

Single-site Laparoscopic High Ligation of the Extraperitoneal Hernia Sac with an Epidural Needle for Incarcerated Ovarian Hernia in Infants

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Abstract

Background: The purpose of this study was to evaluate the safety and efficacy of single-site laparoscopic extraperitoneal hernia sac ligation with an epidural needle for incarcerated ovarian hernia in infants and young children.

Methods: The clinical data of 38 infants with incarcerated ovarian hernia who underwent single-site laparoscopic extradural needle extraperitoneal hernia sac ligation from January 2015 to January 2018 were retrospectively analysed.

Results: All procedures were successfully performed in laparoscopy with no need for conversions to open surgery. All patients were discharged 1-2 days after the operation. During hospitalization and follow-up, there were no complications, such as intestinal or bladder injury, abdominal wall vascular injury, ovarian atrophy, hernia recurrence and contralateral indirect hernia. However, three patients had complications, including two cases of poor healing of the umbilical incision and one case of suture granuloma.

Conclusions: Single-site laparoscopic high ligation of the extraperitoneal hernia sac with an epidural needle is a safe and feasible method for the treatment of incarcerated ovarian hernia in infants and young children. It has the advantages of minimal trauma, no scarring and good cosmetic effects.

Background

An incarcerated inguinal hernia is formed by abdominal organs that cannot be returned after entering the hernia sack and remain in the hernia sac. It is the most common complication of inguinal hernia in children. If it is not handled in time, it can lead to ischaemia and necrosis of the hernia contents, resulting in serious consequences. Although the incidence in female patients is lower than that in male patients, the incidence of hernia content incarceration is higher in female patients than in male patients because of their special anatomical structure. In addition to the intestinal tube and omentum, most of its contents are ovaries, Fallopian tubes and even the uterus. After incarceration, serious complications are often caused by bloodstream disturbance of hernia contents. Traditional incarcerated ovarian hernia surgery requires dissection of the inguinal canal, which would destroy the normal anatomical structure of the inguinal area, with the disadvantages of greater surgical injury, more obvious scar. With the continuous development and innovation of minimally invasive technology, laparoscopic surgery for incarcerated ovarian hernia has gradually been applied in clinical practice^[1-4]. Here, we retrospectively analysed the clinical data of 38 infants with ovarian incarcerated hernia who underwent single-site laparoscopic high ligation of the extraperitoneal hernia sac with an epidural needle and evaluated the safety and effectiveness of this procedure in the treatment of ovarian incarcerated hernia in infants and young children.

Methods

This study was approved by the ethics committee of Fujian Maternity and Child Health Hospital, Affiliated Hospital of Fujian Medical University, and strictly adhered to the tenets of the Declaration of Helsinki. All patients' guardians signed an informed consent form before the operation.

Patients

This study retrospectively analysed the clinical data of 38 patients with incarcerated ovarian hernia in our hospital from January 2015 to January 2018, including preoperative general data and intraoperative, postoperative and follow-up data. All patients were diagnosed by physical examination, combined with clinical manifestation and inguinal colour Doppler ultrasonography, and manual reduction failed. A total of 13 cases were left, 25 cases were right, and the age and weight were, respectively 5month (21day-11month) and 5.6(2.7–11.1)kg (Table 1). A routine clinical examination was performed before the operation, including an electrocardiogram, chest radiography and blood examination. All patients received preoperative bowel preparation with enemas. All patients underwent single-site laparoscopic high ligation of the extraperitoneal hernia sac with an epidural needle.

Table 1
Clinical data of the patients in this study

Item	
Number of patients	38
Age, median (range)	5month (21day- 11month)
Weight,median (range)	5.6(2.7–11.1)kg
No. transcrotalorchidopexies	
Left side	13 (34.2%)
Right side	25 (65.8%)
Operation time, median (range)	
Unilateral	32(26–41)min
Bilateral	45(40–56)min
Time of hospital stay, median (range)	2(2–3)days
Duration of follow-up, median (range)	1years(3month-3years)
Incision length,median (range)	1.1(0.8–1.5)cm

Patients met the inclusion criteria if they presented with incarcerated ovarian hernia. Patients were excluded from this study for the following reasons: (1) their general condition was poor, with a history of peritonitis and systemic poisoning symptoms or serious medical diseases such as cardiopulmonary

dysfunction; (2) they had a history of abdominal surgery; (3) they had a recurrent inguinal hernia; (4) their incarcerated ovaries were necrotic and needed to be replaced by ovariectomy; and (5) they refused to consent to the operation or cooperate during the follow-up schedule.

