International Journal of Anatomy and Research,
Int J Anat Res 2017, Vol 5(4.3):4648-47. ISSN 2321-4287
DOI: https://dx.doi.org/10.16965/ijar.2017.426

Case Report

BILATERAL VARIATION IN THE COURSE OF VERTEBRAL ARTERY

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ABSTRACT

The vertebral artery arises from the first part of subclavian artery and courses within the bony canals of the cervical vertebrae, and then it lies on the upper surface of the posterior arch of the atlas before piercing the dura to enter the cranium. The intracranial part of the vertebral arteries unites at the caudal border of the pons to form the basilar artery. Vertebral artery contributes in supplying posterior part of the brain. In the present case, both the vertebral arteries had normal origin from the first part of subclavian artery. However, the cervical part of the right vertebral artery ascended through the transverse foramina of seventh cervical vertebrae and the left vertebral artery ascended through foramina of fifth cervical vertebrae. Incomplete knowledge of variations of the vertebral artery may lead to serious implications during surgical procedures such as transpedicular fixation technique which is safely performed at the seventh cervical vertebra, in which the vertebral artery is not usually present at the transverse foramen.

KEY WORDS: Vertebral artery, Transpedicular fixation technique, cervical vertebrae, foramen transversarium.

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Access this Article online

Quick Response code

DOI: 10.16965/ijar.2017.426

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 18 Aug 2017
Peer Review: 18 Aug 2017
Revised: None

Accepted: 20 Oct 2017
Published (O): 01 Dec 2017
Published (P): 01 Dec 2017

INTRODUCTION

Blood supply to the brain accounts for about 2.5% of body weight, it receives about one-sixth of the cardiac output. Vertebral artery gains its importance by forming posterior circulation of the brain.

The vertebral arteries are unique because they have long course, greater length, small diameter, asymmetry, segmental branches, division into four parts depending on its course and embryology, formation of single basilar artery by fusion of paired vertebral arteries. The vertebral artery begin in the root of neck as the first branch of the first part of subclavian artery on both the sides. The cervical parts of the vertebral arteries ascend through the transverse foramina of the first six cervical vertebrae. The atlantic part of the vertebral arteries perforate the dura and arachnoid and pass through the foramen magnum. The intracranial part of the vertebral arteries unites at the caudal border of the pons to form the basilar artery. The vertebrobasilar system is clinically referred as posterior circulation of the brain [1].

Incomplete knowledge of variations of the vertebral artery may lead to serious implications during angiography and surgical procedures such as vertebral artery stents. Stabilization of the cervical spine is commonly used for treating unstable spine resulting from trauma,

neoplasia or degenerating conditions. Transpedicular fixation technique is safe only when performed at the seventh cervical vertebra, in which the vertebral artery is not usually present at the transverse foramen [2]. In some cases the vertebral artery is found inside the transverse foramen of seventh cervical vertebrae. Damage to vertebral artery in such cases can lead to various neurological deficits such as Wallenberg syndrome. An abnormal course of the vertebral artery may lead to potential complications during these procedures, alter the cerebral hemodynamics and predispose the patient to intracranial aneurysms [3].

