Thirty-day Outcome of Delayed Versus Early Management of Symptomatic Carotid Stenosis

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Background: The aim of this study was to compare outcomes of early (<15 days) versus delayed carotid endarterectomy (CEA) in symptomatic patients.
Methods: All CEA procedures performed for symptomatic carotid stenosis between January 2006 and May 2010 were retrospectively reviewed. Postoperative mortality (within 30 days), stroke, and myocardial infarction (MI) rates were analyzed in the early and delayed CEA groups.
Results: During the study period, 149 patients were included. Carotid revascularization was performed within 15 days after symptom onset in 62 (41.6%) patients and longer than 15 days after symptom onset in 87 (58.4%) patients. The mean time lapse between onset of neurological symptoms and surgery was 9.3 days (range 1−15) in the early surgery group and 47.9 days (range 16−157) in the delayed surgery group. Thirty-day combined stroke and death rates were, respectively, 1.7% and 3.5% in the early and the delayed surgery groups. Thirty-day combined stroke, death, and MI rates were, respectively, 1.7% and 5.9% in the early and the delayed surgery groups.
Conclusion: During the study period, the reduction of the symptom-to-knife time in application to the carotid revascularization guidelines did not impact our outcomes suggesting that early CEA achieves 30-day mortality and morbidity rates at least equivalent to those of delayed CEA.

INTRODUCTION

Randomized controlled trials have clearly shown the benefit of carotid endarterectomy (CEA) in symptomatic patients[1] with a perioperative complication rate of <6%.[2] More recent reports present convincing evidence in favor of early revascularization after symptom onset.[3,4] An important finding in this regard is that cerebrovascular ischemic events exhibit an exponential recurrence rate reaching 8% and 11.5% at 7 days after a transient ischemic attack (TIA) or minor stroke, respectively.[5−7] However, because the actual benefit of this prevention strategy in relation to perioperative complications has not been demonstrated[8] and considering the lack of early surgery protocols, some vascular surgery centers worldwide continue to perform delayed surgery. The adoption of the carotid guidelines[2] in 2008 by reducing symptom-to-knife time required a new organization of our unit; therefore, we decided to retrospectively review and compare outcomes of early (<15 days) versus delayed carotid revascularization performed before and after this shift on symptomatic patients to discuss this attitude.

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MATERIALS AND METHODS

Patient Selection and Preoperative Management

All CEA procedures performed for symptomatic carotid stenosis at our center between January 2006 and May 2010 were retrospectively reviewed in accordance with approved institutional review board protocols. Patients were classified as symptomatic if, within 3 months of their procedure, they presented with hemispheric stroke or TIA resulting in facial or upper/lower extremity weakness, aphasia, or amaurosis fugax documented by formal neurology evaluation. Crescendo TIA (cTIA) was defined as repeated TIA over a relatively short time period. Stroke in evolution (SIE) was defined as worsening or fluctuating neurological deficit with no improvement between episodes. Referral to our stroke care unit was by primary care practitioners and neurologists. None of the patients of this study underwent preoperative thrombolytic therapy.

In all patients, preoperative bilateral carotid artery duplex ultrasonography demonstrated $\geq$50% stenosis on the symptomatic side according to the North American Symptomatic Carotid Endarterectomy Trial measurement.[9] According to French recommendations, all patients underwent computed tomography (CT) angiography and/or magnetic resonance (MR) angiography of the neck and brain to assess carotid and cerebral circulation and identify the location and size of any infarct. If not already on-going, antiplatelet therapy (aspirin 75 or 160 mg/day) was implemented preoperatively. In some cases, clopidogrel therapy (75 mg) prescribed by the referring physician was continued.

Before 2008, only patients presenting with unstable symptomatic carotid stenosis associated with cerebral infarct <3 cm in diameter underwent early revascularization (<15 days) at our institution. Since January 2008, this policy has changed with revascularization being performed within 15 days of symptom onset in all patients, whenever possible.[10] Patients with extensive ischemic lesions were always re-evaluated 6 weeks later and proposed delayed surgery. In this study, patients who underwent CEA within 15 days of symptom onset were included in the early CEA group, while patients treated later were included in the delayed CEA group. Symptomatic patients treated by carotid angioplasty because of hostile neck, surgically inaccessible lesions, or fibrotic restenosis were excluded from the study. Surgical treatment was not proposed to patients with acute carotid occlusion, hemorrhagic stroke, or extensive permanent neurological deficits.

Operative Technique

Standard endarterectomy with patch closure or eversion endarterectomy was performed under general anesthesia by experienced board-certified vascular surgeons. Common-to-internal-carotid-artery bypass was used in cases involving long-segment stenosis or associated pathologies such as poststenotic dilatation. All patients received an intravenous bolus of heparin (50 UI/kg). The common carotid artery was clamped if mean arterial pressure (MAP) exceeded 100 mm Hg. Carotid stump pressure was the only method used to assess cerebral hemodynamic status. Selective shunting was used at the discretion of the operating surgeon in patients with MAP <100 mm Hg or stump pressure <40 mm Hg. Postoperatively, patients were kept in the anesthesia recovery area to allow close monitoring of arterial pressure for 24 hr and then transferred to the standard surgical ward. Following the procedure, all patients continued single-antiplatelet therapy and, if not already prescribed, began single-statin therapy.

Definitions

Postoperative stroke was defined as occurrence of any new central neurological deficit persisting for more than 24 hr with or without CT or MRI evidence of cerebral infarct. Postoperative TIA was defined as any new central neurological deficit resolving within 24 hr. Unstable patients were defined as patients presenting with cTIA or SIE. Myocardial infarction (MI) was defined as any combination of 2 or more of the following criteria: typical chest pain lasting for 20 min or longer; serum levels of creatine kinase (CK), CK-MB, or troponin two or more times higher than the upper normal limit; and presence of new Q waves on at least 2 adjacent derivations or predominant R waves in V1 (R wave $\geq$1 mm > S wave in V1).

Follow-up

All patients underwent neurological examination by the operating surgeon using the standard scoring form at discharge and 30 days after surgery. In case of doubt or sign of deterioration, advice from the neurologist was sought. Doppler ultrasound surveillance was performed at 1, 6, and 12 month and yearly thereafter.

Outcomes

Postoperative mortality (within 30 days), stroke, and MI rates were analyzed in the early and delayed CEA groups.