

Anomalous Origin of Left Vertebral Artery from Aortic Arch

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Abstract: The study reports the abnormal origin of the left vertebral artery from the aortic arch during routine dissection of a male cadaver aged about 40 years. The right vertebral artery originated from the subclavian artery and had normal course and branches. The left vertebral artery originated from the aortic arch between the origin of left subclavian and left common carotid artery. Thus, the aortic arch had four branches: left subclavian artery, left vertebral artery, left common carotid artery and brachiocephalic trunk. The diameter of the vertebral artery was smaller than the other branches of the aortic arch. The left vertebral artery had normal course upwards towards the foramen transversarium of the 6th cervical vertebra. The length of the prevertebral segment of the left vertebral artery was about 9 cm. Since the vertebral artery is important for the posterior cerebral circulation, the anatomic and morphologic variations of the left vertebral artery are significant for diagnostic and surgical procedures in the head and neck region. It is of clinical importance to know the origin and course of prevertebral segment of the vertebral artery in detail and being aware of the possible variations.

Key words: aortic arch, subclavian artery, variations, vertebral artery

I. Introduction:

The vertebral artery (VA) arises from the superior surface of the first part of the subclavian artery medial to the scalenus anterior muscle. The vessel takes a vertical posterior course to enter into the foramen transversarium of the sixth cervical vertebra. It continues through the transverse foramina of the cervical vertebrae and after passing through the transverse foramen of the atlas, turns posteromedially on its posterior arch, pierces the atlantooccipital membrane and the dura mater, respectively and then enters the foramen magnum [1, 2]. The segment of the VA from its origin at the subclavian artery to its entry into the respective transverse foramina is called the pretransverse or prevertebral segment [2]. Several researchers have reported anomalous origins of the VA such as from the aortic arch, between the left common carotid artery (LCCA) and left subclavian artery (LSA) or after LSA, from the thyrocervical trunk, from the brachiocephalic trunk (BT), from the common carotid artery, from the external carotid artery, from a common carotid trunk formed by LSA and left vertebral artery (LVA) [3–7]. Since the vertebral artery is important for the posterior cerebral circulation, knowing the variation of the origin of VA and its prevertebral course is of great importance for head and neck surgery [8] and vascular angiography.

II. Case Report:

During routine dissection of the branches of the aortic arch in a male cadaver aged about 40 years in the Department of Anatomy, SCB Medical College, Cuttack, we encountered a variation of the aortic arch giving off four branches: LSA, LVA, LCCA and BT (Fig. 1). The LVA originated from the aortic arch between the origins of the LCCA and the LSA. Diameter of the LVA was smaller than the other branches of the aortic arch. The LVA coursed upwards towards the foramen transversarium of the 6th cervical vertebra. The length of the prevertebral segment of the LVA was about 9 cm. The right vertebral artery (RVA) originated from the right subclavian artery. The artery entered the foramen transversarium of the 6th cervical vertebra. The length of the prevertebral segment of the RVA was about 5 cm.



Figure 1. Variant origin of left vertebral artery from the Arch of Aorta. (LCCA: left common carotid artery; LSA: left subclavian artery; BT: brachiocephalic trunk; *LVA: left vertebral artery)

III. Discussion:

Anatomic and morphological variations of the vertebral artery are of immense importance in surgery, angiography and all non-invasive procedures (Matula et al 1997). Literature shows the frequency of origin of the left vertebral artery from aortic arch in the range of about 1%-3% (Dasler and Anson, 1959). According to Bernardi and Deton (1975), the abnormal origin of vertebral artery “may favour cerebral disorders because of alterations in cerebral hemodynamics”. The prevertebral segment of vertebral artery is frequently affected with atherosclerosis (Vicko et al, 1999). Though the overall incidence of anomalous origin of prevertebral segment of vertebral artery is low, it is extremely important to be aware of these complications in patients with this anomaly. Also Nanthan & Seidal, 1993 had reported a left vertebral artery of aortic origin associated with retroesophageal right subclavian artery and thoracic duct terminating on right side, yet with normal origin of right vertebral artery. Komiyana et al, (2001) reported the incidence of arterial dissection of the vertebral artery of aortic origin and vertebral artery of subclavian origin. According to their studies left vertebral artery of aortic origin was associated with a significantly higher incidence of vertebral artery dissection than left vertebral artery of left subclavian artery origin and right vertebral artery of right subclavian origin [9].

Embryological Basis:

Usually the first part of vertebral artery develops from proximal part of dorsal branch of seventh cervical intersegmental artery proximal to postcostal anastomosis. The second part is derived from longitudinal communications of the postcostal anastomoses. In the present case left sixth dorsal intersegmental artery might have persisted as first part of vertebral artery hence left vertebral artery is arising from arch of aorta. According to Vorster et al, 1998, the proximal parts of the segmental arteries are exposed to longitudinal tension and bending due to caudal shifting of the aorta resulting in retarded blood flow and abnormal connections between longitudinal channels (vertebral artery) and subclavian artery or aorta.

IV. Conclusion:

It is important to be aware of this rare variation in the origin and course of left vertebral artery as it might have serious implication in surgical and angiographic procedures. Anomalous Vertebral Artery origin also represents a potential pitfall in diagnosing cerebrovascular injury. The accurate prospective radiological reporting of this anomaly is important, especially in the context of endovascular stent procedures of aortic arch lesions, as the left subclavian artery perfusion would in such cases depend on the subclavian steal phenomenon from a normal left vertebral artery. The presence of an anomalous left vertebral artery would require left subclavian re-implantation in such patients [10].

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