https://doi.org/10.29309/TPMJ/2026.33.06.10507 www.theprofesional.com

ORIGINAL ARTICLE

Comparison between open and laparoscopic needle repair in pediatric inguinal hernia in terms of operating time and complications.

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ABSTRACT… Objective: To compare between open hernia repair and needle-assisted laparoscopic repair in pediatric patients with inguinal hernia in term of operative time and postoperative wound infection. **Study Design:** Randomized Controlled Trial. **Setting:** Department of Surgery, Independent University Hospital, Faisalabad. **Period:** March 2024 to March 2026. **Methods:** A total of 384 pediatric patients aged 1–13 years diagnosed with inguinal hernia were randomly assigned to Group A (OHR, n=192) or Group B (NALR, n=192). Operative time was recorded from skin incision to closure, and wound infection was assessed during a one-month postoperative follow-up using CDC criteria. Data were analyzed using independent t-tests for operative time and chi-square tests for wound infection, with significance set at p≤0.05. It is done in period of 2 year from March 2024-March 2026, Ethical approval no IUH/IRB/000055 date of approval is 01-01-2025. **Results:** The mean operative time was significantly shorter in the NALR group (12.87 ± 3.16 min) compared with the OHR group (24.68 ± 4.25 min, p<0.001). Wound infection occurred in 30 patients (7.8%) in the OHR group, whereas no infections were observed in the NALR group (p<0.001). Operative time and infection rates were consistently lower across all demographic and clinical subgroups in the laparoscopic group. **Conclusion:** Needle-assisted laparoscopic repair offers a safe and efficient alternative to open hernia repair in children, with shorter operative times and reduced postoperative wound complications.

Key words: Needle-assisted Laparoscopic Repair, Open Hernia Repair, Operative Time, Pediatric Inguinal Hernia, Wound Infection.

Article Citation: Raza M, Shuja A, Rasheed H, Nadeem T. Comparison between open and laparoscopic needle repair in pediatric inguinal hernia in terms of operating time and complications. Professional Med J 2026; 33(06):1025-1030. https://doi.org/10.29309/TPMJ/2026.33.06.10507

INTRODUCTION

Inguinal hernia is one of the most common surgical conditions encountered in the pediatric population and represents a significant proportion of elective pediatric surgical procedures worldwide.[1,2] This condition develops when the processus vaginalis is not completely obliterated, which allows the abdominal contents to herniate via the inguinal canal.[3] Inguinal hernias are found to occur between 0.8% and 5% in full-term newborns and up to 30% in preterm neonates.[4] The condition is more frequently observed in males and often presents during the first year of life. Early surgical intervention is recommended due to the substantial risk of incarceration, strangulation, and subsequent ischemic damage to bowel, testes, or ovaries, particularly in infants and young children.[5]

Open herniotomy has long been regarded as the gold standard for managing pediatric inguinal hernias, with excellent outcomes and low recurrence rates.[6] The procedure involves high ligation of the hernia sac through an inguinal incision and has been widely practiced due to its simplicity, safety, and reproducibility.[7-9] However, open repair is not without limitations, including postoperative pain, wound-related complications, risk of injury to spermatic cord structures, and longer recovery times in certain cases.

Over the past two decades, advances in minimally invasive surgery have led to the increasing adoption of laparoscopic techniques for pediatric inguinal hernia repair.[10] Laparoscopic needle-assisted repair, in particular, has gained popularity due to its minimally invasive nature, superior cosmetic results, reduced tissue dissection, and the ability to inspect and repair contralateral patent processus vaginalis during the same procedure.[11,12]

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Article received on:
26/03/2026
Date of revision:
16/04/2026
Accepted for publication:
30/05/2026

Several studies have demonstrated that laparoscopic repair is a safe and effective alternative to open surgery, with comparable recurrence rates and potential advantages such as shorter operative time, reduced postoperative pain, and lower wound complication rates when performed by experienced surgeons.[9,13,14]

Open hernia repairs (OHR) and inguinal hernia repairs (IHR) were compared in a study conducted at Khyber Teaching Hospital's Paediatric Surgery Unit. There were a hundred and ten patients in the study; fifty were put into the NALR group and sixty-five into the OHR group. We found an average age of 2.9612.5 years for NALR and 4.17±3.62 years for OHR. Bilateral NALR took 18.3±3.1 minutes with an OHR of 32±6.3 minutes, in contrast to 12±2.4 minutes for unilateral NALR and 24±3.8 minutes for bilateral NALR. Among the postoperative complications that were prevalent in OHR, there was no surgical site oedema (0% vs. 14%) and no wound infection (0% vs. 4%).[8]

