

*Case Report*

Anomalous Aortic Origin of Left Vertebral Artery- A Case Report

Megha Rapotra, Joseph Abraham, Anshu Sharma

Department of Anatomy, Government Medical College and Hospital, Chandigarh, India.

Corresponding Author: Joseph Abraham

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ABSTRACT

Aim: The anatomical and morphological variation of origin and course of prevertebral segment of vertebral artery is necessary for cardiothoracic surgeries and endovascular interventions.

Materials and Methods: Present variation was found in formalin fixed adult cadaver in department of Anatomy, Government Medical College and Hospital, Chandigarh during routine dissection of thorax.

Results: Normally vertebral artery arose from subclavian artery. In present case left vertebral artery was arising from arch of aorta between left common carotid and left subclavian artery.

Conclusion: An understanding of variability of vertebral artery remains most important in angiography and surgical procedures in thorax, head and neck regions.

Key words- Arch of aorta (AOA), Brachiocephalic trunk (BCT), Common carotid artery (CCA) Left vertebral artery (LVA), Right vertebral artery (RVA), Vertebral artery (VA), Subclavian artery (SA).

INTRODUCTION

Vertebral artery is the first branch of subclavian artery on both sides. This artery ascends between longus colli and scalenus anterior muscle into foramen transversarium of 6th cervical vertebra. Then it ascends through the foramen transversarium of all the above cervical vertebra. It passes through neck and then enters cranial cavity. At the lower border of pons, it joins its fellow to form basilar artery. Anomalous origin of vertebral artery from various other sources like arch of aorta, brachiocephalic trunk and common carotid artery has been presented by different authors from time to time. Aortic origin of vertebral artery is rare.

[1] Detail knowledge of anomalous origin of supraaortic arteries is important in head and

neck surgery, in invasive procedures of neck and for patients who have to undergo four vessel angiography in an emergency. Knowledge of presence of this anomaly becomes even more important in era of carotid artery stunts, vertebral artery stunts and therapeutic options for intercranial interventions. [2]

MATERIALS AND METHODS

Present observation about anomalous origin of vertebral artery was made in an adult male cadaver during routine dissection in Department of Anatomy, Government Medical College and Hospital, Chandigarh. Both right and left arteries were observed for their origin, relation with esophagus, length and diameter.

RESULTS

Right vertebral artery was normal in origin from right subclavian artery and was lateral to esophagus. It was found that left vertebral artery originated from arch of aorta as an independent branch between left common carotid and left subclavian arteries and was posterolateral to esophagus. The measurements were done by using digital vernier caliper. Lengths of both vertebral arteries were measured from their origin to the point of entry into foramen transversarium of 6th cervical vertebra. The length was 78.6 mm on left side and 30.8mm on right side. The diameter of both vertebral arteries were also measured at two points, one at the origin and second just before the artery enters into foramen transversarium of 6th cervical vertebra. Diameter on the right and left side was 4.76mm and 3.76 mm respectively .The abnormal left vertebral artery was colored and photographed. (Fig 1)

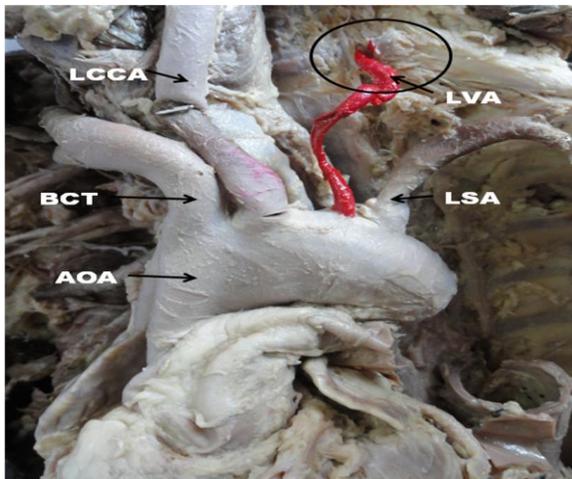


Fig 1:
 AOA : Arch of aorta
 BCT : Brachiocephalic trunk
 LCCA : Left common carotid artery
 LVA : Left vertebral artery
 LSA : Left subclavian artery

The origin of left vertebral artery from arch of aorta between left subclavian and left common carotid artery.

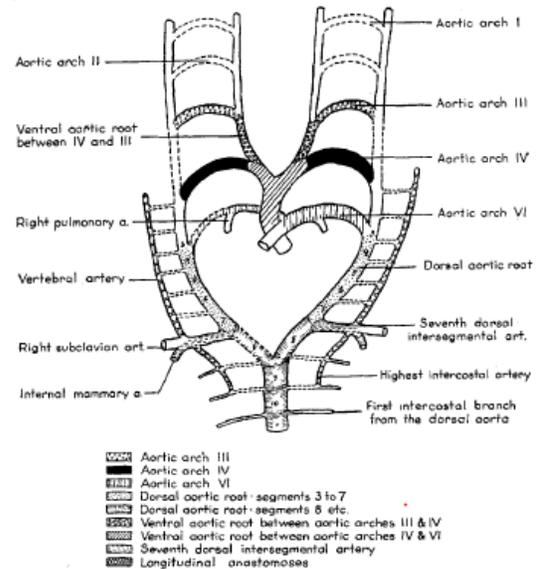


Fig 2: Schematic diagram indicating various components of embryonic aortic arch complex in human embryo. Components which do not normally persist in adult are indicated by broken outlines

