

## CONVERSION OF LAPAROSCOPIC APPENDECTOMY TO OPEN APPENDECTOMY IN CHILDREN REASONS AND CLINICAL OUTCOMES

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**Abstract** *This study was carried out To assess the impact of this conversion on clinical outcomes to better understand the reasons for pediatric patients' open appendectomy procedures as opposed to laparoscopic ones. This medical research study is retrospective. We conducted a retrospective study of pediatric patients (ages 1 to 18) who had appendectomies at MMC Mardan's Department of Pediatric Surgery between January 2010 and December 2020. Patient demographics, preoperative presentation, surgical technique (open or laparoscopic), conversion reasons, intraoperative findings, postoperative problems, duration of hospital stay, and follow-up results were all recorded. The statistical analysis included logistic regression analyses, t-tests, and chi-square tests when appropriate. The research included 462 pediatric patients, of whom 268 had a laparoscopic appendectomy, and 194 underwent open appendectomy. In 56 patients (20.9%), laparoscopic Conversion to open appendectomy was necessary. The most frequent causes of Conversion were adhesion-related vision difficulties (33.9%) and complex appendicitis (46.4%). Compared to patients who had a successful laparoscopic operation, those who had laparoscopic-to-open Conversion had a substantially greater risk of postoperative problems (24.1% vs. 8.2%,  $p < 0.001$ ) and longer hospital admissions (mean 4.7 vs. 2.9 days,  $p < 0.001$ ). The results of a logistic regression study showed that older age (OR 1.22, 95% CI 1.06-1.41) and complex appendicitis (OR 3.14, 95% CI 1.56-6.33) were independent predictors of Conversion. In children, complex appendicitis and intraoperative complications often need Conversion from laparoscopic to open appendectomy. Extended hospital stays and a greater incidence of postoperative complications are linked to these patients. Optimizing results and reducing the need for Conversion need a surgeon with extensive training and expertise in patient selection.*

**Keywords:** Appendicitis; Laparoscopic Appendectomy; Open Appendectomy; Pediatric Surgery; Conversion; Clinical Outcomes

### Introduction

An appendectomy, or the surgical removal of the appendix, is one of the most common emergency treatments for pediatric patients (Bansal, Banever, Karrer, & Partrick, 2012). Traditionally, this procedure was carried out via an open surgical approach. With the advent of laparoscopic surgery in the late 20th century, pediatric surgery saw a dramatic transformation (Idrees & Bartlett, 2010; Lanfranco, Castellanos, Desai, & Meyers, 2004). Reduced surgical pain, shorter hospital stays, and quicker recovery times were benefits of this surgery (Esposito et al., 2012). When treating adults and children with uncomplicated appendicitis, laparoscopic appendectomy swiftly emerged as the preferred procedure (Sartelli et al., 2013). There are disadvantages to laparoscopic appendectomy despite all of its advantages. Surgeons may sometimes have to convert from laparoscopy to open surgery due to

unforeseen complications (Lander, 2012). This is an important conversion since it impacts the patient's clinical course and outcomes. For pediatric surgical practice, it is essential to understand the reasoning for these conversions and the consequences that follow. Examining the clinical results of pediatric patients' Conversion from laparoscopic to open appendectomy and investigating the reasons behind this Conversion are the primary objectives of this retrospective study. This study aims to give significant new information that might guide clinical judgment and improve patient care in pediatric appendectomy cases, a common yet challenging surgical scenario.

### Methods

#### Study Design

Pediatric patients who had appendectomy between January 2010 and December 2020, ages 1 to 18,

were included in this retrospective analysis in the Department of Pediatric Surgery at the MMC Mardan Center.

In this retrospective investigation, we looked at data from kids who were 1 to 18 years old who had appendices removed at MMC Mardan's Department of Pediatric Surgery for ten years, from January 2010 to December 2020. Our primary objectives were to assess the associated clinical results and identify the factors that led certain patients to transition from laparoscopic to open appendectomy. Patient information was meticulously collected and organized, including demographics, preoperative conditions, surgical method (open or laparoscopic), conversion grounds, intraoperative findings, postoperative complications, duration of hospital stay, and follow-up results. Patterns and relationships were found using the statistical analysis findings. T-tests, logistic regression, and chi-square tests were used to review the data and draw wise conclusions thoroughly. Two groups of patients were created: those with laparoscopic appendectomy and those who required Conversion to open appendectomy during the procedure. Next, we compared how long each group spent in the hospital and what issues they had after surgery.

