Evaluation of Clinical Efficacy and Surgical Strategy for 1000 Cases of Carotid Endarterectomy

Xian-Wei Wang, Dong Chen, Jia-Ming Huang, Xue-Da Ding, Zhao-Lei Li

Department of Neurosurgery, Dalian Municipal Central Hospital, Dalian, Liaoning 116033, China

To the Editor: Since the first carotid endarterectomy (CEA) in the world was done by Debakey in 1953, the number of CEA has seen an extensive growing trend. Especially in the 1990s, North American Symptomatic Carotid Endarterectomy Trial and European Carotid Surgery Trial confirmed that CEA is the gold standard for the treatment of carotid stenosis. This procedure had become a new approach to prevent ischemic stroke.

A total of 1000 carotid endarterectomies were carried out from March 2009 to October 2016 in our department. Of these, 723 (72.3%) were males and 277 (27.7%) were females. The average age was 61.9 ± 7.4 years (range: 44.0–88.0 years). Seven hundred and seventy-eight patients (77.8%) were symptomatic and 222 (22.2%) were asymptomatic. The clinical presentations included dizziness, amaurosis, numbness of limbs, dyskinesia, aphasia, and transient ischemic attack (TIAs). All patients with severe (70–99%) carotid stenosis were diagnosed by their clinical manifestations and conformed results of carotid color Doppler flow imaging (CDFI), transcranial Doppler (TCD), carotid and brain computed tomography angiography (CTA). Carotid CDFI and CTA were the most common and essential tests in the clinical diagnosis and evaluation. They are also worthy economic and gold standard tests. We closely monitored patients with high-risk factors and gave them antiplatelet and/or lipid-lowering drug medications in preoperatively for 2 weeks.[1] All the operations were performed by the same surgical group. The same surgical technique was applied in all cases including general anesthesia, stable hemodynamic condition, administration of heparin (1 mg/kg) at 5–10 min before vascular clamping, and direct stitching at initial suture with 6/0 propylene. At the end of the operation, we would not neutralize heparin with protamine sulfate. Stump pressure, TCD, and electroencephalography were monitored during the intact procedure in all patients. All the operations were done fast, accurately, softly, and lightly.[2] We chose the orientation of the incision based on skin fold on the neck and with the purpose of minimizing scar formation. The choice of eversion CEA or standard CEA depended on the location of carotid bifurcation, the length of plaque, the size of vascular lumen, and specific clinical conditions. The use of shunt was according to the indications strictly,[3] which was mainly lied on the situation of cerebral anterior communicating artery and posterior communicating artery and the cerebral collateral circulation. Postoperative practices included subcutaneous drainage placement, incision oppressed for a while, blood pressure monitoring closely, and free radicals scavenging.[4] We used TCD to monitor the cerebral blood velocity every other day, supporting blood volume as necessary, application of antiplatelet and lipid-lowering drugs as needed.[5] Medical staff closely watched patients, to timely detect and correct the patient's psychological problems and relieve their tension and stress. When patients were discharged, we gave them detailed instructions for using home medications and precaution issues and asked patients to be followed at designed visiting times.

The operations were all successful. Median vascular clamping time was 15.7 min (11.0–29.0 min). All patients showed clinical improvement and neurological intact except 21 cases which had complications. The average hospitalized time was 1 week postoperatively. None of the patients developed new strokes or neurological deficit during follow-up. The 21 cases of postoperative complications are listed in Table 1.

All patients (except for the two death cases) were postoperatively followed for 1–36 months. Their quality of

Address for correspondence: Dr. Dong Chen, Department of Neurosurgery, Dalian Municipal Central Hospital, Dalian, Liaoning 116033, China
E-Mail: wxw____www@163.com

Access this article online

Quick Response Code:

Website: www.cmj.org

DOI: 10.4103/0366-6999.229906

Received: 13-01-2018 **Edited by:** Ning-Ning Wang
How to cite this article: Wang XW, Chen D, Huang JM, Ding XD, Li ZL. Evaluation of Clinical Efficacy and Surgical Strategy for 1000 Cases of Carotid Endarterectomy. Chin Med J 2018;131:997-8.

Table 1: Postoperative complications (n = 1000)

Complications	n (%)
Death (infarction)	2 (0.2)
Paralysis	3 (0.3)
Intracranial hemorrhage	1 (0.1)
Hoarseness	1 (0.1)
Epilepsia	4 (0.4)
Postoperative occlusion	3 (0.3)
Severe restenosis	4 (0.4)
Incision hematoma	3 (0.3)
Coma	0 (0)

life was improved for years. One patient felt numbness on one side of his limbs at postoperative 22 months. His CTA showed that surgical carotid artery was unobstructed. He had recovered soon after symptomatic treatment. Another patient did not complain with his medications. He developed a TIA in postoperative on the 7th month and was cured after a short hospitalization. Thereafter, he kept taking his antiplatelet and lipid-lowering drugs, and no more TIAs happened as followed up to 34 months.

