

Stenting for restenosis after prior carotid endarterectomy may be safely performed: a retrospective cohort study

Christiana Anastasiadou¹, Demetrios Tzortzis², Anastasios Papapetrou¹, Nikolaos Zannes², George Kastrisios¹, Sotirios Giannakis¹, Chrisostomos Maltezos¹

¹Vascular Surgery Department - "KAT" General Hospital of Attica, Greece

²Interventional Radiology Department - "KAT" General Hospital of Attica, Greece

Abstract:

Carotid endarterectomy (CEA) is the treatment of choice for carotid artery stenosis, especially for young patients with low or average surgical risk. However, for patients who present with restenosis the therapy of choice remains debatable. We present our experience treating restenosis after CEA with carotid artery stenting (CAS), suggesting that stenting may be safer for the patient. Moreover, we identified some characteristics present among patients with restenosis, such as female gender, low HDL levels, increased fibrinogen and increased BMI.

INTRODUCTION

Carotid endarterectomy is the therapy of choice for significant carotid stenoses, especially in young patients with low or average surgical risk. Generally, restenosis is considered a benign condition when compared to primary atherosclerosis of carotid artery and therefore, it remains controversial if an asymptomatic restenosis should be treated medically or by CEA/CAS. Nevertheless, patients with post CEA restenosis could be considered for treatment too, as they acquire higher risk of late ipsilateral stroke compared with patients with no restenosis and with patients with restenosis following CAS.^{2,3} Treating strategy includes CEA or CAS, as both demonstrate similar periprocedural stroke/death rates. However, re-do CEA is technically demanding and implements an increased risk for cranial nerve injury (CNI).

We present the experience in a Greek tertiary hospital, treat-

ing post-CEA restenosis solely with stenting, and we propose the reasons we consider CAS is superior in restenotic carotid arteries.

METHOD

We performed a retrospective analysis of data collected from patients treated for carotid artery disease between January 2017 and December 2018. Baseline characteristics, demographics and risk factors are presented in Table 1 whereas periprocedural data are presented in Table 2. The diagnosis of restenosis was defined in all patients using duplex scan ultrasonography.

Procedure: We performed computed tomography angiography to assess the atherosclerosis of the aortic arch and the carotid arteries. Informed consent was obtained, orally administered clopidogrel and aspirin was given before treatment. Under local anesthesia and through a transfemoral approach, an angiogram of arch was obtained, and a selective common carotid artery angiogram was performed confirming the diagnosis (Fig. 1). The patient received 5000 units of heparin as a bolus intravenous dose. CAS was performed without utilizing embolic cerebral protection device in most of the cases. A self-expandable stent across the stenosis was used in all cases. Post-dilation with a 5-mm balloon was performed and final angiogram confirmed the satisfactory result (Fig. 2). Atropin and mannitol were not given on a routine fashion

Author for correspondence:

Anastasiadou Christiana

Nikis 2, Kifisia, P.O 14561, Greece

Tel: +30 6949722390, +30 2132086069

ISSN 1106-7237/ 2019 Hellenic Society of Vascular and Endovascular Surgery Published by Rotonda Publications
All rights reserved. <https://www.heljves.com>

GENDER	AGE	SURGERY	TIME TO REINTERVENTION	SMOKING	DM	CAD	FIBRINOGEN	BMI	ANTIPLATELET	HDL	SYMPTOMS	STATIN	HYPERTENSION
F	65	CEA SYNTHETIC PATCH & SHUNT	1 YEAR	NO	YES	YES	HIGH	31	DUAL	LOW	NO	YES	YES
F	52	CEA SYNTHETIC PATCH	8 MONTHS	NO	NO	NO	HIGH	23	A	LOW	NO	YES	YES
M	58	CEA SYNTHETIC PATCH	6 MONTHS	NO	YES	NO	NORMAL	28	C	LOW	NO	YES	YES
F	60	CEA SYNTHETIC PATCH	3 MONTHS	NO	NO	NO	HIGH	26	A	LOW	NO	YES	YES
M	67	EVERSION	1 YEAR	NO	NO	NO	NORMAL	24	A	NORMAL	NO	YES	YES

Table 1. Baseline characteristics, demographics and risk factors

EMBOLIC PROTECTION DEVICE		STENT	MANNITOL	HEMODYNAMIC DEPRESSION
1	NO	X-ACT (Abbott)8-6x40mm	NO	NO
2	NO	X-ACT (Abbott)8-6x40mm	YES	NO
3	NO	X-ACT (Abbott) 9-7x40mm	NO	NO
4	NO	X-ACT (Abbott) 8-6x40mm	NO	NO
5	YES (7.2 EMBOSHIELD NAV.)	X-ACT (Abbott) 9-7x40mm	NO	NO

