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Fenestration of the vertebral artery presented by computed tomography angiography of the neck's blood vessels: A case study

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ABSTRACT

Vertebral artery (VA) fenestration is a rare vascular anomaly. It most commonly occurs in extracranial segments of the VA. This congenital anomaly can occur during the various stages of embryonic development of the VA. This usually does not have clinical significance, but the possibility of associated anomalies such as saccular aneurysms and arteriovenous malformations should be noted. Awareness of vascular anomalies is a key to avoid iatrogenic injury during endovascular diagnostic and therapeutic interventions. Here, we present incidental findings of VA fenestration in a 46-year-old woman evidenced by computed tomography angiography of the neck's blood vessels after I.V. contrast medium applications.

Key words: Vertebral artery fenestration; computed tomography; anomalies; computed tomography angiography

INTRODUCTION

Vertebral arteries (VA) account for 30% of the blood supply to the brain, supplying predominantly the posterior parts of the brain. Fenestration of the VAs is a vascular anomaly and is characterized by the division of the lumen of the blood vessel into two separate and parallel blood vessels that are distally reconnected. When the VA is fenestrated, each blood vessel has its own muscle layer and is lined with a particular endothelium (1). VA fenestration is an anomaly that can be easily visualized during modern scanning techniques such as magnetic resonance (MR) and computed tomography (CT) angiography or color Doppler ultrasonography. Autopsy and angiographic studies show that the incidence of VA fenestration is 0.23%-1.95% (2). VA fenestrations are most commonly present in extracranial segments at the atlantoaxial level and are rarely below the C2 level. Studies show that about 70% of fenestrations are spotted in the upper cervical segments, with the remainder present intracranially (3). This anomaly is often associated with other congenital intracranial and extracranial vascular anomalies, including aneurysms and arteriovenous malformations (4). With this case report, we believe that we will raise awareness of this generally rare condition which prompts further investigation since there are some reports on higher

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incidence of intracranial aneurysms and arteriovenous malformations in association with fenestrations.

CASE REPORT

This is a case of a female 46-year-old patient with cerebrovascular stroke. CT angiography of the neck's blood vessels is done after i.v. contrast application in the superficial venous system of the right hand and it showed fenestration of the left VA at the level of the C4/C5 intervertebral space. It has also been noticed that the VAs in the level of the V4 segments are from both sides distinctly fragile and hypoplastic. (Figures 1-3)

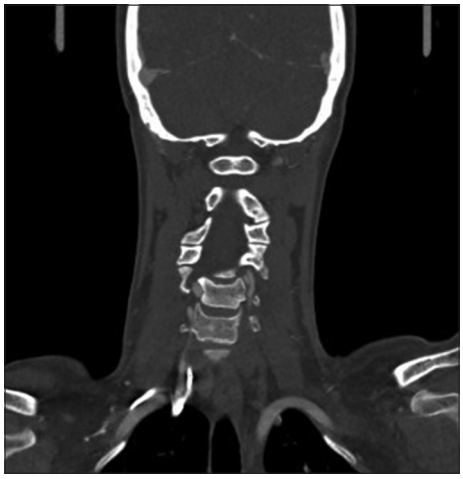

FIGURE 1. The left vertebral artery fenestration on computed tomography coronal scan.

FIGURE 2. The left vertebral artery fenestration on computed tomography sagittal scan.

DISCUSSION

The VAs arise from the subclavian arteries. They flow behind the back of the anterior scalene muscle and reach the level of the C6 foramen transversarium. This part of the VAs is called segment V1. Then, the VAs follow the vertical direction from C6 to the C2 level of the foramen transversarium and that are the V2 segment. From C2 levels, they continue to the foramen magnum represented as the V3 segment. Further, VAs pass along with the dura mater into the foramen magnum and this segment is called V4. VA anomalies are considered to be caused by defects in the process of regression of intersegmental arteries during embryonic development. There are numerous theories about the etiology of VA fenestration.

Ionete and Omojola reported that failure of the regression of the second intersegmental artery leads to extracranial fenestration of the VAs (5). Fenestrations of the VAs are present in the extracranial segments at the atlantoaxial level and on the left side, rarely bilateral.

Kowada and Kikuchi showed the left VA fenestration in two cases at the atlantoaxial level (6). Fenestration of the VAs is not common as an anomaly of blood vessels. Different ratios have been reported in the literature with respect to the frequency of this abnormality.

Rieger and Huber reported the incidence of VA fenestration from 0.23% to 1.95% in angiography and 0.33% in autopsy (2). Tokuda et al. reported an

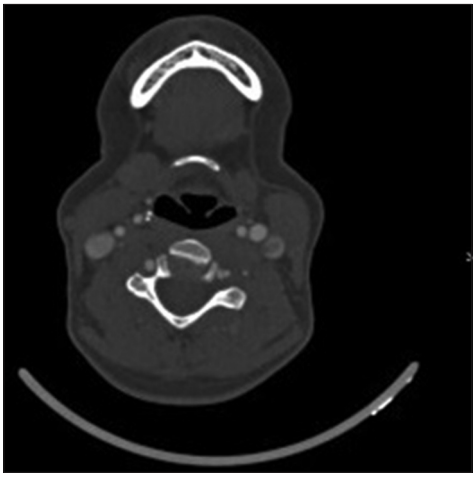

FIGURE 3. The left vertebral artery fenestration on computed tomography axial scan.

incidence of 1.00% in angiography, and Kowada et al. reported an incidence of 1.90% in angiography (7,8).

Some authors believe that fenestration of the VAs is not of clinical relevance, while others claim that it increases the incidence of aneurysms and vascular pathology and is also related to abnormalities of the brain and spinal cord (9).

Kubo et al. have shown an increased risk of developing saccular aneurysms in patients with VA fenestration (4). Drapkin reported the onset of symptomatic intracranial aneurysms in 20% of patients with vertebral fenestration (10).

In our case, fenestration was accidentally spotted and as observed on angiography, there were no other intracranial or extracranial anomalies. Knowledge of VA morphological anomalies is important for both radiologists and head-and-neck surgeons, as any injury to the VA can endanger the vascular supply of the brain.

CONCLUSION

VA fenestration is a rare anomaly that can be visualized by modern scanning techniques such as MR and CT angiography or color Doppler ultrasonography. VA fenestrations are most commonly present in extracranial segments at the atlantoaxial level and usually have no clinical significance, but the possibility of associated anomalies such as saccular aneurysms and arteriovenous malformations must be noted. As it was already stressed in article incidence of VA fenestration ranges from 0.23% to 1.95% with vast majority of fenestrations detected at the levels of V3, and V4 VA segments. In our report, the case of VA fenestration at the level of V2 segment (C4/C5 level) which is readily, and routinely accessible for imaging in every-day Color Doppler examinations.

Knowledge of VA morphological anomalies is important for both radiologists and head-and-neck surgeons, as any injury to the VA can endanger the vascular supply of the brain.

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