Technology

An approximately 5 mm layer-by-layer incision in the umbilical skin was made, and a 3 mm trocar was placed directly into the abdomen to establish a pneumoperitoneum (8–10 mmHg). We then explored the abdominal cavity: a small amount of clear ascites was found in the abdominal cavity, the ring of the affected inguinal canal was not closed, and the oviduct continued to the inguinal canal with slight oedema and hyperaemia (Fig. 1). A 3-mm trocar was placed around the umbilical ring, and the grasping forceps were inserted (Fig. 2). The tension of the Fallopian tube was maintained by lifting the Fallopian tube lightly. Manipulation was performed in vitro (soft skin mass at the groin) to return incarcerated ovaries. The colour of the ovaries was slightly purple, with good blood supply and no necrosis (Fig. 3). Under the guidance of a laparoscope, the skin was punctured at the unclosed side of the skin by the needle of a No. 12 syringe, and the epidural puncture needle with a double-stranded 2 – 0 non-absorbable braided suture was punctured into the anterior wall of the inguinal tube through the anchor point. We performed a sharp separation of the outer half-circle of the inner ring mouth at the extraperitoneal space and pulled the puncture needle out after the coil was pressed by the laparoscope. The epidural puncture needle was pierced into the front wall of the inguinal tube again through an anchor point with a double-stranded 2 – 0 non-absorbable braided suture. After sharply separating the inner half-circle of the inner ring mouth at the extraperitoneal space, the epidural puncture needle was pierced through the centre of the original coil. We also used the laparoscope to press the coil and exit the puncture needle before tightening the front coil. The pierced coil was removed to bring out the second one, and one of the double strands was drawn out. Then, we gradually tightened the coil with the inner ring until it closed under the laparoscope. Finally, we tied a knot under the skin. If there was occult hernia on the opposite side, it should be treated together. After closing the inner ring, we carefully checked the abdominal cavity for bleeding, released the peritoneal gas, and removed the trocar before suturing the umbilical incision (Fig. 4).

Results

Thirty-eight cases of ovarian hernia (including 13 cases on the left side and 25 cases on the right side, as well as 24 cases with unclosed contralateral inguinal ring) successfully underwent laparoscopic high ligation of extraperitoneal hernia sac with an epidural needle under single-site laparoscopy. The operative times of the unilateral and bilateral ovarian hernias were 32(26–41) minutes and 45–56 minutes, respectively. All patients were discharged 2–3 days after the operation (Table 1). During hospitalization and follow-up, there were no complications, such as intestinal or bladder injury, abdominal wall vascular injury, ovarian atrophy, hernia recurrence and contralateral indirect hernia. However, there were three patients with complications, including two cases of poor healing of the umbilical incision and one case of suture granuloma. All patients were followed up for one year. The follow-up time points were one week,

one month, three months, six months and one year after the operation. Outpatient follow-up was used to follow up the symptoms and signs of the children.

Discussion

Incarcerated ovarian hernia is a common type of incarcerated inguinal hernia and one of the emergency diseases in paediatric surgery. As recently reported^[5-6], the incidence of incarcerated ovarian hernia ranges between 6% and 15% of inguinal hernias in female infants.

For female infants with incarcerated ovarian hernias, emergency surgical treatment is needed when manual reduction fails. The traditional surgical approach is to perform high ligation of the hernia sac through the inguinal incision. For children with incarcerated hernias, local inguinal tissue congestion and oedema are obvious, and the operation is difficult. To reduce the difficulty of the operation and tissue identification, the surgical incision is often larger than that of non-incarcerated hernia, the structure of the inguinal canal is more traumatic, and the scar is more obvious after operation. Family members of female children often have higher requirements for postoperative cosmetology. Meanwhile, traditional operations cannot detect and properly address contralateral concealed hernia, while bilateral and contralateral concealed hernia are more common in infants and young children's inguinal hernia, with an incidence rate of approximately 21.2%^[7-11]. These children may have a risk of secondary surgical treatment for contralateral hernia. The advent of minimal access techniques has revolutionized the traditional management of inguinal hernia. With the development of endoscopic equipment and technology, the laparoscopic approach is gaining popularity because of the potential advantages of faster recovery, attenuated pain, improved cosmesis, and low recurrence rate^[12-14].

