ISSN 1220-8841 (Print)
ISSN 2344-4959 (Online)

ROMANIAN
NEUROSURGERY

Vol. XXXV | No. 1 March 2021

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DOI: 10.33962/roneuro-2021-015

Romanian Neurosurgery (2021) XXXV (1): pp. 94-97
DOI: 10.33962/roneuro-2021-015
www.journals.lapub.co.uk/index.php/roneurosurgery

Retrospective study on early outcomes of carotid stenting. Institutional experience

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Keywords
carotid stenosis, stents, stroke

Abstract

Objective: This study is conducted to evaluate the early events after Carotid artery stenting (CAS) among our patients in a single institute.

Methods: This study was conducted on 40 patients. These patients underwent stenting of extracranial carotid arteries. Stenting was performed on symptomatic patients with carotid artery stenosis of more than 50 per cent of asymptomatic patients with more than 70 per cent carotid artery stenosis on Doppler ultrasonography. Follow up period for this study was of one month.

Results: 40 patients who underwent CAS between August 2018 and June 2019 were included in the study. Self-expandable hybrid stents were implanted in all patients and pre or poststent-dilatation was performed if required after implantation. None of the patients suffered from a stroke, myocardial infarction or death due to CAS during their hospital stay. Only one patient had a minor stroke during follow up, which was managed conservatively. No transient ischemic attack (TIA), myocardial infarction or death during the follow-up period. Re-stenosis was not observed in the follow-up carotid Doppler ultrasonography; flow rates were within normal limits.

Conclusions: Carotid stenting is a safe alternative to CEA (carotid endarterectomy) in the treatment of carotid stenosis regardless of age. CAS with cerebral protection can be performed safely in patients who are at high surgical risk, with low perioperative morbidity and mortality. The durability of the procedure must be determined with a longer follow-up. Further high-quality RCTs are required to address other shortcomings and controversies.

Introduction

In the industrialized world, the leading cause of death is stroke. [1]

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ISSN online 2344-4959
© Romanian Society of Neurosurgery

First published
March 2021 by
London Academic Publishing
www.lapub.co.uk

Stroke is also the major culprit of disability in the affected individuals. About 6.5 million strokes occur per year. Atherosclerosis and embolization from stenosed carotid arteries are one of the most common causes of vascular stroke. Bifurcation of the common carotid artery is the common site of stenosis and the atherosclerotic plaques found in this stenosed area. It accounts for nearly 20 % of strokes. This embolization can lead to TIA, brain ischemia, and other neurological manifestations. [2,3] Carotid atherosclerosis is often asymptomatic until a disabling or fatal stroke occurs. Predisposing factors for carotid atherosclerosis are diabetes mellitus, hypertension, hyperlipidemia, and smoking. There is a strong association between the severity of stenosis and stroke risk exists. Medical treatment, interventional angioplasty, and carotid endarterectomy (CEA) are some treatment options for symptomatic carotid artery stenosis.[4] As compared to CEA, Carotid artery stenting (CAS) is a minimally invasive alternative for the treatment of carotid artery stenosis. However, the safety and efficacy of CAS have been approved by various randomized trials (RCTs). The incidence of restenosis after CAS is comparatively low but periprocedural stroke after CAS is a little concern.[4] In this article, we are sharing our institutional experience with CAS, its complication, and early outcome.

Material and methods

We conducted a retrospective study on patients who underwent carotid artery stenting from August 2017 to June 2019 to determine the various outcomes of the procedure and to find out the different outcomes in asymptomatic and symptomatic patients. The total number of patients undergone carotid stenting in our study was 40. As per our departmental protocol the patients who underwent CAS, required to have symptoms with more than 50% of carotid artery stenosis. Asymptomatic patients who had more than 70% carotid artery stenosis on Doppler ultrasonography were also selected for CAS. Patients who suffered transient ischemic attacks (defined as focal neurological dysfunction due to focal brain ischemia without cerebral infarct), minor non-disabling stroke, or amaurosis fugax, considered as symptomatic. Those patients, who have a history of severe stroke, were excluded from the study.

