

Asymptomatic Carotid Artery Dissection Caused by Blunt Trauma —Case Report—

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Abstract

A 42-year-old man presented with asymptomatic traumatic carotid artery dissection 3 months after sustaining blunt injury with tracheal laceration. Magnetic resonance imaging performed as a screening procedure for asymptomatic carotid artery injury unexpectedly showed dissection of the carotid artery. Angiography confirmed carotid artery dissection with narrowing of the true lumen. Balloon angioplasty and stent placement were carried out to dilate the true lumen and isolate the false lumen from blood flow. Intravascular ultrasonographic virtual histology defined the precise anatomic structure of the lesion and identified the internal flap as fibrotic. Careful clinical assessment of patients with blunt cervical trauma may permit diagnosis of carotid artery dissection and intervention prior to the development of cerebral ischemic symptoms.

Key words: blunt carotid artery injury, carotid artery dissection, carotid artery stenting, intravascular ultrasonographic virtual histology

Introduction

Early diagnosis of carotid artery dissection allows prompt intervention to prevent stroke. However, the symptoms of traumatic carotid artery dissection may be delayed, sometimes for weeks or longer. Only 10% of patients display immediate symptoms, whereas 35% develop symptoms only 24 hours or more after injury.⁸⁾ Delayed neurologic symptoms are related to either progressive hemodynamic impairment or thromboembolism. Blunt cervical trauma associated with carotid artery dissection is relatively uncommon, affecting far less than 1% of patients.⁴⁾ Asymptomatic carotid artery injury can easily go undetected during clinical assessment of head and neck trauma.^{2,5)} The onset and severity of a neurologic deficit may depend on multiple factors, so the symptoms may appear immediately after the trauma but more frequently emerge after a delay ranging from hours to months.^{6,8)}

We treated a patient with traumatic carotid artery dissection detected by screening imaging after remaining asymptomatic for 3 months after blunt trauma, who was treated successfully with balloon

angioplasty and stent placement.

Case Presentation

A 42-year-old man suffered injury to the anterior neck after dropping a heavy load and was admitted to a regional hospital. He was treated initially in the intensive care unit for tracheal fracture and recurrent transient bilateral nerve paralysis. Three months after the accident, head and neck magnetic resonance (MR) imaging performed as screening for silent carotid artery injury showed a small left cerebral infarct (Fig. 1) and left carotid artery stenosis, associated with a false lumen resulting from dissection (Fig. 2). Carotid angiography confirmed approximately 95% stenosis at the origin of the left internal carotid artery, with an expanded false lumen (Fig. 3). Single photon emission computed tomography showed decreased cerebral blood flow in the territory of the left internal carotid artery, indicating the risk of future stroke caused by embolism from the site of carotid intimal injury or carotid artery occlusion from enlargement of the dissection. Carotid artery stenting was selected to dilate the carotid ar-

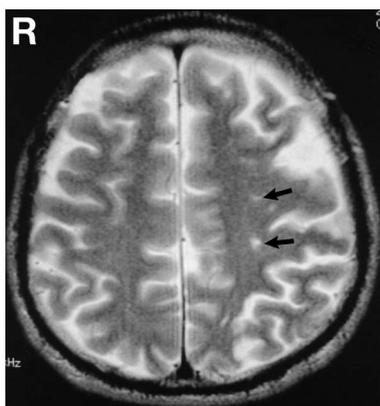


Fig. 1 Axial T₂-weighted magnetic resonance image demonstrating a small infarct in the left cerebral hemisphere (arrows).

tery and exclude the false lumen from the blood flow. Antiplatelet therapy (aspirin, 100 mg/day; ticlopidine, 200 mg/day) was started 7 days before endovascular treatment.

A 6-Fr long sheath (Shuttle; Cook, Bloomington, Ind., U.S.A.) was placed in the distal common carotid artery proximal to the dissection. Systemic heparinization was initiated to maintain the activated clotting time between 200 and 300 seconds. A 0.014-inch Transend EX guidewire (Boston Scientific, Fremont, Calif., U.S.A.) was passed through the stenosis under angiographic road mapping monitoring, for initial placement distal to the re-entry dissection flap to assure passage through the true lumen. A PurcuSurge Guardwire device (Medtronic AVE, Santa Rose, Calif., U.S.A.) was passed through the lesion parallel to the Transend EX guidewire, then an intravascular ultrasonographic virtual histology (IVUS-VH) device (Volcano Therapeutics, Rancho Cordova, Calif., U.S.A.) was passed through the lesion over the first guidewire to define the circumferential anatomic structure of the lesion.

