



Original Article

Open versus Laparoscopic Appendectomy in Pediatric Patients; A Comparative Study in a Single Center

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ARTICLE INFO

Key Words:

Appendectomy, Acute Appendicitis, Laparoscopy, Open Appendectomy, Pediatric

How to Cite:

Rehman, H. U. ., Naeem, T. ., Bugti, Q. ., Shah, V.-E.-S. ., Fayaz, M. ., & Rashid, M. . (2022). Open Versus Laparoscopic Appendectomy in Pediatric Patients; A Comparative Study in A Single Center: Open and Laparoscopic Appendectomy in Pediatric Patients. *Pakistan Journal of Health Sciences*, 3(06). <https://doi.org/10.54393/pjhs.v3i06.371>

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Received Date: 27th October, 2022Acceptance Date: 26th November, 2022Published Date: 30th November, 2022

ABSTRACT

Appendicitis is the commonest surgical emergency in paediatric patients. Appendectomy is still being performed by both open and laparoscopic methods. The first laparoscopic appendectomy was performed in 1983. **Objective:** To compare the outcome of open appendectomies with laparoscopic appendectomies in pediatric patients was the objective of this study. **Methods:** Two hundred pediatric patients of both genders with acute appendicitis were enrolled from emergency department of Pediatric Surgery, Qazi Hussain Ahmad medical complex, Nowshera, from March 2020–December 2020. In this convenient study patients were dividing into two groups. Group A patients received open appendectomy and Group B received laparoscopic appendectomy. Outcome of both procedures were noted and compared between groups by chi square test. **Results:** Mean ages of patients were 10.11±2.67 and 10.01±2.31 years (p=0.796) in group A and B, respectively. There were 63.0% and 69.0% males in group A and B, respectively. Mean operative time, mean hospital stay and mean VAS were 26.19±8.14 vs. 36.79±11.41 min., 2.01±0.61 vs. 1.03±0.01 days and 3.67±1.41 and 6.07±2.01 (p=0.000) in group A and B, respectively. Complications were hemorrhage (0.0% vs. 0.0%; p=1.0), iatrogenic injury (0.0% vs. 0.0%; p=1.0) and Pelvic collection (3.0% vs. 0.05; p=1.0), SSI (6.0% vs. 0.0%; p=0.00) in group A and B, respectively. None of the pediatric patients after laparoscopic appendectomy required another exploration to deal with complications however, 3.0% patients needed exploration in open appendectomy. No mortality (0.0%) was observed in any group. **Conclusions:** laparoscopic appendectomies in pediatric patients is safe and feasible as compared to open appendectomy

INTRODUCTION

Up until the invention of laparoscopic appendectomy (LA) in 1983, the open appendectomy (OA) method, which was first reported in the 19th century and is carried out through a right lower quadrant incision, has largely remained constant [1]. Appendicitis is the commonest surgical emergency in paediatric patients [2, 3]. In USA, one million children present with acute appendicitis, every year [4, 5]. Incidence of acute appendicitis is high in young age groups with a life time risk of 7%-9% [6, 7]. Several techniques to approach inflamed appendix are narrated in literature [8, 9]. Children are those patients that demand less invasive surgery as compared to adults because of parents

emotional and child's psychological factors [10, 11]. Appendectomy is one of the most frequent emergency procedures in children, however the advantages of laparoscopic appendectomies (LA) over open appendectomies (OA) are not yet clear [12,13]. Particularly because of the potentially disruptive effects of illness on their lives, children represent a group of patients who would greatly benefit from reduced postoperative complications, earlier mobilization, and ultimately discharge from hospital [14]. The results of LA and OA in children have been extensively studied, but conclusions have been difficult to come to due to the small study size,

lack of many randomized trials, and potential heterogeneity in patient characteristics, surgical technique and severity of appendicitis between these studies [15]. Laparoscopic appendectomy, unlike other laparoscopic surgeries has not been found superior to open surgery for acute appendicitis [16]. Current study was conducted to confirm the possible benefits of the laparoscopic procedure. The purpose of this study is to compare the clinical outcome in terms of hospital stay, operating time, postoperative complications and analgesia requirement for pain between open and laparoscopic appendectomy. Researchers undertook this study to evaluate the results of open and laparoscopic appendectomies in paediatric patients in order to assess the efficacy of this limited access strategy.

