

Research Article

# A Comparative Study of Two Different Techniques of Laparoscopic Herniotomy in Pediatric Population

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## Abstract

**Aim:** This study evaluates the operative outcomes of two laparoscopic techniques for congenital inguinal hernia repair-Laparoscopic Intracorporeal Purse-String (LIPS) and Laparoscopic Sac Resection with Peritoneal Closure (LSRPC)-in terms of recurrence and testicular atrophy at 3 and 6 months.

**Settings and Design:** A prospective observational study approved by the Institutional Ethics Committee. Participants, aged 6 months to 14 years, were randomized into two groups: Group I (LIPS) and Group II (LSRPC). For bilateral hernias, each side was repaired using different techniques through the same ports. Randomization was done using computer-based algorithms, ensuring no significant differences in anthropometric measurements.

**Methods and Material:**

- Study Duration: February 2023 - October 2024
- Inclusion Criteria: Children aged 6 months to 14 years with inguinal hernias
- Exclusion Criteria: Infants under 6 months, obstructed hernia, previous laparotomy, connective tissue disorders, ascites, ventriculo-peritoneal shunts, failure to obtain consent and recurrent hernias
- Statistical Analysis: Descriptive analysis was conducted using means, standard deviations, percentages and t-tests with SPSS software version 24.0; p<0.05 considered significant

**Results:** Most surgeries were in children aged 5-10 years, with 64% undergoing LIPS and 52% undergoing LSRPC. At 3 months, recurrence occurred in 4% of the LIPS group and none in the LSRPC group. At 6 months, recurrence rates were 8% for LIPS and none for LSRPC. No cases

of testicular atrophy were observed. Mean operative time was shorter for LIPS (20.2 minutes) than LSRPC (25.5 minutes), though this difference was not statistically significant.

**Conclusion:** Both LIPS and LSRPC are safe, effective techniques with minimal recurrence and no testicular atrophy. Future studies should focus on longer follow-ups, larger sample sizes and cost-effectiveness.

**Key Messages:** Both techniques were equally effective and safe, with minimal recurrence and no testicular atrophy for 6 months.

**Keywords:** Laparoscopic Hernia Repair in Paediatric Population; Congenital Inguinal Hernias; Intracorporeal Purse-String; Intracorporeal Sac Resection with Peritoneal Closure

## Introduction

Inguinal hernia is a common paediatric condition and its surgical repair is one of the most frequently performed procedures in this population [1,2]. The presence of the Patent Processus Vaginalis (PPV) has been linked to the development of congenital hernia in paediatric population [3,4]. Minimally invasive surgery has become a cornerstone in paediatric surgical procedures

since its initial application in 1975 for small bowel obstruction [5]. Laparoscopic surgery, in particular, has revolutionized the management of various conditions, including inguinal hernias in children. The first laparoscopic inguinal hernia repair in the paediatric population was described by El-Gohary, primarily performed in female patients due to concerns about the safety of the vas deferens and testicular vessels in males. Over the years, the technique has evolved, incorporating several modifications while maintaining the fundamental surgical principle of paediatric inguinal hernia repair- "high ligation of the sac" [6].