Table 2. Periprocedural data

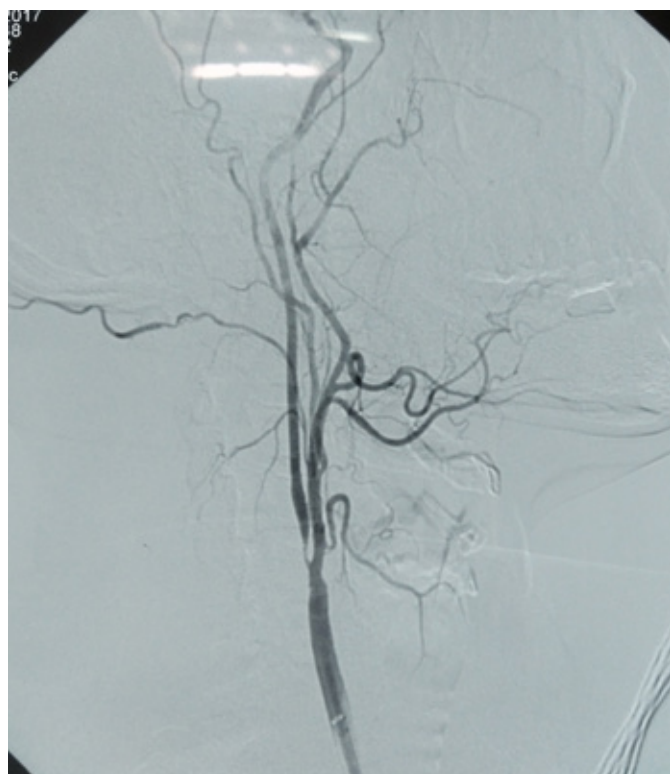


Figure 1. Initial angiogram showing the significant internal carotid artery stenosis



Figure 2. Final angiogram after the stenting of internal carotid artery showing the satisfying

RESULTS

We identified 196 patients treated for carotid artery disease. Five patients presented with carotid restenosis post CEA (2,5%). In our department, indication for revascularization procedure is (re)stenosis >80% (symptomatic/asymptomatic) or <80% in symptomatic patients in individuals with life expectancy more than 5 years. No plaque or other patient characteristics are taken into account for reintervention. In all cases, restenosis was asymptomatic, whereas only one patient was symptomatic in the first place (a major stroke was the indication for the CEA). The initial diagnosis was done with duplex scan in all patients. The majority of patients were women (60%), with low HDL levels (80%), increased BMI (60%) and high fibrinogen levels (60%). None of the patients required atropine administration intra or postoperatively. One patient required intravenous mannitol infusion postoperatively (50cc twice daily) because of mild hyper-perfusion syndrome (head-

ache and confusion without neurological deficits). Moreover, all patients had normal postoperative levels of troponin.

All patients discharged the first postoperative day with double antiplatelet regimen and remain in surveillance protocol (1, 6 and 12 months and annually thereafter) which included physical examination, blood pressure measurement and duplex ultrasonography. Follow up ranges from 1 to 18 months and reveals primary patency in all cases.

DISCUSSION

Regarding pathophysiology, when restenosis occurs in the first month postoperatively, it is considered as residual atherosclerosis and not as restenosis. Restenosis generally begins 3 to 6 months postoperatively because of neointimal hyperplasia and after a time lapse of 2 years it is considered as recurrence of atherosclerosis.¹ According to the literature, the incidence of restenosis ranges from 3% to 30%.⁷ Risk factors associated

with restenosis are diabetes mellitus, smoking, hypertension, female gender, small carotid diameter, renal failure, residual stenosis and primary closure of arteriotomy in the initial CEA^{1,4,6,7}. Our observational study results suggests that female gender, hypertension, CEA using synthetic patch, low HDL levels, increased fibrinogen and increased BMI were common characteristics among patients with restenosis. Regarding the type of surgery, as in our department we rarely perform primary closure of arteriotomy following CEA, we cannot comment on the incidence of restenosis in this group of patients.

