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PROSPECTIVE EVALUATION OF NEEDLE-ASSISTED LAPAROSCOPIC REPAIR OF CONGENITAL INGUINAL HERNIA IN CHILDREN: A CASE SERIES OF 15 PATIENTS

General Surgery

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ABSTRACT

Open herniotomy has traditionally been the preferred and well-established treatment for congenital inguinal hernias in children. Although laparoscopic repair has gained attention as an alternative approach, its widespread use remains debated, often due to limited access to equipment and a lack of technical expertise. However, improvements in anaesthesia and minimally invasive surgical methods have made it possible to perform advanced procedures in children while achieving superior cosmetic outcomes. In this prospective study, needle-assisted laparoscopic repair of congenital inguinal hernias was carried out in 15 children, including 12 boys and 3 girls, aged between 1 and 14 years. Various parameters such as operative duration, intraoperative and postoperative complications, postoperative pain, length of hospital stay, and cosmetic results were assessed and compared. The patients were monitored for an average follow-up period of 6 months to evaluate the effectiveness and safety of the procedure.

KEYWORDS

Needle Assisted Laparoscopic Herniotomy , Congenital Hernia

INTRODUCTION

Congenital inguinal hernia is among the most common surgical conditions requiring operative intervention in infants and children. Traditionally, open herniotomy has been the standard and widely accepted treatment worldwide. However, with advancements in surgical techniques and technology, laparoscopic repair has emerged as an effective alternative in pediatric surgery. The safety and effectiveness of laparoscopic hernia repair have been well established, and the procedure is now routinely performed in many centers.

More recently, a minimally invasive technique involving extracorporeal closure of the hernia defect using needle-assisted suturing has gained popularity. This approach, commonly referred to as Laparoscopic Percutaneous Extracorporeal Closure (LPEC) or Needle-Assisted Laparoscopic Repair (NALR), has been widely adopted in several countries. Despite its growing use internationally, reports from India remain limited.

In this study, we present a series of 15 patients who underwent hernia repair using this technique. The study highlights the advantages and limitations of the procedure and aims to assess its feasibility, effectiveness, and safety in selected pediatric patients, while comparing its outcomes with those of conventional open surgery.

METHODOLOGY :

In this prospective study, 15 children with congenital inguinal hernia underwent needle-assisted laparoscopic hernia repair. The study population included 12 boys and 3girls between 1 and 14 years of age who were randomly selected and presented with either unilateral or bilateral inguinal hernias.

All procedures were carried out under general anesthesia after completion of routine preoperative evaluation, fitness assessment, and obtaining informed consent from the parents. A 5-mm camera port was introduced through a supraumbilical incision. The internal inguinal ring was identified to confirm the presence of a patent processus vaginalis and to assess for any contralateral occult hernia.

A 22-gauge spinal/ 18 gauge intravenous cannula needle loaded with a 2-0 Prolene loop was inserted through a small stab incision made in the groin skin overlying the internal ring. The needle was carefully maneuvered around the internal ring, taking small bites of peritoneum from lateral to medial aspect of ring to achieve circumferential encirclement of the ring. In male patients, meticulous care was taken to prevent injury to the vas deferens and gonadal vessels during this step.

After completing the circumferential passage around the internal ring, the Prolene loop was exteriorized. The needle was then withdrawn and reinserted through the medial aspect of the internal ring, and the free end of the suture was passed through the previously created loop. Gradual traction on the loop enabled complete circumferential placement of the suture around the deep internal ring. The suture was tied extracorporeally, and the knot was buried beneath the skin. The umbilical port incision was closed using 3-0 Vicryl sutures, while the small puncture wound in the groin was approximated with Steri-Strips.

The technique offered several advantages, including excellent cosmetic outcomes with a virtually scarless appearance, making it an attractive alternative for bilateral inguinal hernias, particularly in female children. In addition, the duration of hospital stay was comparable to that associated with conventional open herniotomy.

In male patients, the principal technical challenge involved avoiding injury to the vas deferens and gonadal vessels, collectively referred to as the cord structures. The risk of trauma to these structures was minimized through the use of a spinal needle, which possesses a less traumatic tip. However, in cases with large hernial sacs and defects exceeding 3 cm after pneumoperitoneum, complete encirclement of the defect was technically difficult, resulting in a higher likelihood of recurrence.