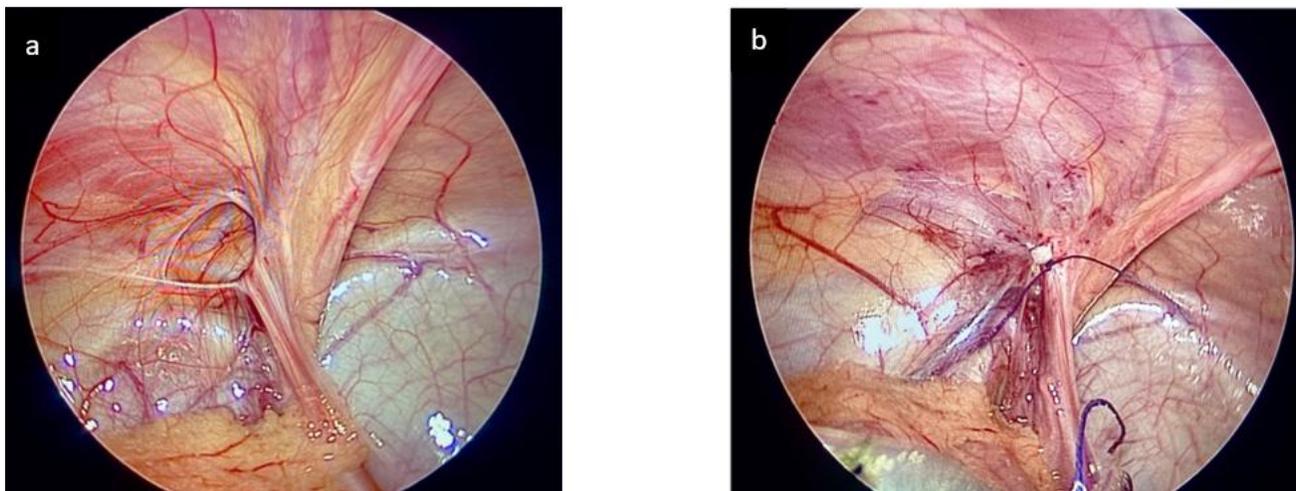
Traditional open repair has gradually been replaced or complemented by laparoscopic techniques due to the benefits of smaller incisions, faster recovery, reduced postoperative pain and improved cosmetic outcomes [7]. These techniques can be categorized into fully intracorporeal methods, where all suturing and knot tying are done within the abdominal cavity using laparoscopic instruments and those with extraperitoneal components, which typically involve suturing outside the peritoneal cavity. Despite the advancements in technique, the primary goal remains consistent across all approaches- achieving effective closure of the hernia defect while minimizing the risk of recurrence and complications [8].

Several laparoscopic techniques involving partial and circumferential peritoneal incision at the Internal Inguinal Ring (IIR) or insertion of purse-string suture around the IIR either percutaneously or transperitoneally, have been described. Among the various techniques developed for laparoscopic inguinal hernia repair, two methods have emerged as prominent: The Laparoscopic Intracorporeal Purse-String technique and Laparoscopic Sac Resection with Peritoneal Closure. However, these laparoscopic techniques are still different from the conventional herniotomy, in which the transection and partial excision of the sac are essential steps. Each of these techniques offers distinct advantages and potential drawbacks, making it crucial to evaluate their effectiveness, particularly in terms of recurrence rates and complications such as testicular atrophy, which can have significant long-term implications for paediatric patients [7].

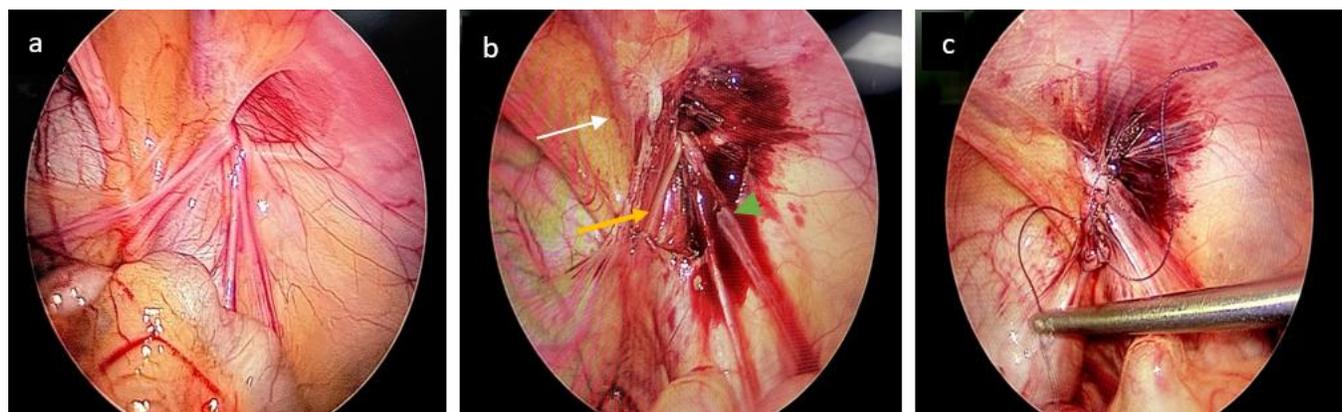
The Laparoscopic Intracorporeal Purse-String (Fig. 1) technique involves reduction of hernial contents and then creating a suture loop around the hernia sac, followed by intracorporeal knot tying to close the defect. This method is minimally invasive, with the potential for lower recurrence rates due to the secure closure of the internal ring. The conventional intracorporeal technique was first described by Montupet and Esposito [9].

