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Anomalous Right Subclavian Artery with Ascending Aortic Aneurysm: A Case Report

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ABSTRACT

We report a rare case of the ascending aortic aneurysm with an anomalous origin of the right subclavian artery. The right subclavian artery branched from the aorta as the fourth major vessel and ran behind the esophagus. Moreover, the left and right coronary arteries arose ectopically from the posterior and the left aortic sinus, respectively.

INTRODUCTION

Congenital failure in the development of the primordial aortic arch results in various vascular anomalies [McDonald 1940]. An aberrant right subclavian artery (ARSA) usually arises as the fourth branch from an otherwise normal aortic arch just behind the origin of the left subclavian artery [Rahman 1993], crosses the midline behind the esophagus, and runs upward to the right thoracic outlet. The incidence of this anomaly in general population ranges from 0.4% to 2% [Rahman 1993]. Here we present an interesting ARSA complicated with an aneurysm of the ascending aorta and with rotation of the origins of the coronary arteries.

CASE REPORT

A 38-year-old woman who had been followed-up for an ascending aortic aneurysm was admitted to our hospital for surgery. Chest computed tomography (CT) showed an ascending aneurysm involving the aortic arch increasing its diameter from 5 to 7 cm over 10 years. She was asymptomatic and denied chest pain, shortness of breath, or dysphagia. Her height was 160 cm and weight was 52 kg. There was no bruit or heart murmur. There was no blood pressure difference between the right and left arms. Other physical examinations and laboratory values were within normal limits. Transthoracic echocardiography showed normal left ventricular ejection fraction (66%), and normal aortic valve. A 3-dimensional CT scan showed an ascending aneurysm extended to the aortic arch with an ARSA (Figure 1). A coronary CT angiography revealed that the origins of the coronary arteries dislocated 90 degree from normal position. The right coronary artery arose from the anatomical left aortic sinus and the left coronary artery from the posterior sinus.

The patient was taken to the operating room for elective aneurysm repair. In surgery, the ascending aorta was aneurysmal up to a few centimeters below the right common carotid artery and adhered to the superior vena cava (Figure 2). Under cardiopulmonary bypass with hypothermic (26°C) cardioplegic arrest, the aorta was opened. Selective antegrade cerebral perfusion was initiated through individually cannulated right and left carotid, left subclavian, and aberrant right subclavian arteries. Under circulatory arrest, distal anastomosis was first performed between the left carotid artery and

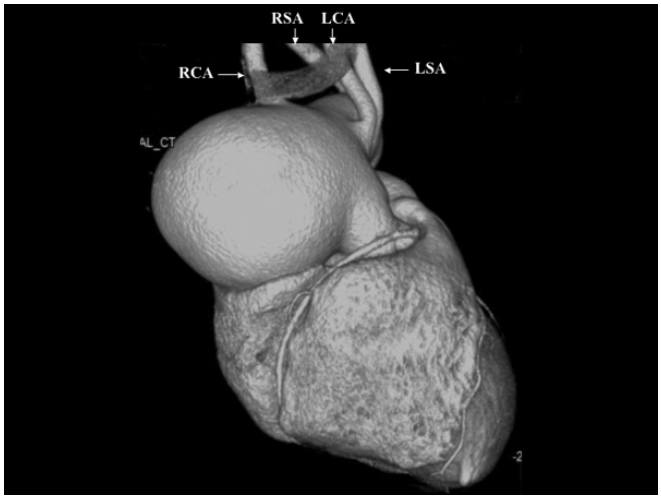

Figure 1. Computed tomography scan of the patient shows an aneurysm of the ascending aorta extending to the aortic arch. An aberrant right subclavian artery arises from the aorta and runs behind the esophagus.

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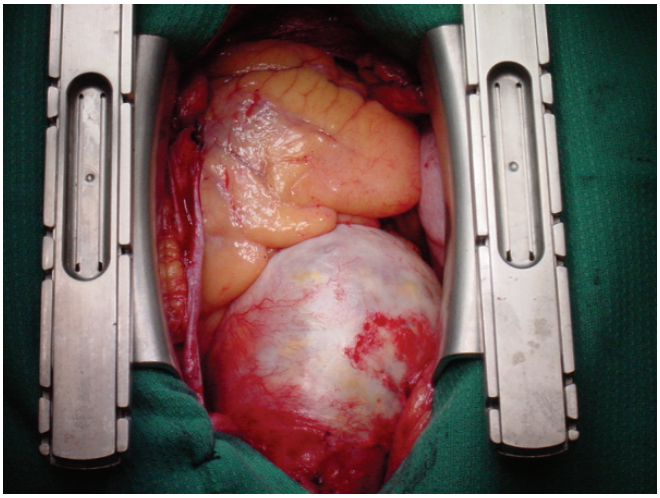

Figure 2. Intraoperative picture shows an aneurysm involving the right common carotid artery adhering to the superior vena cava.

