

## Case Report

# ANOMALOUS ORIGIN OF LEFT VERTEBRAL ARTERY

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## ABSTRACT

**Background:** To document the unusual origin of left vertebral artery from the arch of aorta and to discuss the embryological basis and clinico-anatomical correlation of such variation.

**Materials and Methods:** This finding was seen after thorough and meticulous dissection of the thorax in a 58 year old male cadaver in the department of anatomy, R.G.Kar Medical College.

**Results:** There was anomalous origin of the left vertebral artery from the arch of aorta whereas the right vertebral artery took its normal origin from right subclavian artery.

**Conclusion:** This anatomical variation can be explained in the light of embryological development. In addition knowledge of such variation is important for carrying out surgical procedures.

**KEYWORDS:** Left vertebral artery, Arch of aorta, Right vertebral artery.

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## BACKGROUND

The Vertebral artery (VA) arises from the superior surface of the first part of the Subclavian artery medial to the scalenus anterior muscle. The artery takes a vertical posterior course and then enters into foramen transversarium of the sixth cervical vertebra. This part of vertebral artery i.e from the origin to its entry into the respective transverse foramina is called Pretransverse or prevertebral segment [1]. After passing through the transverse foramen of the atlas it turns posteromedially on its posterior arch, pierces the atlantooccipital membrane and the duramater and then enters the foramen magnum [1,2].

Several anomalies are noted regarding the origin of vertebral artery. It may arise from the aortic arch between the left common carotid artery and the left subclavian artery

or after left subclavian artery. It may also take origin from the thyrocervical trunk, from the brachiocephalic trunk, from the common carotid artery, from the external carotid artery or from a common carotid trunk formed by the left subclavian artery and the left vertebral artery [3,4].

Anomalous origin of the Right vertebral artery arising as the last branch of Aortic arch has also been identified in the anatomical laboratory during routine cadaver dissection in Japan [5]. There was also a study which reported a case of four vessel aortic arch with right carotid, left carotid right subclavian and left subclavian arteries were identified along with right vertebral artery originating from right common carotid artery.

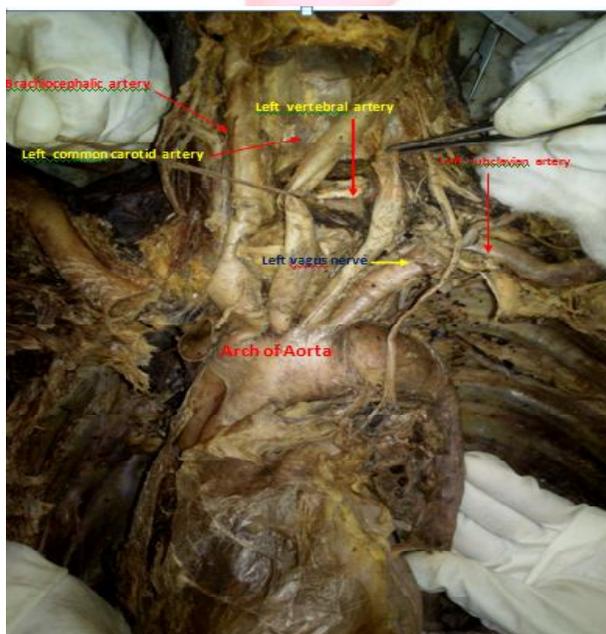
Knowledge regarding the variation of the origin of vertebral artery and its prevertebral course

is of great importance for head and neck surgery and vascular angiography.

### CASE REPORT

Presenting variation found during routine dissection of the aortic arch of a 58 year old male cadaver in the department of anatomy, R.G.Kar Medical College. It was seen that the left vertebral artery took its origin as the direct branch from the aortic arch. The aortic arch itself coursed normally but the left vertebral artery originated directly from the arch in between left common carotid and left subclavian artery. The left vertebral artery passed upwards and then entered into the transverse foramen of the sixth cervical vertebra. But the origin of the right vertebral artery and its course was normal.

**Fig. 1:** Origin of Left Vertebral Artery from Arch of Aorta.



### RESULTS AND DISCUSSION

Anatomic and morphologic variations of the Vertebral Artery has immense importance in surgery, angiography and in all non invasive procedures.