Given the high prevalence of pediatric inguinal hernia and the increasing use of minimally invasive approaches, it is essential to generate robust comparative data to guide surgical decision-making. Evaluating operative time and postoperative complications provides practical and clinically relevant endpoints that directly influence patient outcomes, hospital resource utilization, and parental satisfaction.Therefore, this study aims to compare open hernia repair and laparoscopic needle-assisted repair in pediatric inguinal hernia with respect to mean operative time and frequency of postoperative complications, to identify the technique associated with lower morbidity and improved surgical efficiency.

METHODS

This randomised controlled experiment was performed in the Department of Surgery at Independent University Hospital, Faisalabad, over two years after clearance from the Institutional Ethical Review Committee (IRB 00055/07/25) and the College of Physicians and Surgeons Pakistan (CPSP). Three eighty four paediatric patients diagnosed with inguinal hernia were included by a non-probability sequential sampling method. Children of both genders aged between 1 and 13 years were included in the study. Patients with huge congenital inguinal hernia, recurrent hernia, incarcerated or strangulated hernia, and those having chronic conditions associated with inguinal hernia formation, such as Down syndrome, cystic fibrosis, and cerebral palsy, were excluded.

The sample size was determined with the OpenEpi sample size calculator, supposing a 5% significance level, 80% research power, a wound infection rate of 4% in the open repair cohort, and 0% in the laparoscopic repair cohort. Qualified patients were randomly allocated to two groups via the lottery method. Group A had open inguinal hernia treatment, while Group B got needle-assisted laparoscopic inguinal hernia repair. All surgeries were conducted by a consultant surgeon with a minimum of five years of post-fellowship experience to mitigate operator-related bias.

After obtaining written informed consent from parents or guardians, patients were admitted and operated upon under standard aseptic conditions. Operative time was recorded from the time of skin incision to completion of skin closure. Patients were followed for a period of one month postoperatively to assess wound infection, which was diagnosed according to the Centers for Disease Control and Prevention (CDC) criteria, including purulent discharge, organism isolation from wound culture, or the presence of pain, tenderness, localized swelling, redness, or warmth within 30 days of surgery. All relevant data were recorded on a pre-designed proforma.

Data were analysed with SPSS version 25. Quantitative factors, such as age and surgical duration, were represented as mean ± standard deviation, while qualitative variables, including gender, hernia side, hernia type, and wound infection, were shown as frequencies and percentages. The independent sample t-test was used to compare the mean operating time between the two groups, while the chi-square test was compare to assess wound infection rates. Effect modifiers, including age, gender, hernia side, and hernia type, were managed by stratification, subsequently using chi-square and independent t-tests post-stratification. A p-value of ≤0.05 was deemed statistically significant.

RESULTS

A total of 384 paediatric inguinal hernia patients were examined, with 192 people equally divided between the two study groups. The mean age of the study cohort was 3.93 ± 2.78 years, with the majority of patients falling within the 1–3 year age range. Between the two surgical techniques, there were significant differences in the incidence of wound infection and operating time. Compared to open hernia repair, laparoscopic needle-assisted repair had a much lower rate of wound infection and a shorter operating time.

Table-I presents the demographic and clinical profile of the study population. Females constituted 51.3% (n = 197) of patients, while 48.7% (n = 187) were males. Nearly half of the patients (49.0%) were aged between 1 and 3 years, followed by 29.4% in the 4–6-year age group and 20.6% in the 7–13-year age group. Right-sided inguinal hernia was observed in 46.9% of patients, left-sided in 43.0%, and bilateral hernia in 10.2%. The majority of cases were congenital hernias (94.8%), while 5.2% were incidental.

TABLE-I

Demographic and clinical features of patients

Variable	Category	Frequency	Percent
Gender	Male	187	48.7
	Female	197	51.3
Age	Mean ± S. D	3.93	2.784
Age Group	1–3 Years	188	49.0
	4–6 Years	113	29.4
	7–13 Years	79	20.6
Side of Hernia	Right	180	46.9
	Left	165	43.0
	Bilateral	39	10.2

Table-II compares wound infection rates and operative time between Group A (open hernia repair) and Group B (laparoscopic needle-assisted repair). Wound infection was observed in 30 patients (7.8%) in Group A, while no cases of wound infection were recorded in Group B, showing a statistically significant difference (p = 0.001). The mean operative time was significantly longer in Group A (24.68 ± 4.25 minutes) compared to Group B (12.87 ± 3.16 minutes), with a p-value of 0.001.

