

ANOMALOUS ORIGIN OF THE LEFT VERTEBRAL ARTERY: CASE REPORT

ORIGEM ANÔMALA DA ARTÉRIA VERTEBRAL ESQUERDA: RELATO DE CASO

ORIGEN ANÓMALO DE LA ARTERIA VERTEBRAL IZQUIERDA: INFORME DE CASO

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ABSTRACT

The aortic arch has three branches. The brachiocephalic trunk, the first and largest branch, ascends toward the right side of the trachea, dividing into the left common carotid and left subclavian arteries. The second and third branches, respectively, are the right common carotid and right subclavian arteries, with their respective branches, and may frequently present anatomical variations. One of the branching patterns observed in the aortic arch is a direct origin of the left vertebral artery between the left common carotid and left subclavian arteries, which is of great clinical importance. This case report describes an anatomical variation of the left vertebral artery, which originated from the aortic arch between the left common carotid and subclavian arteries. This was observed during dissection of the anatomical specimen in the Human Anatomy Laboratory of the School of Health Sciences of the Amazonas State University.

Keywords: Left Vertebral Artery. Aortic Arch. Anatomy. Anatomical Variation.

RESUMO

O arco aórtico possui três ramos. O tronco braquiocéfálico, primeiro e maior ramo, ascende em direção ao lado direito da traqueia, dividindo-se nas artérias carótida comum esquerda e subclávia esquerda. O segundo e o terceiro ramos, respectivamente, são as artérias carótida comum direita e subclávia direita, com seus respectivos ramos, podendo frequentemente apresentar variações anatômicas. Um dos padrões de ramificação observados no arco aórtico é a origem direta da artéria vertebral esquerda entre as artérias carótida comum esquerda e subclávia esquerda, o que possui grande importância clínica. Este relato de caso descreve uma variação anatômica da artéria vertebral esquerda, que se originava diretamente do arco aórtico entre as artérias carótida comum esquerda e subclávia esquerda. A variação foi observada durante a dissecação de um espécime anatômico no Laboratório de Anatomia Humana da Escola de Ciências da Saúde da Universidade do Estado do Amazonas.

Palavras-chave: Artéria Vertebral Esquerda. Arco Aórtico. Anatomia. Variação Anatômica.

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RESUMEN

El arco aórtico tiene tres ramas. El tronco braquiocefálico, la primera y más grande rama, asciende hacia el lado derecho de la tráquea, dividiéndose en las arterias carótida común izquierda y subclavia izquierda. La segunda y la tercera ramas, respectivamente, son las arterias carótida común derecha y subclavia derecha, con sus respectivas ramificaciones, y pueden presentar con frecuencia variaciones anatómicas. Uno de los patrones de ramificación observados en el arco aórtico es el origen directo de la arteria vertebral izquierda entre las arterias carótida común izquierda y subclavia izquierda, lo cual tiene gran importancia clínica. Este informe de caso describe una variación anatómica de la arteria vertebral izquierda, que se originó del arco aórtico entre las arterias carótida común izquierda y subclavia izquierda. Esta variación fue observada durante la disección de un espécimen anatómico en el Laboratorio de Anatomía Humana de la Escuela de Ciencias de la Salud de la Universidad del Estado de Amazonas.

Palabras clave: Arteria Vertebral Izquierda. Arco Aórtico. Anatomía. Variación Anatómica.

1 INTRODUCTION

The aorta is the largest vessel in the human body, responsible for supplying oxygenated blood to multiple structures. It originates in the left ventricle of the heart, which is located in the superior mediastinum. The aorta extends to the level of the fourth lumbar vertebra (L4), where it bifurcates into the right and left common iliac arteries. The thoracic aorta includes the ascending aorta, the aortic arch, and the descending aorta (JAMES et al., 2023). The aortic arch has three branches. The brachiocephalic trunk, the first and largest branch, ascends superolaterally to the right side of the trachea, dividing into the left common carotid and left subclavian arteries. The second and third branches are, respectively, the right common carotid artery and the right subclavian artery, with their respective branches (MOORE, 2013).

The subclavian arteries give rise to several branches responsible for supplying structures in the head and neck. These arteries are divided into three parts containing their respective vessels: vertebral artery, internal thoracic artery, thyrocervical trunk, costocervical trunk and dorsal artery of the scapula (GRAY, 2010).

