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Original Article

Percutaneous Laparoscopic Extracorporeal Suturing Versus Laparoscopic Intracorporeal Suturing in Inguinal Hernia Repair in Children

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Abstract

Background: Laparoscopic inguinal hernia repair has become an increasingly accepted approach in paediatric surgery. Among the minimally invasive techniques, intracorporeal suturing and percutaneous extracorporeal suturing are widely practiced, yet debate remains regarding their comparative outcomes.

Objective: To compare the outcomes of intracorporeal suturing and percutaneous extracorporeal suturing techniques in laparoscopic inguinal hernia repair in children.

Methods: This study was conducted in the Department of Paediatric Surgery, Dhaka Medical College Hospital, from September 2022 to February 2024. A total of 131 male children aged 2–12 years with clinically diagnosed inguinal hernia were enrolled and randomly allocated into two groups: Group A (intracorporeal suturing, n=65) and Group B (extracorporeal suturing, n=66). Operative time, per operative and post operative complications, and short term outcomes were analysed. Statistical analysis was performed using SPSS.

Results: The mean age of patients was comparable between the two group, mean age was 6.22 ± 1.90 years in Group A and 6.05 ± 2.53 years in Group B, showing no statistically significant difference.The mean duration of surgery was significantly longer in Group A compared to Group B ($p<0.001$). No significant difference was observed between the groups regarding intra operative complications, postoperative hydrocele, testicular atrophy, or recurrence during follow up. Both techniques were found to be safe and effective.

Conclusion: Percutaneous extracorporeal suturing is a safe, effective, and time saving alternative to intracorporeal suturing in laparoscopic inguinal hernia repair in children, with comparable complication rates and favourable outcomes.

Key words: Pediatric inguinal hernia, laparoscopy, intracorporeal suturing, extracorporeal suturing, minimally invasive surgery.

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Introduction

Inguinal hernia is the most prevalent surgically correctable condition in children and results from persistence of the processus vaginalis. Patent processus vaginalis (PPV) is present in 80–95% of male neonates and gradu

ally decreases with age, reaching 15–37% beyond early childhood [1]. The incidence of inguinal hernia in the pediatric population ranges from 1–5% and is significantly higher in premature infants, reported to be as high as 10–30% [2]. The condition occurs more frequently in boys than girls, with a male-to-female ratio ranging from 3:1 to 10:1, and shows a right-sided predominance due to delayed descent of the right testis. A positive family history has been reported in approximately 11.5% of cases [3].

Inguinal hernia repair is one of the most commonly performed operations in paediatric surgery [4]. Open herniotomy with high ligation of the PPV has long been regarded as the gold standard procedure. However, over the past two decades, minimally invasive surgery has emerged as an effective alternative, offering advantages such as superior cosmetic outcomes and the ability to evaluate and repair contralateral PPV during the same operation [5]. Laparoscopic inguinal hernia repair was first described in 1993 using an intracorporeal purse-string suture technique, followed by the introduction of extracorporeal suturing methods in 2000.

Laparoscopic repair involves closure of the internal inguinal ring and may be broadly categorized into intracorporeal and extracorporeal techniques. Intracorporeal suturing requires advanced laparoscopic skills and experience, while extracorporeal suturing employs a percutaneous approach with knot tying outside the fascia, making it technically simpler [6]. Although laparoscopic repair provides benefits such as reduced tissue trauma, better visualization, and contralateral assessment, concerns persist regarding recurrence, operative time, cost, and technical complexity [7]. With the increasing use of laparoscopic techniques in pediatric inguinal hernia repair, this study aims to compare percutaneous extracorporeal suturing with intracorporeal knotting in terms of operative outcomes and safety in children.

