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Case Report

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A Rare Variantion of Left Vertebral Artery Originating from External Carotid Artery: A Case Report

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Abstract

Variations of vertebral arteries are congenital anomalies occurring during the embryonic development. We established a variant left vertebral artery which is a branch of left external carotid artery, by using magnetic resonance angiography and computerized tomographic angiography in a 43-year-old female patient whose vertebral arteries could not be detected in Doppler ultrasonography performed for the evaluation of her dizziness. This vertebral artery was extending up outside the transverse foramina until it entered into the left transverse foramen of the cervical vertebrae at the C1 level. Awareness of such variations of vertebral arteries is important with regard to the prevention of possible cerebrovascular injuries in interventional radiological procedures and vascular surgeries. For this reason, we would like to present this rare case of left vertebral artery showing a different origin and course outside the transverse foramina.

Keywords: Variant Left Vertebral Artery, Computerized Tomographic Angiography, Magnetic Resonance Angiography.

Case Report

A 43-year-old female presented with dizziness, neck and left arm pain and left arm numbness ongoing for 2.5 months. Her medical history had no special feature. Neurological examination did not reveal out any pathologic finding. The patient was pre-diagnosed with cervical disc pathology, occipitocervical region anomalies, intracranial or spinal lesions, and carotid and/or vertebral artery (VA) pathologies. There was no pathology in cranial and cervical spinal magnetic resonance imaging (MRI). Carotid and VA Doppler ultrasonography (USG) was performed and showed no flow through both of the vertebral arteries. Hypoplasia, occlusion or agenesis was considered. Carotid magnetic resonance angiography (MRA) (Figure 1) and then carotid computerized tomographic angiography (CTA) (Figure 2) were performed and revealed that the left VA was originating from the proximal part of left external carotid artery (ECA) as its 5th main branch superior to its facial branch. The diameter here was 5 mm, and the diameter of V4 segment was 2.8 mm. This vertebral artery ascended upwards outside the transverse foramina, parallel to the spine and entered into the left transverse foramen of the cervical vertebrae at the C1 level rather than the usual C6 level (Figure 3). Basilar artery was formed by left VA and it was hypopylasic. Right VA was originating from the right subclavian artery as usual and it was also hypoplasic (Figure 4). Its diameter was 1.9 mm and it was ending as posterior inferior cerebellar artery (PICA) also as a variant. The current radicular symptoms were considered to be due to the compression of the VA resulted from its abnormal course. Symptomatic conservative treatment (drugs including acetylsalicylic acid, pregabalin, thioctic acid and betahistine dihydrochloride) was planned and she was followed up.

