



## CASUISTIC PAPER

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# Anomalous origin of the left vertebral artery from the arch of the aorta

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## ABSTRACT

**Introduction.** Although there are lots of varieties of aorta arch, they seem to appear relatively rarely. Anomalies of aortic arch departures are mainly concerned with its location, course, the place of departure and number of its main branches. However, they warrant attention due to their importance in operative, diagnostic, and endovascular procedures.

**Aim.** We want to present here a case of a female cadaver with rare aortic arch origin of the left vertebral artery. The aim of this article is to complete the frame of anomalies in aortic arch and to explore rare variability shown in this specific case.

**Description of the case.** The present report describes an anomalous case of the left vertebral artery arising from the aortic arch between the left common carotid artery and the left subclavian artery in a female cadaver during dissection in an anatomical laboratory. Aortic origin of the vertebral artery is a rare anatomic variant.

**Conclusion.** Thorough knowledge of anomalous origin is important for patients who undergo operation of an aortic arch or inferior part of the neck. Normally, the vertebral artery arises from the first part of the subclavian artery on both sides.

**Keywords.** anatomy, dissection, vertebral artery

## Introduction

Although there are lots of varieties of aorta arch, they seem to appear relatively rarely. Anomalies of aortic arch departures are mainly concerned with its location, course, the place of departure and number of its main branch-

es.<sup>1,2</sup> Three trunks leave the aortic arch: brachiocephalic trunk, left common carotid artery, left subclavian artery (counted from the right side).<sup>3</sup> Vertebral artery is the first branch which comes from the ascending part of the subclavian artery.<sup>4,5</sup> It goes upwards, covered by longus col-

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li muscle, then comes into foramen of transverse process of C-6 vertebra and goes through foramina of transverse processes of C-5, C-4, C-3 and C- 2, it makes an arch to the foramen of atlas (C-1), creates a sulcus there, in the end enters foramen magnum of the occipital bone. On the clivus inside the cranium, the right and the left vertebral artery join into basilar artery, which divides to upper cerebellar arteries and then posterior cerebral arteries, which are part of the cerebral arterial circle.<sup>4,6</sup>

**Aim**

We want to present here a case of a female cadaver with rare aortic arch origin of the left vertebral artery. The aim of this article is to complete the frame of anomalies in aortic arch and to explore rare variability shown in this specific case.



**Fig. 1.** Left vertebral artery, the part which leaves aorta arch between left common carotid artery and left subclavian artery and goes to the transverse process of vertebra C-5, length: 9 cm (vertebral artery marked with pins)

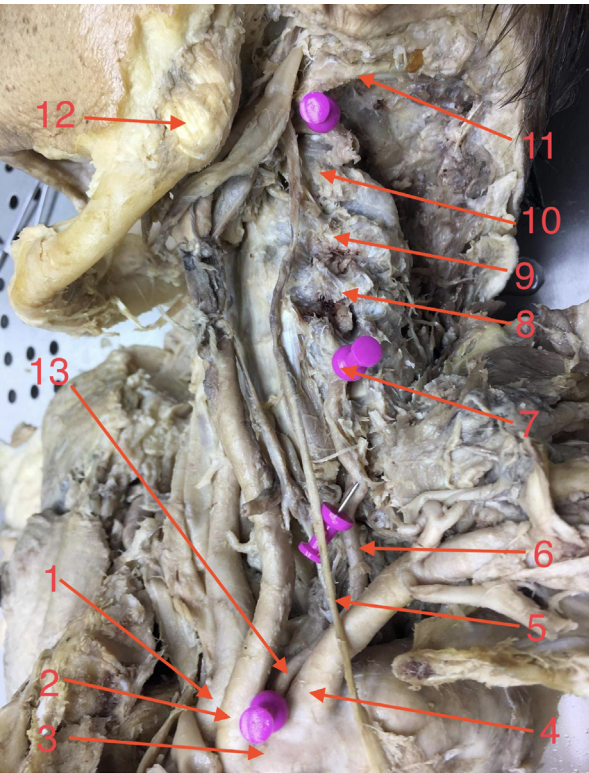
**Description of the case**

The dissection revealed rare variability of vertebral artery: the vertebral artery departure directly from the aortic arch between left common carotid artery and left subclavian artery. Furthermore, we found a variability of the course in transverse vertebrae processes: it enters the transverse process of C-5 (not C-6 as normal). The variability of the departure of vertebral artery from the aortic arch is noticed more often on the left side. Common is also a situation when the artery enters into fora-

men of C-4 or C-5 transverse process, where we can find characteristic cusp on that vertebrae.

In our case we divided the vertebral artery into parts:

- 1<sup>st</sup> part which goes from the aorta arch to foramen of transverse process of C-5 (length: 9cm) – Fig 1,
- 2<sup>nd</sup> part goes through foramina of transverse processes of C-5, C-4 and C-2 (length: 6 cm) – Fig 2,
- 3<sup>rd</sup> – the arch that enters foramen of transverse process of first vertebrae (length: 2 cm),
- 4<sup>th</sup> part that enters to the foramen magnum of occipital bone.



**Fig. 2.** Left vertebral artery, the part which goes through foramina of transverse processes of vertebrae C-5, C-4 and C-2.

- 1 – Brachiocephalic trunk, 2 – left common carotid artery, 3 – aortic arch, 4 – left subclavian artery, 5 – left vagus nerve, 6 – left vertebral artery, 7 – left transverse process of C5, 8 - left transverse process of C4, 9 - left transverse process of C3, 10 - left transverse process of C2, 11 – basement of occipital bone, 12 – left angle of mandible, 13 - left vertebral artery (vertebral artery marked with pins)

**Discussion**

The early detection of anomalies related with artery ramification from aortic arch play significant role in prevention of complications occurred after operation of an aortic arch or inferior part of the neck.<sup>7,8,9,10</sup> They are usually discovered pre-operatively in CT angiography. Clinicians should be aware of the fact that there are more cases

with left aberrant vertebral arteries than right ones.<sup>11,12</sup> Patients with abnormal departure of vertebral artery are usually asymptomatic.<sup>12,13</sup> Furthermore, there is a significant correlation in presence of aneurysm, vascular malformations, pain in occipital regions or in presence of Moyamoya disease connected with abnormalities of vertebral artery ramification.<sup>11,12,14,15,16</sup> The cause of this correlation is not fully understood, it is suspected to have two starting points. The first one applies to congenital abnormalities of arterial structure, the second is connected with modification of intracerebral circulation.<sup>11,17</sup>

In the case of vertebral artery ramification directly from an aortic arch significantly more often this artery is ascending into transverse foramen of cervical vertebrae C5-C6.<sup>5,18</sup> The upper point of entry of vertebral artery into transverse foramen, what may disturb circulation dynamics in the intracranial part, what lead to characteristic symptoms among people with similar anomalies.<sup>11,19,20</sup>

The case presented shows the course of the left vertebral artery with its anomalies placed in the direct departure from the aortic arch. The first variability we noticed during dissection was direct departure of left vertebral artery from aortic arch (the proper place of left vertebral artery departure is left subclavian artery). The second was the left vertebral artery's course variability – it entered into the C-5 transverse process foramen (normally it should first enter the foramen of transverse process of C-6). The final part of the vertebral artery's course in our case seemed not to have any variability and therefore it can be said that blood flow to the brain was not disturbed.

## Conclusion

To prevent complications during surgery of the aortic arch or lower neck, recognition and reporting of these variations is important during interpretation of CT angiography. It is also important to recognize anomalous origin of the vertebral arteries before transfemoral catheterization to the vertebral arteries to reduce catheterization failure.

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