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# Perioperative Results Eversion Carotid Endarterectomy in Bilateral Symptomatic Stenosis

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## ABSTRACT

**Introduction:** Carotid endarterectomy (CEA) is a standard treatment for the prevention of stroke and death in patients with significant stenosis of the internal carotid artery. Eversion endarterectomy is warranted in patients with symptoms of cerebral ischemia and the degree of stenosis of 70-99%. The same is suitable for treating a symptomatic carotid artery stenosis with contralateral stenosis (50-70%). **Purpose:** The aim of this study was to evaluate perioperative complications (ICV, TIA, MI, mortality) in patients treated with carotid eversion endarterectomy with unilateral and bilateral symptomatic stenosis (with bilateral stenosis treated with ACI stenosis  $\geq 70\%$ ). **Patients and Methods:** The study included 139 patients with symptomatic carotid artery stenosis at the Department of Vascular Surgery of the University Clinical Center of Sarajevo in the period from January 2012 to December 2014 year. Given the involvement of ACI stenosis patients were divided into two groups. Group A consisted of 74 patients with bilateral stenosis (surgically treated with ACI stenosis  $\geq 70\%$ , while the degree of stenosis opposite ACI was from 50-70%), and group B of 65 patients with unilateral stenosis  $\geq 70\%$ . **Results:** Of the 139 patients included in the study, in the group A was 74, of which 46 male (62.2%) and 28 female (37.8%), while in group B were 42 male (64.6%) and 23 female (35.4%) ( $p = 0.90$ ). The subjects in group A were slightly older 65.9 ( $\pm 7.8$ ) compared to group B 64.2 ( $\pm 7.7$ ) ( $p = 0.17$ ). Analysis of risk factors indicating a higher number in Group A compared to group B, but the difference was not statistically significant: 34 smokers (45.9%) versus 36 (55.4%);  $p = 0.34$ , patients with hypertension (63 (85.1%) against the 52 (80.0%);  $p = 0.56$ ), with statin therapy (62 (83.8%) versus 52 (80.0%);  $p = 0.72$ ), diabetes (18 (24.3%) versus 18 (27.7%);  $p = 0.79$ ) and with a heart disease (18 (24.3%) versus 7 (10.8%);  $p = 0.06$ ). Analysis of the frequency of perioperative complications between the groups was not statistically significant: ICV (2/74 versus 3/65;  $p = 1.00$ ), TIA (2/74 versus 3/65;  $p = 0.88$ ), one death was recorded in group A, while myocardial infarction (MI) we had in either group. **Conclusion:** In this study, no statistically about significant differences in the number of perioperative complications (from 0 to 30 days) between the two groups. With this risk is acceptable to perform carotid endarterectomy in a patient in the opposite ACI stenosis of 50-70%.

**Key words:** eversion carotid endarterectomy, symptomatic stenosis, bilateral stenosis, unilateral stenosis.

## 1. INTRODUCTION

Carotid endarterectomy (CEA) is a standardized treatment for the prevention of stroke (ICV) and death in patients with severe internal carotid artery (1-4). Symptomatic carotid artery results in that the ICV is the leading cause of disability in the world (5-7). The frequency of the stenotic extracranial arteries increases with age, the value of total cholesterol, low density lipoproteins, fibrinogen, systolic blood pressure, and the consumption of cigarettes. Carotid stenosis was associated with an increased incidence of both stroke and mortality in the elderly, age over 50 years increases the risk of both stroke four times, until the age over 59 years it has increased to the same as

8 times (8, 9). Carotid artery stenosis is defined as narrowing of the lumen of the arteries, is manifested by difficulties due to acute or chronic cerebrovascular insufficiency, transient or permanent neurologic deficit, depending on the vessel which is affected by pathological process. The highest incidence of stenotic lesions in the bifurcation of the carotid arteries (34%), and also is very high and the vertebral arteries (18-22%). Representation of occlusive lesions is far less common and is the bifurcation of the carotid artery 8.5%, and for vertebral artery between 4.0 and 5.7% (10).

Symptoms and signs of cerebrovascular insufficiency carotid area are: fainting, dizziness, contralateral hemi-

paresis, hemisensory or hemiparesis, amaurosis fugax (ipsilateral transient monocular blindness), aphasia, dysphasia (if the affected dominant hemisphere), contralateral hemianopia, mental changes in the form of states of confusion. Transient ischaemic attack (TIA) or ischaemic stroke (ICV) is associated with the occlusion of one of the carotid artery in 9% of patients (11).

