

Case Report:

Anomalous origin of vertebral artery from arch of aorta: A case report

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Abstract:

Knowledge of the great vessels of the aortic arch and their variations is important for both the endovascular interventionist and the diagnostic radiologist. Accurate knowledge of the normal and variant arterial anatomy of the vertebral artery is important for clinical procedures and vascular radiology. In the present case, a unilateral variation in the origin of vertebral artery was observed. The left vertebral artery took origin from the arch of aorta and entered the foramen transversarium of the fifth cervical vertebra. The right vertebral artery took origin from the right subclavian artery. The literature on the variations of the artery is studied and its clinical significance and ontogeny is discussed.

Keywords: vertebral artery

Introduction

The vertebral artery (VA) is clinically described as the first branch of the subclavian artery; however, multiple variations in the origin of that vessel have been reported in the literature[1]. The vertebral artery arises from the superior aspect of the subclavian artery, passes through the foramina of all cervical transverse processes except the seventh, curves medially behind the lateral mass of atlas, and then enters the cranium via the foramen magnum. At the lower border of pons, it joins its fellow to form the basilar artery. Occasionally, it may enter the bone at fifth, fourth, or seventh cervical transverseforamen [2]. An abnormal origin of the vertebral artery may favour cerebral disorders because of alterations in cerebral hemodynamicsand predispose the patient to intracranial aneurysms[3].Knowledge of the great vessels of the aortic arch and their variations is important for both the endovascular interventionist and the diagnostic radiologist. The variations of

vertebral artery remains most important in angiography and surgical procedures. This has become more important in the era of carotid artery stents, vertebral artery stents, and therapeutic options for intercranialinterventions[4]. The advances in the endovascular intervention in recent years has required more accurate knowledge and a greater understanding of the variation in great vessels. Anomalous variation in the vertebral artery (VA) is regarded as an embryonic maldevelopment, and its incidence is low[5].

Case report

During routine dissection of head and neck region in Kasturba Medical College, Manipal, we observed a unilateral variation in the origin of vertebral artery in a 45 year oldfemale cadaver. On the left side the VA was taking origin from the arch of aorta between the left subclavian artery and left common carotid artery as shown in Fig 1.It then coursed vertically upwards and entered the foramen transversarium of fifth

cervical vertebrae. On the right side the VA was arising from the right subclavian artery.

Discussion

Multiple variations in the origin of the VA have been reported in the literature, such as the VAs can arise from the aortic arch, the common carotid, or the internal or external carotid arteries. They also may have duplicate origin from the arch of aorta and the subclavian artery. The most frequent variation (2.4–5.8%) is the left VA arising directly from the aortic arch between the left common carotid artery and left subclavian artery [6]. In such cases, the VA generally enters the transverse foramen of C4–C5 rather than C6 [7]. On the other hand, aortic arch origin of the right VA is a rare anatomic variant[6].

In the other reported case, the left VA arose between the origins of the left common carotid and left subclavian arteries and the aberrant right VA arose from the descending aorta distal to the origin of the left subclavian artery [7].

Anomalous blood vessels are of common occurrence. They may be due (i) to the choice of unusual paths in the primitive vascular plexus, (ii) to the persistence of vessels normally obliterated, (iii) to the disappearance of vessels normally retained, and (iv) to incomplete development and to fusions and absorption of parts usually distinct [8]. The vertebral artery is an important vessel, which arises as a secondary development, on each side of the midplane, from a series of dorsal rami of dorsal intersegmental arteries belonging to the neck. These rami undergo longitudinal linkage just dorsal to the ribs (post costal anastomosis). All of the original stalks then atrophy except the most caudal one in the series. The resulting longitudinal vessel is the vertebral artery; it takes origin, along with the subclavian from the seventh intersegmental artery.

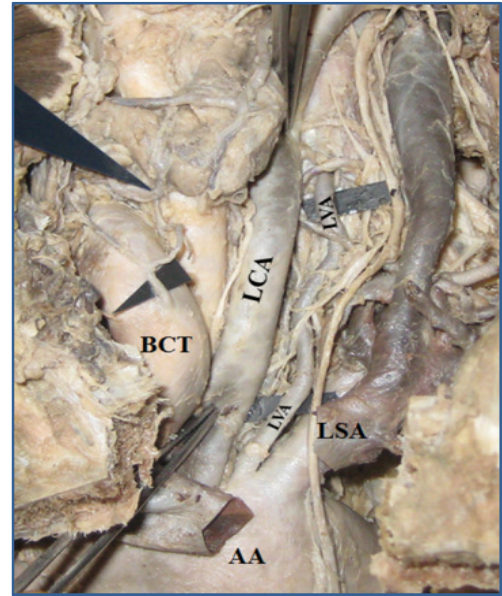
The seventh cervical intersegmental continues as the left subclavian and hence as the distal part of the right [8]. A left vertebral artery of aortic origin may be because of the persistence of the dorsal division of the left 6th intersegmental as the first part of the vertebral artery instead of that of the left 7th intersegmental artery, which seems to be the cause of variation in our case[9].

The VA enter the sixth cervical foramen in 88% cases, seventh in 5%, and fifth in 7% cases [10]. In another study, the artery is reported to enter 6th, 7th, 5th, and 4th cervical vertebrae in 94.9%, 0.3%, 3.3%, and 1.6% cases, respectively [11]. According to Gray's anatomy, the artery enters the foramen transversarium of the 6th cervical vertebra in 90% cases, while those of 7th, 5th, 4th, and 3rd in 2%, 5%, 2%, and 1% cases, respectively [2]. Without a thorough knowledge of anomalous origins of the great vessels, angiography can be difficult or impossible. If the vertebral arteries are not identified in their normal position, this finding can be misinterpreted as the vessels being congenitally absent. This information is important for vascular or cardiothoracic surgical planning. Anomalous origins may lead to altered hemodynamics and predispose the patient to intracranial aneurysm formation. Therefore, in patients with these anomalies, a thorough search for coexisting aneurysms should be undertaken. Endovascular therapy can be performed before they present clinically as subarachnoid haemorrhages[12]. Surgical procedures that would necessitate exposure of vertebral artery include repair of aneurysms, excisions of craniocervical junction masses, vertebral endarterectomy, vertebral artery bypass, and bony decompression of the vertebral artery. Also anatomical variations in vertebral artery if missed can lead to catastrophic sequelae in

surgeries like atlantoaxialtransarticular screw fixation, anterior cordectomy[13].

Figure 1 showing the origin of left vertebral artery from arch of aorta between the left subclavian artery and left common carotid artery.

BCT- brachiocephalic trunk, LVA-left vertebral artery, LCA-Left common carotid artery, LSA-Left subclavian artery, AA- arch of aorta.



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