

Mid- to long-term results of SuPerLap single-port treatment in inguinal hernia

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ABSTRACT

Introduction. Laparoscopic treatment of inguinal hernia is gaining popularity in many hospitals, but the use of working channel scopes is not as widely extended. We present our long-term experience with the SuPerLap (laparoscopic-assisted percutaneous suture) technique described by Rosell et al.⁽¹⁾ for epigastric hernia repair in the percutaneous, single-port treatment of inguinal hernia using working channel scopes.

Materials and methods. A retrospective analysis of a series of male patients with congenital inguinal hernia undergoing surgery from February 2017 to December 2020 was carried out. A 5 mm-0° pleuroscope with a 3.5 mm working channel, a 20 G epidural needle, a 36 cm/3.5 mm laparoscopic Maryland dissector, and 3-0 polypropylene and polyester sutures were used.

Results. 384 inguinal hernia repairs using the SuPerLap technique were performed in 295 male patients – 206 unilateral repairs and 89 bilateral repairs. In 24 bilateral cases (26.95%), preoperative diagnosis had been unilateral. Mean age was two years (2 weeks-13 years). Mean operating time was 14 minutes (6-50 min) for unilateral repair, and 27 minutes (14-80 min) for bilateral repair. There were two cases of epigastric vessel damage, and one case of early recurrence in a newborn, who successfully underwent re-intervention using the SuPerLap technique. No late complications were recorded after a mean follow-up of 1-36 months.

Conclusions. Working channel scopes using the SuPerLap technique avoid additional ports in inguinal hernia repair. They allow for excellent functional results, without visible scars, and minimize spermatic cord manipulation. Laparoscopy allows previously undiagnosed defects to be concomitantly treated.

KEY WORDS: Inguinal hernia; Hernia repair; Laparoscopy; Single port; Thoracoscope; Scarless surgery.

RESULTADOS A MEDIO-LARGO PLAZO DEL TRATAMIENTO MONOPUERTO SUPERLAP DE LA HERNIA INGUINAL

RESUMEN

Objetivos. La laparoscopia en el tratamiento de la hernia inguinal está cada vez más presente en muchos hospitales. El uso de ópticas con canal de trabajo no está tan extendido. Se presenta la experiencia a largo plazo en la aplicación de la técnica SuPerLap (sutura percutánea laparoscópica) propuesta por Rosell y cols.⁽¹⁾ para la reparación de hernias epigástricas en el tratamiento monopuerto, percutáneo de las hernias inguinales mediante el uso de ópticas con canal de trabajo.

Material y método. Serie quirúrgica de hernia inguinal congénita en varones (febrero de 2017-diciembre de 2020). Se utilizó: pleuroscopio de 5 mm-0° con canal de trabajo de 3,5 mm; aguja epidural 20 G; suturas de polipropileno y poliéster 3/0; disector Maryland laparoscópico (36 cm-3,5 mm).

Resultados. Se realizaron 384 herniorrafias inguinales según técnica SuPerLap en 295 varones (206 unilaterales, 89 bilaterales). En 24 casos bilaterales (26,95%) el diagnóstico preoperatorio fue unilateral. La edad media fue de dos años (2 semanas-13 años). El tiempo medio quirúrgico fue 14 minutos (6-50 min) en unilaterales, 27 (14-80 min) en bilaterales. Hubo dos casos de lesión de vasos epigástricos y una recidiva precoz en un neonato, reintervenido satisfactoriamente mediante técnica SuPerLap. En un seguimiento de 1-36 meses no hubo complicaciones tardías.

Conclusiones. El uso de ópticas con canal de trabajo según técnica SuPerLap posibilita prescindir de puertos adicionales en el tratamiento de la hernia inguinal. Permite resultados funcionales comparables y cirugía sin cicatrices visibles. Minimiza la manipulación del cordón espermático. La laparoscopia permite el tratamiento concomitante de defectos no diagnosticados previamente.

