

Long-term Restenosis Rate of Eversion Endarterectomy on the Internal Carotid Artery

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Objectives. The eversion endarterectomy of the internal carotid artery was introduced in Hungary in 1991. The aim of this study was to define the long-term restenosis rate of this procedure.

Patients and Methods. Between 1991 and 1993, 171 operations, on 151 patients, were performed by single surgeon: with long-term follow up of 109 patients, which included annual physical and ultrasound examinations. Restenosis rate and plaque morphology were defined. Survival and patency rate were analysed by life-tables.

Results. The combined perioperative stroke morbidity and mortality rate was 0.8%. The 5-year patient survival rate was 85%, the recurrent stenosis free rate was 88% at 5 years. Only 9% of the patients had carotid restenosis of more than 70% during this period. Ultrasound plaque morphology showed calcification in one case. Two patients had re-operations, with plaque histology showed myointimal hyperplasia in each case.

Conclusions. Our results for restenosis are compare favourably with the 2–34% restenosis rate reported in the literature. Ultrasound and histological findings suggest that atherosclerosis does not play a significant role in the development of restenosis after the eversion carotid endarterectomy.

Key Words: Eversion endarterectomy; Internal carotid artery; Recurrent stenosis.

Introduction

Since the first endarterectomy on the internal carotid artery, hundreds of thousands of patients worldwide have undergone carotid reconstruction. Eversion carotid endarterectomy has become used widely since 1991 in our institution.^{1,2} In the literature restenosis rates of 2–34% after carotid artery endarterectomy have been reported.^{3–9} The aim of this study was to define the long-term restenosis rate of eversion carotid endarterectomy.

Patients and Methods

Between 1991 and 1993, 171 operations were performed on 151 patients by the same surgeon. Male–female ratio was 2:1, the average age of the patients was 63.4 (42–84) years. Patients underwent regular checkup in every 6 months. The percentage of restenosis calculated from velocity measurement was recorded. Restenosis above 70%, according to

NASCET criteria, was considered significant. The mean follow-up time was 56 months. Data were analysed by life-table methods. Survival data were compared to the age and sex matched Hungarian population. Patency rates were compared to data from the literature for patients who underwent eversion and standard carotid endarterectomy. In cases of redo surgery, patch-plasty, PTFE interposition grafting or angioplasty were performed.

Results

The combined perioperative stroke morbidity and mortality rate was 0.8%. The 5-year patient survival rate was 85%. The survival rate in the endarterectomy group was similar to that of the age and sex matched Hungarian population (85% versus 82% at 5 years).

Survival without recurrent stenosis was 91% at 5 years (Fig. 1). Although 11 patients (9%) had significant restenosis, only two patients had redo surgical procedures, one patient having bilateral procedures. Restenosis was detected in four patients at 6-month follow-up, in four, two and one patients at 12, 18, 24 months following endarterectomy, respectively. The indication for redo surgery was ipsilateral transient

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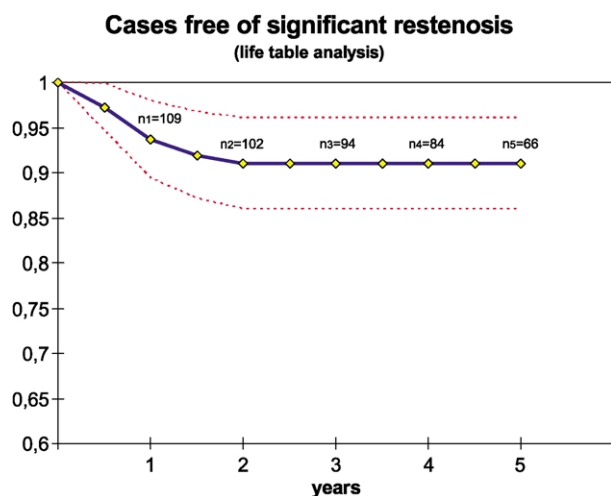


Fig. 1. Survival free from significant restenosis following eversion endarterectomy of the internal carotid artery (the number of studied cases in postoperative year 1–5 were 109, 102, 94, 84 and 66, respectively, the interrupted lines show 95% confidence intervals).

ischaemic attack (TIA) in one patient and bilateral high grade (>90%) stenosis in the other. Ultrasound examinations indicated restenosis of greater than 50% in 12% of all cases (13 of 109 cases). Ultrasound plaque morphology showed intimal thickening typical of myointimal hyperplasia without significant calcification except in one case where the echodensity suggested calcification. Histological examination in the redo surgical cases showed myointimal hyperplasia (Fig. 2).

