

'EMINENCE BASED' CLINICAL SCENARIO

How Should I Treat a Patient with a Tandem Carotid Artery Atherosclerotic Stenosis Involving the Internal Carotid Artery and the Innominate/Proximal Common Carotid Artery?

Tandem lesions comprising significant internal carotid artery (ICA) stenosis combined with severe stenosis (>50%) of the origin of the ipsilateral common carotid artery (CCA) or innominate artery may be challenging to treat. While total surgical repair yields high peri-operative mortality rates of up to 20%, the technical feasibility of total endovascular repair depends highly on aortic arch anatomy and precludes the use of cerebral protection. Alternatively, a hybrid technique to simultaneously correct for both lesions includes retrograde stenting of the proximal lesion followed by standard carotid endarterectomy (CEA) at carotid bifurcation level in the same session using a single cervical incision.

All symptomatic patients considered eligible for carotid revascularization by this hybrid procedure undergo pre-operative electrocardiography triggered 256 slice computed tomography angiography (CTA) to enable three dimensional planning. Three dimensional CTA enables pre-operative assessment of arterial diameters and optimal intra-operative C-arm positioning to ensure accurate stent placement (i.e., prevent stent overextension > 2 mm in the aorta) and to diminish x-ray time and the amount of contrast. The procedure is performed under general anesthesia in a hybrid or conventional operating room using a mobile C-arm. Clopidogrel 75 mg once daily is administered 3 days pre-operatively until 3 months post-operatively. Cerebral monitoring (electroencephalography and transcranial Doppler) may serve as a guide to assess cerebral function and perfusion, and microembolization during the procedure.

A standardized skin incision as for longitudinal CEA is used. After surgical exposure of the carotid bifurcation, heparin 5,000 IU intravenously is provided and the CCA, external carotid artery (ECA), and ICA are clamped. If tolerated, the CCA clamp is removed and retrograde puncture of the CCA is performed with an 18 gauge introducer needle. If clamping is not tolerated, the CCA and ECA clamp are removed, and the ICA is intermittently clamped during retrograde puncture of the CCA and during angioplasty (Fig. 1). The rationale for treating the

proximal lesion first is fourfold: (1) keeping, at all times, the option to restore blood flow to the brain whenever needed; (2) to create the arteriotomy later on and wash out potential debris by retrograde flushing from both the ICA and ECA; (3) less difficulty when the patient does not tolerate carotid cross clamping, as a retrograde puncture with a shunt in position is hazardous; (4) thrombus formation at the newly positioned stent can be prevented by retrograde heparin solution, or frequent flushing at the distal CCA clamp level. The position of the puncture site is chosen to function as the proximal point of the later arteriotomy for CEA. A standard J-tip guide wire (3 mm × 150 cm) is introduced into the CCA using the Seldinger technique. A 10 cm long 6-French sheath with radiopaque marker is now introduced over the guidewire under fluoroscopic control. Following the positioning of the C-arm at the predefined angle to visualize the stenosis optimally and at the correct 90° angle of the CCA or innominate artery with the aortic arch, a retrograde angiogram with 5 mL non-diluted contrast creates the roadmap. Under fluoroscopic control, a Terumo wire with an angled tip (width 0.035"; length 260 cm) passes the proximal aortic arch branch vessel stenosis retrogradely, and is introduced into the ascending or descending aorta (depending on the optimal angle). Predilatation may be performed using a 3–4 mm percutaneous transluminal angioplasty balloon (0.035"; 4 mm × 40 mm × 80 cm). Guided by angiographic results and pre-operative CTA data, an appropriately sized (most often 8 × 30 mm) balloon expandable stent (0.035") is deployed over the proximal lesion. A completion angiogram with 5 mL non-diluted contrast confirms the positioning of the stent and the patency of the CCA tract. Post-dilatation can be performed at the discretion of the operator. Subsequently, the sheath is removed and a clamp is positioned on the distal CCA and ECA. If indicated, a Javid shunt can be inserted at this stage. The arteriotomy is extended distally over the carotid bulb and standard longitudinal CEA can be performed. The arteriotomy is closed with a venous or bovine pericardium patch.

Post-operatively, neurologic status should be assessed by a stroke neurologist. Patients are followed up clinically at 3 months with assessment of patency by duplex ultrasound.

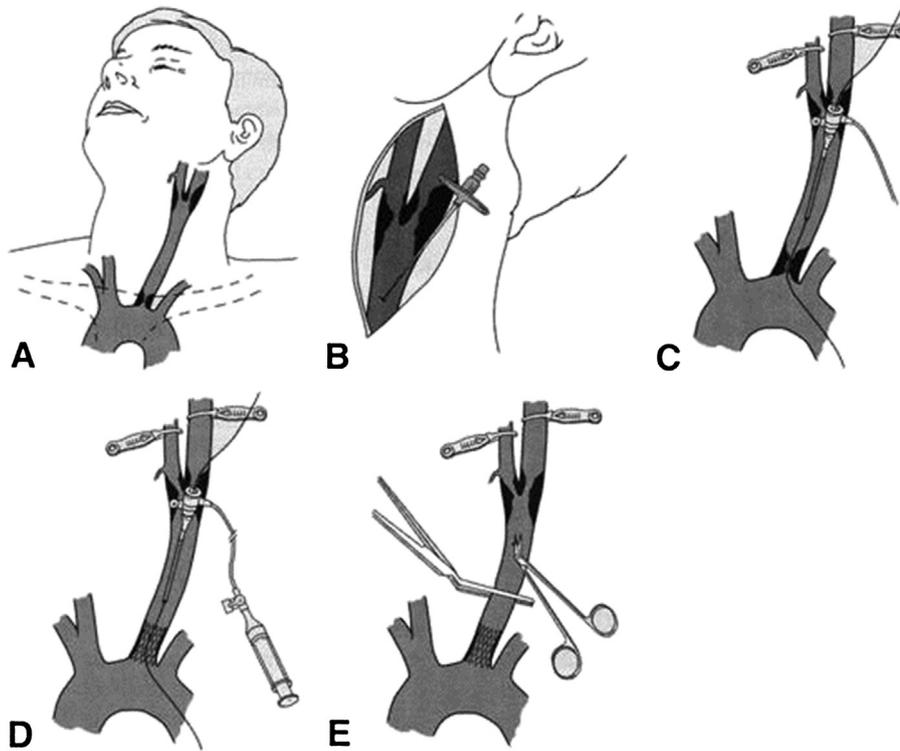


Figure 1. Overview of the steps to perform retrograde common carotid artery origin percutaneous transluminal angioplasty with stenting followed by regular open endarterectomy of the carotid bifurcation.

During the learning curve for performing this technique, follow up may include a CTA of the aortic arch and carotid outflow tract to assess stent positioning.

G.J. de Borst^{*}, C.E. Hazenberg
 Department of Vascular Surgery, University Medical Center
 Utrecht, PO Box 85500, Utrecht 3508 GA, The Netherlands

*Corresponding author.
 Email-address: g.j.deborst-2@umcutrecht.nl (G.J. de Borst)