Operative Techniques

Transumbilical endoscopic surgery for incarcerated inguinal hernias in infants and children

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ABSTRACT

Purpose: To describe transumbilical laparoscopic herniorrhaphy after unsuccessful attempted manual reduction of incarcerated inguinal hernias in infants and children.

Methods: In our two hospitals, two-trocar transumbilical endoscopic surgery (TUES) is the standard technique used to repair incarcerated inguinal hernias in infants and children. Seventeen patients (aged 8 months to 2.5 years; median, 15 months; 15 boys, 2 girls) with incarcerated inguinal hernias underwent urgent laparoscopy after unsuccessful attempted manual reduction. Two 3- or 5-mm trocars were inserted into the abdomen through two intraumbilical incisions, under laparoscopic guidance. The hernia was reduced by combined external manual pressure and internal pulling with bowel forceps. After inspection of the bowel, a round needle with a 2-0 nonabsorbable suture was introduced into the peritoneal cavity through the anterior abdominal wall near the internal inguinal ring. The hernial orifice was closed with an extraperitoneal purse-string suture around the internal inguinal ring, and tied with an intraperitoneal knot. A similar procedure was performed on the contralateral side if the processus vaginalis was patent.

Results: The TUES procedure was successful in all patients. No conversions to open surgery were required. The mean operating time was 30 min (range, 25–40 min). All patients were discharged on the second postoperative day. No complications such as postoperative bleeding, hydrocele, or scrotal edema were observed. The mean follow-up period was 15 months. No cases of testicular atrophy, hypotrophy, or hernia recurrence were reported.

Conclusions: Our preliminary experience with using TUES for the treatment of incarcerated inguinal hernias in infants and children had satisfactory outcomes. This technique appeared to be safe, effective, and reliable, and had excellent cosmetic results.

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1. Patients and methods

Between December 2009 and December 2012, 58 cases of incarcerated inguinal hernias were attempted manual reduction unsuccessfully. 41 cases were voluntary to accept open surgery. 17 cases (age range, 8 months to 2.5 years; median age, 15 months; 15 boys, 2 girls; 4 left-sided, 11 right-sided, 2 bilateral) were voluntary to accept TUES. These cases presented to our two hospitals. Six patients treated with gastrointestinal decompression and fluid infusions before surgery had dilated bowel loops or signs of small bowel obstruction with bilious vomiting, dehydration, etc. The surgery was performed within six hours after admission.

Under general anesthesia, patients were placed supine in the Trendelenburg position with a 15° tilt and the knees flexed. The laparoscopic monitor was placed at the patient’s feet. The surgeon stood on the left side of the patient, and the camera operator stood on the right side. Two 3- or 5-mm curved intraumbilical skin incisions were made. A Veress needle was inserted into the abdomen, and a pneumoperitoneum was established at 6–10 mmHg. Two 3- or 5-mm trocars were inserted through the umbilicus, together with a 4.5-mm
0° laparoscope and 3-mm bowel forceps. The abdominal insufflation seemed to widen the internal inguinal ring. In most cases, the incarcerated organs were easily reduced under direct vision by combined external manual pressure and internal pulling with bowel forceps (Fig. 1). In two cases, the anterolateral part of the internal inguinal ring was cut with scissors to assist reduction (Fig. 2). After reduction, the bowel was inspected for ecchymosis and peristalsis. A round needle with a 2-0 nonabsorbable suture was then introduced into the peritoneal cavity through the anterior abdominal wall near the internal inguinal ring under laparoscopic vision. A 5–8 cm length of the end of the suture was kept within the peritoneal cavity for suturing and knot-tying, and the needle was passed through the peritoneum to place an extraperitoneal purse-string suture around the internal inguinal ring, taking care to avoid injury to the spermatic cord. The needle was then passed back into the peritoneal cavity and out through the abdominal wall, and was cut from the suture outside the abdomen. The hernial sac was compressed to expel any gas and liquid. The purse-string suture was tied intraperitoneally using a one-hand tie technique with a triple knot (Fig. 3). To achieve this, the operating assistant kept tension on the end of the suture outside the abdominal cavity, and 3- or 5-mm needle-holding forceps were used to manipulate the end of the suture inside the peritoneal cavity (Fig. 4). Airtightness was confirmed by the absence of hernial sac enlargement when the intraperitoneal pressure was increased. The same procedure was performed on the contralateral side if the processes vaginalis was patent. In all cases, the incarcerated small bowel or ovary was congested and red immediately after reduction, and bowel resection was considered unnecessary. No suturing was required for the needle or trocar puncture wounds. The umbilical wounds were covered with sterile absorbent gauze.

