

ARTERIES GET CONFUSED: AN ARCH VARIATION

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We present a case of an arch anomaly in a 54-year-old female who was admitted to our hospital for magnetic resonance angiography (MRA) to evaluate her right-sided numbness. MRA revealed a truncus bicaroticus, right common carotid artery (CCA) originating right vertebral artery, right subclavian artery arising as the final branch of the descending aortic arch and arch originating left vertebral artery. The possible embryologic mechanism and clinical importance of this previously unreported variant are reviewed.

Key-word: Arteries, abnormalities.

There are several types of aortic arch anomalies. They are mostly asymptomatic and incidental findings of arteriograms or anatomic postmortem studies, but it is important to identify them especially before surgeries. In this case report we present unique arch variation with magnetic resonance angiography (MRA) and try to explain its potential embryological development.

Case report

A 54-year-old woman was referred to radiology department for

MRA for the evaluation of right-sided numbness. Patient stated that the numbness was increasing while she was elevating her arm. Her medical history was uneventful. On her physical examination right radial artery pulse was weaker than left and there was more than 30 mmHg discrepancies between her right and left upper extremity blood pressures. MRA revealed contour abnormalities and mild stenosis of right subclavian artery and an unique aortic arch variation; truncus bicaroticus, right common carotid artery (CCA) originating right vertebral artery (VA),

right subclavian artery arising as the final branch of the aortic arch and arch originating left vertebral artery (Fig. 1). No other abnormalities such as dissection, stenosis, or aneurysmal dilatations were detected on that variative arterial vasculature. We suggested a barium swallow chest x-ray and thorax computed tomography to further evaluate the course of the right subclavian artery, but the patient denied any further evaluation. We gave the patient 100 mg acetyl salicylic acid daily for mild stenosis of right subclavian artery and recommended follow up annually.

