Original Article

Laparoscopic techniques for congenital inguinal hernia repair

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Abstract

Background: Laparoscopic inguinal hernia repair has an established role in the management of this condition in children in trained hands. Indeed, it is fast becoming the gold standard for the treatment of inguinal hernia in children. The laparoscopic technique has the advantage that it is simple, feasible, and safe. Also, the contralateral internal inguinal ring and other hernia sites such as femoral, obturator, or internal hernia can be diagnosed and treated at same sitting and other occult pathologies may be diagnosed. The risk of injury to the vas deferens and cord structures in this procedure is lesser when compared to the conventional open technique.

Keywords: Laparoscopy, inguinal hernia.

INTRODUCTION

Laparoscopic inguinal hernia repair has an established role in the management of this condition in children in trained hands. Indeed, it is fast becoming the gold standard for the treatment of inguinal hernia in children. The laparoscopic technique has the advantage that it is simple, feasible, and safe. Also, the contralateral internal inguinal ring and other hernia sites such as femoral, obturator, or internal hernia can be diagnosed and treated at same sitting and other occult pathologies may be diagnosed. The risk of injury to the vas deferens and cord structures in this procedure is lesser when compared to the conventional open technique. (Lukong, 2012)

A. Intraperitoneal approaches:

1. Endolooping (laparoscopic inversion ligation):

This method of laparoscopic inguinal repair is widely used in female children. This is a modification of the intracorporeal technique, using three ports and nonabsorbable sutures. It is thought that inversion and ligation of sac at the internal inguinal ring would reduce the risk of recurrence (0.8–2.5%). {Lipskar, 2010}

This technique involves grasping the farthermost portion of the sac by a grasper placed through the ipsilateral working port and using an endoloop, introduced through the contralateral working port, to ligate the inverted sac, thus achieving high ligation without the use of needles or knotting (Saranga et al, 2008)

This technique was applied only in female with congenital inguinal hernia as the cord structures cannot be identified from the tie in male. (Glick, 2006)

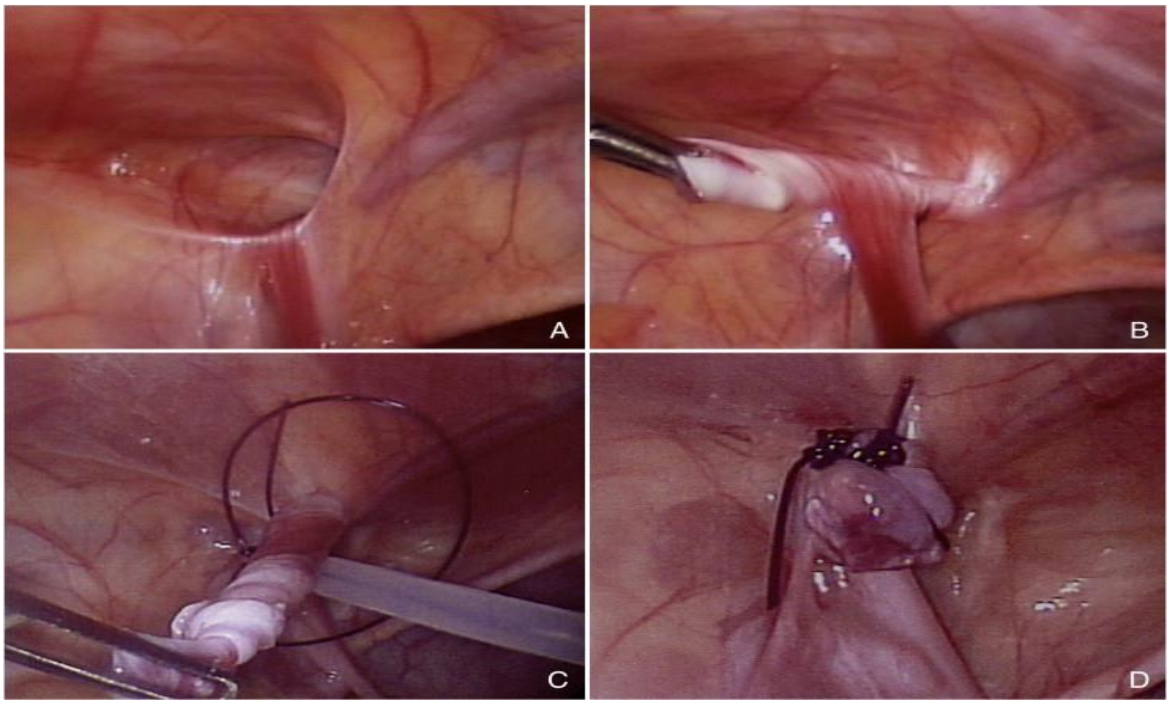


Fig (1) Laparoscopic inversion ligation.
(a) Identification of hernia. (b) Inversion of peritoneum.
(c) Twisting and double ligation of sac. (d) Excision of sac.