METHODS

Two hundred pediatric patients (newborn 12 years) of both gender with acute appendicitis were enrolled from emergency department of Pediatric Surgery, Qazi Hussain Ahmad Medical Complex, Nowshera from March 2019 - December 2020. Patients with appendicular mass on clinical examination were excluded from the study. In this convenient study patients were dividing into two groups (100 in each group). Group A: patients underwent open appendectomy. Group B: patients underwent multiport laparoscopic appendectomy. Demographic features and outcome of both procedures were noted and compared between groups by chi square test. p-value of less than equal to 0.05 was considered significant. The sample of the study was calculated through devising a pro-forma for the two procedures. The required data were collected and calculated for the two groups following statistical package for the social sciences (SPSS) technique version 21.0. Regarding the inclusion and exclusion criteria all the cases of paediatric age group were included in the study while those cases with perforated appendix having frank peritonitis were excluded from the study. We excluded all patients above 12 years of age from this study.

RESULTS

The mean ages of patients were 10.11±2.67 years and 10.01±2.31 years (p=0.796) who underwent open and laparoscopic appendectomies, respectively. The majority of patients i.e. 51.0% and 63.0% were belonged to age group 7-9 years in open and laparoscopic appendectomies, respectively. We compared different variables between the two groups in terms of age and gender of the patients to evaluate the commonest age group which was 7-9 years old with a total number of patients 114 patients. Among these patients 51 patients were treated with open surgery and 63 patients underwent laparoscopic surgery. The second commonest age group was 10 - 12 years old patients with a

total number of 70 patients out of which 39 patients were managed as open procedure and a laparoscopic approach was carried out in 31 patients. The other age groups were divided into 4-6 years old patients with acute appendicitis with a total number of 13 patients which was 8 patients for open surgery and 5 cases for laparoscopic surgery. The 1-3 years old age group was least common where the diseased patients with acute appendicitis were treated with open procedure with 2 to 1 ratio for open versus laparoscopic surgery. (Table 1)

Variables		Open appendectomy (n%)	Laparoscopic appendectomy (n%)	p-value*
Age (years)	Mean±SD	10.11±2.67 years	10.01±2.31 years	0.796**
	Newborn	0 (0.0)	0 (0.0)	
	1-3	2 (2.0)	1 (1.0)	
	4-6	8 (8.0)	5 (5.0)	
	7-9	51 (51.0)	63 (63.0)	
Gender	10-12	39 (39.0)	31 (31.0)	0.981**
	Male	63 (63.0)	69 (69.0)	
	Female	37 (37.0)	31 (31.0)	

Table 1: Characteristics of patients and acute appendicitis

*Chi square test; **Not nignificant

Regarding the outcome of open and laparoscopic appendectomies in paediatric patients we selected some parameters and compared them between the two groups. We selected four parameters which were mean operative time, hospital stay, pain intensity measured on the basis of visual analogue scale (VAS) and post-operative complications. Some important complications which were considered for the study were hemorrhage, iatrogenic injury, pelvic collection, surgical site infections (SSI) and the need for exploration again. Characteristics of patients and acute appendicitis and Outcome of open and laparoscopic appendectomy in paediatric patients are shown in Table 1 & 2. No mortality was reported in any case among any group of open and laparoscopic appendectomy.

Parameters		Open appendectomy (n%)	Laparoscopic appendectomy (n%)	p-value*
Mean operative time		26.19±8.14 min.	36.79±11.41 min.	0.000***
Hospital stay		2.01±0.61 days	1.03±0.01 days	0.001***
Pain VAS		3.67±1.41	6.07±2.01	0.000***
Complications	Hemorrhage	0 (0.0)	0 (0.0)	0.0001***
	Iatrogenic injury	0 (0.0)	0 (0.0)	1.0**
	Pelvic collection	3 (3.0)	0 (0.0)	1.0**
	Surgical site infections (SSI)	6 (6.0)	0 (0.0)	0.00***
	Need for exploration	3 (3.0)	0 (0.0)	0.00***
	Mortality	0 (0.0)	0 (0.0)	1.0**

