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A tailored approach to operative repair of extracranial carotid aneurysms based on anatomic types and kinks

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Carotid artery aneurysm;
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Abstract

BACKGROUND: To present outcomes following an operative approach of extracranial carotid artery aneurysm (ECAAs) based on anatomic types and associated kinks.

METHODS: This study represents retrospective analysis of anatomic type based approach to operative repair of 84 patients with ECAA from 1994 to 2011, 28 (33.3%) with associated kinking. Patients were followed for neurological ischemic events, hematoma, cranial nerve injury, myocardial infarction, neurological, and overall mortality. The results are presented as early, within 30 days after the surgery, and long term during the follow-up.

RESULTS: In the early postoperative period, there were no strokes or mortalities, cranial nerve injury rate was 2.4% while 1 patient had myocardial infarction (1.2%). During the follow-up, 4 patients (4.8%) had stroke, out of which 2 patients died (2.3%), while overall mortality was 4.6%. The average 5-year survival rate was 96 ± 3%.

CONCLUSION: Excellent outcomes can be obtained with surgical repair of ECAA, which should be tailored to the anatomic types and presence of kinks.

Extracranial carotid artery aneurysm (ECAA) is a rare disease triggered by atherosclerosis, trauma, fibromuscular dysplasia, or related to previous carotid surgery (post-endarterectomy aneurysms).[1–3] Since a high risk of rupture and embolization has been described in patients with ECAA, surgical treatment is the preferable treatment option.[3–5] Isolated extracranial internal carotid artery (EICA) aneurysms are uncommon entity as well, estimated at .1% to 2% of the total carotid surgery procedures.[1] The exact incidence is not entirely known but it is expected to be about .8% to 1% of all arterial aneurysms and about 4% of all peripheral arterial aneurysms.[6] EICA could also be initiated by atherosclerosis, dysplasia, infection, trauma, or iatrogenic cause.[7]

The exact incidence of associated kinking and extracranial carotid aneurysms is not known. After reviewing the

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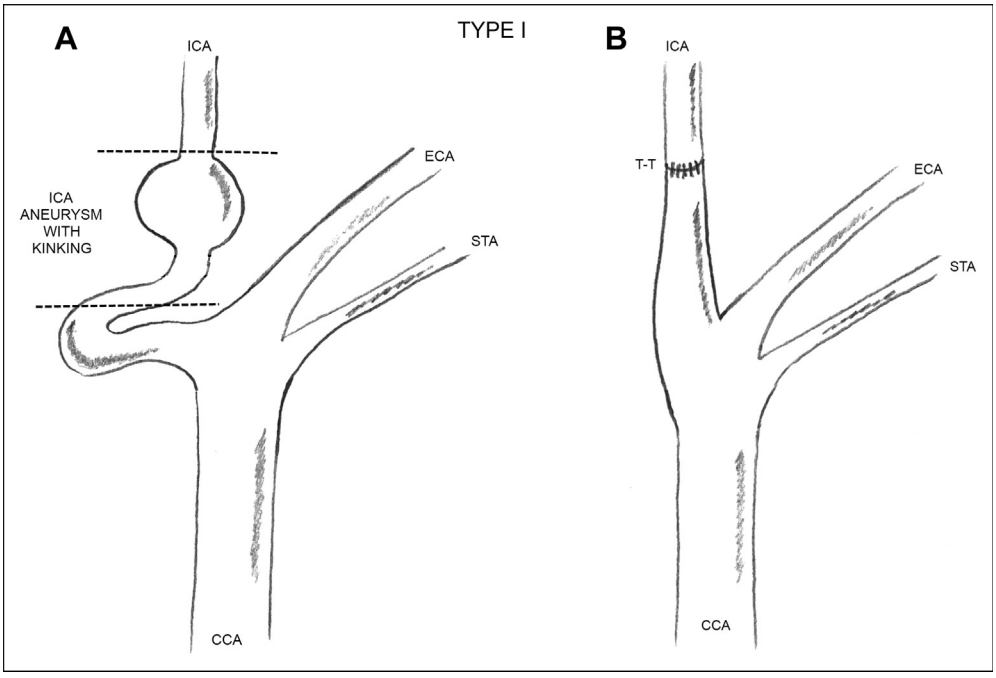

Figure 1 ICA aneurysm and kinking – surgical technique Type I: (A) before the surgery and (B) after aneurysm resection and end-to end anastomosis. CCA = common carotid artery; ECA = external carotid artery; ICA = internal carotid artery; STA = superior thyroid artery; T-T = termino-terminal anastomosis.

literature, only a few case reports have been published on this subject.[8–11] The aim of this study was to present our experience in carotid aneurysm surgical treatment with special emphasis on isolated internal carotid artery (ICA) aneurysms with associated kinking.

Patients and Methods

Study design

This study represents retrospective review of prospectively collected data in 2 major vascular surgery university clinics. Ethical Committee of both institutions approved this study. The study included 84 patients who were surgically treated for ECAA's from January 1994 to July 2011, and 28 patients (33.3%) had ICA aneurysm with associated kinking.

Out of this number, 23 patients from our 2 centers were also included in our previous article reporting on surgical outcome of ECAA repair from 3 university centers.[12]

All patients were initially diagnosed using Doppler ultrasonography when aneurysmal disease of carotid arteries was discovered, followed by selective angiography in 33 patients (39.3%), and multidetector computed tomography angiography (MDCT) in 51 patients (60.7%) for detailed evaluation.

According to our institution experience, kinking was considered significant if peak systolic velocity was >180 cm/sec. In all patients with ICA kinking, selective or MDCT angiography confirmed its significance. Observed angle at the site of the kinking was between 30° and 60° with a large number of patients with observed angle <30°.

Attending neurologist examined all patients to evaluate actual neurological status, whereas brain computed tomography was performed in all symptomatic patients. After all these neurological examinations, surgical treatment was indicated.

Surgical techniques and intraoperative management

Surgical treatment was performed under either general endotracheal anesthesia or in regional anesthesia if severe obstructive pulmonary disease or cardiac comorbidity was present. Carotid arteries and aneurysm exposure were followed by systemic heparinization and clamping. For intraoperative cerebral perfusion assessment, we used cerebral oximetry that indicated a need for intraluminal shunt placement.

Carefully balanced anesthetics influenced appropriate cerebral protection during clamping time. Several surgical techniques were performed depending on the characteristics of the intraoperative findings. We have used anatomical classification proposed by Attigah et al[13] but modified in some parts because of kink presence. The first type (Type I) included aneurysm resection, shortening of the artery (in case of associated kinking), and end-to-end anastomosis (Fig. 1). This type refers to the first part of Attigah's Type I that include end-to-end anastomosis.[13]