Hypoplasia of the vertebral artery in human – a case report

CAMPOS, D.1,2*

1Department of Biology and Pharmacy, Universidade de Santa Cruz do Sul – UNISC, Av. Independência, 2293, CEP 96815-900, Santa Cruz do Sul, RS, Brazil
2Department of Basic Health Sciences, Universidade Federal de Ciências da Saúde de Porto Alegre – UFCSPA, Av. Sarmento Leite, 245, CEP 90050-170, Porto Alegre, RS, Brazil

*E-mail: d campos@unisc.br

Abstract

Hypoplasia of the vertebral artery (VA) is rare, and incidentally encountered in radiological imaging techniques. During routine activities in the Laboratory of Human Anatomy from University of Santa Cruz do Sul, Brazil, it was observed a 70 years old male cadaver with hypoplasia of the right VA. Thus, the purpose of this study is to report this case of hypoplasia of the VA emphasizing some morphological, functional and clinical data about this rare vascular abnormality, in order to offer useful information to anatomists, radiologists, vascular and head and neck surgeons. Moreover, to our knowledge, this variation has not been cited in recent medical literature.

Keywords: hypoplasia, vertebral artery, cadaver, human.

1 Introduction

According to classical descriptions, the vertebral artery (VA) arises from the superior aspect of the subclavian artery, passes through the foramina of all cervical transverse processes except the seventh, curves medially behind the lateral mass of atlas, and then enters the cranium via the foramen magnum. At the lower pontine border, it joins its fellow to form the basilar artery and, occasionally, it may enter the bone at fifth, fourth or seventh cervical transverse foramen (STANDRING, 2008).

This artery is classically divided into 4 segments: the first segment starts from its origin on the subclavian artery to the C6 transverse process; the second from C6 to C2 transverse process; third from C2 to the foramen magnum; and the fourth form the foramen magnum to vertebrobasilar junction (TUNCER, AKGÜL and KARABULUT, 2010).

Additionally, the knowledge about the variations of the vertebrobasilar arterial complex is important for surgeons operating at the skull base, cranio-cervical junction, cervical region and for clinicians interpreting the imaging of this region (SHOJA, TUBBS, KHAKI et al., 2006). Moreover, numerous studies (MIZUTANI, ARUGA, KIRINO et al., 1995; MOKRI, HOUSER, SANDOK et al., 1988; SMITH, SNYDERMAN, KASSAM et al., 2002; MELING, FRIDRICH, EVENSEN et al., 2008; KOCAELI, CHAALALA, ANDALUZ et al., 2009; MATSUSHIMA, KAWASHIMA, MASUOKA et al., 2010; GUPTA, RADHAKRISHNAN, PALIMAR et al., 2013), involving structures of the skull base have described important morphological, functional and clinical data about the VA, including those related to VA hypoplasia (BLICKENSTAFF, WEAVER, YELLIN et al., 1989). Thus, in this study we report an additional rare case of VA hypoplasia emphasizing some aspects of this clinical and morphological vascular unusual configuration.

2 Case Report

In a Caucasian adult male cadaver with cause of death by respiratory failure associated with dementia, with 70 years old, belonging to the didactical collection of the Laboratory of Human Anatomy from University of Santa Cruz do Sul, Brazil, it was noted a hypoplasia of the right VA. This abnormal artery had a diameter of 1.50 mm whereas the left artery a diameter of 6.80 mm. The length of the left VA from its origin to where it entered the foramen transversarium of C6 was 90.10 mm whereas that of the right from its origin to the foramen transversarium of C6 was 75.25 mm. The basilar artery was normal and receives most or all of its blood supply from the contralateral VA (Figure 1). This abnormality was seen only on the right side and there was no sign of deformation in other regions of the encephalic vascular system. The measurements were taken using a digital pachymeter from Digimess®, Brazil.

3 Discussion

It is known that anomalous blood vessels are commonly reported in the medical literature. These abnormalities may be due to the: choice of unusual paths in the primitive vascular plexus; persistence of vessels normally obliterated; disappearance of vessels normally retained; or incomplete development and to fusions and absorption of parts usually distinct (AREY, 1957).

Shoja, Tubbs, Khaki et al. (2006) reported that bad development and anomalies of the vertebral arteries are also generally considered very rare and have been described in single-case reports and in small series of patients with a single type of pathology.

Some authors estimate that the arteries are unequal in size approximately in 60% of cases. In this context, the left VA is often larger in size than the right (SHOJA, TUBBS, KHAKI et al., 2006; PATASI, YEUNG, GOODWIN et al., 2009), which is true in our case report. Clinically, it is possible to assume that this may lead to altered hemodynamics and predispose the patient to intracranial aneurysm formation (PATASI, YEUNG, GOODWIN et al., 2009). Therefore, a thorough search for coexisting aneurysms should be undertaken in patients with these anomalies.

