

# Bilateral Variation in the Origin of Vertebral Artery

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## Abstract:

During routine dissection we encountered variations in relation to origin of vertebral artery bilaterally. On right side vertebral artery arise from brachiocephalic trunk and on left side vertebral artery arises from arch of aorta. Vertebral artery is an important part of the circle of willis and it is important to posterior cerebral circulation. Abnormal origin of vertebral artery “may favor cerebral disorders because of alterations in cerebral hemodynamics. An understanding of the variability of vertebral artery remains most important in angiography and surgical procedures where an incompatible knowledge of anatomy can lead to complications.

## Key Words:

Arch of aorta, Brachiocephalic trunk, Prevertebral segment, Vertebral artery

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## INTRODUCTION:

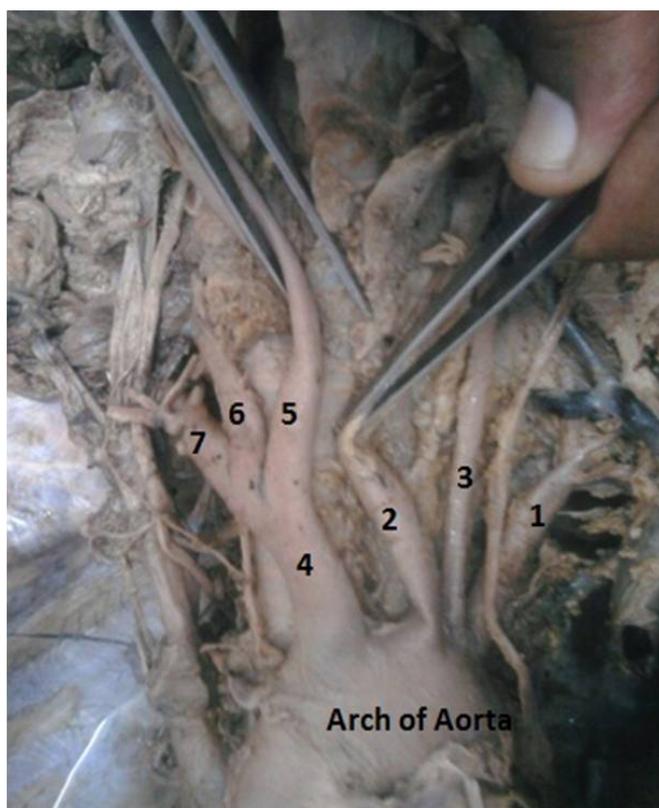
The vertebral artery is important to posterior cerebral circulation. According to the standard textbooks of anatomy, vertebral artery is the largest and most constant stem of subclavian artery, both in origin and distribution. It arises from the superior surface of the first part of the subclavian artery medial to the scalenus anterior muscle. The vessel takes a vertical posterior course to enter into the transverse process of the sixth cervical vertebra by passing through scaleno-vertebral triangle. 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]. The segment of the vertebral artery from its origin at the subclavian artery to its entry into the respective transverse foramina is called the pretransverse or prevertebral segment [2]. Both Vertebral arteries unite at the caudal border of the pons to form unpaired basilar artery. This vessel courses along the ventral aspect of the brainstem [3,4].

Arterial derangements within the thorax are common, complex and can assume many diverse forms. These derangements in origin and course of main vessels occurring either individually or in combination with other cardiovascular defects are mostly explainable on ontogenic basis, which can thus be blamed for a myriad of clinically relevant anomalies [5]. The major branches of arch of aorta are the great ways for blood supply to the head and upper limb, and are of particular interest in clinical angiography. The proximal segment of these branches and of the aortic arch is common sites for atherosclerosis with clinical consequences for blood supply to brain [6].

Anomalies of origin and distribution of these branches can cause changes in cerebral hemodynamic that may lead to cerebral abnormalities [7].

## CASE REPORT:

During routine cadaveric dissection for undergraduate students in the department of anatomy Sri B M Patil Medical College, Hospital & Research centre, BLDE University, Bijapur we found variation in the origin of vertebral artery bilaterally. Variations were dissected, examined & photographed. Variation include, Bilateral variation in the origin of vertebral artery: left vertebral artery originated directly from arch of aorta between the origin of left common carotid artery and left subclavian artery. The origins distance between the left vertebral artery and the neighboring arteries were 3 mm both medial and lateral side. Diameter of the left vertebral artery at its origin was 6 mm. The variant left vertebral artery coursed upward to the transverse foramen of cervical 6<sup>th</sup> vertebra. The length of the prevertebral segment of the variant left vertebral artery was 89 mm. The right vertebral artery originated directly from the brachiocephalic trunk, where in brachiocephalic trunk is terminated by trifurcating into three branches. The terminal branches are right common carotid artery, right vertebral artery and right subclavian artery. Diameter of right vertebral artery at its origin was 7 mm. The artery entered the transverse foramen of the cervical 6<sup>th</sup> vertebra. The length of the prevertebral segment of the right vertebral artery was 57 mm (fig -1).



**Figure 1** Bilateral variation in the origin of vertebral artery

1. Left subclavian artery,
2. Left Common Carotid artery,
3. Abnormal left vertebral artery,
4. Brachiocephalic trunk,
5. Right Common Carotid artery
6. Abnormal right vertebral artery
7. Right subclavian artery

#### DISCUSSION:

Vertebral artery is an important part of the circle of willis it is not simple; it is complicated, because of the interrelationship between the carotid and vertebral systems perfusion of the entire brain is dependent on this relationship and must be approached from this point of view.

Anatomical variations in the major vessels of have been reported earlier. The review of literature shows many variations. It is very common to find the variation in the origin of left vertebral artery especially from arch of aorta, but it is not common to find the bilateral variation in the origin of vertebral artery especially from brachiocephalic trunk. However, bilateral variation in the origin of vertebral artery has not been reported to the best of our knowledge.

The most common branching pattern of the aortic arch in humans comprises of three great vessels; first, the brachiocephalic trunk, then the left common carotid artery

and finally the subclavian artery. This pattern occurs in 65-80% of the cases [8]. The final configuration of the aortic arch and its branches is probably related to the associated "migration" and "merging" of the branches, together with the different growth rates in the various arteries [9]. The aortic arch anomalies are also associated with chromosome 22q11 deletion [10].

A study by Nayak et al reported the classical branching pattern of the aortic arch in which 91.4% of 62 cadavers, and the left vertebral artery arising from the arch of aorta in 1.6% of the cases. This anomalous branching pattern of the arch of aorta can be attributed to developmental changes in the fusion process and the absorption of some of the aortic arches into the aortic sac [11]. According to few research studies the frequency of origin of the left vertebral artery from the aortic arch was between 5.6 - 6% [12&13].

#### EMBRYOGENESIS

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 anastomosis with the consequent regression of the stems of the upper six intersegmental arteries. Third part develops from spinal branch of the first cervical intersegmental artery. Fourth part owes its development from the pre neural division of the spinal branch [1].

In left side the left sixth dorsal intersegmental artery might have persisted as the first part of vertebral artery hence left vertebral artery was arising from arch of aorta, but on the right side right limb of aortic sac might have terminated in short distance gives rise to trifurcation of brachiocephalic trunk.

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