Normally the vertebral artery arises from supero-posterior aspect of the subclavian artery. Then it passes through the foramina of all cervical transverse processes except the seventh and curves medially behind the lateral mass of atlas and then enters into the cranium via foramen magnum. At the pontine border it joins with its fellow of opposite

side to form the basilar artery. Occasionally it may enter the bone at the 4<sup>th</sup>, 5<sup>th</sup> or 7<sup>th</sup> transverse cervical foramen.

There are about 20 case reports describing an aberrant right subclavian artery (ARSCA) and an anomalous origin of the right vertebral artery from right common carotid artery.(right VA-CC) [6]

According to the study done by Gluncic V, Ivkic G, Marin D, and Percac S the unusual origin of both the vertebral arteries in a single cadaver has been documented. Left vertebral artery arises directly from the common trunk of vertebral and subclavian artery at the aortic arch and enters the transverse cervical foramen at C-4 level. Right vertebral artery arises from the right common carotid artery and enters the transverse cervical foramen at C-3 level [7].

Cheng M, Xiaodong X, Wang C, et al reported a case where they noticed the double origin of the left vertebral artery from the left subclavian artery and the aortic arch [8].

Common trunks of the vertebral and the subclavian arteries has been demonstrated by cardiac catheterization [9]. Angiography also demonstrated an anomalous origin of the left common carotid artery sharing a common trunk with the innominate artery and a large right vertebral artery arising from the right common carotid artery [10].

Contrast enhanced CT has also revealed anomalous origin of both the vertebral arteries from the aortic arch distal to the origin of left subclavian artery which was later confirmed by CT angiography [11].

Rare variation of the left common carotid artery and the right vertebral arteries originating from the brachiocephalic trunk and the left vertebral artery arising from arch of aorta, proximal to the origin of the left subclavian artery has been reported [12].

There was another case reported by Nanthan [13] in the year of 1983 where they found the aortic origin of left vertebral artery associated with retroesophageal right subclavian artery. They also noticed the termination of thoracic duct on right side but the right vertebral artery took normal origin.

**Embryological Explanation:**

Every anomaly in the vascular anatomy can be related to genesis, regression or persistence of one or other segment of the embryologic artery. In that case also one of these things could take place. The intersegmental arteries are the branches of the dorsal aorta. They originate from the branchial system. Initially the vertebral artery is formed by the longitudinal anastomosis of the cervical segmental arteries. Usually the first part of VA develops from the proximal part of dorsal branch of 7<sup>th</sup> cervical intersegmental artery proximal to post costal anastomosis. The second part is derived from the longitudinal communication of the post costal anastomosis. In the present case the left 6<sup>th</sup> dorsal intersegmental artery might have persisted as the 1<sup>st</sup> part of VA

**Clinical Importance:**

Abnormal origin of the vertebral artery may give rise to a wide variety of symptoms ranging from mild dizziness, headache to disturbed cerebral circulation resulting into intra-cranial haemorrhage.

The true value of detecting anomalous origin is of diagnostic value before vascular surgery of supra-aortic arteries and endovascular interventions [14].

Anomalous origin of vertebral artery is also of diagnostic importance during CT angiography, MR angiography and Doppler sonography.

Anomalous origin may be a risk factor for the development of saccular aneurysm at the origin of posterior communicating artery, with increased haemodynamic stress or vertebro-basilar insufficiency [15].

The vertebral artery may be in close spatial relation with the thyroid gland. During aspiration of thyroid gland the needle may inadvertently injure the VA.

Detailed knowledge of the origin, course and relation of vertebral artery is especially important in case of anterior cervical spine surgery [6].

For patients undergoing 4 vessel angiography anomalous origin of the branches of arch of

aorta is very important This anomalous origin of vertebral artery through the foramen transversarium other than C-6 may present with the features of hypotension, bradycardia and quadriplegia in a patient with history of fall from the height and fracture of C-3, C-4 vertebrae. This case was reported by some previous authors.

According to Bemardi and Deton [16] the abnormal origin of vertebral artery may favour cerebral disorders because of alterations in cerebral haemodynamics.

In the year 1999 Vicko [17] reported that the prevertebral segment of vertebral artery is frequently affected with atherosclerosis. Though this anomaly is rare but it is extremely important to be aware of this complication in a patient with this anomaly.

According to previous studies the left vertebral artery of aortic origin was associated with a significantly higher incidence of vertebral artery dissection than left vertebral artery of left subclavian artery origin and right vertebral artery of right subclavian artery origin [18].

