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The Agony of Choice: Diagnosis of Cervical Artery Dissection by Means of Duplexsonography or Magnetic Resonance Imaging?

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A sharp rise in the diagnosis of dissection of extracranial brain supplying arteries as a cause of cerebral ischemia in young adults has been noted in the recent past due to increased and intensified clinical awareness as well as advanced technical options [1]. On the basis of 2 cases, we report on the diagnostic challenge to the clinician and the difficulties involved when using noninvasive imaging technologies such as extracranial duplexsonography (ECD) and magnetic resonance imaging (MRI).

Case 1

A 27-year-old female patient complained of diffuse headaches and a slight pain in the left cervical region after a cupboard weigh-

ing about 100 kg had fallen against her head. The neurological examination was unrevealing except for a slight ptosis of the left eyelid and a mild holocranial diffuse headache.

The initial ECD showed no abnormalities. However, due to the described severity of the trauma caused by the weight of the heavy cupboard and the left ptosis, cervical MRI with axial T1-fat-saturated sequences as well as MR angiography were performed. These revealed significant signal increase of the left common carotid artery in the fat-saturated sequences, whereas the MR angiography showed no abnormalities (fig. 1a, b). There was a visible extension of the signal increase into the internal carotid artery in follow-up MRIs, but the follow-up ECDs were unable to detect any flow or vessel wall abnormality.

Case 2

A 38-year-old male patient reported that he had felt a sudden slap in his neck and a sudden attack of rotatory vertigo the day before. Due to the persistence of an unsteady gait and a new onset of numbness of the left upper arm, he came to our emergency department. Except for the diffuse hypesthesia of the left upper arm, the neurological examination detected no other abnormalities.

ECD showed increased flow velocities of 220 cm/s, raised pulsatility and a diastolic backflow in the V3-segment of the right vertebral artery. The following MRI with fat-suppressed images on day 2 after the initial symptoms showed hypoplasia of the right vertebral artery, but the diagnosis of a dissection could not be confirmed (fig. 1c). Within 2 days the ECD abnormalities normalized. A MRI follow-up 2 weeks later reconfirmed the diagnosis of dissection (fig. 1d).

Discussion

These 2 cases demonstrate that dissections can be missed by either ECD or MRI when used as single method. Our first patient came with 1-sided neck pain, along with a partial Horner's syndrome. Even though she showed no signs of focal cerebral ischemia and ECD was normal, we carried out a MRI because her symptoms and the severe trauma [2] clinically suggested the diagnosis of dissection. Schievink [1] has stated that the classic triad of localized pain, Horner's syndrome and ischemia is found in less than one third of patients with carotid dissection, but the presence of any 2 elements of this triad strongly implies the diagnosis of dissection. The clinical presentation of the second patient (sudden unilateral neck pain, symptoms of vertebrobasilar ischemia) has led to the diagnosis of vertebral dissection. It was confirmed by means of ECD but not by the initial MRI. MRI confirmation was obtained 2 weeks later.

ECD has its limitations in demonstrating dissection in patients in whom intramural hematoma causes only slight morphological changes of the vessel wall or hemodynamic-nonrelevant lesions [3]. Thorough ultrasound examinations reveal roughly 13% negative findings in the initial examination of cervical artery dissection [4]. The sensitivity of ultrasound for the detection of cerebral artery dissection has been found in general to be 92% for both vascular territories [5], yet only 69% in patients without cerebral ischemia but with isolated Horner's syndrome [6].

The visualization of vessel hematoma can be difficult to depict by MRI during the first 3 days, as reflected in case 2. During this phase of the dissection, the rim of the acute intramural hematoma consists of deoxyhemoglobin and may not reveal hyperintensity, but rather appear isointense relative to the adjacent muscle [7, 8].

Fig. 1. Case 1: Hyperintensity in the left common carotid artery in fat-saturated T1 MRI sequences (a). Normal lumen of the carotid artery in MR angiography (reduced quality due to motion artefacts) (b). Case 2: Patent right vertebral artery without intramural hematoma in fat-saturated T1 MRI sequences on initial examination (c). Hyperintensity in the right vertebral artery in fat-saturated T1 MRI sequences on follow-up 2 weeks later (d).

The MRI fat suppression technique is used to differentiate peri-arterial fat from the hyperintense intramural hematoma. Yet vertebral dissections can be missed by MRI due to the small diameter of the vertebral artery, its anatomical variations and the high signal intensity of the surrounding venous structures [9, 10]. Since most MRI scanners perform with 1.5 tesla, we cannot exclude that in the near future with routinely higher field strength of 3.0 tesla, MRI techniques will have an improved visualization of the intramural hematoma [11].

About 20% of the patients with spontaneous cervical artery dissection exhibit an isolated Horner's syndrome [6, 12] and up to 66% of the patients show no ischemic signs on initial presentation [12]. In the days and weeks following the initial event, between 50 and 95% of the patients with a spontaneous dissection of the carotid artery will develop a complete ischemic stroke [12]. Therefore, a rapid diagnosis is essential.

In conclusion, clinical awareness and preciseness of clinical examination are required to initiate correct diagnostic investigations and to find the proper diagnosis. A combination of different methods may lead to a greater degree of diagnostic accuracy.

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