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Technical note

The use of flow diverter stents in the management of traumatic vertebral artery dissections

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ABSTRACT

Flow diverters constitute a new generation of flexible self-expanding stent-like devices with a high metal-surface area coverage, specifically designed for the endovascular management of complex cerebral aneurysms. Recently, other potential applications for these devices in the field of occlusive cerebrovascular disease have been described. In vertebral artery dissections causing occlusion associated with a burden of extensive clots, we have found that the reduced porosity of the diverter mesh serves as an effective barrier to in-stent clot protrusion and distal embolization. We describe the novel use of a flow diverter for the management of an occlusive traumatic vertebral artery dissection. Diverter implantation allowed subsequent angioplasty.

1. Introduction

Flow diverters constitute a new generation of flexible self-expanding stent-like devices with a high metal-surface area coverage, specifically designed for the endovascular management of wide-necked, fusiform, large, and giant unruptured intracranial aneurysms.[1–4] They were designed to achieve aneurysm occlusion through endoluminal reconstruction of the dysplastic segment of the parent artery that gives rise to the aneurysm.[2,3] Recently, flow diverters have been found to offer valuable options in the management of other vascular lesions, including symptomatic chronic carotid occlusion. This opens new potential applications for these devices in the field of cerebrovascular disease.[5]

In vertebral artery dissections causing occlusion associated with a burden of extensive clots, we have found that the reduced porosity of the diverter mesh serves as an effective barrier to in-stent clot protrusion and distal embolization. We describe the novel use of a flow diverter for the management of a complicated occlusive traumatic vertebral artery dissection causing impending major stroke. Diverter implantation allowed subsequent angioplasty.

2. Patient and description of the technique

A 66-year-old man was admitted to the Emergency Room after falling from a height. Upon arrival he was alert and oriented, with signs of head and neck trauma, and complaining of significant neck pain. The patient was neurologically intact but complained of dizziness and persistent nausea.

Head and neck CT scans revealed multiple fractures of the spine in the posterior and middle columns of C4, C5, and C6. The cervical collar was left on. CT angiogram of the cervical arteries revealed a severe dissection of the dominant left vertebral artery at the V2 segment causing moderate stenosis and mild dissection of the contralateral hypoplastic vertebral artery. CT angiogram of the intracranial vessels showed no communication between the carotid and vertebrobasilar circulations (Fig. 1A).

The patient was started on heparin and followed clinically. Follow-up CT angiogram obtained after 16 hours revealed progression of the left vertebral artery dissection to near total occlusion (Fig. 1B). Heparin was stopped and the patient was taken to the interventional neuroradiology suite.

Anesthesiologists and spine specialists recommended against the use of general anesthesia due to substantial comorbid conditions and spinal instability; thus a 6F introducer sheath was placed at the right femoral artery under local anesthesia. Left vertebral artery angiogram confirmed complete occlusion of the artery at the level of C5. The right vertebral artery angiogram showed the vertebral artery ending in an enlarged posterior inferior cerebellar artery that also supplied the contralateral cerebellar hemisphere. There was a faint opacification of the basilar artery through leptomeningeal collaterals (Fig. 1C). The left vertebral artery angiogram demonstrated complete occlusion of the dominant artery at the V2 segment (Fig. 1D). Carotid angiograms failed to show primary collateral supply to the vertebrobasilar system.

