

Case Report

Abnormal origin of the left vertebral artery: A case study

Radhakrishna Shetty K^{*}, Shivarama C.H., Dinesh S.M. and Avadhani R.

Department of Anatomy, Yenepoya Medical College, Deralakatte, Mangalore, Karnataka, India.

***Correspondence Info:**

Dr. Radhakrishna Shetty K.

Department of Anatomy,

Yenepoya Medical College,

Deralakatte, Mangalore, Karnataka, India.

E-mail: anatradsadr@gmail.com

Abstract

In this paper we are presenting an anatomical variation of the left vertebral artery originating from the arch of aorta. This variation was found in one of the male cadaver during routine dissection while teaching for UG students. In this case we found four branches arising from arch of aorta. First branch on the right side was brachiocephalic trunk with two branches, namely right common carotid artery and right subclavian artery. The second branch was the left common carotid artery, the third branch was the left vertebral artery and fourth one was left subclavian arteries. We traced the branches and confirmed them by their course.

Keywords: Arch of aorta, Brachiocephalic trunk, Carotid artery, Subclavian artery.

1. Introduction

Normally vertebral arteries are the first branches of the subclavian arteries¹. The vertebral arteries arise at the level of the upper part of the sternoclavicular joint. This artery ascends between longus colli and scalenus anterior muscle into the foramen transversarium of the sixth cervical vertebra. It passes through the neck and then enters the cranial cavity¹. The two vertebral arteries are usually unequal in size and the left is frequently larger than right one^{2,3}. The vertebral arteries pass through the foramina transversarium of the first six cervical vertebrae on both sides, which penetrate the posterior atlanto-occipital membrane and enter the cranial cavity through the foramen magnum². On reaching the anterior surface of the medulla oblongata of the brain at the level of the lower border of pons, it joins the vessel of the opposite side to form the basilar artery⁴.

Kim *et al.*⁵ studied two rare cases with anomalous vertebral artery had retroesophageal right subclavian artery. Among these two Korean cases, one patient had a right vertebral artery arising from the right common carotid artery, and a left vertebral artery originating from the third branch off the aorta. Both vertebral arteries ascended anteriorly to the transverse foramen of cervical vertebra 5 to cervical vertebra 6 and entered the transverse foramen of cervical vertebra 4. The other patient had a right vertebral artery arising from the right common carotid artery and entering the transverse foramen of cervical vertebra 5⁵. In the recent study an abnormal origin of a left inferior thyroid artery from the left vertebral artery that in turn originated from the aortic arch was observed on a 72-year-old Caucasian male cadaver⁶.

The different variations of the branches arising from the arch of aorta are well known and documented by several authors². However, here we are presenting our case with four branches of arch of aorta.

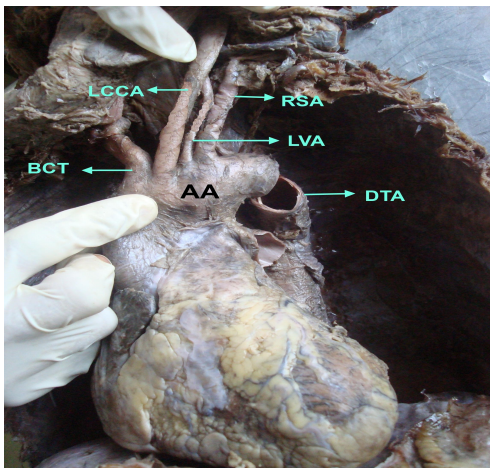
2. Case

The present observation was made during routine dissection class for UG students in department of anatomy,

Yenepoya medical college, Karnataka, India. We found a variation in the origin of left vertebral artery in a 60-year old male cadaver. The variation during dissection of thoracic region and then dissected the head and neck region to trace the branches arising from arch of aorta. We spotted all the branches of the arch of aorta, starting from right to left. The first branch on the right side was brachiocephalic trunk with two branches, namely right common carotid artery and right subclavian artery. The second, third, fourth branches were left common carotid artery, left vertebral artery and left subclavian artery respectively. This is confirmed by tracing the branches raised by the arch of aorta along with course of the branches. The left vertebral artery originated from aortic arch was located between the origins of the left common carotid and left subclavian arteries (Fig.1). No other variations were found in the region of head, neck and thorax. Here we are showing structural variations in the heart with arch of aorta.

2.1 Photograph of dissected part

Fig 1: Anterior view of the dissected heart showing abnormal origin of left vertebral artery from arch of aorta (AA)



BCT: Brachiocephalic trunk
 LCCA: Left common carotid artery
 LVA: Left vertebral artery
 LSA: Left subclavian artery
 DTC: Descending thoracic aorta.

3. Discussion

Normally three branches arise from the arch of aorta and they are: brachiocephalic trunk, left common carotid artery and left subclavian artery⁷. Brachiocephalic trunk is the first and the largest branch of arch of aorta and the left common carotid artery arises immediately to the left of the brachiocephalic trunk⁸. The left subclavian artery arises further to the left and more posterior than the other branches⁸. However, the two different studies showed 4% and 6% of the population had the left vertebral artery arise from the arch of aorta between left common carotid and left subclavian artery⁹.

