

ANOMALOUS ORIGIN OF LEFT VERTEBRAL ARTERY ARISING FROM THE ARCH OF AORTA AND ITS EMBRYOLOGICAL BASIS

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ABSTRACT

Background and Aim: Arterial disarrangements within the thorax are common and assume many diverse forms. The anatomic and morphologic variation of the origin and course of the prevertebral segment of the vertebral artery is necessary for vascular radiology, planning of aortic arch surgery or endovascular interventions. The present study is aimed at finding the origin and course of the left vertebral artery from the arch of aorta between left common carotid and left subclavian arteries.

Materials and Methods: Present study was done on six formalin fixed cadavers during routine dissection allotted for the first year students of Kanyakumari Government Medical College Asaripallam, Nagercoil. The direct dissection method was used. A comparative analysis was done with previous studies.

Result: Usually the vertebral artery arises from supero-posterior aspect of the first part of the subclavian artery. But in a 60 yrs old adult female cadaver showed a variation, that the arch of aorta gave off four branches in which the left vertebral artery arose as 3rd branch between the left common carotid and left subclavian arteries.

Conclusion: Variation observed in the study is in par with variation observed in previous studies. The knowledge about the variant origin of left vertebral artery is necessary for interventional radiologists and surgeons to avoid complications in the head and neck region.

KEYWORDS: Prevertebral segment, supero-posterior aspect of subclavian artery, arch of aorta.

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INTRODUCTION

Vertebral artery arises from the supero-posterior aspect of the first part of the subclavian artery. It passes through the foramina transversarium of all the cervical vertebrae except the 7th cervical vertebra. It curves medially behind the lateral mass of the atlas and enters the cranium by penetrating the posterior atlanto-occipital membrane and enters it through the foramen magnum. At the lower pontine border it joins its fellow to form the basilar artery. Occasionally it may enter the cervical vertebral column via C4, C5 or C7. This course along the vertebral

aspect of the brain stem [1].

The segment of vertebral artery from its origin & entry into the respective transverse foramina is called the prevertebral (or) pretransverse (or) V1 of the vertebral artery.

The proximal segments of the vertebral artery and the arch of aorta are common sites for atherosclerosis with clinical consequences for blood supply to the brain. Understanding the variation of the vertebral artery remains the most important in angiography and surgical procedures where an incompatible knowledge of anatomy may lead to complications.

MATERIALS AND METHODS

The present study was done by direct dissection method on 6 formalin fixed cadavers which were allotted for the first year students of Kanyakumari Government Medical College Asaripallam, Nagercoil. An anatomical variation was observed in a 60 yrs old female cadaver in whom the left vertebral artery originated from the left side of the arch of aorta as its 3rd branch between left common carotid and left subclavian arteries.

OBSERVATIONS

During routine dissection, in a 60 yrs old female cadaver the thoracic cavity was opened and the contents of the superior mediastinum were dissected. We observed all the branches arising from the arch of aorta starting from right to left are viz., the first branch was brachiocephalic trunk, the second branch was left common carotid artery, usually the third branch must be the left subclavian artery but in this specimen the left vertebral arose as a third branch and the fourth branch was left subclavian artery.

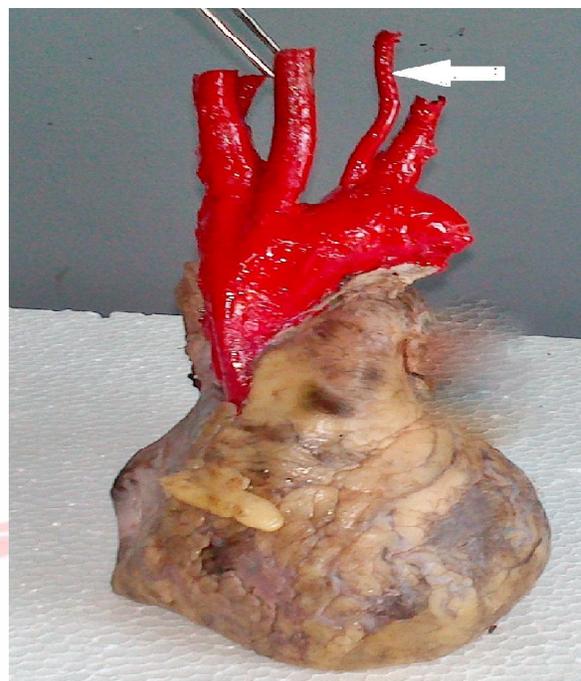
In this female cadaver the left vertebral artery instead of arising from first part of corresponding subclavian artery it arose directly from the arch of aorta between the left common carotid and the left subclavian arteries (16.67%). The prevertebral segment of the left vertebral artery had a straight course. No congenital variations were found.

