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Our experience with Carotid Endarterectomy

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ABSTRACT

Stroke is the second most common cause of cardiovascular mortality. Atherosclerosis is the most common cause of carotid artery stenosis. The most common site is carotid bifurcation where the carotid baroreceptors and internal carotid artery exist. The primary objective of carotid surgery is to protect the brain from an ischemic damage. In this study, we evaluated early and mid term result of 24 patients who had undergone unilateral carotid endarterectomy surgery.A total of patients (17 males, 7 females; mean age 68.62 years; ranges from 55 to 91 years) who underwent CEA operations between January 2015 and january 2017 were retrospectively analyzed. Postoperative complications (neurological and non-neurological) and mortality were the primary outcome points in the study. Clinical findings and risk factors were evaluated. Among the seven of the 24 NIRS monitored patients (5 males, 2 females; mean age 65.8 years; range 60 to 75 years), a significant decrease in cerebral SO2 was observed during clamping of the common carotid artery. For this reason we decided to use intracarotid shunt. We observed that the cerebral oximetry values were increased after the use of a shunt in these seven cases. Discussion NIRS monitoring is a precious tool which provides vital information and is used to determine whether a shunt is needed during CEA surgery. The present study showed that carotid endarterectomy under general anesthesia accompanying NIRS, measurement of the stump pressure and usage of dacron patch material can be performed with acceptable mortality and morbidity.

1. Introduction

Stroke is the second most common cause of cardiovascular mortality. Atherosclerosis is the most common cause of carotid artery stenosis. The most common site is carotid bifurcation where the carotid baroreceptors and internal carotid artery exist. Baroreceptors play an effective role in the autoregulation of the blood pressure. A carotid endarterectomy (CEA) is an effective treatment modality for patients with carotid stenosis of greater than 70% (De Bakey ME, 1975) Perioperative stroke risk ranges from 2 to7.5%. Different techniques of carotid endarterectomy (CEA) have considerable affect on the results and the need for restenosis. The primary objective of carotid surgery is to protect the brain from an ischemic damage. The blood flow is directed from common carotid artery (CCA) to the ICA via a shunt. Shunt is generally used in patients with contralateral carotid artery stenosis or failure of Willis. A number of techniques for monitoring are used to define the need for peroperative shunt placement. Observation of stump bleeding from the internal carotid artery (ICA), measurement of carotid artery stump pressure (CASP), jugular venous oxygen saturation (SO2), transcranial Doppler (TCD), electroencephalography (EEG), the bispectral index (BIS), and cerebral oximetry [near-infrared spectroscopy (NIRS)] are used to determine the lack of cerebral perfusion and a need for shunt placement during surgery (Aksun M et al., 2013). Cerebral NIRS monitoring is an easy and noninvasive method for measuring cerebral oxygen saturation (rSO2) and provides the direct measurement of SO2. NIRS detect the reflections from a deep pool area at the intersection of the anterior cerebral artery and the middle cerebral artery in the brain. This device shows mixing of arterial and venous blood at a ratio of 30/70. NIRS monitoring Carotid endarterectomy (CEA) surgery reduces the incidence of stroke in patients with critical carotid artery stenosis (Ballotta E, 2002)

2. Patients, materails and methods

A total of 24 patients (17 males, 7 females; mean age 68.62 years; ranges from 55 to 91 years) who underwent CEA operations between January 2015 and january 2017 were retrospectively analyzed (Table 1). Stenosis of the carotid arteries according to the North American Symptomatic Carotid Endarterectomy Trial (NASCET) criteria. The initial examination was performed by color Doppler ultrasonography, whilst the definitive diagnosis was made by computed tomography angiography. A written informed consent was obtained from each patient. Five of the symptomatic patients had transient ischemic attack (TIA), six had hemiparesis, three had amaurosis fugax. 70 to 95% carotid artery stenosis was confirmed by computed tomography angiography. Ten patients were operated for the left side and fourteen patients for the right side. All patients were operated by a single surgeon. All patients were operated under the general anesthesia. All patients received low molecular weight heparin before and after the operation and acetylsalicylate 100 mg/day or clopidogrel 75 mg/day after the operation. Postoperative neurological evaluation was performed according to the presence of clinical findings. Postoperative complications (neurological and non-neurological) and mortality were the primary outcome points in the study. Clinical findings (grade of stenosis grades, symptoms, stroke), risk factors (coronary artery disease, previous coronary artery bypass surgery, preoperative myocardial infarction, hyperlipidemia, diabetes mellitus, smoking, hypertension, peripheral arterial disease, chronic obstructive, postoperative neurological complications (Paralysis, stroke, monoplegia, hemiplegia, hemiparesis, TIA) and non neurological complications (Bleeding, rupture, infection and thrombosis), renal insufficiency, gastrointestinal complications, arrhythmias, heart failure and mortality were recorded.