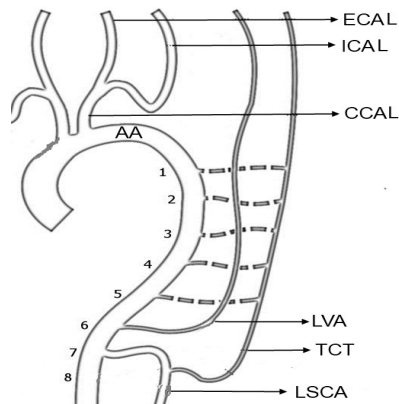
The left vertebral artery may arise directly from the left common carotid artery, from the root of the left subclavian artery, and may arise from the arch of aorta^{2,7}. According to few research studies the frequency of origin of the left vertebral artery from the aortic arch was 5.6%². The right vertebral artery can arise from the first part of the right subclavian artery (1% cases), directly from the arch of aorta (3%), from right common carotid artery or from brachiocephalic trunk^{9,10}.

In the present case we found the left vertebral artery arising from the upper surface of the arch of aorta and it was located between the origins of the left common carotid and left subclavian arteries.

3.1 Embryology

Normally first part of vertebral artery develops from dorsal division of 7th intersegmental artery which itself forms proximal part of left subclavian artery. The 6th intersegmental artery and its dorsal division usually disappear as does the segment of dorsal aorta (Fig. 2).

In the present case, where vertebral artery arises from aortic arch, we feel that dorsal branch of 6th intersegmental artery as the first part of the vertebral artery instead of left 7th intersegmental artery^{3,11}. Hence, blood flow through these persists forming a vertebral artery of aortic arch origin¹².

Figure 2: Embryology of vertebral artery of aortic arch.

ECAL: External carotid artery left
 ICAL: Internal carotid artery left
 CCAL: Common carotid artery left
 LVA: Left vertebral artery
 TCT: Thyro Cervical Trunk
 LSCA: Left subclavian artery

The origin of the left vertebral artery reported globally from different authors with a range of 3.1%–8.3%^{1,12}. 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^{1,3}.

4. Conclusion

So far the available evidences not showed any symptoms related to anatomical variation in the vertebral artery. However, rarely some patients with clinical symptoms like dizziness, the association with this symptom is not known. The study of these anatomical variations is important for vascular surgeries. To know the exact cause for these anatomical variations, further molecular studies on developmental pathways to be conducted.

References

1. Satti SR, Cerniglia CA, Koenigsberg RA. Cervical vertebral artery variations: an anatomic study. *AJNR Am J Neuroradiol* (2007) 28(5):976-80.
2. Patasi B, Yeung A, Goodwin S, Jalali A. Anatomical variation of the origin of the left vertebral artery. *International Journal of Anatomical Variations* (2009) 2:83–85.
3. Sikka A, Jain A. Bilateral variation in the origin and course of the vertebral artery. *Anat Res Int* (2012) 2012:580765. doi: 10.1155/2012/580765.
4. Richard SS. *Clinical Anatomy By Regions. 8th Ed., Lippincott Williams & Wilkins* (2008) 751.
5. Kim YD, Yeo HT, Cho YD. Anomalous variations of the origin and course of vertebral arteries in patients with retroesophageal rightsubclavian artery. *J Korean Neurosurg Soc* (2009) 45(5):297-299. doi: 10.3340/jkns.2009.45.5.297.
6. Natsis K, Didagelos M, Nossios G, Adamopoulou A, Nikolaidou E, Paraskevas G. Combined anomalous origin of a left inferior thyroid artery and a left vertebral artery: a case report. *Cases J* (2009) 2:7400. doi: 10.1186/1757-1626-2-7400.
7. Manyama M, Rambau P, Gilyoma J, Mahalu W. A variant branching pattern of the aortic arch: a case report. *J Cardiothorac Surg* (2011) 6:29. doi: 10.1186/1749-8090-6-29.
8. Romanes GJ. *Cunningham's Manual Of Practical Anatomy. 15th Ed. 2nd Volume., Oxford University press* (2007) 59.
9. Koenigsberg RA, Pereira L, Nair B, McCormick D, Schwartzman R. Unusual vertebral artery origins: examples and related pathology. *Catheter Cardiovasc Interv* (2003) 59:244–250.
10. Kubikova E, Osvaldova M, Mizerakova P, El Falougy H, Benuska J. A variable origin of the vertebral artery. *Bratisl Lek Listy* (2008) 109:28–30.
11. Shhadeh A, Sair HI, Kanamalla US. Bifid direct aortic arch origin of left vertebral artery: a unique vascular variant. *J Vasc Interv Radiol* (2007)18(8):1051-1053.
12. Singla RK, Sharma T, Sachdeva K. Variant origin of left vertebral artery. *International Journal of Anatomical Variations* (2010) 3:97–99.