Materials and Methods

This study was conducted in the Department of Paediatric Surgery, Dhaka Medical College Hospital, Dhaka, from September 2022 to February 2024.Male children aged 2 to 12 years with clinically diagnosed inguinal hernia scheduled for elective laparoscopic repair were considered eligible.Male children aged 2–12 years who were clinically diagnosed inguinal hernia and gave written informed consent from parents or legal guardians were included in this study. Recurrent inguinal hernia, obstructed or strangulated hernia and previous abdominal surgery cases were excluded here.

A total of 131 patients were enrolled using consecutive sampling and randomly allocated into two groups using computer generated randomization: Group A (n=65): Intracorporeal suturing technique, Group B (n=66): Percutaneous extracorporeal suturing technique. All patients underwent laparoscopic inguinal hernia repair under general anaesthesia. In Group A, the internal inguinal ring was closed using intracorporeal suturing with absorbable sutures. In Group B, closure was achieved using percutaneous extracorporeal suturing with a spinal needle and non absorbable sutures. Standard postoperative care was provided in both groups. Data were collected using a predesigned data collection sheet. Primary outcome was duration of surgery. Secondary outcomes included per operative complications, postoperative hydrocele, testicular atrophy, and recurrence. Data were analysed using SPSS version 26. Quantitative variables were expressed as mean ± standard deviation, and qualitative variables as frequencies and percentages. A p value <0.05 was considered statistically significant. Ethical approval was obtained from the Ethical Review Committee of Dhaka Medical College. Informed written consent was taken from parents or legal guardians prior to enrolment.

Results

This study was conducted at the Department of Paediatric Surgery, Dhaka Medical College Hospital, Dhaka, from September 2022 to February 2024 to evaluate the Comparison between the outcome of intracorporeal suturing and percutaneous suturing in laparoscopic inguinal hernia repair in children.

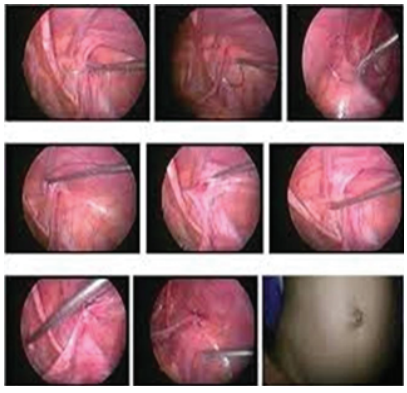


Fig- Intracorporeal knotting techniques

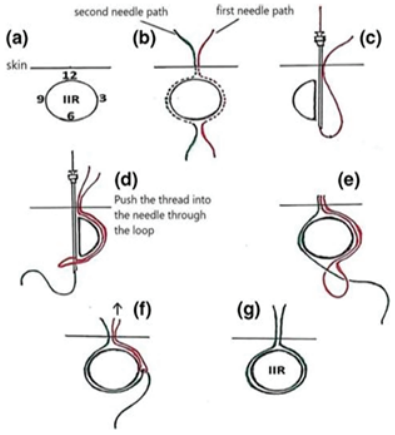


Fig- Extraxorporeal knotting techniques

The analysis data were presented in the tables. A total of 131 children were included in the study, with 65 in Group A and 66 in Group B. The mean age was 6.22 ± 1.90 years in Group A and 6.05 ± 2.53 years in Group B, showing no statistically significant difference.

Table 1: Comparison of duration of surgery (in minutes) between study groups (n=131)

Duration of surgery	Group		**Total**	**p value**
	Group A	Group B		
	n (%)	n (%)		
≤ 20 min	8 (12.31)	37 (56.06)	45	**<0.001**
20-30 min	0	15 (22.73)	15	
30-40 min	2 (3.08)	09 (13.64)	11	
> 40 min	55 (84.62)	05 (7.58)	60	
Total	65 (100)	66 (100)	131	
Mean ±SD	47.04 (±12.14)	26.45(±8.64)		

Regarding duration of surgery, the duration of surgery 47.04 (±12.14) were in group A and 26.45(±8.64) were in Group B. The mean duration of surgery significantly higher in Group A in comparison to Group B (<0.001).

