Anomalous Origin and Course of Left Vertebral Artery with its Clinical Significance - A Case Report

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Abstract

Vertebral arteries are the first branch of subclavian arteries one on each side which forms important source of blood supply to posterior aspect of brain. Adequate knowledge of arterial anomalies of vertebral arteries is necessary for clinicians or surgeons as its injury may occur during fracture or dislocation of cervical vertebrae. The present case was observed during routine dissection of thorax in the Department of Anatomy. Multiple variations of left vertebral artery (LVA) were observed in male cadaver; variant origin from arch of aorta, entry of LVA through foramen transversarium of C5, LVA artery dividing into 2 divisions in the space between C2 and C3, no foramen transversarium on left side in C1. The case demonstrated fenestrated variation in VA at the craniovertebral junction and an anomalous origin. Variations in VA at craniovertebral junction may influence treatment options for upper cervical spine pathologies. Knowledge of these variations can help surgeon to plan necessary interventions. The variation is explained on embryological basis.

Keywords: Vertebral Artery; Variation; Intersegmental Artery; Foramen Transversarium

Abbreviations

BCT: Brachiocephalic Trunk; LCCA: Left Common Carotid Artery; LVA: Left Vertebral Artery; LSCA: Left Subclavian Artery; RVA: Right Vertebral Artery; BA: Basilar Artery; FIA: First Intersegmental Artery; VA: Vertebral Artery; PICA: Posterior Inferior Cerebellar Artery. (In figure 1, 2 and 3 A: Persistent first intersegmental artery, B: Small division of vertebral artery passing through bony canal, C: 1st cervical spinal nerve, D: Posterior arch of atlas)

Introduction

Vertebral artery (VA) arises from the superoposterior aspect of the first part of the subclavian artery. It passes through the foramina transversaria of all the cervical vertebrae except the seventh, curves medially behind the lateral mass of the atlas and enters the skull via foramen magnum. The artery joins its fellow to form the basilar artery (BA) at the lower pontine border. Each VA is divided into four parts. The segment of the artery from its origin to its entry into foramen transversarium of 6th cervical vertebra is called V1 segment, part of the artery which passes through the transverse foramina of 6th cervical to 2nd cervical vertebrae for better protection is V2 segment, part which lies over the arch of atlas is V3 or Sub-occipital segment and part which enters foramen magnum is V4 segment [1]. Vertebral artery
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Can arise from many sources such as from the arch of aorta, between the left common carotid artery and left subclavian artery or after left subclavian artery, from the thyrocervical trunk, from the brachiocephalic trunk, from the common carotid artery, from the external carotid artery, from a common carotid trunk formed by left subclavian artery and left vertebral artery. Left vertebral artery (LVA) arising from arch of aorta is described with a frequency of 2.5 to 5.8% in cadaveric specimens [2]. It is important to recognize such variants to avoid any complications during head and neck surgery, supra-aortic arch surgery and non-invasive vascular procedures [3]. Developmentally, Vertebral arteries are formed by the longitudinal anastomoses which link the intersegmental arteries in the cervical region. Eventually the longitudinal anastomoses regresses except for the seventh, which is called proximal part of subclavian artery including the point of origin of the adult VA [4].

Case Report

The present variant related to origin and course of left vertebral artery was observed in the Department of Anatomy, Sree Narayana Institute of Medical Sciences, Ernakulam, India. During routine dissection of thorax to expose branches of arch of aorta for first year MBBS students four branches were observed from right to left; brachiocephalic trunk, left common carotid artery, accessory branch and left subclavian artery (Figure 1). The accessory branch was traced into the neck where it entered the foramen transversarium of 5th cervical vertebra. This accessory branch from arch of aorta was identified as left vertebral artery (LVA). Left vertebral artery aroused from the arch of aorta instead of from 1st part of left subclavian artery. LVA passed through foramen transversarium of 5th cervical vertebra instead of 6th cervical vertebrae, the artery split into two branches: smaller branch passed through a bony tunnel in the posterior arch of atlas as there was absence of foramen transversarium on the left side of atlas (Figure 2). The larger branch traversed along the inferior surface of posterior arch of atlas to enter spinal canal. Both (smaller and larger) branches united near foramen magnum to form common trunk. The common trunk united with the right vertebral artery (RVA) in front of clivus to form basilar artery (Figure 3). Right vertebral artery demonstrated normal origin, course and distribution. No variations were detected in the basilar artery and its branches.

Figure 1: Showing anomalous origin from arch of aorta.
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Discussion

Origin and course of left vertebral artery is frequently asymmetric. Detection of small vertebral artery by angiography will be difficult. This small VA if ends in the basilar trunk it will be termed ‘hypoplastic’ and termed as ‘atretic’ if not connected to the basilar artery. Complete absence of vertebral artery will be replaced by a persistent congenital anastomosis called proatlantal artery [5]. Rhoton., et al. observed that vertebral artery was covered partially by the posterior atlanto-occipital membrane and the bony canal was formed by groove which surrounded a short segment of artery completely. Out of 50 specimens observed by Rhoton., et al. 24 (48%) were observed
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Variations in the origin and course of vertebral artery can be put forward by understanding the embryological basis. Any change in the origin and course of vertebral artery with respect to cervical region would alter the options available for treatment of pathologies related to cervical vertebrae. It is advisable for identification of any variant origin and course of vertebral artery preoperatively to avoid the risk and to minimize the complications during any surgical interventions at the craniovertebral junction.

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Conflict of Interest

Nil.

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