

## Carotid eversion endarterectomy: prospects in a developing country

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**B**angladesh has an estimated population of 130 million. Approximately 1.2 million of them are disabled. It is estimated that 70% of them are due to consequences of stroke.<sup>1</sup> Stroke is the most common cause of death as a result of neurologic disorders and the third leading cause of death in the United States of America each year. Ischemic stroke from atherosclerotic lesions of the carotid bifurcation is the most common cause of stroke in adults.<sup>2</sup> In recent years carotid endarterectomy has proved to be the most effective form of management for atherosclerotic carotid bifurcation disease. The primary objective of surgery for extracranial lesions involving the cerebrovascular system is the prevention of stroke. The early results comparing carotid endarterectomy by standard method with or without patch to that of eversion endarterectomy suggests that eversion endarterectomy by itself may be a better and more beneficial way to perform carotid endarterectomy. There are various prospective randomized studies suggesting that eversion carotid endarterectomy allows to remove the entire atherosclerotic plaque and closure of the carotid artery at the widest part such as the carotid bulb. Therefore, early occlusion, restenosis, stroke and mortality rates have improved.<sup>2-5</sup> The paper highlights the surgical procedure involved in carotid eversion endarterectomy, evaluates the perioperative results and examines its prospects in a developing country like Bangladesh. Fifteen patients of the Neurology Department of the Bangabandhu Sheikh Mujib Medical University (BSMMU), and 8 patients of the vascular surgery department of the National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh are included in this study. Thirteen of them were subjected to carotid endarterectomy by eversion technique during February through to May, 2002.

After proper clinical evaluation all 23 patients were examined by carotid duplex and 8 re-evaluated by magnetic resonance angiography. All patients revealed significant stenosis at carotid bifurcation, internal carotid artery (ICA) and external carotid artery (ECA) origins above the range of 60-70% and more. Indications of surgery was based on prospective randomized trials which provided definitive data concerning indication for carotid endarterectomy.<sup>3,4</sup> 1. Patients with hemispheric or monocular transient ischemic attacks (TIAs) or prior mild stroke with a 70% or greater stenosis. 2. Patients

with crescendo TIAs in the presence of a 50% or greater stenosis. 3. Asymptomatic patients with high grade stenosis.

Any patients who has had a major stroke in the past and was found devastated by neurologic dysfunction or altered level of consciousness was excluded from surgery. In our series, out of 23 patients 10 were excluded from surgery due to either total occlusion of ICA or very poor general condition as a result of stroke. Six of our patients undergoing endarterectomy had previous coronary artery bypass grafting and one had grafting for abdominal aortic aneurysm. Out of 13 patients, 12 were given cervical rami block anesthesia with mild sedation. One patient underwent endarterectomy under endotracheal intubation anesthesia. The affected carotid artery was approached through standard incision. Once the carotid bifurcation was identified, intravenous unfractionated heparin (2000-3000 intravenous approximately) was given and common carotid artery (CCA), ICA and ECA were mobilized. The main feature of the procedure was complete division of the ICA at the bulb. The ICA was mobilized circumferentially and endarterectomy started at the rim (**Figure 1**). The adventitia and the outer layer of the media were separated from the atheromatous core. Gently peeling the outer layer over the atheromatous core allowed us to see the end point directly (**Figure 2**). After complete removal of the atheromatous plaque, the ICA was back flushed with blood, inverted back and then irrigated with heparinized normal saline. Endarterectomy from CCA and ECA was carried out next and ICA was reanastomosed to the CCA using continuous 6/0 prolene suture (**Figure 3**). After this circulation was reestablished into the ECA first then ICA. The wound was closed in 2 layers. The average cross clamp time was approximately 12 minutes. Drain was not routinely used and postoperative heparinization was not carried out. In the postoperative period patients remained for at least 8 hours in an intensive nursing area irrespective of the type of anesthesia. Nothing was allowed orally until the following day. An adequate neurologic examination was practiced to evaluate extremity strength, fine hand movements, articulated speech, visual acuity and mentation. The neurologic evaluation was repeated frequently during the initial postoperative period. Maximum effort was given to keep our patients hemodynamically stable. Provided that all parameters were satisfactory after several hours of observation, the patient was transferred to a general care ward, where full activity was encouraged during the 3-4 days of hospital convalescence. After discharge from hospital an outpatient examination was performed approximately a month later in order to assess the neurologic status, the presence and quality of carotid pulse and residual bruit, if any and wound healing. After