In response, Becmeur, et al., introduced a technique that involves complete sac dissection at the deep inguinal ring, followed by purse-string suture ligation (Fig. 2) [10]. Although this method offers a more thorough repair by addressing the hernia sac at its origin, there remains a paucity of comparative data assessing their outcomes, particularly in terms of hernia recurrence and the risk of testicular atrophy [11]. Given the anatomical and physiological considerations in paediatric patients, especially males, it is essential to critically evaluate the long-term safety and efficacy of these techniques. Inguinal hernias in children are known to have low recurrence rates, but when recurrences do occur, they can result in significant morbidity. Similarly, testicular atrophy, though rare, can have profound implications on future fertility and hormonal function.

This study aims to fill the gap in the existing literature by providing a comparative analysis of two laparoscopic herniotomy techniques-Laparoscopic Intracorporeal Purse-string and Laparoscopic Sac Resection with Peritoneal Closure-in paediatric patients. Specifically, focusing on the operative outcomes in terms of hernia recurrence and testicular atrophy, both at 03 months and 06 months postoperatively. By comparing these two techniques, the study seeks to determine which method offers superior outcomes with minimal complications, thereby guiding future surgical practice in paediatric inguinal hernia repair.



**Figure 1:** (a): Laparoscopic view of open Deep inguinal ring of Left side (White arrow) in a female patient and (b): laparoscopic intracorporeal purse string using 3-0 Vicryl.



**Figure 2:** (a): Laparoscopic view of right deep inguinal ring after reducing the hernial contents; (b): Complete Sac resection. The vas deferens (yellow arrow), Inferior epigastric vessels (White arrow) and internal spermatic vessels (Green arrow head) can be seen; (c): Peritoneal leaflet closure using 3-0 vicryl.

### Study Design

This investigation was done as a comparative observational study following approval from the Institutional Ethics Committee. The representative population for this study were consecutive patients those who agreed to participate in the study with a signed written informed consent.

*Selection of subjects:* The study population included patients aged 6 months to 14 years, of any ethnicity, presenting with inguinal hernia to Army Hospital (RandR). These individuals, from both rural and urban settings across the country, were found to be eligible if they provided written informed consent and met the inclusion criteria. Participants were randomized into two groups for laparoscopic hernia repair: Group I (Laparoscopic Intracorporeal Purse-String technique) or Group II (Laparoscopic Sac Resection with Peritoneal Closure). For bilateral hernias, each side was repaired using a different technique through the same ports. Randomization was performed using computer-based algorithms, ensuring no significant differences in anthropometric measurements between groups.

*Inclusion Criteria:* Patients in the age group of 06 months to 14 years with inguinal hernias.