TABLE-II

Comparison of Wound Infection and Operative time and in both groups

		Group		Total	P-Value
		Group A	Group B		
Wound Infection	Yes	30	0	30	0.001
		7.8%	0.0%	7.8%	
	No	162	192	354	
		42.2%	50.0%	92.2%	
Operative Time		24.68 ± 4.25	12.87± 3.16		0.001
Total		192	192	192	
		100.0%	50.0%	50.0%	

TABLE-III demonstrates the association of wound infection with demographic and clinical variables. Wound infection occurred exclusively in Group A, with no infections observed in Group B across all categories. A statistically significant association was found between wound infection and gender, age groups, side of hernia, and type of hernia. Higher infection rates were observed in females, children aged 7–13 years, patients with right-sided hernia, and those with congenital hernia, with p-values ranging from <0.001 to 0.040.

TABLE-III

Association of wound infection according to demographic and clinical variables (n = 384)

Variable	Category	Group A (OHR) n (%)	Group B (NALR) n (%)	P-Value
Gender	Male	13 (13.4)	0 (0.0)	<0.001
	Female	17 (17.9)	0 (0.0)	<0.001
Age Group	1–3 years	10 (11.5)	0 (0.0)	<0.001
	4–6 years	5 (12.5)	0 (0.0)	0.002
	7–13 years	14 (23.0)	0 (0.0)	0.025
Side of Hernia	Right	19 (19.8)	0 (0.0)	<0.001
	Left	8 (10.1)	0 (0.0)	0.002
	Bilateral	3 (17.6)	0 (0.0)	0.040

TABLE-IV shows the comparison of mean operative time across demographic and clinical variables in both groups. Operative time was consistently longer in Group A than in Group B across all subgroups, including gender, age categories, side of hernia, and type of hernia. The longest operative time was observed in patients with bilateral hernia in Group A

(29.54 ± 5.33 minutes) compared to Group B (18.25 ± 2.97 minutes). All comparisons demonstrated statistically significant differences, with p-values ≤ 0.007.

TABLE-IV

Association of Operative time according to demographic and clinical Variables (n = 384)

		Group	N	Mean /Min	Std. D	P-Value
Gender	Male	Group A	97	24.71	4.261	0.001
		Group B	90	12.18	2.811	
	Female	Group A	95	24.64	4.262	0.001
		Group B	102	13.48	3.339	
Age	1- 3 Years	Group A	91	24.71	4.50	0.001
		Group B	101	13.48	3.50	
	4- 6 Years	Group A	40	24.05	3.48	0.001
		Group B	73	12.10	2.68	
	7-13 Years	Group A	61	25.05	4.34	0.001
		Group B	18	12.64	2.23	
Side of the hernia	Right	Group A	96	24.06	3.99	0.001
		Group B	84	12.35	2.49	
	Left	Group A	79	24.38	3.64	0.001
		Group B	86	12.01	2.40	
	Bilateral	Group A	17	29.54	5.33	0.007
		Group B	22	18.25	2.97	

DISCUSSION

In this randomized controlled trial comparing open hernia repair (OHR) with needle-assisted laparoscopic repair (NALR) for pediatric inguinal hernia, we observed that laparoscopic repair was associated with significantly shorter operative time and a lower frequency of wound infection than open repair. These findings add to a growing body of literature suggesting that minimally invasive approaches may offer practical benefits in pediatric surgical practice.

The operative time advantage seen with NALR in our study, a mean of 12.87±3.16 minutes versus 24.68±4.25 minutes for open repair, is consistent with several recent comparisons of laparoscopic and open techniques in children. For instance, Rahman et al. found similar reductions in operating times for NALR compared to OHR in pediatric patients, highlighting the efficiency of laparoscopic closure, especially when performed by experienced surgeons.[9] In systematic reviews of laparoscopic versus open pediatric hernia repair, some studies report significantly shorter operative times for laparoscopic approaches, particularly for bilateral cases, and shorter unilateral repair times in pooled analyses of recent RCTs as well.[4,14] A 10year systematic review including over 90,000 hernia repairs noted shorter operative time for laparoscopic repair in both unilateral and bilateral cases in subgroup analyses, though female unilateral cases showed longer laparoscopic times, illustrating that outcomes may vary across patient subpopulations. These collective data support the notion that the laparoscopic technique can enhance surgical efficiency, especially as surgeons become proficient in endoscopic suture ligation and intracorporeal handling.

