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Case report

Anomalous origin of right vertebral artery from right common carotid artery

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ABSTRACT

Anomalous origin of vertebral arteries is a rare vascular anomaly and mostly discovered as incidental findings during computed tomography angiogram , magnetic resonance angiography or digital subtracted angiogram of the aortic arch and cerebral vessels. Herein, we present an extremely rare case of a 31-year-old female who presented with headache after emotional trauma. A conventional cerebral angiogram showed anomalous origin of the right vertebral artery. This finding was incidentally discovered, and it is of utmost importance for future head and neck endovascular interventions to avoid inadvertent arterial injury.

Introduction

In exceedingly rare instances, the vertebral artery may originate from the common carotid artery (VACC). It happens with a different embryonic mechanism on either the right or the left side of the carotid artery. However, when it occurs on the right side, it is persistently linked with an ipsilateral aberrant right subclavian artery (ARSA) [1]. Anomalous origin of vertebral artery (VA) is a rare condition and is mostly discovered as an incidental finding during angiographic studies [1]. We report an extremely rare case where the right vertebral artery (RVA) arises from the right common carotid artery (RCCA), with an absent brachiocephalic trunk. The right subclavian artery (RSCA) arose as the first branch of the aortic arch, followed by the RCCA, left common carotid (LCCA) and left subclavian artery (LSCA). A similar case has been reported by Vitošević et al. [2]. Kesler et al. published a case where the RVA originated from the RCCA with a present brachiocephalic trunk [3].

Abbreviations: ARSA, aberrant right subclavian artery; AVM, arteriovenous malformation; CTA, computed tomography angiogram; DSA, digital subtracted angiogram; LCCA, left common carotid; LECA, left external carotid artery; LICA, left internal carotid artery; LSCA, left subclavian artery; MRA, magnetic resonance angiography; RCCA, right common carotid artery; RSCA, right subclavian artery; VA, vertebral artery.

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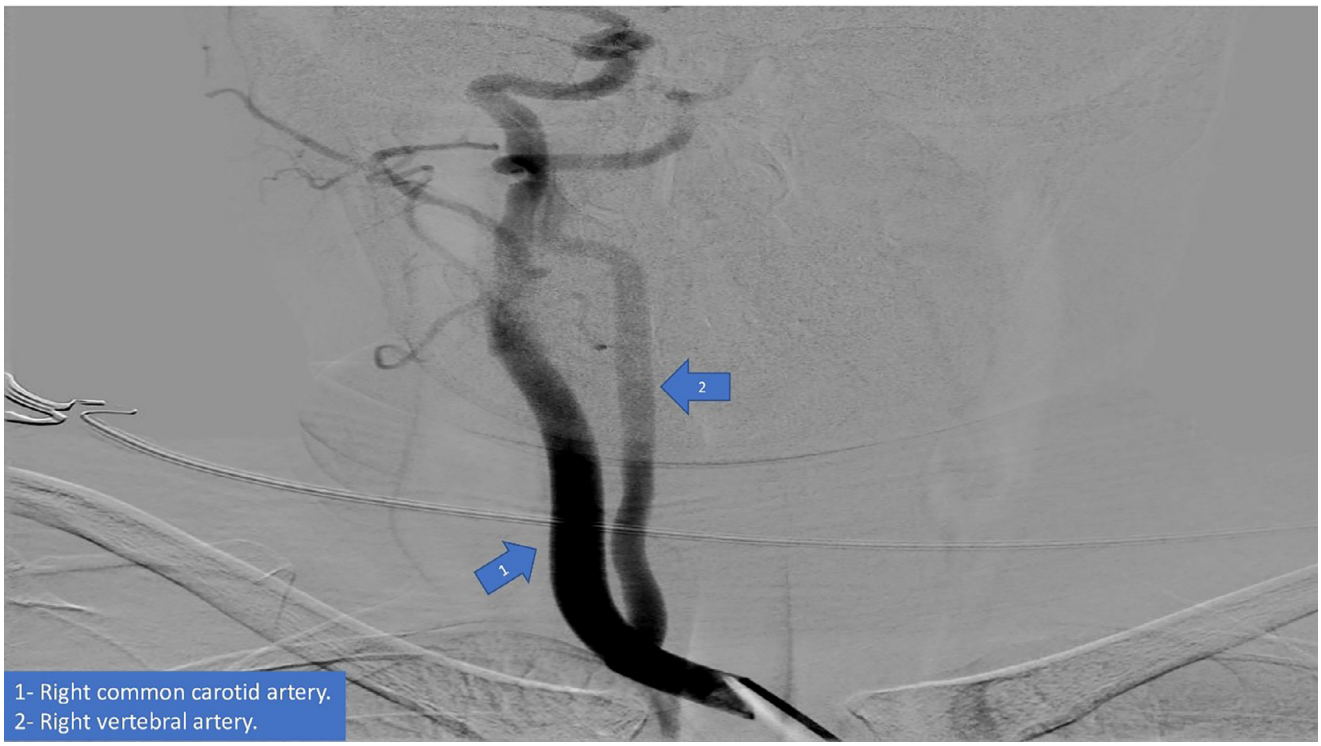

