

Research Article

A STUDY ON VARIANT ORIGINS OF VERTEBRAL ARTERY

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ABSTRACT

Vertebral artery is the first branch of subclavian artery. It is an important source of blood supply to the brain. Its injury may occur at the time of cervical fracture or dislocation. If the vertebral arteries are not found in their normal position, they may have a variant origin. The present study was done on thirty human full term fetuses to know the origin of vertebral arteries of both sides. During this we encountered two different variations on the left side. They are the dual origin of left vertebral artery (LVA) from the arch of aorta & the left subclavian artery and the aortic origin of LVA instead of left subclavian artery. A thorough understanding of anomalous vertebral arteries is very much important while performing diagnostic and interventional angiography.

Key Words: vertebral artery, subclavian artery, cervical vertebra, foramen transversarium.

INTRODUCTION

The vertebral artery begins in the root of the neck as the first branch of the subclavian artery (SA). It ascends in the neck to enter the cranial cavity to supply blood to the brain. The vertebral artery on both sides passes through the foramina transversaria (FT) of the first six cervical vertebrae, penetrate the posterior atlanto-occipital membrane and enter the cranial cavity through the foramen magnum. They unite at the caudal border of the Pons to form an unpaired basilar artery, which supplies the brain. A variation in the origin and distribution of the vertebral artery can cause alterations in cerebral hemodynamics that may predispose to aneurismal formation with a greater risk of cerebrovascular accidents (Bernardi 1975; Satti 2007). The knowledge of variations in vertebral artery is of great clinical interest to the neurosurgeon and radiologist for diagnostic investigation and surgical procedures of the neck. The present study showed anomalous origins of left vertebral artery which are clinically important.

MATERIALS AND METHODS

Thirty full term human fetuses were studied for variations in the origin of vertebral artery. Dissection was done on both sides of the neck region to detect the origin of vertebral artery.

RESULTS

In the present study, two different variant origins of vertebral arteries were found only on the left side. One was a rare variation of left vertebral artery, which had a dual origin from the arch of aorta (AA) and from the left subclavian artery. The branch of subclavian artery passed through the foramen transversarium of sixth cervical vertebra. The vertebral artery of aortic origin passed superficial to transverse process of sixth cervical vertebra. Later this branch joined with vertebral artery of subclavian origin at the level of C5-C6 to form a single trunk that passed through the foramen transversarium of fifth cervical vertebra. Rest of the vessel had a course of normal vertebral artery (fig. 1)

Another was a common variation, where the left vertebral artery arose as a third branch of aortic arch between left common carotid (LCC) and left subclavian artery (LSA) and entered into foramen transversarium of sixth cervical vertebra (fig. 2).

