Surgical treatment for complicated carotid artery stenting

J.H. Kwon, Y. Han, H. Kwon, H.S. Hong, T.-W. Kwon, Y.-P. Cho*, G.-E. Kim

Department of Surgery, University of Ulsan College of Medicine and Asan Medical Center, Asanbyeongwon-gil 86, Songpa-gu, Seoul 138-736, Republic of Korea

INTRODUCTION

According to a recently published randomized controlled trial, carotid artery stenting (CAS) is a reasonable alternative to carotid endarterectomy (CEA), especially in high-risk surgical candidates. With the increasing use of CAS, in-stent restenosis (ISR) and other post-CAS complications are expected to increase proportionally. Herein, we report two cases of CAS-related complications with clinical manifestations that were successfully treated by operative reconstruction.

REPORT

Case 1

A 71-year-old male underwent right CAS for a >70% symptomatic internal carotid artery (ICA) stenosis at an outside facility. Five years later, the patient developed recurrent transient ischemic attacks (TIAs) (4—5 times per day), and duplex ultrasound demonstrated an echolucent atherosclerotic plaque with an irregular surface without significant ISR (diameter reduction, 45%) at the level of the right carotid bulb. Because we could not find any other definite causes of recurrent TIAs, a diagnosis of ISR-related recurrent TIAs was made and CEA was performed.

The surgical procedure was carried out under general anesthesia. Intraoperatively, minimal periarterial scarring and inflammation were noted, and the arterial dissection was performed without difficulty. The common carotid artery (CCA) and ICA proximal and distal to the stent appeared free of disease, and carotid cross-clamping was done after systemic heparinization. A longitudinal arteriotomy was made, extending from the CCA to the ICA beyond the proximal and distal endpoints of the stent, and the anterior wall of the stent was divided with Mayo scissors. A Javid carotid shunt (Bard Inc., Murray Hill, USA) was placed between the CCA and the ICA (Fig. 1A). A cleavage plane was easily developed, and an endarterectomy with patch angioplasty was performed in the standard fashion with the stent incorporated into the specimen. Examination of the specimen revealed a fragment of tubular tissue and a 4-cm long stent inserted within the tissue; there was a recurrent atherosclerotic plaque within the stent, with a deep ulceration at the level of the carotid bifurcation (Fig. 1B). We suspected that the cause of the recurrent neurological symptoms was repeated microembolization from the deep ulceration, although luminal narrowing was not significant.

The patient’s postoperative course was uneventful, and follow-up magnetic resonance imaging and angiography confirmed patent carotid arterial flow. Forty-one months follow-up have been completed without any further complications.

Case 2

A 69-year-old male underwent left CAS for a >70% symptomatic ICA stenosis at an outside facility. Two days later, the patient presented with a high fever, and six days after CAS, blood culture identified methicillin-resistant Staphylococcus aureus. Ten days after CAS, he suddenly complained of left neck swelling. Although follow-up blood culture after two weeks’ antibiotic therapy resulted in no growth of any organism, left neck swelling was gradually aggravated, and neck computed tomographic (CT) angiography obtained 4
weeks after CAS revealed two pseudoaneurysms with active bleeding (Fig. 2) around the stent insertion site, from the left CCA and the superior thyroid artery, respectively. The patient was referred to our hospital for urgent surgical management of the stent infection.

The surgical procedure was carried out under general anesthesia. Intraoperatively, intense perivascular inflammation with pseudoaneurysms enveloped the artery containing the stent (Fig. 3A), and carotid artery dissection was not feasible. The CCA and ICA proximal and distal to the stent appeared free of disease, and carotid cross-clamping was done after systemic heparinization. A Javid carotid shunt was placed between the CCA and the ICA (Fig. 3B). A large pseudoaneurysmal sac from the left CCA was identified (Fig. 3C). After the external carotid artery was ligated, both the CCA and ICA were transected. The arterial segment containing the stent was removed and a great saphenous vein graft was interposed between left CCA and ICA (Fig. 3D). The patient’s postoperative course was uneventful, and follow-up neck CT angiography confirmed patent carotid arterial flow and disappearance of the pseudoaneurysmal sacs (Fig. 4). Fourteen months follow-up have been completed without any complications.

DISCUSSION

Recently, CAS has become a valid alternative to CEA in high-risk patients because of its minimal invasiveness and similar short-term results compared with CEA. However, the increasing use of CAS has inevitably resulted in an increase in complications and cases of ISR after CAS.

The long-term durability of CAS has not yet been proven, and the stenosis rate after CAS is reported to be much higher than post-CEA. However, there is no consensus on the optimal timing of secondary intervention for ISR, and the generally recommended criteria are based on the patient’s symptomatology and the degree of stenosis. For symptomatic patients the indication for secondary intervention is widely accepted to be narrowing of the lumen of >50%, and for asymptomatic patients, narrowing of >80%.

In this study, we found that, in addition to the patient’s symptomatology and the degree of ISR, the characteristic of the plaque was an important factor in deciding when to treat ISR. When ISR is not significant, CEA should still be recommended in symptomatic patients when there are no other definite causes of the recurrent neurological symptoms, and the preoperative imaging studies reveal a recurrent echolucent atherosclerotic plaque with an irregular surface, suggestive of an unstable, embolic lesion.

Carotid stent infection is a rare but potentially fatal complication following CAS. It may induce dense inflammatory changes in tissues adjacent to the stented artery followed by destruction of the arterial wall, active bleeding or pseudoaneurysm formation. The only treatment option for this severe complication is removal of the arterial segment containing the infected stent and interposition of an autologous vein graft between the CCA and ICA. However, the operative management of the infected carotid
stent presents technical challenges to the vascular surgeon because of the greater technical complexity of intra-operative dissection due to the presence of an intense perivascular inflammatory process, the risk of cranial nerve injury, and the difficulty in controlling both the proximal and distal portions of the stented artery.\textsuperscript{5}

With increasing use of CAS, there will be increasing need for secondary interventions following failure of the CAS. Vascular surgeons will be faced with a higher frequency of complications from these procedures, as well as ISR. Although we report two cases of CAS-related complications successfully treated by operative revascularization, surgical treatment of CAS-related complications remains a challenging option, and studies on larger cohorts are warranted.

FUNDING
None.

CONFLICTS OF INTERESTS
None.

REFERENCES