In the same specimen the right vertebral artery had the usual origin arising from the supero-posterior aspect of the first part of the right subclavian artery and the prevertebral segment had a straight course.

Fig. 1: Anomalous origin of left vertebral artery (Bct- Brachiocephalic trunk; Lcc- Left common carotid; Lva- Left vertebral artery; Ls- left subclavian artery)



Fig. 2: ← indicates abnormal origin of left vertebral artery.



DISCUSSION

Henry Gray, J.G.B. Grant has reported that the vertebral artery arises from the first part of the subclavian artery. In the present study, 5 out of 6 specimens showed the usual origin of the vertebral artery arising from the first part of subclavian artery [1].

Jaideo Manohar Ughade and his co-workers had recorded that the left vertebral artery arose from the arch of aorta in a 50 yr old male cadaver out of 20 specimens[2].

Panicker and his teammates had recorded that the left vertebral artery arising from the arch of aorta in 1 out of 20 specimens (5%) dissected [3].

Ananthanarayana Iyer recorded that in 7 out of 828 bodies in which the left vertebral artery arose from the arch of aorta [4].

Anomalies in the origin of left vertebral artery in which it may arise from the arch of aorta in nearly 2.5% of the cases [5].

Komiyama M and et al. recorded that 4 out of 21 specimens dissected in which the left vertebral artery had an aortic origin [6].

Kubikova et al. recorded 1 out of 6 cadavers with left vertebral artery arising from the arch of aorta [7].

Ronald A Bergeman and his co-workers recorded

that 1.79% of the specimens out of 563 with the left vertebral artery arising from the arch of aorta [8].

Mange Manyama et al. had recorded that nearly 2.4-5.8% of the individuals had left vertebral artery arising from the aortic arch [9].

Beata Patasi and her teammates found that approximately 6% of the populations have left vertebral artery arising from the arch of aorta [10].

Sumit Tulshidas Patil et al. recorded that nearly 8% of the individuals presented with left vertebral artery arising from the arch of aorta [11].

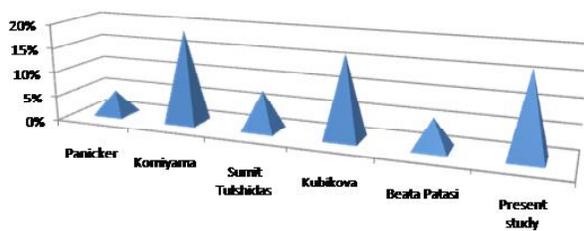
C Bhattarai and PP Poudel recorded that 6 out of 85 cadavers showed the direct origin of left vertebral artery from the arch of aorta [12].

Nurcan IMRE et al. recorded that in 2.5 % of the cases the left vertebral artery had an aortic origin [13].

Rajan Kumar Singla et al. suggested that nearly 3.1-8.3% of the individuals presented the direct origin of left vertebral artery from the arch of aorta [14].

V.Jayanthi et al. found that out of 20 cadavers 1 specimen showed the aortic origin of left vertebral artery [15].

Origin of left vertebral artery form aortic arch



Embryological Basis:

In the cervical region, the branches of somatic intersegmental arteries of successive segments became interconnected by formation of longitudinal anastomoses, which are formed in three situations, pre-coastal, post-coastal and post-transverse anastomoses.

The vertebral artery is formed by post-coastal longitudinal anastomoses during the 7-18mm embryonic stage (32-40 days). The longitudinal anastomoses is formed between the first and the seventh cervical intersegmental arteries.

The proximal segments of the intersegmental arteries except the seventh regresses. The main stem of the seventh intersegmental artery becomes subclavian artery and the longitudinal anastomoses becomes the vertebral artery arising from the subclavian artery.

The first part of the vertebral artery from its origin to its entry into the foramen transversarium of the 6th cervical vertebra is formed by the dorsal division of the seventh cervical intersegmental artery.

The second part of vertebral artery lying in the foramen transversarium of the 6th cervical vertebra to the 1st cervical vertebra is formed from the post-coastal anastomoses between the 1st to 6th cervical intersegmental arteries.

The third part of vertebral artery running transversely on the arch of atlas, is derived from the spinal branch of the 1st cervical intersegmental artery.

In the present case the left 6th dorsal intersegmental artery might have persisted as the first part of the left vertebral artery hence the left vertebral artery is arising from arch of aorta. Left vertebral artery not frequently springs from the arch of aorta arising from the left common carotid and the left subclavian arteries. That is evidently due to the absorption of the stem of the seventh intersegmental artery into aortic arch [3].

CONCLUSION

Variation observed in the study is in par with variation observed in previous studies. The knowledge about the variant origin of left vertebral artery is necessary for interventional radiologists and surgeons to avoid complications in the head and neck region.

Conflicts of Interests: None

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