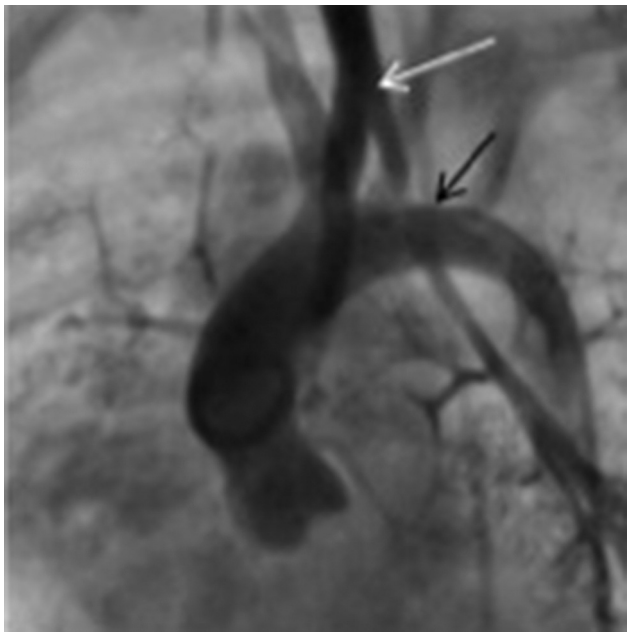

Fig 3. Simultaneous aortogram and bronchogram. The tracheal bifurcation is higher than normal (white arrow). The left main bronchus is narrow where it passes behind the distal aortic arch (black arrow).

proper positioning of the patient and appropriate exposure and angulation of the X-ray beam [4]. Radiographs alone do not demonstrate the spatial relationship between the tracheobronchial tree and the arch of the aorta. Computed tomography with three-dimensional reconstruction provides valuable information regarding the precise length of the trachea, the angle of bifurcation, and the course and relationship of the bronchi to the surrounding structures. Computed tomography scan has the added advantage of concurrent evaluation of the lungs. Magnetic resonance imaging has also been reported to deliver an accurate diagnosis [5]. A contrast bronchogram not only confirms the diagnosis of high tracheal bifurcation, it also helps in ruling out the presence of distal bronchomalacia.

The earliest description of aortopexy was by Gross and Neuhäuser [6] in 1948 for relief of tracheal compression caused by an anomalous innominate artery. The same principles can be used for effective therapy for left bronchial compression by the arch of aorta. Surgical approach can be through a sternotomy or a left anterior thoracotomy. We believe that sternotomy is advantageous. It permits a subtotal thymectomy and more thorough mobilization of the distal ascending aorta and the head and neck vessels. Regardless of the approach, it is essential to lift the entire arch forward, as described in our technique, to ensure adequate relief from the compression. The use of intraoperative bronchoscopy is not universally accepted, but may be a valuable indicator of the efficacy of aortopexy [7]. Aortopexy should be limited to what is absolutely necessary to avoid distortion of the arch.

To conclude, congenital short trachea is a rare cause of left main bronchial obstruction. A high index of suspicion is required to diagnose a short trachea. Aortopexy of the aortic arch can be an effective method to relieve such obstruction.

References

1. Hall RM. High tracheal bifurcation. Anaesthesia 1979;34:503–5.
2. Wells TR, Wells AL, Galvis DA, Senac MO, Landing BH, Vachon LA. Diagnostic aspects and syndromal associations of short trachea with bronchial intubation. Am J Dis Child 1990;144:1369–71.
3. Comerci SC, Berdon WE, Levin TL, Ruzal-Shapiro C. Congenitally short trachea and high carina with left mainstem bronchus compression by the ligamentum arteriosum. Pediatr Radiol 1995;25(Suppl):194–6.
4. Wells TR, Landing BH, Padua EM. The question of parallax-effect on radiographic assessment of short trachea in infants and children. Pediatr Radiol 1991;21:490–3.
5. de Priester JA, Vos GD, van Waardenburg DA, Oei TK. Congenitally short trachea with compression of the left mainstem bronchus: MRI findings. Pediatr Radiol 1998;28:342–3.
6. Gross RE, Neuhäuser EBD. Compression of the trachea by anomalous innominate artery. An operation for its relief. Am J Dis Child 1948;75:570–4.
7. Torre M, Carlucci M, Speggiorin S, Elliott MJ. Aortopexy for the treatment of tracheomalacia in children: review of the literature. Ital J Pediatr 2012;38:62.

FEATURE ARTICLES

Bochdalek Hernia in a Symptomatic Adult

Anique Herling, Fahd Makhdom, MD, Abdullah Al-Shehri, MD, and David S. Mulder, MD, MS

Division of Thoracic Surgery, McGill University Health Center, Montreal General Hospital, Montreal, Quebec, Canada

Bochdalek hernias usually present in neonates with respiratory failure, need to be operated early and are associated with a high mortality. We describe an adult patient who came to the emergency department with nonspecific recurrent chest and abdominal pain. A computed tomography scan showed a large posterolateral diaphragmatic defect and an oversized spleen. The hernia was repaired by a thoracoabdominal approach and Gore-Tex patch. Congenital diaphragmatic hernias are rare and are associated with nonspecific symptoms in adults. With suspicious chest or abdominal radiographs, a computed tomography scan is essential to plan an individualized surgical intervention.

(Ann Thorac Surg 2014;98:701–4)

Congenital diaphragmatic hernias (CDH) are a group of diaphragmatic malformations due to a failure in

Accepted for publication Sept 17, 2013.