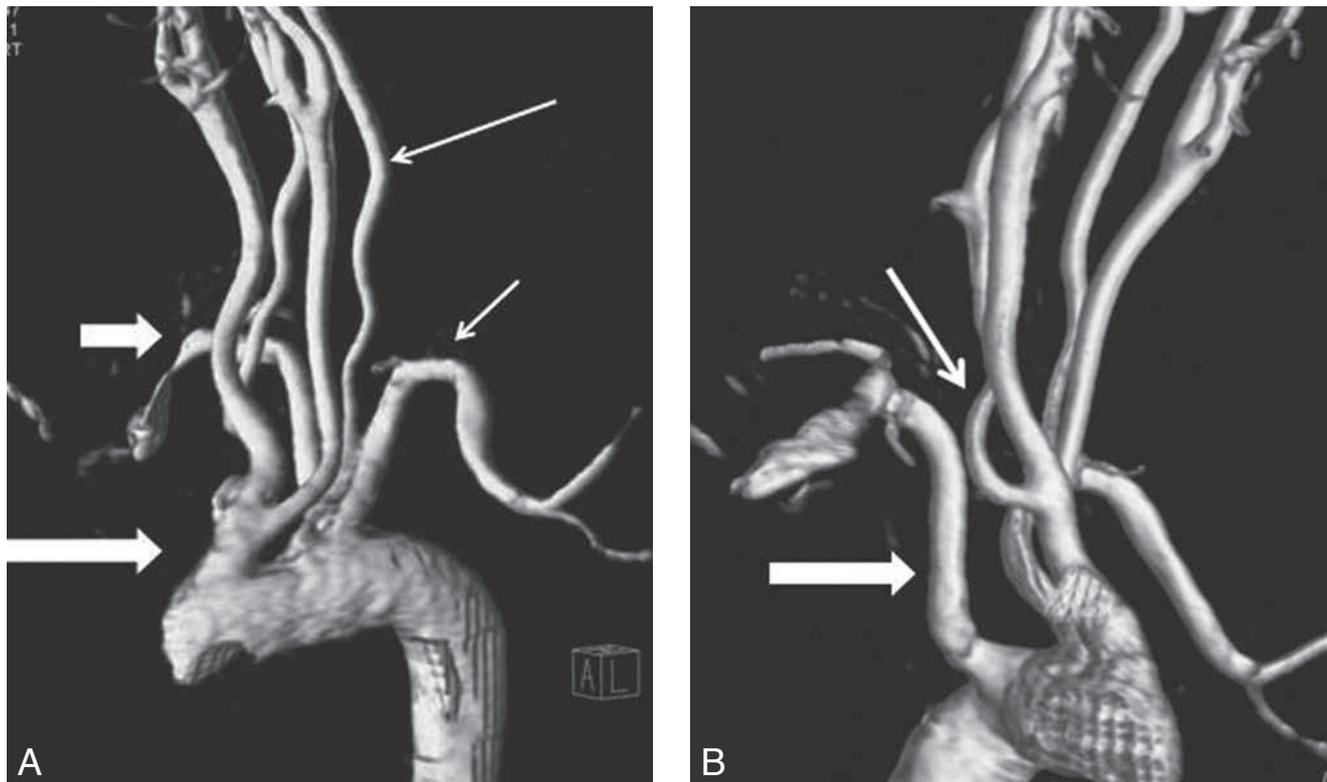


Fig. 1. — MRA of the aortic arch. A: truncus bicaroticus (thick long arrow), left vertebral artery (thin long arrow) originating directly from arch, aberrant right subclavian artery (thick short arrow), left subclavian artery (short arrow). B: Aberrant right subclavian artery (thick arrow), right vertebral artery (thin arrow) originating from right CCA.

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Discussion

Aortic arch anomalies are common congenital aberrations, which typically do not manifest any overt clinical symptoms. They are usually found incidentally during aortograms, workup for mediastinal diseases or autopsy. Among all the variants, the most frequent anomaly is the common origin of left common carotid artery and brachiocephalic truncus, which is also known as 'Bovine arch'. An aberrant right subclavian artery as the most distal branch of the aortic arch is rare, representing approximately 1% of all arch vessel anomalies and can cause dysphagia associated with compression of the esophagus between the trachea and the artery, termed dysphagia lusoria (1). There are also several types of anomalous origin of the vertebral arteries. The most common form is the origin of the left vertebral artery directly from the aortic arch between the left common carotid artery and left subclavian artery with a prevalence of 2.4% to 5.8% (2). Also anomalous right vertebral artery origins are reported in literature (2-4).

Our report represents an extremely rare combination of anomalies of the aortic arch: first, aberrant right subclavian artery; second, the left and right common carotid arteries share a common origin (truncus bicaroticus); third, the right vertebral artery originates from the right common carotid artery and fourth, left vertebral artery originates from arch directly.

In the embryo, the right subclavian artery develops during the sixth to eighth week of gestation. The proximal part originates from the right fourth aortic arch artery, and the distal part from the right dorsal and right seventh intersegmental ar-

teries. If the right fourth aortic arch artery and/or the right dorsal aorta abnormally regress, the right subclavian artery develops from the right seventh intersegmental artery and the distal segment of the right dorsal aorta. This vessel usually originates dorsally and therefore has a retroesophageal course and may result in dysphagia due to compression of the esophagus (5).

There are six pairs of primitive aortic arches, one for each brachial cleft. Among those, the third and fourth pairs are associated with the development of the aortic arch system. The third pair of cervical aortic arches gives rise to the left and right common carotid arteries. At seven weeks gestation, both common carotid arteries arise from a common vascular trunk. The persistence of this stage of development in the derivatives of the embryonic ventral aorta gives the vascular pattern called common origin of carotid arteries (truncus bicaroticus). The prevalence of this anomaly is less than 0.2% (6).

Embryologically, the VA is formed by the development of longitudinal anastomoses that link the cervical intersegmental arteries. The intersegmental arteries eventually regress except for the seventh, which becomes the proximal subclavian artery and which includes the point of origin of the VA in adults. A separation of the right vertebral artery from the subclavian artery can be explained by migration of the vertebral artery onto the dorsal aorta or with a separate development of the vertebral artery from the C6 or C8 intercostal artery instead of the C7 intercostal artery (4). If the right vertebral artery arises from the C6 intercostal artery, with obliteration of the longitudinal anastomosis between the C6 and C7 intercostal

artery, and the obliteration of the right dorsal aorta occurs proximal to the C7 intercostal artery origin, the origin of the right subclavian artery is moved to the left (A. lusoria). The right vertebral artery, however, originates from the right common carotid artery. And in the left side if the sixth intersegmental artery persists instead of the seventh, the left vertebral artery has a single origin from the aortic arch, between the left common and subclavian arteries.

As a conclusion, aortic arch anomalies are interesting anatomic variants which thoracic and vascular surgeons as well as interventional radiologists should be aware of especially prior to interventions.

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