

Carotid endarterectomy with mini-invasive access in locoregional anaesthesia

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Abstract. *Aim:* To assess the validity of a carotid endarterectomy (CEA) with a mini-invasive access via a 3-7 cm cutaneous incision in locoregional anaesthesia as a viable alternative to the traditional access with a cutaneous incision longer than 7 cm. *Materials and Methods:* We carried out a retrospective analysis of 76 consecutive patients (Group A) who had undergone carotid CEA in locoregional anaesthesia with cervical mini-access (3-7 cm incision), compared to a preceding series of 95 patients (Group B) who had undergone the same operation through a traditional access (incision > 7 cm). All patients in Group A were examined solely by means of duplex ultrasound scanning. *Results:* No mortality occurred in Group A and the morbidity rate was as follows: 1.3% strokes, 2.6% minor neurological events and 6.5% transitory deficit of peripheral nerves. In Group B, the mortality rate was 1%, with the following morbidity rate: 2% strokes, 1% minor neurological events and 7.3% transitory deficit of peripheral nerves. Statistical analysis revealed the two groups as being compatible for age, sex, associated pathologies and type of surgery. No statistically significant differences emerged between the two series of patients with regards to neurological morbidity or operative mortality. *Conclusions:* In addition to being more aesthetically pleasing, mini-invasive access is a viable alternative to the traditional access for patients undergoing carotid CEA in locoregional anaesthesia. (www.actabiomedica.it)

Key words: Carotid endarterectomy, mini-incision, locoregional anaesthesia

Introduction

Modern surgery is increasingly moving towards mini-invasiveness for various reasons: it is less painful, involves a shorter hospital stay, and yields better aesthetic results(1, 2).

Carotid endarterectomy (CEA) prevents strokes in patients with severe carotid stenosis, as the numerous studies in the literature and the revision of the Cochrane Library witness (3-8).

A mini-invasive access is also justified for carotid surgery (incision of 3-7 cm) after meticulous preoperative mapping for the precise identification of the bifurcation site which leads to an accurate incision.

Materials and methods

At the Vascular Surgery Unit of Parma University Hospital, in 2005 76 patients (Group A) underwent Carotid CEA; their personal, co-morbidity and clinical data are reported in Tables 1 and 2. All patients underwent a thorough preoperative B-mode duplex ultrasound scanning examination (G E medical systems logic™book XP), with spectral analysis of the common, external and internal carotid artery, which localised the bifurcation with respect to the angle of the mandible and calculated the extension and morphology of the plaque. After mapping (Figs. 1, 2), the procedures were carried out with an "aimed" longitu-

Table 1. Comparison between the two groups of patients with reference to sex, age and risk factors (n.s. = not significant)

	Patients with Mini-access	Patients with Traditional access	Significance
N	76	95	
Sex			
Males	43 (57%)	59 (62%)	n.s.
Females	33 (43%)	36 (38%)	
Age			
Mean	72.14	73.24	n.s.
Median	74.00	74.00	
Minimum	47	49	
Maximum	92	89	
Range	45	40	
Std. Deviation	9.95	8.00	
Skewness	-0.64	-0.74	
Kurtosis	0.17	0.52	
Smoker			
Yes	22 (29%)	26 (27%)	n.s.
No	54 (71%)	69 (73%)	
Hypertension			
Yes	67 (88%)	84 (88%)	n.s.
No	9 (12%)	11 (12%)	
Cardiopathy			
Yes	24 (32%)	28 (29%)	n.s.
No	52 (68%)	67 (71%)	
Diabetes			
Yes	9 (12%)	23 (24%)	p ~ 0.05
No	67 (88%)	72 (76%)	
Renal insuf.			
Yes	4 (5%)	9 (9%)	n.s.
No	72 (95%)	86 (91%)	
Pulmonary disease			
Yes	5 (7%)	5 (5%)	n.s.
No	71 (93%)	90 (95%)	

dinal cervical mini-access from 3 to 7 cm in length (mean length 4 cm): in 40% of the cases the incision was shorter than 4 cm. Surgery was always performed in locoregional anaesthesia with a longitudinal arteriotomy. Carotid reconstruction was carried out by means of direct suture in 53% of the cases, and in the remaining 47% a Dacron patch (3.8 cm mean length) was used (Tab. 3). In 11% of the cases, neurological

Table 2. Comparison between the two groups of patients regarding the pre-operative clinical picture (n.s. = not significant)

	Patients with Mini-access	Patients with Traditional access	Significance
N	76	95	
Symptomatic			
Yes	32 (42%)	34 (36%)	n.s.
No	44 (58%)	61 (64%)	
Controlateral carotid occlusion			
Yes	5 (7%)	4 (4%)	n.s.
No	71 (93%)	91 (96%)	

**Figure 1.** Preoperative duplex scan carotid bifurcation mapping**Figure 2.** Aesthetical result at one month

Table 3. Comparison between the two groups of patients regarding types of surgery (n.s. = not significant)

	Patients with Mini-access	Patients with Traditional access	Significance
N	76	95	
CEA with patch			
Yes	36 (47%)	44 (46 %)	n.s
No	40 (53%)	51 (54%)	
Shunt			
Yes	8 (11%)	14 (15%)	n.s
No	68 (89%)	81 (85%)	

intolerance to clamping required the use of a Javid shunt.

