

# Carotid Artery Angioplasty and Stenting as a First-choice Revascularization Therapy for Cervical Carotid Artery Stenosis

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## Summary

*We examined the patients with cervical carotid artery stenosis (>70%) treated by carotid artery angioplasty and stenting (CAS) as a first-choice direct revascularization therapy. The patients consisted of 45 men and seven women; their mean age was 70.4 years (range, 54-84 yr), with 60 cervical carotid stenosis (39 symptomatic and 21 asymptomatic).*

*Sixty procedures resulted in successful stent deployment in 55 cases, percutaneous transluminal angioplasty (PTA) only without stenting in three, and failed angioplasty due to inaccessibility in two. Morbidity was seen in three cases associated with thromboembolic complication.*

*Instant restenosis was observed in one case, which was successfully treated with subsequent PTA. CAS seems reasonable treatment for cervical carotid artery stenosis, although further accumulation of the cases will be needed to evaluate the efficacy between CAS and carotid endarterectomy.*

## Introduction

Carotid artery angioplasty and stenting (CAS) has been widely adopted for cervical

carotid artery stenosis. Although randomized trial comparing CAS with emboli protection with CEA showed a definitive advantage of CAS in the patients at potentially increased surgical risk, prospective randomized trial for all eligible patients are now under way. In this study, we examined the patients with cervical carotid artery stenosis by CAS as a first-choice direct revascularization therapy.

## Patients and Methods

Since April of 2002, the patients with cervical carotid artery stenosis that were considered candidates for direct revascularization therapy have been treated by CAS in our institution. The patients consisted of 45 men and seven women (mean age 70.4 years, range 54-84 yr) with 60 cervical carotid stenosis (>70%) (39 symptomatic and 21 asymptomatic).

In 39 symptomatic patients, ten were treated in an acute stage (within seven days), nine in a subacute stage (8-30 days) and 20 in chronic stage (>30 days). Eight patients had bilateral lesions. Four patients with asymptomatic carotid stenosis had angina pectoris that were supposed to undergo the coronary artery bypass grafting (CABG).

## Results

Among 60 CAS attempts, vascular access to the lesion was achieved in 58, 56 via femoral artery and two by direct carotid puncture. Two inaccessible cases subsequently underwent CEA in one and no intervention in one. Successful stent deployment following predilatation with percutaneous transluminal angioplasty (PTA) was achieved in 55 cases, 21 of which underwent postdilatation with repeated PTA. PTA only without stenting was performed in three because of highly calcified lesion in two and coiling of distal internal carotid artery in one. In cases treated with CAS, preoperative assessment revealed vulnerable carotid plaque morphology such as hypoechoic lesion in 36, calcification in 17 and floating thrombus (mobile plaque) in four.

Of 58 with successful vascular access, emboli protection system by distal internal carotid artery (ICA) occlusion during CAS procedure was used in 55. Twelve of them demonstrated transient neurological decline including paresis in four, loss of consciousness in four, confusion in two and paresis with confusion in two, however none of them developed any persistent sequelae.

All cases performed CAS or PTA achieved satisfactory reopening of the carotid stenosis (stenosis ratio less than 20%) except two cases with high calcified lesion.

Periprocedural morbidity was seen in three cases with cerebral infarction (distal embolization during direct carotid puncture, post-stenting embolization, and haemodynamic compromise due to cardiac insufficiency).

All cases with angina pectoris underwent CAS without adverse cardiovascular events and subsequently underwent CABG without adverse cerebrovascular events.

Instant restenosis was observed in one case 18 months after CAS that was successfully dilated with repeated PTA.

## Discussion

With the advent of the stent technology and the embolic protection system, CAS has been a revascularization alternative as well as carotid endarterectomy for cervical carotid artery stenosis. SAPHIRE trial<sup>1</sup>, which is the first randomized trial comparing CAS with emboli protection with CEA, shows a definitive advantage

of CAS in the patients at potentially increased surgical risk. At the moment there is no definite evidence that CAS can be applied for any patients eligible for a direct carotid revascularization, although some prospective randomized trials comparing CAS with CEA are now in progress<sup>2,3</sup>.

Since April of 2002, in our institution, CAS has been attempted for any patients with cervical carotid artery stenosis requiring direct revascularization therapy. Considering that some patients in this study are at increased surgical risk including coronary insufficiency, had vulnerable plaque containing calcification and lipid rich core that has been ever considered contraindication for CAS and underwent therapy in an acute stage, technical success rate of 95% and complication rate of 5% might be accepted, although the case number is too small to show the feasibility of CAS as compared with CEA.

Despite that more than half of the symptomatic patients were treated within 30 days after onset; ten underwent CAS within seven days and some of them demonstrated progressive neurological deterioration associated with haemodynamic compromise, all of them were successfully performed CAS. Optimal timing of the CAS for the symptomatic patients is currently the issue under debate, however the patients with worsening symptom due to progressing stroke can be candidates for direct revascularization even in an acute stage.

In patients with asymptomatic carotid stenosis, four patients who were supposed to undergo CABG for angina pectoris were at high risk that is an exclusion criterion of Asymptomatic Carotid Atherosclerosis Study<sup>4</sup>. For the patients with asymptomatic carotid stenosis and symptomatic coronary artery disease, coronary intervention should be performed prior to carotid intervention. However, if the patients require the open heart surgery, CAS under local anesthesia can be considered to undergo safely in advance of CABG. However, unlike CEA, there are some potential CAS-related problems that might affect adversely to the coronary disease and following CABG: hypotension due to carotid sinus reflex caused by stent deployment or requirement of antiplatelet therapy for a while to prevent thromboembolic complication associated with stent deployment. Therefore, indication of CAS for asymptomatic patients, especially for the cases

with systemic co-morbidity, must be carefully determined.

### Conclusions

With the efficacy and the safety of CAS, it is expected that CAS will be the alternative to

CEA for cervical carotid stenosis in near future, although some issues still remain unsolved.

In order to establish CAS as a first-choice therapy in the management of carotid stenosis, patients eligible for this treatment should be carefully screened and followed up over a long period of time.

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