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TECHNICAL NOTE

Hybrid treatment of symptomatic carotid disease

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Hybrid treatment is a well reported technique for tandem carotid artery disease. Herein, we present a previously undescribed technique to facilitate safe passage of a guidewire via the inflow limb of the Pruitt-Inahara shunt in the proximal common carotid artery. This technique helps to obviate the risk of causing dissection or intimal damage during retrograde access and carotid stenting in hybrid carotid procedures.

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INTRODUCTION

Carotid endarterectomy (CEA) is a commonly performed procedure to reduce the risk of stroke and transient ischaemic attack in patients with symptomatic internal carotid artery (ICA) stenosis. Although reported to be present in only 2% of cases, tandem stenotic disease in the proximal common carotid artery (CCA) may exist,[1] for which hybrid treatment consisting of a standard CEA and proximal carotid stenting has been described.[2] Recent evidence suggests that such combined surgical and endovascular treatment for tandem carotid disease carries a higher risk of stroke and death than CEA alone.[3] Herein, a previously undescribed technique is presented that may help vascular specialists perform hybrid carotid procedures more safely by obviating the risk of causing dissection or intimal damage during retrograde carotid access and stenting.

SURGICAL TECHNIQUE

A 67 year old woman was admitted to the vascular surgery department following a non-disabling right hemispheric stroke. A duplex ultrasound scan demonstrated a 60–69% stenosis in the right ICA.

For further evaluation and treatment planning, the patient underwent a computed tomographic angiogram (CTA) of the aortic arch and carotid arteries, which revealed a 90% stenosis at the origin of the right CCA and a 70% stenosis at the right carotid bifurcation and ICA origin (Fig. 1). The CTA

Figure 1. Three dimensional reconstruction of a computed tomographic angiogram demonstrating the focal stenosis in the proximal common carotid artery (purple arrow) and the origin of the internal carotid artery (yellow arrow).

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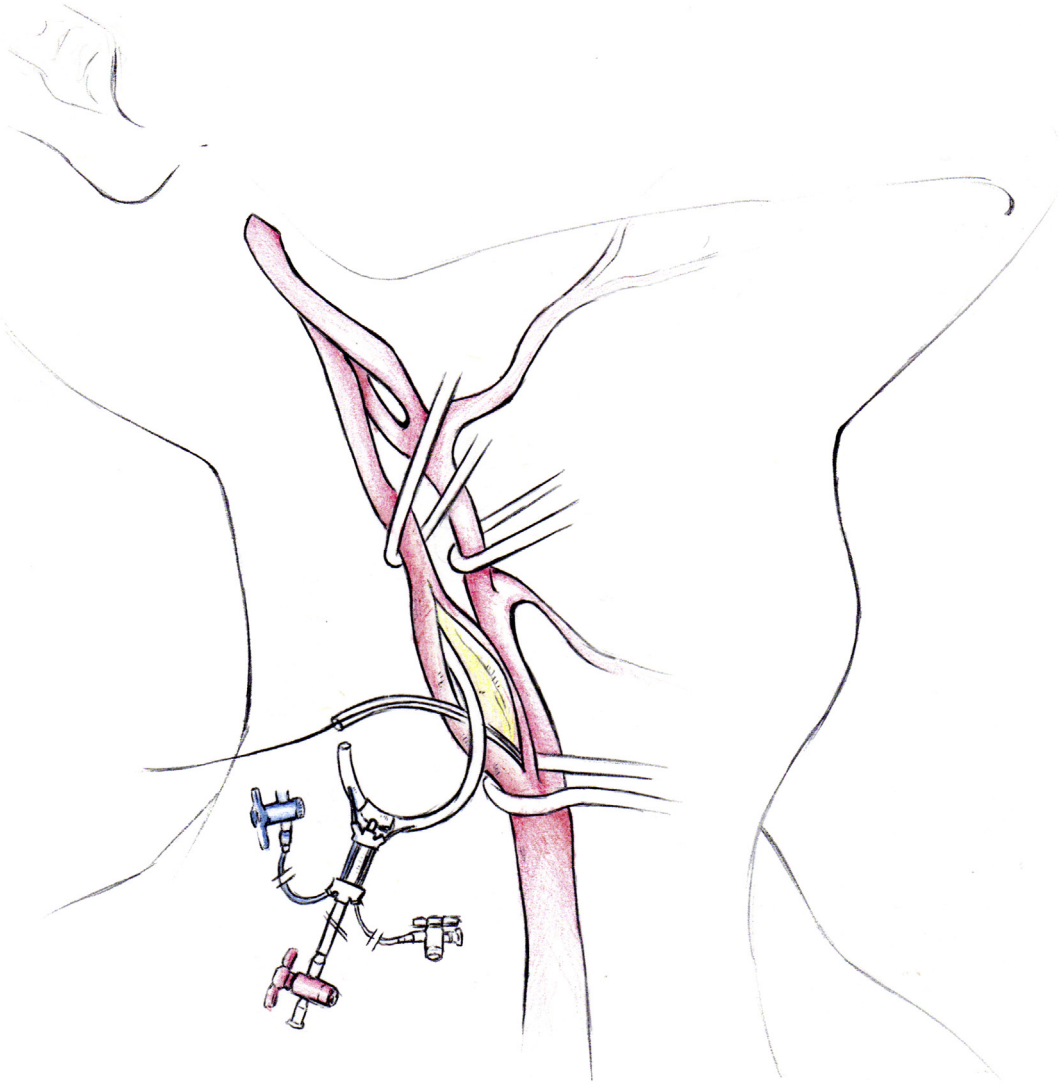

