Case Report

Percutaneous cervical carotid artery access with stenting of the left internal carotid artery in an elderly patient

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Abstract To describe the successful endovascular treatment in a nonagenarian with symptomatic internal carotid artery stenosis using direct carotid artery access. An independent 98 year-old man was admitted to our hospital for symptoms of progressive weakness with disorientation and dysphasia. Carotid Duplex ultrasonography was performed which revealed a totally occluded right internal carotid artery and high grade stenosis of the left internal carotid artery by velocities of 608/240 cm/sec. The patient refused surgical endarterectomy and thus he was referred for carotid artery stenting. Using the femoral artery approach and multiple catheter techniques, access to the common carotid artery could not be accomplished safely. The procedure was aborted and he was therefore brought back to the catheterization laboratory the following day for direct carotid access. Carotid artery stenting was accomplished by using of a 6F sheath percutaneously in the left common carotid, cerebral protection device (CPD) and a Nitinol stent. The patient was discharged the following day without complications. At 14 months follow-up the patient is functional and independent without recurrence of symptoms.

Carotid artery stenting via direct access can be accomplished in patients when the femoral artery approach is anatomically prohibitive. In this case of advanced age and the patient’s refusal for surgery, direct carotid access was his only option. (J Geriatr Cardiol 2007;4:111-4.)

Introduction

Carotid artery stenting (CAS) has emerged as an acceptable alternative to open carotid endarterectomy. 1-5 The technique of CAS is still undergoing constant evolution. Technological difficulties to overcome include such obstacles as:

- Acutely angled common carotid artery
- Tortuous innominate artery
- Calcific stenosis and tortuosity at the index site

Which all can prevent access and treatment of extracranial carotid artery stenosis. In fact, difficulty in accessing the supra-aortic vessels from the femoral approach leads to procedural failure in 2% to 7% of cases. 6

We describe the successful endovascular treatment of a critical left internal carotid artery (ICA) stenosis in a patient with advanced age and anatomical challenges making the femoral artery approach prohibitive.

Case report

A 98 year-old man with diabetes and chronic obstructive pulmonary disease who had suffered a transient ischemic attack 7 years earlier was found to have a completely occluded right ICA and a left ICA stenosis of 60-79% by carotid Doppler examination by velocities of 305/98 cm/sec. At that time the patient was not considered a surgical candidate because of his advanced age, as well as comorbidities, thus medical therapy was enhanced. Now he presented with progressive symptoms of weakness, decreased awareness and memory loss. Carotid duplex ultrasound showed chronic 100% occlusion of the right ICA and had a left ICA velocity of 608/240 cm/sec consistent with > 80% stenosis. The consulting neurologist, concluded that the patient’s symptoms were consistent with left hemispheric transient ischemic attacks.

After written informed consent was obtained the patient’s catheterization was accomplished via the right femoral artery approach. Aortic arch angiography (Figure 1) revealed a very calcified, tortuous, elongated bovine aortic arch configuration. Selective injection of the left common carotid was then performed using a 5F Vitek catheter. The left ICA just after the bifurcation demonstrated a 90% proximal stenosis (Figure 2a). Intracranial angiography from the left common carotid artery showed complete left to right filling of the intracranial vasculature (Figure 2b) as would be expected with a right internal carotid artery total occlusion. A 6F Shuttle® sheath (Cook®, Inc, Bloomington, IN) was positioned in the descending thoracic aorta. However, after
multiple attempts to gain access to the left common carotid artery a stable position could not be accomplished inside the common carotid artery. The highly calcified aortic arch was prohibitive for access in a safe manner to the carotid system. To avoid the risk of embolization with the aggressive catheter manipulations the procedure was aborted.

