

Laparoscopic versus Open Inguinal Hernia Repair in Children A Multicenter Retrospective Study of Outcomes

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ABSTRACT

Background: PIH repair is one of the common procedures conducted by pediatric surgeons. Objective: To compare laparoscopic vs open inguinal hernia repair in kids regarding operative characteristics and postoperative outcomes.

Methods: This multicenter retrospective cohort research involved 650 pediatric cases who had inguinal hernia repair at participating pediatric surgery centers. Patients were equally divided into laparoscopic (n = 325) and open repair groups (n = 325). Demographic data, preoperative hernia characteristics, operative time, and postoperative outcomes (recurrence and complications) were collected from medical records.

Results: There were statistically insignificant variances between groups according to age or sex distribution. The laparoscopic group had a significantly greater rate of bilateral repair than the open group (43.1% vs. 24.6%, p below 0.001), whereas preoperative hydrocele was more common in the open group (23.1% vs. 4.6%, p below 0.001). Operative time did differ insignificantly between laparoscopic and open repair for overall, unilateral, or bilateral procedures (p > 0.05 for all). Postoperative outcomes were comparable, with low recurrence rates (1.8% laparoscopic vs. 1.2% open, p = 0.524) and insignificant variance in overall complication rates (4.6% vs. 2.5%, p = 0.137).

Conclusion: Laparoscopic and open inguinal hernia repair in kids demonstrate comparable safety and efficacy. The choice of surgical approach should be guided by surgeon expertise and individual patient factors rather than differences in outcomes.

Keywords: Laparoscopic repair; Pediatric inguinal hernia; Open herniotomy; Surgical outcomes

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INTRODUCTION

Inguinal hernia repairs constitute one of the most prevalent procedures conducted by pediatric surgeons, with open repair serving as the conventional method for decades. As much as eleven percent of infants may get contralateral metachronous hernias; nevertheless, the necessity of contralateral exploration remains contentious, especially given that only one to two percent of kids with accidental patent processus vaginalis (PPV) would manifest a symptomatic hernia within one year (1).

Annually, approximately twenty million cases worldwide receive groin hernia repair, rendering it one of commonly executed procedures. Groin hernias may manifest acutely, frequently as strangulated or acutely irreducible hernias. Repair of an acute groin hernia generally results in inferior postoperative results than elective surgery. The incidence of emergency groin hernia repairs fluctuates considerably according to a country's income level, with rates spanning from

3.7 to 9.6 percent (2).

1 in 4 adult males is at possibility of acquiring an inguinal hernia over their lifetime, rendering inguinal hernia repair one of the most prevalent procedures conducted by general

surgeons globally. The prevalence of inguinal hernias escalates with age, resulting in a fifty percent likelihood of occurrence in seventy-year-old men. Complications also escalate with age, particularly when repair is conducted in an emergency setting (3).

Pediatric inguinal hernia (PIH) is a prevalent surgical issue faced by children general surgeons, and its repair can be executed utilizing either an open or laparoscopic technique. Both methodologies entail technical intricacies concerning the ligation of the hernia sac and the closure of the inguinal ring. The selection of surgical strategy and procedure may differ based on several parameters, involving case age, prematurity, hernia recurrence, hernia reducibility or imprisonment, and additional case risk factors that elevate intra-abdominal pressure (4).

PIH is identified in 0.8 to 4.4 percent of kids per year. The majority of these hernias are indirect, with abdominal contents herniating into the inguinal canal via a patent processus vaginalis (5). Surgical repair, typically entailing the dissection of the hernia sac at the internal ring and subsequent high ligation of the sac, is the globally recognized ultimate treatment. Given the condition's

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elevated frequency rate, hernia repair is among the most frequently conducted surgeries in kids (6).

The prevalence of PIH varies from 0.8 to 5 percent, escalating to over thirty percent in preterm newborns. Management is essential because of the possibility of incarceration of the colon, testis, or ovary, which happens in around three to sixteen percent of the kids with an inguinal hernia. Open inguinal hernia repair is the predominant management modality in kids; however, the laparoscopic technique is gaining traction in contemporary practice (7, 8).

This research aims to compare open vs laparoscopic inguinal hernia repair in kids.

PATIENTS AND METHODS

This multicenter retrospective cohort research has been performed on a total of 650 cases that have been involved and equally allocated into two groups according to the surgical technique used: the laparoscopic inguinal hernia repair group (n = 325) and the open inguinal hernia repair group (n = 325) at multiple pediatric surgery centers.

Inclusion criteria: Pediatric cases with a clinical identification of inguinal hernia and cases that had either laparoscopic or open inguinal hernia repair.

