A VARIABLE ORIGIN OF VERTEBRAL ARTERY

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Abstract: The vertebral artery is important to posterior circulation of brain. Accurate knowledge of the normal and variant arterial anatomy of the vertebral artery is important for vascular pathology and clinical procedures. In the present paper, a variation of vertebral artery on the left side arising from the arch of aorta has been reported. Further its embryological basis and applied aspects are discussed in detail.

Keyword: vertebral artery, variations, sub-clavian artery, arch of aorta.

INTRODUCTION:
The Vertebral artery (VA) is important to posterior circulation of brain. It arises from the supero- posterior aspect of the subclavian artery. It ascends back between the longus colli and scalenus anterior, behind the common carotid artery and vertebral vein. The segment of the Vertebral artery from its origin at the sub-clavian artery to its entry into respective transverse foramina is called pre-vertebral or pre-transverse segment. According to the standard textbooks of anatomy, vertebral artery is the largest and most constant stem of subclavian artery, both in origin and distribution. The left vertebral artery is dominant in approximately 50% of individuals, whereas the right one is dominant in 25% and they are of roughly equal caliber in the remaining (15). In 5% - 10% non dominant vertebral artery ends as the posterior inferior cerebellar artery and doesnot join the contralateral vertebral artery (7). The course and variability in origin of left vertebral artery (12) and its clinical importance in cerebral disorders clinically (16) and surgically (4) has been described. Its importance in head and neck surgery, angiography and arterial dissection (9) has also been mentioned in the literature.

CASE REPORT:
During the dissection of the branches of the aortic arch of a 57 years old male cadaver in the dissection hall at the institute of anatomy, Madurai medical college, it is found that the aortic arch gave off four branches, right brachio-cephalic trunk, left common carotid, left vertebral and left sub-clavian artery.
The left vertebral artery originated from the Aortic arch between the origins of the left common carotid and left sub-clavian. The origin distance between the left vertebral artery and left common carotid artery and left sub-clavian arteries were 4.01mm and 5.67mm. The diameter of the left vertebral artery at its origin was 6.13mm. The left vertebral artery coursed upward to the transverse foramen of the C5. The length of the prevertebral segment of the LVA was 9.2cm. The prevertebral segment of the left vertebral artery runs posterior to left brachiocephalic vein; lateral to the common carotid artery, vagus nerve, trachea and the esophagus; medial to the sub-clavian artery and phrenic nerve. It is crossed by thoracic duct and inferior thyroid artery. The left vertebral artery courses upwards to the transverse foramen of the C5 vertebra. The size of the right vertebral artery at its origin was 5.73mm. The right vertebral artery arises 13mm distal to the origin of the right subclavian artery and it enters the transverse foramen of C6 vertebra. The length of the prevertebral segment of the right vertebral artery was 5.3cm.

**DISCUSSION:** A vertebral artery of aortic arch origin has been earlier described by different authors in the range of 3.1% - 8.3% TABLE SHOWING INCIDENCE OF LEFT VERTEBRAL ARTERY OF AORTIC

The left vertebral artery is classified according to the origin from the Aortic arch(10) as; TYPE A: Between a Left common carotid artery and Left subclavian artery -3% TYPE B: Between a common trunk formed by Brachio-cephalic trunk & Left common carotid artery and Left subclavian artery -1% TYPE C: After the Left subclavian artery -1% TYPE D: After common trunk and Left subclavian artery as the third branch - 0.1% TYPE E: After a common trunk as a second branch -0.1% TYPE F: Different from type A, Right subclavian artery appears from descending aorta -0.1% TYPE G: One of the two roots as a penultimate branch -1% TYPE H: Both vertebral artery from the aortic arch -0.1% A variant origin of this kind, because of

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**PICTURE SHOWING RIGHT VERTEBRAL ARTERY ORIGIN FROM SUB-CLAVIAN ARTERY.**

BCT - BRACHIO-CEPHALIC TRUNK
RCCA - RIGHT COMMON CAROTID ARTERY
RSC - RIGHT SUB-CLAVIAN ARTERY
RVA - RIGHT VERTEBRAL ARTERY
LCCA - LEFT COMMON CAROTID ARTERY
LVA - LEFT VERTEBRAL ARTERY
LSC - LEFT SUB-CLAVIAN ARTERY

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alternations in the cerebral haemodynamics may favour cerebral disorder. The alternation in the pattern of blood flow, straight course, antigravity movement of the blood flow and relatively narrow lumen of the artery arising from a high pressure artery increases the incidence of the cerebrovascular disorders (4). The most frequent pathology affecting the extra cranial vertebral artery is atherosclerosis (6). The commonest site of which, according to Fischer et al (1965) (6) is at the origin of vessel from Subclavian artery. The prevertebral segment of vertebral artery is frequently affected with atherosclerosis (16). A left vertebral artery of aortic origin associated with Retro esophageal Right Sub-clavian artery and Thoracic duct terminating on right side, yet with normal origin of Right vertebral artery (12). Entrance point of the left vertebral artery originating from the aortic arch was also reported variable. Most common entrance points were reported as C5 & C6 respectively. Nevertheless, C6 reported as the most common entrance point. Overall, the most common entrance for vertebral arteries was at C6. Different levels of entry of the VA to the transverse foramen may also contribute to differences in hemodynamics. There had been reported a variation in the origin of vertebral artery, where the case was asymptomatic. Some patients complained of dizziness, however which was thought to have no connection to the anomalous origin of the vertebral artery (8).

**EMBRYOLOGICAL BASIS:** Normally, the first part of vertebral artery develops from the proximal part of dorsal branch of the 7th cervical intersegmental artery proximal to post-costal postcostal anastomosis. The anomalous blood vessels may be due to (2) 1) the choice of unusual paths in the in the primitive vascular plexus 2) the persistence of vessels normally obliterated 3) the disappearance of vessels normally retained 4) incomplete development 5) fusions and absorption of the parts usually distinct.

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<table>
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<tr>
<th>ORIGIN</th>
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<tbody>
<tr>
<td>BEAN (1965)</td>
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<tr>
<td>ADACHI (1928)</td>
<td>5.4%</td>
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<tr>
<td>NIZANOWSKI et al. (1962)</td>
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<td>CAVADAR &amp; ARISAN (1989)</td>
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<td>YORSTER (1998)</td>
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<td>PANICKER et al. (2002)</td>
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<td>YAMAKI (2006)</td>
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<tr>
<td>C4</td>
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<td>C5</td>
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<td>C7</td>
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There are two factors that influence the development of the branches of sub-clavian artery(17) 1) first ability of the blood to follow the longitudinal channels offering the least resistance 2) the tension on the vessels resulting from the caudal shifting of the heart of Aorta. In cases, where vertebral artery arises from aortic arch, the dorsal branch of 6th intersegmental artery itself and segment of dorsal aorta fail to disappear, so blood flow through these persist forming a vertebral artery of Aortic origin.

CONCLUSION:
Thus knowing the variation of the origin of the vertebral artery and its prevetebral course is of great importance for head and neck surgery angiography and diagnosis of cerebro – vascular diseases.

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