Satti, Cerniglia and Koenigsberg (2007) described that endovascular therapy can be performed before these patients...
disease such as: occlusion, thrombosis, arterial dissection, vascular surgery in the neck region or in cases of intravascular these abnormalities are of diagnostic importance either prior to clinically asymptomatic. Also according to these same authors, abnormalities VA are incidental findings because they are generally in angiographic and anatomic postmortem examinations, SATTI, CERNIGLIA and KOENIGSBERG, 2007) suggested LIEBIG et al., 1999; SHOJA, TUBBS, KHAKI et al., 2006; options for intercranial interventions. In the era of carotid artery stents, VA stents and therapeutic implications. Therewith, this has become more important understanding of the variability of the VA remains most important in angiography and surgical procedures where variations in VA if missed can lead to catastrophic sequelae in skull base and other head and neck operations and aid in the interpretation of imaging. Additionally, surgical procedures that would necessitate exposure of VA include: repair of aneurysms, excisions of craniovertebral junction masses, vertebral endarterectomy, bypass and bony decompression of the VA. Also anatomical variations in VA if missed can lead to catastrophic sequelae in surgeries like atlantoaxial transarticular screw fixation, anterior corpectomy (SIKKA and JAIN, 2012). Thus, we undertook this study with the aim of providing a more accurate report about a rare case of VA hypoplasia, because of its interesting relationships with altered hemodynamics and predispose the patient to intracranial aneurysm formation. Moreover, this work aimed to provide a simple but multidisciplinary synthesis of the current knowledge concerning the morphogenesis, variation, and clinical significances of the VA, and to help promoting future studies in this area. Lastly, this study is useful for academics, clinicians and surgeons who handle and have special interest in anatomical structures discussed in this work.

References


BERGMAN, RA., AFIFI, AF. and MIYAUACHI, R. Vertebral artery variations. In: BERGMAN, RA. Illustrated encyclopedia of human
org/AnatomicVariants/Cardiovascular/Images0001/0095.shtml>

Blickenstaff, KL., Weaver, FA., Yellin, E., Stain, SC.,
and Finck, E. Trends in the management of traumatic vertebral artery
101-106, discussion 105-106.http://dx.doi.org/10.1016/0002-
9610(89)90355-3 PMid:2757137.

Bruneau, M., Corneilus, JF., Marneffe V., Triffraux M.,
George B. Anatomical variations of the V2 segment of the
S20-S24. PMid:1688547.

Gupta, C., Radhakrishnan, P., Palimar, V., D’Souza, AS., and
Kiruba NL. A quantitative analysis of atlas vertebrae and its

Hachem, K., Abi Khalil, S., Slaba, S., Jebra, V., and
Ghosain, M. Non invasive imaging of bilateral vertebral arteries

Hamilton, WJ., Boyd, JD., and Mossman, HW. Human
embryology: prenatal development of form and function. 4th ed.

Kao, CL., Tsai, KT., and Chang, JP. Large extracranial vertebral
aneuysm with absent contralateral vertebral artery. *Texas Heart

Kocaeli, H., Chaalala, C., Andaluz, N., and Zuccarello, M.
Spontaneous intradural vertebral artery dissection: a single-center
PMid:1981901.

Lemke, AI., Benndorf, G., Liebig, T., and Felix, R.
Anomalous origin of the right vertebral artery: review of the literature and
case report of right vertebral artery origin distal to the left subclavian
1318-1321. PMid:10472992.

Matsushima, T., Kawashima, M., Masuoka, J., Mineta, T.
and Inoue, T. Transcondylar fossa (supracondylar transjugular
tubercle) approach: anatomic basis for the approach, surgical procedures,

Meling, TR., Fridrich, K., Egenes, JF., and Nedregaard, B.
Malignant granular cell tumor of the skull base. *Skull Base*, 2008,
PMid:18592017.

Mizutani, T., Aruga, T., Kirino, T., Miki, Y., Saito, I.,
and Tsuchida, T. Recurrent subarachnoid hemorrhage from
untreated ruptured vertebralbasilar dissection aneurysms. *Neurosurgery*,
doi.org/10.1227/00006123-199505000-00003 PMid:7791980.

MOIKI, B., Houser, OW., Sandok, BA., and Piepgras, DG.
Spontaneous dissections of the vertebral arteries. *Neurology*, 1988,
vol. 38, n. 6, p. 880-885.http://dx.doi.org/10.1212/WNL.38.6.880
PMid:3368009.

MOORE, KL., Dalley, AF., and Agur, AMR. *Anatomia orientada

Patasi, B., Yeung, A., Goodwin, S., and Jalali, A. Anatomic
variation of the left vertebral artery. *International Journal of

Poonam, Singla, RK., and Sharma, T. Incidence of anomalous
origins of vertebral artery-anatomical study and clinical significance.

Satti, SR., Cerniglia, CA., and Koenigsberg, RA. Cervical
vertebral artery variations: an anatomic study. *American Journal of

Shoja, MM., Tubbs, RS., Khaki, AA., Shokouhi, G.,
Farahani, RM. A rare variation of the vertebral artery. *Folia

Sikka, A. and Jain, A. Bilateral variation in the origin and course
PMid:22720161.

Smith, JC., Snyderman, CH., Kassam, AB., and Fukui, MB.
Giant parapharyngeal space lipoma: case report and surgical approach.

Standring, S. *Gray’s Anatomy: the anatomical basis of clinical

Tuncer, MC., Akgul, YH., and Karabulut, O. Angiography
imaging of absence vertebral artery causing of pulsatile tinnitus: a case

Williams, PL., Warwick R., Dyson, M., and Bannister, LH.

Woodcock, RJ., Cloft, HJ., and Dion, JE. Bilateral type 1
proatlantal arteries with absence of vertebral arteries. *American Journal

Received July 31, 2014
Accepted November 15, 2015