



## LAPAROSCOPIC NEEDLE-ASSISTED INGUINAL HERNIA REPAIR IN CHILDREN: A SINGLE INSTITUTIONAL EXPERIENCE

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**ABSTRACT** Laparoscopic needle assisted inguinal hernia repair (LNAR) in children has gained wide acceptance over the past decade, but studies with longer term follow-up are lacking. We present a group of children undergoing laparoscopic needle-assisted repair (LNAR) in our children with long-term follow-up. Clinical database was maintained for children <12 years of age who underwent laparoscopic needle-assisted repair between 2017 and 2022. 223 patients with 268 LNAR were included during the 5-year period. Mean age at surgery was 4.5 years (6 months to 12 years). Hernia repair is done with a single-port needle-assisted technique. After identification of a patent processus vaginalis, the internal ring is encircled using a 22G-Touhy needle for placement of a purse-string suture, tied extracorporeally, and buried beneath the skin. The overall hernia recurrence rate was 0.7%. LNAR is safe and effective in children with similar complication rates to other techniques, including open repair. Furthermore, laparoscopy objectively identifies asymptomatic or occult contralateral defect, uses a smaller incision, and eliminates dissection of the cord structures potentially reducing the risk of cord injury.

**KEYWORDS :** Laparoscopic hernia repair; Laparoscopic needle-assisted repair, Touhy needle

### INTRODUCTION

Congenital inguinal hernia is one of the most common surgical problems in children. Open herniotomy is the standard method of treatment. In recent years laparoscopic techniques are evolving and laparoscopic needle assisted inguinal hernia repair (LNAR) has gained wide acceptance [1–3]. The benefits of laparoscopy include excellent visual exposure, reduced operative time, excellent cosmetic results, visualization of the contralateral side and comparable recurrence and complication rates [4]. There is a lack in long-term outcomes data that extend beyond 1–2 years after surgery [5]. The present study is on a surgical technique called laparoscopic needle-assisted assisted repair (LNAR), which was originally described by Takehara et al. [6], and modified by Hebra et al. to include use of the Touhy spinal needle [7]. This technique has demonstrated low complication rates [8]. The purpose of this study of paediatric patients undergoing LNAR was to further define the benefits of utilizing paediatric laparoscopic hernia repair. We have maintained a clinical quality database to monitor these patients for adverse outcomes, particularly recurrence.

### METHODS

#### Study Design

We performed a single-centred cohort study utilizing clinical outcomes database kept for longitudinal follow-up of children who underwent LNAR at our institution between January 2017 and December 2022.

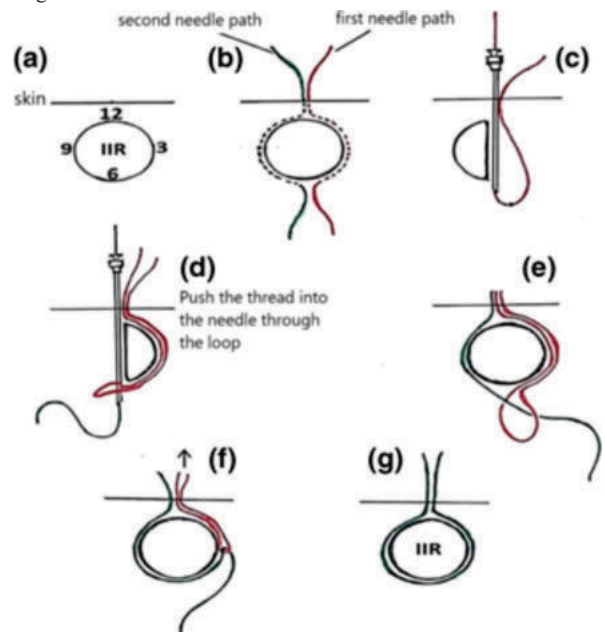
#### Inclusion Criteria

All children under age 12 years who underwent LNAR with our surgical technique were included in this study. Excluded from this study were open repairs, other laparoscopic techniques and age less than 6 months.

#### Surgical Technique

The laparoscopic needle-assisted inguinal hernia repair (LNAR) technique involves one 3mm camera trocar placed through the umbilical skin, with a stab incision overlying the deep inguinal ring. Using a Touhy spinal needle, a 3–0 Prolene suture is guided around the deep ring in the preperitoneal space, carefully dissecting the vas deferens and gonadal vessels away from the peritoneum. An intracorporeal loop is then introduced through the peritoneum while the needle is retracted. The free needle is then guided preperitoneally on the opposite side of the deep ring and guided through the intraperitoneal loop, which is then used as a snare and the two ends of

the suture are brought up to the surface. This suture is tied down and buried subcutaneously, completing the high ligation of the sac at the ring.



**Fig. 1: LNAR – Surgical Technique**

#### Data Collection

Datapoints were obtained using a combination of surgeon-reported questionnaires and chart review of all patients at our institution that underwent LNAR over the time-period between January 2017 and December 2022. Data variables included age, gender, side of repair, operative details, concurrent procedures, follow-up data and complications. Both pre-operative and post-operative diagnoses were recorded and any contralateral defect noted on surgical evaluation was documented as a bilateral inguinal hernia and repaired laparoscopically. Recorded complications included recurrence, contralateral hernia, wound infection and suture granuloma.