Address correspondence to Dr Mulder, Division of Thoracic Surgery, L9-512 Montreal General Hospital, 1650 Cedar Ave, Montreal, PQ H3G1A4, Canada; e-mail: david.mulder@muhc.mcgill.ca.

0003-4975/$36.00
http://dx.doi.org/10.1016/j.athoracsur.2013.09.074

fusion of the septum transversum with pleuroperitoneal folds of the diaphragm within the first 8 weeks of gestation [1]. Bochdalek hernia is the most frequent CDH, occurring in 1 of 2,500 live births [2]. It usually presents in neonates with respiratory distress due to lung hypoplasia and pulmonary hypertension [2]. Stabilization with extracorporeal membrane oxygenation and early surgery has improved outcomes [3]. The Bochdalek hernia is associated with significant mortality among neonates, ranging between 40% and 50% [2]. Bochdalek hernia is rare in adults. Treatment and outcome are variable [1].

A 24-year-old Chinese man was admitted to the emergency department with chest and abdominal pain of 3 days' duration. That was associated with a sensation of "gurgling" in his chest. At the age of 5 he had an episode of abdominal pain, nausea, and vomiting, which was treated conservatively in a Chinese hospital. Since then he has noted several episodes of abdominal pain yearly, without vomiting. He had no history of chest trauma. Physical examination revealed decreased air entry in the left side of the chest. The abdomen was scaphoid, and soft with normal bowel sounds. Vital signs and laboratory studies were normal. Abdominal radiographs showed ascending colon and small bowel in the left chest (Fig 1). Computed tomography scan of chest, abdomen, and pelvis with intravenous contrast showed a large posterior diaphragmatic hernia. It contained the entire small bowel, the entire large bowel, proximal to the splenic flexure, the appendix, and the pancreatic body and tail. There was no evidence of volvulus or compromised hernia bowel. The spleen was midline and measured 24 cm in length (Fig 2).

Ten days after presentation, the patient was taken to the operating room. An anterolateral thoracotomy through the seventh intercostal space was later extended into the abdomen (Fig 3). The chest cavity contained multiple loops of small bowel, right colon, cecum, and appendix as well as tail of pancreas. The left lung was noted to be compressed and moderately hypoplastic. The neck of the defect was posterior and about 10 to 12 cm in diameter. The herniated bowel was reduced to

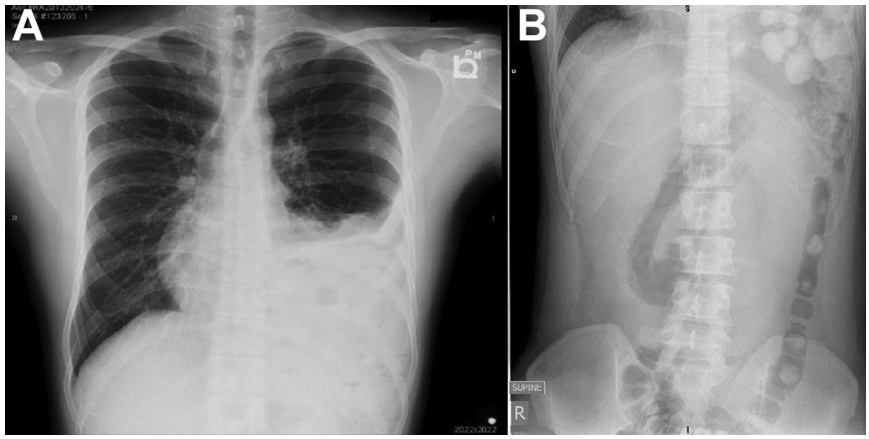

Fig 1. Radiograph of (A) chest and (B) abdomen 2 showing herniated intestine in the left side of the chest.

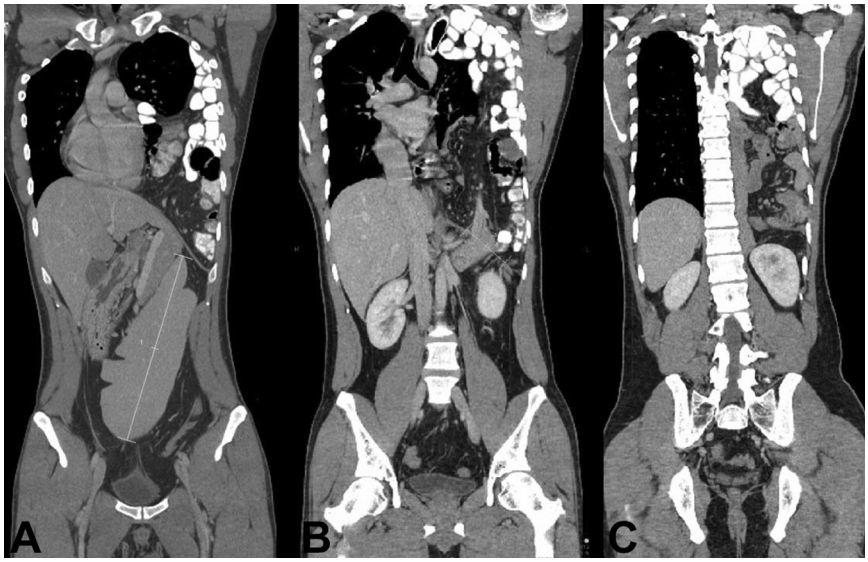

Fig 2. Computed tomography scan of (A) chest, (B) abdomen, and (C) pelvis showing a large diaphragmatic hernia.