Fig. 1 – Digital subtracted angiogram (DSA) in angiographic AP projection demonstrating origin of RCCA directly from aortic arch with absent brachiocephalic trunk and RVA arising from RCCA.

Case presentation

We present case report of 31-years -old female patient presented with a history of acute severe headache after an emotional trauma. She has no significant medical, surgical, family, or past medical history.

An MRI and CT of the brain were performed in a private outside facility and concluded to be unremarkable apart from an incidental finding of neck varices. At our hospital, she underwent a conventional 4- vessels cerebral angiogram through a right femoral access, to further investigate these varices and to rule out the potential for an arteriovenous malformation (AVM) in the neck. The digital subtracted angiogram (DSA) showed an extremely rare, anomalous origin of the RVA arising from the RCCA (Fig. 1) with an absent brachiocephalic trunk.

The RCCA was the first branch of the aortic arch followed by the RSCA (Fig. 2), LCCA, and then the LSCA. The left vertebral artery (LVA) originated normally from the first part of the left subclavian artery (SCA) (Fig. 3 and 4). Other DSA findings on the DSA were a bilateral transverse sinus focal stenosis at the junction with the sigmoid sinus (Fig. 5) that was more evident on the left side. Also noted, prominent Emissary, vertebral veins as well as spinal column venous drainage and to lesser extent the pterygoid plexus with venous varices at posterior aspect of the neck that might be suggestive of early impaired intra cerebral venous drainage due to the described transverse sinus focal stenosis (Fig. 6). There was also a short segment of arterial dissection present at the proximal cervical part of the right (internal carotid artery (ICA). An illustration showing the described arch anomaly compared to the usual arch anatomy is shown in Fig. 7.

Discussion

Vertebral arteries originate from the first part of subclavian arteries, and ascend to the cervical C6 level where they enter the foramen transverserium then curve behind lateral mass of C1 (atlas) to enter the cranial fossa through the foramen magnum and finally join each other in the prepontine cistern to form the basilar artery [4].

Embryologically, there are 7 cervical intersegment arteries that arise from the dorsal aorta. The 1st to 6th intersegment arteries degenerates between 14-17 weeks of gestation, while the 7th intersegmental artery develops into both the vertebral and subclavian arteries [2,5]. Anomalies occur if the 1st- 6th intersegmental arteries fail to regress.

If the 1st or 2nd intersegmental artery persists, an abnormal origin of the VA from the internal or external carotid results, if the persistent artery occurs from the 3rd to the 6th intersegmental artery, a VA-CC or Vertebral artery (VA) arising from the common carotid artery (CC).