Prolene suture material facilitated smooth circumferential encirclement of the hernial defect; however, loosely tied knots carried an increased risk of slippage. Although Vicryl sutures were also evaluated, their multifilament nature made circumferential passage

around the hernial sac more difficult and increased the possibility of entrapment of the cord structures. Consequently, 2-0 Prolene was used as the primary suture material in the majority of cases.

All patients were discharged on the day after of surgery and were subsequently followed up at 2 weeks, 1 month, 3 months, and 6 months. During follow-up, postoperative outcomes including scrotal edema, hydrocele formation, recurrence of hernia, and cosmetic appearance were assessed. Needle-assisted herniotomy was successfully performed in all patients without any intraoperative complications. Follow-up evaluation revealed no evidence of hernia recurrence in any of the cases.

RESULTS :

In this prospective study we have performed Spinal/intravenous needle assisted laparoscopic congenital hernia repair on 15 children (12Boys & 3 Girls) from age group 1 year to 14years**.** Needle-assisted herniotomy was successfully performed in all patients without any intraoperative complications. There was one case of post operative hematoma noted. Follow-up evaluation revealed no evidence of hernia recurrence in any of the cases.

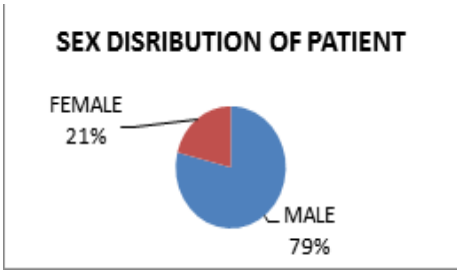


Image showing steps of Needle-Assisted Laparoscopic Repair (NALR)

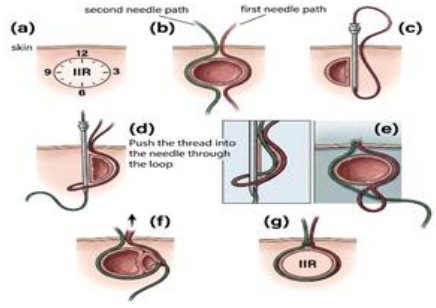
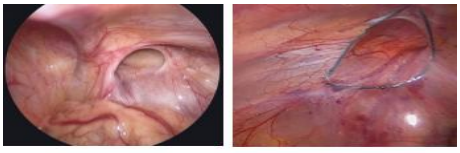


Image showing pre-operative laproscopic deep inguinal ring defect, intra-operative deep ring closure using prolene 2-0, post-op deep ring closure laproscopic view



Outcome	Number (%)
Hematoma	1
Scrotal Edema	0
Hydrocele Formation	0
Wound Infection	0
Recurrence	0
Readmission	0
Excellent Cosmetic Outcome	15 (100%)

DISCUSSION :

Indirect inguinal hernia is a common condition in the pediatric population and results from the failure of the processus vaginalis, a peritoneal extension that normally facilitates the descent of the testes from the abdomen into the scrotum, to close properly. Several factors have been associated with an increased risk of developing this condition, including prematurity, low birth weight, undescended testes, respiratory disorders, and the need for mechanical ventilation.(1)

One of the most serious complications of inguinal hernia in children is incarceration and strangulation of the herniated contents, with the highest risk occurring during infancy (2). Conventional open herniotomy remains the most widely accepted and routinely performed surgical technique in the pediatric age group. This procedure primarily involves high ligation of the hernial sac at the level of the internal inguinal ring (3). However, dissection of the hernial sac from the spermatic cord structures to reach the deep inguinal ring may carry the risk of injury to the vas deferens, formation of hematoma, and damage to the testicular artery, particularly in children where the hernial sac is often delicate and fragile.

In recent years, laparoscopic repair of pediatric inguinal hernia has gained widespread acceptance as an alternative treatment modality and continues to increase in popularity because of its demonstrated feasibility, effectiveness, and safety. The advantages of laparoscopic repair include superior visualization of the operative field, easy assessment of the contralateral inguinal region, minimal tissue dissection, reduced risk of injury to the vas deferens and gonadal vessels, prevention of iatrogenic testicular ascent, and shorter operative duration, especially in obese children and in cases of recurrent hernia.

