

A COMPARATIVE ANALYSIS OF OPEN VERSUS LAPAROSCOPIC INGUINAL HERNIA REPAIR IN CHILDREN

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ABSTRACT

Background

Inguinal hernia repair is a common pediatric surgical procedure, with open and laparoscopic techniques being the two main approaches. While both methods are effective, each has unique advantages and limitations.

Objective

This study was aimed to compare the clinical outcomes of open versus laparoscopic inguinal hernia repair in children to provide evidence for choosing the optimal approach.

Methods

This cross-sectional comparative study was carried out at the Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakistan, from Oct, 2009 to Mar, 2010. A total of 120 pediatric patients were included, with 60 undergoing open surgery and 60 undergoing laparoscopic repair. Demographic characteristics, operative details, postoperative outcomes, and parental satisfaction were evaluated. Statistical analyses were performed to identify significant differences between the groups.

Results

Laparoscopic repair demonstrated advantages in terms of shorter hospital stays (1.5 vs 1.8 days, $p < 0.05$), reduced pain scores (3.5 vs 4.2, $p < 0.05$), faster return to normal activities (5.2 vs 7.5 days, $p < 0.01$), and better cosmetic outcomes (87% vs 75% achieving good results, $p < 0.05$). However, laparoscopic procedures required significantly longer operative times (60.8 vs. 50.3 minutes, $p < 0.01$) and incurred higher surgical costs. Complication rates, including recurrence and wound infections, were low and comparable between groups. Parental satisfaction was higher for laparoscopic surgery due to faster recovery and improved cosmetic outcomes.

Conclusion

Both open and laparoscopic hernia repairs are safe and effective options for children. Laparoscopic repair offers significant advantages in recovery, pain reduction, and aesthetics but requires more operative time and resources. Tailored decision-making, considering patient and family preferences and healthcare settings, remains essential.

Keywords: *Inguinal hernia, Pediatric surgery, Laparoscopic repair, Open repair, Postoperative outcomes, minimally invasive surgery, Hernia recurrence, Cosmetic outcomes.*

INTRODUCTION

Surgical management of inguinal hernia is one of the most frequently performed surgical procedures in children, with a considerable prevalence of the problem in the pediatric population (1). A lump in the groin region characterises the condition and is due to the patent processus vaginalis, which forms an inguinal sac. In most of the diseases, inguinal hernias are common and straightforward but can lead to complications like incarceration or strangulation and hence require surgery (2).

In the past, open hernia surgery was the common form of hernia surgery, and it has been widely documented that this process is safe and effective. It involves making an incision directly over the hernia site, where the consultant can manually deal with the hernia sac. However, the increased use of surgical technology has made it possible to employ different surgical techniques that provide less tissue damage, such as laparoscopic hernia repair (3).

Laparoscopy was established in adult surgery but has recently been applied in pediatric surgery because of some advantages, such as making small incisions, minimizing postoperative pain, early return to normal duty and better cosmetic results. Also, the laparoscopic technique permits the visualization of the opposite groin area; therefore, the Contralateral hernia, if present, is also diagnosed and repaired at the same time (4). However, some benefits, such as increased vision in obese patients complicated with dense subcutaneous fat, and concerns such as longer operative time, higher cost and the issue of the surgeon learning curve, mean the routine application in children remains a point of discussion up to the time of this report.

In the latest systematic review on whether laparoscopic hernia repair provides a better outcome than open technique and what factors could influence the result, studies were included based on the medical databases (5). Some papers focus on the high outcomes of laparoscopic methods, while other papers have discussed the dependability and economic aspects of the open procedure. These variations advocate for conducting the study based on the context that relates to clinical practice. This study seeks to compare the open and laparoscopic inguinal hernia repair in children at a tertiary care hospital and was aimed to compare the advantages and disadvantages of the two procedures based on the study of various parameters that include operative time, postoperative recovery, complication rate, and parents' satisfaction with the outcome of the operation.

METHODOLOGY

This cross-sectional comparative study was carried out at the Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical

College, Bannu, Pakistan, from Oct, 2009 to Mar, 2010. Its objective was to evaluate the differences between the two approaches to the surgical treatment of inguinal hernia in children. Sixty patients aged 0 up to 14 years were categorised to the open repair, while 60 were to the laparoscopic repair. Patient privacy was upheld throughout the study since all data was coded before the analysis was conducted. All patients were reviewed at least one month after surgery to evaluate early recovery, and the results included long-term data were available, including recurrence and chronic pain. The criteria for inclusion stated that patients should have a confirmed diagnosis of inguinal hernia, medical records and follow-up data should be available, and at least one month of data on follow-up after the surgery should be available. Patients were excluded if they were operated on for emergency reasons, including strangulation or incarceration, had insufficient data to make decisions, had other abdominal disorders that needed different treatments, or had prior surgeries for inguinal hernia repair. These criteria helped to achieve similarity and comparability in the studied population. The questionnaire assessment was based on a data sheet consisting of demographic characterization (age, gender, BMI), clinical characteristics (type of hernia, laterality and symptoms), operative data (surgical approach, operative time, type of anaesthesia, experience of the surgeon), and postoperative data (length of stay, postoperative pain, time to return to normal activity, complications). Cosmetic outcomes were also evaluated, and parental satisfaction was assessed using a standardized Likert scale during follow-up visits. Economic factors, including surgical, hospital, and follow-up costs, were recorded. Statistical calculations were made using the SPSS program. Data obtained for categorical variables were presented as frequency and percentages of the respondents. Data on the continuous variables were described in terms of means and standard deviation of the responses as well. The independent-sample t-test was used to compare the two groups. In this study, significance was measured at only $p\text{-value} < 0.05$.

