

# Endovascular Exclusion of Carotid Stump Syndrome

How endovascular intervention can be a viable option for treating this rare condition.

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**P**ersistence of cerebral and/or visual symptoms despite occlusion of the ipsilateral internal artery defines a clinical condition known as *carotid stump syndrome* (CSS).<sup>1</sup> The underlying pathophysiology may be related to the passage of emboli from the remaining stump of an occluded internal carotid artery (ICA) via the ipsilateral external carotid artery (ECA) into the middle cerebral artery circulation by way of reversed flow in the ophthalmic artery.<sup>2,3</sup> Embolic factors are often considered the more likely culprit, although CSS has also been attributed to hemodynamic factors.<sup>1</sup> If hypoperfusion were the cause of these symptoms, the physician would not expect the symptoms to be localized. Another possible source is turbulent flow in the carotid stump, which could feasibly cause microembolization.<sup>4</sup>

Treating CSS requires isolating the ECA from ICA microembolization. The standard treatment for this rare situation is surgical ligation of the ICA and endarterectomy of the ECA when indicated. The following case report is an example of endovascular management of CSS.

## CASE REPORT

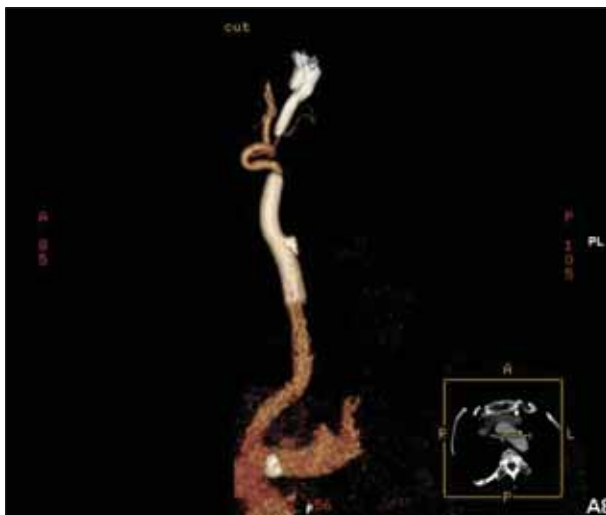
A 72-year-old woman with a history of hypertension was referred to our clinic for transient ischemic attacks in the right ICA region. Her symptoms consisted mainly of recurrent “curtain coming down” episodes (ie, amaurosis fugax), which had recently increased in frequency (two to three episodes/day). Her workup included both neurologic and ophthalmic evaluations; however, these causes were not related to her symptoms. Computed tomographic (CT) imaging of the brain showed lacunar infarcts. Electrocardiography and transthoracic echocardiography ruled out thromboembolic sources from the heart. Her carotid ultrasound showed occlusion of the right ICA without stenosis of the ECA. This occlusion was confirmed with CT angiography, which also showed a patent residual stump at the ori-



Figure 1. Selective catheterization of the right CCA. The arrow indicates the ICA stump.

gin of the ICA. The contralateral ICA and vertebral artery were patent, with mild atherosclerosis. The patient was maintained on a daily low dose of aspirin (81 mg/day).

We offered the patient surgical and endovascular treatment options. The patient received a 300-mg loading dose of clopidogrel. An arch aortogram showed a type I arch. The right common carotid artery (CCA) was then accessed with



**Figure 2.** A three-dimensional reconstruction of CT angiography at 6 months shows complete exclusion of the ICA stump, patent stent graft into the CCA, and the ECA.

a single-curve catheter (Bernstein) and a stiff Glidewire (Terumo Interventional Systems, Somerset, NJ), which were maintained in the ECA (Figure 1). An 8- X 50-mm Viabahn stent graft (W. L. Gore & Associates, Flagstaff, AZ) was deployed to exclude the ICA stump. Completion angiography showed successful placement of the stent graft. The patient was discharged home on postoperative day 1 on aspirin and 75 mg of daily clopidogrel. She was seen at 1 week, 1 month, and 6 months after the procedure and continued to be asymptomatic. Figure 2 shows the 6-month follow-up CT angiography.

## DISCUSSION

CSS is a rare condition. On occasions when it is suspected, the treating physician must take care to rule out all other possible embolic sources (including the aortic arch, proximal CCA, contralateral cerebral hemisphere, and cardiac emboli). Once it seems that more common embolic sources are less likely to be responsible for symptoms, the operator can then suspect the ICA stump as the source of microemboli, which causes continued cerebrovascular events and can be treated surgically or endovascularly. Of these options, surgical treatment has shown clinical success in eliminating the embolic source and is considered by many to be the standard treatment.

Surgical intervention involving oversewing the ICA origin and endarterectomy of the ECA is the customary method for treating CSS. However, certain instances can make a minimally invasive approach preferable. Unfavorable neck anatomy, history of radiation, previous neck surgery, and severe comorbidities may cause endovascular intervention to be more seriously considered over surgical intervention.

But even patients who are candidates for surgery sometimes prefer endovascular intervention because it is mistakenly perceived as “only a needle stick” and thus less traumatic than the “cut-the-neck-open” option.

Theoretically, anticoagulation could be a viable treatment for CSS, but patients’ symptoms often require treatment despite them being on a therapeutic regimen of anticoagulants and antiplatelets. Our patient had recurrent symptoms despite the administration of warfarin and aspirin and was thus presented with the two treatment options. She ultimately refused open surgery and opted for endovascular intervention with an understanding of the risks associated with both treatments. Upon placement of a stent graft, her symptoms completely resolved; postoperatively, we were able to discontinue the warfarin but maintained the aspirin and clopidogrel regimen. The patient was stable and asymptomatic 6 months after the procedure.

## CONCLUSION

CSS is rare, and a thorough workup is required to exclude other causes of symptoms. Although open stump exclusion is safe and effective, this case underscores the fact that endovascular intervention can be performed as an alternative to open surgery. ■

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