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Use of composite polyester/collagen mesh in the repair of recurrent congenital diaphragmatic hernias

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ABSTRACT

Case 1 is an 18 year-old woman with a third recurrence of a left congenital diaphragmatic hernia (CDH). She had previously undergone a primary repair of a recurrence via laparotomy and an additional repair of a second recurrence with PTFE mesh via a thoracotomy. Following her third recurrence she underwent successful laparoscopic repair utilizing composite polyester/collagen (Parietex™ Composite, Covidien, Sofradim, France) mesh. Six years following surgery, she has carried a pregnancy to term and has not recurred. Case 2 is a 5 month-old infant who presented with a recurrent right-sided CDH. She initially underwent primary repair via thoracotomy along with a right pneumonectomy at an outside institution. She presented with incarceration of her liver, hepatic venous thrombosis, mediastinal shift, and respiratory distress. She underwent successful repair with composite mesh through a right thoracoabdominal incision. At 8 months post-operatively, she has no evidence of recurrence in spite of the expected mediastinal deviation to the right and right thoracic volume loss as a result of being status post right pneumonectomy. Recurrences occur in a significant number of patients following repair of congenital diaphragmatic hernia, particularly cases in which a mesh implant are utilized. Historically, PTFE has been the product of choice for a diaphragmatic implant by pediatric surgeons. However, this product does not incorporate into surrounding tissues which theoretically places patients at risk for recurrence. Polyester/collagen composite mesh has been used for decades in adults undergoing complex groin and ventral hernia repairs with excellent results. However, its use for congenital diaphragmatic hernias has not been previously described. We present the successful utilization of this product in two cases which were at extremely high risk for future recurrence. Additional investigations should be done and long term follow up regarding application of this product for this challenging clinical condition.

Congenital diaphragmatic hernia (CDH) affects approximately 1 in 2500 live births [1]. As advances in prenatal assessment and perinatal management have improved outcomes for neonates with CDH, emphasis has shifted to long-term follow-up of infants following surgical repair [2]. With increased survival, however, so has the prevalence of recurrence [1–3]. Published data on CDH recurrence is limited to isolated reports and small case series, with recurrence rates ranging from 4 to 50% [4–6]. Although several materials, absorbable or non-absorbable, and biologic or synthetic, have been used to repair CDH, the ideal material has yet to be established [7–10]. Historically, expanded polytetrafluoroethylene (PTFE, trademark Gore-Tex® [W. L. Gore and Associates, Flagstaff, AZ]) has been the product of choice for a non-absorbable diaphragmatic implant by pediatric surgeons. However, this product does not incorporate into surrounding tissues compared to other materials, theoretically increasing a patients' risk for recurrence [11]. Polyester/collagen composite meshes have been used for decades in adults undergoing complex groin, incisional, and ventral hernia repairs with excellent results [10]. Here we present two cases of CDH recurrence successfully treated with Parietex™ Composite mesh (Covidien, Sofradim, France).

1. Methods

A retrospective chart review was performed on two patients for data collection.

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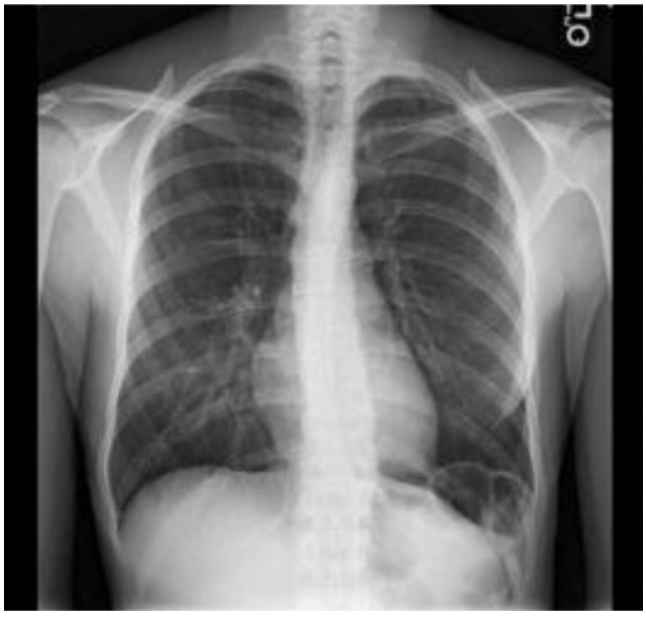

Fig. 1. Pre-operative chest radiograph depicting left sided diaphragmatic defect with colon herniating into the left hemithorax.