Before the procedure, detailed history and clinical and laboratory examinations were performed. Routinely electrocardiography (ECG) was done in all patients and detailed interpretation performed by the cardiology team.

All patients underwent carotid Doppler ultrasound, magnetic resonance angiography (MRA) of the carotid arteries, or computed tomography angiography (CTA) of the carotid arteries. Data were collected for both rights and left carotid arteries, regardless of which carotid artery was stented. The degree of stenosis was grouped into ranges using velocity criteria in Doppler ultrasound. The categories were: < 70% stenosis and >70% stenosis or occluded.

In this procedure, we used self-expandable stents and both proximal and distal embolic protection devices (Figure 1). In all patients, a stent with a distal or proximal protection device was placed after accessing a femoral artery. Predilatation before stent placement and post dilatation after stenting was performed depending upon the surgeon's choice and requirement. Every patient received standard medical care post-procedural, including the treatment of hypertension, hyperlipidemia, and diabetes. In our study, a detailed neurologic evaluation was performed at baseline, during the hospital stay. Any complications such as transient ischemic stroke, myocardial infarction, visual deterioration, and death were reported. Follow up period of our study was 30 days.

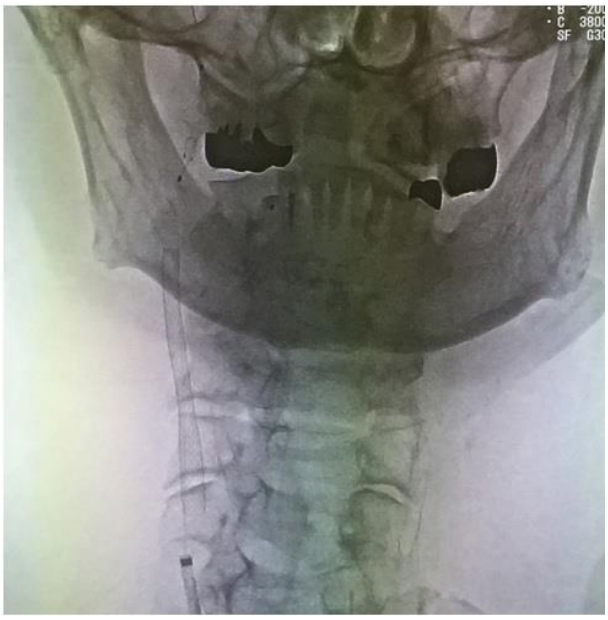

Figure 1. Showing self-expandable stent with diastal embolic protection device.

Results

Forty patients who underwent CAS between the study periods were included in the study conducted at Bantane hospital, Fujita health university, Nagoya, Japan. The mean age was 71.61 years (range: 48-89 years old) and the percentage of male participants was 90%. 40% of our patients were less than 70 years of age. 72.5% of patients were having a history of hypertension which was considered as the most common cardiac risk factor. 60 % of our patients had stenosis > 70 percent and among them 41.66 % were symptomatic. The most common neurologic sign was hemiparesis (stroke- 8 patients) followed by transient ischemic attack (TIA-5 patients) and amaurosis fugax (2 patients). The ratio of males and females in our study was 9:1. 38% patients were symptomatic and the rest was asymptomatic. Embolic protection devices (EPDs), as well as self-expandable hybrid stents, were used in all cases. Distal EPDs were used in 25% cases whereas, proximal EPDs in 75% cases. There was no stroke, MI, or death in our study population during the period of hospital stay. Patients were followed up and the mean follow-up period was 30 days after discharge. Only one patient had a minor stroke in the follow-up period, which was managed conservatively. No TIA, myocardial infarction, or death during the follow-up period. Doppler Ultrasonography was used to look for re-stenosis (observed by flow rate) of carotid vessels during the follow-up periods. No evidence of restenosis was noticed during this period.