2. Suturing of the internal ring:

It ensures the ligation of the neck of the PPV, without its division. It involves intracorporeal placement of interrupted or continuous sutures, including only the peritoneum or, at times, some underlying muscular tissue as well. (Wang, 2021)

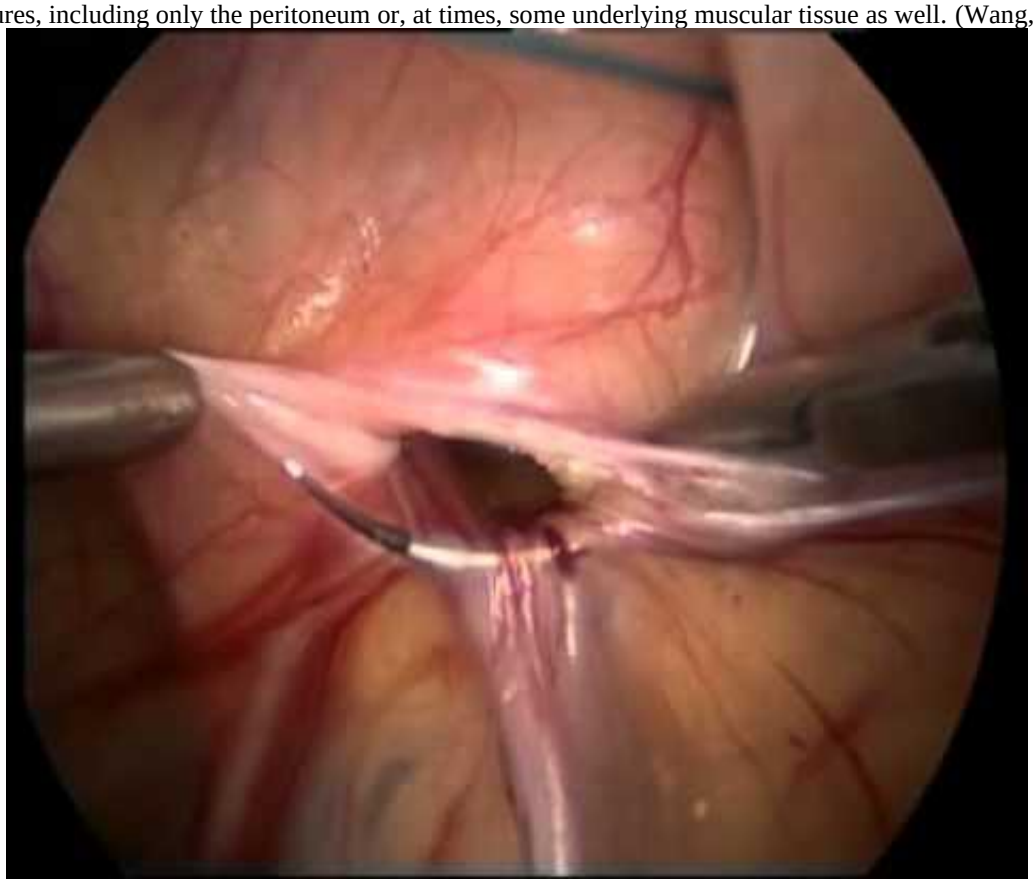


Fig (2): Intracorporeal suturing of the internal inguinal ring.

