
Taqi E et al ¹¹ ;2008	68	213	12	9.4	1	NR	NR	3	10	1	20
Wang X et al ¹² ;2009	80	48	7.4	6.6	0	3	13	2	7	1	6
Nataraja RM et al ¹³ ;2012	182	193	11.6	10.9	8	NR	NR	15	19	NR	NR

LA- Laparoscopic Appendicectomy; OA- Open Appendicectomy; * median age; NR- Not Reported

abdomen was made and open laparotomy was done. It showed gangrenous appendix with pyoperitoneum. Appendicectomy with lavage was done. Post operative period was uneventful and he was discharged on day 5 of surgery. However he presented after 2 days with pus discharge from laparotomy wound. A provisional diagnosis of intraabdominal collection with burst abdomen was made and he was managed conservatively. He was discharged after a week. He again presented three months after surgery with acute adhesive intestinal obstruction for which laparotomy was done. (Figure 2). Adhesions were released and incisional hernia was closed. Now he is in follow up.

Case 3

A 5 years old female presented with history of pain abdomen, vomiting and fever for last 4 days. Investigations done outside, before referral had suggested appendicitis and when she presented to us, she had fever, pain abdomen along with tachypnea and tachycardia. There was mild abdominal distention with generalised tenderness. A decision to perform laparoscopic appendicectomy was taken. A 10mm umbilical and two working 5 mm ports were placed. There was perforation in appendix with generalises pus in abdominal cavity. (Figure 3) Appendicectomy was done long with lavage of abdominal cavity. A drain was also placed. Post operative period was uneventful. She was discharged on day 4 and presented after a week with superficial

port site infection, which was drained. Now she is in follow up and asymptomatic.

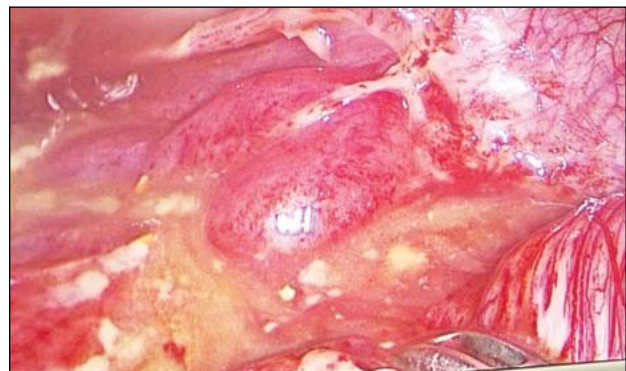


Figure 3: Appendicular perforation with abscess seen during Laparoscopy.

Case 4

A 3 years old male presented with history of pain abdomen, vomiting and fever for last 3 days. Investigations done showed appendicular perforation with free fluid in abdominal cavity. (Figure 4). He had fever, pain abdomen along with tachypnea and tachycardia. There was mild abdominal distention with generalised tenderness. There was perforation in appendix with generalises pus in abdominal cavity. Laparoscopic appendicectomy with lavage was done. Post operative period was uneventful. She was discharged on day 4 and presented after a week with superficial port site infection, which was drained. Now he is in follow up.