Exclusion criteria: Cases with incomplete medical records, cases that underwent simultaneous abdominal or pelvic surgical procedures, and recurrent hernias repaired using techniques other than standard open or laparoscopic approaches.

Methods

All patients were subjected to the following:

Data Collection

Information has been extracted retrospectively from hospital records and operative notes. Collected variables included: Demographic data: age at surgery (months) and

sex, Preoperative hernia characteristics: hernia laterality (right, left, or bilateral) and presence of preoperative

hydrocele; operative details: surgical approach, type of repair (unilateral or bilateral), and operative time (minutes); and postoperative outcomes: hernia recurrence and postoperative complications through the monitoring period.

Surgical Techniques

Open inguinal hernia repair was carried out through a standard inguinal incision with dissection and high ligation of the hernia sac at the degree of the internal ring. Laparoscopic inguinal hernia repair was performed using a standard minimally invasive approach under general anesthesia, allowing visualization of both internal inguinal rings and closure of the PPV using intracorporeal suturing.

Outcome Measures

The 1ry results were operative time, hernia recurrence, and postoperative complications. 2ry results involved the rate of unilateral versus bilateral repair and the presence of preoperative hydrocele. Follow-Up

Patients were followed postoperatively through outpatient clinic visits and medical records to assess for complications and hernia recurrence.

Statistical Analysis

Statistical analysis has been carried out utilizing suitable statistical tools. Continuous variables have been presented as mean $\pm$ SD or median (interquartile range), whilst categorical parameters have been stated as frequencies and percentages. Group comparisons have been carried out utilizing Student's t-test or the Mann-Whitney U test for continuous parameters and the chi-square or Fisher's exact test for categorical parameters. A p-value less than 0.05 has been deemed statistically significant.

RESULTS

Table 1: baseline features between the studied groups.

Characteristic	Laparoscopic (num.=325)	Open (num.=325)	p-value
Age in months [median (IQR)]	24 (12–48)	30 (18–60)	0.052
Sex			
Male [n (%)]	215 (66.2%)	230 (70.8%)	0.221
Female [n (%)]	110 (33.8%)	95 (29.2%)	

p<0.001 is highly significant, P value below 0.05 is statistically significant, P value above 0.05: Not significant, SD: standard deviation.

There was statically insignificant variance between the two surgical groups the according to demographic characteristics. Although the laparoscopic group tended to be younger (median 24 months vs. 30 months), this variance did reach statistical insignificance (p equal to 0.052). Sex distribution was similar between groups (p equal to 0.221). (Table 1)

Table 2: Pre-operative Hernia Features between the examined groups.

Characteristic	Laparoscopic (num.=325)	Open (num.=325)	p-value
Bilateral repair [n (%)]	140 (43.1%)	80 (24.6%)	<0.001
Unilateral repair [n (%)]	185 (56.9%)	245 (75.4%)	<0.001
Right-sided hernia [n (%)]	200 (61.5%)	190 (58.5%)	0.450
Left-sided hernia [n (%)]	125 (38.5%)	135 (41.5%)	0.450
Pre-op hydrocele [n (%)]	15 (4.6%)	75 (23.1%)	<0.001

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There was statically significant variance between the two surgical groups according to Bilateral repair and Pre-op hydrocele. The laparoscopic group had a greater proportion of bilateral repairs (43.1% vs. 24.6%, p below 0.001), whereas the open group had a significantly greater rate of

preoperative hydrocele (23.1% vs. 4.6%, p below 0.001), while there was statically insignificant variance between the two surgical groups regarding Right-sided hernia and Left-sided hernia. (Table 2)

Table 3: Comparison of Operative Time between the studied groups.

Type of Repair	Laparoscopic (n=325)	Open (n=325)	p-value
Overall (minutes) (Mean $\pm$SD)	21.1 $\pm$ 5.6	20.3 $\pm$ 5.2	0.0596
Bilateral (minutes) (Mean $\pm$SD)	28.7 $\pm$ 5.575	29.5 $\pm$ 5.9	0.0761
Unilateral (minutes) (Mean $\pm$SD)	15.5 $\pm$ 4.5	15 $\pm$ 4	0.1348

There were statistically insignificant variances in operative time among laparoscopic and open inguinal hernia repair in a large matched pediatric cohort (n=325 per group), with all p-values exceeding 0.05 (overall: p equal to 0.0596; bilateral: p equal to 0.0761; unilateral: p equal to 0.1348).

