Challenging Vertebrobasilar Revascularization

Irregular atherosclerotic disease made crossing the lesion difficult.

BY LEE R. GUTERMAN, PHD, MD

A 75-year-old man presented to the emergency department with a 2-hour history of dizziness and speech abnormality. The acute stroke team was activated. A CT scan of the head was obtained, which failed to demonstrate any evidence of intracranial hemorrhage, hypodensity, or mass effect consistent with acute stroke.

On examination, the patient was awake and oriented but could not easily articulate speech. His ability to comprehend language and complex commands was intact, but it appeared he had trouble positioning his lips and tongue to verbalize a response. His pupils were equal and reactive to light; extraoccular muscles were intact, and visual fields were intact to confrontation. His face was symmetric. The results of motor exam were 5/5, and in all groups he had no drift. Finger-to-nose testing was smooth, and rapid alternating movements were slightly slow—the left hand was slower than the right.

While in the emergency department, the patient's neurological symptoms began to resolve, and the patient returned to neurological baseline without any treatment. He was admitted to the hospital for observation. Magnetic resonance imaging and magnetic resonance angiography of the head were unremarkable. Carotid Doppler demonstrated increased velocities in the cervical carotid bifurcation bilaterally.

Given the patient's transient inability to articulate speech and mouth the words, involvement of the vertebrobasilar circulation was suspected. A diagnostic cerebral angiography was obtained.

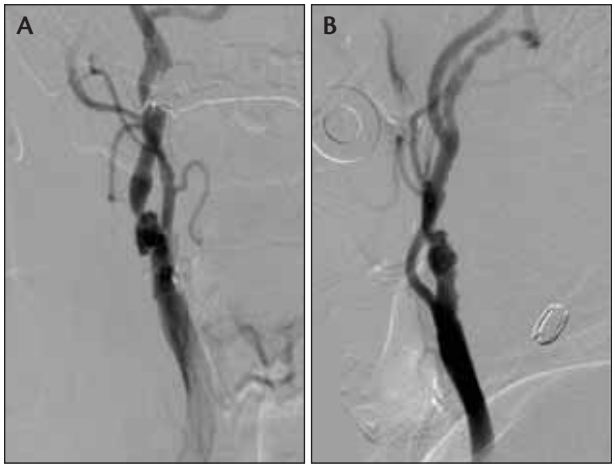

Figure 1. A right anteroposterior (A) and lateral selective (B) common carotid artery angiogram.

ANGIOGRAPHIC FINDINGS

In Figure 1, the right anteroposterior and lateral selective common carotid artery angiograms are displayed. The right cervical carotid bifurcation appears irregular and ulcerated with a stenotic segment in the right internal carotid artery. Initial inspection of the course of the right internal and external carotid circulation demonstrates a pair of vessels ascending intracranially. The left cervical carotid bifurcation had a smooth focal 70% stenosis. The left vertebral artery was small, and the majority of its circulation ended early in the intracranial vertebral artery at the level of the posterior inferior cere-

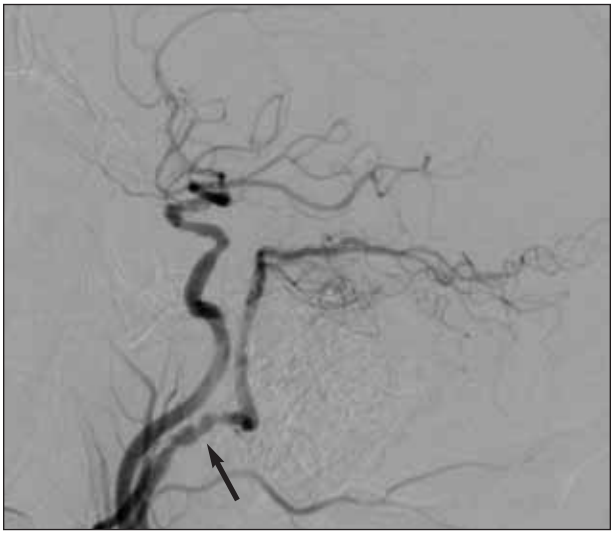

Figure 2. A right common carotid injection lateral view displays a bifurcation of the internal carotid artery distal to the bifurcation of the common carotid artery.

bellar branch. Therefore, the left vertebral artery was not the main supply to the basilar artery or its branches.

