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Vertebral Artery Dissection Diagnosed with CT

J. R. Soper, G. D. Parker, and J. M. Hallinan

Summary: Vertebral artery dissection after neck manipulation has been well described. A case of bilateral vertebral artery dissection diagnosed with dynamic CT scanning of the neck is reported. The CT appearances and correlative angiographic and MR findings are presented.

Index terms: Arteries, dissection; Arteries, vertebral; Neck, computed tomography

Vertebral artery dissection can occur spontaneously or follow trauma, such as neck manipulation. Clinical suspicion has previously required angiography for diagnosis. More recently there have been reports of diagnosis with magnetic resonance (MR) imaging (1). We report a case of bilateral vertebral artery dissection after cervical manipulation, initially diagnosed with computed tomography (CT), that had angiographic confirmation.

Case Report

A 26-year-old woman had had neck stiffness for approximately 1 month. During this time she had had a number of chiropractic neck manipulations with no improvement. On one occasion she had experienced a transient episode of diplopia shortly after the manipulation, but this rapidly resolved.

On the day of presentation she had received an injection of lidocaine and betamethosone into the right side of her neck at the level of the third cervical vertebra. Her neck was then forcibly rotated to both right and left sides. During this maneuver she had a rapid onset of symptoms including diplopia, tinnitus, weakness of the left side of her face, and paresthesia of both upper and lower limbs, particularly on the right. On admission, neurologic examination revealed some cranial nerve signs including absence of eye abduction bilaterally, nystagmus, and left facial weakness in addition to long-tract signs with weakness of all four limbs, right-sided clonus, and a left extensor plantar response.

A head CT scan was normal. A CT scan of the upper neck was obtained to exclude a paravertebral hematoma. A dynamic scanning technique that used 3-mm contiguous sections during infusion of 100 mL of iodinated contrast material at a rate of 2 mL per second via a power injector was performed (Fig 1). CT showed a pinpoint opacified lumen on the left from C-4 to C-2. Above C-2, the entire lumen was reopacified. On the right there was no contrast opacification within the vertebral artery above C-2. The diagnosis of bilateral vertebral artery dissections was made, and the patient was begun on anticoagulants.

MR examination 12 hours later showed similar findings (Fig 2). On the left, high signal intensity consistent with methemoglobin filled most of the left vertebral artery lumen to the level of C-2. On the right, similar high signal was present within the vertebral artery above C-2 on T1-weighted images. High-signal changes consistent with infarction were seen on the right side of the pons on T2-weighted images (Fig 2B).

Angiography was performed immediately after MR, and the MR findings were confirmed (Fig 3). The dissection on the left extended from T-1 to C-2 as a long regular stenosis. There was a small aneurysm at C-6. This was presumed to be a traumatic pseudoaneurysm. CT had not shown it because C-4 was the lowest level scanned. Complete occlusion of the right vertebral artery was present above C-2. Intraluminal filling defects consistent with thrombus were seen in the basilar artery, which refilled from the left internal carotid artery.

With anticoagulants, marked clinical improvement occurred over a 2-week period. On discharge, the cranial nerve signs and limb weakness had resolved. A subjective paresthesia persisted in both lower limbs.

Discussion

Vertebral artery dissection in association with neck manipulation is well described (2, 3). The earliest report of vertebrobasilar occlusion resulting from cervical manipulation was published in 1947 (4). The diagnosis is usually suspected on clinical grounds and can be supported by findings of posterior circulation infarction on head CT scans. The "gold standard" for diagnosis is angiography. More re-

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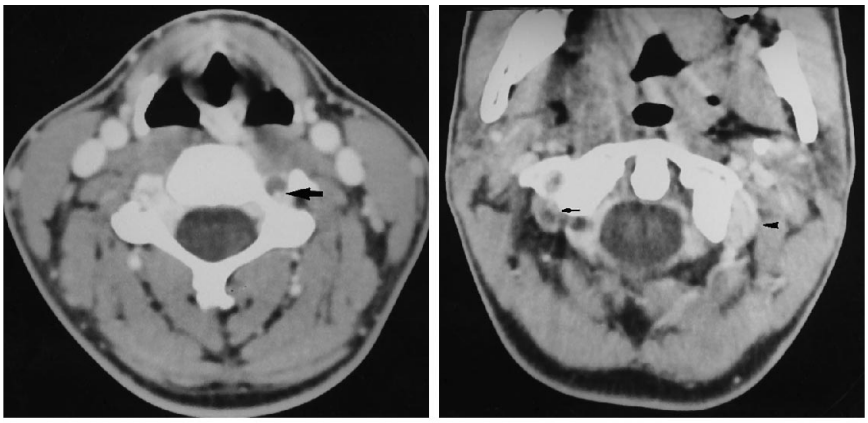

A B

Fig 1. Axial CT scans after contrast administration.

A, Left vertebral artery has an eccentric, contrast-filled true lumen (*arrow*) and a surrounding crescent of hypodensity giving a "double lumen" appearance.

