

Carotid Angioplasty with Autologous Facial Vein

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Introduction: Carotid endarterectomy (CEA) is the „gold standard” for the treatment of carotid stenoses. In this study we evaluate the results after using an alternative patch material for arteriotomy closure.

Material and methods: This study is a retrospective, observational study, in which we have compared 2 groups of 8 patients operated on in our clinic between 2008–2012, the first group of 8 patients with CEA and facial vein patch, the second group of 8 consecutive patients with CEA and PTFE patch.

Results: In the A group there were 6 males, in the B group 5 males. Group A had a median age of 60 years, group B had a median age of 60.5 years. All patients were operated for severe carotid stenosis. We evaluated the time of surgery, which varied for group A between 70 and 85 minutes, with a median of 77 minute, for group B between 75 and 100 minutes, with a median of 88 minutes. We observed a significant difference between the 2 groups regarding the time of surgery, in favour of group A ($p=0.010$).

Conclusions: The advantages of a autologous venous material are represented by endothelised patch, reduction of desendothelised area, higher resistance to infections. The use of facial vein for endarterectomy patch needs the same incision, elevating the cost-efficiency of the procedure, and significantly reduces the operating time compared with PTFE due to a faster achievement of haemostasis.

Keywords: facial vein, carotid endarterectomy, patch angioplasty

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Introduction

Carotid endarterectomy is considered the “gold standard” for the treatment of carotid stenoses. There are two important types of carotid endarterectomy routinely used, direct endarterectomy and eversion endarterectomy [1,2]. In case of direct endarterectomy, the closure of the arteriotomy can be primary or using a patch angioplasty technique [3]. The recommendations of the European Society of Vascular Surgery regarding carotid arteriotomy closure methods sustain the idea of patch angioplasty, especially if the internal carotid artery’s diameter is smaller than 5.5 mm [4].

There are multiple choices for the angioplasty patch material. We advance a classification, in which we have mentioned our team’s interest in the angioplasty patch materials (noted with asterisk):

- A. biological
 - Venous
 - Distal or proximal internal saphenous vein
 - Mono or double layer facial vein*
 - Arterial (resected carotid artery, with or without endarterectomy)*
- B. sintetic
 - gore-tex
 - dacron
 - Acuseal [5], Finesse [6], etc

In standard prejugular approach of the carotid artery during carotid endarterectomy, the surgeon routinely divides the facial vein, a primary branch of the internal jugular vein; our team developed, independently, a method of harvesting this vein from its origin to its first major bifurcation, in order to use the existing venous material as a patch for carotid angioplasty.

Material and methods

This study is a retrospective, observational study, in which we compared 2 groups of patients, each consisting of 8 patients. In study group A we included the patients in which we had performed direct carotid endarterectomy and patch angioplasty with mono- or double-layer autologous facial vein, between 2008–2012. In study group B, representing the 8 control patients, we had performed carotid endarterectomy and patch angioplasty with PTFE. In order to demonstrate the similarity between the two groups, we had chosen for group B a consecutive series of patients operated in the same center, by the same team.

Surgical technique

The surgical intervention started in a standard manner, until the point of dissection of the facial vein-internal jugular vein confluent. We dissect the facial vein medially, until its bifurcation, for a length of 5–7 cm. Thus, the obtained conduit must be prepared before use. There are two modalities, in mono- or double-layer. In mono-layer fashion, the harvested facial vein is longitudinally sectioned and conserved in heparinated serum. In case of double-layer technique, the harvested facial vein is sectioned, eversed and its margins are sawn together in a few points. Simple eversion of the vein is difficult and may produce parietal lesions, due to a relatively constant collateral vein, previously ligated.

After facial vein harvesting and preparation, the routine operating steps for direct carotid endarterectomy follow. Following the inspection of the endarterectomised area, we estimate the size of the needed patch and tailor it from the facial vein patch, starting from one of its corners. In case of double-layer facial vein patch, we recommend to stitch the margins during tailoring for an easier patch manipulation.

