This issue of the Journal of the Norwegian Medical Association features two cases of carotid artery dissection, detected by MRI and ultrasound respectively. Which method should be used when?

Cervical artery dissection – choice of diagnostic imaging

An arterial dissection occurs when a tear in the intima of the vessel wall allows blood to flow into a false lumen and form an intramural haematoma. The wall between the true and the false lumen is often referred to as a «flap». A haematoma located between the intima and the media will bulge into the lumen, giving rise to a stenosis and often a thickening of the arterial wall. A haematoma between media and adventitia will cause a pseudoaneurysm (1). Complications include cerebral ischaemia, caused either by embolus formation in the case of an intimal tear or by hypoperfusion due to significant stenosis. On rare occasions the tear may go through the adventitia and cause subarachnoid haemorrhage if the dissection extends intracranially. Different radiological examinations can detect different features of the dissection.

MRI with anatomical cross-sections is best suited to detecting the intramural haematoma characteristic of an arterial dissection (2). In the case report by Amthor et al., the characteristic crescent sign can be seen bilaterally in the wall of the internal carotid artery (3). Supplementary MR angiography can be used to visualise the intraluminal stenosis, and diffusion-weighted imaging of the brain to detect ischaemia. MRI does not require contrast or radiation exposure, but entails thicker slices than a CT scan, is less readily available and may be contraindicated in patients with metal implants.

CT angiography with intravenous contrast is effective in revealing the contours of the arterial lumen, and thus stenoses and pseudoaneurysms. The classic finding is an elongated eccentric tapering of contrast, with the «flap» sometimes visible (2). It may also be possible to gain an impression of the intramural haematoma, but this is more difficult than with MRI. CT angiography has higher resolution and is more readily available than MRI, but requires radiation exposure and the use of intravenous contrast. The latter may be contraindicated in cases of kidney failure and allergy.

Ultrasound examination of the cervical arteries can reveal the flap, the false lumen and the intramural haematoma, while Doppler ultrasound can reveal haemodynamic changes caused by stenosis (4, 5). Ultrasound examination is non-invasive and more readily available than MRI. However, it is user-dependent, and cannot be used to examine distal parts of the internal carotid artery because bony structures obstruct the view. This is also the case for the vertebral arteries. Ultrasound can thus be used to reveal a dissection in the proximal internal carotid artery, but not in the other cervical arteries (6).

Conventional catheter-based angiography used to be the gold standard for dissections. An elongated tapering of contrast could be seen, although not the intramural haematoma itself (2). This technique is now very rarely used diagnostically as it is invasive and involves radiation exposure.

In 2009, a systematic review compared CT angiography with MRI/MR angiography and found them to be equally suited to detect dissection of the carotid artery and the vertebral artery (7). In another article from 2008, two neuroradiologists compared CT angiography and MR/MR angiography in the same 18 patients with dissections. They preferred CT angiography for dissections in the vertebral arteries, but considered the methods equally effective for assessing the carotid arteries (8). Negative ultrasound findings should be confirmed by means of additional diagnostic imaging (6, 9). A good example is patients with Horner's syndrome as the only sign of carotid dissection, where ultrasound failed to detect the dissection in three out of ten patients in whom a dissection was subsequently confirmed (10).

A number of international professional bodies, including the American Heart Association, the American Stroke Association and the International Headache Society, do not make any specific recommendations, beyond pointing out that all three techniques can be used, but must sometimes be used in combination in order to obtain the final diagnosis (11, 12). Several review articles recommend starting with MRI/MR angiography, which is best suited to detect the intramural haematoma and cerebral ischaemia (3, 6, 9, 13).

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