3. Purse string suture with skipping vas and vessels:

This technique use intracorporeal purse string suture around the internal ring skipping the vas deferens & spermatic vessels. (Boo et al, 2012)

When using the standard three port technique with intracorporeal knot tying or the two port technique with an assistant port for intraabdominal suturing, the hernial orifice is closed with an N-shaped or purse string suture, which may leave gaps in the peritoneum. These gaps may reduce the formation of peritoneal adhesions to keep the gap closed, and the recurrence may occur if the knots gradually loosen. (Chang et al, 2011)

The purse string suture included the peritoneum and the underlying fascia lateral to the spermatic cord. Before the knot was tied, the hernia sac was compressed to expel any gas. The peritoneum was completely closed, and the airtightness was confirmed by the absence of hernia sac enlargement when the intraperitoneal pressure was increased. (R. Shalaby et al., 2015)

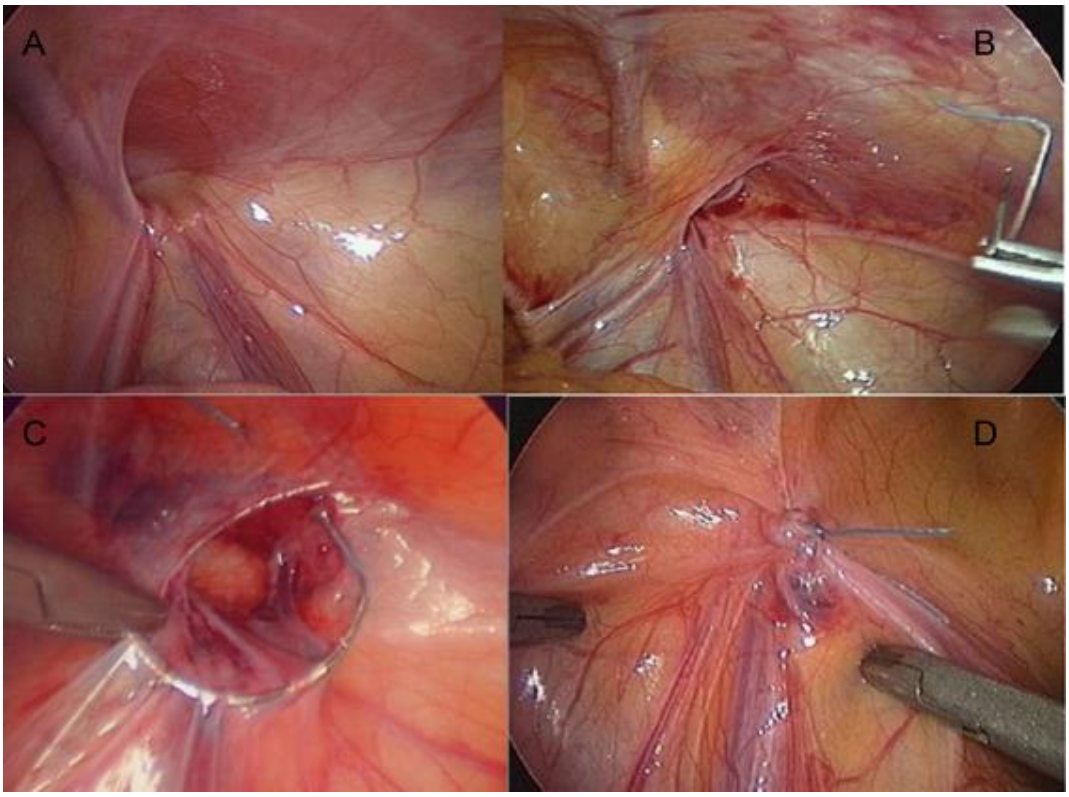


Fig (3): Purse string suture.

4. Flip-Flap technique:

This technique involves raising a peritoneal flap by dissection and detaching the anterior and lateral hemi circumference of the sac, flipping it over medially to cover the hernial site and anchoring it with an intracorporeally placed suture. (Yip, 2004)

This forms a one-way peritoneal valve that prevents abdominal contents from entering the sac while selectively allowing fluid from the distal sac to enter the general peritoneal cavity, thereby preventing postoperative hydrocele formation... (Garzi et al, 2020)

Satisfactory results have been noticed by Hassan et al. in a comparative study of this flip-flap technique with the conventional open technique. (Hassan, 2007)

5. Disconnection of the sac and peritoneal ligation:

It includes detachment of the sac with suture obliteration, by laparoscopic division of the PPV at the level of the internal ring followed by its suture intracorporeally. **(**Elbatarny et al, 2020)

With three ports and nonabsorbable sutures employed. In this technique, the hernia sac is resected and closed with a purse-string suture at the level of the internal inguinal ring. Becmeur et al. recorded no recurrence with this method. This was done in an attempt to reduce the recurrence. (Becmeur, 2004)