An anomalous origin of the right vertebral artery is rarer than the left counterpart. The most common variant of the left VA is to arise directly from the left-sided aortic arch between the LCCA and LSCA with a prevalence rate of 2.4% –5.8% [5,6]. Anomalous origin of the RVA is mostly associated with an aberrant RSCA with an incidence about 0.18%. In this case the RSCA arises distal to the LSCA instead of being the first branch

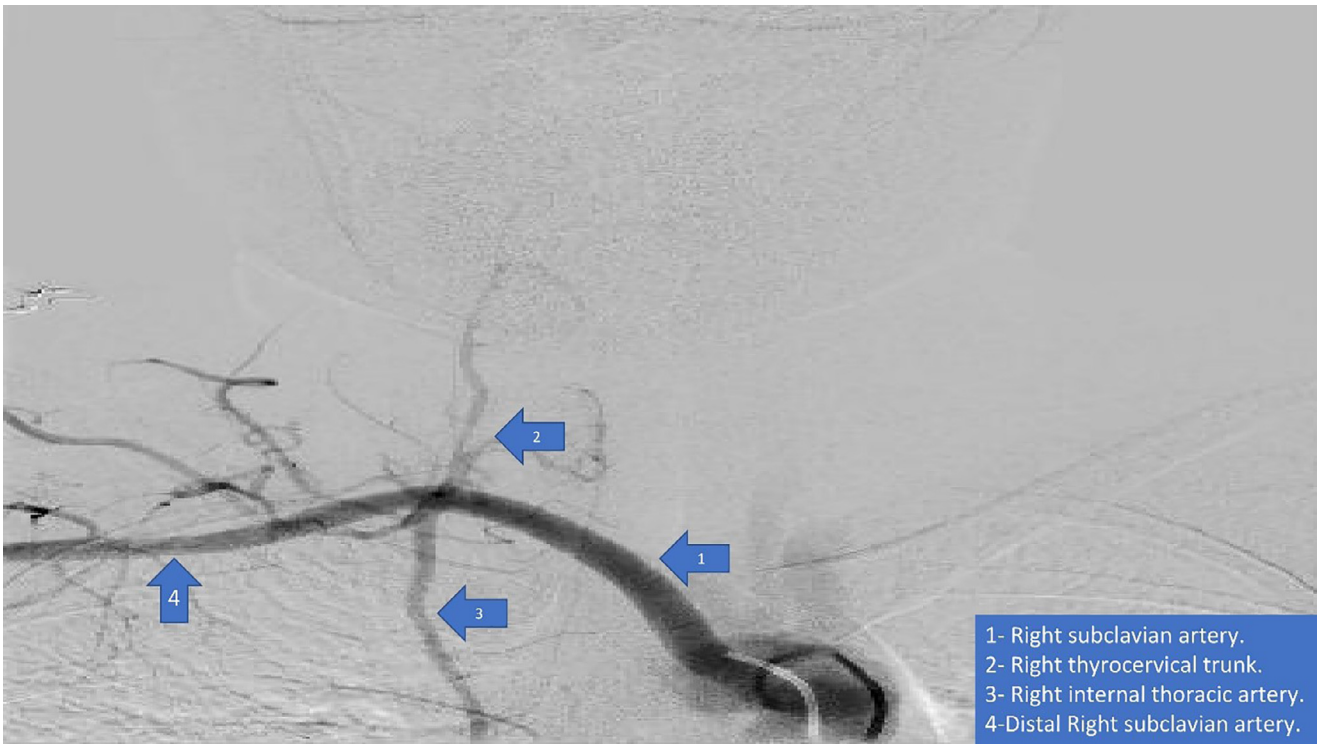

Fig. 2 – DSA in AP projection showing absent Right brachiocephalic trunk with RSCA directly arising from aortic arch.

