

Treatment of an extracranial internal carotid artery aneurysm with a flow-diverting stent

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No evidenced-based guidelines exist for the treatment of extracranial carotid artery aneurysms (ECAAs). The “gold standard” for symptomatic ECAAs is surgical intervention. In distally located ECAAs just below the base of the skull, endovascular monotherapy may be beneficial. We present the case of a 21-year-old man with a symptomatic saccular aneurysm in the distal internal carotid artery receiving a flow-diverting stent. The stent was successfully positioned without adverse procedural events. At 6 months, computed tomography angiography revealed secondary occlusion of the aneurysm without further complications. The flow-diverting stent may serve as an additional treatment option for the endovascular specialist considering invasive treatment in patients with an ECAA. (*J Vasc Surg Cases* 2015;1:191-3.)

Extracranial carotid artery aneurysms (ECAAs) are rare. Most ECAAs are found by coincidence during screening for other pathologic processes, whereas most ECAAs are asymptomatic. In case of symptoms, these are generally due to either local compression resulting in peripheral neurologic dysfunction of the cranial nerves or cerebral ischemia as a result of thrombotic events. ECAA rupture is considered to be very rare.¹

To date, no evidence-based protocols for treatment of patients with ECAA are available.¹ Surgical intervention is regarded as the treatment of choice for symptomatic or progressively growing ECAA,¹⁻³ but this should be balanced against the natural risk, which is still hardly known. In ECAAs located more distally in the internal carotid artery (ICA) and near the base of the skull, endovascular therapy is advocated.⁴⁻⁶ Endovascular therapy may consist of stenting with or without coiling of the aneurysm. Stent placement has developed in the last decade, and different types of stents are available to exclude the ECAA. Coated stents may be difficult to maneuver through the often tortuous carotid arteries because of the stiffness of the stent. Alternatively, the more flexible bare-metal stent has demonstrated good aneurysm obliteration rates.⁷ More recently, flow-diverting stents have been proven to be effective in excluding intracranial aneurysms.⁸ In this case report, we describe the first case in the literature

with exclusion of an extracranial aneurysm of the ICA using a flow-diverting stent. The patient’s consent to publish was obtained.

CASE PRESENTATION

A 21-year-old man was admitted through the emergency department of a peripheral hospital with multiple injuries due to a car accident. Glasgow Coma Scale score was 1 at the crash site but gradually improved to 3 when he was admitted to the hospital. The following injuries were sustained to the body and extremities: pneumothorax with multiple rib fractures; laceration of the spleen, liver, and pancreas; right-sided acetabulum fracture; and fracture of the distal proximal tibia on the right. Most important, initial diagnostics by computed tomography (CT) of the brain and thorax revealed a cerebral infarction in the left occipital lobe and an aneurysm of the brachiocephalic trunk. One month later, control CT angiography (CTA) showed a second yet unnoticed large saccular aneurysm of the left ICA. This was possibly a postdissection aneurysm. The saccular aneurysm measurements were 14 by 13 mm, with a cranial-caudal length of 16 mm and a wide neck of 12 mm located near the base of the skull (*Fig 1*). Another 18 days later, the patient developed hoarseness; the consulting ear, nose, and throat specialist and ophthalmologist diagnosed a left-sided Horner syndrome and paresis of the nervus laryngeus recurrens. Immediate CTA of the carotid arteries showed no aneurysm growth, but there was an increase in thrombosis in the aneurysm of the ICA. After starting clopidogrel (Plavix), the patient was referred to our tertiary referral hospital for consideration of further ECAA treatment.

Because of the distal location of the aneurysm, surgical exclusion was recognized as difficult and therefore not desirable. After multidisciplinary consultation, it was decided to manage the ECAA by endovascular means. Because coil placement was impossible owing to the wide aneurysm neck (*Fig 1, A*), a Pipeline embolization device (PED; ev3, Irvine, Calif) flow-diverting stent was chosen. The procedure was performed under local anesthesia, and the periprocedural medication consisted of 5000 units of heparin. In the angiography suite, a microcatheter was navigated past the aneurysm, and three PEDs were placed. All these stents had a diameter of 5 mm. Two of these stents had a length of 30 mm, and

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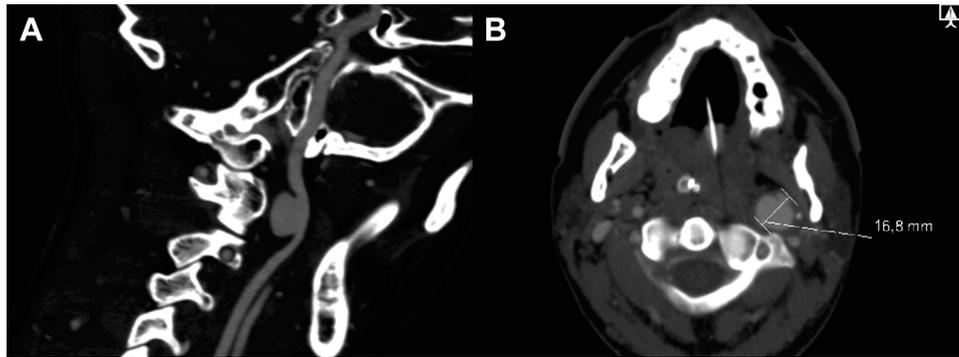


Fig 1. Initial computed tomography angiography (CTA) in the sagittal plane (A) and the transverse plane (B) showing a large saccular aneurysm.