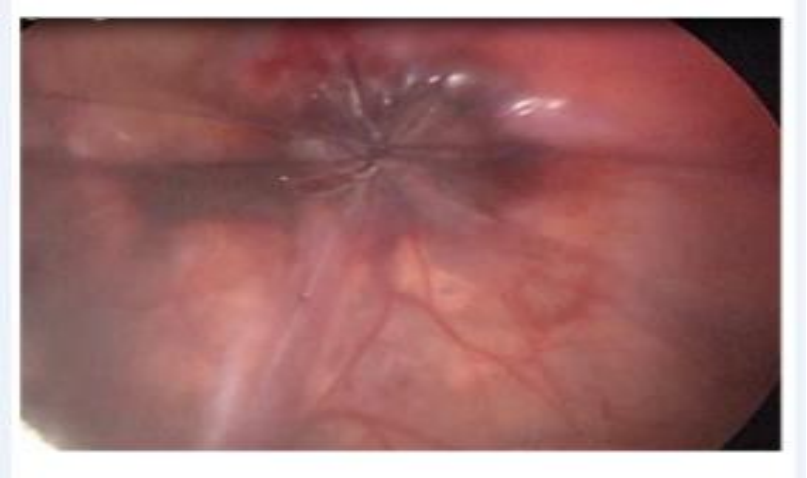


Fig (4): Peritoneal closure after hernial sac disconnection.(Quoted from **Becmeur.** 2004)

6. Disconnection of the sac, no ligation just resection:

Here, the hernia sac is resected at the level of the internal inguinal ring and allowed to close spontaneously. This novel technique has been reported in literature with preliminary results showing satisfactory outcome and no recurrence, in Riquelme's series a purse string closure of the ring was done for >10 mm size of the deep ring. It is logical for the critics to believe that leaving the peritoneum unsutured may invite more recurrences in infants due to a suboptimal sealing mechanism of the conjoint muscle. The method uses three ports and no sutures are employed (Riquelme et al, 2010)