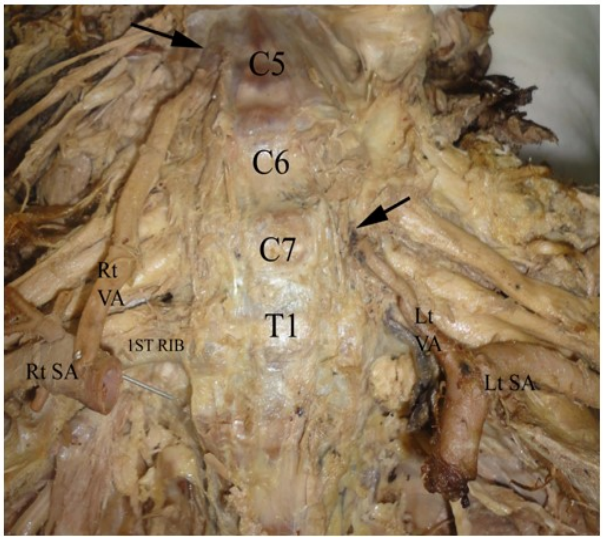
MATERIALS AND METHODS

During routine dissection of head and neck region in the dissection hall, a bilateral variation in the course of vertebral artery was observed in a 60 years old embalmed male cadaver. Dissection was performed as per Cunnin-gham's manual of practical anatomy. Sternocleidomastoid was cut to expose scalenovertebral triangle. Both the vertebral arteries had normal origin from the first part of subclavian artery. The cervical part of the right vertebral artery ascended through the transverse foramina of seventh cervical vertebrae and the left vertebral artery ascended through foramina of fifth cervical vertebrae. After removal of larynx and oesophagus, anterior surface of the cervical vertebral column was exposed, prevertebral fascia covering the prevertebral muscles (longus colli and longus capitis muscle) was seen. Both the vertebral arteries were seperated from sorrounding loose connective tissue attachments from its origin up to the transverse foramen of the cervical vertebra [4]. During dissection the first costal cartilage was located there by first thoracic vertebra (T1) was identified which lies at the same level. The seventh (C7) and sixth (C6) cervical vertebrae were identified by counting above T1.

OBSERVATIONS

During our routine dissection bilateral variation was noted in the course of the vertebral artery. On both the sides the vertebral artery arose from first part of the subclavian artery. The right and left vertebral artery then passed through scalenovertebral triangular space between longus colli and scalenus anterior muscle. The cervical part of the right vertebral artery ascended through the transverse foramina of seventh cervical vertebrae and the left vertebral artery ascended through foramina of fifth cervical vertebrae. After its anomalous course from second (vertebral) part both the arteries reached up to the transverse process of C1 vertebra. From the foramen transversarium of axis to that of atlas, the arteries passed upwards laterally making convex outward loop. Third part of the artery then winded backward around the lateral mass of atlas and appeared in suboccipital triangle. Finally they entered the vertebral canal below the lower arched border of the posterior atlanto-occipital membrane and continued as the fourth part. The fourth part of the artery pierced dura and arachnoid maters. Then both the arteries passed upward and medially through foramen magnum in front of the first tooth of ligamentum denticulatum. At the lower border of pons artery from both the sides fused to form basilar artery.

Fig. 1: Showing the bilateral variations of the vertebral artery.



DISCUSSION

Study of Vertebral artery is important as it forms posterior circulation of the brain. Bruneau M et al studied course of vertebral artery by means of MRI and CT angiography. Bruneau et al [5] described bilateral abnormality 0.8% and unilateral abnormality 12.4% which was more common on left side .In his study, vertebral artery entering transverse foramen of C5 was more in number than C7 vertebrae. Kajimoto[6] BHJ et al found variations of vertebral artery entering the

transverse foramen of cervical vertebra to be 7.5%. Susan Standring et al [1] mentioned that 10% of vertebral artery enters transverse foramina of cervical vertebrae other than C6 vertebrae. Panjabi et al [7] in his 3D study mentioned that damage to the variant vertebral artery is possible while fixing transpedicular screw at C7. Ughade JM et al [8] reported a case of anomalous left vertebral artery of aortic origin which may be due to persistence of the dorsal division of the left 6th intersegmental as the first part of the vertebral artery instead of left 7th intersegmental artery.

The vertebral artery is composite in development. The first part is developed from dorsal ramus of seventh cranial intersegmental artery, the second part from post-costal anastomosisof upper six spinal branch of first intersegmental artery and fourth part from preneural branch of the first intersegmental artery. Maldevelopment anomalies of the vertebral arteries have embryological basis and may be due to the unusual paths in the primitive vascular plexus, persistence of vessels normally obliterated, disappearance of vessels normally retained or due to incomplete development, fusions and absorption of parts usually distinct [9]. Genetic factors and local hemodynamics influence the establishment of final pattern of the artery [10].

CONCLUSION

In the present case cervical part of the right vertebral artery ascended through the transverse foramina of seventh cervical vertebrae and the left vertebral artery ascended through foramina of fifth cervical vertebrae. Such anomalous course may lead to altered hemodynamics and predispose to intracranial aneurysm[3]. This information is important for vascular or cardiothoracic surgical planning such as treating aneurysms, removal of craniocervical junction masses, bony decompression of the vertebral artery, vertebral endarterectomy and vertebral artery bypass[11]. Knowledge of such variation is important while performing transpedicular fixation or other spinal surgeries.

Conflicts of Interests: None

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How to cite this article:

Poorwa Baburao Kardile, Jaideo Manohar Ughade. BILATERAL VARIATION IN THE COURSE OF VERTEBRAL ARTERY. Int J Anat Res 2017;5(4.3):4645-4647. **DOI:** 10.16965/ijar.2017.426