Overall, laparoscopic repair averaged 21.1 $\pm$ 5.6 minutes compared to 20.3 $\pm$ 5.2 minutes for open repair, while unilateral cases were nearly identical (15.5 $\pm$ 4.5 vs. 15 $\pm$ 4 minutes) and bilateral cases showed comparable durations (28.7 $\pm$ 5.575 vs. 29.5 $\pm$ 5.9 minutes).

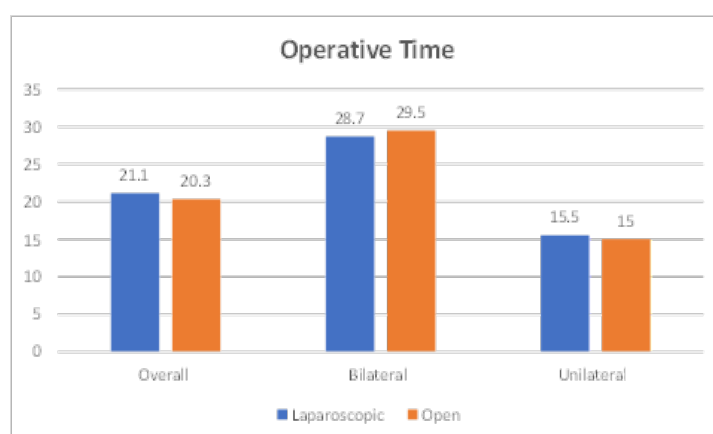


Figure 1: Distribution of operative Time between the examined groups.

Table 4: Post-operative Results among the studied groups.

Outcome	Laparoscopic (num.=325)	Open (num.=325)	p-value
Recurrence [n (%)]	6 (1.8%)	4 (1.2%)	0.524
Post-op complications [n (%)]	15 (4.6%)	8 (2.5%)	0.137

There was statically insignificant variance between the two surgical groups according to postoperative outcomes. Recurrence rates were low in both groups (1.8% laparoscopic vs. 1.2% open, p = 0.524), and overall

complication rates revealed insignificant variance (4.6% vs. 2.5%, p = 0.137). (Table 4)

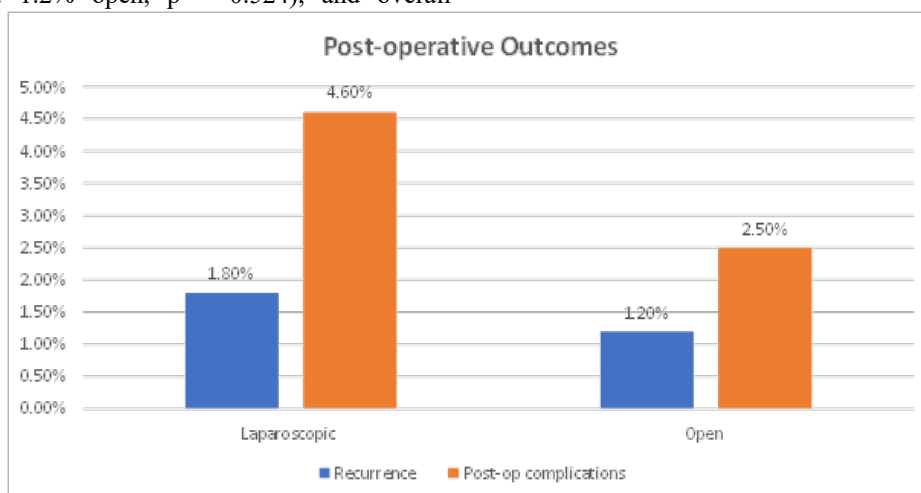


Figure 2: distribution of post-operative outcomes between the studied groups.

DISCUSSION

Regarding demographic data, findings revealed that there was statistically insignificant variance between the two surgical groups regarding demographic characteristics. Although the laparoscopic group tended to be younger (median 24 months vs. 30 months), this variance did reach statistical insignificance (p equal to 0.052). Sex distribution was similar between groups (p equal to 0.221). In agreement with Sachdeva et al. (9), who compared the results of inguinal hernia repair in two research groups: LHR and open hernia repair utilizing the Z suture or purse string technique, which included 85 children. Their study reported that there was statistically insignificant variance between the two surgical groups according to demographic characteristics. Sex distribution was similar between groups (p equal to 0.449).

Additionally, our research corroborated the findings of Ma et al. (10), who examined the surgical techniques for inguinal hernia repair in adolescents, kids, and young adults across various sexes and ages, comparing surgical results such as reoperation rates and complications following open and laparoscopic inguinal hernia repair in a large hernia center in China, which included 3,249 cases. Their analysis indicated that there was statistically insignificant variance in demographic variables between the two surgery groups. The sex distribution was comparable among groups (p equal to 0.163).