PALABRAS CLAVE: Hernia inguinal; Herniorrafia; Laparoscopia; Monopuerto; Toracosopia; Cirugía sin cicatrices.

INTRODUCTION

Inguinal hernia is one of the most frequent pathologies in pediatric patients. In many hospitals, laparoscopic treatment has progressively gained importance over open surgery as it is associated with minimal spermatic cord

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Figure 1. 5 mm scope with a 3.5 mm working channel through which a 36 cm laparoscopic Maryland dissector was introduced.

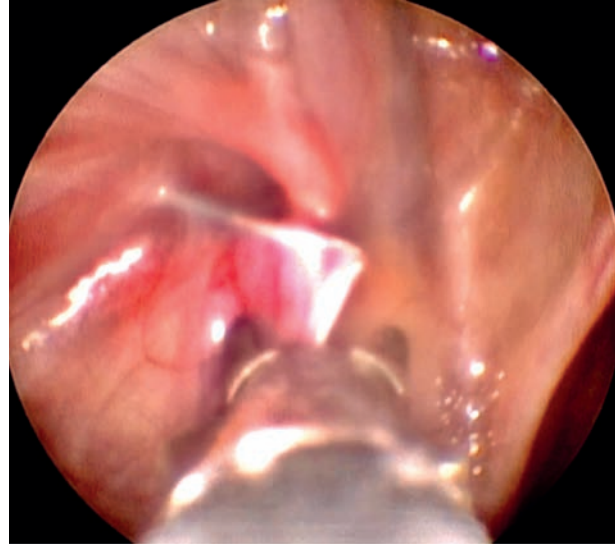


Figure 2. View of the lateral hemicircumference suture using an auxiliary dissector.

manipulation in male patients, better cosmetic results, and early recovery^(2,3).

The single-port technique described by Patkowski et al.⁽³⁾, which involves the percutaneous suture of the deep inguinal ring under laparoscopic vision, has added to the advantages of laparoscopy, but is limited by a long learning curve and great technical difficulty. However, the use proposed by Rosell et al.⁽¹⁾ for working channel scopes in the laparoscopic single-port treatment of epigastric hernias using the SuPerLap technique demonstrates the advantages of it in abdominal wall reconstruction procedures. We present a modification of the laparoscopic percutaneous treatment of inguinal hernia using the SuPerLap (laparoscopic-assisted percutaneous suture) technique and a working channel scope. Mid- and long-term results are demonstrated.

MATERIALS AND METHODS

A descriptive, retrospective analysis of a series of male patients diagnosed with indirect inguinal hernia undergoing laparoscopic-assisted repair using the SuPerLap technique at our healthcare facility from February 2017 to December 2020 was carried out.

Patients with previous history of abdominal surgery and patients diagnosed with complicated inguinal hernia requiring urgent surgery were excluded.

Description of the SuPerLap technique

Using a transumbilical single port, the pneumoperitoneum is maintained at 8-10 mmHg. A 5 mm/0° scope with a 3.5 mm working channel is introduced. The deep inguinal ring is identified externally, while exerting pressure with a mosquito forceps or a similar device under laparoscopic vision to identify the puncture site.

For the percutaneous suture, a 20 G epidural needle is used. A 3/0 polypropylene thread is passed through it. The tip of the needle is partially curved up to 85-90 degrees, thus allowing for a 2 cm trajectory perpendicular to the needle's axis. While holding the epidural needle from its base between the first and third fingers, and while stabilizing it at the level of the angle with the second finger, a perpendicular puncture is carried out at the site previously identified using the mosquito forceps, until the fascia is crossed and the tip of the needle is visualized in the preperitoneal space.

Using a 36 cm/3.5 mm (length/caliber) Maryland dissector, introduced through the working channel of the scope previously described (Fig. 1), the peritoneum of the deep inguinal ring is approximated towards the needle, while suturing the lateral hemicircumference (Fig. 2).