## 2. 2. AIM OF STUDY

The aim of this study was to evaluate perioperative complications (ICV, TIA, MI and mortality) in patients treated with carotid eversion endarterectomy with unilateral and bilateral symptomatic stenosis (with bilateral stenosis treated with ACI stenosis  $\geq 70\%$ ).

## 3. PATIENTS AND METHODS

### 3.1. Patients

The retrospective-prospective study included subjects with symptomatic stenosis of the internal carotid artery (ICA) surgically treated at the Clinic for Vascular Surgery of the University Clinical Centre in Sarajevo, in the period from January 2012 to December 2014. Given the involvement of ACI stenosis patients were divided into two groups. Group A consisted of 74 patients with bilateral stenosis (surgically treated with ACI stenosis  $\geq 70\%$ , while the degree of stenosis opposite ACI was from 50-70%), and group B of 65 patients with unilateral stenosis  $\geq 70\%$ . The patients were examined by a neurologist and a vascular surgeon. Were considered, clinical characteristics, preoperative neurological symptoms (vertigo, amaurosis fugax, TIA and a small stroke), and perioperative (0-30 days) complications. The clinical characters and: age; half; hypertension (presence of a systolic blood pressure  $> 140$  and / or diastolic pressure  $> 90$  mm Hg or specific therapy); dyslipidemia (statin use); diabetes mellitus (insulin or oral antidiabetic drugs); smoking; coronary artery disease (angina, myocardial infarction (MI) or coronary revascularization).

Carotid endarterectomy is done by eversion technique, without the use of shunt. Operatively treated stenosis  $\geq 70\%$ . From perioperative complications (0-30 days) in both groups were analyzed and compared: ICV, TIA, MI, mortality and demographic characteristics and risk factors.

Information for risk factors for cardiovascular and cerebrovascular diseases were collected for each subject. Data for smoking were categorized as smokers (current and those who had stopped a month ago and less) and non-smokers, hypertensive patients are those who use antihypertensive therapy. In addition, the data on the use of statins, and diagnosis Diabetes mellitus and coronary artery disease. Data were collected on symptomatology carotid stenosis: vertigo, amaurosis fugax, TIA and minor stroke.

The degree of stenosis was determined by Doppler ultrasound, MRI angiography, CT and digital subtraction angiography (IA DSA). Digital subtraction angiography was performed in patients with suspected occlusion. Stenosis detected with Doppler ultrasound confirmed with MRI in angiography 115 (82.7%), with CT angiography in 10 patients (7.2%) and with a DSA in 14 patients (10.1%)

Perioperative complications were TIA (transient neurological deficit lasting up to 24 hours), ICV, IM and death that occurred within 30 days after endarterectomy.

### 3.2. Methods

The operations were performed under local anesthesia using the eversion technique. Eversion carotid endarterectomy implies: transection at the level of the carotid bifurcation, removal of plaque twisting arteries and carotid artery reimplantation anatomical internal. The implantation of a foreign material (the patch) is not required. Intraluminal shunt was not used. To test the statistical significance between categorical variables of group A and group B was used  $\chi^2$ , which was calculated in SPSS version 21.0. The difference between the samples was considered significant if  $p < 0.05$ .

## 4. RESULTS

Of 139 patients included in the study, in the group A was 74, of which 46 male (62.2%) and 28 female (37.8%), while in group B, 65, 42 male (64.6%) and 23 female (35.4%) ( $p = 0.90$ ). The subjects in group A were slightly older 65.9 ( $\pm 7.8$ ) compared to group B 64.2 ( $\pm 7.7$ ) ( $p = 0.17$ ). Analysis of risk factors indicating a higher number in Group A compared to group B or the observed difference is not statistically significant: 34 smokers (45.9%) versus 36 (55.4%);  $p = 0.34$ ), patients with hypertension (63 (85.1%) versus 52 (80.0%);  $p = 0.56$ ), with statin therapy (62 (83.8%) versus 52 (80.0%);  $p = 0.72$ ), diabetes (18 (24.3%) versus 18 (27.7%);  $p = 0.79$ ) and with a heart disease (18 (24.3%) versus 7 (10.8%);  $p = 0.06$ ) (Table 1).