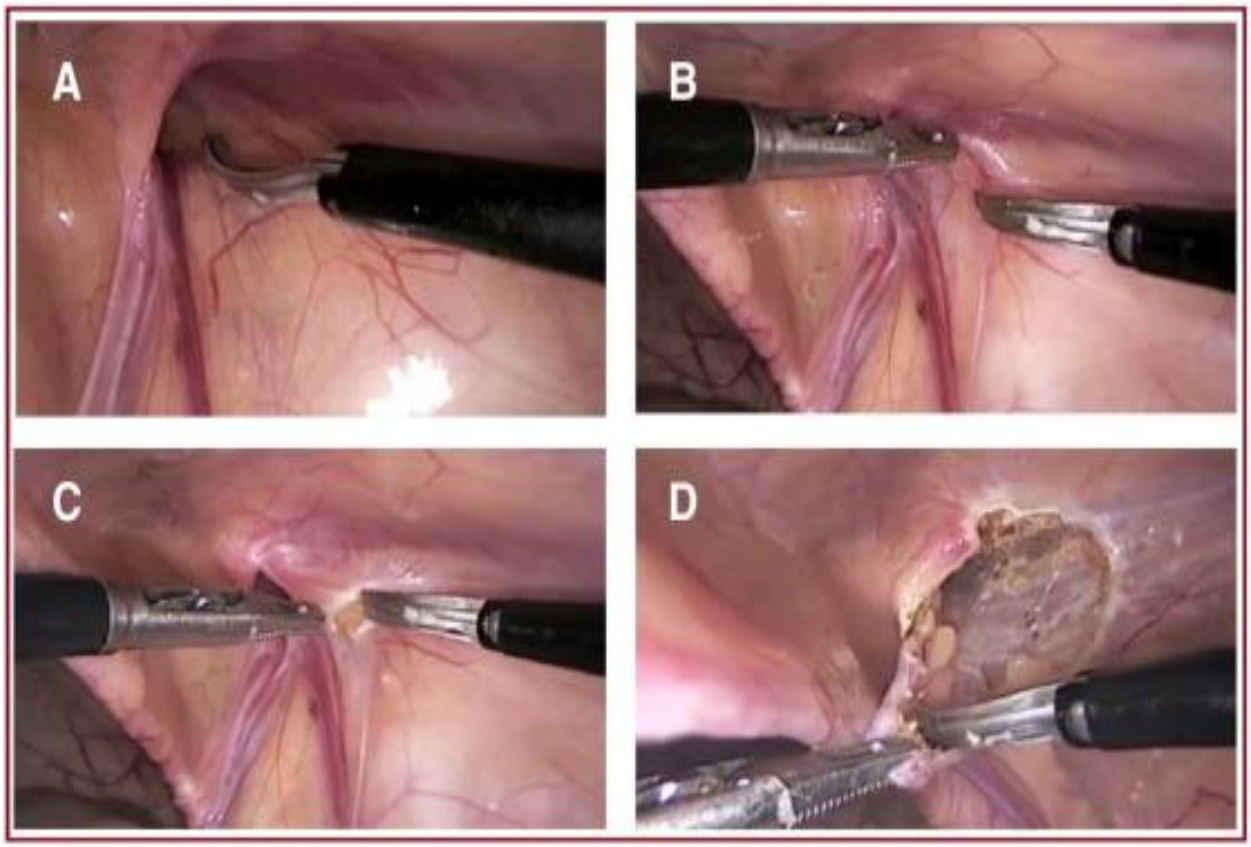


Fig (5): Resection of the sac without ligation.

7. Muscular arch repair:

In these techniques a repair of the muscular arch is tried by approximation of muscle arch with pectineal ligament. (Shehata et al, 2015)

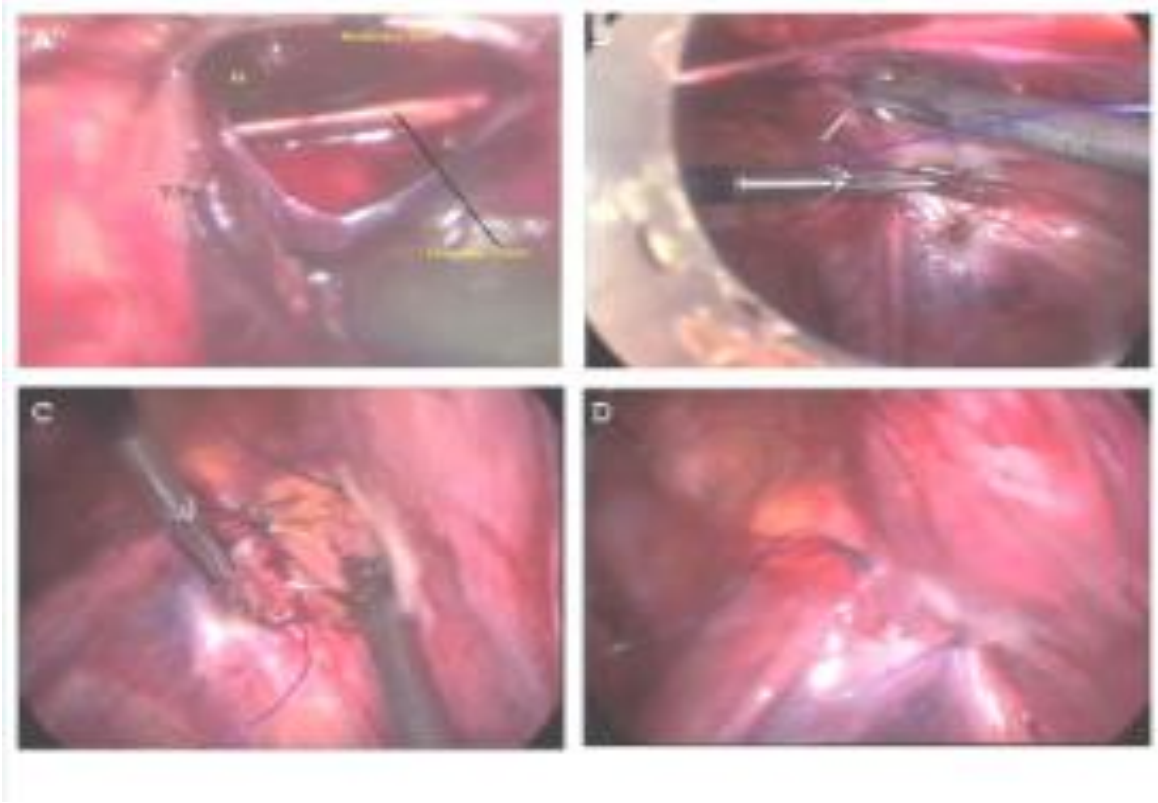


Fig (6): Laparoscopic Muscular Arch Repair. (Quoted from **Shehata**.2015).