A long loop of this suture is left in place, while carrying it towards the contralateral deep inguinal orifice with the forceps, and the needle is removed. Care should be exercised in order to leave the polypropylene suture where it is. The procedure is now repeated at the medial hemicircumference using a 3/0 polyester suture, while ensuring the puncture is carried out at the exact same point of the previous passage, and the polyester loop is loose and within the polypropylene loop. The needle is removed, and the polyester suture is exteriorized while removing the polypropylene suture (Fig. 3). Finally, the double polyester thread is knotted while exerting traction on the ipsilateral testis caudally and medially, whereas the knot remains in the subcutaneous space. The umbilical access is closed with absorbable suture as per the surgeon's technique.

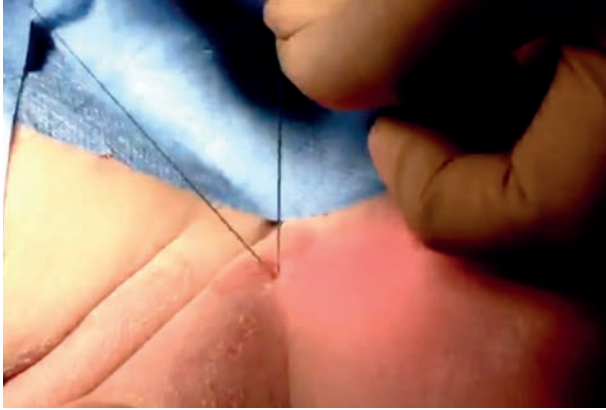


Figure 3. Following polyester suture exteriorization, extracorporeal knotting was performed. The knot remained subcutaneous, which allowed for inguinal hernia repair without visible scars.

RESULTS

At our institution, 384 laparoscopic-assisted percutaneous hernia repairs using the SuPerLap technique were carried out in 295 male patients, 206 of whom had been diagnosed with unilateral hernia, and 89 with bilateral hernia. In 24 out of the 89 (26.95%) bilateral cases, patients had been preoperatively diagnosed with unilateral hernia, with a persistent contralateral processus vaginalis being found at surgery. In one patient, diagnosis of bilateral inguinal hernia was achieved during laparoscopic pyloromyotomy. Mean age at surgery was 2 years (2 weeks-13 years). Mean operating time was 14 minutes (6-50 min) for unilateral hernia, and 27 minutes (14-80 minutes) for bilateral hernia.

Regarding intraoperative complications, the epigastric vessels were accidentally damaged in two cases. This was fixed within a few minutes by exerting external compression only.

Regarding immediate postoperative complications, there was one case of hernia recurrence in a 2,500 g newborn on postoperative day 7. He underwent re-intervention on the following day using the same technique.

No postoperative hydrocele, recurrence, or other late complications were recorded after a mean follow-up of 1-36 months.

DISCUSSION

Contrarily to open surgery, conventional laparoscopic inguinal hernia repair does not require an inguinal incision, but only two or three ports in order to suture the deep inguinal orifice⁽²⁾.

The single-port technique described by Patkowski et al.⁽³⁾, which involves the percutaneous suture of the deep

inguinal ring under laparoscopic vision, has added to the advantages of laparoscopy. However, it is limited by a long learning curve as laparoscopic instruments are not used, which makes triangulation impossible. Therefore, an additional port is sometimes used to complete surgery in a safe manner, owing to the risk of iliac or spermatic vessel damage, or even ductus deferens damage.

Even though the single-port technique contemplates using additional ports under certain circumstances, other techniques such as percutaneous hydrodissection under laparoscopic vision⁽⁴⁾ have been described to increase safety. In other cases, a single transumbilical incision is performed, and two parallel ports are introduced through it⁽⁵⁾. A systematic review comparing 15 series of conventional laparoscopy and single-port laparoscopy hernia treatments, with a total of 3,680 pediatric patients, concluded that single-port extracorporeal suture was superior to conventional intracorporeal suture in terms of hernia recurrence and operating times⁽⁶⁾.