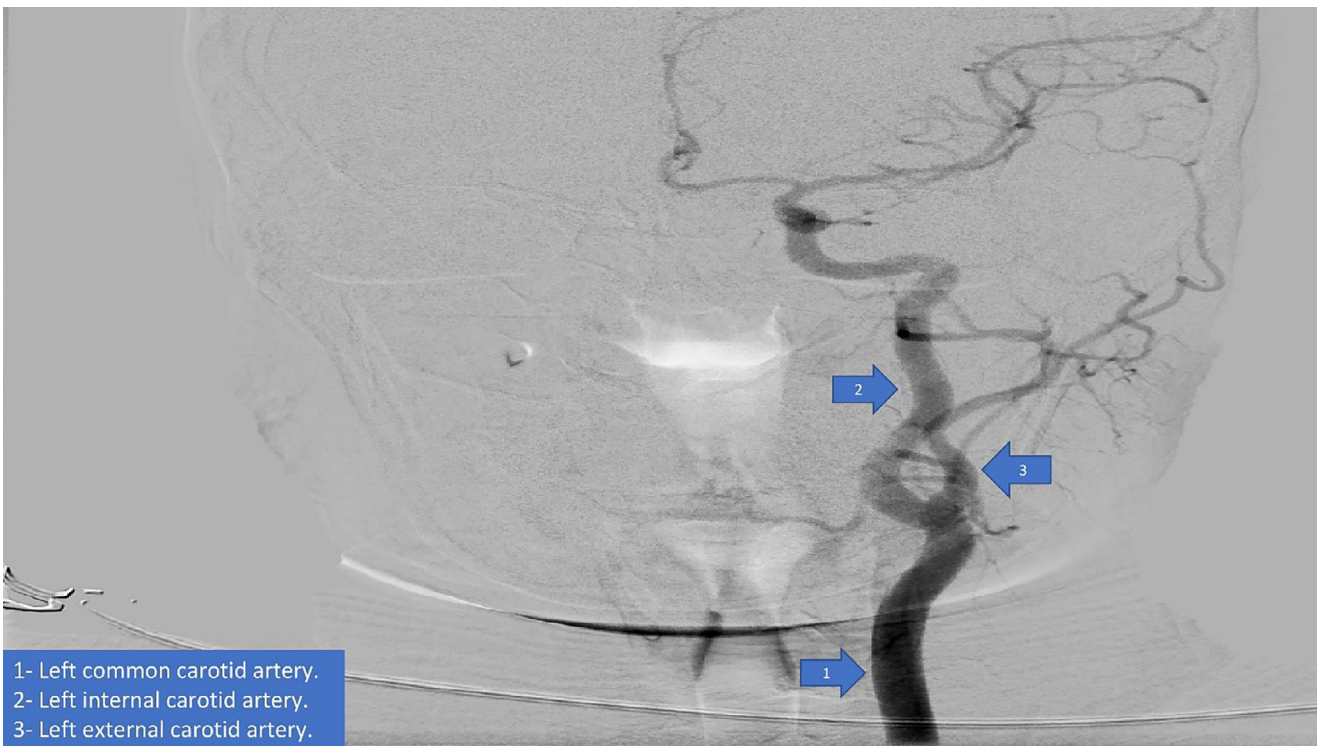

Fig. 3 – DSA in AP projection showing LCCA, LECA and LICA.

