ASSESSMENT OF CAROTID ENDARTERECTOMY IN A SAMPLE OF IRANIAN PATIENTS

Kavian Ghandehari[(1)], Hadi Modaghegh[(2)]

Abstract

BACKGROUND: Carotid endarterectomy (CEA) is recommended in patients with symptomatic and some times asymptomatic carotid stenosis in vascular surgery centers with low perioperative complication rate.

METHODS: A stenosis retrospective study was carried out in patients underwent CEA in 3 vascular surgery centers in Tehran and 2 centers in Mashhad. Patients' selection criteria, methods of detection of carotid stenosis, method of anesthesia, surgical techniques and perioperative complications were evaluated.

RESULTS: Overall, 388 CEA in 345 patients (65% males) with mean age of 66.8 year old (ranged 46-84 years) were evaluated. Detection of carotid stenosis was made by one carotid duplex ultrasound in 90% of CEA candidates. The whole perioperative stroke death rate in reported Iranian vascular surgery centers is 6.4%. Perioperative stroke death rate in Imam Reza, Razavi, Shohaday Tajrish, Taleghani and Iranmehr hospitals was 2.4, 0, 4.8, ,10.2 and 10.2 percent, respectively.

CONCLUSION: In Iran, CEA is recommended only in patients with symptomatic ≥ 70% internal carotid arterystenosis and preferably in patients with symptomatic ≥ 90% stenosis. Method of detection of carotid stenosis in Iranian vascular surgery centers should be corrected.

Keywords: Carotid, Endarterectomy, Iran.

***ARYA Atherosclerosis Journal* 2010, 5(4): 191-194**

Date of submission: 13 Aug 2009, *Date of acceptance:* 28 Jan 2010

Introduction

Carotid endarterectomy (CEA) has been performed in Iran since 1991 by vascular surgeons. The benefits of CEA will not be realized if perioperative morbidity and mortality is excessive. Stroke, hyperperfusion syndrome including cerebral edema and intracerebral hemorrhage, lower cranial nerve palsy, wound hematoma, myocardial infarction, arrhythmia and death are CEA's complications.[1] The results derived from North American Symptomatic Carotid Endarterectomy Trial (NASCET)[2] and European Carotid Surgery Trial (ESCT)[3] revealed that the patients with symptomatic internal carotid artery (ICA) stenosis should be referred to a surgical center with perioperative stroke and death less than 6%.[2,3] If the combined perioperative stroke and death approached to 10% the benefit of CEA is negated.[4] The Asymptomatic Carotid Artery Surgery (ACAS) trial confirmed that patients with asymptomatic carotid stenosis should only be operated by surgeons with perioperative stroke and death rate of less than 3%.[5] Review of diagnostic method of ICA stenosis, criteria of patient selection, surgical technique and perioperative complications in Iran demonstrates significant differences than standard protocols of CEA.[2,3,5] This retrospective observational study compares the above characteristics of CEA in various Iranian vascular surgery centers.

Materials and Methods

A retrospective study was performed by reviewing patients' demographic data, patients' selection criteria and methods of detection of carotid stenosis. Methods of anesthesia, surgical techniques and

1- MD FLSP, Professor of Cerebrovascular Disease, Mashhad University of Medical Sciences, Mashhad, Iran.
2- MD, Professor of Vascular Surgery, Mashhad University of Medical Sciences, Mashhad, Iran.
Corresponding author: Kavian Ghandehari, E-mail: kavianghandehari@yahoo.com

perioperative complications were evaluated. Perioperative complications evaluated during 30 days after operation. All of the patients were operated by vascular surgeons and patients operated by neurosurgeons were excluded. The computerized archives of Imam Reza and Razavi hospitals served for data extraction of Mashhad vascular surgery centers during 2003-2008. A single surgical team performs CEA operation in these hospitals. The results and data of CEA in Shohada Tajrish[6], Taleghani[7] and Iranmehr[8] hospitals in Tehran during 1991-2006 derived from published articles. CEA operations in Taleghani and Iranmehr hospitals are performed by a single surgical team.[7,8] The research was approved by ethics committee of Imam Reza hospital, Mashhad. Guidelines for performance of CEA in Iranian vascular surgery centers were designed in assessment of total data of reported CEA in Iranian medical literature.[6-8]

Results

Overall, 388 CEA in 365 patients (65% males) with mean age of 66.8 years old (ranged 46-84 years) were evaluated. These candidates of CEA were referred from neurology, cardiac surgery and vascular surgery centers in 62%, 23% and15 %, respectively.

Method of detection of ICA stenosis

In Imam Reza and Razavi hospitals, detection of ICA stenosis in symptomatic and asymptomatic patients was made by one carotid duplex sonography in 95% of candidates. Magnetic Resonance Angiography (MRA) had been requested for confirmation of occluded ICA in report of duplex sonography. Conventional angiography was performed in 5% of symptomatic and asymptomatic candidates of CEA. In Shohada Tajrish hospital, detection of symptomatic ICA stenosis was made by one carotid duplex sonography in 94% of CEA candidates and asymptomatic candidates had their carotid stenosis detected in 90% by conventional angiography. This team does not trust the results of MRA for detection of carotid stenosis even as an adjunctive vascular imaging. In Taleghani and Iranmehr hospitals symptomatic ICA stenosis was detected by one carotid duplex exam in 95% and both hospitals have one team of vascular surgery. This surgical team did not use MRA for detection of carotid stenosis or occlusion. None of the above vascular surgery teams pay attention to the presence of tandem stenosis in ipsilateral middle cerebral artery or carotid siphon by transcranial doppler, MRA or conventional angiography.