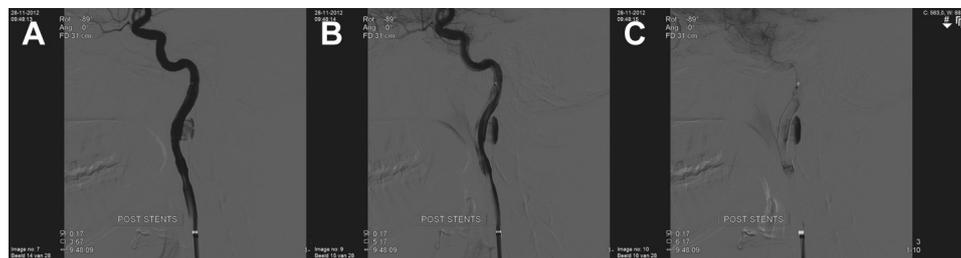


Fig 2. (A-C) Angiograms of the left internal carotid artery (ICA) directly after stent placement, showing reduced blood flow in the aneurysm sac.

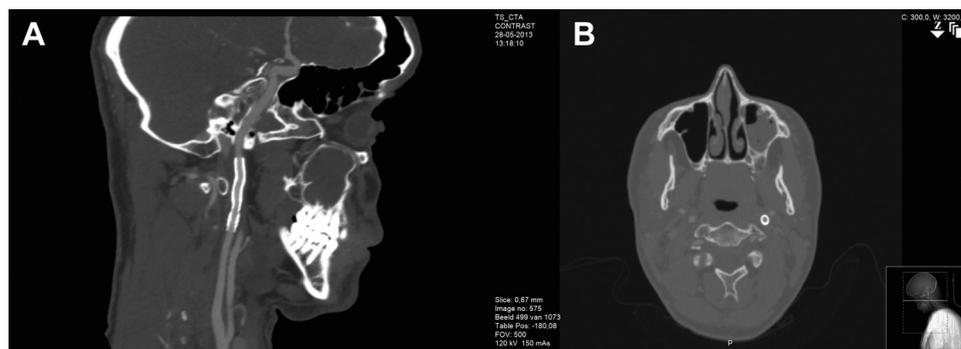


Fig 3. Follow-up computed tomography angiography (CTA) at 6 months in the sagittal plane (A) and the transverse plane (B). No aneurysm sac is noticeable.

one had a length of 35 mm, all with increments of 0.25 mm. The stents were placed in the ICA from healthy to healthy arterial wall while overlapping each other to ensure minimal inflow and outflow through the aneurysm. Combined, they had a total length of 43.1 mm. An embolic protection device was not used. There were no periprocedural complications, and a completion angiogram showed reduced filling of the aneurysm and adequate flow in the ICA. As can be seen on the angiogram in Fig 2 of the left ICA directly after stent placement, the flow is reduced in the aneurysm sac but not fully cut off. This is part of the working mechanism of the flow diverter stent to reduce stress on the aneurysm wall and eventually to cause occlusion and shrinkage of the

aneurysm. The brachiocephalic trunk aneurysm was treated non-operatively with yearly follow-up.

After the procedure, clopidogrel 75 mg/d was continued for 3 months and aspirin 100 mg/d lifelong. The follow-up CTA after 6 months showed no new cerebral infarctions. CTA of the carotids showed complete exclusion of the aneurysm with shrinkage of the sac and a fully patent ICA after a year's follow-up (Fig 3).

DISCUSSION

In this young patient with postdissection ECAA, endovascular therapy with the PED resulted in successful ECAA exclusion with sustained cerebral perfusion without

procedural complications. At 6 months, complete obliteration of the aneurysm sac was noted.

Although a PED is commonly used for treatment of intracranial aneurysm, for which it is proven to be effective, the treatment of ECAAs is not within the instructions for use of this specific device. The optimal approach for patients with ECAA has recently been taken up by the Carotid Aneurysm Registry Project Group.⁹ The stent's mesh influences both inflow and outflow in the aneurysm, inducing thrombosis and eventually complete obliteration of the aneurysm.⁸ Primary obliteration rates of 86% to 93% have been observed.^{10,11} Major advantages of the PED noticed in intracranial arteries are the maneuverability, which proves to be beneficial in tortuous arteries,¹² and 100% retrievability up to full deployment.¹³ Several Pipeline devices can easily be used, depending on aneurysm characteristics.⁸ In the treatment of intracranial aneurysm, stent dislocation does not seem a manifest complication.^{7,14} Whether this will also be true for PEDs used to treat ECAAs remains a subject for further research.

CONCLUSIONS

In this case, a 21-year-old man with development of a post-traumatic ECAA was successfully treated with a new endovascular technique. A flow-diverting PED was successfully positioned with preservation of cerebral blood flow and total secondary occlusion of the aneurysm without complications. The PED may serve as an additional treatment option for the endovascular specialist considering invasive treatment of patients with an aneurysm of the extracranial carotid artery.

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