Figure 2. Guidewire passed into the proximal common carotid artery via the proximal (inflow) limb of the Pruitt-Inahara shunt.

also revealed a 70% ostial stenosis in the left CCA and a 60% stenosis at the origin of the left ICA.

A decision was made at the multidisciplinary team meeting to offer the patient right CEA and stenting of the CCA at the same time as a hybrid procedure. The procedure was performed 12 days after the index cerebrovascular event in a fully equipped hybrid theatre (Discovery IGS 740; GE Healthcare, Chalfont St Giles, UK). The initial operative plan was to perform the endarterectomy in a standard fashion under general anaesthesia, using a Pruitt-Inahara shunt (LeMaitre Vascular, Burlington, MA, USA) and a bovine pericardial patch (LeMaitre Vascular) repair. The plan was to complete the suture line around the patch as much as possible before shunt removal and subsequently place a 7 Fr sheath through the suture line. This would allow access for stenting of the proximal CCA while the ICA was clamped to provide cerebral protection. The patient was taking antiplatelet therapy (clopidogrel 75 mg) and was systemically anticoagulated with 5000 U heparin prior to arterial clamping.

On opening the CCA and ICA, an unexpected burden of atheromatous disease was found in the CCA. After completing the endarterectomy, it became clear that "blind" placement of a guidewire or sheath without direct vision could easily result in entering a subintimal plane and/or causing dissection of the CCA. As the shunt was already in an intraluminal position within the CCA, a decision was made to use it as conduit to ensure safe passage of the guidewire and sheath (Fig. 2). A "step" at the transition from the diseased CCA to the endarterectomised segment was not treated.

The inflow limb of the shunt was clamped. The ICA was clamped and the outflow limb of the shunt was removed. The CCA was controlled with a vessel sling and the inflow limb control balloon was deflated. The inflow limb of the shunt was then transected and held in place. An 0.035 inch guidewire was passed through the shunt into the aortic arch. The shunt was then removed over the guidewire and replaced with the 7 Fr sheath. The CCA was stented with an 8 mm $\times$ 47 mm balloon expandable stent (Ev3 Visipro;