In the case of epigastric hernias, Correia-Pinto et al.⁽⁷⁾ described a minimally invasive technique that avoids incision in the abdominal midline while allowing for a direct visualization of the defect. However, it requires an additional port for laparoscopic suture purposes. Rosell et al.⁽¹⁾ described the SuPerLap technique for epigastric hernia repair, which modifies the technique by Correia-Pinto et al.⁽⁷⁾ and eliminates the need for an additional port by using a working channel scope and performing an extracorporeal suture of the defect. Results are similar to those from the conventional technique.

With adequate planning, the rationale of the SuPerLap technique can be applied to resection and reconstruction surgeries alike. At our institution, it has been implemented in inguinal hernia repair in male patients, as described in this article, but also in thoracoscopic sympathectomy for the treatment of primary hyperhidrosis, and in the ultrasound-guided single-port surgery of intestinal duplication cysts. It can also be used in other easily reproducible techniques.

The main advantage of it in inguinal hernia repair in male patients lies in the fact no additional ports are required thanks to the 5mm working channel scope, with results being similar to those from other single-port techniques. But the SuPerLap technique has other advantages, namely the use of the dissector, which serves as a guide to suture the peritoneum of the deep inguinal orifice in a safe fashion. This avoids damage in the ductus deferens and the spermatic vessels, and since no additional ports are required, it reduces anesthetic and therefore operating times.

Another advantage of the SuPerLap technique, which is comparable to the conventional laparoscopic approach, lies in the fact it allows for a better control of postoperative pain, to the extent at-home analgesia may not even be required. In complicated inguinal hernia, laparoscopy

could be useful for the intra-abdominal exploration of the herniated structures and the peritoneal cavity, but since this was a descriptive analysis, patients diagnosed with complicated inguinal hernia were excluded.

Adequately selecting the patient to be offered the technique is key. Patients not tolerating laparoscopy should definitely be excluded. In our case, we believe early recurrence in our series could be a result of including a newborn at the beginning of our learning curve. In addition, previous history of abdominal surgery could be a relative contraindication. These patients were excluded from our series because this was a descriptive analysis, but in our daily practice, SuPerLap can be offered as a first-line treatment – provided that parents are informed of conversion possibilities. In our patient with history of perforated necrotizing enterocolitis undergoing surgery neonatally, and diagnosed with inguinal hernia at the age of 8 months, the SuPerLap technique was initially used. However, after adhesions compromising the dissection of the inguinal ring's anatomy were found, decision was made to convert to conventional laparoscopy.

This technique is equally reproducible in girls, without the risk of spermatic cord damage involved by surgery in boys. However, in this population, we prefer the laparoscopic cauterization of the hernia sac described by Godoy-Lenz et al., known as BURNIA⁽⁸⁾, given its innocuousness and the reduction in operating times it entails, with results being similar to those from open surgery. In male patients, sac cauterization could damage the ductus deferens and the spermatic vessels, which are adjacent to it. Therefore, we prefer to use this technique in girls only, and the SuPerLap technique in boys.

In order to provide adequate training in inguinal hernia surgery, Moreira-Pinto et al.⁽⁹⁾ proposed a model consisting of two surgical gloves and a scope, subject to changes according to the technique to be trained in. Training allows the learning curve to be shortened⁽¹⁰⁾. At our institution, the SuPerLap technique is the first-line treatment for inguinal hernia repair, and it is widely accepted by parents. It is our treatment of choice even with surgeons who are currently being trained in endoscopic surgery.

In conclusion, the application of the SuPerLap rationale in the single-port laparoscopic surgery of inguinal hernia in children is feasible and reproducible, even with surgeons who are currently being trained in endoscopic surgery – provided that patients are adequately selected at

the beginning of the learning curve. It offers similar functional and cosmetic results, without the need for additional ports. In addition, it reduces anesthetic and operating times, especially in bilateral inguinal hernia. It limits spermatic cord damage. It allows persistent processus vaginalis and other abdominal wall defects to be detected. These may be treated in the same surgery with no additional ports required.

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