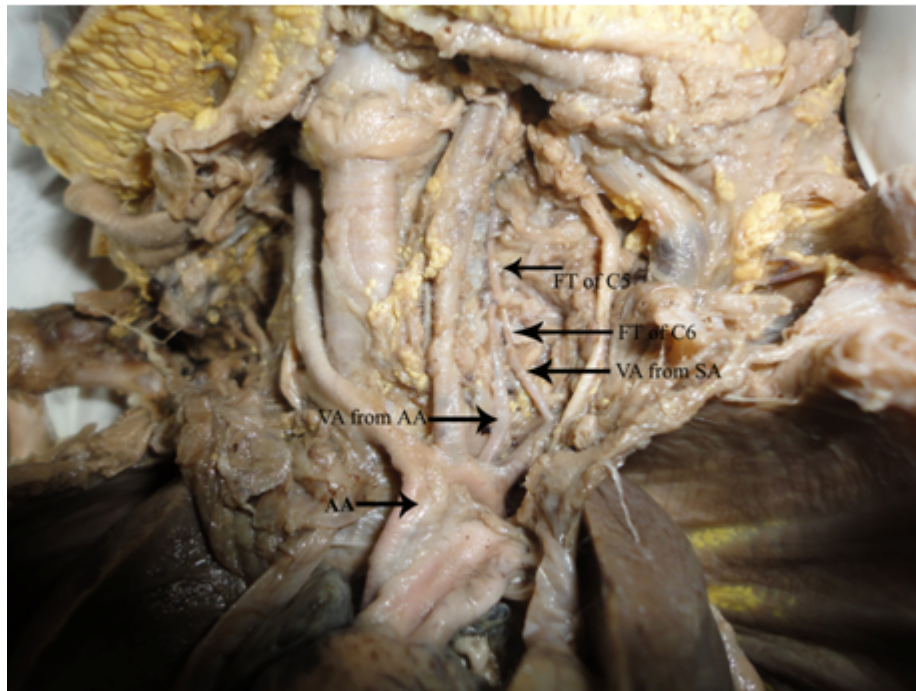


Figure 1: Dual origin of vertebra artery

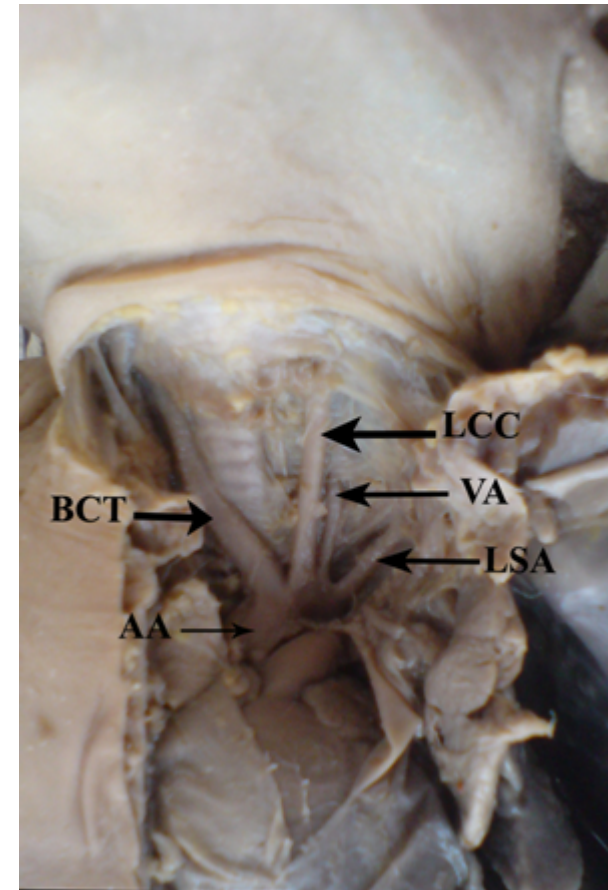


Figure 2: Vertebral artery from arch of aorta

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DISCUSSION

Embryologically the vertebral artery (VA) differs from other vessels and is characterised by great variety of malformations. The anomalous origins reported were vertebral artery of aortic arch between the LCC and LSA, after LSA, from the thyrocervical trunk, from the brachiocephalic trunk (BCT), from the common carotid artery, from the external carotid artery (Gluncic 1999, Yazar 2003, Strub 2006). The dual origin of vertebral artery from both the aortic arch and the left subclavian artery to form a distal common trunk is a rare condition (Thomas 2008).

Satti (2007) described the cervical vertebral artery variations and explained them embryologically. The variations described were left vertebral artery as the second branch of the left subclavian, a left vertebral artery with two origins, right vertebral artery arising as the last branch of the aorta, a right vertebral artery arising as the second branch of the right subclavian artery, and right vertebral artery with proximal duplication as the second branch of the right subclavian artery.

The dual origin of left vertebral artery like the variation of the present study had an increased incidence of associated injuries during intervention and it was due to dissociation of additional cervical intersegmental branches from the dorsal aorta followed by anastomosis of small vascular branches to form a common vertebral artery distally Satti (2007).

Cheng et al (2009) also mentioned this type of variation in his study on vertebral arteries. Nogueira (1997) found the dual origin of the left vertebral artery in the vertebral angiography of a 39-year old woman after being involved in a motor vehicle accident. The clinical significance of this rare anomaly is that it mimics as VA dissection in vertebral angiography.

The other variant of the present study was the left vertebral artery of aortic arch origin between left common carotid and left subclavian artery. This type of variant origin was reported by Komiyama (2001) as 2.4% and Yamaki (2006) as 5.8%.

The clinical importance of LVA of aortic arch origin is its higher incidence of vertebral artery dissection than LVA of left subclavian artery origin and right vertebral artery of right subclavian origin Yamaki (2006).

EMBROLOGY

In the developing embryo to vascularise the developing somites intersegmental branches of the dorsal aorta extend from the cervical to the sacral region. In the cervical region only the 7th intersegmental artery persists and the rest disappears. The first part of vertebral artery typically originates from the proximal part of dorsal branch of 7th cervical intersegmental artery. The second part of the vertebral artery derived from longitudinal communication between post costal anastomosis of cervical intersegmental arteries. The anomalous blood vessels are due to unusual paths in the primitive vascular plexus (or) due to the persistence of vessels normally obliterated (or) due to the disappearance of vessels normally retained (Arey 1957). In the present study, dual origin of vertebral artery is due to persistence of 6th cervical intersegmental artery along with 7th cervical intersegmental artery. So the 6th cervical intersegmental artery developed into vertebral artery of aortic origin and the 7th cervical intersegmental artery developed into vertebral artery of subclavian origin. This is followed by a longitudinal communication between these branches forming a common trunk.

The vertebral artery, only of aortic origin is due to persistence of 6th cervical intersegmental artery followed by disappearance of 7th cervical intersegmental artery which is supposed to form a normal vertebral artery of subclavian origin.

SUMMARY

Knowledge of different variations of vertebral arteries is very much important for the endovascular interventionist and the diagnostic radiologist. As it is the main source of blood supply to the brain, clinicians must be aware of its normal and abnormal origins. Rare anomalies of vertebral artery like dual origin might be misconstrued as a dissection of vertebral artery at the

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conventional angiography. Failure to recognize such an anomaly might result in nonindicated therapeutic intervention.

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