The disparity in operative time between laparoscopic and open techniques may be partly attributable to differences in tissue dissection and closure. In open repair, more extensive dissection is required to isolate and ligate the hernia sac, whereas NALR involves minimal soft tissue disruption with percutaneous suture closure, often under direct laparoscopic visualization. This could accelerate completion, reduce anesthesia duration, and potentially decrease the risk of complications associated with prolonged operative exposure in young children.

Importantly, our study demonstrated a significantly lower rate of wound infection in the laparoscopic group, with no infections observed in NALR patients compared to 7.8% in the open group. This aligns with multiple meta-analyses indicating that laparoscopic techniques are associated with reduced wound complications, including infections.[5] For example, one systematic review found that laparoscopic repair significantly decreased wound infection rates and overall postoperative complications compared with open repair in children, suggesting improved safety profiles.[10] The minimally invasive nature of laparoscopy smaller incisions, decreased exposure of subcutaneous tissues, and less manipulation of the inguinal region likely contributes to this protective effect.

While overall complication rates are often similar

between laparoscopic and open techniques in large pooled analyses, the pattern of specific complications may differ. Some meta-analyses report comparable overall complication and recurrence rates, but significantly lower wound infection and contralateral hernia incidence with laparoscopy.[5] Another large meta-analysis reported reduced major male-specific postoperative complications and lower incidence of metachronous contralateral inguinal hernia (MCIH) with laparoscopic herniorrhaphy. Although our trial did not assess contralateral hernias or long-term recurrence, the absence of early postoperative infections suggests that NALR may confer immediate benefits that are highly relevant clinically and for parental satisfaction.

These findings must be interpreted in the context of the wider evidence base, which includes some heterogeneity in results. Earlier meta-analyses have shown mixed results for operative time and complications, with some older data suggesting longer laparoscopic operative times for unilateral repairs and no significant difference in wound infection.[10] Differences in study design, surgeon experience, age distribution, and perioperative care likely contribute to these discrepancies. Nevertheless, more recent evidence increasingly supports the advantages of minimally invasive techniques, particularly with evolving laparoscopic suturing methods and improved instrumentation that reduce operative time and improve outcomes.[15]

Another important consideration is that laparoscopic repair allows simultaneous inspection and management of contralateral patent processus vaginalis, which can prevent future metachronous hernia without additional incisions. This capacity is unique to laparoscopy and has been noted as a key benefit in several comparative studies.[13,16] Although this outcome was not measured in our study, it may contribute to decreased longterm morbidity and surgical burden when integrated into clinical practice.[17]

The followup period was limited to one month postoperatively, restricting our ability to evaluate recurrence rates, longterm complications, or impacts on testicular development. These outcomes are crucial in pediatric populations and warrant longer followup in future trials. Moreover, the study was conducted in a single center with experienced surgeons, which may limit generalizability to settings with varying laparoscopic expertise.[18]

Future research should focus on multicenter randomized trials with longer followup to assess not only shortterm outcomes like operative time and wound infection but also longterm recurrence, chronic pain, testicular function, and qualityoflife measures, including cosmetic satisfaction and recovery milestones. Additionally, costeffectiveness analyses will be valuable, particularly in lowresource settings where the upfront investment in laparoscopic equipment may be a barrier despite its clinical advantages.

Study adds to a growing consensus that needle-assisted laparoscopic repair is a safe, efficient, and low-morbidity alternative to open hernia repair in children. Shorter operative times and reduced wound infections demonstrated in this trial reinforce the value of minimally invasive approaches, particularly where surgical expertise and facilities are available. As laparoscopic techniques continue to evolve, they are likely to play an increasingly prominent role in pediatric hernia surgery, aligning with modern surgical priorities of efficiency, safety, and improved postoperative experience.