Laparoscopic high ligation of extraperitoneal hernia sac with an epidural needle is a simple, reliable and simple puncture technique that can be accomplished by external ligation. It has the advantages of minimal trauma, fast recovery, low recurrence rate and good cosmetic effects^[15-19]. Compared with traditional high ligation of the hernia sac, it has the following advantages. First, female infants with ovarian incarcerated hernia have obvious local tissue congestion and oedema, and traditional surgery is prone to damaging local tissues, such as ovaries and Fallopian tubes. Laparoscopic operation does not dissect the structure of the inguinal canal, avoiding the influence of local tissue congestion and oedema on the operation. Second, Shalaby et al.^[20] reported that incarcerated hernia is easier to reposition under laparoscope because the hernia contents are pulled by grasping forceps without damage to the abdominal cavity, and then the hernia contents are repositioned by an external technique. In addition, the pneumoperitoneum pressure enables carbon dioxide to be blown into the inner ring mouth, thereby expanding the inner ring mouth. Among the 38 children in this group, incarcerated hernia was not reduced before surgery. The application of laparoscopy with an operation channel for non-invasive grasping forceps can enlarge the internal ring mouth and assist in pulling the hernia contents. Incarcerated hernia is relatively easy to reduce. Third, contralateral concealed hernia can be found under laparoscopy and treated simultaneously^[3,21]. In this group, contralateral concealed hernia was found in 24 children during

the operation, and these children underwent high ligation of the hernia sac to prevent the risk of reoperation caused by the contralateral hernia. Fourth, the ovary is an important endocrine organ in women and is also the source of female reproductive cells, which play a very important role in women's lives. Therefore, when incarcerated inguinal hernia occurs in female children and the hernia contents are suspected to be the ovaries, it is extremely important to judge the nature and vitality of the hernia contents in a timely manner to guide subsequent treatment. Laparoscopy can accurately observe the reduction process of the incarcerated hernia contents^[22]. It is clear that there is no damage to the ovary after reduction. If ovarian ischaemia and necrosis are found, urgent treatment should be provided to prevent the serious consequences of blind manual reduction for children^[1]. In this group, seven cases were incarcerated for a long period of time, and the suspected disorder of incarcerated ovarian blood supply was found during the operation. After laparoscopic-assisted reduction, the observation time was prolonged, and the blood supply of ovaries recovered, thus preventing ovariectomy. Fifth, under the microscope, the hernia sac is ligated at a higher position through external operation of the epidural puncture needle, and no space is left for the suture of the inner ring orifice, which is helpful to prevent recurrence after operation^[23]. Sixth, the incision is concealed, there is no obvious scarring after the operation, and the cosmetic effect is good, which can reduce feelings of inferiority that may occur in the psychological development of female children and is more readily acceptable by their families.

Although this retrospective study had a certain size, there are still several limitations. First, this was a retrospective study with a limited number of patients from a single centre, and more research from multiple centres is needed to assess the effectiveness and complications of this technique. Second, the median follow-up duration was relatively short, and a longer follow-up period is warranted.

Conclusion

In conclusion, single-site laparoscopic high ligation of epidural needle extraperitoneal hernia sac for ovarian incarcerated hernia in infants is a safe and feasible alternative to conventional surgery. The cosmetic results were impressive, leading to less physical and psychological trauma, and the follow-up results were promising.

Declarations

Ethics approval and consent to participate

This study was approved by the ethics committee of our university and strictly adhered to the tenets of the Declaration of Helsinki. In addition, all patients' guardians signed an informed consent form before the operation.

Consent for publication

Written informed consent was obtained from the patients' guardians for publication of clinical data.

Availability of data and materials

The datasets generated during and analysed during the current study are not publicly available due to patient privacy but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

None.

Authors' contributions

Yun-jin Wang, Liu Chen and Chao-ming Zhou designed the study, collected the clinical data, performed the statistical analysis, participated in the operation, and drafted the manuscript. Qi-liang Zhang, Jian-qin Zhang, Xu Cui participated in the operation and revised the article. All authors read and approved the final manuscript.