Management of restenosis remains debatable since restenosis is considered less aggressive than primary atherosclerosis. Symptomatic patients should definitely receive revascularization, but it is unclear whether asymptomatic patients are benefited from a repeated procedure. Considering treating strategy, both endovascular and open surgical repair has been described for this group of patients, especially if the patients present with symptoms. A recent metaanalysis suggests that CAS is not superior to re-do CEA concerning periprocedural stroke/death rates.^{1,5} Nonetheless, patients treated with CAS have a lower risk for new restenosis and periprocedural cranial nerves injury.⁵ Although cranial injury is considered transient and completely resolving within the first year, it remains a troublesome complication affecting the quality of life and limiting the benefit of carotid surgery. It is our belief that stenting is simpler and it could be preferred for several reasons. Firstly, re-do procedures are technically demanding because of the presence of fibrosis. Furthermore, CAS is associated with low risk for myocardial infarction. Another reason is patient's preference. It is a fact that re-do procedures brings discomfort to patients and their relatives, especially those with comorbidities. Moreover, since recurrence is usually caused by neointimal hyperplasia, protection device is not always mandatory. Though, in cases where residual lesion or recurrent atherosclerosis is suspected, one should anyhow use a protection device. Also, intra or postoperatively hemodynamic depression is unlikely to happen because carotid body is not functioning (due to dissection during the initial procedure). Finally, cost participates to some extent in decision making, especially in Greece. Hospital costs for CEA (operation plus four days of hospitalization) have the same hospital costs for CAS (stenting plus two days of hospitalization) which estimated to be approximately 1300 Euros. Concerning stent selection, surgeon's preference was a self-expanding, closed-cell, tapered, bare metal stent with high radial force in order to overcome rigid/calcified lesions. Nowadays, there is a variety of materials available in the market suitable for all anatomies and indications/contraindications of CAS in restenotic carotid arteries do not seem to differentiate from what we already know.

Based on our experience, CAS could be used to treat restenosis following CEA as it represents a fast, safe and effective solution. The small number of patients treated with this method is a limitation of this observational, retrospective study.

CONCLUSION

Individuals with restenosis following CEA can result to ipsilateral stroke. CAS combines several advantages (medical, aes-

thetic and social-economic) and it could be the preferred therapy for those patients. However, randomized control studies are essential to prove this suggestion.

Acknowledgement: Informed consent has been obtained from patients for publication of patient characteristics and accompanying images.

No conflict of interest.

REFERENCES

- 1 Fokkema M, Vrijenhoek J, Rolf R, Schermerhorn M, Bots M, Pasterkamp G, et al on behalf of the TREAT CARE Study Group. Stenting Versus Endarterectomy for Restenosis Following Prior Ipsilateral Carotid Endarterectomy. An Individual Patient Data Meta-analysis Ann Surg. 2015;261:598-604.
- 2 Kumar R, Batchelder A, Saratzis A, AbuRahma AF, Ringleb P, Lal BK, et al. Restenosis after Carotid Interventions and Its Relationship with Recurrent Ipsilateral Stroke: A Systematic Review and Meta-analysis Eur J Vasc Endovasc Surg. 2017;53: 766-775.
- 3 Bonati L, Gregson J, Dobson J, McCabe DJH, Nederkoorn PJ, van der Worp HB et al. Restenosis and risk of stroke after stenting or endarterectomy for symptomatic carotid stenosis in the International Carotid Stenting Study (ICSS): secondary analysis of a randomised trial. Lancet Neurol 2018;17: 587-96
- 4 Gaudry M, Bartoli J, Bal1 L, Giorgi R, Masi M, Magnan P et al. Anatomical and Technical Factors Influence the Rate of In-Stent Restenosis following Carotid Artery Stenting for the Treatment of Post-Carotid Endarterectomy Stenosis PLoS ONE 11(9): e0161716
- 5 Texakalidis P, Giannopoulos S, Jonnalagadda A, Kokkinidis D, Machinis T, Reavey - Cantwell J et al. Carotid artery endarterectomy (CEA) vs Carotid artery stenting (CAS) for restenosis after CEA: A systematic Review and meta-analysis. World Neurosurg. 2018;120:563-571.
- 6 Garzon-Muvdi T, Yang W, Rong X, Caplan J, Ye X, Colby G et al. Restenosis After Carotid Endarterectomy: Insight Into Risk Factors and Modification of Postoperative Management World Neurosurg. 2016;89:159-167.
- 7 Texakalidis P, Tzoumas A, Giannopoulos S, Jonnalagadda Anil K, Jabbour Pascal, Castilla L et al. Risk Factors for Restenosis After Carotid Revascularization: A Meta-Analysis of Hazard Ratios. World Neurosurg. 2019;125:414-424.