Also, our study agreed with Shirima et al. (11), who compared postoperative outcomes between open herniotomy (OH) and laparoscopic hernia repair (LHR) among pediatric cases and included 156 pediatric patients. Their study found that their study reported that there was statistically insignificant variance between the two surgical groups regarding demographic characteristics. Sex distribution was similar between groups (p equal to 0.308). Regarding hernia characteristics before surgery, findings revealed that there was statistically significant variance among the two surgical groups regarding bilateral repair and pre-op hydrocele. The laparoscopic group had a greater proportion of bilateral repairs (43.1% vs. 24.6%, p below 0.001), while the open group had a significantly greater rate of preoperative hydrocele (23.1% vs. 4.6%, p below 0.001), while there was statistically insignificant variance between the two surgical groups regarding right-sided hernia and left-sided hernia.

In agreement with Sachdeva et al. (9), their study stated that there was statistically significant variance among the two surgical groups according to bilateral repair and pre-op hydrocele, while there was statistically insignificant variance among the two surgical groups according to right-sided hernia and left-sided hernia.

As well, our study agreed with Shirima et al. (11), Their study found that there was statically significant variance among the two surgical groups regarding bilateral repair and Pre-op hydrocele, while there was statically insignificant variance between the two surgical groups according to Right-sided hernia and Left-sided hernia.

Also, our study agreed with Bharathi et al. (12), who compared open versus laparoscopic inguinal hernia repair in kids and included 85 kids. Their research found that there

was statistically significant variance among the two surgical groups according to bilateral repair and pre-op hydrocele, while there was statistically insignificant variance among the two surgical groups regarding right-sided hernia and left-sided hernia.

Regarding the comparison of operative time, findings showed that there were statistically insignificant variances in operative time between open and laparoscopic inguinal hernia repair in a large matched pediatric cohort ($n=325$ per group), with all p -values exceeding 0.05 (overall: p equal to 0.0596; bilateral: p equal to 0.0761; unilateral: p equal to 0.1348). Overall, laparoscopic repair averaged 21.1 ± 5.6 minutes compared to 20.3 ± 5.2 minutes for open repair, while unilateral cases were nearly identical (15.5 ± 4.5 vs. 15 ± 4 minutes) and bilateral cases showed comparable durations (28.7 ± 5.575 vs. 29.5 ± 5.9 minutes).

In agreement with Shirima et al. (11), their study reported that there were statistically insignificant variances in operative time between open and laparoscopic inguinal hernia repair in a large matched pediatric cohort, with all p -values exceeding 0.05 (overall: p equal to 0.023). Overall, laparoscopic repair averaged 63.71 ± 15.63 minutes compared to 63.86 ± 22.25 minutes for open repair, while unilateral cases were nearly identical (111.07 ± 30.64 vs. 62.50 ± 7.81 minutes).

Regarding outcomes after surgery, findings showed that there was statistically insignificant variance among the two surgical groups according to postoperative outcomes. Recurrence rates were low in both groups (1.8% laparoscopic vs. 1.2% open, $p = 0.524$), and overall complication rates revealed insignificant variance (4.6% vs. 2.5%, $p = 0.137$).

In agreement with Sachdeva et al. (9), their research stated that there was statistically insignificant variance between the two surgical groups according to postoperative outcomes. Recurrence rates were low in both groups (5.8% laparoscopic vs. 0% open), and overall complication rates revealed insignificant difference (14.7% vs. 11.4%, $p = 0.993$).

As well, our study agreed with Shirima et al. (11), Their study found that there was statistically insignificant variance between the two surgical groups according to postoperative outcomes. Recurrence rates were low in both groups (6.7% vs. 4.0%, $p = 0.620$), and overall complication rates revealed insignificant variance (4.5% vs. 1.8%, $p = 0.393$).

Similarly, our study agreed with Bharathi et al. (12), Their study found that there was statistically insignificant variance among the two surgical groups according to outcomes after surgery. Recurrence rates were low in both groups, and overall complication rates revealed insignificant variance.

CONCLUSION

Open and laparoscopic inguinal hernia repair in kids are equally efficient and safe procedures. There were insignificant variances among the two groups according to demographic characteristics, operative time, recurrence, or overall postoperative complications. Laparoscopic repair has been related to a higher rate of bilateral repair, while

open repair showed a higher incidence of preoperative hydrocele; however, hernia laterality did not differ significantly between the two approaches. Overall, both techniques provide comparable outcomes, and the choice of procedure should depend on surgeon experience and individual case factors rather than differences in safety or effectiveness.

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