### Data Analysis

The study population was analysed for number of hernia repairs, age and gender distribution, operative time, and complications. Complications were divided into those occurring early (30 days). Complications such as hydrocele, wound infection, and suture granulomas were divided into two groups: those that resolved with medical management and those that necessitates surgical intervention. Self-resolving hydroceles were not included in the surgical complication. Mean operative time was calculated for all patients, with notation of unilateral versus bilateral repair. Follow-up was divided into short-term follow-up in the immediate 30 days post-operative period and long-term follow-up that occurred after the 30-day postoperative period.

### Statistical Analysis

All means, medians, standard deviations and standard error of the mean were calculated in Microsoft Excel. Statistical analysis was done using Student's T-test to determine significant differences in patient operative time, demographics and complication rates between different subsets. Significance level was set at a p-value of <0.0001

### Results

#### Study Population

223 patients with 268 LNAR repairs were done at our institution between January 2017 and December 2022. Right side repair was done in 41.25%, left side repair in 38.56% and bilateral repairs in 20.17% (Table 1). Mean operative time of unilateral hernias was 17 min, while bilateral hernia was 28 min. Mean patient age at surgery was 4.5 years with a range of 6 months to 12 years. (Table 1)

#### Follow-up

Of the 223 patients that underwent LNAR, 210 (91%) had long-term follow-up, as previously defined. The mean follow-up time for these patients was 3 years; 13 patients (5.8%) did not receive follow-up beyond the 30-day post-operative period.

#### Complication Rate

There were 18 total complications with the 268 hernia repairs which contributes about 8% complication rate of which 8 children required surgical intervention. The complications observed in this study were recurrence (n = 2), contralateral hernia (n = 3), wound infection (n = 6), and suture granuloma (n = 7). The overall recurrence rate was 0.7%. The mean time to recurrence was 1.5 years. A total of 3 patients were found to have contralateral metachronous hernias on the unrepaired side on follow-up. Six patients (2%) were found to have wound infections. One patient with wound infection required drainage, while the majority of infections (5/6) were treated successfully on antibiotics alone. Suture granulomas occurred post-operatively in 7 hernia repairs (2.5%) with 2 requiring surgical excision.

#### Timing of Complications

Complications occurring within 30 days of surgery are defined as early and after 30 days as late. 6 of them occurred within 30 days and 12 out of 18 complications occurred in the late postoperative period. All contralateral hernias, recurrence and suture granulomas were observed in the late post-operative period. All wound infections occurred during the early post-operative period.

**Table 1: Results**

PARAMETERS	OBSERVATION
No. of cases	223
No. of repairs	268
Mean age	5.2 years
Sex	Male – 182, Female-51
Laterality	R-92, L-86, B/L-45
Mean Operative time	U/L-17 min, B/L-28min
Complications	Total-18, Recurrence -2

### DISCUSSION

This study denotes a group of children who underwent laparoscopic hernia repair with long-term follow-up. This study of LNAR inguinal hernia repair in children, validates that the technique is effective with a minimal recurrence rate of 0.7%, which is lower than the open repair [9]. There was a relatively a minimal complication which requires a relatively low surgical intervention rate of 2.1%.

Though minimally invasive technique was well accepted among paediatric surgeons, adoption of laparoscopic inguinal hernia repair in

day-to-day practice has been slow [10]. Open inguinal hernia repair is the gold standard with excellent results in children. Meta-analysis of recent studies comparing laparoscopic versus open technique have shown that lesser operative time in laparoscopic extraperitoneal repair compared to open [11], which in-turn decrease healthcare utilization and shorter anaesthetic time [12]. In addition to this, studies have shown that laparoscopic approaches had less post-operative complications in patients which includes intraoperative complications, recurrence, hydrocele, testicular atrophy and metachronous contralateral hernia [13]. There is no statistically significant difference in recurrence rates between laparoscopic and open approaches which was shown by recent meta-analysis comparing laparoscopic and open approaches [14]. Despite these studies, there is a lack of comparable long-term follow-up of LNAR patients when comparing laparoscopic to the open repair method is a limitation that was noted in the study [15]. This lack of long term follow-up leads to delays in the adoption of laparoscopic repair as recurrences can occur several years after surgery. This present study has a longer follow-up time which is extremely important for evaluating and reporting the recurrences which occurred in the late complication group. Furthermore, the length of follow-up of this study increases the validity of the observed low recurrence rate.

### CONCLUSION

The LNAR is a simple, effective, and safe procedure even when performed by trainees or surgeons without any previous experience in laparoscopy. This single centered long term analysis of outcomes of LNAR in children further shows the safety as-well-as the efficacy of the laparoscopic technique. This study proves the laparoscopic inguinal hernia repair as safe and effective method with acceptably low recurrence and complication rates.

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