Table 2: Comparison between Group A and Group B according to per-operative Injury to minor vessels (n=131)

Injury to minor vessels	Group		**Total**	**p value**
	Group A	Group B		
	n (%)	n (%)		
Present	09 (13.85)	00	09	0.002
Absent	56 (86.15)	66 (100)	122	
Total	65 (100)	66 (100)	131	

Injury to minor vessels 9(13.85%) was in Group A and none of Group B. That is statistically significant (p <0.05).

Table 3: Comparison between Group A and Group B according to post-operative Secondary hydrocele formation at 2 weeks (n=131)

Post-operative Secondary hydrocele format ion at 2 wks	Group		**Total**	**p value**
	Group A	Group B		
	n (%)	n (%)		
Present	08 (12.31)	02 (3.03)	10	**0.04**
Absent	57 (87.69)	64 (96.97)	121	
Total	65 (100)	66 (100)	131	

Post-operative Secondary hydrocele formation at 2 wks. 08(12.31%) were found in Group A and 2(2.03%) were found in Group B. That is statistically significant (<0.05).

Table 4 :Comparison between Group A and Group B according to Recurrence rate of study population (n=131)

Recurrence	Group		**Total**	**p value**
		Group B		
	n (%)	n (%)		
Present	01 (1.53)	4(6.06)	5	**0.17**
Absent	64 (98.46)	62 (92.42)	126	
Total	65 (100)	66 (100)	131	

Table shows recurrence rate one case (1.53%) in Group A and 4 cases (6.06%) were in group B. That was not statistically significant.

No significant intra operative complications were observed in either group.

Postoperative follow up showed no significant difference between the groups regarding testicular atrophy, or hernia recurrence.

Discussion

This cross-sectional study was conducted in the Department of Paediatric Surgery, Dhaka Medical College Hospital, to compare the outcomes of percutaneous extracorporeal suturing and intracorporeal knotting in laparoscopic inguinal hernia repair.

The mean age of patients was comparable between the two groups (6.22 ± 1.90 years in Group A vs. 6.05 ± 2.53 years in Group B), with the majority aged between 2 and 6 years. These findings are consistent with previous studies reporting similar pediatric age distributions [4].

The mean operative time was significantly longer in Group A compared to Group B (47.04 ± 12.14 minutes vs. 26.45 ± 8.64 minutes; p < 0.001). This finding aligns with earlier reports demonstrating shorter operative times for extracorporeal techniques compared to intracorporeal approaches [7-9]. The increased duration associated with intracorporeal suturing may be attributed to the technical complexity of intracorporeal knot tying, limited working space, and the need for advanced laparoscopic skills.

Minor vascular injury occurred in 9 (13.85%) patients in Group A, whereas no vascular injury was observed in Group B, a statistically significant difference (p < 0.05). This may be related to needle manipulation within the abdominal cavity during intracorporeal suturing, which increases the risk of injury to small vessels, as also reported by Wang et al. [10]. No vas deferens injury was observed in either group, likely due to clear laparoscopic visualization.

Recurrence was noted in one patient in Group A and four patients in Group B, primarily due to ligature slippage and technical errors associated with surgeon inexperience. All recurrent cases were successfully managed by open herniotomy. No postoperative testicular atrophy was observed in either group, consistent with previous studies reporting low to absent rates following laparoscopic repair [10].

Secondary hydrocele formation at two weeks postoperatively was significantly higher in Group A than Group B (12.31% vs. 2.03%; $p < 0.05$). However, most cases resolved spontaneously, and no persistent hydrocele was observed at 16 weeks in either group. Demographic variables and baseline characteristics were comparable between the groups.

Conclusion

Both techniques have similar overall outcomes, but extracorporeal knotting offers shorter operative time and fewer perioperative complications. Its simplicity and efficiency make it a safe and effective option, especially in pediatric patients and diverse surgical settings.

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