In this study, there were three cases of postoperative paralysis. Two of them developed temporally ipsilateral paralysis and one was contralateral. Two patients with ipsilateral paralysis had lower postoperative systolic blood pressure (SBP) and cerebral perfusion deficiency. Therefore, the maintenance of SBP at a right range (120–140 mmHg; 1 mmHg = 0.133 kPa) is very important, and sufficient cerebral perfusion should be done without the conflict of cardiac function. Preoperative consent is also clearly required.

Our experience is as follows: (1) high-risk patients (epilepsia and large cerebral infarction) should avoid surgery. If they were prepared for operation, they should be careful to use anticoags and hypotensor. Blood pressure had to be strictly controlled in the perioperative period. It should decrease the clamping time in the operation; (2) evaluation the blood flow velocity of media cerebral artery by TCD before the operation, estimating physiological reserve function in cerebral blood vessels, and precaution of postoperative hyperperfusion; (3) TCD test revealed that there is more than 175% acceleration of blood flow in ipsilateral carotid after CEA or the pulsatility index increased 100%. Therefore, it is important to closely monitor hyperperfusion postoperatively; and (4) controlled epilepsia and intracranial pressure and minimized severe headache.

In this study, there was one case of hoarseness (0.1%). Postoperative examination revealed that the patient had a subluxation of arytenoid. The patient was continually followed by otorhinolaryngology doctors postoperatively. The Laryngeal recurrent nerve was easy to be injured in thin patients with long necks and sharp ends in retractor, which is originating from vague and locating in the midline of paratracheal. Based on intraoperative somatosensory-evoked potential monitoring, we should not retract deeply at the midline.

In our group, there were 4 cases (0.4%) with postoperative epilepsia. Two presented contralateral limbs twitching for few hours postoperatively without loss of consciousness. No more twitching appeared when antiepileptic medication was given. Head computed tomography showed small multiple cortex infractions in the operation side. We considered that this epilepsia was caused by cerebral embolization. The other 2 cases were intracranial hemorrhage.

In this study, 4 cases (0.4%) of post-CEA had severe carotid stenosis (>70%). Repeat CTA showed anatomic stenosis in the distal section of the operation. It was believed when blood flow was restored after eversion endarterectomy, the intimal varus or lining floating resulted in luminal narrowing. No further surgical procedure was done, but they were closely followed because the patients had no symptoms and performed well.

In conclusion, the characteristics of successful CEAs should be: (1) the team cooperation which included skillful, experienced, and knowledge surgical team, and qualitative and well-trained nursing team; (2) relatively fixed or staff: with good surgical assistant, anesthesiologists, and/or nurses; (3) multidisciplinary consultations: peroperative management for patients with high-risk factors and complications; (4) program managing process for strictly grasping the surgical indication and for inspection/examination/testing patients pre-, intra-, and post-operatively; and (5) the choice of incision and operative approach should be based on the specific circumstances of patients with good personal planning.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Ballotta E, Renon L, Da Giau G, Toniato A, Baracchini C, Abbruzzese E, *et al.* A prospective randomized study on bilateral carotid endarterectomy: Patching versus eversion. Ann Surg 2000;232:119-25. doi: 10.1097/00000658-200007000-00017.
2. Wang Q, Li YH, Wang TL, Feng H, Cai B. Protective effect of low-dose sevoflurane inhalation and propofol anesthesia on the myocardium after carotid endarterectomy: A Randomized controlled trial. Chin Med J 2015;128:1862-6. doi: 10.4103/0366-6999.160487.
3. Aburahma AF, Stone PA, Hass SM, Dean LS, Habib J, Keiffer T, *et al.* Prospective randomized trial of routine versus selective shunting in carotid endarterectomy based on stump pressure. J Vasc Surg 2010;51:1133-8. doi: 10.1016/j.jvs.2009.12.046.
4. de Borst GJ, Hilgevoord AA, de Vries JP, van der Mee M, Moll FL, van de Pavoordt HD, *et al.* Influence of antiplatelet therapy on cerebral micro-emboli after carotid endarterectomy using postoperative transcranial Doppler monitoring. Eur J Vasc Endovasc Surg 2007;34:135-42. doi: 10.1016/j.ejvs.2007.05.004.
5. D'Andrea A, Conte M, Riegler L, Scarafile R, Cocchia R, Pezzullo E, *et al.* Transcranial Doppler ultrasound: Incremental diagnostic role in cryptogenic stroke part II. J Cardiovasc Echogr 2016;26:71-7. doi: 10.4103/2211-4122.187947.