Figure 1: MRA image of left ECA-based left VA

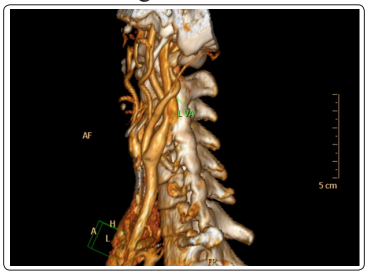

Figure 2: CTA image of left ECA-based left VA

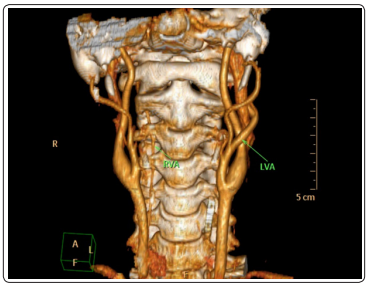

Figure 3: CTA image of left VA traveling outside transverse foramina

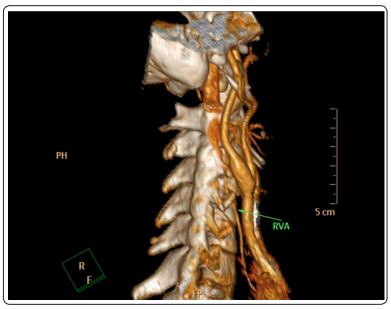

Figure 4: CTA image of hypoplasic right VA

Discussion

After 1960s, the development of angiography technique made it easier to detect the normal vascular anatomy and its variations. CTA and MRA, which were developed later, provided more detailed information about vascular variations and associated pathologies. Among these, VA based variations, are congenital anomalies occurring during the embryonic development [1]. There are various studies which have reported variant VAs with different origins including thyrocervical trunk, brachiocephalic trunk, common carotid artery, external carotid artery and the aortic arch [2-4]. Such extraordinary patern of branching is known to be causing different anastomosis pathways having different distribution and significance [3,5]. The VA normally arises as the first branch of the subclavian arteries medial to thyrocervical trunk. The most common variation of the vertebral artery (2.4-5.8%) is the left VA originating from the aortic arch between the left common carotid artery and the left subclavian artery [6-11]. In our case, the variant left VA was originating from the ECA as a fifth main branch. Then VAs enter transverse foramina of C6, ascends upward and goes through the six transverse foramina of the first six cervical vertebrae at 90% of cases and through the transverse foramina of the first five cervical vertebrae at 5% of cases, enters into the cranium through the foramen magnum and connects with the opposite VA at lower pontine level on the midline to form the basilar artery and supply brain stem and posterior part of the cerebrum [6,12-17]. In our case, the left VA progressed outside the transverse foramina and entered into only the transverse foramen of C1. Just as in our case, a VA can sometimes end up as a PICA and the other may continue as a basilar artery [18]. In 73% of the cases, two vertebral arteries are asymmetrical [19]. The left VA is dominant at 50-60% of cases. The right and the left VA show equal dominance at 25% of cases. Calibrations of VAs are generally different and range between 0.92-4.09 mm on average and the left one is generally larger [16,20]. In our case, the diameter of left VA was 5 mm at its origin and 2.8 mm at V4 segment. The right VA which was of subclavian artery origin was hypoplasic.

Most of the cases reported in the literature, remained asymptomatic for long years, however there are also some reported cases having symptoms including dizziness and vertigo [21,22]. In patients presented with clinical findings suspected for vertebrobasilar insufficiency, the initial screening method is basically the Doppler USG. Yet, due to the unique constraints of the USG, the most potential regions for vascular narrowing may not be monitored. Though being sufficient as a preliminary examination, Doppler USG is insufficient in reaching a definitive diagnosis. On the other hand, imagings of neck and brain vessels by MRA or CTA have become quite popular. While vertebral arteries can be imagined along all of their length by MRA or CRA, information about the other vessels can also be obtained. Still, these examinations can remain insufficient in certain situations in which digital subtraction angiography (DSA) may be needed. However, the risks involved in DSA are out of question in CTA and MRA. Furthermore, in the evaluation of atherosclerosis and flexural are of the vessels, CTA is better than DSA [4]. In addition, it takes shorter time and is operator-independent with fewer movement artifacts.

Increased risk for cerebrovascular diseases including aatherosclerosis, vascular malformations, arterial dissection and resulting intracranial complications associated with variable origin and the course of the VAs has been described in the literature [21,23]. The extra-cranial part of the VA is often affected by atherosclerosis leadİng to stenosis especially in its origin. Abnormal origin can affect hemodynamics and can lead to intracerebral vascular malformations including formation of an aneursm due to turbulent blood flow [24]. Abnormal VA may be an independent risk factor for arterial dissection [9]. A longer extra-cranial course can lead to stretching and dissection of the vessel wall. Dissection of vertebral artery has been more commonly reported in younger patients in recent years. In the literature, his evaluation of a patient presented with persistent headache and neurological symptoms revealed out arterial dissection in the abnormally originated VA [25]. Therefore, in patients with a cerebral aneurysm or arteriovenous malformation or the patients presenting with spontaneous intracerebral hemorrhage, evaluation for vascular anomalies of the neck would be useful. Besides, abnormal vascular courses can be the cause of radicular pain, as in our case, due to their contact with nearby neural structures. These variations are also important in cerebrovascular and thoracic interventional procedures. During especially neck dissection; knowing about the location and/or orientation of neck structures, their neighborhoods and keeping the variations in mind, are all important to prevent development of unexpected complications which can be associated with permanent neurological deficits. In cases whose vertebral arteries originate from the carotid artery or its branches, the common carotid artery ligation can lead to disruption of the blood flow to the posterior fossa [8].

Although these variations are rare, due to their clinical and surgical importance, if vertebral arteries cannot be detected at its normal location in Doppler USG, additional screening with MRA and/or CTA should be performed. Awareness of the VA which exits and progresses in an abnormal manner would be useful in diagnosis of cerebrovascular pathologies and in prevention of possible complications in interventional radiological procedures and vascular surgeries.

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