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Giant inguinal hernia in a preterm child - Technical challenges and long-term outcome

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ABSTRACT

Giant inguinal hernias are rare in children, and they represent a unique challenge for pediatric surgeons. The sparse literature includes variable definitions of the disease and different surgical techniques without significant difficulties with the decrease of abdominal domain. We present a prematurely born boy with a unilateral giant inguinal hernia which developed promptly after birth. This case highlights the multiple possible challenges related to giant inguinal hernias in children. We also discuss the possible treatment options and the advantages and disadvantages based on the current literature.

1. Introduction

Giant inguinal hernias are extremely rare in children. These cases represent a unique surgical challenge due to the size of the hernia sac and possible loss of abdominal domain. Uniform definition of a giant inguinal hernia in pediatric patients is missing making reliable comparison of surgical techniques difficult. In the few published pediatric cases various surgical procedures have been used without significant difficulties in closing the abdominal cavity primarily [1–4].

We report a case of a preterm boy with a giant inguinal hernia and significant loss of abdominal domain necessitating staged closure of the abdominal cavity.

2. Case report

A male infant was born at 23 weeks weighing 680 g. The newborn was intubated due to the severe respiratory problems. At the age of 12 days a right-sided inguinal hernia was observed. After starting noninvasive respiratory support (Noninvasive Neutrally Adjusted Ventilatory Assist, NIV-NAVA) at the age of four weeks the size of the hernia rapidly increased. Reduction became impossible due to the giant size of the hernia and loss of abdominal domain. Fortunately, no signs of incarceration developed. Due to prematurity and continuous noninvasive respiratory support the surgery was delayed until the child reached full gestational age. The hernia kept gradually growing during the first two months reaching the size of the infant's head (Fig. 1). Full enteral feeding was achieved at six weeks age. The patient had no other underlying diseases.

The first procedure was performed at the age of four months (weight 4000 g). Due to the giant size of the hernia an abdominal approach was chosen. A transverse incision was made in the right lower abdomen. The entire small bowel and the right-sided large

Abbreviations: VAC, vacuum-assisted closure.

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bowel was returned to the abdominal cavity from the hernia sac. The right testicle was intra-abdominal. After reduction, the normal-sized right testicle was fixed in the scrotum. The

Hernia was then repaired internally with 2–0 interrupted absorbable sutures (polyglactin 910) closing the inguinal canal. The closure of the abdominal cavity was attempted with significant tension. Due to the undeveloped abdominal cavity this caused a significant increase in airway pressure and lower limb stasis. A spring-loaded prefabricated silo (size 5cm) was placed over the eviscerated intestine. The incision was partly closed with 2–0 interrupted absorbable sutures (polyglactin 910) for the silo to fit tightly (Fig. 2). The plan was to gradually reduce the intestine to the abdominal cavity during the following week.

The attempt to gradually reduce the intestine was unsuccessful because the silo dislocated several times during the first post-operative days. Seven days after the first procedure the eviscerated intestine was repositioned in the abdominal cavity in operation room. This time the airway pressure and the lower limb status stayed acceptable and allowed closure of the abdominal cavity with a biological soft tissue mesh (STRATTICE™ Reconstructive Tissue Matrix, a porcine-derived acellular dermal matrix, size 8 × 20cm). The mesh was fixed to the fascia with 2–0 running nonabsorbable sutures (polyester) and the skin was closed over the mesh with 3–0 interrupted nonabsorbable sutures (polyester).

Six days later skin dehiscence developed, and vacuum-assisted closure (VAC) was started with 50 mmHg negative pressure. Wound infection necessitating antibiotic treatment developed and VAC treatment was required for 8 weeks. Eight weeks after the second procedure the child developed adhesive bowel obstruction requiring surgery. Adhesions between the mesh and the small bowel were brought down and the skin was closed without tension. Postoperatively an abscess requiring drainage with Penrose drain developed in the right scrotum.

Due to the nutritional difficulties a percutaneous endoscopic gastrostomy was inserted at the age of ten months. Later, at the age of one year and one month, a laparotomy was performed due to an incarcerated ventral hernia that had developed laterally between the mesh and fascia. The entire mesh was removed, and the abdomen was closed with 0 interrupted absorbable sutures (polyglactin 910).