The vertebral artery normally arises from the first part of the subclavian artery and is medial to the thyrocervical trunk. It enters through the transverse foramen of the sixth cervical vertebra (C6) and traverses the transverse processes of the upper cervical vertebrae, finally entering through the foramen magnum, supplying the brain and spinal cord (EINSTEN et al., 2016). However, in approximately 5% of cases, the left vertebral artery originates from the arch of the aorta, often between the left common carotid and subclavian arteries (RYAN; BORDONI, 2023). Similarly, there is evidence of other variations in the origin of the vertebral artery, in which it originates from the descending aorta (PANDEY et al., 2020).

It is evident that understanding the abnormalities that the vertebral artery may present is essential when it is necessary to perform surgical procedures such as angiography, either to diagnose or to intervene (SATTI et. al, 2007).

The anomalous origin of the vertebral artery favors the occurrence of hemodynamic alterations, leading to a predisposition to cerebrovascular disorders and the formation of intracranial aneurysms. Furthermore, more detailed information about the variations in this artery is crucial for endovascular interventionists involved in the treatment of patients with cerebrovascular diseases. Such information is crucial to minimize the risk of damage to the vertebral artery during various procedures (LAZARIDIS et al., 2018).

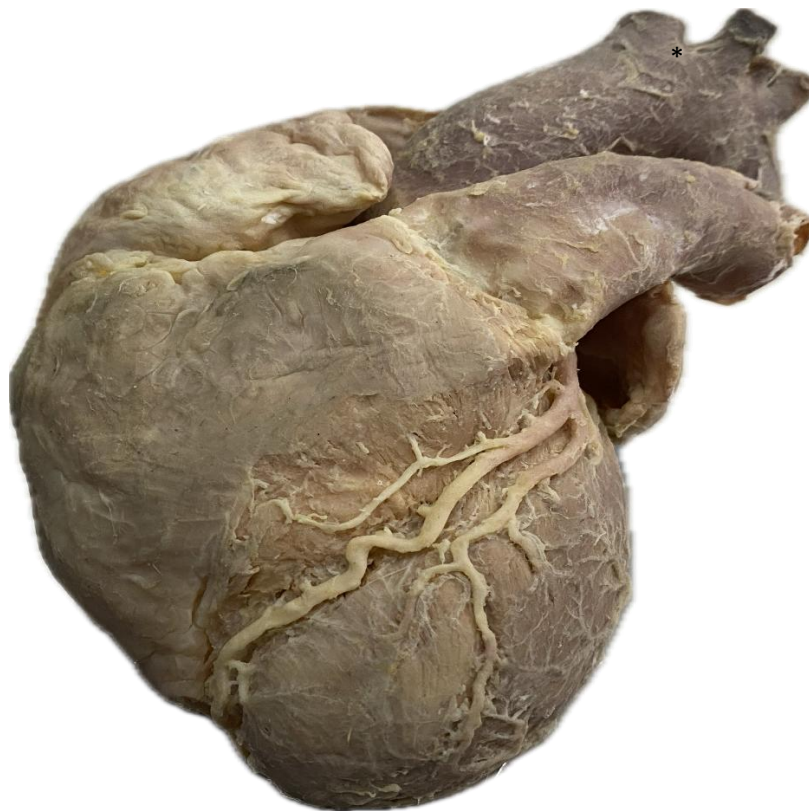
Therefore, this case report aims to describe an anatomical variation of the left vertebral artery, which originated from the aortic arch, between the left common carotid and subclavian arteries, a fact that was observed during the dissection of the anatomical specimen in the Human Anatomy Laboratory of the State University of Amazonas.

2 CASE REPORT

During the dissection process of the aortic arch of a male cadaver belonging to the Human Anatomy laboratory of the State University of Amazonas, the emission of the left vertebral artery between the left common carotid artery and the left subclavian artery was noted.

Figure 1

Anatomical variation of the left vertebral artery in the aortic arch



Legend: Left vertebral artery*

3 DISCUSSION

The vertebral arteries generally develop between 33 and 55 days of intrauterine life and are normally formed by longitudinal anastomoses connecting the seven cervical intersegmental arteries. The intersegmental arteries obliterate during this process, except for

the 7th intersegmental artery, which develops into the subclavian artery, surrounding the origin of the vertebral artery. In some cases, the anastomosis between the 6th and 7th intersegmental arteries does not develop on the left side, and the 6th intersegmental artery remains, and then the left vertebral artery arises from the aortic arch between the left common carotid and subclavian arteries (WASSERMAN et al., 1997). In addition to developmental defects, deletion of chromosome 22q11 has been reported to be associated with such aortic arch anomalies (MOMMA et al., 1999).