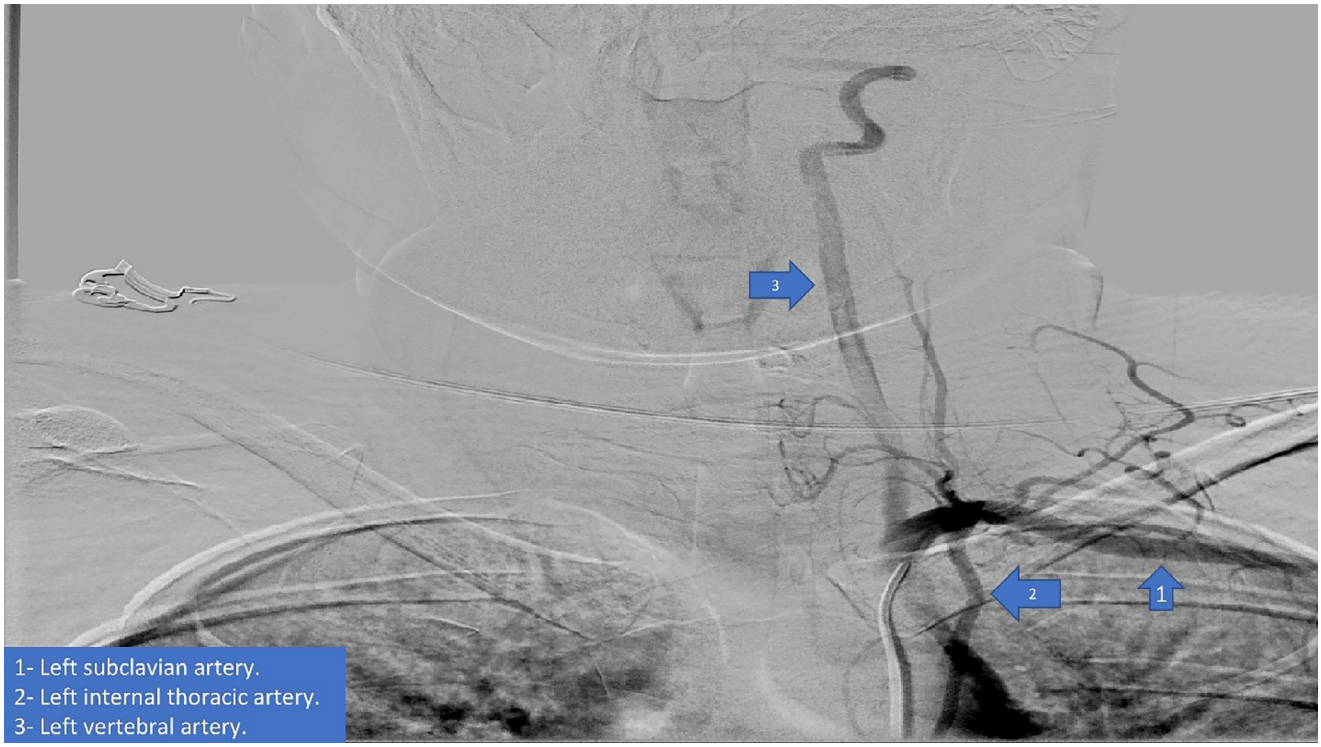

Fig. 4 – DSA in AP projection showing normal origin of LVA from 1st part of LSCA.