RESULT

The demographic and clinical characteristics of the patients included in both groups for comparison were similar. The mean age for surgery was 6 years among the two groups, and they were not significantly different. The majority of the patients were male due to the higher incidence of Inguinal Hernias in males, while the gender distribution was more or less similar in both groups. Moreover, there were no statistically significant differences in the mean weight, height and BMI, indicating that both groups were fairly homogenised in terms of physical attributes.

With regard to clinical characteristics, unilateral hernias were more frequent than bilateral hernias in both groups, and there were equal numbers of right-sided and left-sided hernias. Pain and swelling

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complaints had greater prevalence than cases without symptoms, and there was no statistically significant difference in the history of previous abdominal surgeries or diseases. These balanced distributions of the baseline characteristics enhance the validity of the comparative study on surgical outcomes.

Table 1: Baseline Demographic and Clinical Characteristics of Patients Undergoing Inguinal Hernia Repair

Variable	Open Surgery (n=60)	Laparoscopic Surgery (n=60)	p-value
Age (years, mean \pm SD)	5.8 \pm 2.1	6.1 \pm 2.3	0.45
Gender (Male/Female)	45/15	42/18	0.60
Weight (kg, mean \pm SD)	19.5 \pm 4.8	20.2 \pm 5.0	0.55
Height (cm, mean \pm SD)	109.8 \pm 10.2	111.3 \pm 11.1	0.34
BMI (mean \pm SD)	16.2 \pm 1.9	16.4 \pm 2.0	0.60
Type of Hernia (Unilateral/Bilateral)	50/10	47/13	0.50
Hernia Laterality (Right/Left)	38/22	40/20	0.73
Hernia Size (Small/Medium/Large)	35/20/5	30/25/5	0.55
Symptoms (Pain/Swelling/Asymptomatic)	20/30/10	15/35/10	0.50
Prior Abdominal Surgery (Yes/No)	8/52	7/53	0.77
Associated Conditions (e.g., Preterm Birth, Respiratory Issues)	5 cases	4 cases	0.74

The data on surgical procedures reveal notable differences between the two approaches. The mean surgical time was significantly longer for laparoscopic repair (60.8 minutes) compared to open repair (50.3 minutes), suggesting that the laparoscopic approach may require more time due to its technical complexity. However, both procedures were primarily performed under general anaesthesia, with only a few cases using regional anaesthesia.

Mesh usage was slightly higher in the laparoscopic group, although the difference was not statistically significant. Interestingly, additional intraoperative findings, such as the discovery of contralateral hernias or other conditions, were slightly more frequent in the laparoscopic group, potentially due to the better visualization offered by this approach. Only one case required conversion from laparoscopic to open surgery, indicating a high success rate for minimally invasive techniques.

Table 2: Procedural Details and Intraoperative Findings

Variable	Open Surgery (n=60)	Laparoscopic Surgery (n=60)	p-value
Duration of Surgery (minutes, mean \pm SD)	50.3 \pm 15.2	60.8 \pm 17.5	0.01
Surgeon Experience (Junior/Senior)	25/35	20/40	0.38
Type of Anesthesia (General/Regional/Local)	55/5/0	58/2/0	0.34
Mesh Usage (Yes/No)	5/55	10/50	0.16
Additional Findings (Yes/No)	8/52	12/48	0.33
Conversion to Open Surgery (Yes/No)	N/A	1/59	-

The comparison of postoperative outcomes highlights some advantages of laparoscopic surgery. Hospital stay was shorter for the laparoscopic group (1.5 days vs. 1.8 days for open surgery), and pain scores were also lower (3.5 vs. 4.2 on a 0-10 scale), both showing statistically significant differences. Patients undergoing laparoscopic repair resumed normal activities faster (5.2 days vs. 7.5 days for open surgery), a crucial factor for parents and caregivers.

The rates of complications, including wound infections and hematoma formation, were slightly lower in the laparoscopic group, but the differences were not statistically significant. Recurrence rates were minimal in both groups, indicating the overall effectiveness of both surgical techniques. Cosmetic outcomes, assessed as good, were significantly higher in the laparoscopic group (87% vs. 75%), likely due to smaller incisions and less visible scarring.