Table 2: Outcome of open and laparoscopic appendectomies in paedric patients

*Chi square test; **Not significant, ***significant

DISCUSSION

Laparoscopy appendectomy is well unknown among adult patients to deal with acute appendicitis but in children, it is not well established in emergency circumstances [17]. In the present study, we compared the short term outcome of this minimal access approach for acute appendicitis with open technique of appendectomy in children to determine the safe use of laparoscopic appendectomy. The majority of patients i.e. 51.0% and 63.0%, in our study was belonged to age group 7-9 years in open and laparoscopic appendectomies, respectively and the mean ages of patients were 10.11 ± 2.67 years and 10.01 ± 2.31 years ($p=0.796$) who underwent open and laparoscopic appendectomies, respectively. However, in a retrospective study by Pogorelic Z et al, median age of patients was 13 years [18]. Similar to our study, in a Retrospective cohort study by Langer et al, mean age of patients was 10.4 ± 3.7 years and 12.8 ± 3.2 years in open and laparoscopic appendectomies, respectively [14]. The male predominance was observed in our study i.e. 63.0% and 69.0% ($p=0.981$) in group A and B, respectively. Similarly, in a retrospective study by Pogorelic Z et al, majority of patients were male i.e. 64% and 58% in open and laparoscopic appendectomy groups, respectively [18]. In a Retrospective cohort study by Lee SL et al, majority of patients were male i.e. 63% and 57% in open and laparoscopic appendectomies, respectively [19]. Mean operative time of appendectomy in our study was 26.19 ± 8.14 min. and 36.79 ± 11.41 min. ($p=0.000$) in group A and B, respectively. In a retrospective study by Pogorelic Z et al, median operative time were 45 min and 30min. in open and laparoscopic appendectomy groups, respectively [18]. Mean Hospital stay in our study after appendectomy was 2.01 ± 0.61 days and 1.03 ± 0.01 days ($p=0.001$) in group A and B, respectively. In a retrospective study by Pogorelic Z et al, median hospital stay were 6 days and 3 days after open and laparoscopic appendectomies, respectively. Mean VAS after appendectomy in our study was 3.67 ± 1.41 and 6.07 ± 2.01 ($p=0.000$) in group A and B, respectively. Complications of open and laparoscopic appendectomies in our study were hemorrhage (0.0% vs. 0.0%; $p=1.0$), Iatrogenic injury (0.0% vs. 0.0%; $p=1.0$) and Pelvic collection (3.0% vs. 0.05; $p=1.0$), SSI (6.0% vs. 0.0%; $p=0.00$). In a retrospective study by Pogorelic Z et al, Complications after open and laparoscopic appendectomies were wound infection (3.9% vs. 1.0%; $p < 0.05$), intraabdominal abscess (1.7% vs. 1.7%; $p > 0.05$), dehiscence of appendiceal stump (0.2% vs. 0.3; $p > 0.05$), ileus (0.4% vs. 0.0%; $p > 0.05$) and postoperative wound bleeding (0.0% vs. 0.3%; $p > 0.05$) [18]. In a meta-analysis by Aziz et al, authors observed that wound infection was significantly lower after laparoscopic appendectomy as

compared to open appendectomy (1.5% vs. 5%) however more intra-abdominal abscess formation and longer operative time were observed in laparoscopic appendectomy than open appendectomy [20]. None of the pediatric patients after laparoscopic appendectomy required another exploration to deal with complications in our study however, 3.0% patients needed exploration in open appendectomy. In a retrospective study by Pogorelic Z et al, reoperations were performed in 1.3% and 1.3% patients who underwent open and laparoscopic appendectomy groups, respectively. No mortality (0.0%) was observed in any group in our study [18]. This study was carried in single center on small sample size. Multicenter and larger sample sizes are required to make guidelines.

CONCLUSIONS

Current results showed the advantages of the laparoscopic approach over open appendectomy including shorter hospital stay, decreased need for postoperative analgesia, early food tolerance and lower rate of wound infection. It is therefore recommended that laparoscopic appendectomies in pediatric patients is safe and feasible as compared to open appendectomy because of good short term outcome of laparoscopic approach in children.

Conflicts of Interest

The authors declare no conflict of interest

Source of Funding

The author(s) received no financial support for the research, authorship and/or publication of this article

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