

How I Do It

A simple single-port laparoscopic-assisted technique for completely enclosing inguinal hernia in children

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Abstract. Single-port endoscopic-assisted percutaneous extraperitoneal closure of inguinal hernia with variable devices is a novel technique in minimal-access surgery for pediatric inguinal hernias. However, a small peritoneal gap of the suture at the location of spermatic vessels and vas deferens may be left untouched, whereas some subcutaneous tissues, including nerves and muscles, may cause injury by their inclusion in the upper portion of the circuit suturing. The technique may fail to entirely enclose the hernia defect and has the potential to lead to higher incidence of hydrocele and hernia recurrence. The authors describe the modification of single-port endoscopic-assisted ligation with a homemade hooked injection needle, which is designed to cause hydrodissection to the preperitoneal space, tautly enclose the hernia defect without upper subcutaneous tissues and a lower peritoneal gap, and aid in the achievement of a near-zero recurrence rate.

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The techniques of minimal-access surgery for pediatric inguinal hernia are numerous, and they continue to evolve, with a trend toward increasing use of extracorporeal knotting and decreasing use of working ports and endoscopic instruments.¹ Nowadays, single-port endoscopic-assisted percutaneous extraperitoneal closure with variable devices is the ultimate attainment in minimal access surgery for pediatric inguinal hernia.²⁻⁵ Reported single-port techniques with extracorporeal knotting are shown in Table 1. However, the universally known limitations of the techniques are that without the aid of the assistant instrument port, dissection of the hernia sac is limited, and a small peritoneal gap (at the location of the spermatic vessels and vas deferens) might be left untouched during ligation of the

hernia sac.²⁻⁴ This small peritoneal gap might possibly contribute to hernia recurrence or hydrocele formation in the future.² Because this is a technique of percutaneous closure of inguinal hernia, some tissues between the skin and hernia sac, including nerves and muscles, may cause injury by their inclusion in the suture, and this will increase the postoperative morbidity in the long term.²⁻⁵

To preserve the advantage and overcome the limitations of the single-port technique, we designed a novel technique to close an inguinal hernia percutaneously with the aid of a transabdominal 5-mm telescope and an innovative homemade hooked injection needle.

Methods

The surgical technique was modified according to our previous publication.⁵ After general anesthesia, patients

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Table 1 Reported one-trocar technique with extracorporeal knotting

Study	Technique	Port size (mm)	Number of associated stabbing incisions	Complete ring	Subcutaneous tissue inclusion	Tensionless knot tying	Protection of vas deferens and spermatic vessels
Harrison et al (2005) ²	Extraperitoneal	2.7	2 (unilateral) 4 (bilateral)	— Small gap	+	—	+ Jump over them
Ozgediz et al (2007) ³	Extraperitoneal	2.7	2 (unilateral) 4 (bilateral)	— Small gap	+	—	+ Jump over them
Patkowski et al (2006) ⁴	Transperitoneal	2.5 or 5	1 (unilateral) 2 (bilateral)	— Small gap	+	—	+ Jump over them
Chang et al (2008) ⁵	Transperitoneal	5	1 (unilateral) 2 (bilateral)	+	+	+	+
Present series	Transperitoneal	5	1 (unilateral) 2 (bilateral)	+	—	Hydrodissection + Hydrodissection	Hydrodissection + Hydrodissection

were placed in a supine position. The TV screen was placed at the patient's feet.³ The surgeon operating stood on the patient's left side, and the camera assistant was on the right side. One 5-mm trocar was introduced through the umbilicus in an open method. The abdomen was insufflated to 10 to 12 mm Hg pressure, and a 5-mm, 30° laparoscope (Karl Storz GmbH & Co, Tuttlingen, Germany) was introduced into the peritoneal cavity. The corresponding skin of the orifice of the hernia defect was first marked by means of transabdominal illumination of the laparoscopy. At the marked site, a 16-gauge homemade hooked injection needle (Optiva I.V. Catheter Radiopaque, I.D. 1.8 × 50 mm; Ethicon Endo-Surgery, Johnson & Johnson Company, New Brunswick, NJ; Fig. 1) with a nonabsorbable suture (mostly silk 3-0) was introduced and advanced along the preperitoneal space on the medial side of the hernia defect and passed into the intra-abdominal space medial to the vas deferens

(Fig. 2). The suture was detached from the hooked needle, and the needle was subsequently withdrawn until the tip reached the roof of the hernia defect with the end of the suture remaining in the intra-abdominal cavity. Then, the needle was reintroduced along the lateral side of the hernia defect into the intra-abdominal space at the same peritoneal puncture point to pick up the silk by the hook, and the suture was then pulled through the abdominal wall. During the procedure, 5 to 8 mL of isotonic saline solution was infused via the needle into the preperitoneal space (hydrodissection) to obtain the preperitoneal dissection of both sides of the hernia defect and avoid trauma to the vas deferens and spermatic vessels. The hernia defect was closed and the circuit suturing was tied extracorporeally. Cauterization was unnecessary during the procedure. The same procedure was performed on the contralateral side if there was patent processus vaginalis. No stitching was required for the needle puncture wound, whereas the closure of the peritoneum and fascia was necessary for the umbilical wound.

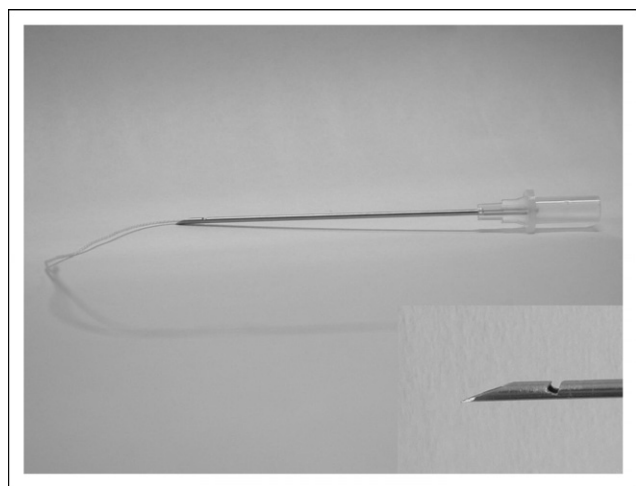


Figure 1 The hooked injection needle device was easily made by modifying a 16-gauge angiocatheter without its sheath. One end of a suture was inversely placed from the tip of the needle, and the device has a hook (lower inset) near the tip for catching hold of the suture.

Results

We began performing the surgical technique in March 2008. From March to April 2008, 12 consecutive children with unilateral inguinal hernias were treated with the modified single-port laparoscopic-assisted technique. There were 8 boys and 4 girls. Their ages ranged from 64 days to 8 years (mean, 3.7 ± 2.3 years), and their body weights ranged from 5.1 to 22 kg (mean, 14.3 ± 4.8 kg). Sixteen procedures were performed, and contralateral patent processus vaginalis was present in 4 patients. Additional umbilical hernia repair was performed in 1 patient. All the patients did well during the procedures, and no operative morbidity was experienced. The mean operating time was 25.1 ± 4.3 minutes (range, 18–31 min) for unilateral and 41.5 ± 5.8 minutes (range, 34–47 min) for bilateral lesions. All patients could be discharged the same day except for 1 infant.

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