3. Results

Twenty one patients (87%) had right internal carotid artery stenosis ranges between 30% and 100%. Seventy patients (70%) had left internal carotid artery stenosis ranges between 30% and 99%. Ten patients (41%) had underwent left carotid endarterectomy and fourteen patients (59%) had underwent right carotid endarterectomy surgery. One patient (4.15%) had a history of chronic renal insufficiency, thirteen (54%) patients had a history of HT and thirteen (54%) had a history of DM. The mean body mass index was 27.65 kg/m2. Among the seven of the 24 NIRS monitored patients (5 males, 2 females; mean age 65.8 years; range 60 to 75 years), a significant decrease in cerebral SO2 was observed during clamping of the common carotid artery. For this reason we decided to use intracarotid shunt. We observed that the cerebral oximetry values were increased after the use of a shunt in these seven cases. There was no infection, pseudoaneurysm, or patch rupture. Four patients (16%) had minor incisional hematoma and required revision. Ten patients (41%) had coronary stenting or underwent coronary artery bypass grafting. Two deaths (8.3%) and one major stroke (4.15%) were seen among the patients. Twenty two (91%) patients were recovered uneventfully and were discharged with oral anticoagulation or antiagregan therapy. The mean time to discharge was 3.83±2.64 (range, 3 to 27) days except two deaths and major stroke. Within the follow-up period, none of the patients had neurologic events, residual stenosis, restenosis, occlusion or pseudoaneurysm. The mean follow-up after CEA operation was 17±6.4 (range, 11 to 24) months. No restenosis or residual stenosis were detected on follow up by computed tomography angiography.

4. Discussion

More than 70% stenosis in diameter for asymptomatic and more than 50% stenosis in diameter for symptomatic patients were the indications for carotid endarterectomy (Brott TG et al., 2011). Carotid endarterectomy is recommended to patients who are asymptomatic under the age of 75 years old, more than 70% stenosis with a 3% surgical risk (Grego F et al., 2005). The risk of stroke and death is five years and stroke development are 3% and 12% respectively (Liapis CD et al., 2009; Hidiroglu M et al., 2010). The postoperative cranial nerve damage was found 8.6% in NASCET study and in ECST study 5.1%. Only one (4.15%) patient was oberserved with temporary cranial nerve damage in our study. North American Symptomatic Carotid Endarterectomy Trial; NASCET) suggest that surgey should be postpone 4-6 weeks after cerebrovascular event. 40-50% patients who are diagnosed with carotid artery stenonis are associated with coronary artery stenonis (Yildirim T et al., 2004). Shunt placement has a 1-3% risk of an emboli or dissection (North American, 1991). It is postulated that the most sensitive monitoring for cerebral perfusion takes placein patients who are awake, for this reason many CEA operations are performed under general anesthesia. Intracarotid shunt can be used to ensure adequate cerebral perfusion. NIRS monitoring is a precious tool which provides vital information and is used to determine whether a shunt is needed during CEA surgery. Syntetic patch materials prevent incision related morbidities (i.e. bleeding, hematoma, edema, infections) in diabetic and obese patients (Ozdemir N et al., 1995). The main limitation of our study is the absence of long-term follow-up data. In addition, another limitation was the absence of the comparison of the CEA with medical or carotid artery stenting. This small sample study may have affected the results and the retrospective design of the study.

In conclusion, carotid endarterectomy under general anesthesia is an easy, effective and quick technique. It provides an adequate surgical exposure. Our study demonstrates that carotid endarterectomy under general anesthesia accompanying NIRS, measurement of the stump pressure and usage of dacron patch material can be performed with acceptable mortality and morbidity. Our clinical experience and early results of surgery are compatible with the literature and support carotid endarterectomy as a safe procedure with low morbidity and mortality rates.

Declaration of conflicting interests
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Tables

Table 1: Demographic features of the patients.

	Age	sex	endarterectomy	CRI	DM	HT	right ICA	left ICA
1	72	M	left			+	0	80
2	83	M	right		+		80	0
3	71	M	left			+	0	70
4	73	M	right		+		75	0
5	74	F	left			+	50	90
6	59	F	left		+		70	0
7	91	M	right			+	90	60
8	72	M	left		+		90	60
9	65	M	right		+		90	0
10	69	M	right			+	85	45
11	82	F	right				95	0
12	66	M	right			+	80	0
13	62	M	right		+	+	80	80
14	48	M	left				60	60
15	59	M	left				100	99
16	74	M	right		+	+	80	30
17	75	F	right	+	+	+	85	65
18	61	M	left				0	75
19	65	F	left		+	+	30	75
20	55	F	left				30	80
21	65	M	right		+	+	90	0
22	66	M	right		+		99	30
23	67	M	right		+	+	60	60
24	73	F	right		+	+	80	90

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