

Endoluminal stent reconstruction of low-grade, symptomatic carotid plaques: a treatment alternative—report of two cases

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Abstract

Introduction—Medical treatment of low-grade (<50% luminal narrowing) symptomatic carotid stenosis has been the treatment of choice because trial data showed no evident benefit to carotid endarterectomy for these patients. Such patients may have recurrent neurological symptoms despite adequate medical therapy owing to recurrent plaque rupture. In such cases, carotid stenting may represent an option for treatment but has not been tested in trials because of previous failure of carotid endarterectomy to demonstrate any benefit for patients with low-grade carotid stenosis. The cases presented here illustrate the perioperative safety and potential benefit of carotid stenting for such patients with persistent neurological symptoms despite adequate medical therapy.

Case material—Two patients with low-grade stenosis and recurrent transient ischemic attack or stroke despite antiplatelet therapy were treated with carotid stenting. Both patients were treated after recent ipsilateral neurological events in the absence of an evident cardioembolic source. Carotid plaque ulceration thought to be related to the ischemic events was present in both cases. No perioperative complications were noted. On followup, the patients showed resolution of symptoms and had no new neurological events.

Conclusion—Carotid stenting of low-grade but symptomatic carotid plaque refractory to medical management represents a surgical option for treatment. Further studies may be warranted to evaluate stenting as a suitable treatment option.

Keywords

carotid artery stenting; low-grade stenosis; symptomatic

Introduction

Medical treatment of low-grade (<50% luminal narrowing) symptomatic carotid stenosis has been the treatment of choice [1,2] because trial data showed no evident benefit to carotid endarterectomy for these patients [3]. Nevertheless, these patients may have recurrent neurological symptoms despite adequate medical therapy because of recurrent plaque rupture [4]. In such cases, carotid stenting may represent an option for treatment

but has not been tested in trials due to previous failure of carotid endarterectomy to demonstrate any benefit in the setting of low-grade carotid stenosis. We present a report of two such cases that were treated with stenting, demonstrating the perioperative safety and potential benefit of carotid stenting for this subset of patients.

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Figure 1. (Case 1) Common carotid artery injections before (left) and after (right) carotid stenting, displaying preoperative high-risk features (ulceration highlighted with arrow) and postoperative endoluminal reconstruction of the vessel.

Case 1

An 84-year-old gentleman presented with a 1-day history of increased confusion and altered mental status. He also had left arm weakness that resolved spontaneously. In addition, his wife reported that he had been increasingly forgetful and lethargic. Medical history was notable for coronary artery disease, hypercholesterolemia, hypertension, and diabetes mellitus type 2. He had a positive family history of cardiac disease and Alzheimer's disease. He was an ex-smoker who had quit more than 40 years earlier and denied use of alcohol. Medications taken orally on a daily basis prior to presentation included aspirin (325 mg), clopidogrel (75 mg), and rosuvastatin (10 mg).

On examination, the patient was alert and oriented, although evasive to questions. His speech was clear, and there was no facial asymmetry or facial droop. He was ambulating with no ataxia and there was a negative pronator drift. He had a positive Romberg test, with heel-to-shin and finger-to-nose tests intact. Pupils were equal, round, and reactive to light and accommodation. The remainder of the examination was within normal limits.

A stroke investigation was done, which showed multiple age-indeterminate subacute infarctions in the right parietal lobe on computed tomography (CT), and moderate stenosis of the ipsilateral internal carotid artery (ICA) on magnetic resonance (MR) imaging. Angiography displayed approximately 40% right ICA stenosis with an ulcerated plaque (Figure 1, left). Evaluation for a cardioembolic source of the stroke, including transesophageal echocardiography, was negative. After conferring with the neurology team, it was felt that the ulcerated carotid plaque represented the most likely source of recurrent symptoms, despite previous treatment with antiplatelet



Figure 2. (Case 2) Common carotid artery injections before (left) and after (right) carotid stenting, displaying preoperative high-risk features (ulceration highlighted with arrow) and postoperative endoluminal reconstruction of the vessel.

agents. After discussion of the risks and benefits with the patient and family, carotid stenting was performed without incident (Figure 1, right).

On followup evaluations performed 2 years and 5 months after stenting, the patient was doing well with complete resolution of symptoms. He was awake, alert, and oriented with normal mental status including judgment and orientation, and his neurological examination was within normal limits. Doppler examination showed no evidence of significant stenosis.