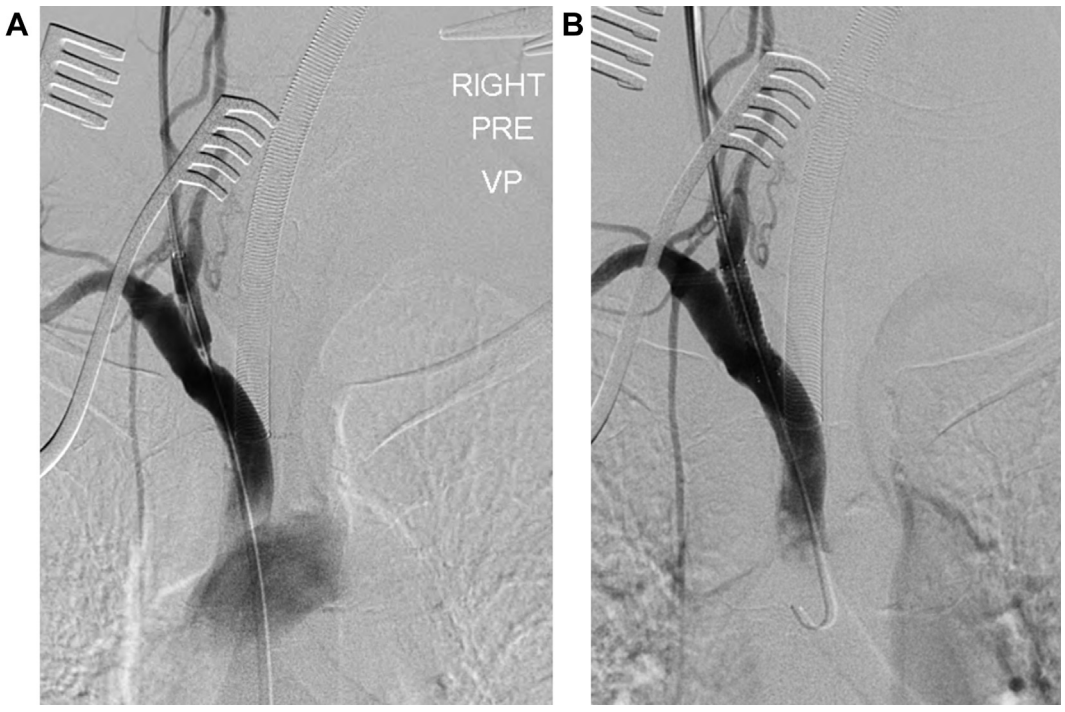

Figure 3. On table angiogram (A) before and (B) after stent placement.

Minneapolis, MN, USA) with an excellent radiological result (Fig. 3). The sheath was removed and the suture line completed. The patient was discharged the following day without complication on dual antiplatelet therapy (75 mg aspirin and 75 mg clopidogrel), which was continued for three months. The patient remains well with no further cerebrovascular episodes nine months later.

DISCUSSION

Cannulation of arteries for endovascular treatment can be hazardous in the presence arterial disease. In particular, entering a subintimal plain unintentionally can lead to the creation of an intimal flap, leading to vessel thrombosis, occlusion, embolisation, and/or ischaemia. Vessel perforation may also ensue, which can lead to significant haemorrhage. Additionally, once a subintimal plane has been created, navigation back into the vessel lumen can be very challenging, time consuming, and can fail. Often in hybrid cases, these risks can be mitigated by insertion of a guidewire under direction vision before arterial closure. However, in some cases this may not be possible and a guidewire must be passed blindly.

The technique described herein takes advantage of the established intraluminal position of the arterial shunt to ensure safe passage of the initial guidewire before sheath insertion. The small diameter of the Pruitt-Inahara shunt is particularly suited to this technique as it allows passage of a 0.035 inch wire with minimal bleeding. In addition, it allows almost the entire patch to be sutured in place before it requires removal. The main pitfall is losing position of the shunt once the balloon is deflated; therefore, adequate dissection and control of the CCA is important to control the inflow while the wire is passed.

A previous paper has reported a technique for treating tandem lesions of the carotid artery.[4] Briefly, this involves direct retrograde puncture of the CCA and stenting of the more proximal lesion before completing the endarterectomy. While this method has merits, the main advantage of the technique is that it ensures luminal position of the guidewire in a diseased artery, while still allowing flushing out of any debris post stenting before the patch is completed. It is also an option when the surgeon has committed to an "endarterectomy first" approach and already has a shunt in place, as puncturing below a shunt may be hazardous. Furthermore, the presented method avoids a prolonged period of clamping above a stent, potentially reducing the risk of stent thrombosis.

It is the authors' practice to perform CEA under general anaesthesia with mandatory shunting. Therefore, for surgeons who selectively shunt (under local anaesthesia or by using other means of assessing cerebral perfusion), this method may not be directly applicable, but could be borne in mind when faced with a significant burden of disease.

This previously undescribed technique facilitates safe hybrid CEA and retrograde common carotid stenting in patients at risk of carotid artery dissection.

CONFLICTS OF INTEREST

None.

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