Table 3: Postoperative Outcomes and Complications

Variable	Open Surgery (n=60)	Laparoscopic Surgery (n=60)	p-value
Hospital Stay (days, mean \pm SD)	1.8 \pm 0.7	1.5 \pm 0.5	0.02
Pain Scores (mean \pm SD, scale 0–10)	4.2 \pm 1.1	3.5 \pm 1.0	0.01
Time to Resume Normal Activities (days, mean \pm SD)	7.5 \pm 1.8	5.2 \pm 1.5	<0.01
Wound Infection (Yes/No)	5/55	2/58	0.24
Hematoma Formation (Yes/No)	4/56	3/57	0.70
Recurrence Rate (Yes/No)	3/57	2/58	0.65
Cosmetic Outcome (Good/Fair/Poor)	45/12/3	52/7/1	0.05

Follow-up data reinforce some of the benefits of laparoscopic surgery. Recovery time was significantly shorter for laparoscopic repairs (9.8 days vs. 12.2 days), suggesting a faster return to routine life. Long-term complications such as chronic pain were infrequent and did not differ significantly between groups. Parental satisfaction was higher for laparoscopic procedures, with more parents rating the experience as highly satisfactory, likely due to better cosmetic results and quicker recovery.

Table 4: Follow-Up Outcomes and Economic Analysis

Variable	Open Surgery (n=60)	Laparoscopic Surgery (n=60)	p-value
Time to Complete Recovery (days, mean \pm SD)	12.2 \pm 3.5	9.8 \pm 2.8	<0.01
Long-Term Complications	4 cases	2 cases	0.40

(e.g., Chronic Pain)			
Parental Satisfaction (High/Moderate/Low)	48/10/2	55/5/0	0.04

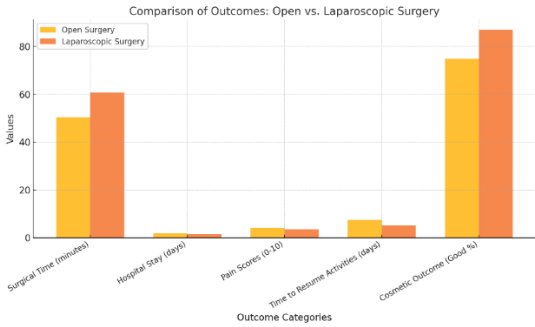


Figure 1: Graph compares key outcomes between open and laparoscopic inguinal hernia repair. Laparoscopic surgery required longer operative time (60.8 vs 50.3 minutes) but offered notable advantages, including shorter hospital stays (1.5 vs 1.8 days), lower pain scores (3.5 vs 4.2), and quicker recovery, with patients resuming normal activities in 5.2 days compared to 7.5 days for open surgery. Additionally, cosmetic outcomes were superior in the laparoscopic group, with 87% achieving good results versus 75% in the open group. These findings highlight laparoscopic repair as a minimally invasive option with better recovery and aesthetic benefits, albeit at the cost of longer operative times.

DISCUSSION

This study compared the outcomes of open versus laparoscopic inguinal hernia repair in pediatric patients, with findings consistent with existing literature on the subject (6-9). Both surgical techniques were effective, but each demonstrated distinct advantages which can guide clinical decision-making.

Laparoscopic surgery took longer operative time than open repair, though this was expected due to the inherent technical demanding nature of this approach as well as the additional equipment used in laparoscopic procedures as described by other authors (10,11). However, the findings showed the laparoscopic approach had numerous benefits, such as minimal hospital stay, minimal postoperative pain, and early ambulation. The benefits mentioned above agree with earlier findings as the main advantage of laparoscopic surgery embraced reduced invasiveness, contributing to better recovery indicators. This is especially helpful for pediatric patients since shorter recovery times enable children to get back to their routines, cutting down on the stress families' experience.

The study also found better cosmetic outcomes in the laparoscopic group, with a higher percentage of patients achieving good aesthetic results. This aligns with studies emphasizing the role of smaller incisions in laparoscopic procedures, which result in less visible scarring (12-15). Cosmetic outcomes are increasingly recognized as an important consideration in pediatric surgery, as they impact patient and family satisfaction.

Complication rates, including wound infections and recurrence, were low in both groups and comparable to rates reported in other studies (16-18). This suggests that both techniques are safe when performed by experienced surgeons. However, the slightly lower pain scores and faster recovery in the laparoscopic group could make it the preferred choice for patients prioritizing comfort and reduced downtime.

While this study provides valuable insights, certain limitations must be acknowledged. The relatively short follow-up period limits the ability to assess long-term outcomes, such as chronic pain or recurrence. Additionally, the study was conducted in a single hospital, which may limit the generalizability of the findings. Future multicenter studies with longer follow-up periods could provide more comprehensive data.

CONCLUSION

Both open and laparoscopic inguinal hernia repairs are effective and safe options for pediatric patients. Laparoscopic surgery offers advantages in terms of recovery time, pain reduction, and cosmetic outcomes, making it an attractive choice for many families, particularly when resources allow. Open surgery, however, remains a reliable and cost-effective option, particularly in resource-limited settings or when shorter operative times are prioritized. Tailored decision-making, considering patient-specific factors and family preferences, remains key in choosing the optimal surgical approach.

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