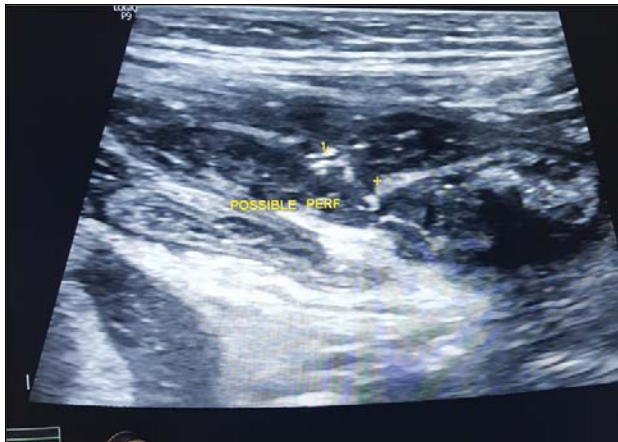


Figure 4: USG showing appendicular perforation with free fluid

Discussion

Laparoscopic appendicectomy is preferred by many pediatric surgeons because of its advantages namely, reduction in postoperative convalescence, reduced analgesic requirements and duration of hospital stay, in addition to improved visualization of the peritoneal cavity, decreased rate of misdiagnosis and superior cosmetic results. Its opponents cite increased operative cost, increased operative time, and concerns about a higher incidence of intra-abdominal abscesses, particularly after perforated appendicitis as its demerit. In a meta analysis comparing open with laparoscopic appendicectomy in children, it was suggested that laparoscopic appendicectomy in children reduces complications.⁴ However, the authors concluded that more high-quality randomized trials are needed in which comparisons are also made based upon severity of appendicitis. A search of English literature showed nine studies in which these comparisons between open and laparoscopic approach for complicated appendicitis had been done. (Table 1). Most of these are non randomised trials and only one of them had done subset analysis of children less than 5 years of age.¹³ This is because it is rare to have appendicitis in small children, although they have more chances of being complicated. In these studies, although age range is 1 to 10 years, average age is 8 to 10 years. One interesting pattern in almost of these studies is that average age of open appendicectomy for complicated appendicitis is lower than laparoscopic

appendicitis, suggesting that for younger children, open appendicectomy is preferred for complicated appendicitis by many surgeons.

Smaller children, because of small abdominal cavity, are still a surgical challenge for a laparoscopic surgeon. If the inflammatory adhesions, edema and distention of gut because of ileus are considered, a very small working area is available for a surgeon in these cases. In two of our cases, because of these reasons, we straightway opted for open surgery rather than laparoscopic surgery. In the other two children, laparoscopy was selected as distention was not much and it was thought that we can get space for laparoscopy.

The other major advantage of laparoscopy is abdominal lavage, which can be done in all areas. One of the open surgery case, in spite of lavage, developed intraabdominal collection and burst abdomen. Although, it is difficult to make recommendation based upon single case, it is still controversial, whether open or laparoscopic appendicectomy has more chances of intraabdominal abscess. In a recent metaanalysis, laparoscopic appendicectomy in children were associated with lower incidence of wound infections and bowel obstruction, but the rate of intra-abdominal abscess was higher than open appendicectomy.¹⁴ Similar findings had been reported in smaller children also.¹³ None of our laparoscopic appendicectomy had intraabdominal abscess. In our series, open appendicectomy was associated with more complications namely wound infection and adhesive obstruction needing second laparotomy. Both the laparoscopic appendicectomy had superficial port site infection, which were managed by drainage. They responded well and scar in long run is minimal.

Decision to undertake open or laparoscopic appendicectomy in these small children is a decision a pediatric surgeon has to make. Appendicitis in smaller children less than 5 years has more chances of being complicated and has more chances of complications. Based upon these findings, younger children with complicated appendicitis were recommended to have open appendicectomy.¹³ However, in our opinion, if there is distention, chances of dense adhesions and inexperienced surgeon, then open laparotomy should

be chosen. Otherwise laparoscopy is a fair option in these small children. It is well known that experience of surgeon in pediatric laparoscopy is an important determinant.¹⁵ The initial opposition to laparoscopy appendectomy were primarily because of increased vascular and bowel injuries, longer operating and setup times and fewer trained pediatric surgeons who can do laparoscopy, as there were no adult index case like laparoscopic cholecystectomy in children.¹⁶ These are related to training and experience. Surgeon not experienced in pediatric laparoscopy should not undertake these procedures, more so, in small children.

Conclusion

Laparoscopic appendicectomy should be considered for complicated appendicitis in small children, who has minimal abdominal distention, by an experienced laparoscopic surgeon if available. Open laparotomy should be done if such an expertise is not available.

Financial Support and Sponsorship: Nil

Conflict of Interest: None

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