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CASE REPORT

Kommerell's Diverticulum and Stenosis of an Aberrant Left Subclavian Artery

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ABSTRACT

Left aortic arch with an aberrant right subclavian artery is the most common anomaly of the aortic arch. Other rare anomalies include the occurrence of a right aortic arch with an aberrant left subclavian artery that has a diverticulum at its site of origin, known as Kommerell's diverticulum. Right-sided aortic arch with an aberrant left subclavian artery is an uncommon entity that is usually asymptomatic, but may present in adults with symptoms of dysphagia or tracheal compression. This report is of an asymptomatic 80-year-old patient with this rare anomaly associated with stenosis of an aberrant left subclavian artery.

Key Words: *Aorta, thoracic; Constriction, pathologic; Diverticulum; Subclavian artery*

INTRODUCTION

Kommerell's diverticulum is an aortic diverticulum at the origin of an aberrant subclavian artery, named after Burckhard Friedrich Kommerell, who published a scholarly description of this diverticulum in 1936, demonstrated by barium swallow examination.[1] A right-sided aortic arch is an anatomic variant occurring in approximately 0.1% of the population;[2,3] in half of these patients, the left subclavian artery is also aberrant.[4,5] Patients with a right aortic arch and left ligamentum arteriosum frequently develop an aneurysm at the origin of the left subclavian artery. This is called a Kommerell's diverticulum and is a remnant of the left fourth aortic arch. Kommerell originally described an aortic diverticulum in a patient who had a left aortic arch and an aberrant right subclavian artery. These variants may occur in combination with congenital heart defects or may be isolated.[6]

CASE REPORT

A routine chest X-ray demonstrated a right-sided aortic arch and a tortuous descending dilated aorta (Figure 1) in an 80-year-old man. Contrast-enhanced computed tomography (CT), done to exclude aneurysmal dilatation of the aorta, revealed a right-sided aortic arch, right descending thoracic aorta, and an aberrant left subclavian artery arising from a distal aortic arch diverticulum (Kommerell's diverticulum) [Figure 2]. The aberrant retro-oesophageal course of the left subclavian artery was associated with a focal stenosis at its origin from Kommerell's diverticulum. From proximal to distal, the order of origin of the vessels from the right-sided aortic arch was as follows: left common carotid, right common carotid, right subclavian, and left subclavian arteries.

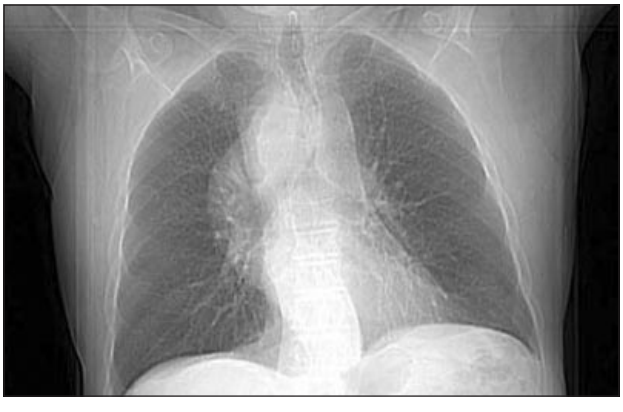

Figure 1. Frontal chest topogram demonstrating a tortuous right-sided aortic arch.

DISCUSSION

This is the first report of an incidental right-sided aortic arch with stenosis at the origin of an aberrant left subclavian artery arising from Kommerell's diverticulum.

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Submitted: 19 July 2006; Accepted: 1 December 2006.

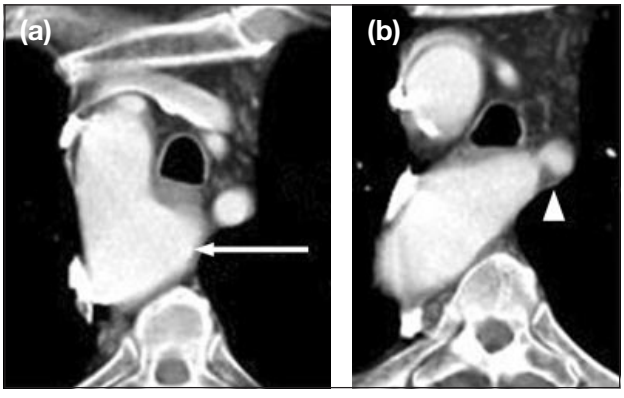

Figure 2. Computed tomography scan of the chest demonstrates (a) a right-sided aortic arch and Kommerell's diverticulum (arrows) at the origin of an aberrant left subclavian artery; and (b) focal luminal narrowing is noted at the origin of the left subclavian artery (arrowhead).