*Exclusion Criteria:*

- Infants (below 06 months of age)
- Obstructed/irreducible hernia
- Previous history of laparotomy
- Existing contraindication to laparoscopy

- Connective tissue disorders, ascites, children with ventriculo-peritoneal shunts.
- Failure to obtain consent
- Recurrent hernias

### **Surgical Techniques**

#### *Group 1: Laparoscopic Intra-Corporeal Purse-String (LIPS) (Fig. 3)*

Montupet and Esposito

*Equipment/Suture*

1. 5-mm, 0° laparoscope
2. Two 3-mm trocars were placed laterally, just below the level of the umbilicus on each side
3. 3-0 absorbable suture

*Steps*

1. The periorificial peritoneum was incised lateral to the internal ring
2. Introduce suture directly through the abdominal wall
3. Intracorporeal purse-string stitch done around the internal ring
4. In larger hernias (>4-5 mm) one or more interrupted suture was added between conjoined tendon and crural arch

#### *Group 2: Laparoscopic Sac Resection and Peritoneal Closure (LSRPC) (Fig. 4)*

Becmeur, et al.,

*Equipment/Suture*

1. 5-mm umbilical trocar
2. Two 3 mm trocars were placed laterally, just below the level of the umbilicus on each side
3. 3-0 Viacryl

*Steps:*

1. Intracorporeally, circumferential incision of peritoneum at internal inguinal ring
2. Completely divide the processus vaginalis by separating the sac and the peritoneum at the level of the internal inguinal ring
3. Free the entirety of the processus vaginalis from the vas and vessels to excise the entirety of the hernia sac intact.
4. Introduce suture directly through the abdominal wall
5. Laparoscopically close the ring, avoiding the vas and vessels

*Study Methodology:* Patients reporting to Department of paediatric surgery with symptoms of inguinal hernia will be evaluated for the following:

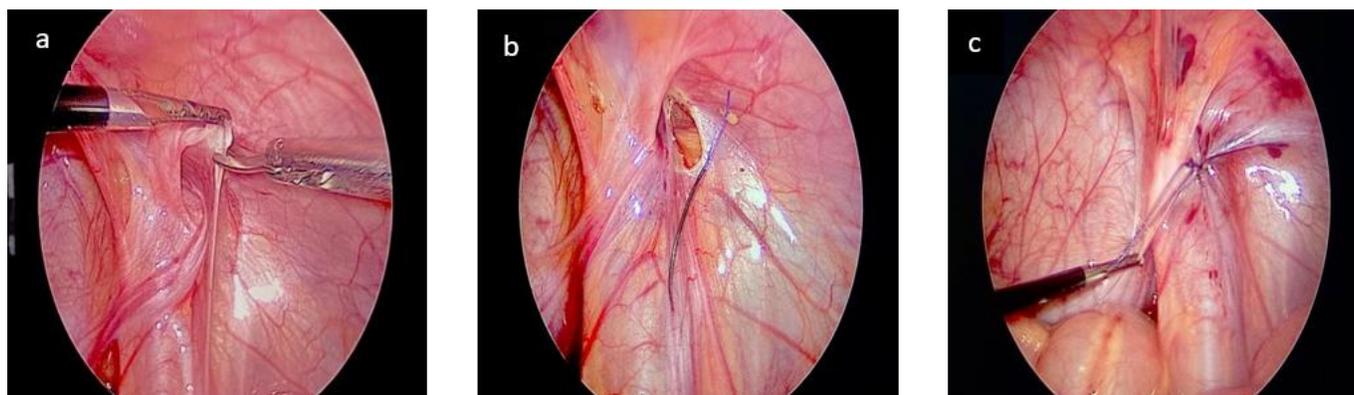
#### 1. Patient Demographics:

- Age
  - Sex
  - Resident of
  - Congenital abnormality if any
  - Age of gestation at birth
  - Birth weight
- #### 2. Clinical History on admission
- Onset of Symptom
  - Progression
  - Duration of Symptoms
  - Any symptoms of obstruction/ Irreducibility
  - Previous history of laparotomy
  - Existing contraindication to laparoscopy
  - Any Connective tissue disorders, ascites, H/o ventriculo-peritoneal shunts