Ozgediz et al. introduced the concept of minimal instrumentation combined with extracorporeal knot tying for laparoscopic inguinal hernia repair, thereby simplifying the procedure and making an already minimally invasive operation even less invasive (4). Laparoscopic hernia repair has been reported to be highly effective and safe in children owing to reduced access-related trauma, limited tissue dissection, decreased postoperative pain, minimal blood loss, and earlier return to normal daily activities (5).

Several laparoscopic techniques for pediatric inguinal hernia repair have been described in the literature. Schier, in 1998, utilized 2-mm instruments without the use of trocars to perform intra-abdominal suturing of the internal inguinal ring in 25 female patients. Closure was achieved using two Z-sutures, and favorable outcomes were reported (6). Lee and Liang subsequently performed microlaparoscopic high ligation of the internal inguinal ring in 450 patients, achieving excellent outcomes with a very low recurrence rate of 0.88% (7).

Shalaby and colleagues employed a Reverdin needle (Martin MedizinTechnik, Tuttlingen, Germany) to accomplish extracorporeal ligation of the internal inguinal ring in 187 groin hernias among 150 patients and reported superior results compared to intracorporeal techniques. Furthermore, they compared intracorporeal purse-string suturing with extracorporeal closure using the Reverdin needle and found that the latter significantly reduced operative time while providing excellent cosmetic outcomes and a low recurrence rate (8).

In the present technique, a spinal/intravenous needle, which is readily available in routine surgical practice, was used to encircle the deep inguinal ring around the patent processus vaginalis. This approach eliminates the need for specialized needles or hooks and can be performed by surgeons possessing basic laparoscopic skills without requiring expertise in intracorporeal knot-tying techniques.

A review of the available literature revealed a similar technique described by Tatekawa in 2012, in which an epidural needle was utilized along with preperitoneal hydrodissection to separate the vas deferens and gonadal vessels from the operative field (9). We believe that complete circumferential encirclement of the internal ring, evacuation of the hernial sac contents, and reduction of intra-abdominal pressure before knot tying may contribute to lowering the incidence of postoperative scrotal swelling and hernia recurrence.

During the six-month follow-up period, no cases of postoperative scortal swelling were observed. Although the operative time was relatively longer during the initial learning phase of the procedure, a significant reduction was achieved with increasing experience, decreasing from approximately 25 minutes to 10 minutes per case.

The issue of contralateral exploration for a patent processus vaginalis

(PPV) remains controversial. However, during laparoscopic evaluation, inspection of the contralateral side becomes straightforward and can be performed routinely without additional surgical dissection, thereby allowing automatic identification of a contralateral PPV when present.

CONCLUSIONS :

We conclude that this technique represents a simple, safe, and effective method for the repair of pediatric inguinal hernias. The procedure does not require any specialized instruments or equipment, making it both cost-effective and easily reproducible in routine surgical practice. Furthermore, it can be successfully performed by surgeons possessing basic laparoscopic skills without the need for advanced expertise in laparoscopic suturing techniques.

An additional advantage of this approach is that it eliminates the requirement for laparoscopic dissection of the hernial sac, thereby reducing tissue manipulation and minimizing the potential risk of injury to surrounding structures. Based on our experience, the use of a 22-gauge spinal needle/ 18 gauge intravenous cannula was found to be particularly advantageous because its fine and less traumatic tip facilitates safe passage around the internal inguinal ring while minimizing tissue trauma.

The 2-0 Prolene suture material was also found to be well suited for this technique, as it can be easily passed through the needle and allows secure circumferential ligation of the internal ring. Moreover, monofilament suture material appears to be preferable to multifilament sutures, as it offers smoother passage around the hernial sac and is associated with a lower risk of inadvertent entrapment of the spermatic cord structures within the ligature. Therefore, the combination of a 22-gauge spinal needle/ 18 gauge intravenous cannula and 2-0 Prolene suture provides a practical, safe, and reliable option for laparoscopic repair of pediatric inguinal hernia.

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