Previously, the prenatal ultrasound appearance of a congenital critical stenosis of an aberrant left subclavian artery in a newborn has been reported.[7]

A right-sided aortic arch is the result of abnormal organogenesis of the primitive aortic arches. Between the fourth and fifth weeks of embryonic life, blood leaves the heart by a single vessel, the truncus arteriosus, which divides into paired branches, the ventral aortae. These are connected with paired dorsal aortae by 6 branchial vessels, called aortic arches.[8]

A segment of the right ventral aorta, the right fourth arch, and a portion of the right dorsal aorta develop into the right subclavian artery and the innominate artery. The left fourth arch persists as the adult aortic arch and, with the anlagen of the seventh dorsal intersegmental artery, forms the left subclavian artery (Figure 3a).[6,8-10] A right-sided aortic arch results from persistence of the right fourth aortic arch and involution of the left aortic arch (Figure 3b). In patients with a right aortic arch, there are 2 primary branching patterns: retro-oesophageal left subclavian artery and mirror image branching. Patients with a retro-oesophageal left subclavian artery have a vascular ring formed by the right arch, left pulmonary artery, and ligamentum arteriosum. This is the most common type of vascular ring and is generally loose. Therefore, symptoms of tracheal or oesophageal compression are mild or absent.

Patients with a right aortic arch and left ligamentum arteriosum frequently develop an aneurysm at the origin of the left subclavian artery (Figures 3c and 3d). This is called a Kommerell's diverticulum and is a remnant of the left fourth aortic arch.[11,12] Due to the atherosclerotic changes that occur in the adult arterial wall, it is difficult to distinguish a true Kommerell's diverticulum from an acquired aneurysm of the origin of an aberrant subclavian artery.[3]

Kommerell's diverticulum can occur in a number of aortic arch anomalies that cause symptoms of tracheal or oesophageal compression. The diverticulum is generally well developed because the foetal ductus arteriosus at the origin of the aberrant left subclavian artery carries a large volume of blood. In contrast, patients with tetralogy of Fallot and a right-sided aortic arch do not develop an aortic diverticulum.[13] These patients have low ductal flow during foetal-life, as the right ventricular infundibular stenosis limits normal

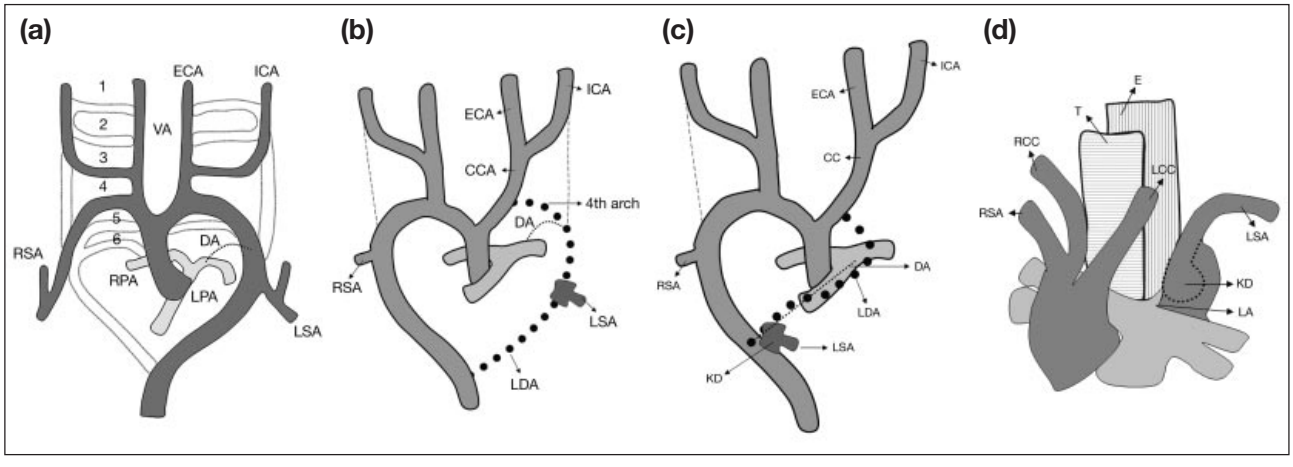

Figure 3. Development of a (a) normal left-sided aortic arch; (b) right-sided aortic arch; (c) involution of the left dorsal aorta and development of Kommerell's diverticulum; and (d) right-sided aortic arch, aberrant left subclavian artery, and Kommerell's diverticulum.
Abbreviations: 1 to 6 = primitive aortic arches; CC = carotid artery; E = Oesophagus; ECA = external carotid artery; ICA = internal carotid artery; KD = Kommerell's diverticulum; LA = ligamentum arteriosum; LDA = left dorsal aorta; LSA = left subclavian artery; PA = pulmonary artery; RSA = right subclavian artery; T = trachea.

right-to-left flow. The aberrant right subclavian artery that occurs in conjunction with a left-sided aortic arch does not always arise from an aortic diverticulum.

Kommerell's diverticulum is a rare aortic arch anomaly. With the increased use of CT and magnetic resonance imaging techniques, this uncommon entity will be diagnosed more frequently than in the past. When indicated, earlier diagnosis can facilitate timely surgical intervention.

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