

CASE REPORT



Dramatic Neuro Rescue Following Retrograde Carotid Stenting for Type A Aortic Dissection With Bilateral Carotid Involvement

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Abstract

Stanford type A aortic dissection (TAAD) is an indication for urgent surgical repair and does not change with findings of malperfusion involving the innominate and carotid arteries. Historically, the outcomes from uncorrected cerebral malperfusion have been associated with dismal neurological outcomes, made worse with involvement of the extracranial carotid arteries. This case involves a patient with neurological deficits in the setting of TAAD with compromise of the common carotid arteries. The patient had profound improvement of the neurological deficits after a staged bilateral retrograde carotid stenting using a lower radial force venous stent in the setting of acute arterial dissection.

Introduction

Stanford type A aortic dissection (TAAD) is a surgical emergency requiring immediate repair. When accompanied by malperfusion of branch vessels, the prognosis is incrementally dire. Cerebral malperfusion in TAAD is associated with a stroke rate of 42% and mortality rate of 28%.¹ Malperfusion of both carotid arteries portends worse outcomes.

We describe a case of bilateral common carotid artery (CCA) compromise in a patient presenting with a TAAD with profound neurological deficit. Staged retrograde carotid stenting using the newly released Abre self-expanding nitinol venous stent (Medtronic) achieved a dramatic neuro rescue. We obtained informed consent from this patient for publication of this case report and accompanying images.

Case Description

A 58-year-old male with a 40 pack-year smoking history presented to the emergency department with 7 hours of chest pain and diaphoresis. An electrocardiogram on presentation revealed ischemic changes, leading to immediate cardiac catheterization. During the cardiac catheterization, a dissection flap was noted in the ascending aorta and the right coronary artery could not be engaged, resulting in immediate transfer to the operating room. There was no opportunity for any additional imaging, as this was a true emergency.

The patient underwent an emergency replacement of the ascending aorta and hemiarch with a 30-mm Hemashield graft with reconstruction of the sinotubular junction, resuspension of the aortic valve, and coronary artery bypass graft with reverse saphenous vein to the right coronary artery. Surgery was performed under hypothermic circulatory arrest with cerebral perfusion provided by placing soft-tipped catheters in the innominate and the left CCAs.

Postoperatively, the patient was noted to have left-sided weakness and a markedly decreased level of consciousness (LOC). There was no evidence of stroke or intracranial hemorrhage on head computed tomography (CT). A head and neck CT angiogram demonstrated near total effacement of the true



Figure 1. Computed tomography angiogram of the neck and head demonstrating near total effacement of the true lumen of the left common carotid artery.

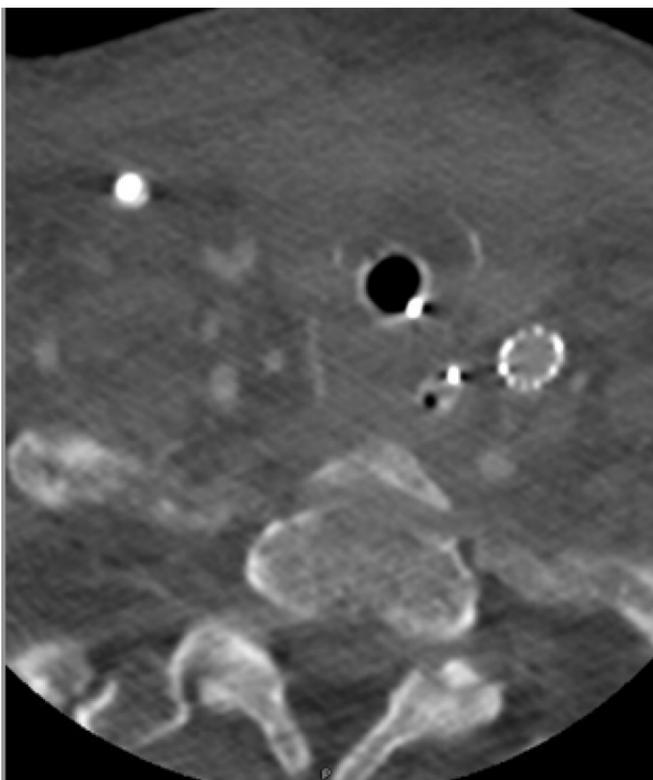


Figure 2. Sixty percent stenosis of the mid-right common carotid artery from a dissection flap involving the vessels.



lumen of the left CCA (**Figure 1**) and 60% stenosis of the mid-right CCA from a dissection flap involving the vessels (**Figure 2**).

The following day, the patient underwent retrograde stenting of the left CCA by cut down over the carotid bifurcation. A 10-mm x 80-mm followed by a 12-mm x 100-mm from distal to proximal Abre self-expanding venous stent was utilized for the repair. We were able to restore the true lumen of the left CCA (**Figure 3** and **Figure 4**).

The patient's neurological status improved with a normal LOC and improvement in the left-sided weakness. A week later he only had mild left arm weakness. He then underwent retrograde stenting of the dissection involving the mid right CCA utilizing a 12-mm x 100-mm Abre self-expanding venous stent with complete restoration of the lumen of the right CCA.

Over the next few days, the residual left arm weakness completely resolved. On 30-day follow-up, he was noted to have an essentially normal neurologic examination with normal motor function of the left upper extremity (**Figure 5**). At 1 year, the patient remained free of neuro deficits.