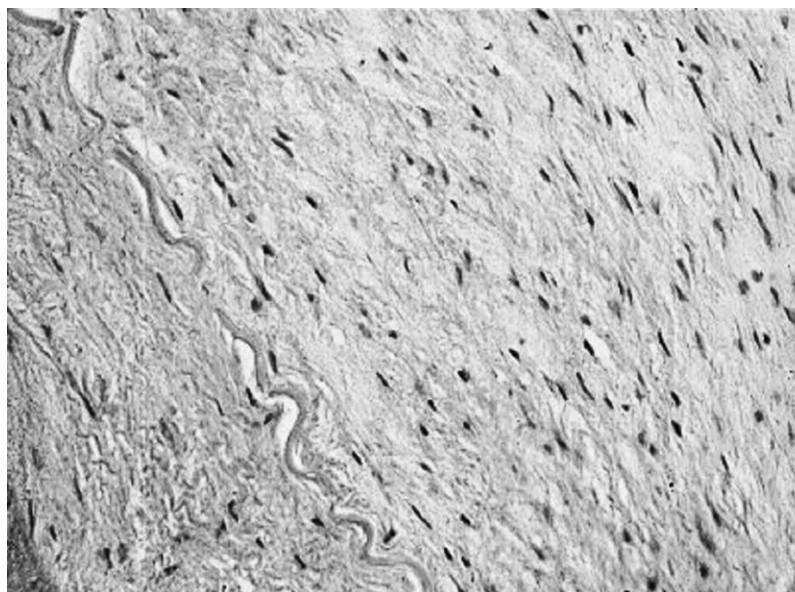


Fig. 2. Histological section shows myointimal hyperplasia after removal of a carotid plaque following restenosis of the internal carotid artery.

Discussion

Eversion endarterectomy, of the internal carotid artery, was introduced simultaneously at two independent centres. In our institution we adopted the technique described by Kasprzak and Raithe^{1,2}

Early restenosis following carotid endarterectomy is due to either myointimal hyperplasia or residual stenosis. In cases of early restenosis, clinical symptoms are found only in 1–2% of the patients, because the neointimal layer is smooth, not thrombogenic, or embolic. Symptoms in patients with neointimal hyperplasia are usually due to absence of proper collateral circulation, or result from haemodynamic changes. According to the literature, the occurrence of restenosis following carotid reconstructions is related to the closing method of the arteriotomy. Our early data for the first 80 patients undergoing the eversion procedure, published previously, show a 3.9% significant restenosis rate after 27 months of follow-up.³ The results of multicentre clinical trials indicate restenosis rates of 0.3–3.6% after 15–23 months of follow-up.^{4–9}

The 9% restenosis rate after 5 years in our study is acceptable, considering that patients on our learning curve were included. We could not find a single study with longer follow-up period, than ours (56 months average). The eversion technique for carotid endarterectomy has become dominant in the last 10 years, so that there is no comparison with other surgical procedures.

Our reoperation rate (2.7%) is comparable to that of other centres (1.2–3.6%).^{4–9}

Significant restenosis after carotid surgery is not a clear indication for redo surgery, because it is rarely symptomatic. In our experience reintervention is indicated in symptomatic cases only, or when an explicit progression to 90% restenosis or higher is found. Our previous results show higher complication rates in redo surgery than in primary cases. However, the rate of reoperations has decreased in the last 4–5 years, since percutaneous transluminal angioplasty has become the preferred choice of redo procedures.¹⁰

Conclusion

The peri-operative morbidity data and the late results from our institution are comparable to those of multicentre studies. Our 5-year restenosis rate (9%) is acceptable and encouraging for future practice. The ultrasound and the histological findings suggest that atherosclerosis does not play a significant role in the development of restenosis after the eversion endarterectomy. Similar to the results of prospective clinical studies, our data indicate that eversion endarterectomy of the internal carotid artery is safe, effective and durable, and thus become the standard procedure for the treatment of significant carotid artery stenosis.

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