The patient refused carotid endarterectomy. With extensive discussion, the patient was offered endovascular CAS using direct cervical carotid access. With his head turned slightly to the right, the left side of the neck was injected with local anesthetic subcutaneously. Using a Micropuncture® introducer set (Cook®, Inc, Bloomington, IN) access to the left common carotid artery was obtained. A 6F sheath was then placed in the left common carotid artery (Figure 3) via standard techniques. Heparin anticoagulant was administered intravenously to obtain an activated clotting time of >275 seconds. A 0.014” Hi-Torque Floppy II wire (Guidant, Corp, Santa Clara, CA) was used to cross the stenosis. With some difficulty in maneuvering through the calcific region, a 5 mm SpideRx™ distal protection device (EV3, Plymouth, MN) was advanced beyond the stenosis to the distal ICA and deployed by releasing the protective covering sheath. This CPD was chosen because it has the lowest crossing profile. Continuous neurological monitoring was assessed using contralateral hand gripping. The 90% left ICA stenosis was first pre-dilated with a 4 mm×2 cm coronary balloon because of severe calcification in order to allow safe passage of the intravascular stent. Then the 8 mm diameter by 30 length AccuLink™ cerebral stent (Guidant, Inc, Santa Clara, CA) was deployed across the stenosis. The deployment was complicated by the extreme calcification which prevented a smooth withdrawal of the covering sheath. Post dilation of the stent was performed using a single inflation with a 5 mm×2 cm balloon at 8 atmospheres. A post stent arteriogram revealed minimal the residual stenosis (Figure 4). Retrieval of the SpideRx protection device revealed a large amount of captured debris (Figure 5). Hep-

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Fig 1. Aortic Arch arteriography which demonstrates a very calcified, tortuous, elongated bovine aortic arch configuration.

Fig 2 A. Critical stenosis of the left internal carotid artery with circumferential calcification noted. Present also is a 7mm disk. B. Contrast arteriography demonstrates patency of the right middle cerebral and anterior cerebral arteries from the left A2 segment.

Fig 3. Sterile drapes surround the introducer sheath.
arin anticoagulation was reversed with protamine 50 mg intravenously to accommodate immediate sheath removal. A Boomerang™ 6-10 Wire (CARDIVA Medical, Inc, Mountain View, CA) was inserted for hemostasis while the 6F sheath was removed. The Nitinol disc was deployed with the external clamp placed on the distal wire to obtain hemostasis (Figure 6). The Boomerang™ 6-10 was removed 20 minutes later. Slight pressure was held to the neck for an additional 10 minutes and a band aide was placed over the puncture site. He was discharged the following day.

Now at the young age of 99, 1 year later, duplex ultrasound showed a widely patent stent with a velocity of 117/27 cm/sec. The patient remains independent and has not had any recurrence of symptoms.

**Discussion**

CAS is becoming an increasingly popular alternative to treat symptomatic and asymptomatic carotid artery disease. Many trials have been completed while new trials are ongoing to assess the efficacy of this procedure. Most CAS procedures are performed using the femoral artery approach. There are, however, reports of CAS using the brachial artery, and axillary artery.

In the elderly, it is quite common for the vasculature to be increasingly tortuous precluding access to the carotid arteries via the standard approach. Direct common carotid artery access for coil embolization and for other vascular emergencies have previously been reported. Surgical access of the common carotid artery has also been reported for use in carotid stenting procedures. This shows the viability of direct percutaneous cervical access with subsequent ICA stenting, and the use of the Boomerang™ Wire to obtain hemostasis after CAS in octogenarians.

In our situation, the left common carotid artery originates from the brachiocephalic artery at a position and angle such that the brachial artery and femoral artery approaches were not feasible. Surgery withstanding, direct cervical carotid access was the only other option for this patient.

We feel that the use of the Boomerang™ Wire for hemostasis provides a distinct advantage over prolonged manual compression or the use of other closure devices. The Boomerang™ provides immediate temporary hemostasis allowing the arteriotomy site and tissue tract to recoil to around the 0.051”. The decreased duration of compression minimized the risk of carotid sinus stimulation that could have lead to bradycardia or hypotension. No foreign body was left in the arteriotomy site or subcutaneous tissue thus avoiding the risk of clot formation. In other vascular beds these closure devices have been associated with rare complications such as stenosis, thrombosis, and infection.

**Conclusion**

Carotid artery disease in the elderly presents a difficult decision for management. In the asymptomatic patient
multiple trials lean towards medical management. However in the symptomatic population, surgical management would appear to decrease the risk of stroke. Endovascular treatment in the elderly patient with a known contralateral occlusion was successfully treated using percutaneous direct cervical carotid access and assisted hemostasis using the Boomerang™. This treatment regime could open the way for future management when difficult situations arise in this high risk population.

References

15. Ferreira AC, Eton D, de Marchena E. Late clinical presentation of femoral artery occlusion after deployment of the angio-seal closure device. J Invasive Cardiol 2002;14:689-91