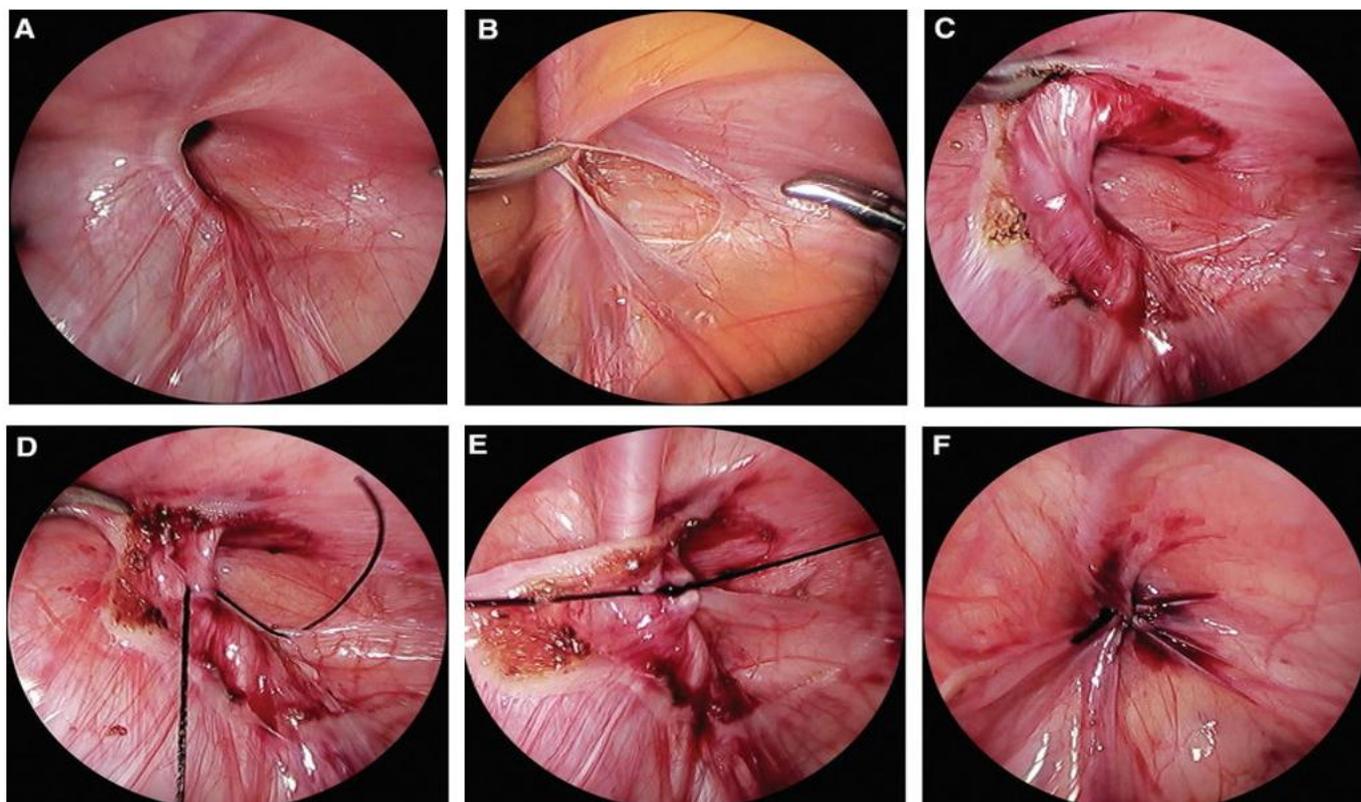
3. Parameters on Admission
  - Weight
  - Local examination - Bilateral inguinal region examination
4. Investigations
  - CBC
  - +/- USG Abdomen
5. Intra-OP Parameters: Surgical Procedure employed
  - Laparoscopic Intracorporeal Purse-String
  - Laparoscopic Sac Resection and Peritoneal Closure
6. Post-op Parameters
  - Transient hydrocele
  - Port site emphysem
  - Clinical improvement
  - Post-op complications (Bleeding/hematoma/SSI)
7. At Discharge
  - Port site
  - Bilateral inguinal regio
  - Clinical status
8. Follow up after 03 months
  - Bilateral inguino-scrotal region  
(For reoccurrence and testicular atrophy)
9. Follow up after 6 months:
  - Bilateral inguino-scrotal region  
(For reoccurrence and testicular atrophy)

#### *Statistical Analysis*

The analysis included profiling of patients on different demographic, clinical and laboratory, parameters. Descriptive analysis of quantitative parameters were expressed as means and standard deviation. Categorical data were expressed as absolute number and percentage. Independent Student t - test was used for testing of mean between independent groups. P-value < 0.05 is considered statistically significant. All analysis was done using SPSS software, version 24.0.