8. Single instrument intracorporeal knot tying:

Longitudinal transumilical skin incision was done for insertion of the umbilical port and a 3-mm Maryland forceps. (Ismail, 2014)

RN was used for insertion of a purse string suture with single instrument intracorporeal suture tie around internal inguinal ring. (Ismailet al, 2014)

The purse string knot airtightness was stress-tested by raising the intraperitoneal CO2 pressure to 16–24 mm Hg for about 30 seconds. (Ismail, 2014)

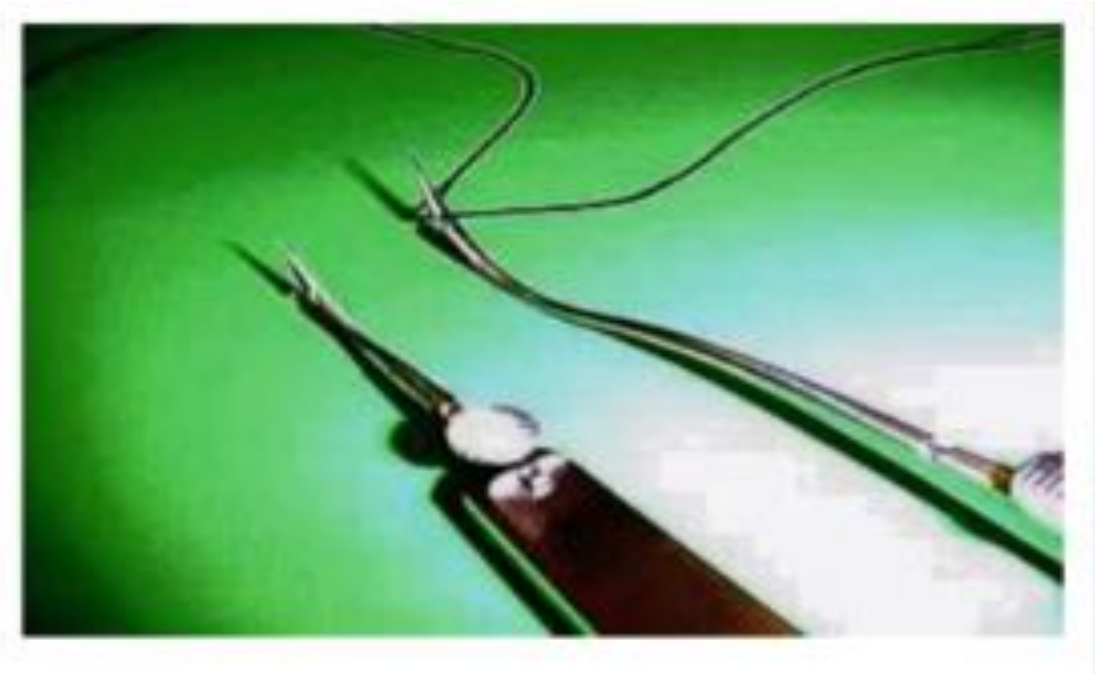


Fig (7): Reverdin needle.

B) Extra peritoneal approaches:

1. Subcutaneous endoscopically assisted ligation (SEAL)

The internal inguinal ring is looped under endoscopic control using a 1/0 or 2/0 absorbable suture swaged on a large needle (36–40 mm, curved round body) introduced percutaneous using a strong conventional needle holder. Skipping the vas and vessels and directed to the skin, suture is tied extra corporeally, in females the round ligament could be anchored in the suture. (Muncie et al, 2019)