In Figure 2, a right common carotid injection lateral view displays a bifurcation of the internal carotid artery distal to the bifurcation of the common carotid artery. This right common carotid artery injection reveals that the origin of the right vertebral artery comes directly from the extracranial internal carotid artery, causing the entire basilar circulation to be fed from the right internal carotid artery. The internal carotid artery from the common carotid bifurcation to the vertebral origin displays atherosclerotic disease with stenosis. In addition, the right vertebral artery, in its horizontal segment proximal to the vertebrobasilar junction, also has irregular stenosis. Careful inspection of the basilar artery demonstrates atherosclerotic stenosis in the midbasilar segment.

TREATMENT

The patient was placed on 324 mg of aspirin and 75 mg of clopidogrel. Treatment of the cervical carotid bifurcation was considered. The irregular vertebrobasilar stenosis covers a long segment of vessel and is not highly stenotic. The cervical carotid bifurcation has a tight stenosis in the portion of the extracranial internal carotid artery proximal to the aberrant right vertebral origin. If this portion of the internal carotid artery occluded, the right anterior cerebral and middle cerebral arteries as well as the entire basilar circulation would be at risk. The decision was made to revascularize the right internal carotid artery and then, in a separate procedure, consider treating the long segment stenosis in the right vertebral artery.

Figure 3. The EPI device can be seen in the internal carotid artery distal to its bifurcation with the right vertebral artery (arrow) (A). The carotid was revascularized using an 8-mm X 20-mm Wallstent, without complication (B).

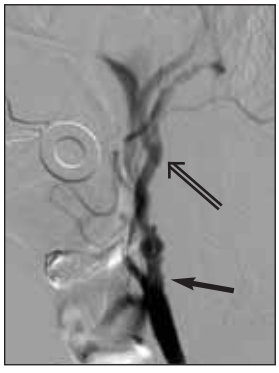

Figure 4. A right common carotid angiogram demonstrates the bifurcation of the internal carotid (arrow) and right vertebral (double arrows) arteries after stent placement.

Figure 5. A right common carotid artery angiogram (lateral view) shows no change in the intracranial circulation after stent placement.

A 6-F Envoy guide catheter (Cordis Endovascular, a Johnson & Johnson Company, Miami, FL) was placed into the right common carotid artery. The patient was placed on heparin to obtain an activated clotting time greater than 250 seconds. The right cervical carotid lesion was crossed with an EPI FilterWire (Boston Scientific Corporation, Natick, MA). Roadmap fluoroscopy was

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used to ensure that the vertebral origin was not instrumented. The landing zone proximal to the right vertebral artery origin was inadequate; therefore, the EPI device was placed distal to the vertebral origin. If the EPI device were placed between the internal carotid origin and the vertebral origin, an unstable wire position would have resulted. Tracking of the balloon and stent could have been problematic. Yet, this position inferred protection of the distal basilar and carotid circulation. I chose to anchor the device securely in the right internal carotid artery proximal to the skull base and distal to the right vertebral origin. In Figure 3A, the EPI device can be seen in the internal carotid artery distal to its bifurcation with the right vertebral artery.

Consideration was given to using two EPI devices: one in the internal carotid and one in the distal vertebral artery. The vertebral artery measures approximately 3 mm, and the basilar artery was 2.5 mm. The landing zone for the vertebrobasilar filter would have been in the basilar artery. Due to concerns of basilar artery thrombosis and flow compromise, this technique was not utilized. The carotid artery was revascularized using an 8-mm X 20-mm Wallstent (Boston Scientific) without complications (Figure 3B), and the patient was discharged the next day. In Figure 4, a right common carotid angiogram demonstrates the bifurcation of the internal carotid and right vertebral arteries after stent placement. In Figure 5, a right common carotid artery angiogram shows no change in the intracranial circulation after stent placement.

FUTURE TREATMENT

The plan is to consider treatment of the vertebrobasilar lesion if the patient becomes symptomatic or if the vertebrobasilar stenosis increases. A follow-up angiogram is scheduled 6 months from the time of carotid stent placement. It would be possible to repair the vertebral or basilar lesion with a Wingspan intracranial stent (Boston Scientific). This procedure is usually performed without distal protection secondary to the crossing and capture profile, as well as the fear of deploying a protection device into delicate vessels within the intracranial circulation. A safe and effective intracranial distal protection device will prove useful in the future as intracranial revascularization procedures increase in number. ■

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