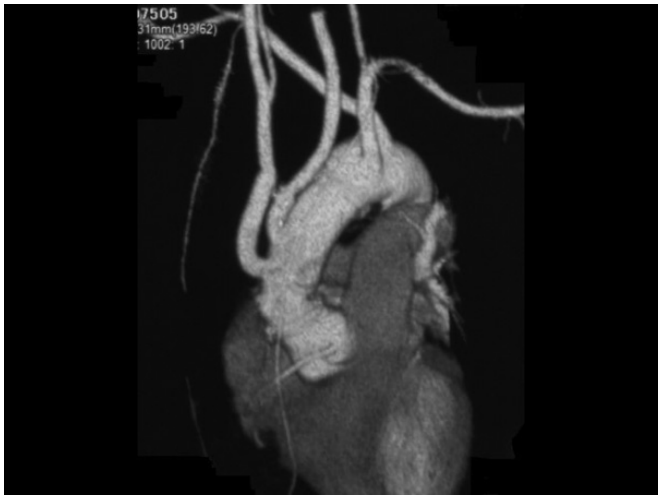

Figure 3. Postoperative computed tomography scan shows the reconstruction of the major vessels.

the left subclavian artery using a 22-mm branched aortic arch graft (Hemashield; Meadox Medical, Oakland, NJ, USA). After completion of the distal anastomosis, systemic circulation was restarted via the side branch of the branched graft. Then the proximal anastomosis of the graft was performed just above the sino-tublar junction. Finally, reconstruction of the left and right carotid arteries was performed using respective side branches of the aortic graft. Spontaneous rhythm was restored while rewarming the patients. The patient was weaned from cardiopulmonary bypass without difficulties. The total bypass time was 170 minutes, and the selective cerebral perfusion time was 37 minutes.

Postoperative recovery was uneventful. Postoperative 3-dimensional CT demonstrated satisfactory reconstruction of the ascending aorta, as well as the right and left carotid arteries (Figure 3). Histologic examination of the ascending aortic aneurysm demonstrated no atherosclerosis or medial necrosis.

DISCUSSION

The aberrant origin of the right subclavian artery was first reported by Hanuld in 1735 [Miller 1992]. It usually takes place from the dorsal aspect of the aorta just distal to the left subclavian artery and crosses the midline to the right at the space between the esophagus and the vertebral column. Associated congenital cardiovascular anomalies with ARSA are not rare, which include trancus arteriosus, double outlet right ventricle, tetralogy of Fallot, septal defects, aortic and mitral atresia, patent ductus arteriosus, aortic coarctation, and/or pulmonary stenosis [Zapata 1993].

The majority of patients with this condition are asymptomatic. However a possible symptom of the retroesophageal right subclavian artery is dysphagia, as termed "dysphagea lusoria" (meaning dysphagia caused by the deformed alimentary pathway) described by Bayford in 1787 [Miller 1992]. It is not unusual for the origin of the ARSA to become aneurysmal in adults, referred as Kommerell's diverticulum [Kommerell 1936]. Difficulty swallowing may be observed if the adjacent esophagus is compressed either by the torturous ARSA or by the dilated Kommerell's diverticulum [Mok 1979]. In our case, the ARSA was not reconstructed due to the lack of aneurysm expanding to the area.

ARSA with an aneurysm in the arch or descending aorta or aortic dissection have been previously reported [DeBakey 1955; Gross 1990]. However, in this case , there was an ascending aneurysm, which was unrelated to the Kommerell's diverticulum or chronic dissection. The pathogenesis of the ascending aortic aneurysm of this patient is not clear. Histologic examination of the ascending aortic aneurysm demonstrated no atherosclerosis or medial necrosis. The patient had no characteristics of Marfan's syndrome. We speculate that the ascending aortic aneurysm was related to congenital weakness of the aortic wall.

Displacement of the coronary orifice could be secondary to the development of the ascending aortic aneurysm, although the sinus of the Valsalva was spared from the aneurysm. The counter-clockwise rotation of the sinus of Valsalva may have caused elongation and acute angle formation in the left main trunk.

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