FIGURE 2. Cross-sectional view of the thorax with introduced sternal retractor and bilateral elevating plates.

A period of thorough bleeding control was necessary. The sternum was closed by cerclage with 8 wires, and the pectoral muscles were attached to the sternal bone with wound drainages placed underneath, followed by standard wound closure in layers.

The patient's postoperative course was uneventful. The patient remained in a hemodynamically and respiratory stable condition. After loading with phenprocoumon, the patient could be discharged.

The postoperative routine examination after 3 months showed an excellent result (Figure 1, B). The patient expressed satisfaction but did report feeling a slight restriction when bending forward, although he already had noticed an improvement. We anticipate that this dysesthesia will continue to dissipate over time.

DISCUSSION

Concomitant repair of pectus excavatum and cardiac defects is controversial. Leaving the deformity untreated may lead to problematic exposure of the heart or even cardiac impairment.¹ Many authors consider midsternotomy inappropriate for concomitant repair.²⁻⁵ Although opinions diverge, it seems obvious that the worse the chest wall deformity, the more it will affect heart function and regeneration after staged repair. In very severe cases such as this one, it is morphologically impossible to correct the heart without correcting the chest wall.

We have demonstrated an approach by midsternotomy. Especially in patients with mitral valve deficiency, many of alternatively described approaches seem inadequate. Owing to the extensive wound area, particular care must be taken to control bleeding.

Our patient's smooth recuperation proves that a concomitant repair using midsternotomy can be the treatment of choice in severe cases of pectus excavatum.

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A rare case of vascular ring: Retroesophageal artery between the right brachiocephalic artery and the left descending aorta

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A vascular ring is a congenital aortic arch anomaly that presents with tracheal and esophageal compression by vascular structures. Vascular rings have been classified according to embryologic, pathologic, and radiographic criteria. We describe a very rare vascular ring due to an abnormal retroesophageal artery in an infant.

CLINICAL SUMMARY

A 5-month-old baby was referred to our hospital because of long-standing wheezing and difficulty feeding. Gastroesophagographic analysis revealed compression of the esophagus,

FIGURE 1. Magnetic resonance imaging of the coronal view (A) and transverse view (B) revealed that there was an abnormal retroesophageal artery between the right brachiocephalic artery and the left descending aorta.

which suggested the existence of an aberrant right subclavian artery with normal left aortic arch. Magnetic resonance imaging revealed a normal left aortic arch with a right brachiocephalic artery, left common carotid artery, and left subclavian artery. There was a fourth vessel arising from the medial arch just beyond the left subclavian origin (Figure 1, A). This vessel measured approximately 2 mm in diameter and passed posterior to the trachea and esophagus, taking a course similar to that of a classic aberrant right subclavian artery. This aberrant vessel appeared to converge with the right brachiocephalic bifurcation (Figure 1, B). This artery created a complete vascular ring (Figure 2). Magnetic resonance imaging also revealed significant narrowing of the distal trachea. Surgical intervention was performed through a left thoracotomy. The left ductal ligament and abnormal artery were divided in the same manner as division of a classic aberrant right subclavian artery. Although the patient had chylothorax, after conservative therapy, he was discharged from the hospital. His respiratory symptoms were improved after the operation.

DISCUSSION

According to the vascular structure of the vascular ring, these anomalies have been well analyzed and classified in

FIGURE 2. Three-dimensional reconstruction image of the thoracic aorta. Complete vascular ring consisted of the normal left aortic arch, brachiocephalic artery, and abnormal retroesophageal artery (arrow). Both the trachea and esophagus went through the vascular ring. AAo, Ascending aorta; DAo, descending aorta; SCA, right subclavian artery.

the literature as 5 distinct types, including (1) double aortic arch, (2) right aortic arch with left ligamentum, (3) left aortic arch with aberrant (retroesophageal) right subclavian artery, (4) pulmonary artery sling, and (5) innominate artery compression.¹⁻³ A left aortic arch with aberrant right subclavian artery is not typically a complete vascular ring, although this anatomy can create symptoms caused by compression of the esophagus and trachea. In this case, however, the aberrant subclavian artery joined the brachiocephalic artery at the takeoff of the normal right subclavian artery, thus creating a complete ring. This vascular ring case report does not fit any previous reported classification. Holmberg and Presnell⁴ reported a vascular ring caused by a similar aberrant vessel in a dog. This case is a very rare anomaly, and this is the first human clinical report in the literature to our knowledge.

A left aortic arch associated with an aberrant right subclavian artery is the most common aortic arch anomaly, with an incidence of 1% to 2%.⁵ However, it rarely causes clinical symptoms. If there is a compression symptom of the trachea and esophagus in a patient with a normal left aortic arch, existence of an aberrant right subclavian artery, as well as the above anatomy, should be suspected.

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