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Intestinal venous congestion as a complication of elective silo placement for gastroschisis

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Use of a spring-loaded silastic silo has been advocated as a means of gentle reduction of the herniated bowel, while avoiding the possible complications of primary closure of gastroschisis. We recently encountered intestinal venous congestion during elective silo reduction of gastroschisis. Two babies with gastroschisis were treated postdelivery with a spring-loaded silo placed under the fascial defect and the eviscerated bowel suspended within the silo. Patient #1 had no bowel matting. On day of life 2, the bowel within the silo was noted to be dusky. The silo was removed, and the bowel was indeed congested, but viable. Complete reduction with a modified Bianchi closure was performed at the bedside. Patient #2 had severe matting of the bowel and did not require intubation for silo placement. As daily reductions progressed, the bowel was noted to be congested on day 2. On day 3, removal of the silo revealed frank bowel necrosis with impending perforation. Two-thirds of the small bowel required resection, leaving the child with short bowel. Venous congestion within a silo should be given prompt attention, including removal of the silo, as bowel infarction may result.

The optimal technique and timing for closure of gastroschisis remain a topic of great debate among pediatric surgeons. Primary, emergent closure is claimed by some to result in acceptable outcomes,[1,2] whereas the use of a spring-loaded silastic silo in conjunction with delayed closure is hailed by others as superior.[3-7] The silo technique is touted as a means of gentle reduction of the herniated bowel, while avoiding the possible complications of primary closure. Progressive reduction of the bowel back into the abdominal cavity is designed to prevent the catastrophic complications possible with early primary closure, namely, bowel ischemia and infarction. We present two babies who suffered intestinal venous congestion after elective silo placement for the closure of gastroschisis.

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Case reports

Patient 1 was born by vaginal delivery at 38 weeks estimated gestational age to a 20-year-old G1P0 healthy mother. He was prenatally diagnosed with gastroschisis. At birth, he weighed 2.2 kg and exhibited typical gastroschisis with a small abdominal wall defect to the right of the umbilicus. The small bowel, bladder, a very distended sigmoid colon, and the right testicle were exteriorized in the gastroschisis (Figure 1A). After transfer to our center, a 4-cm silastic spring-loaded silo was installed under the abdominal wall fascia with the patient in the neonatal intensive care unit. No anesthesia was required except oral