**Figure 3:** (a) laparoscopic view of right inguinal hernia with Intraop incision of periorificial peritoneum lateral to deep inguinal ring; (b): Introduction of absorbable suture directly through the abdominal wall; (c): Intracorporeal suturing of deep inguinal ring.



**Figure 4:** (a): Intraop Laparoscopic finding open Right Deep inguinal ring; (b): Circumferential incision over the processus vaginalis; (c): Completion of circumferential incision; (d): Introduction of 3-0 Vicryl directly through abdominal wall; (e,f): Intracorporeal closure of peritoneum leaflets.

## Results

Most surgeries occurred in children aged 5-10 years for both procedures (64% for Laparoscopic Intracorporeal Purse and 52% for Sac resection with peritoneal closure). With a chi-square value of 0.784 and a p-value of 0.676, there is no statistically significant association between the type of surgery and age group. Although males underwent both types of surgeries more frequently than females, these differences are not statistically significant.

For the right side hernia, 44.0% of cases (11 out of 25) were operated using the Laparoscopic Intracorporeal Purse, while 28.0% (7 out of 25) were managed with Sac Resection with Peritoneal Closure, making up 36.0% of all cases. For the left side hernia, 24.0% of cases (6 out of 25) were operated using the Laparoscopic Intracorporeal Purse, while 40.0% (10 out of 25) underwent Sac Resection with Peritoneal Closure, totalling 32.0% of all cases. For bilateral hernias, both surgical methods were used equally, with 32.0% of cases (8 out of 25 for each method). The Chi-square test yielded a value of 1.890 with a p-value of 0.390, indicating no statistically significant association between the type of surgery and the side of hernia operated ( $p > 0.05$ ). Therefore, the choice of surgical method does not appear to be associated with the side of hernia.

At 03 months only 1 patient (4.0%) in the Laparoscopic Intracorporeal Purse group experienced recurrence, while there were no recurrences in the Sac resection with peritoneal closure group. With a chi-square value of 1.020 and a p-value of 0.312, the association between the type of surgery and recurrence at 3 months is not statistically significant. Even at 6 months the recurrence rate is very low across both surgery types, with only 2 patients (8.0%) experiencing recurrence in the laparoscopic intracorporeal purse group, while no patients in the sac resection with peritoneal closure group had recurrence. The chi-square value of 2.083 and p-value of 0.149 indicate no statistically significant association between the type of surgery and recurrence at 6 months also. Nil cases of testicular atrophy were reported at three months and 06 months post-surgery across both types of procedures: laparoscopic intracorporeal purse and sac resection with peritoneal closure. All patients (100%) had a negative outcome for testicular atrophy, suggesting both surgical methods are associated with a low risk of this complication.

The mean duration of surgery was shorter for the Laparoscopic Intracorporeal Purse group ( $20.2 \pm 7.8$  minutes) compared to the Sac Resection with Peritoneal Closure group ( $25.5 \pm 11.4$  minutes). The difference in surgery duration between the groups was not statistically significant, as indicated by the p-value of 0.062.

