CASE REPORT

Differential diagnosis of vertebral artery fenestration and dissection – case report

Diagnostyka różnicowa fenestracji i rozwarstwienia tętnicy kręgowej – opis przypadku

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KEYWORDS:

- arterial fenestration
- vertebral artery fenestration
- arterial dissection
- vertebral artery dissection

ABSTRACT

Arterial fenestration is a rare anatomical variant characterized by the presence of a congenital segmental duplication of an artery. In certain imaging modalities it may resemble arterial dissection, which, unlike arterial fenestration, is potentially lethal and requires treatment. The use of diagnostic methods that ensure a comprehensive visualization of the vascular system, such as computed tomography angiography (CTA), may complete inconclusive results of exams performed with other modalities and enable the differential diagnosis of arterial fenestration and dissection.

SŁOWA KLUCZOWE:

- fenestracja tętnicy kręgowej
- rozwarstwienie tętnicy kręgowej

STRESZCZENIE

Fenestracja stanowi rzadki wariant anatomiczny charakteryzujący się obecnością wrodzonego odcinkowego zdwojenia tętnicy. Jej obraz w pewnych badaniach radiologicznych przypomina niekiedy rozwarstwienie tętnicy, które to, w przeciwieństwie do fenestracji, może doprowadzić do śmierci pacjenta i wymaga leczenia. Zastosowanie metod obrazowania zapewniających kompleksową wizualizację naczyń, takich jak angiografia tomografii komputerowej (angio-TK), może stanowić uzupełnienie niejednoznacznych wyników uzyskanych w innych badaniach oraz umożliwić diagnostykę różnicową fenestracji i rozwarstwienia.

Introduction

Arterial fenestration (AF) is a rare anatomical variant characterized by the presence of a congenital segmental duplication of an artery. It is the result of an incomplete fusion of primordial vessels during embryological development. AF arises from a division of the lumen of an artery into two separate channels which reconnect distally. Although AF may coincide with various vascular pathologies, including most notably aneurysms (1, 2, 3), the anomaly itself is benign and requires no treatment.

The image of AF in diagnostic modalities such as Doppler ultrasound, computed tomography (CT) or magnetic resonance imaging (MRI) may resemble that of arterial dissection (AD) (4, 5). AD occurs when blood enters the wall of an artery through a tear in the intima, resulting in the formation of a second channel running alongside the true lumen of the vessel. Unlike AF, AD is a potentially lethal pathology, the identification of which should prompt the initiation of adequate therapy. The knowledge of AF and AD's similar presentation in imaging and the ability to differentiate between them is therefore paramount in patient management.

Case

A 41-year-old woman developed intense occipital headaches and non-specific sensory disorders. Due to a clinical suspicion of cervical spondylopathy a neurologist ordered a cervical spine MRI examination, in which no pathologies of the vertebrae were detected. However, the scan showed a segmental duplication of the right vertebral artery (VA) lumen at C5 to C7 level (Figure 1). Since the MRI results were inconclusive and the symptoms persisted, a cervical Doppler ultrasound was performed. Although the measured blood flow velocity in both vascular channels was comparable, the right VA ultrasound image was interpreted by the examiner as possibly indicative of an AD. As a result, the neurologist referred the woman to our emergency department.

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The patient presented with a 4-day history of pain in the back of the head which responded poorly to non-steroidal anti-inflammatory drugs. She reported having undergone a session of weight training one week prior to admission. Physical examination showed nothing of note, the patient was alert and oriented, vital signs were normal. An arch to vertex CTA was ordered to assess the cervicocerebral arteries, with the specific aim of evaluating the right VA and confirming or excluding AD. The scan revealed that the image obtained in MRI and Doppler ultrasound was the result of a right VA fenestration at C5 to C7 level comprised of two vascular channels presenting equal and simultaneous contrast enhancement (Figure 2, 3). No signs of dissection were found and the CTA image was otherwise unremarkable. A consultation with a neurologist at the hospital, who re-examined the patient, led to the conclusion that the occipital pain was caused by a tension-type headache. The patient was discharged on the day of admission.

Discussion

The presented case involved differentiating between vertebral artery dissection (VAD) and vertebral artery fenestration (VAF). Cases of patients with VAF who were initially misdiagnosed with VAD have been reported in literature (6, 7, 8). The ability to distinguish between patients with VAD and VAF is essential to correctly managing both of these groups. VAD is a condition with the potential of inducing severe complications, including vessel stenosis or occlusion and thromboembolic infarcts (9), and as such requires the application of adequate treatment, which may involve administration of antiplatelet medication, an endovascular intervention or surgical repair (10). In contrast, VAF constitutes a benign anatomical variant. Hence, a competent differential diagnosis using imaging may enable successful therapy of patients with VAD while sparing patients with VAF unwarranted therapeutic interventions.