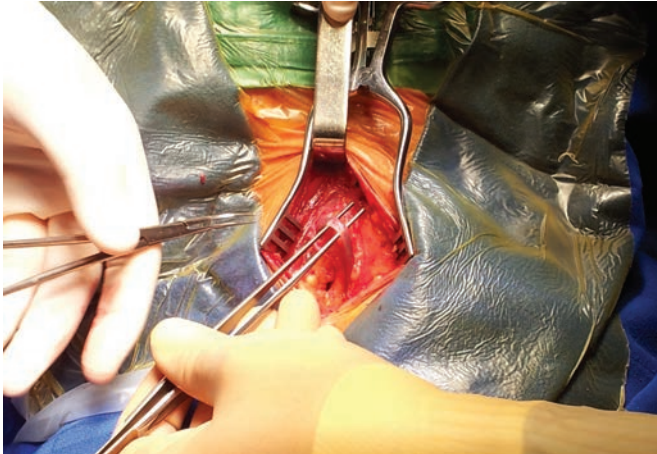


Fig. 1. Harvesting and preparation of the facial vein

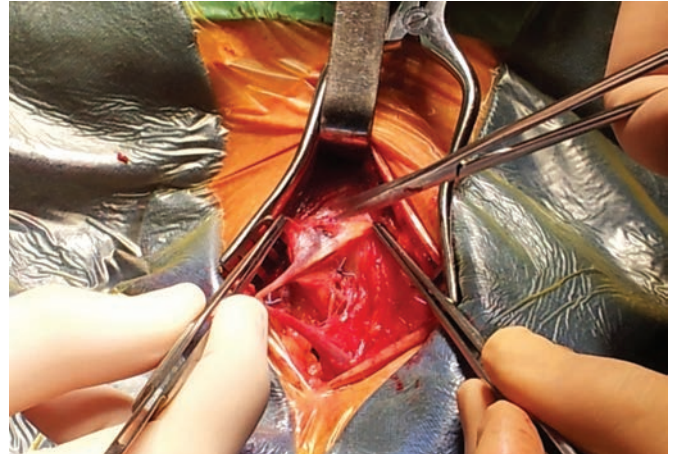


Fig. 2. Back-table preparation of the facial vein for patch angioplasty

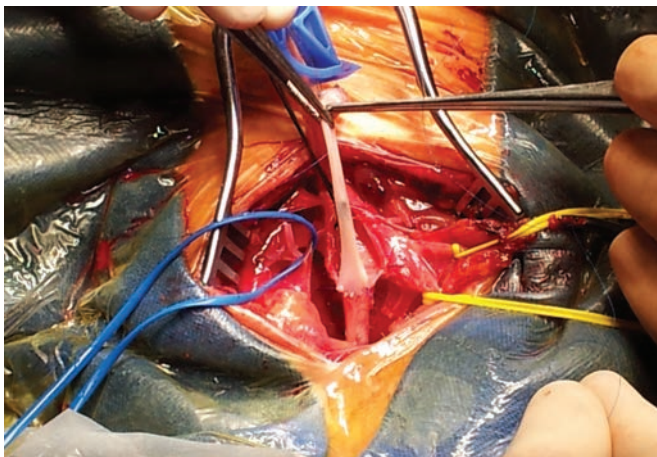
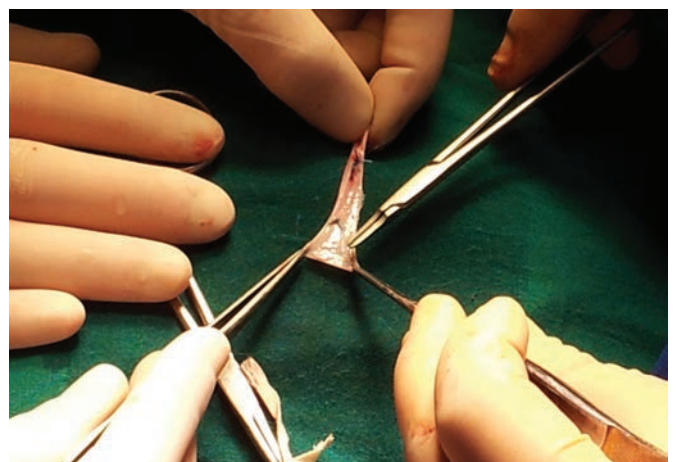
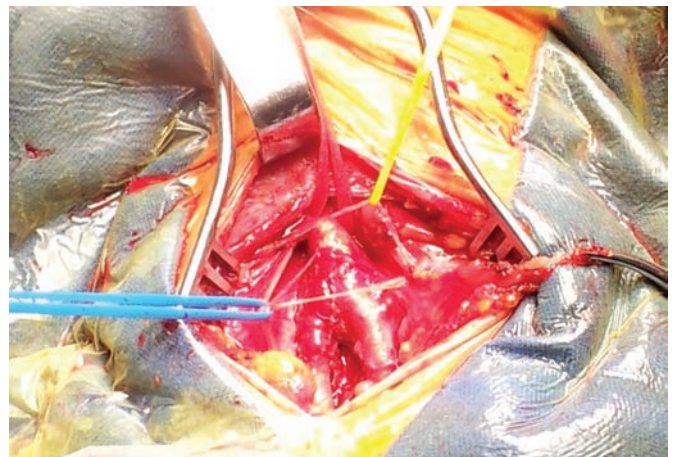