Case 2

An 84-year-old woman presented with recurrent episodes of transient left arm numbness that were ongoing for 2 weeks. Her past medical history was positive for rheumatoid arthritis, hypothyroidism, and cervical surgeries (C5–C6), along with tonsillectomy, hysterectomy, removal of basal cell carcinoma from the upper lip, and bladder repair. Her family history was non-contributory. She had no history of smoking but reported occasional alcohol use. After her first transient ischemic attack, she was placed on a daily oral regimen of aspirin (325 mg), clopidogrel (75 mg), and rosuvastatin (10 mg). As her symptoms continued, she was admitted for observation and started on heparin for deep vein thrombosis prophylaxis.

On examination, the patient was alert and oriented to time, place, and person. Her neurologic examination was intact with no sensory loss or motor weakness in the upper or lower extremities bilaterally. The deep reflexes were normal and symmetrical. Tests of cerebellar function were unremarkable, with normal balance and gait.

CT of the head and MR imaging of the brain displayed no acute intracranial abnormality. An investigation for a cardioembolic source, including transesophageal echocardiography, was negative. Angiography displayed right ICA stenosis of 40% (Figure 2, left). After confer-

ring with the neurology team, it was felt that the ulcerated carotid plaque represented the most likely source of the transient ischemic attack. The anticoagulant therapy was discontinued. After discussion of the risks and benefits of stent reconstruction with the patient, right carotid artery stenting was performed (Figure 2, right). After an uneventful procedure, the patient was discharged.

On followup evaluation 3 years later, the patient reported no active complaints. She was asymptomatic and doing well, with a normal neurological examination and no significant stenosis on Doppler examination.

Discussion

Patients with low-grade (<50%) but symptomatic carotid stenosis represent a challenge to the clinician. Overwhelming evidence from trials does not support carotid endarterectomy to treat such patients [3] and favors medical management as the best treatment modality [1,2]. However, high-risk carotid plaques have been observed in patients with low-grade carotid stenosis who may present with recurrent symptoms [5–7]. Surgical options may be considered when patients have ischemic symptoms from carotid plaque despite adequate medical treatment, presumably from serial episodes of plaque embolism [4]. The patients described in this report were selected for treatment owing to recurrent ipsilateral neurological symptoms due to plaque embolism and/or the presence of high-risk carotid plaque features, such as ulceration or hemorrhage [5,6], in the absence of an evident cardioembolic source of these events. Both patients had received adequate medical therapy, which had failed to resolve their symptoms.

The theoretical benefit of carotid stenting in the setting of a symptomatic plaque with low-grade stenosis is reconstruction of the endoluminal surface and restoration of laminar flow (illustrated in our cases in Figure 1, right; Figure 2, right) [8–10]. The perioperative risk of carotid stenting for low-grade carotid stenosis is theoretically low, as the usual intraoperative problems associated with high-grade stenosis, such as plaque embolization and perioperative myocardial infarction, are not encountered. This is due to a relatively patent carotid artery at the site of stenosis, allowing uncomplicated passage of stenting devices and not typically requiring balloon angioplasty. As a result, plaque emboli are minimized during placement of the stent, and limited barotrauma to the carotid bulb theoretically minimizes the risk of perioperative myocardial infarction.

The patients in the cases presented here had complete resolution of their symptoms after carotid stenting of

their low-grade lesions. There were no complications of myocardial infarction, stroke, in-stent thrombosis, or restenosis in the perioperative or postoperative period. This supports carotid stenting as a possible treatment option for symptomatic patients with low-grade, but high-risk, carotid stenosis that is refractory to medical management. It should be noted that such cases are uncommon, and the procedures performed for these patients were not reimbursed by Medicare.

Conclusion

Endoluminal reconstruction of symptomatic carotid plaque with high-risk features such as plaque ulceration may represent an option for cases that are refractory to medical therapy. Carotid stenting in this setting carries low perioperative risk of stroke and other complications in our experience. For such patients, long-term efficacy of stenting to produce risk-reduction of ischemic stroke remains unknown.

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tleff, Inc. and Genentech; serves on National Steering Committees for Penumbra, Inc. 3D Separator and Covidien SWIFT PRIME trials; serves on an advisory board for Codman & Shurtleff and Covidien Vascular Therapies; and has received honoraria from American Association of Neurological Surgeons; courses, Annual Peripheral Angioplasty and All That Jazz Course, Penumbra, Inc., and from Abbott Vascular and Codman & Shurtleff, Inc. for training other neurointerventionists in carotid stenting and for training physicians in endovascular stenting for aneurysms. Dr. Siddiqui receives no consulting salary arrangements. All consulting is per project and/or per hour.

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