Furthermore, we used logistic regression analysis to determine the independent factors impacting the need for Conversion. This study aimed to define the circumstances that resulted in children undergoing open appendectomy instead of laparoscopic surgery and to determine the clinical consequences of this treatment. It highlights how crucial it is to have surgeons with the required expertise and carefully choose patients to reduce conversion rates and enhance patient outcomes in pediatric appendectomy scenarios.

**Inclusion Criteria**

Children aged 1 to 18 who had appendice removal from the Department of Pediatric Surgery at MMC Mardan between January 2010 and December 2020 were included in our study. Data on patient demographics, preoperative presentation, surgical method, grounds for Conversion, intraoperative findings, postoperative complications, hospital stay, and follow-up outcomes were gathered to investigate the Conversion of laparoscopic to open appendectomy in this population.

**Exclusion Criteria**

Excluded from the analysis were pediatric patients who did not fall within the age range of one to eighteen, those whose data was missing or incomplete, and those who did not have an appendectomy at the MMC Mardan Department of Pediatric Surgery between January 2010 and December 2020. This ensured that a consistent group with complete and reliable data would be the focus of the investigation.

**Data Collection**

Information was gathered from surgical databases and computerized medical records. The following factors were noted for every patient: Demographics, body mass index (BMI), age, and gender. Duration of symptoms, appendicitis symptoms, and test results are all part of the preoperative presentation. Laparoscopic or open appendectomy is the surgical approach. Motives behind Conversion: results obtained during surgery led to the decision to switch from LA to OA. The appearance of the appendix, adhesions, and other pertinent intraoperative findings. Postoperative problems include wound dehiscence, abscess development, and infections at the surgical site. Hospital Stay Length: The total number of days from operation to release. Follow-up Results: Return to regular activities, postoperative discomfort, and readmissions.

**Statistical Analysis**

The statistical analysis was carried out using SPSS 28.0. Chi-square tests were used to evaluate categorical data, while t-tests were used to investigate continuous variables. We used a logistic regression analysis to find independent factors corresponding to the Conversion to open-access. P-values less than 0.05 were deemed statistically significant.

**Results**

There were 462 juvenile patients in this study; 268 had laparoscopic appendectomy, and 194 underwent open appendectomy. There were 56 cases, or around 20.9% of the patients, when the laparoscopic approach was substituted with an open appendectomy. The primary reasons for Conversion were complicated appendicitis, which happened in 46.4% of cases, and problems viewing the appendix due to intra-abdominal adhesions, which happened in 33.9% of instances. In terms of clinical outcomes, patients who had a successful laparoscopic procedure experienced a shorter average hospital stay (4.7 days) and a notably higher rate of postoperative complications (24.1% vs. 8.2%, p < 0.001) in comparison to patients who underwent a laparoscopic-to-open conversion. A logistic regression analysis revealed that the need for pediatric patients to have an open appendectomy rather than a laparoscopic one was independently predicted by older age (OR 1.22, 95% CI 1.06-1.41) and severe appendicitis (OR 3.14, 95% CI 1.56-6.33).

Table 1: Demographics and Preoperative Presentation

Variable	Laparoscopic (n=268)	Open (n=194)
Age (years) mean ± SD	10.4 ± 3.2	10.8 ± 2.9
Gender (male)	150 (56.0)	112 (57.7)

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<b>n (%)</b>		
<b>BMI (kg/m<sup>2</sup>)</b>	18.3 ± 2.	18.6 ± 2.1
<b>mean ± SD</b>		
<b>Duration of symptoms (hours)</b>	24 (18-36)	28 (20-40)
<b>median (IQR)</b>		

Table 2: Reasons for Conversion

Reason for Conversion	Number of Cases (n=56)	Percentage (%)
Complicated appendicitis	26	46.4
Difficulty in visualization	19	33.9
Intraoperative bleeding	6	10.7
Other technical difficulties	5	8.9

Table 3: Clinical Outcomes

Outcome Measure	Laparoscopic (n=268)	Open (n=194)	p-value
Postoperative Complications (%)	22 (8.2)	56 (24.1)	< 0.001
Length of Hospital Stay (days), mean ± SD	2.9 ± 1.2	4.7 ± 1.6	< 0.001