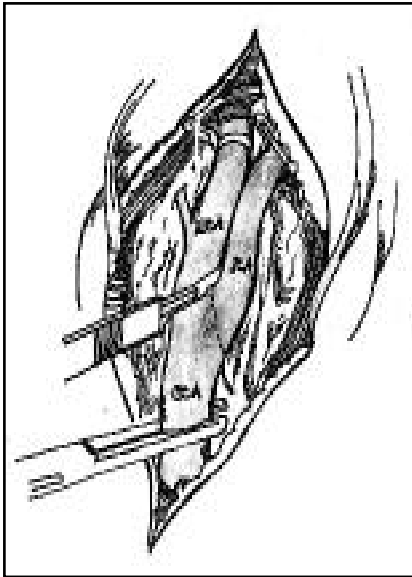


Figure 1 - Diagram showing exposure of carotid bifurcation and line of division of internal carotid artery for eversion endarterectomy. ECA - external carotid artery, CCA - common carotid artery, ICA - internal carotid artery.

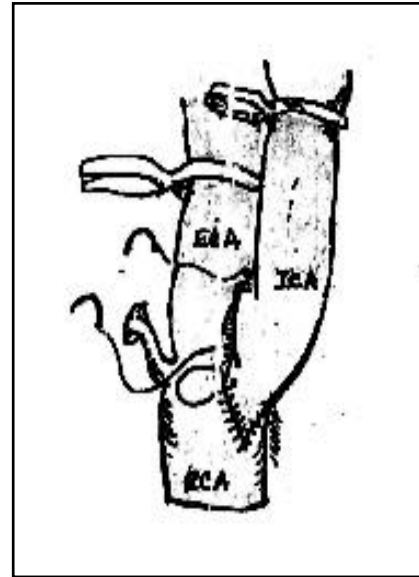


Figure 3 - Diagram showing re-anastomosis of the ICA to CCA. ICA - internal carotid artery, CCA - common carotid artery, ECA - external carotid artery.

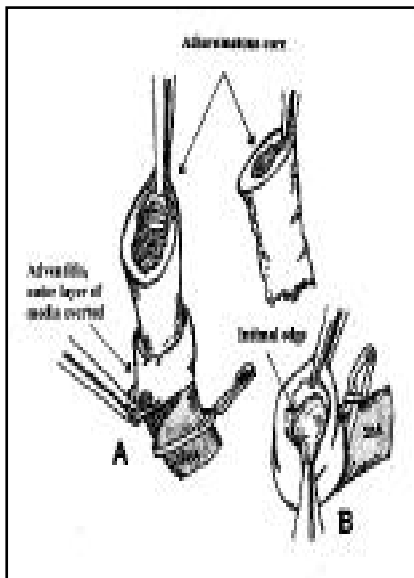


Figure 2 - (a) Starting and (b) completion of eversion endarterectomy. ICA - internal carotid artery

this the patients were scheduled for 6 monthly follow up which included clinical examination and duplex ultrasound study of neck vessels.

In this study, total 13 patients were subjected to carotid endarterectomy using eversion technique, first of its kind introduced in Bangladesh in recent times. Smoking was found as the commonest (76.9%) among the risk factors followed by coronary artery disease (61.5%). The next common factor was hypertension and diabetes mellitus

(53.8%). The age of the patient ranged from 45-75 years with the highest number in the age group 61-75 years (53.8%). Patients were predominantly male (84.6%). Indications for operation were symptomatic disease in 12 (92.3%) and asymptomatic patient with significant carotid lesion in one (7.7%, **Table 1**). CCA to ICA shunts were not used in any patient, but kept ready at hand. There was no operative death. Two patients died from myocardial infarction during the first month of surgery (**Table 2**). Two patients suffered from postoperative hypertensive crisis followed by stroke. One of them recovered fully during the next 3 months, while other one developed right sided hemiplegia. Early follow up of carotid endarterectomy was found to be encouraging. Out of 13 patients, all surviving 11 showed 100% patency of the operated carotid artery. The surgical approach to cerebrovascular disease is predicated on the relief of symptoms of cerebral dysfunction and prevention of cerebral infarction or stroke by excision of a critical lesion in the extracranial carotid artery. The eversion method of carotid endarterectomy is a recently introduced method in Bangladesh and our initial experience is encouraging. Simply awareness and a few non-invasive tests made diagnosis of carotid artery disease. Patients with history of TIA, amaurosis fugax, stroke or significant atherosclerotic risk either for them or family were advised carotid artery evaluation. Until recently, angiography of the carotid artery was the gold standard for diagnosis of carotid stenosis. It is invasive and relatively costly procedure. For our patients, we replaced this test with duplex study and or MRA. Although the carotid endarterectomy operation is critical, it is simple enough that it can be performed in any standard

Table 1 - Indications for carotid endarterectomy.