As a non-invasive, low-cost and widely available diagnostic method, ultrasound is often the first examination to be conducted in order to assess cervical arteries. However, it may fail to provide satisfactory imaging of said vessels; specifically, when evaluating VA's cervical segments and the possibility of a VAF, its application might be limited (11). There is a number of other diagnostic modalities to choose from to further investigate anomalies suggestive of AD. Digital subtraction angiography (DSA) has conventionally been considered the gold standard of AD diagnosis, showing vessel stenosis or dilation at the site of the dissection or in its proximity. Nonetheless, due to DSA being an invasive procedure, exams such as CTA or MRI and magnetic resonance angiography (MRA) tend to be favored. Our patient underwent a CTA scan, which demonstrated two separate vascular channels of normal caliber emerging from the VA. The image was not indicative of an intimal flap separating true and false vessel lumens and showed no intramural haematoma, which would suggest an AD. This allowed to conclude the detected anomaly was in fact an AF. In similar cases to ours, where the use of multiple modalities does not provide enough data for a satisfactory differential diagnosis of fenestration and dissection, studies such as CTA or MRA should be considered the examination of choice.

Proper visualization of the investigated finding when differentiating between dissection and fenestration plays a central role, as focusing on some of its characteristics not relating to its morphology, such as location, might result in examiner's bias towards an incorrect diagnosis. The V2 and V3 vertebral artery segments are the most common locations for VAD (12), while a diagnosis of VAF could be favored in case of an intracranial (V4) location (4). Our patient presented with an anomaly involving parts of V1 and V2 segments, which could lead to an inclination to view the diagnosis of a dissection as more probable in the absence of CTA scan results as evidence to the contrary.

Figure 1. A T2-weighted axial MR scan of the cervical spine reveals two separate lumens of the right vertebral artery. Signal intensity is homogenous and low in both of them. No signs of dissection are visible.

Source: own data.

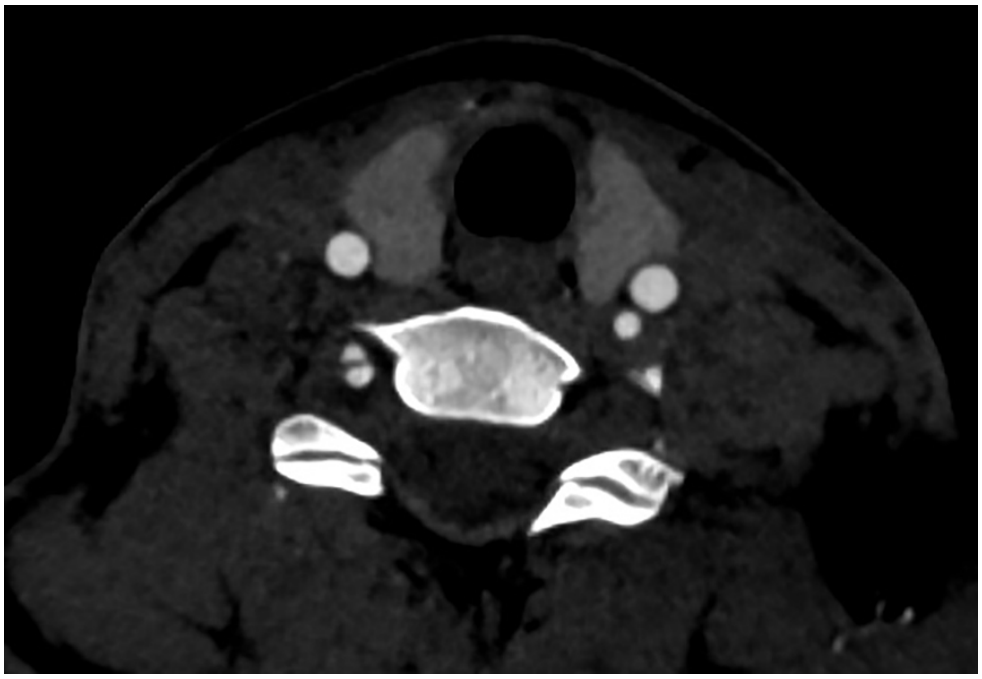

Figure 2. A CECT axial scan of the neck reveals two separate lumens of the right vertebral artery. Contrast enhancement is homogenous and low in both of them. No signs of dissection are visible.

Source: own data.

Figure 3. A VRCT of the cervical arteries reveals segmental duplication of the right vertebral artery at the C6-C7 level.

Source: own data.

Thorough radiological diagnostics is all the more important due to the fact that not only can VAF mimic VAD's image in certain modalities, but the patient's clinical presentation might also misleadingly suggest a dissection. Our patient had a history of occipital headaches, a symptom which could as well appear in VAD (13). Furthermore, she reported a recent weight training session. This could also further substantiate a clinical suspicion of dissection, as blunt trauma and sudden neck movements, which might occur during resistance training, are considered to be factors contributing to VAD formation (9, 13, 14).

As evidenced by this case, a broadening of radiological diagnostic tools used to assess a possible AD can prove to be crucial and influence subsequent clinical decisions pertaining to patient management. The image obtained in CTA completed the inconclusive results of MRI and cervical Doppler ultrasound, and enabled arriving at the correct diagnosis despite a potentially misleading clinical presentation.

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