**Discussion**

The findings of this retrospective study provide valuable new insights into the clinical outcomes and determinants that affect pediatric patients' Conversion from laparoscopic to open appendectomy. These insights are essential to optimizing patient care and surgical decision-making in this common but complex surgical context. From our data, the most frequent reason why pediatric patients switch from laparoscopic to open appendectomy is acute appendicitis. This is consistent with earlier research that has shown time and time again that a significant risk factor for open surgery is complicated appendicitis (Di Saverio et al., 2020; Maggioni et al., 2002). When treating acute appendicitis, which is characterized by extensive inflammation, the development of an abscess, or a perforation, surgery poses unique challenges. An open approach is often the best option to provide efficient treatment and lower postoperative problems since it requires extensive inspection and drainage (Grehan, 2022). It has also been found that a significant contributing factor to conversion was intraoperative problems, most notably the inability to visualize the appendix because of adhesions. This is in line with the volume of research on the effect of adhesions on laparoscopic operations (Yau, Siu, Tang, Yang, &

Li, 2007). Adhesions may restrict the surgical field, which increases the difficulty of performing the laparoscopic treatment safely. A surgeon's ability to recognize these difficulties and decide whether to transition to open surgery depends on their judgment (Horvath et al., 2017). Our results clarify the clinical ramifications of switching to an open appendectomy for pediatric patients. Compared to patients who had successful laparoscopic operations (8.2%), patients who had a laparoscopic-to-open conversion had a considerably higher chance of postoperative problems (24.1%) (p < 0.001). The difference in the incidence of complications underscores the therapeutic benefit of Conversion and stresses the significance of selecting patients carefully and making surgical decisions with care. Furthermore, our study's findings demonstrated that patients requiring Conversion had a mean hospital stay of 4.7 days, significantly higher than the 2.9-day stay of patients who had successful laparoscopic procedures (p < 0.001). This extended hospital stay is due to the complexity of the surgical procedures involved in conversion cases and the potential for increased postoperative care requirements. Using logistic regression analysis, two independent predictors of Conversion were identified in pediatric patients. Complicated appendicitis was a significant predictor (OR 3.14, 95% CI 1.56-6.33), in agreement with prior studies (Adachi, Okamoto, Ono, Kanematsu, & Kuroki, 2011; Blakely et al., 2011). Because acute appendicitis requires more extensive surgical intervention, its presence substantially increases the likelihood of Conversion. Older age was revealed to be an additional predictor of conversion (OR 1.22, 95% CI 1.06-1.41). This finding may result from older pediatric patients having more severe and complex cases of appendicitis, which may complicate laparoscopic surgery. The therapeutic implications of our work emphasize the critical role that surgical judgment and experience play in operating a pediatric appendix. Surgeons must carefully analyze the patient's characteristics, particularly age and the risk of severe appendicitis, to choose the appropriate surgical approach. Additionally, surgical teams should be prepared to go from intraoperative complications to open surgery quickly and skillfully. When doing juvenile appendectomies, the surgeon's expertise and competence should come first to reduce the need for Conversion and enhance patient outcomes. Retaining a high level of proficiency in both open and laparoscopic techniques will enable surgeons to adapt to the particular needs of every case. In summary, this study offers novel insights into the variables that influence pediatric patients' transition from laparoscopic to open appendectomy and the associated clinical outcomes. It emphasizes how essential individualized patient care, surgical

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proficiency, and adaptability are to raising the bar for pediatric appendectomy care and optimizing patient outcomes.

### Conclusion

In juvenile patients, the choice to switch from laparoscopic to open appendectomy is mostly influenced by the intricacy of the appendix and the technical difficulties that arise during the procedure. Although Conversion is sometimes required, it is linked to an increased risk of surgical complications and prolonged hospital stays. When doing juvenile appendectomies, surgeons should carefully examine patient selection, unique anatomical variables, and their expertise to minimize the need for Conversion and maximize results.

### Limitations

This research includes the possibility of unmeasured confounding factors and its retrospective methodology, which might lead to bias. The variables driving Conversion and their effect on long-term outcomes in pediatric appendectomy need additional investigation via prospective studies with bigger sample numbers and longer follow-up periods.

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### Author's Contribution:

Concept & Design of Study: Muhammad Javad Khan, Data Analysis: Kiramat Ullah, Revisiting Critically: Inayat Ullah, Statically analysis & Final Approval of version: Muhammad Qasim khan

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### Declarations

#### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

#### Ethics approval and consent to participate

Not applicable

#### Consent for publication

Not applicable

#### Funding

Not applicable

#### Conflict of Interest

Regarding conflicts of interest, the authors state that their research was carried out independently without

any affiliations or financial ties that could raise concerns about biases.



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