Indications	n of patients
<b>Symptomatic stenosis</b>	
Stroke	7
Transient ischemic attack	5
<b>Asymptomatic stenosis</b>	1
<b>Total</b>	<b>13</b>

Table 2 - Results.

Operative mortality	n of patients
<b>Complications</b>	1
Hemorrhage	2
Hypertensive crisis followed by stroke	1
Neurologic deficit due to cranial nerve trauma	0
Thrombosis of carotid artery	
Postoperative death due to other cause (for example myocardial infarction)	2

operating room setting by competent vascular surgeons. The operation is carried out under local anesthesia with carotid cross clamping time of about 12-15 minutes. Medications required in the perioperative period were minimum. We did not use any artificial graft or vein graft (patch). As a result operations were less time consuming and less costly. Eversion endarterectomy was found effective for the management of redundancy in 3 of our patients. After mobilization of the ICA, redundant part was accommodated by proximally slide-shifting the bifurcation (for example, extending arteriotomy of CCA proximally) and ICA anastomosed.

The most important and difficult part of the total procedure and perioperative period was the control of hypertension or hypotension. Related literatures mention about the fluctuation of blood pressure due to manipulation of sinus nerve mechanism and the procedure as a whole.<sup>6</sup> Two of our patients had postoperative hypertensive crisis followed by stroke. It is to be mentioned here that both of them had extreme fluctuation of blood pressure in the early postoperative period inspite of all measures. The present series of carotid eversion endarterectomy, though small in volume, highlights its necessity in a developing country with poor economy. Diagnosis of the disease by less costly and repeatable non-invasive procedures and conduct of the surgery with minimal resources and cost allowed our patient to avail it and return home with satisfactory result.

In conclusion we can say that carotid eversion endarterectomy is a plausible and worthwhile procedure to be considered in developing countries.

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References

1. Haque MA. Community participation in prevention and primary management of `Brain attack`. Chandpur experience 1999 [unpublished data].
2. Shah DM. Techniques of eversion carotid endarterectomy and contemporary results. *Perspect Vasc Surg* 1998; 9: 49-62.
3. North American Symptomatic carotid Endarterectomy Trial (NASCET) Investigators clinical alert: benefit of carotid endarterectomy for patients with high grade stenosis of the internal carotid artery. *Stroke* 1991; 22: 816-817.
4. European Carotid Surgery Trialist's Collaborative Group: MRC European carotid surgery trial, interim results for symptomatic patients with severe (70-90%) or with mild (0-29%) carotid stenosis. *Lancet* 1991; 337: 1235-1243.
5. Entz L, Jaranyi Z, Nemes A. Comparison of perioperative results obtained with carotid eversion endarterectomy and with conventional patch plasty. *Cardiovasc Surgery* 1997; 5: 16-20.
6. Norman R, Hertzner NR. Postoperative management and complications following carotid endarterectomy. In Rutherford RR, editor. Vol. II. Vascular surgery. Philadelphia (PA): WB Saunders Company; 1995. p. 1554-1572.

The outcome of pregnancies complicated by hyperemesis gravidarum

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**H**yperemesis gravidarum is a common complication of early pregnancy, and pathogenesis of this condition remains an enigma.<sup>1</sup> There is also no unified agreement on whether hyperemesis gravidarum has an impact on the final outcome of affected pregnancy.<sup>2,3</sup> Inspired by these questions we decided to undertake this retrospective study. The files of 75 patients with hyperemesis gravidarum who delivered in Sultan Qaboos University Hospital, Oman between October 1998 and October 2002 were evaluated. All of them were first trimester, singleton pregnancies. The criteria to diagnose hyperemesis gravidarum was as follows: ketonuria of 2 pluses or more, vomiting at least 4 times a day and no other medical cause that might have been responsible for emesis. The control group of 150 patients with the same characteristics, but no excessive vomiting was selected randomly. The average age of the patients was identical in both groups at 26 years. The incidence of pregnancy complications, namely, anemia gravidarum, pregnancy induced hypertension, intrauterine growth retardation, polyhydramnios and oligohydramnios, diabetes, preterm rupture of