Placement of a self-expanding stent (Wallstent RP, 9 × 18 mm; Boston Scientific) was attempted without predilation, but the stent could not expand sufficiently because of sclerosis of the vessel wall. IVUS-VH demonstrated fibrous tissue associated with a necrotic area in the vessel wall, suggesting that fibrosis of the internal flap might have progressed in the 3 months since the trauma (Fig. 4). Predilation was carried out using an Amiia balloon catheter (4 × 40 mm; Cordis, Miami Lakes, Fla., U.S.A.), with distal protection provided by the PurcuSurge device. A Wallstent RP (9 × 35 mm; Boston Scientific) was then placed. After withdrawing the stent delivery system, an export catheter was

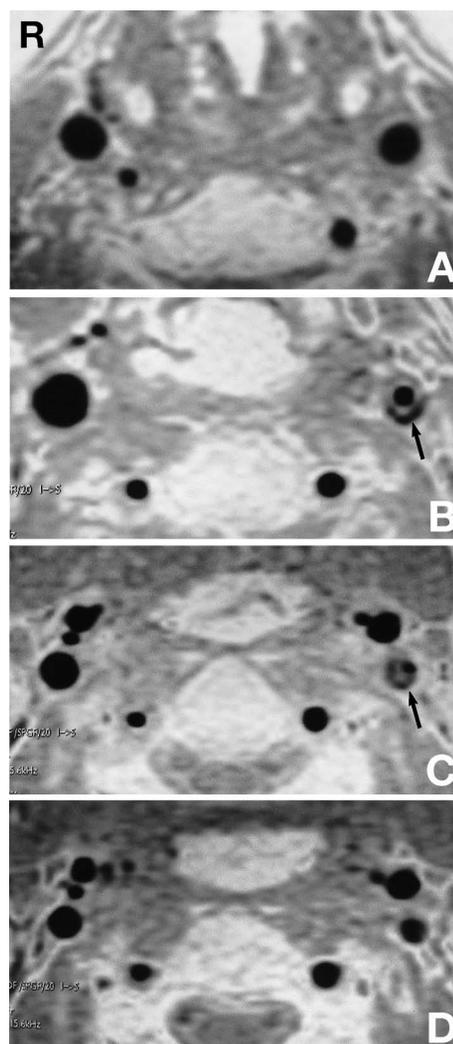


Fig. 2 Axial magnetic resonance images of the bilateral common carotid arteries (T₁-weighted reverse images; repetition time, 23 msec; echo time, 69 msec; matrix, 256 × 128), showing a false lumen compressing the true lumen of the left carotid artery (arrows). A: Level of the common carotid artery; B: level of the carotid bulb; C, D: proximal levels of the internal carotid artery.

used to aspirate blood, which contained small thrombi. Stenting was then carried out successfully. The blood pressure was maintained within the normal range during the operation.

Postprocedural angiography showed effective dilation of the stenosis and exclusion of the false lumen from the circulation (Fig. 5). Systemic heparinization was maintained for 2 days after the procedure, ticlopidine administration was continued for 30 days following stenting, and aspirin medication was continued indefinitely.