Discussion

Before the introduction of embolic protection devices and hybrid self- expandable stents, the post-procedural complications used to be high but with the uses of these devices, morbidity and mortality were remarkably reduced. Setacci et al. observed in his prospective study that the combined stroke and death rate at 30 days for symptomatic patients who underwent CAS was about 10 percent.[5] Gray et al. analyze the data from 2 prospective multicentric studies. Analysis from these 2 post-market surveillance studies (EXACT, CAPTURE-2) on 6,320 high-risk patients, showed a 3.6 percent death and stroke rate over a period of 30 posts procedural days.[6] The mean age of patients in our study was 71.61 years. One patient in our study developed a minor no disabling stroke which was managed conservatively and successfully. No associated mortality in our cases as compared to other studies. 30 days stroke rate is also comparable to other studies on exclusive carotid stenting.[5]

The absolute perioperative risks we observed when considering CAS is that there is a lower absolute risk of stroke in asymptomatic patients than for symptomatic carotid stenosis. Previous studies have suggested that prophylactic revascularization for asymptomatic carotid stenosis may not have clear advantages over medical management when the procedural risk exceeds 3%.[7] In our center procedural risk is less than 3%.

According to a study, the 30-day stroke of 16% for symptomatic primary-CAS patients but no stroke in the asymptomatic group.[8] Their 16% stroke rate significantly exceeds the 2.5% rate reported in the current study.

In a study by Hobson et al, CAS was successful in all 17 cases and produced no periprocedural neurologic deficits or deaths.[9] Similar favorable results were reported by Yadav et al, with only one minor stroke in 25 CAS procedures in 22 symptomatic patients.[10]

Naggara et al showed that the use of an embolic protection device (EPD) lowers the risk of stroke at the time of CAS. In our study, we used distal or proximal embolic protection devices and self-expandable stents.[11] According to some studies, the use of closed-cell stent design decreases the operative and postoperative stroke rates.[12] Calvin et al stated that high volume operators had the lowest operative stroke and death rates.[13] In SAPPHIRE and CREST studies post-CAS myocardial infarction (MI) was associated with 2.4 and 1.1 % cases respectively.[14,15] Antiplatelet therapy when initiated early can reduce the recurrence of neurological events after non-cardioembolic TIA/stroke.[16] In our study, one patient developed minor strokes which was not disabling and there was no effect on hospital stay and all patients were discharged in stable conditions. As compared to other studies, there was no mortality or myocardial infarction in our groups. A 2012 Cochrane review of 7572 patients from 16 trials reported that endovascular treatment was associated with significantly lower risks of MI, cranial nerve palsy, and haematomas.[17]

Conclusion

Stroke is a major contributor to the global health

burden. CAS is a good alternative treatment for carotid artery stenosis. According to many studies, periprocedural stroke is more commonly associated with CAS but MI and other complications are far less in post-CAS patients. The present analysis emphasizes that CAS can be performed with high procedural success and reasonable procedural safety in a high-volume center with experienced interventionists, utilization of appropriate devices, and under embolic protection devices. However, an expert operator is needed to avoid cardiovascular complications in high-risk patients. Guidelines for performing CAS, use of instruments, embolic devices, dual or single antiplatelet therapy pre and post-procedure, and use of closed or open cell stents are variable and need to be defined. High-quality RCT is required so that CAS can be performed for specific reasons and with specific instruments. This procedure is less invasive and better tolerated, and is a better future treatment option for carotid stenosis. Moreover, in comparison with CEA, CAS is an effective as well as a safe treatment option for the high-risk patients with carotid artery stenosis, and hence it is expected that more institutes will opt for this intervention in upcoming years.

Acknowledgements

Authors thank all staffs of Bantane Hospital, Fujita Health University, Nagoya, Japan for supporting us.

Declarations

Financial support and sponsorship: Nil

Conflict of interest: There are no conflicts of interest

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