The arch of the aorta, which is the continuation of the ascending aorta, generally gives rise to three branches: the brachiocephalic trunk, the left common carotid artery, and the left subclavian artery in approximately 85% of cases (Kurt et al., 1997). Anatomical variations may frequently occur. The most common anomaly concerns the right subclavian artery, which originates directly from the arch of the aorta and joins the right upper limb through an aberrant path (Zapata et al., 1993).

The left vertebral artery, under normal conditions, usually arises from the left subclavian artery medial to the thyrocervical trunk and supplies the upper spinal cord, brainstem, and cerebellum. The vertebral artery ascends through the transverse foramina of all cervical vertebrae except the seventh, entering the posterior cranial cavity through the foramen magnum (BORLEY et al., 2008). Unusual branching patterns are also present and have been classified. One of the branching patterns observed in the aortic arch is a direct origin of the left vertebral artery between the left common carotid and left subclavian arteries, which is classified as the Adachi TYPE C variation. This variation, which is the second most common variant pattern, has been reported numerous times, generally with a prevalence of 0.79%–8% (CELIKAY et al., 2013).

Abnormalities in the origin of the vertebral artery are usually asymptomatic and are usually only detected on anatomical examinations after death. Furthermore, aortic arch anomalies play an important role in carotid stenting. According to the study by Faggioli et al., the neurological risk and technical failure rate in carotid stenting procedures are increased by aortic arch anomalies (FAGGIOLI et al., 2007).

4 CONCLUSION

The direct origin of the left vertebral artery from the aortic arch may alter cerebral hemodynamics by increasing blood flow through this vessel. The combination of a larger arterial diameter and direct aortic inflow can lead to asymmetric perfusion of the circle of

Willis, potentially predisposing individuals to cerebrovascular disturbances. From a surgical standpoint, the preoperative identification of this vascular variant is essential to minimize intraoperative risks and avoid iatrogenic injury, particularly during procedures involving the neck or upper thoracic region.

REFERENCES

- Batalha, C. G. da S., et al. (2023). Variação da artéria vertebral esquerda: Relato de caso. In *Variações anatômicas: O avanço da ciência no Brasil – Volume 3* (pp. 171–177). Editora Científica Digital.
- Borley, N. R., et al. (Eds.). (2008). *Gray's anatomy: The anatomical basis of clinical practice*. Churchill Livingstone.
- Celikyay, Z. R., et al. (2013). Frequency and imaging findings of variations in human aortic arch anatomy based on multidetector computed tomography data. *Clinical Imaging*, 37(6), 1011–1019. <https://doi.org/10.1016/j.clinimag.2013.07.007>
- Faggioli, G. L., et al. (2007). Aortic arch anomalies are associated with increased risk of neurological events in carotid stent procedures. *European Journal of Vascular and Endovascular Surgery*, 33(4), 436–441. <https://doi.org/10.1016/j.ejvs.2006.11.016>
- Kurt, M. A. (1997). A case with coincidence of aberrant right subclavian artery and common origin of the carotid arteries. *Annals of Anatomy*, 179(2), 175–176. [https://doi.org/10.1016/S0940-9602\(97\)80047-1](https://doi.org/10.1016/S0940-9602(97)80047-1)
- Momma, K., et al. (1999). Aortic arch anomalies associated with chromosome 22q11 deletion (CATCH 22). *Pediatric Cardiology*, 20(2), 97–102. <https://doi.org/10.1007/s002469900415>
- Yuan, S. M. (2016). Aberrant origin of vertebral artery and its clinical implications. *Brazilian Journal of Cardiovascular Surgery*, 31(1), 52–59. <https://doi.org/10.5935/1678-9741.20160009>
- Zapata, H. T. (1993). Aberrant right subclavian artery with left aortic arch: Associated cardiac anomalies. *Pediatric Cardiology*, 14(3), 159–161. <https://doi.org/10.1007/BF00795647>