## Discussion

In assessing the effectiveness of laparoscopic intracorporeal purse-string and laparoscopic sac resection with peritoneal closure techniques for paediatric laparoscopic herniotomy, our study provides significant insights into operative outcomes such as recurrence rates, testicular atrophy and surgical duration. The results indicate that both techniques demonstrate comparable safety and efficacy, with minor differences in specific parameters, aligning with findings from existing literature on paediatric hernia repair. Our analysis revealed no significant correlation between the patient's age and the choice of surgical technique, with the majority of procedures in both groups being performed on children aged 5-10 years ( $p=0.676$ ). Additionally, while males accounted for a higher proportion of surgeries in both techniques, the gender difference was not statistically significant ( $p=0.185$ ). These observations are consistent with previous research, which highlights the higher prevalence of paediatric inguinal hernias in males [12,13]. Regarding the side of hernia, we observed no significant difference between the two techniques concerning right- or left-sided hernias or bilateral presentation, with p-values exceeding 0.05 in all cases. Both techniques were equally effective for bilateral cases, with 32% of patients in each group presenting bilaterally. This lack of association corroborates existing findings that surgical approach does not influence hernia side or laterality outcomes in paediatric populations [14,15,16]. Recurrence rate after laparoscopic hernia repair in many series ranged from 0.7 to 4.5% [12,14,17-19]. In terms of recurrence in our study, only a minimal rate of recurrence was observed, specifically in the laparoscopic intracorporeal purse-string group, with a single recurrence at 3 months which persisted even at 06 months and in another case recurrence noted at 06 months.

In contrast, no recurrences were reported in the sac resection with peritoneal closure group at either follow-up interval. However, these differences were not statistically significant ( $p=0.312$  at 3 months,  $p=0.149$  at 6 months). These findings align with previous literature, which suggests that while recurrence is uncommon following laparoscopic hernia repair in paediatric populations, variations in technique may influence recurrence risk slightly, particularly in complex or recurrent hernia cases [12,14,17-19]. Testicular atrophy was assessed at both follow-up intervals and notably, no cases were reported in either group at 3 or 6 months, suggesting a favourable outcome regarding preservation of testicular vascularization and function in both techniques. This finding is significant, as testicular atrophy is a rare but serious complication in paediatric hernia repair. The absence of atrophy aligns with reports from comparable studies showing low or negligible atrophy rates when laparoscopic approaches are used [20,12,14].

An interesting finding in our study was the difference in mean operative time between the two techniques. The laparoscopic intracorporeal purse-string technique demonstrated a shorter mean duration of  $20.2 \pm 7.8$  minutes compared to  $25.5 \pm 11.4$  minutes for sac resection with peritoneal closure, though this difference did not reach statistical significance ( $p=0.062$ ). These findings suggest that while both techniques are efficient, the intracorporeal purse-string method may offer a slight advantage in terms of reduced operative time, potentially reducing anesthesia exposure and operative strain in paediatric population. Prior research has similarly reported shorter operative times for purse-string technique. Montupet and Esposito performed a purse-string suture around the proximal peritoneum with a median operating time of 19 min [15]. Similarly, Oshiba A, conducted a comparative study between purse string suture and peritoneal disconnection with ligation techniques in the laparoscopic repair of inguinal hernia in infants and children and found that mean operative time was less in purse-string technique [12].

## Conclusion

In conclusion, both laparoscopic intracorporeal purse-string and sac resection with peritoneal closure techniques demonstrate safety and efficacy in paediatric laparoscopic herniotomy. The absence of significant differences in recurrence rates, testicular atrophy and operative side outcomes suggests that the choice of technique can be tailored to the surgeon's expertise or specific case requirements. The observed reduction in operative time associated with the purse-string technique may offer a slight clinical advantage; however, its practical significance warrants further investigation in studies with larger sample sizes. These findings are consistent with existing literature, reinforcing the utility of laparoscopic approaches for paediatric hernia repair with minimal risk of serious complications. Future research should prioritize long-term follow-up to evaluate outcomes beyond six months and examine potential impacts on growth or subsequent surgical requirements.

## Conflict of Interests

The authors declare that they have no conflicts of interest.