CONCLUSION

Needle-assisted laparoscopic repair (NALR) of paediatric inguinal hernia is a secure, effective, and less invasive substitute for traditional open hernia repair (OHR). Future multicenter trials with extended follow-up are necessary to evaluate long-term results, including hernia recurrence and the need for contralateral repairs.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

1. Almeida DS, Medina LHA, Miranda NC, Almeida TS, Mattos LF, Marchi ME, et al. **Laparoscopy versus open technique for inguinal hernia repair in children: A systematic review and meta-analysis.** Cureus. 2024; 16(12):e74992.
2. Abebe MS, Tareke AA, Alem A, Debebe W, Beyene A. **Worldwide magnitude of inguinal hernia: Systematic review and meta-analysis of population-based studies.** SAGE Open Medicine. 2022 Nov;10:20503121221139150.
3. Tanyel FC. **Obliteration of the processus vaginalis after testicular descent.** Balkan Medical Journal. 2024; 41(2):89.
4. Cho YJ, Kwon H, Ha S, Kim SC, Kim DY, Namgoong J-M, et al. **Optimal timing for inguinal hernia repair in premature infants: Surgical issues for inguinal hernia in premature infants.** Annals of Surgical Treatment and Research. 2023; 104(5):296-301.
5. Pogorelić Z, Anand S, Križanac Z, Singh A. **Comparison of recurrence and complication rates following laparoscopic inguinal hernia repair among preterm versus full-term newborns: A systematic review and meta-analysis.** Children. 2021; 8(10):853.
6. Elsaedy MA, Shehata MA, Almetaher HA, Kabbash IA, Shehata SM. **Laparoscopic versus open inguinal hernia repair in pediatric age group: A systematic review and meta-analysis.** Journal of Pediatric Endoscopic Surgery. 2024; 6(2):55-64.
7. Tran HM, MacQueen I, Chen D, Simons M. **Systematic review and guidelines for management of scrotal inguinal hernias.** Journal of Abdominal Wall Surgery. 2023; 2:11195.
8. Rahman FU, Abdullah F, Rehman IU, Ali S. **Comparison of needle assisted laparoscopic repair and open repair of inguinal hernia in paediatric population: A randomized controlled trial.** Khyber Medical University Journal. 2019; 11(4):209-13.
9. Ma Q, Liu X, Zou Z, Liang C, Chen J, Yang H, et al. **Surgical methods and outcomes of inguinal hernia repair in children, adolescents and young adults in a retrospective cohort study.** Scientific Reports. 2025; 15(1):9220.
10. Petridou M, Karanikas M, Kaselas C. **Laparoscopic vs. laparoscopically assisted pediatric inguinal hernia repair: A systematic review.** Pediatric Surgery International. 2023; 39(1):212.
11. Xie J, Koo DC, Lee MJ, Sugiyama G. **The evolution of minimally invasive inguinal hernia repairs.** Annals of Laparoscopic and Endoscopic Surgery. 2024; 9.
12. Ellbbany A, Saxena AK. **Paediatric inguinal hernia repair: A review of robotic technique adoption.** Journal of Pediatric Endoscopic Surgery. 2025; 1-5.
13. Hasson HM. **Open laparoscopy as a method of access in laparoscopic surgery.** Gynaecological Endoscopy. 1999; 8(6):353-62.
14. Rehman HU, Deen Q, Nadeem M, Siddique M, Cheema B, Nasir M. **Comparison of single port laparoscopic inguinal hernia repair versus open herniotomy in term of recurrence and postoperative scrotal hematoma: Single port laparoscopic versus open herniotomy.** Pakistan Journal of Health Sciences. 2025; 84-7.
15. Ayme APP, Suárez JMC, Ortega MMP, Gualoto GGG, Lima SLS, Campoverde AER, et al. **Advancements in minimally invasive surgical techniques: A comprehensive review.** Salud, Ciencia y Tecnología. 2024; 4:745-.
16. Nakashima M, Ide K, Kawakami K. **Laparoscopic versus open repair for inguinal hernia in children: A retrospective cohort study.** Surgery Today. 2019; 49(12):1044-50.
17. Luo H, Xu J, Chen J, Ni Z. **Clinical efficacy of laparoscopic treatment of pediatric inguinal hernia: A meta-analysis.** American Journal of Translational Research. 2024; 16(10):5155.
18. Tahoun MM, Dahab MM, Kamel KA, Youssef TY. **Exploring Efficacy and Safety: A Comparative Prospective Cohort Study of Needle-scopic Inguinal Hernia Repair vs Open Herniotomy in Pediatrics.** World Journal of Laparoscopic Surgery with DVD. 2025.

AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Muhammad Raza:** Data collection, manuscript writing.
2	**Awais Shuja:** Literature review.
3	**Hamid Rasheed:** Data analysis.
4	**Tahir Nadeem:** Revisions.