B, More superiorly, a filling defect is seen in the lumen of the right vertebral artery (*arrow*) as it passes around the posterior arch of the atlas. The lumen of the left vertebral artery is now opacified with contrast material (*arrowhead*).

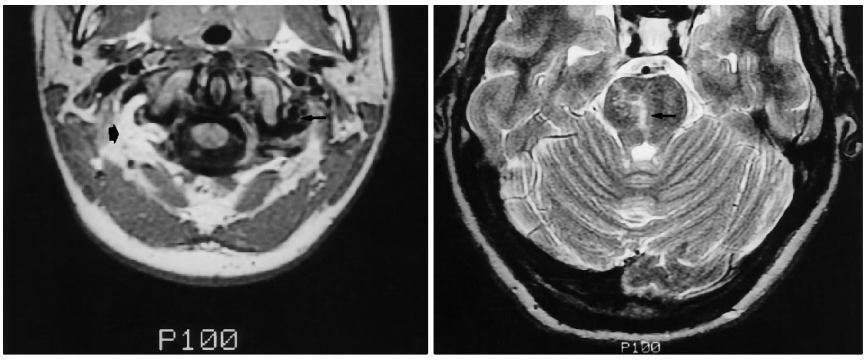

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Fig 2. *A*, Axial T1-weighted spin-echo MR image (720/20/2 [repetition time/echo time/excitations]) shows high signal intensity of methemoglobin within the right vertebral artery at C-1 (*short arrow*). Flow void indicating a patent lumen at this level is seen on the left (*long arrow*).

B, Axial T2-weighted fast spin-echo MR image (6000/108/4). Abnormal high signal intensity seen within the pons on the right (*arrow*) indicates infarction.

cently, diagnosis of vertebral artery dissection with MR has been reported (1). Diagnosis of vertebral artery dissection with CT scanning is unusual.

There have been numerous reports of dissection of the internal carotid arteries diagnosed with contrast-enhanced CT (5, 6). The CT findings described include a "double lumen" appearance with an eccentric round-shaped hyperdensity of the true lumen and a surrounding crescentic hypodensity corresponding to the false lumen, or a vessel of increased diameter with faulty visualization of the lumen. A few reports regarding dissection of the carotid artery suggest that CT and MR can be as valuable as angiography because the intramural hematoma can be demonstrated directly (7, 8). In elderly patients, atherosclerosis with severe intimal disease could mimic the CT findings in this case; however, the age of the patient as well as the length of the lesion on the left made this unlikely in our case.

The diagnosis of vertebral artery dissection with MR has been recently described for both spin-echo and gradient-echo sequences (1).

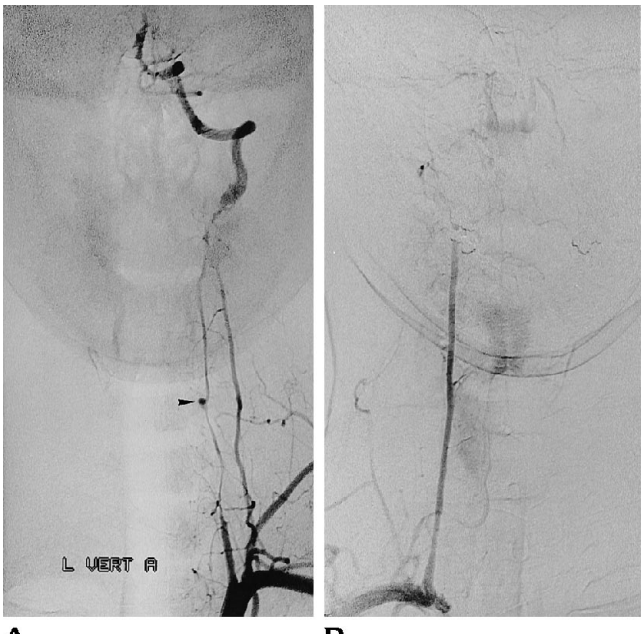

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Fig 3. *A*, Left vertebral angiogram shows the long stenosis of the artery beginning in the first segment of the vessel at the upper margin of T-1 extending to C-2. The small aneurysm is seen at the lower third of the dissection at C-6 (*arrowhead*).

B, Right vertebral angiogram shows complete occlusion of the artery at C-2.

Both T1- and T2-weighted conventional spin-echo images show crescentic high signal intensity within the wall of a compressed true lumen. Flow void within the true lumen signifies patency. Gradient-echo images show increased signal in the true lumen when patent. If the dissection is extensive, the true lumen can be completely compressed, with subsequent thrombosis. As in our case, the high signal of subacute thrombus might then be seen within the true lumen on spin-echo images.

Dissection of major vessels in the neck can be demonstrated noninvasively with CT as well as with MR. Although previous reports have stressed the utility of MR, CT may be a useful alternative when MR is not available, such as in emergency situations, in patients with sufficient brain stem dysfunction to require ventilation, or in claustrophobic patients unable to tolerate MR examination.

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