LETTER / Neuroradiology

Spontaneous cervical artery dissection: Role of a SE-T1-weighted fat-sat volume acquisition

Keywords: Cervical artery dissection; Carotid artery dissection; Vertebral artery dissection; MRI; Spin echo T1-weighted

Cervical artery dissections (CAD) are a diagnostic challenge for radiologists. They are a major aetiology of cerebral infarction in young adults. MRI is the standard technique for diagnosing and monitoring CAD. It has limitations due to problems with spatial resolution on the "classic" axial spin echo T1-weighted (SE-T1) sequences with fat suppression, especially when studying segment V3 of the vertebral arteries and the petrous portion of the internal carotid artery. Moreover, spontaneous high signal intensity from the paravertebral venous plexus may be seen on axial SE-T1 sequences, sometimes even when venous flow saturation is used, and this can mimic a genuine dissection. We present a case that illustrates the value of a SE-T1 volume acquisition with fat suppression to explore the entirety of the cervical vessels from their origins on a 1.5T MRI (Table 1).

Case report

Mrs A, a 47-year-old female with no medical history or treatment of note, was admitted to hospital after a transient ischaemic attack (TIA) affecting the left upper limb with concomitant right-sided tinnitus. CT of the brain without intravenous contrast material was normal. An MRI of the head and neck (GE MR 450W) showed no abnormalities of the cerebral parenchyma, but there was a dissection causing preocclusive stenosis in the petrous portion of the right internal carotid artery seen on a SE-T1 volume acquisition with fat suppression (Fig. 1). A gadolinium-enhanced MRA confirmed that there was widespread stenosis of the right internal carotid artery. The patient was then given effective anticoagulation therapy. The recurrence of contralateral tinnitus on the second day led us to carry out a second MRI. This demonstrated a second dissection causing stenosis that affected the petrous portion of the left internal carotid artery, with an acute intramural haematoma showing iso-signal intensity on T1-weighted images (Fig. 2a). On a repeat MRI carried out three days later, the intramural haematoma showed the usual high signal intensity on T1-weighted images, indicating a return to the sub-acute stage (Fig. 2b).

Discussion

This case illustrates recurrence of a dissection on a different artery and shows us the potential difficulties of diagnosing a dissection in the acute phase, when the intramural haematoma shows iso-signal intensity on T1-weighted images. It allows us to introduce a new SE-T1 volume acquisition with fat suppression.

CAD are characterised by an intramural haematoma developing in the tunica media. They are the leading cause of infarction in young adults, accounting for almost 20% of all the cases [1]. They occur post-traumatically or spontaneously. The prognosis is good, with mortality below 5%, and this is mainly connected to the extent of the cerebral ischaemia [2,3]. Recurrence is rare, affecting 0–25% of the cases, and is more common in the first two months after the dissection [4].

Carotid artery dissections are twice as common as vertebral artery dissections [5] and they primarily occur in the cervical internal carotid artery: 80% in the petrous portion and 20% in the mid-cervical portion. They spare the medulla oblongata and rarely extend within the skull because the

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Comparison between the parameters of axial SE-T1 sequences with fat suppression (2D) and SE-T1 volume acquisition with fat suppression (3D).</th>
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</thead>
<tbody>
<tr>
<td>Type of sequence</td>
<td>Axial SE-T1 with fat saturation</td>
</tr>
<tr>
<td>FOV (mm)</td>
<td>240 × 240</td>
</tr>
<tr>
<td>Matrix</td>
<td>288 × 224</td>
</tr>
<tr>
<td>Number of excitations</td>
<td>1</td>
</tr>
<tr>
<td>Thickness of slice (mm)</td>
<td>5</td>
</tr>
<tr>
<td>Space between slices (mm)</td>
<td>1</td>
</tr>
<tr>
<td>TR (ms)</td>
<td>600</td>
</tr>
<tr>
<td>Effective TE (ms)</td>
<td>8.1</td>
</tr>
<tr>
<td>Duration (min)</td>
<td>4.5</td>
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<td>FOV: field of view; TR: time of repetition; TE: time of echo.</td>
<td></td>
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</tbody>
</table>
Figure 1. Axial reconstruction (a) based on the sagittal acquisition (b) of the SE-T1 volume acquisition with fat saturation focused on the right internal carotid artery: intramural haematoma of the right internal carotid artery in the petrous portion (arrow), in the form of a high signal intensity crescent on T1-weighted images with increased vascular calibre. Coronal (c) and sagittal reconstructions (d) of the gadolinium-enhanced MRA of the supraaortic arteries focused on the right internal carotid artery: excentric preocclusive stenosis (arrow) sparing the medulla oblongata.

The petrous portion of the temporal bone is so narrow [2]. Vertebral artery dissections mainly affect the segment V3 at the atlas and axis vertebrae (34%) and segment V2, enclosed within the transverse foramen (35%) [5]. Cervical artery dissections can be multiple, as seen in 28% of the cases [6].

Imaging has a crucial role as it is able to confirm the diagnosis, identify any associated cerebral ischaemia, and it is used for patient follow-up. MRI has become the standard method, as it allows for both an endoluminal and parietal exploration at the same time, while being non-irradiating and non-invasive.

The protocol in common usage is carried out with a standard head/neck coil. The exploration begins at the cerebral level with standard imaging that allows any cerebral infarction to be diagnosed (diffusion, axial T2-weighted*,...
Spontaneous Flair, muscle millimetre-thick of Our physiological dissections cannot, portion is isotropic multiple normal 25 dissection.

It, mimicking the physiological signal is high, but the signal has a lower signal intensity on T1. The field of exploration is large, comprising a full study of the supraaortic arteries in a single acquisition. It is an isotropic volume acquisition that through the use of multiple planes, facilitates the assessment of the extent of lesions and the analysis of vascular loops, especially in portion V3 of the vertebral artery. It is also easier to draw a reproducible comparison with gadolinium-enhanced MRA. The spatial resolution is improved by the use of adjacent millimetre-thick slices that make it very easy to distinguish between the artery and the surrounding structures (venous plexus, bones), as well as facilitating the detection of focal dissections. The inflow effect on axial acquisitions (venous structures produce high signal intensity) is avoided with volume acquisition in the sagittal plane. Finally, in our experience and according to various studies, there is good quality fat saturation.

Conclusion

SE-T1 volume acquisition with fat suppression offers a number of advantages (speed of acquisition, large field of exploration, increased spatial resolution, possibility of studies in multiple planes) and should replace the standard axial sequence in the routine investigation of arterial dissections.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References


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