



A human case study demonstrating the safety and effectiveness of laparoscopic surgical glue injection hernioplasty for pediatric indirect inguinal hernia[☆]



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ABSTRACT

The purpose of this pediatric case report was to provide clinical evidence supporting the safety and effectiveness of laparoscopic surgical glue injection hernioplasty (LSGIH) in humans for indirect inguinal hernia repair. We performed LSGIH on a female newborn for a right indirect inguinal hernia that was incidentally discovered during a laparoscopic right salphingo-oophorectomy for prenatal right ovarian cyst torsion. Under laparoscopic control, the internal ring was closed by injection of Histoacryl[®] into the internal opening of the patent processus vaginalis. One month later, the patient underwent another laparoscopic operation due to torsion of a newly developed contralateral ovarian cyst. During the second operation, we were able to clearly observe the previous LSGIH site. Despite partial absorption of the injected Histoacryl[®], the opening of the internal ring remained closed without any evidence of adhesions. This case supports LSGIH as a simple, safe, and useful technique for pediatric inguinal hernioplasty. However, more clinical trials should be performed to confirm the long-term reliability and safety of LSGIH in humans.

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Prior to the advent of effective anesthesia and surgery, injection of sclerosing agents into hernia sacs was used to correct inguinal hernias. However, since the effectiveness of such injections was both uncertain and unsafe, injection hernioplasty was abandoned as an accepted medical practice [1]. With the increased use of laparoscopy in pediatric surgery, laparoscopic inguinal hernioplasty has been gaining in popularity. However, there are some limitations of laparoscopic hernioplasty that detract from its popularity, namely, correct laparoscopic placement of the suture is not so easy, requiring a considerable level of skill and a significant learning curve. To overcome these limitations, laparoscopic surgical glue injection hernioplasty (LSGIH) was evaluated in two animal models, the results of which showed that the procedure is simple, effective, and safe [2,3]. However, the effectiveness and safety of LSGIH in humans has yet been demonstrated. This case report provides clinical evidence

supporting LSGIH as a safe and effective procedure for pediatric indirect inguinal hernia repair.

This study was approved by the Institutional Review Board of the Yonsei University College of Medicine (Approval number: 4-2013-0823).

1. Case report

1.1. First laparoscopic operation for right ovary torsion

A female newborn was transferred to our tertiary children's hospital for evaluation of a prenatal intraperitoneal mass detected after normal vaginal delivery with a gestational age of 40 weeks and birth weight of 3140 g. Postnatal abdominal ultrasonography revealed the possibility of torsion of a right ovarian cyst. Emergency laparoscopic exploration with a 5 mm subumbilical camera port insertion was performed at 10 days of age. The laparoscopic view indicated a normal left ovary but torsion of a right ovarian cyst with necrosis. A right salphingo-oophorectomy was successfully performed using a conventional laparoscopic technique. Incidentally, a 7 mm PPV at the right inguinal ring was noted during the procedure (Fig. 1). After explaining to the parents the possibility of right

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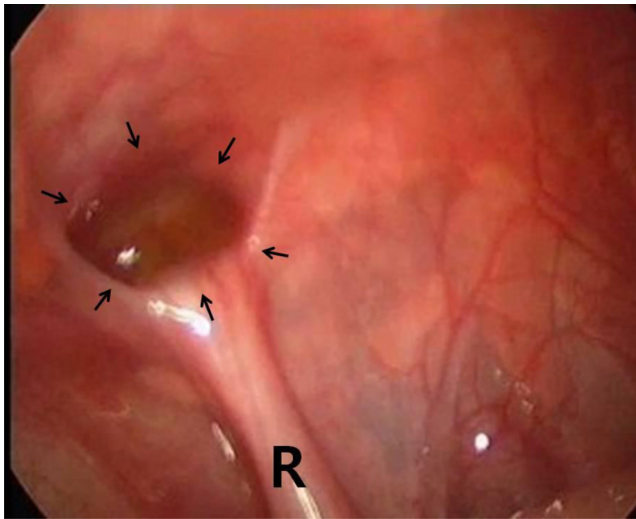


Fig. 1. Opening of the right patent processus vaginalis (arrows) was incidentally noted during laparoscopic right salpingo-oophorectomy for right ovarian cyst torsion. R: round ligament.