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## References

1. Hammoud M, Gerken J. Inguinal hernia [Internet]. In: StatPearls. Treasure Island (FL): StatPearls Publishing. 2023.
2. Li J, Gong W, Liu Q. Intraoperative adjunctive techniques to reduce seroma formation in laparoscopic inguinal hernioplasty: A systematic review. *Hernia*. 2019;23(4):723-31.
3. Zakaria OM. Patent contralateral processus vaginalis in infants and children: Is herniotomy justified? *Oman Med J*. 2018;33(6):481-5.
4. Decker E, Currie A, Baig MK. Prolene hernia system versus Lichtenstein repair for inguinal hernia: A meta-analysis. *Hernia*. 2019;23(3):541-6.
5. Meinzer A, Alkatout I, Krebs TF, Baastrup J, Reischig K, Meiksans R, et al. Advances and trends in pediatric minimally invasive surgery. *J Clin Med*. 2020;9(12):3999.
6. O'Brien L, Hannan E, Hassett S. Laparoscopic paediatric inguinal hernia repair: Lessons learned from 102 cases. *Ir J Med Sci*. 2022;192(1):321-6.
7. Borkar NB, Pant N, Ratan S, Aggarwal SK. Laparoscopic repair of indirect inguinal hernia in children: Does partial resection of the sac make any impact on outcome? *J Laparoendosc Adv Surg Tech A*. 2012;22(3):290-4.
8. Croce E, Olmi S. Intracorporeal knot-tying and suturing techniques in laparoscopic surgery: Technical details. *JLS*. 2000;4(1):17-22.
9. Suttiwongsing A, Khorana J, Ruangwongroj P, Niruttivat K. Laparoscopic extraperitoneal technique versus open inguinal herniotomy in children: Historical controlled intervention study. *World J Pediatr Surg*. 2022;5(4):e000436.
10. Becmeur F, Philippe P, Lemandat-Schultz A, Moog R, Grandadam S, Lieber A, et al. A continuous series of 96 laparoscopic inguinal hernia repairs in children by a new technique. *Surg Endosc*. 2004;18(12):1738-41.
11. Lim JM, Chang HK, Park SJ. Laparoscopic pediatric inguinal hernia repair; intracorporeal purse-string suture using needlescopic 2-mm instruments. *J Minim Invasive Surg*. 2020;23(1):30-5.
12. Oshiba A, Ashour K, Aboheba M, Shehata S, Shalaby R. Comparative study between purse-string suture and peritoneal disconnection with ligation techniques in the laparoscopic repair of inguinal hernia in infants and children. *Ann Pediatr Surg*. 2016;12(4):137-41.
13. Duong TA, Russell G, Esparaz JR, Mortellaro VE. Comparison of two laparoscopic techniques in management of pediatric inguinal hernias. *J Laparoendosc Adv Surg Tech A*. 2022;32(10):1114-20.
14. Shalaby R, Ismail M, Dorgham A, Hefny K, Alsaied G, Gabr K, et al. Laparoscopic hernia repair in infancy and childhood: Evaluation of 2 different techniques. *J Pediatr Surg*. 2010;45(11):2210-6.
15. Montupet P, Esposito C. Fifteen years experience in laparoscopic inguinal hernia repair in pediatric patients: Results and considerations on a debated procedure. *Surg Endosc*. 2011;25(2):450-3.
16. Dreuning K, Maat S, Twisk J, van Heurn E, Derikx J. Laparoscopic versus open pediatric inguinal hernia repair: State-of-the-art comparison and future perspectives from a meta-analysis. *Surg Endosc*. 2019;33(10):3177-91.
17. Montupet P, Esposito C. Laparoscopic treatment of congenital inguinal hernia in children. *J Pediatr Surg*. 1999;34(3):420-3.
18. Saranga Bharathi R, Arora M, Baskaran V. Pediatric inguinal hernia: Laparoscopic versus open surgery. *JLS*. 2008;12(3):277-81.
19. Chan KL, Tam PK. Technical refinements in laparoscopic repair of childhood inguinal hernias. *Surg Endosc*. 2004;18(6):957-60.
20. Dreuning K, Maat S, Twisk J, van Heurn E, Derikx J. Laparoscopic versus open pediatric inguinal hernia repair: State-of-the-art comparison and future perspectives from a meta-analysis. *Surg Endosc*. 2019;33(10):3177-91.

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