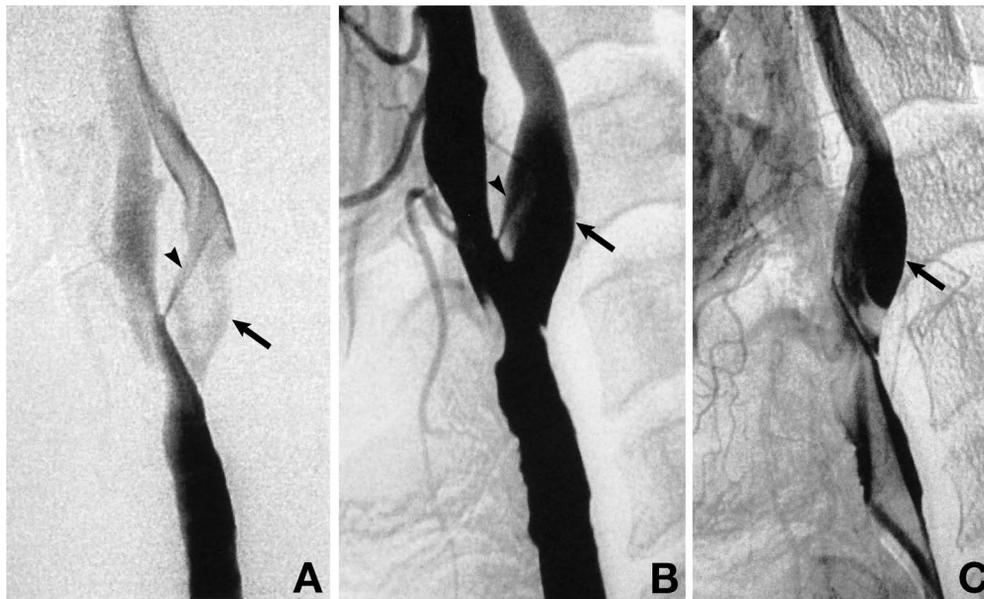


Fig. 3 Lateral angiograms of the left common carotid artery demonstrating an expanded false lumen (arrows) compressing the true lumen (arrowheads), and abnormal jet flow from the common carotid artery into the internal carotid artery. A: Early arterial phase; B: midarterial phase; C: late arterial phase.

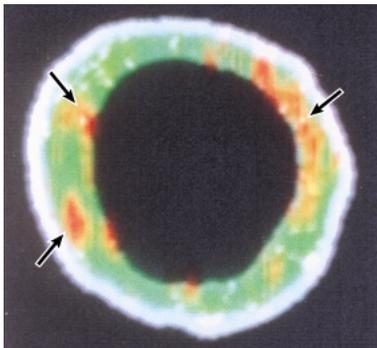


Fig. 4 Intravascular ultrasonographic virtual histology of the left carotid artery, demonstrating details of the intimal flap including fibrous plaque (labeled green) with partially necrotic core (labeled red; arrows).

Discussion

Neuroimaging may be helpful in assessing the presence and extent of the vascular lesion. In the present case, MR imaging visualized narrowing of the true arterial lumen and expansion of the false lumen. Digital subtraction angiography provided a more precise assessment, and confirmed the carotid artery dissection.



Fig. 5 Lateral left carotid angiogram after placement of a self-expanding stent in the previously narrowed segment of the carotid artery showing minimal residual filling of the false lumen (arrow).

A grading system¹⁾ is available for angiographic findings in blunt carotid artery injury, with grade I representing luminal irregularity or dissection with less than 25% luminal narrowing; grade II, dissection or intramural hematoma with over 25% narrowing, intraluminal thrombus, or a raised flap; grade III, pseudoaneurysm formation; grade IV, occlusion; and grade V, transection with free extravasation of blood. This classification provides a guide to treatment. Recent improvements in endovascular techniques allow stent placement for grade II and III lesions, achieving acceptable results.¹⁾ Our present case was classified as grade II, based on the presence of narrowed true arterial lumen and expansion of the false lumen.

Endovascular stent placement for blunt carotid artery injury with dissection is intended to dilate the true lumen and isolate the false lumen from blood flow.^{2,4,5)} Endovascular treatment of carotid artery dissection requires passage of devices through the true lumen. In the present case, the 0.014-inch Transend EX guidewire was passed through the stenosis under road mapping monitoring. Location in the true lumen was assured by advancing the guidewire beyond the re-entry site of the flap. Then the PercuSurge Guardwire device could be passed safely through the lesion in parallel with the Transend EX.

Balloon angioplasty is usually avoided in the treatment of traumatic carotid artery dissection to prevent rupture of a heavily damaged artery.³⁾ A self-expanding stent is used most often for the same reason. In the present case, the segment with luminal narrowing had apparently undergone fibrosis, so predilation before stent placement was required for sufficient luminal expansion.²⁾

Intravascular ultrasonography is the “gold standard” for evaluation of plaque, lumen, and vessel dimensions. Recently, the spectral analysis of radiofrequency ultrasound backscatter signals (“virtual histology”) has been developed to assess plaque morphology in vivo.⁷⁾ IVUS-VH can identify four different types of atherosclerotic plaques with reasonable certainty: fibrous, labeled green; fibrolipidic, labeled greenish-yellow; densely calcific, labeled white; and centrally necrotic, labeled red. In the present case, IVUS-VH defined the precise ana-

tomic structure of the lesion and identified the internal flap as fibrotic. IVUS-VH technology may identify both the configuration and the tissue constituents of carotid artery dissection lesions, thus providing important information and allowing safe and effective endovascular treatment.

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