Fig. 3. Facial vein patch suture and final intraoperative image



Closure of the arteriotomy is performed in a standard manner, the mono-layer facial vein patch is used with its intimal layer inside, while the double-layer patch has an intimal surface on each side.

The advantages of a venous patch for angioplasty are well known: minimizing the non-endothelised surface, easier hemostasis, higher resistance to infections, higher cost-efficiency. There are no recommendations regarding the type or material of the patch to obtain a better late postoperative result.

Results

During this study, we statistically compared the study groups, each consisting of 8 patients, to demonstrate the non-inferiority of this technique, meaning consideration of this angioplasty material as a viable solution.

Study group A consisted of 6 male and 2 female patients. In control group B, there were 5 male and 3 female patients.

For statistical comparison we have used Fisher's test, and the proportion of observations in the categories that

define the contingency table are not significantly different from the randomized occurrence ($p=1.000$).

The patients' age in group A ranged between 48 and 69 years, with a mean value of 60. In group B, patients' age varied from 53 to 71 years, with a mean value of 60.5. Evaluation of data showed a similar distribution (Equal Variance Test: Passed, $p=0.708$). Mann-Whitney test performed on this data underlined the fact that there is no significant difference between the 2 groups of patients ($p=0.721$).

All patients included in the study had similar diagnoses, higher than 75% atherosclerotic carotid stenosis, without significant coronary artery lesions. All patients were operated on in general anesthesia with oro-tracheal intubation.

Hospital stay was similar for all of the 16 patients from the study. They stationed 24 hours in the cardiovascular intensive care unit, 24 hours in the postoperative ward and were discharged on the 3rd postoperative day.

In all patients, we used cerebral protection with intravascular shunt, without incidents or accidents. Perivascular drainage was used in all patients, removed after 24 hours. We also evaluated the time of intervention in all cases.

In study group A, intervention times varied from 70 to 85 minutes, with a median of 77 minutes. In study group B, intervention times ranged from 75 to 100 minutes, with a median of 88 minutes. The two groups had a similar distribution (Equal Variance Test: Passed, $p=0.673$).

For statistic comparison, we used the Mann-Whitney test, with a statistically significant difference between the two groups, in favor of group A ($p=0.010$).

Postoperative control of these patients was performed clinically at discharge and clinically and echografically at 1 month after discharge. All patients presented ipsilateral to the intervention submandibular hypo- or anesthesia. There were no other major or minor complications in these patients. There were no residual postoperative stenoses.

Discussions

Even though we have initiated the use of facial vein independently in our center, after searching on this topic in the literature, we have found 2 articles presenting this technique [7,8]. Both studies describe the use of facial vein as a carotid angioplasty material and they are non-inferiority studies, similar to ours.

The use of a carotid angioplasty material with an endothelialised surface as a patch is important, reducing the

disendothelialised area to minimum, so reducing the rate of thromboembolic events or the postoperative stenosing endoluminal scar. Venous angioplasty material originating from the same patient is very resistant to infections, reducing the risk of local infectious complications to minimum.

Introducing the facial vein as an angioplasty material is highly cost-effective, allowing the harvesting of venous patch through the main incision, reducing thus the number of necessary incisions and the overall material use.

Regarding the operating time, there is a statistically important difference in favor of the facial vein group, when compared with a PTFE group. Even though it has an added operating step, the harvesting of the facial vein, this needs only 3–5 minutes. The other advantage of the venous angioplasty material consists of a more efficient and quicker hemostasis around the suture line compared to PTFE, compensating significantly the operating time.

Conclusions

This study demonstrated the non-inferiority of this technical variation for carotid endarterectomy with patch plasty. Shorter operating time, higher comfort for the patient (one incision) are solutions to augment cost-efficiency rate, a very important goal in cardiovascular medicine.

References

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