2. Results

Case 1 is an 18 year-old woman with a third recurrence of a left CDH. She was originally treated with open primary repair in infancy. She also underwent an open Nissen fundoplication for severe gastro-esophageal reflux disease in infancy. The patient did well until age 10, at which time she presented with a small bowel obstruction. On exploratory laparotomy, she was found to have a CDH recurrence. This was repaired primarily. She continued to do well for several years until she developed gradually worsening abdominal pain and poorly managed reflux symptoms. On CT at the time, she was found to have a second recurrence of CDH with colon herniated into the left chest (Figs. 1 and 2). On barium swallow, she also had a small paraesophageal hernia. She subsequently underwent a thoracotomy for repair of this second recurrence with PTFE mesh. Fourteen months later, she presented to our group with a 6-month history of gradually worsening left-sided and epigastric abdominal pain. Vital signs and lab evaluation were normal. Admission radiographs again demonstrated colon herniating into the left chest. CT scan of the chest, abdomen, and pelvis showed a defect of the left lateral diaphragm measuring approximately 5 cm with herniated transverse colon. There was no clinical or radiologic evidence of compromised viscera.

Two days after admission, the patient was taken to the operating room for a laparoscopic repair. After extensive adhesiolysis, just lateral to the spleen, there was noted to be two defects in the left hemi-diaphragm, measuring approximately 4 cm and 2 cm in largest dimensions. The larger defect was noted to contain a loop of transverse colon, and the smaller defect contained omentum. These intra-abdominal contents were reduced and the hernia sac resected. A type III hiatal hernia was also identified along with an intact but loose fundoplication. A Surgisis hiatal hernia bioprosthetic patch (SIS®, Cook Biotech Inc., Cook Deutschland GmbH, Monchengladbach) was placed around the posterior and lateral aspects of the esophageal hiatus and prior fundoplication plicated over a bougie. With the collagen surface toward the bowel, Pareitex™ Composite mesh cut to approximately 8 cm × 12 cm was then laid across the entire left hemi-diagphragm from the hiatus to Gerota's fascia posterolaterally, and anteriorly to the anterior abdominal wall. This was secured using both absorbable and non-absorbable tacks. The patient's post-operative radiograph showed intact diaphragmatic contour with reduced intra-abdominal contents. She was discharged from the hospital on post-operative day 5 without complication. Six years following surgery she has had no further recurrence and has successfully carried a pregnancy to term (Figs. 3 and 4).

Case 2 is a 5 month-old female infant who initially underwent thoracotomy for primary repair of a right-sided CDH along with a right pneumonectomy in the newborn period. She has a history of pulmonary hypertension with chronic respiratory insufficiency, requiring supplemental oxygen at home. She presented with a several week history of increasingly labored breathing. On initial evaluation, she was notably tachypneic with labored breathing and increased baseline oxygen requirement. She responded well to medical management during her initial hospital stay, and returned to her clinical baseline one week after admission. Radiologic work-up during her hospital course, however, demonstrated a CDH recurrence. Echocardiogram revealed compression of the left and right atrium by what appeared to be the liver. Radiographs showed complete opacification of the right pneumothorax with leftward shift of the mediastinum. On CT scan, the majority of the right lobe of the liver was herniated into the right chest, extending to the apex of the right hemi-thorax with mass effect on the superior vena cava. There was also herniation of a portion of the right kidney and small bowel into the right chest (Figs. 5 and 6). For concern of mass-effect on her overall cardiorespiratory status, the patient was taken for

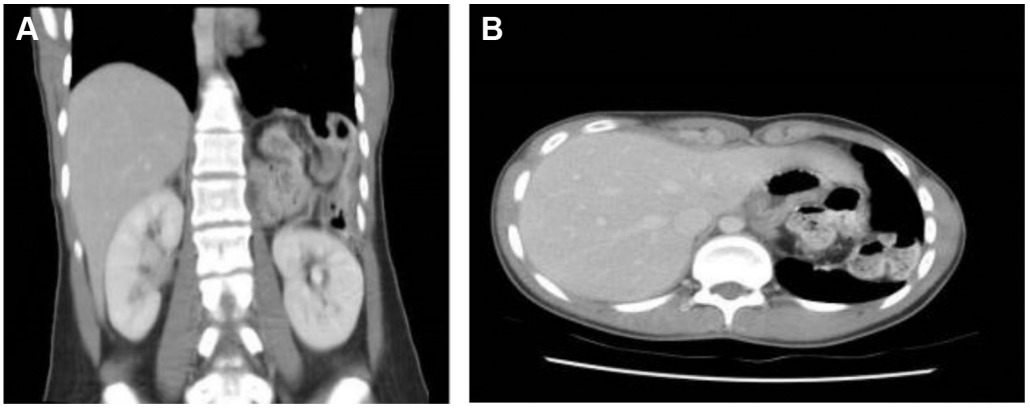

Fig. 2. Computed tomography of chest and abdomen in (A) coronal section, and (B) transverse section prior to repeat repair, showing left diaphragmatic defect with herniated transverse colon.