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Bilateral aortic origins of the vertebral arteries with right vertebral artery arising distal to left subclavian artery: case report

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AbstractBackground: Bilateral aortic origins of the vertebral arteries are a rare anatomic variant, with fewer
than 20 cases reported in the literature. This particular variant has only been reported twice.
Case Description: A 35-year-old woman presented to the emergency department after trauma to the
head and a witnessed convulsion. Subsequent workup included MRI/MRA, which resulted in
identification of the anomaly.
Conclusion: The clinical importance of aortic arch anomalies lies in that it may be a source of
misinterpretation, as one may conclude occlusion of the vertebral artery if the aberrant origin is not
included in the MRA or CTA imaging parameters. Therefore, it is important to scan through the
entire aortic arch to just below the level of the ligamentum arteriosum when performing these
noninvasive modalities. In addition, vertebral arteries arising from the aortic arch have an increased
risk of dissection.
© 2007 Elsevier Inc. All rights reserved.Keywords:Vertebral artery; MRI; MRA; Congenital vascular anomaly

1. Introduction

Although aortic origin of the LVA is an anatomic variant with a prevalence of 2.4% to 5.8% [5], an aortic origin of the RVA is much less common with fewer than 20 cases reported in the literature [1-3,5-10]. Bilateral origins of the vertebral artery are rarer with less than 10 cases reported in the literature [2,3,5,7]. We report an even rarer aberration with the RVA arising from the descending aortic arch distal to the left subclavian artery and the LVA arising from between the left common carotid and left subclavian arteries. There have only been 2 other reports of this anomaly with this one being the first to identify the variant with MRA [3,7].



Fig. 1. Surface rendering from 3-D gadolinium-enhanced MRA shows 5 vessels arising from the aortic arch, in the following order: BT, LCCA, LVA, LSCA, RVA.

Abbreviations: BT, Brachiocephalic trunk; CTA, Computed tomography angiography; LCCA, Left common carotid artery; LSCA, Left subclavian artery; LVA, Left vertebral artery; MIP, Maximum intensity projection; MRA, Magnetic resonance angiography; MRI, Magnetic resonance imaging; RVA, Right vertebral artery.

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2. Case report

2.1. Clinical presentation

A 35-year-old woman presented to the emergency department after falling from a bicycle which was followed by a witnessed convulsive episode. Her physical examination was remarkable for forehead abrasions but was otherwise normal. Her workup for suspected seizure disorder included MRA of the neck which was performed on a 1.5-T MRI scanner and included 2-dimensional (2-D) time of flight and 3-D gadolinium-enhanced MRA. Postprocessing was performed using Vitrea 2 software (Vital Images, Minnetonka, Minn).

2.2. Radiographic findings

The study showed that both vertebral arteries arose directly from the aortic arch. Five trunks in total originated from the aortic arch with the following order from right to left: BT, LCCA, LVA, LSCA, and RVA as the last branch (Figs. 1 and 2). The BT, LCCA, and LSCA were otherwise normal. The LVA entered the left fourth transverse foramen, which is expected for LVAs that arise directly from the aorta [7]. The RVA coursed posterior to the esophagus and entered the right seventh transverse foramen. No other abnormalities such as vertebral dissection, stenosis, or aneursymal dilatations were seen in the arterial vasculature.



Fig. 2. Maximum intensity projection image obtained with 3-D gadoliniumenhanced MRA shows the origin of the right vertebral artery off the descending aorta (white arrow). Note the slight narrowing of the aorta before the takeoff of the right vertebral artery consistent with a pseudocoarctation.

The aortic arch was remarkable for an area of mild narrowing at the level of the ligament arteriosum consistent with aortic pseudocoarctation. The patient did not have secondary signs of a hemodynamically significant coarctation such as upper extremity hypertension or blunting of the dorsalis pedis pulses. Normal upper extremity blood pressure measurements (blood pressure of 119/74) were recorded, and both dorsalis pedis pulses were detectable and comparable in strength to the radial pulses. In addition,

MRA did not show formation of collateral circulation.

3. Discussion

Bilateral origins of the vertebral artery are rare, and the particular branching pattern seen in this case has only been described twice, once in a cadaver and once with a CTA [3,7]. Also noted in this case was an infundibulum, or diverticulum, at the anomalous origin of the RVA similar to previous reports [3,7]; however, the presence of pseudo-coarctation was not described previously.

The clinical importance of such anomalies lies in that it may be a source of misinterpretation, as one may conclude occlusion of the vertebral artery if the aberrant origin is not included in the MRA or CTA imaging parameters. Therefore, it is critical to scan through the entire aortic arch to the level of the ligamentum arteriosum when performing these noninvasive modalities. Vertebral arteries of aortic origin have also been shown to be associated with increased predilection for dissection in comparison to those of subclavian artery origin [4]. Identification of these anomalies is also important for angiographic or surgical planning.

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Commentary

The authors report an excellent demonstration of bilateral origin of both vertebral arteries from the aortic arch. One

can imagine the difficulty in finding the origin of these arteries during an angiogram if we did not have MRA.

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