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Figures

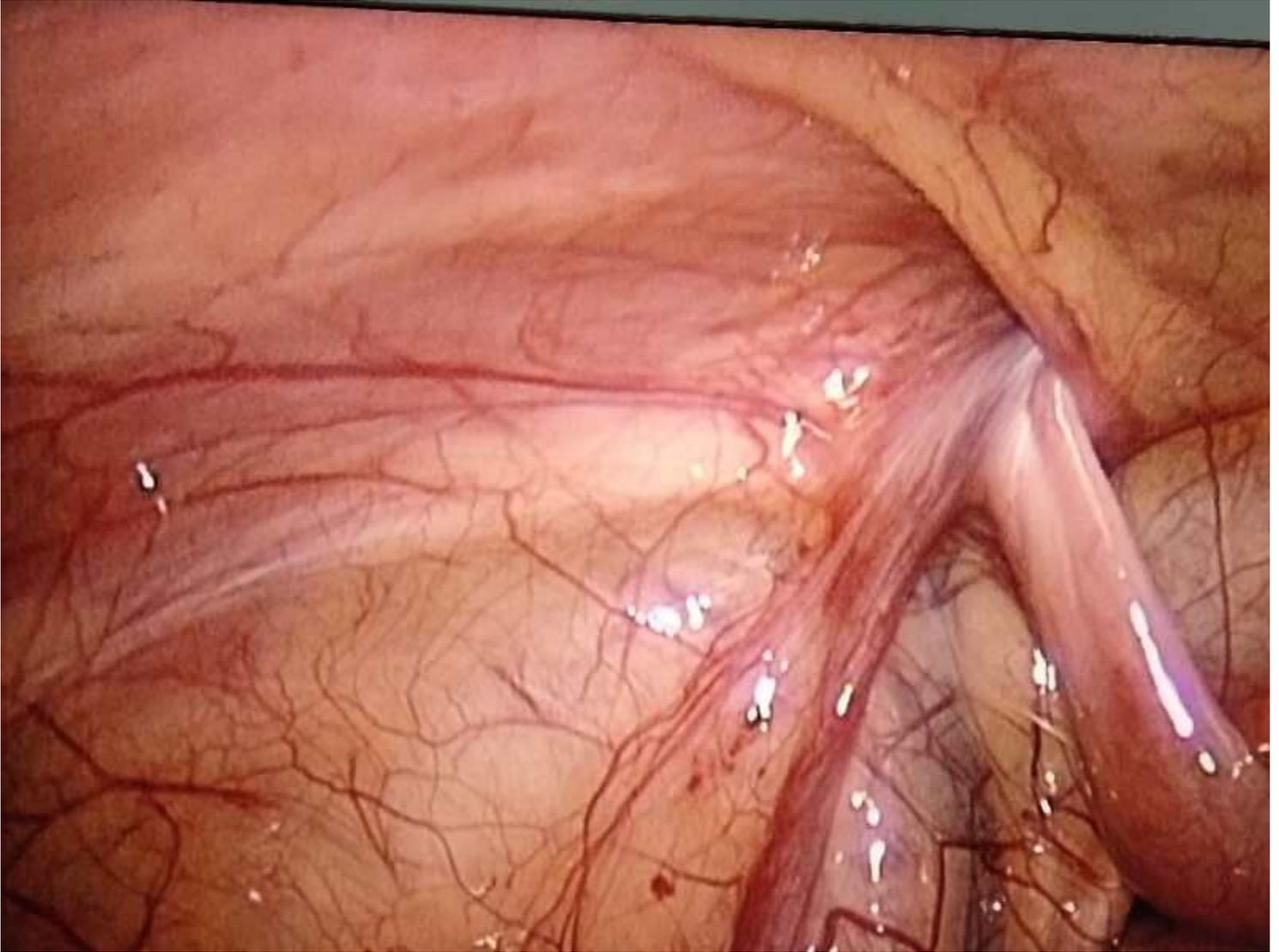


Figure 1

the abdominal cavity: a small amount of clear ascites was found in the abdominal cavity, the ring of the affected inguinal canal was not closed, and the oviduct continued to the inguinal canal with slight oedema and hyperaemia



Figure 2

A 3-mm trocar was placed around the umbilical ring, and the grasping forceps were inserted



Figure 3

The colour of the ovaries was slightly purple, with good blood supply and no necrosis



Figure 4

After closing the inner ring, we carefully checked the abdominal cavity for bleeding, released the peritoneal gas, and removed the trocar before suturing the umbilical incision