2. Results

Reduction of the hernia by combined external manual pressure and laparoscopic assistance was achieved in all cases. In 15 cases, the incarcerated organs were pulled out of the hernial sac using laparoscopic instruments. In the other two cases, the internal inguinal ring was cut. The incarcerated organs (bowel or ovary) were inspected after reduction, and no necrosis was observed. Nineteen herniorrhaphies were performed in 17 patients using the two-trocar TUES technique. The postoperative course was uneventful in all patients, and no severe perioperative complications were observed. The mean operating time was 30 min (range, 25–40 min). According to the guidelines of the clinical pathway manager system, all patients were discharged on the second postoperative day. The mean follow-up period was 15 months (range, 6–30 months). Color Doppler ultrasonography before surgery and 6 months after surgery.
in 15 cases showed normal blood flow and normal testicular size compared to the opposite side. There were no cases of recurrence, postoperative hydrocele, or testicular atrophy or ascent at the time of this writing.

3. Discussion

Laparoscopic inguinal hernia repair is now used as an alternative to conventional open herniotomy in children. Although there is ongoing debate regarding the preferred method of inguinal hernia repair, the laparoscopic approach is gaining popularity because of the potential advantages of faster recovery, attenuated pain, improved cosmesis, and low recurrence rate [7–9]. Laparoscopic repair of incarcerated inguinal hernias in infants has been previously reported. Laparoscopic repair involves abdominal insufflation, which widens the internal inguinal ring and facilitates reduction. The procedure allows good visualization of the operative field, and all organs can be inspected for injury immediately after reduction.

In recent years, there has been increasing interest in the new field of scarless endoscopic abdominal surgery such as TUES. Endoscopic surgery via natural orifices leaves no visible scar, and represents a significant advance in treatment options. In TUES, all the instruments and the camera are inserted through one umbilical incision, which is minimally invasive and offers better cosmesis than previous surgical techniques.

Our surgical technique involved insertion of two trocars through the umbilicus, with a bridge of fascia between them, which were used for a camera and a working instrument. Abdominal insufflation widened the internal inguinal ring, which helped to reduce the hernia. In most cases, the incarcerated organs were easily returned to the abdominal cavity by pulling with bowel forceps combined with external pressure. If this was unsuccessful, the anterolateral part of the internal inguinal ring was cut with scissors.

After reduction of an incarcerated hernia, the incarcerated organs should be inspected for adequate circulation, ecchymosis, and peristalsis. If necessary, a suction-irrigation instrument can be used to spray the incarcerated organs with warm saline to improve the blood supply and alleviate edema.

With experience, our operating time is now slightly shorter for this procedure than for open surgery. The procedure is easier to perform in females than in males, because the spermatic cord must be protected in males. We did not use any special instruments during our procedures. The technique is simple and can be performed quickly. We have experienced no complications to date.

When using the standard three-port technique with intracorporeal knot-tying or the two-port technique with an assistant port for intrabdominal 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 recurrence may occur if the knots gradually loosen [10]. In this series, the purse-string suture included the peritoneum and the underlying fascia lateral to the spermatic cord. Before the knot was tied, the hernial sac was compressed to expel any gas. The peritoneum was completely closed, and airtightness was confirmed by the absence of hernial sac enlargement when the intraperitoneal pressure was increased. Laparoscopic percutaneous extraperitoneal closure of the hernial orifice has also recently been developed. However, percutaneous closure may result in nerve and muscle injury if these structures are caught in the suture ring [11].

Our technique provides the benefits of laparoscopic surgery, avoids trauma to the spermatic cord and ligation of abdominal wall tissues (nerves and blood vessels), and eliminates the need for a second instrument port. In addition, our technique has excellent cosmetic results because only two 3- or 5-mm umbilical incisions are required to treat unilateral or bilateral hernias. The wound scar of the laparoscopic port is hidden in the umbilicus, and the other wounds are minimal (Fig. 5). Scarless abdominal surgery by TUES will undoubtedly increase in popularity [12].

Our preliminary experience with using TUES for the treatment of incarcerated inguinal hernias in infants and young children indicates that it has short postoperative hospital stay, low complication, low recurrence rate, and has excellent cosmetic results. Compared with other current laparoscopic extraperitoneal closure techniques, the method we have developed is easy to perform and the instruments are readily available. Our results suggest that TUES for the treatment of inguinal hernias in infants and young children is safe, effective, and reliable. Further studies with larger patient numbers and longer follow-up periods should be conducted to further investigate this technique.

References