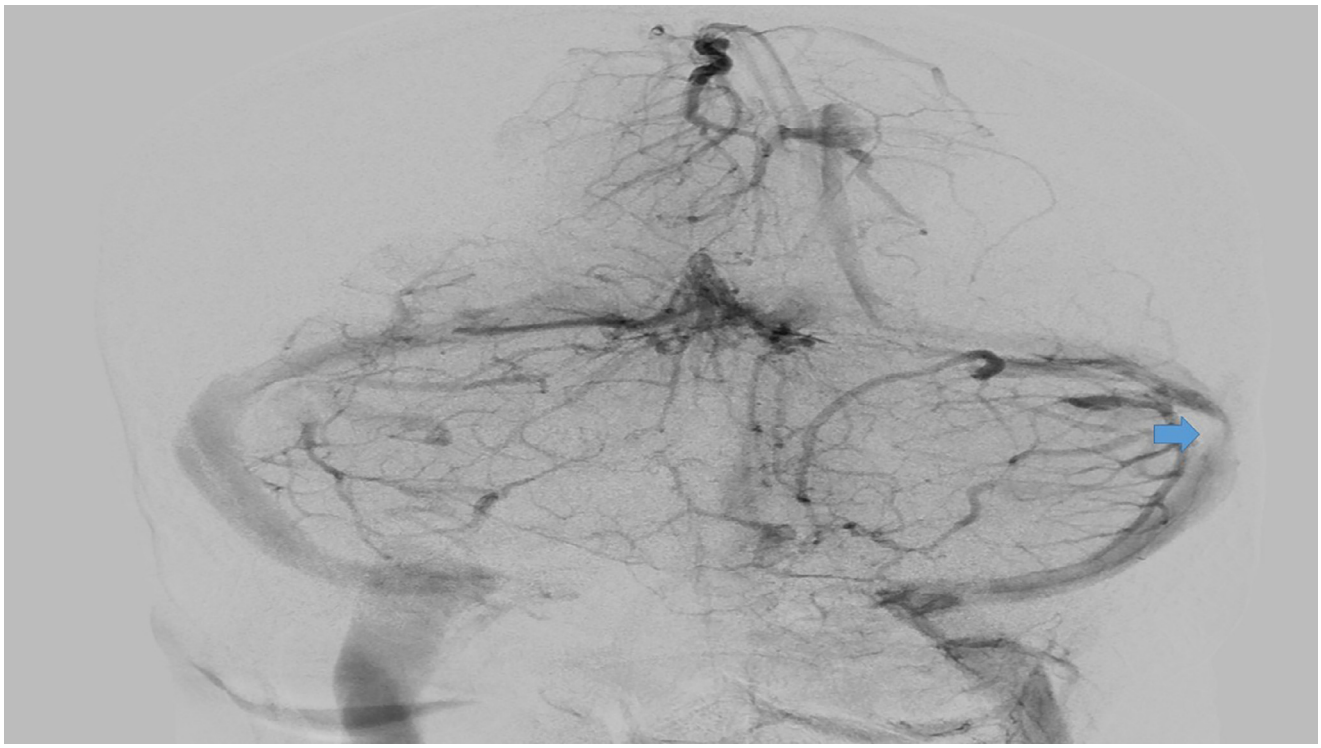

Fig. 5 – DSA in AP projection showing an attenuated left transverse sinus with focal stenosis at the junction. The arrow indicates the left sigmoid sinus.