**CONCLUSION**

We hope that our study has provided valuable data to the clinicians and anatomists by enhancing their knowledge regarding the variation of the origin of the Vertebral artery as it might have serious implications in surgery and angiographic procedures.

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**Conflicts of Interests: None****REFERENCES**

- [1]. Matula C, Trattig S, Tschabitscher M, Day JD, Koos WT. The course of the prevertebral segment of the vertebral artery: anatomy and clinical significance. *Surg Neurol.* 1997; 48: 125–131.
- [2]. Moore KL. *The Developing Human. Clinically Oriented Embryology.* 3<sup>rd</sup> Ed. WB Saunders, Philadelphia. 1982; 291–318.
- [3]. Strub WM, Leach JL, Tomsick TA. Left vertebral artery origin from the thyrocervical trunk: a unique vascular variant. *AJNR Am J Neuroradiol.* 2006; 27: 1155–1156.

- [4]. Yazar F, Yalcin B, Ozan H. Variation of the aortic arch branches: Two main trunks originating from the aortic arch. *Gazi Medical Journal*, 2003; 14:181–184.
- [5]. Higashi N, Shimada H, Simamura E, Hatta T. Right vertebral artery as the fourth branch of the aortic arch. *Anat Sci Int*. 2008 Dec; 83(4): 314-8.
- [6]. Park JK, Kim SH, Kim BS, Choi G. Two Cases of Aberrant Right Subclavian Artery and Right Vertebral Artery that Originated from the Right Common Carotid Artery. *Korean J Radiol*. 2008 July; 9(Suppl): S39–S42.
- [7]. Gluncic V, Ivkic G, Marin D, Percac S. Anomalous origin of both vertebral arteries. *Clin Anat*. 1999; 12: 281–284.
- [8]. Cheng M, Xiaodong X, Wang C, You C, Mao B, He M, Zhang C. Two anatomic variations of the vertebral artery in four patients. *Ann Vasc Surg*. 2009; 23(5): 689.e1-5.
- [9]. Cetin I, Varan B, Orün UA, Tokel K. Common trunks of the subclavian and the vertebral arteries: presentation of a new aortic arch anomaly. *Ann Vasc Surg*. 2009; 23(1): 142-3.
- [10]. Chahwan S, Miller MT, Kim KA, Mantell M, Kirksey L. Aberrant right subclavian artery associated with a common origin of carotid arteries. *Ann Vasc Surg*. 2006; 20(6): 809-12.
- [11]. Goray VB, Joshi AR, Garg A, Merchant S, Yadav B, Maheshwari P. Aortic arch variation: a unique case with anomalous origin of both vertebral arteries as additional branches of the aortic arch distal to left subclavian artery. *AJNR Am J Neuroradiol*. 2005; 26(1): 93.
- [12]. Shiva Kumar GL, Pamidi N, Somayaji SN, Nayak S, Vollala VR. Anomalous branching pattern of the aortic arch and its clinical applications. *Singapore Med J*. 2010; 51(11): e182-3.
- [13]. Nanthan H and Saidel M.R. The association of a retroesophageal right subclavian artery, a right sided terminating thoracic duct and a left vertebral artery of aortic origin. *Anatomical and Clinical considerations*. *Anatomica* 1983; 117: 363-373.
- [14]. Albayram S1, Gailloud P, Wasserman BA. Bilateral arch origin of the vertebral arteries. *AJNR Am J Neuroradiol*. 2002; 23(3): 455-8.
- [15]. Jayanthi V, Prakash, Devi MN, Geethanjali BS, Rajini T. Anomalous origin of the left vertebral artery from the arch of the aorta: review of the literature and a case report. *Folia Morphol (Warsz)*. 2010; 69(4): 258-60.
- [16]. Bemardi L, Deton P. Angiographic study of a rare anomalous origin of the vertebral artery. *Neuroradiology* 1975; 9: 43-47.
- [17]. Vicko G, Goran I, Damjan M and Sanja P. Anomalous origin of both vertebral arteries. *Clinical Anatomy* 1999; 12: 281-284.
- [18]. Komiyana M, morikawa T, nakajiman H et al. High incidence of arterial dissection associated with left vertebral artery of aortic origin. *Neurology Medical Chir (Tokyo)* 2011; 41(1): 8-11.

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