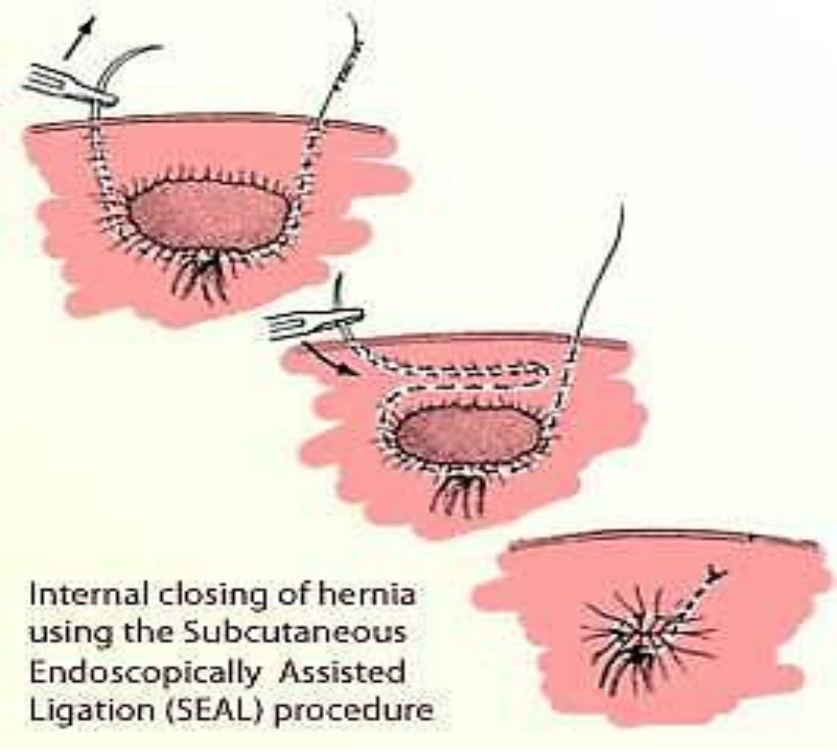


Fig (8): subcutaneous endoscopically assisted ligation (SEAL).

2. Needlescopic hernia repair:

Reverdin needle (RN) is a surgical needle with an eye that can be opened and closed with a slide. It essentially modifies the delivery of the suture material, creating an extracorporeal knot tying. It markedly reduces both operative time and technical difficulty. (R. Y. Shalaby et al, 2006)

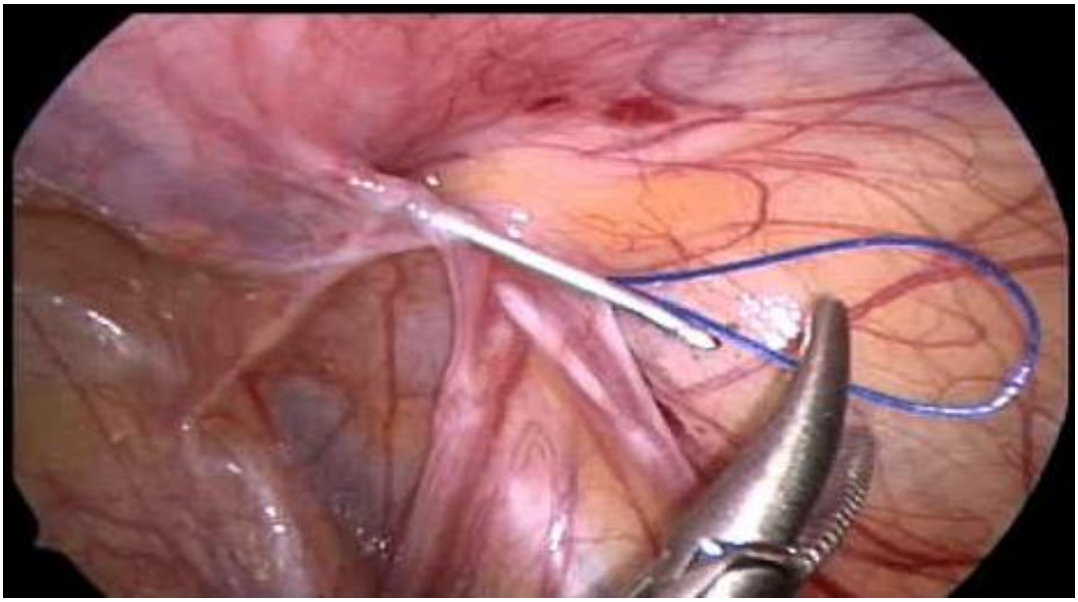


Fig (9): Needlescopic hernia repair.