	Group A	Group B	P
N	74	65	
Average age, years (SD)	65.9 ( $\pm 7.8$ )	64.2 ( $\pm 7.7$ )	0.17
Sex, Male-Female, (%)	46 - 28	42 - 23	0.90
Smoker.no (%)	34 (45.9%)	36 (55.4%)	0.34
Hypertension. N, (%)	63 (85.1%)	52 (80%)	0.56
Diabetes. N, (%)	18 (24.3%)	18 (27.7%)	0.79
Hyperlipidaemia. N, (%)	62 (83.8%)	52 (80.0%)	0.72
Coronary artery disease. N, (%)	18 (24.3%)	7 (10.8%)	0.06

**Table 1. Demographics and Risk Factors**

Analysis of the incidence of preoperative complications between the groups was not statistically significant difference: ICV (2/74 versus 3/65;  $p = 0.00$ ), TIA (2/74 versus 3/65;  $p = 0.88$ ), one death was recorded in group A, while myocardial infarction (MI) we had in either group (Table 2).

	Group A N=74	Group B N=65	P
ICV. N, (%)	2/74 (2.7%)	3/65 (4.6%)	0.88
TIA. N, (%)	2/74 (2.7%)	3/65 (4.6%)	0.88
Death. N, (%)	1/74 (1.4%)	0/65 (0.0%)	1.00
I.M. N, (%)	0/74	0/65	1.00
Total	5/74 (6.8%)	6/65 (9.2%)	0.65

**Table 2. Perioperative complications**

Of all the patients we had vertigo in 32 subjects (23.0%), TIA in 45 (32.4%), amaurosis fugax in 40 (28.8%) and minor stroke in 22 (15.8). Representation of perioperative complications in relation to the symptoms shown in Table 3.

	Vertigo 32/139 (23.0%)	TIA 45/139 (32.4%)	Amaurosis fugax 40/139 (28.8%)	Minor stroke 22/139(15.8%)	Total 139/139 (100%)
ICV	0/32	3/45 (6.7%)	1/40 (2.5%)	1/22(4.5%)	5/139 (3.6%)
TIA	0/32	3/45 (6.7%)	2/40 (5.0%)	0/22	5/139 (3.6%)
Death	0/32	0/45	0/40	1/22 (4.5%)	1/139 (0.70%)

**Table 3.** Perioperative complications 0–30 days in relation to preoperative symptomatology

### 5. DISCUSSION

Our research no statistically significant difference between the analyzed groups in terms of perioperative complications (0-30 days endarterectomy), and is therefore an acceptable risk to perform carotid endarterectomy in patients in whom the opposite ACI stenosis of 50-70%. The absence of statistically significant differences can be explained by small sample size.

The average age of the respondents in this study is, for group A was 65 (± 7.8) and for Group B 64 (± 7.7) without statistical significance (p = 0.17), which is less compared to the average age of the respondents in similar studies (12). Increased representation of women in both groups is in accordance with the aforementioned research. Since the frequency of the stenosis extra cranial arteries increases with age, the value of total cholesterol, low density lipoprotein, systolic blood pressure, and the consumption of cigarettes is understandable why all the above factors have in both treatment groups (8).

In our study we did not have IM even though we had patients after MI and with angina pectoris. The reason for this can be found in the fact that ECG and cardiac enzymes do in the case of clinical indications while, in some studies, they worked postoperatively according to the protocol (13). In this sense, our experience is more in line with research in which the frequency of perioperative myocardial infarction was 0.5% and criteria similar to ours in determining such events. (14)

Used eversion carotid endarterectomy techniques, without the use of shunt under local anesthesia. The current data are too limited to support or reject the routine or selective shunting in carotid endarterectomy. Some studies do not indicate the necessity of using the shunt (15). Some form of intraoperative monitoring used by most authors, but we rarely apply them considering that these techniques require additional staff, spend you time and are expensive (16). No method of monitoring in selective shunting has not shown that yields better results (17). With eversion endarterectomy, an experienced surgeon can complete the anastomosis, before some of the player does that required a shunt, which is still certainly does not mean that the neurological deficits occur. However, both problems remain controversy and there is still no consensus whether intraoperative shunt and / or monitoring is necessary.

Although regional (local) anesthesia is theoretically offers many advantages such as better perioperative hemodynamic stability, a direct evaluation of the patient's neurological status and reduction in the incidence of complications, there is still insufficient evidence from randomized trials that compared carotid endarterectomy contacted the local and general anesthesia (18, 19, 20), although some surveys prefer local anesthesia (21).

### 6. CONCLUSION

According to the results of this research can be said to be Eversion carotid endarterectomy can be performed, with acceptable risk, in patients for bilateral stenosis of the ACI, where the treated side with the degree of stenosis ≥ 70, while the opposite side 50-70%. Let alone the fact that there was no statistically significant difference between the analyzed groups in terms of perioperative complications (from 0 to 30 days).

**CONFLICT OF INTEREST: NONE DECLARED.**

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