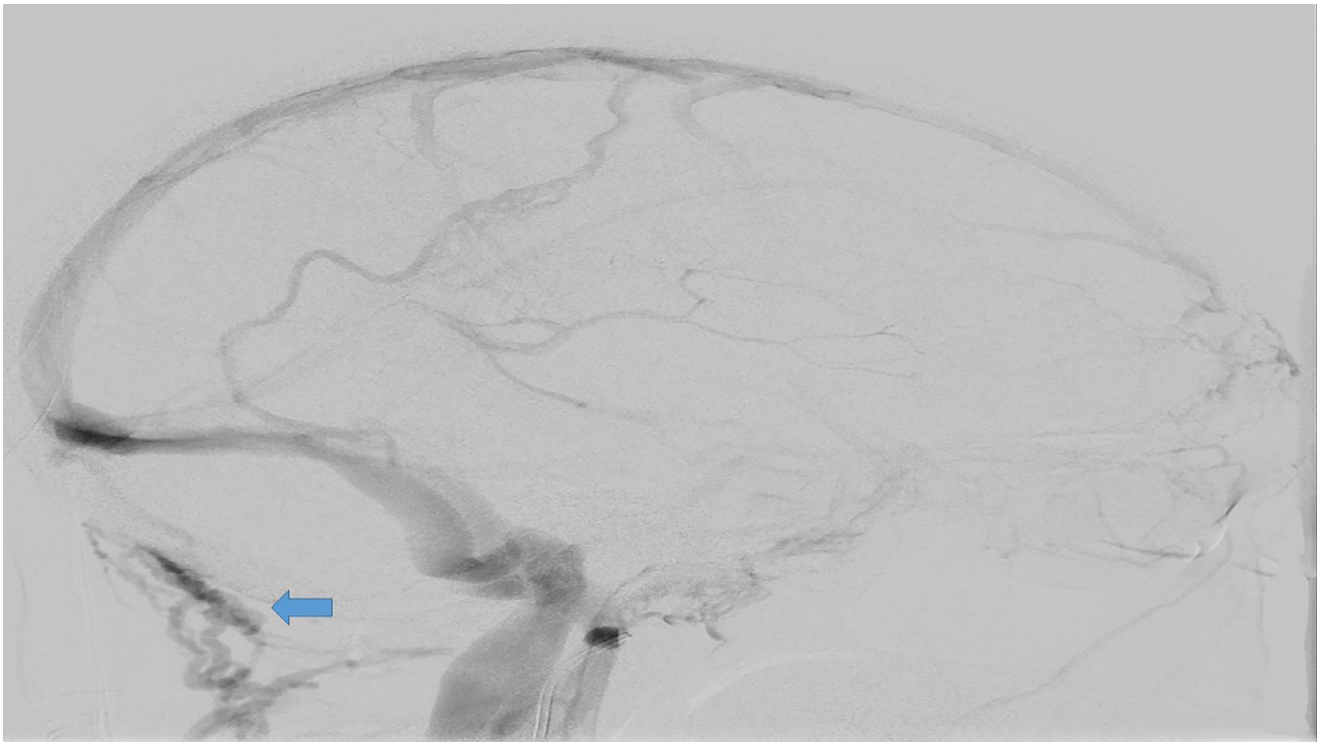

Fig. 6 – DSA in lateral projection showing venous varices at posterior aspect of the neck.

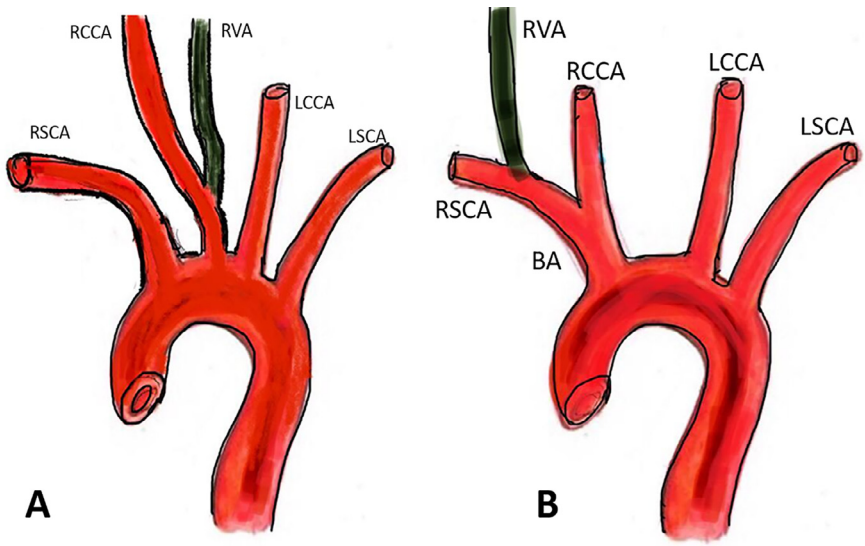

Fig. 7 – An illustration showing the described anomaly of the right vertebral artery arising from the right common carotid artery (A) in comparison to the usual arch anatomy where the right vertebral artery arises from the right subclavian artery (B). BA, brachiocephalic artery; LCCA, left common carotid artery; LSCA, left subclavian artery; RCCA, right common carotid artery; RSCA, right subclavian artery; RVA, right vertebral artery.

of brachiocephalic trunk, then curves back to reach the right side by passing mostly posterior to the esophagus, sometimes causing dysphagia [5,6].

Lemeke et al. reported 6 cases of RVA arising from the RCCA with a normal brachiocephalic trunk [7]. Lazaridis et al. also reported in their systematic review, a classification for vertebral arteries of variable origin. In the systematic review, there were 5 cases where the RVA originated from the RCCA with a present brachiocephalic trunk [8].

Conclusion

Vertebral artery anomalies are rare, notably in the right VA. They are and usually incidentally discovered during angiographic imaging of the head and neck, however, it is of extreme importance for preoperative planning of head and neck surgical intervention to avoid inadvertent arterial injury.

Patient consent

As per research policy in King Hamad university Hospital. A written informed consent was obtained from the patient on the date of 04/11/2020, confirming that the patient agrees on using the images of the investigations done for academic purposes only without disclosure of the patient's name or personal photo.

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