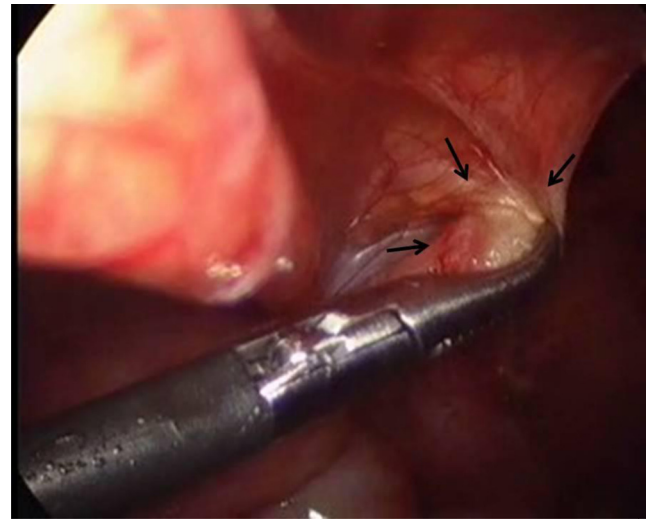


Fig. 2. The internal opening of the PPV was electrically cauterized with a 3 mm laparoscopic dissector to make a raw area of the mesothelial layer (arrows). R: round ligament.

inguinal hernia symptoms later in life, we obtained consent and performed a right LSGIH (Figs. 2, 3). The patient was discharged without any complications on postoperative day 5.

1.2. Laparoscopic surgical glue injection hernioplasty (LSGIH)

The internal opening of the PPV was electrically cauterized with a 3 mm laparoscopic dissector to generate a raw area on the mesothelial layer (Fig. 2). The opening of the PPV was then closed by covering the parietal peritoneum using a laparoscopic instrument. While maintaining the PPV in a closed position, a polyethylene tube was inserted into the peritoneal cavity, and its tip was placed into the inlet of the PPV using another 3 mm laparoscopic instrument. About 0.5–1 cc of N-butyl-2-cyanoacrylate (b-CAN, Histoacryl®; B. Braun, German) was then carefully injected through a polyethylene tube to bond the cauterized peritoneum together in order to maintain closure of the PPV after removal of the laparoscopic instrument. Sometime later (3–4 s), when the surgical glue appeared to have hardened, the laparoscopic instrument used to keep the PPV closed was carefully removed. After verifying that the PPV remained closed by the surgical glue, the operation was completed (Fig. 3).

1.3. Second laparoscopic operation for left ovary torsion

Although the patient did not exhibit any clinical evidence of right inguinal hernia when she visited an outpatient clinic, ultrasonography of the inguinal area was performed one month after the surgery to determine the effectiveness of the LSGIH procedure. There was no ultrasonographic evidence of recurrent right inguinal hernia at the LSGIH site; however, it was suspected that the left ovary had a newly developed cyst with torsion. After confirmation by CT scan, emergency laparoscopic exploration was planned.

During the second laparoscopic operation, the left fallopian tube was untwisted and the left ovary cyst was partially excised. After completing the procedures related to the left ovary, we observed the previous LSGIH site by laparoscopy. Despite partial absorption of the surgical glue, the internal opening of the PPV remained completely closed. In addition, there was no adhesion of intraperitoneal organs to the LSGIH site (Fig. 4). The patient was discharged 7 days after the second operation and was followed-up without any

evidence of recurrence of inguinal hernia 18 months after the LSGIH procedure.

2. Discussion

The laparoscopic approach for inguinal hernias in children has become an alternative option to conventional open inguinal hernioplasty [4]. Advantages of laparoscopic inguinal hernioplasty include the ability to evaluate the contralateral side; avoidance of access trauma to the spermatic cord structures, iatrogenic cryptorchidism, or testicular atrophy; shorter operative time; and less postoperative pain. However, the surgical principles behind laparoscopic hernia repair are the same as those of open repair, requiring closure of the PPV at its neck. Various techniques for laparoscopic hernia repair for children via PPV closure have been reported, and can be categorized into one of two approaches: intracorporeal [5–7] or extracorporeal ligation [5,8–14]. Both of these techniques require suturing and ligation of the internal ring

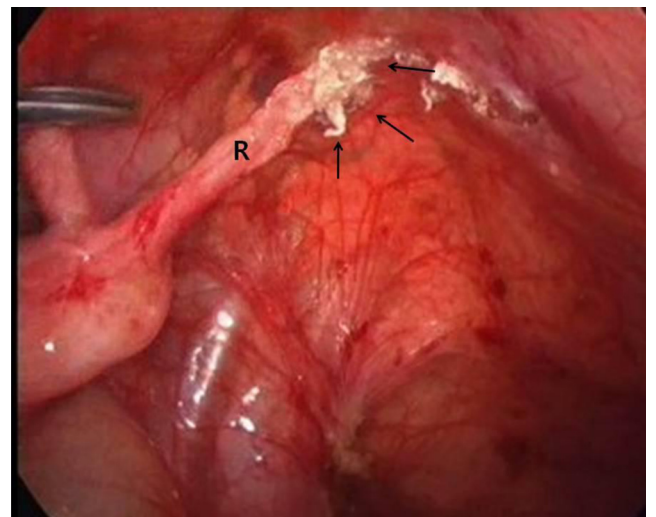


Fig. 3. Laparoscopic view during the first operation showing that the opening of the PPV remained well closed (arrows) after laparoscopic surgical glue injection hernioplasty (LSGIH). R: round ligament.

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