Courtesy to- Alexander Barry

DISCUSSION

In humans, development of vertebral arteries begins at 7mm embryonic stage. In the cervical region, the branches of somatic intersegmental arteries of successive segments became interconnected by formation of longitudinal anastomosis, which are formed in three situations, precoastal, post coastal and post transverse anastomoses. The vertebral artery is formed by post coastal longitudinal anastomosis during the 7-18 mm embryonic stage (32-40 days). The longitudinal anastomosis 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 anastomosis becomes the vertebral artery arising from subclavian artery. The first part of the VA is formed by the dorsal division of the seventh cervical intersegmental artery. The second part of vertebral artery is formed from the post

coastal anastomosis between the 1st to 6th cervical intersegmental arteries. The third part of vertebral artery is derived from the spinal branch of the 1st cervical intersegmental artery. (Fig 2). [3-5]

Previous studies suggested left vertebral artery of aortic origin results from persistence of proximal part of 6th intersegmental artery as a prevertebral part of vertebral artery. [6-8] Others suggested it was persistence of 7th intersegmental artery. [9,10] 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. [11] In present case, VA arises from aortic arch, it was assumed that vertebral artery (1st part) originate from dorsal branch of 6th intersegmental artery instead of left 7th intersegmental artery. Hence it became a branch of arch of aorta. According to Mumma et al, aortic arch anomalies were also due to chromosomal 22 q deletion. [12]

Many variations have been documented in literature about the anomalous origin of vertebral artery from brachiocephalic trunk, right common carotid artery, left subclavian artery, right internal carotid artery and thyrocervical trunk. [9,13,14] Most common variation of left vertebral artery is, as a branch of aortic arch in approximately 80% of reported cases. Branching order in those cases from right to left side, right BCT, left CCA, LVA, and left SA. [15] Similar pattern has also been reported by Anson BV and Mcvay CB in 64.9%. [16]

Unilateral anomalous origin of vertebral artery has been reported by most of the authors. [7,9,14-18]

A single case with bilateral anomalous origin of vertebral artery was published, in which RVA originated from

right common carotid artery and LVA from common trunk with left subclavian artery. [13]

A study in Japanese population did not find sex difference in incidence of anomalous origin of left vertebral artery; [20] although in an Indian study anomalous origin of LVA was found in 5 out of 6 females and only single case of anomalous origin of left vertebral artery was seen in male. [18]

The incidence of anomalous origin of left vertebral artery has been noted as 2.4-5.8% . [20,21]

Some other cases of anomalous origin of left vertebral artery were mentioned in literature. The anomalous origin of left vertebral artery from arch of aorta was reported in 2.5 %, 1-3%, 5%, 1.79%, 2.4-5.8%, 6%, 8%, 3.1-8.3% of cases. [18,22,15,23,7,17,24-27] Single case of aortic origin of left vertebral artery had recorded. [2,28,29] Other authors reported the same in 4 cases , 6 out of 85 cases and 7 out of 828 cases. [30-32]

Left vertebral artery arising from arch of aorta between left common carotid and left subclavian arteries were found in 2.4-5.8 %, 4-6 % ,5% ,16.67% 28.6% cases. [15,14,2,3]

Vertebral arteries were usually unequal in size, the left being larger than right. [28] It was not applicable in present study as it was found the diameter of right vertebral artery was more (4.76mm) than left (3.76 mm). Some other authors reported, diameter of prevertebral part of left vertebral arteries were 2.5mm, 3.1mm and 5.51mm respectively. [33,7,6] According to Cruveilhier, left vertebral artery reduce to a small twig but the right vertebral artery being of a normal diameter.

In present study both vertebral arteries were entering into foramen transversarium of 6th cervical vertebra. In another study vertebral artery entered 6th

cervical vertebra in 88%, 7th cervical vertebra in 5%, and 5th cervical vertebra in 7%. [17] Another author reported the artery to enter 6th, 7th, 5th and 4th cervical vertebra in 94.9%, 0.3%, 3.3% and 1.6% cases respectively. [34] Therefore knowledge regarding anomalous origin and course of VA is necessary for surgeon to avoid complication in head and neck region.

Not only anomalous origin of right vertebral artery, but also its origin from various other arteries like arch of aorta in 9 cases and from carotid artery was observed. [21] It was found that, right vertebral artery originating from aortic arch in 9 cases, from brachiocephalic trunk in 3 cases, from right common carotid artery in 16 cases, single case from right internal carotid artery and 13 cases of right vertebral artery with double origin. [9] 2 cases with aberrant right vertebral artery were noted, out of which one is from thyrocervical trunk and the other from common carotid artery. [14] Origin of right vertebral artery from right common carotid artery was observed in 13.3 % and 0.18% cases. [19,35,36]

CONCLUSION

Knowledge of anomalous origin of vertebral artery is an important entity as it is responsible for the supply of major parts of the brain. Due to lack of thorough knowledge of anomalous origins of the great vessels, angiography can be difficult. 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 cardiothoracic surgery. [14] Present case resemble in origin given by Imre et al, Panicker et al, and Albayram et al and is probably resulted from persistence of proximal part of 6th intersegmental artery. [6-8]

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