We carried out a comparative analysis with a preceding consecutive series of 95 patients (Group B) undergoing Carotid CEA with traditional access (longer than 7 cm); the personal, co-morbidity and clinical data are reported in Tables 1 and 2. In this group a locoregional anaesthesia was performed. Carotid reconstruction was carried out by means of direct suture of the arteriotomy in 54% of these cases, and in the remaining 46% a Dacron patch was used. Finally, in 15% of the cases neurological intolerance to clamping required the use of a Javid shunt (Tab. 3). The differences between the two series of patients in terms of statistical significance were evaluated using the Mann-Whitney non-parametrical test for the variables on a continuous or ordinal scale, and using the Chi-squared test and Fisher's exact test for the variables defined on a nominal scale (Tabs. 1-3).

Results

In the 76 patients of Group A, undergoing mini-access surgery, no deaths occurred; 1 (1.3%) patient suffered from a stroke due to an acute postoperative thrombosis, in 2 (2.6%) cases minor neurological events occurred, and, finally, 5 (6.5%) patients showed transitory deficit of peripheral nerves, of the first, second and third class according to Sunderland's classification. Mean hospital stay was 4.2 days (median 4 days), with a minimum of 2 and a maximum of 15 days. In the 95 patients of Group B, undergoing

Table 4. Comparison of the results between the two groups of patients

	Patients with mini-access	Patients with Traditional access	Significance
	76	95	n.s
Mortality	0	1 (1%)	n.s
Stroke	1 (1.3%)	2 (2%)	n.s
TIA	2 (2.6%)	1 (1%)	n.s
Peripheral nerve lesions	5 (6.5%)	7 (7.3%)	n.s

surgery via a traditional access, the mortality rate was 1% (a patient aged 89 yrs. with a stroke in evolution, occlusion of the contra-lateral carotid artery, who underwent emergency surgery); two cases (2%) of stroke, and one case (1%) of a minor neurological event were observed; in addition, in 7 cases (7.3%) transitory deficit of peripheral nerves, of the first, second and third class according to Sunderland's classification occurred. Mean hospital stay was 4.7 days (median 4 days), with a minimum of 3 and a maximum of 12 days. No statistically significant difference was noted between the 2 groups concerning mortality or neurological morbidity (Tab. 4).

Discussion

Surgical access to the carotid bifurcation for CEA is usually performed by vascular surgeons by means of a longitudinal incision extending along the anterior margin of the sternocleidomastoid muscle. For aesthetic satisfaction, a transversal incision has been proposed following the cervical cutaneous folds (9, 10). This access, however, presents technical disadvantages such as the compression of the ramus marginalis of the mandibular branch of the facial nerve and the difficulty to perform a proximal or distal extension of the access if needed.

In the last few years, a reduction in the extension of the traditional longitudinal incision for CEA has been proposed (2, 11).

The CEA technique with a mini-incision (3-7 cm) allows for an accurate examination of the carotid artery by means of preoperative duplex ultrasound



Figure 3. Intraoperative Javid-shunting

scanning allowing to determine the site of the bifurcation with respect to the angle of the mandible, as well as the extension of the plaque and its morphology and anatomic-pathological characteristics (“soft” or “hard”). This set of data enables us to make an incision that is accurately aimed at both site and extension. For this purpose, some authors have used magnetic resonance angiography (9). In our experience, duplex ultrasound scanning has always been reliable and in no case have we had to turn to other examinations, such as angiography, contrast CT scans or magnetic resonance angiography (2, 11).

It has never been necessary for us to extend the cutaneous incision, not even when a shunt was used or when the arterial suture required an angioplasty with a patch (Fig. 3). However, as it can be imagined, the longitudinal miniaccess does not preclude a possible proximal or distal widening for a more extensive control of the carotid artery.

In our experience, the major neurological morbidity rate in the group of patients undergoing a mini-invasive access was 1.3%; this is in line with the most recent data in the literature (4, 12, 13), reporting a neurological morbidity rate ranging from 1.2% to 2.8%, and is completely compatible with the data obtained for the control group (standard incision).

The lesion of peripheral nerves, which in the literature varies from 3% to 48% (10, 14-16), was witnessed in 5 (6,5%) patients in the group with mini-in-

vasive access and in 7 (7.3%) cases in the group with traditional access without significant statistical difference.

Conclusions

We consider the mini skin incision in patients undergoing CEA to be a safe alternative to the standard incision. The procedure can be performed safely, with no change in mortality, incidence of perioperative stroke or other minor complications. In addition, the result is more aesthetically pleasing to the patient. However, in order for this surgical option to work, we believe that it is of fundamental importance to carry out thorough preoperative duplex ultrasound scanning to confirm the site of the carotid bifurcation and to localise the precise site of the disease.

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