Discussion

Without immediate correction, cerebral malperfusion in the setting of TAAD has devastating prognostic implications. No cohesive treatment algorithm has been proposed for this occurrence.

Fukuhara et al² reported on 775 patients presenting with TAAD, 10% of whom had cerebral malperfusion. Most patients underwent open repair for TAAD. Only 2 patients had carotid stenting. There was 40% in-hospital mortality of all comers; 81.3% mortality was neurologically related. All patients with internal carotid artery occlusion developed cerebral edema and herniation and died irrespective of the management. In contrast, 79% of patients with unilateral or bilateral CCA occlusion, including those presenting in a comatose state, survived. They concluded that CCA occlusion or comatose state should not be a contraindication for prompt surgical intervention.

The international registry for acute dissection (IRAD) data suggest that patients with TAAD who present with stroke have poorer in-hospital survival; however, those selected for surgical treatment have better late survival, and dramatic reversal of neuro deficits has been observed.³ Revascularization of the brain within 9 hours of the acute event has shown improved neurologic outcomes.⁴

Sibinga Mulder et al⁵ reported a dramatic salvage and neuro rescue of a patient presenting with TAAD with severe stenosis of the innominate and

Figure 3. Intraoperative angiogram prior to stent deployment of the left common carotid artery.



Figure 4. Intraoperative angiogram obtained post deployment in the proximal left common carotid artery.

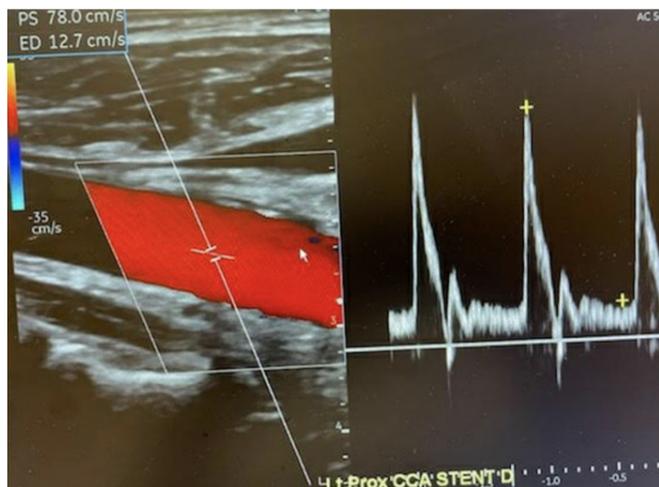


Figure 5. Postoperative carotid duplex, obtained at the 30-day follow-up appointment

appeared to have been the right clinical decision given the dramatic improvement in the LOC following stenting of the left CCA. The neurological changes that were present, including decreased consciousness, were felt to be secondary to global hypoperfusion of the brain rather than an embolic event. This may explain the improvement noted in the LOC and modest improvement of the left-sided weakness. Alternatively, the improvement of the left-sided weakness may have been a function of time. Skeptics will question the decision to proceed with stenting of the right CCA with the clinical improvement seen. Our aim was to fully revascularize the brain as far as possible. This decision was influenced by the knowledge that correction of the malperfusion of any organ, but particularly the brain, will lead to better outcomes. Judging by the outcome of the case, this decision appears to have been justified.

The Abre self-expanding venous stent exerts an outward radial force of 0.79 N/cm^2 and appears to be well suited for expansion of the true lumen in the setting of acute arterial dissection. In the absence of atherosclerotic plaque, the use of a balloon-expandable stent may exert excessive radial force and damage the fragile vessel wall; this would risk stent graft-induced new dissection.

Conclusion

We believe that use of the Abre venous stent offers the surgeon an important new tool for treatment of a patient presenting with TAAD with unilateral or bilateral cerebral malperfusion with neurological compromise. Expedient carotid revascularization along with repair of the aorta may rescue the patient from an otherwise dismal prognosis. ■

occlusion of the left CCA from the dissection flap. Thoracic endovascular aortic repair with a chimney graft in the innominate artery resulted in complete resolution of the TAAD and recovery from left hemiplegia.

This case with bilateral carotid malperfusion represents an example of profound neurological compromise reversed by staged retrograde carotid stenting.

Mukherjee et al⁶ recently reported on 4 patients with cerebral malperfusion who underwent retrograde carotid stenting using the Vici venous stent (Boston Scientific), which was discontinued because of stent migration after under-sizing when used in iliac veins for stenosis or occlusion. They also reported successful outcomes using the Abre self-expanding venous stent.

Retrograde stenting of the carotid artery has the advantage of cannulating the true lumen of the artery. It allows the wire to remain in the true lumen including in the area of dissection.

Success with retrograde access is also common in interventions for peripheral arterial disease or superior mesenteric artery stenosis when the antegrade approach may have failed.

The above-described case report is unique in that it involves bilateral carotid involvement with profound depression of the LOC, which was dramatically reversed following retrograde stenting of the left CCA. The residual left upper extremity weakness also resolved following stenting of the right CCA. Both procedures were performed using the Abre self-expanding venous stent.

In the setting of left-sided weakness and decreased LOC, we chose to stent the left CCA first, as the vessel was almost completely effaced compared with the right CCA, which was only modestly compromised in comparison. This

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