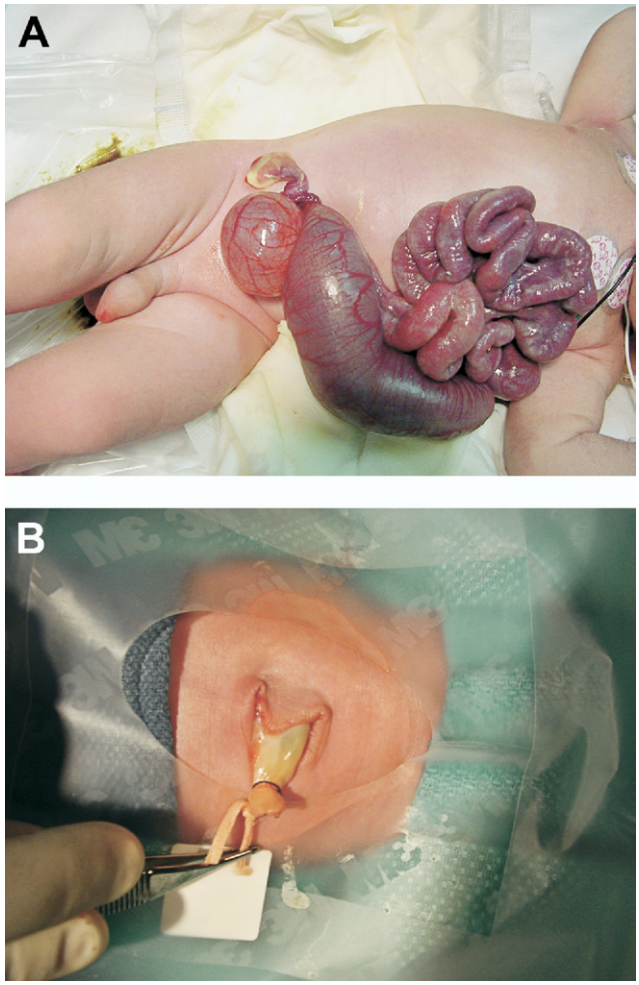

Figure 1 (A) Small bowel, a distended sigmoid colon, distended bladder, and the right testicle can be seen exteriorized through a typical but narrow gastroschisis defect. (B) After reduction of the abdominal organs in the neonatal unit on day 2 of life, the defect was easily closed with an umbilical cord flap that was secured to the skin with steristrips. (Color version of figure is available online.)

sucrose solution. A rectal examination was done to stimulate passage of meconium, but extensive manipulations were avoided at this point. Rectal irrigations were later done without much return. The next morning, the bowel within the silo appeared dusky, and the base of the silo was noted to be small and plicated. Despite relaxation and elective intubation, the congestion of the bowel did not improve. At this point, we considered enlarging the defect but decided to attempt primary closure because of the absence of matting. After sterile preparation and draping, the silo was removed, and rectal irrigations combined with manual compression of the sigmoid were performed. This allowed easy and complete reduction of the bowel into the abdominal cavity. The umbilical stump was folded over the defect and secured in place with steristrips (Figure 1B).[6]

Following this reduction, the baby did quite well. He began oral intake 9 days after reduction with gradual progression to full feeding in 5 days. He was discharged home after 21 days in the hospital.

Patient 2 was born at 36 weeks estimated gestational age to a 21-year-old G3P2 healthy mother. A recent immigrant to the country, she did not receive proper prenatal care before her immigration at 34 weeks of pregnancy. At that time, an ultrasound revealed the presence of gastroschisis. The patient weighed 3.2 kg at birth and, after transfer to our center, was treated with a preformed silo as per our custom. Through a typical gastroschisis defect, the entire small bowel and the proximal colon were eviscerated. The left fallopian tube was also outside of the abdominal cavity. The bowel was severely matted, and it was also covered in the mother's stool (Figure 2A). After saline washing, the colon and some of the small bowel were reduced during sterile placement of a 4-cm spring-loaded silastic silo. General anesthesia was not necessary. Twice daily reductions were then performed. On day of life 2, the small bowel appeared dusky and congested. The cinching mechanism on the silo was released, and the patient was intubated and paralyzed without any change. The next day, the bowel still appeared dusky and cloudy fluid was noted within the silo (Figure 2B). Under sterile conditions in the neonatal intensive care unit, the silo was removed. On removal of the bag, most of the exteriorized small bowel was found to be necrotic with a clear demarcation just above the fascia (Figure 2C). Our impression was that the bowel loops at the bottom of the silo had not been reducing when pressure was applied at the top of the silo, resulting in an accordion effect on the exteriorized loops causing venous congestion, further edema, and further compression of the mesenteric vessels. The patient was taken to the operating room where she underwent resection of 53 cm of frankly necrotic small bowel. Primary anastomosis was performed. A total of 27 cm of small bowel (12 cm proximal and 15 cm distal) remained along with the ileocecal valve and entire colon. To avoid the increased abdominal pressure related to fascial closure, the abdominal wall defect was closed by flapping the umbilical stump over the opening and securing it with steristrips, as for patient 1. The patient was extubated 3 days later and started on enteral feeding 2 weeks postoperatively. She was maintained on total parenteral nutrition for 2 months while advancing oral feeding. She was discharged from the hospital supported with enteral feedings only and has done remarkably well, with a weight at the 75th percentile and height at the 50th percentile without any special diet at 18 months of age.

Discussion

Multiple reports exist comparing different techniques of gastroschisis closure. The spectrum ranges from immediate operative closure to elective delayed midgut reduction without anesthesia[8] to delayed repair with a preformed silo.[9]