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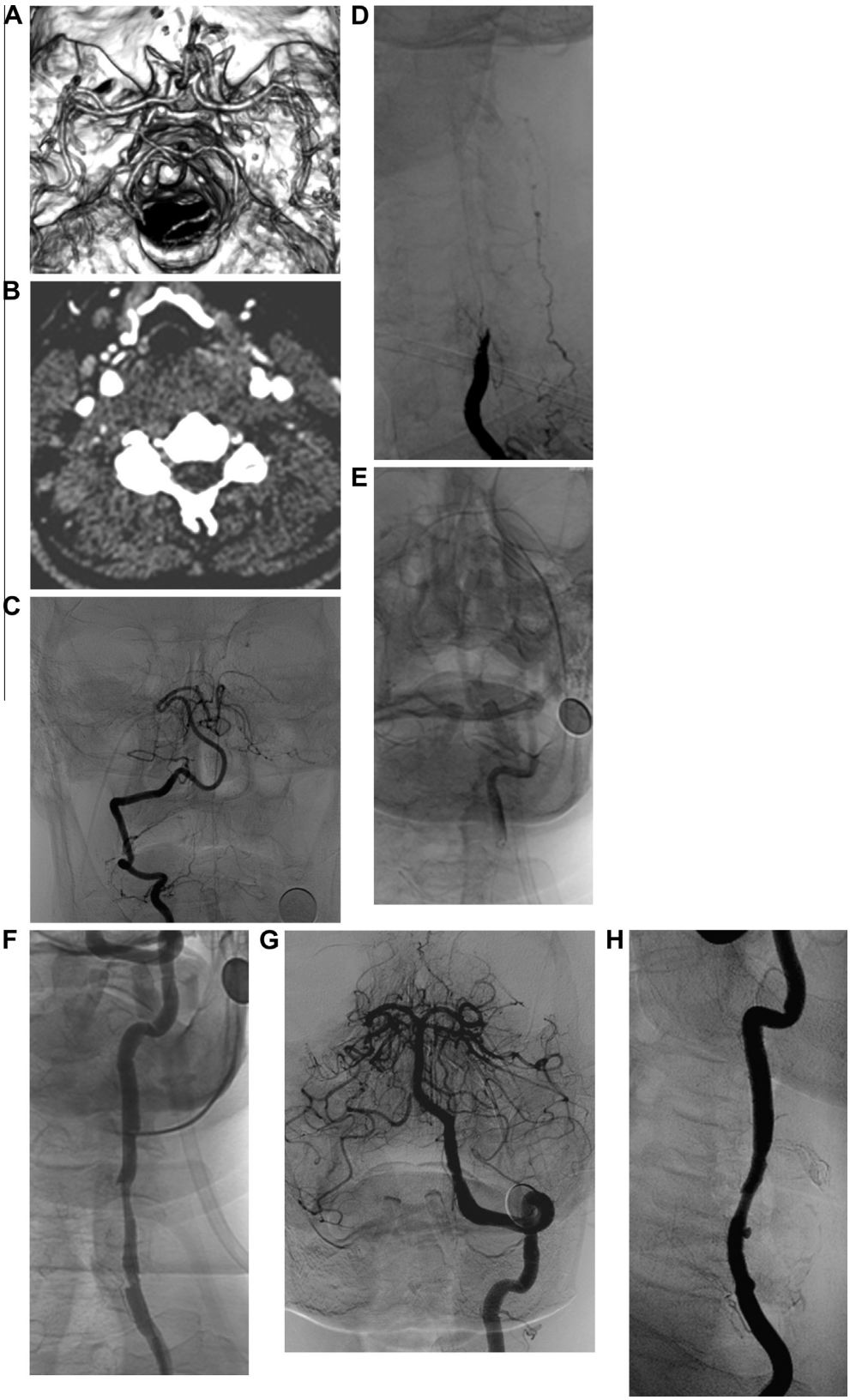

Fig. 1. (A) CT angiography reconstruction of intracranial arteries showing an incomplete circle of Willis (no posterior communicating arteries anastomose anterior to posterior circulations). (B) CT angiography of the cervical arteries showing a hypoplastic right vertebral artery and severe dissection of the dominant left vertebral artery. (C) Right vertebral artery angiogram showing the hypoplastic vertebral artery ending at the posterior inferior communicating artery. Only a faint collateral opacification of the basilar artery is insinuated. (D) Left vertebral artery angiogram demonstrating complete occlusion of the proximal dominant artery (V2 segment). (E) Vertebral artery occlusion is crossed with a microcatheter. Microangiogram identifies the uninjured true lumen beyond clots complicating the dissection and causing complete occlusion. (F) Left vertebral artery angiogram showing the repaired arterial segment immediately after applying low-pressure angioplasty over the implanted diverter. (G) Left vertebral artery angiogram obtained immediately after recanalization showing restitution of the normal vertebrobasilar circulation. (H) Follow up angiogram obtained after 3 months showing the repaired arterial segment.