At the age of two years the right normal-sized testis was undescended and palpable in the inguinal skinfold. The scrotal skin was abundant, and the penis partly buried. No recurrence of the inguinal or ventral hernia was observed (Fig. 3). Nutritional support via gastrostomy was still required. At the age of two years and eight months a right-sided orchiopexy was successfully performed.

3. Discussion

This case highlights the multiple possible challenges related to giant inguinal hernias in children. The size of the hernia anticipated difficulties in the closure of the abdominal cavity and the silo was chosen as the primary method for staged closure. Against our expectations the silo failed. In the second procedure the abdomen was closed with a biological mesh and the skin closure was very tight. As anticipated skin dehiscence developed, which was successfully treated with VAC. The patient required two additional laparotomies due to problems related to the mesh. Finally, after numerous procedures the patient is asymptomatic and growing progressively without recurrence of the inguinal hernia.

Loss of abdominal domain is rarely encountered in children with giant inguinal hernias [1–4]. Preoperative progressive pneumoperitoneum has been successfully used in adults to increase abdominal domain, however, it seems to be applied in only one child with omphalocele in combination with botulinum toxin injections [1,5]. Tissue expanders have also been used in various diseases, but experience in children is sparse and in none of the pediatric cases the underlying disease has been a giant inguinal hernia [6]. Concerns



Fig. 1. Preoperative appearance of the giant inguinal hernia at the age of three months.



Fig. 2. A spring-loaded prefabricated silo was placed over the eviscerated intestine in the first procedure.

in these approaches include potential expansion of the hernia sac and prolonged preoperative hospitalization due to pain and multiple other complications [7,8]. Component separation has been successfully used in children, mainly in infants with giant omphalocele, to enlarge the abdominal wall surface [9,10], and might also be beneficial in patients with giant inguinal hernias. Although, the staged closure with the silo in gastroschisis patients has been proven effective in most patients [11], in our experience this method is poorly adapted to giant inguinal hernias. The failure was probably related to the size and shape of the wound and might have been prevented by suturing the silo around the wound. The use of a mesh across the laparotomy incision with or without skin flaps increases the abdominal capacity but the optimal technique and material for the repair is still under debate. In adults, biological meshes have not been proven to be superior to synthetic meshes in the repair of complex ventral hernias, although experimental studies have demonstrated reduced adhesion formation with biological meshes [12–14]. To date, to our knowledge there is no evidence to guide selection of an optimal type mesh in children to minimize postoperative infections and adhesions, and to prevent ventral hernias. Unfortunately, in our case the employment of a biological mesh resulted in all aforementioned complications. These complications would have been avoided only by primarily choosing a different method for abdominal closure. Alternative methods (preoperative progressive pneumoperitoneum with or without botulinum toxin, tissue expanders and component separation) may have prevented the use of a mesh, but probably would have not prevented complications or decreased the length of hospital stay.

The risk of incarceration has been a concern when delaying inguinal hernia surgery in premature infants, yet it seems to be no more probable. However, postponing the operation may decrease recurrence rate and respiratory difficulties [15,16]. In previously reported similar cases an early approach was chosen, but both neonates were born much closer to being full term [2,4]. In our case the prematurity of the unstable child did not permit early surgical interventions and the delay did not result in incarceration of the herniated bowel. No recurrence developed, which might be related to our delayed and staged approach and to the surprisingly narrow internal inguinal ring despite the giant size of the hernia sac.

Previously reported uncomplicated giant inguinal hernias have been successfully repaired through an inguinal incision [1,3,4]. However, to our knowledge in none of these cases the hernia has been comparable in size to our case. If an inguinal approach had been chosen, the reduction of hernia would have been very difficult and eventually impossible due to loss of the abdominal domain. The



Fig. 3. Appearance of the abdominal and inguinal region at the age of two years.

advantages of a transverse abdominal incision include easier and safer reduction of the bowel under visual control and straightforward closure of the internal inguinal ring. A lower midline incision might be beneficial when considering combining component separation to a transabdominal inguinal hernia repair.

4. Conclusion

Giant inguinal hernias in children are rare and challenging. Each patient should be treated individually depending on the size of the child and the hernia. The repair should be thoroughly planned to avoid complications and prolonged hospital stay. The silo is an attractive method, but in our experience seems to work poorly without securing sutures. Other feasible methods should be preoperatively considered when loss of abdominal domain is expected.

Patient consent

Formal written consent was obtained from the child's parents to publish this case report, including consent for publication of all photographs.

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Authorship

All authors attest that they meet the current ICMJE criteria for authorship.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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