3. Percutaneous internal ring suturing (PIRS):

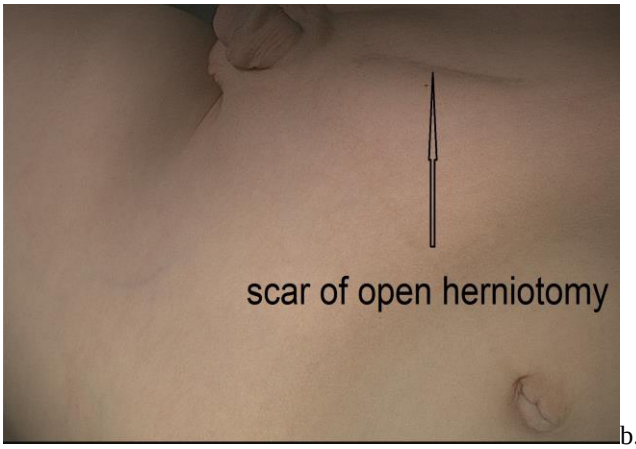
This technique (similar to SEAL) has been used to loop the internal ring extraperitoneally under laparoscopic guidance. In PIRS, an 18-gauge epidural needle with a 3/0 non absorbable suture in its barrel replaces the swaged needle. (Thomas et al, 2016)

Hollow needle with suture material inside is passed percutaneously under the peritoneum of each half of the internal ring. It allows extracorporeal knot-tying by catching a loop of the suture material and pulling it to the surface. Some intraoperative and postoperative complications were reported. Recurrence was three cases out of 106 children. (Patkowski, 2006)

Fig (10): Percutaneous internal ring suturing using epidural needle (PIRS).

Advantages of laparoscopic repair: (Lima et al., 2002)

- Less pain.
- Earlier return to normal activities.
- Repair of bilateral hernias through the same port.
- Good option to repair recurrent hernias.
- Good option to repair incarcerated hernias
- Excellent cosmetic results.
- Detection and repair of femoral and direct hernia.



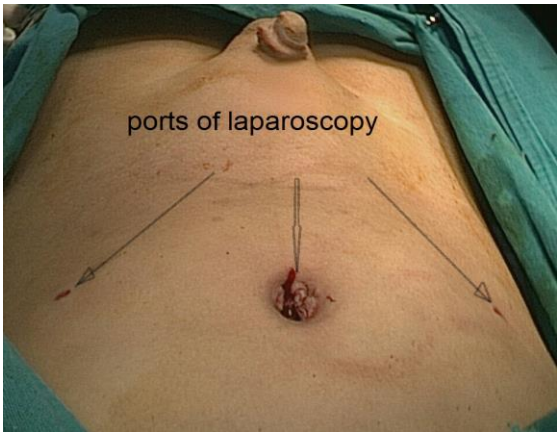
b. 

Fig (11): Cosmetic results after open (a) vs. Laparoscopic herniotomy (b)

Disadvantages of laparoscopic repair: (Lima et al., 2002)

- Increased cost.
- Longer operating time.
- A prolonged learning curve.
- Recurrence.

Complications of inguinal hernia repair

Recurrence: The risk of recurrence in an elective inguinal hernia repair is less than 1% in several large series. It is higher in premature infants, in children with incarcerated hernias, and in children with associated diseases (e.g., connective tissue disorder, ventriculoperitoneal shunt). Recurrence rates are as high as 50% in children with connective tissue disorders and mucopolysaccharidoses. A recurrent hernia even can be the presenting symptom in these diseases. (Ein et al, 2006)

Injury to Cord/Testis: Injury to the cord/testis is a rare occurrence in elective hernia repairs, with an incidence of approximately 1 in 1000 in large surgical series. A recognized injury to the vas should be managed by immediate repair with fine (8-0) suture, and the family should be informed of the event. (Baird et al, 2011)

Infection occurs in 1% to 3% of cases, and postoperative hematoma has a similarly low incidence, Persistent hydrocele can occur, particularly if a very large hydrocele was present preoperatively. It is important to instruct the family about this possibility before repair. Most postoperative hydroceles are simply observed for 6 to 12 months. If they do not resolve, aspiration may be tried once or twice. Persistent non resolving hydroceles usually require trans-umbilical diagnostic laparoscopy to exclude a recurrent hernia. In the absence of recurrence, a trans-scrotal exploration and obliteration of the hydrocele sac is performed. (Ein et al., 2006)

Port site hernias (alternative plural: herniae) are a rare complication of laparoscopic surgery, affecting ~1.5% (range 0.7-2.8%) of surgeries. They may be early-onset or late-onset, and may result in small bowel obstruction. (P Rao et al, 2008)

Subcutaneous emphysema describes the presence of gas in subcutaneous tissue. It has several known causes, among them as a postoperative complications. (David W et al, 2009)

Wound infections most surgical wound infections show up within the first 30 days after surgery. Surgical wound infections may have pus draining from them and can be red, painful or hot to touch. You might have a fever and feel sick. (Espinosa JA et al, 2020)

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