Patient-selection criteria for CEA

Patients with symptomatic ≥ 60% ICA stenosis or asymptomatic ≥ 75% ICA stenosis were candidate for CEA in Imam Reza and Razavi hospitals. Patients with symptomatic ≥ 70% ICA stenosis were candidate for CEA in Shohada Tajrish hospital, however 24% of CEA in this center was performed in patients with asymptomatic ≥ 70% ICA stenosis; 98% of CEA in Taleghani and Iranmehr hospitals were carried out in patients with symptomatic ≥ 70% ICA stenosis.

Method of anesthesia

All of the CEA operations were done under general anesthesia in Shohada Tajrish, Taleghani, Iranmehr and Razavi hospitals. Cervical sympathetic ganglionic block served for all of CEA operations in Imam Reza hospital until 2007 and thereafter general anesthesia has been used for 90% of CEA in this center.

The main reason of cervical block anesthesia in Imam Reza hospital during 2003-2007 has been placement of arterial clamps without intra-arterial shunting which needs monitoring of the patient.

Surgical technique

Intra-operative arterial shunting was used in all of CEA operations in Shohada Tajrish, Taleghani, Iranmehr and Razavi hospitals. In Imam Reza hospital, all of the CEA operations were done without intra-arterial shunting up to 2007 and thereafter intra-arterial shunting served for CEA. Despite Imam Reza and Razavi hospitals, arterial patch in site of CEA was used in all of Tehran vascular surgery centers.

Perioperative complications

Perioperative stroke and death rate in Imam Reza, Razavi, Shohada Tajrish, Taleghani and Iranmehr hospitals was 2.4%, 0%, 4.8%, 10.2% and 10.2%, respectively. Table 1 demonstrates the perioperative complications of CEA in each center. The whole perioperative stroke and death rate in reported Iranian vascular surgery centers is 6.4%.

Table 1. Perioperative complications of CEA in each surgical center

Perioperative complications	Imam Reza 86 CEA	Razavi 14 CEA	Shohada 42 CEA	Taleghani 49 CEA	Iranmehr 197 CEA
Stroke	1-1.2%	_	1-2.4%	2-4.1%	12-6.1%
Death	1*-1.2%	_	1**-2.4%	3-6.1%	4-2%
Hyperperfusion cerebral edema	_	1-7.1%	_	_	_
Wound hematoma	7-8.1%	_	3-7.1%	_	3-1.5%
Lower cranial nerve paresis	1-1.2%	_	_	_	1-0.5%
Total	14-16.3%	1-7.1%	5-11.9%	5-10.2%	20-10.2%

***** Death due to extensive brain infarction.

** Death due to intracerebral hemorrhage secondary to hyperperfusion syndrome.

Discussion

In Iranian vascular surgery centers, ICA stenosis is usually detected by one carotid duplex sonography, because vascular surgeons trust the skill and experience of their sonographers in determination of ICA stenosis. However, there is no published validation study of their sonographers. At the other side, Iranian vascular surgeons prefer to refuse to accept the risk and complications of conventional angiography in candidates of CEA. This diagnostic strategy is out of the standard protocols of CEA operation.[1,4,5] Conventional angiography is the gold standard for diagnosis of ICA stenosis[1,4,5] and is indicated when carotid duplex and MRA show disparate results or are indeterminate.[1,4,5] In centers with validated vascular imaging, if the results of carotid duplex is corresponding with MRA or CT angiography in a patient, combination of duplex with one of these vascular imagings could substitute conventional angiography.[1,4] Although presence of tandem stenosis reduces the probability of hyperperfusion syndrome after CEA, however it has negative influence in effectiveness of CEA in restoring cerebral blood supply.[4] Thus, Iranian vascular surgeons should pay attention to tandem stenosis in these candidates. Results of reported clinical trials of CEA have shown that groups of patients with symptomatic ≥ 70%, ≥ 90% and 50-69% ICA stenosis require 6, 4 and 24 CEA operations for prevention of 1 stroke in the next 2 years, respectively.[2,3] Based on the ACAS trial, 67 asymptomatic patients with ≥ 60% ICA stenosis should be operated for prevention of 1 stroke in the next 2 years.[5] The risk of medical therapy alone increases with the degree of stenosis.[1,4] There is no difference in adverse outcomes among those with different degrees of ICA stenosis.[9] The benefit of surgery is greater for patients in high vascular risk profile category.[10] These vascular risk factors do not add to the hazard of CEA.[9,11] Selection strategy of CEA candidates in each center depends on their perioperative stroke and death rate. Review of data from 3644 patients undergoing CEA in the United States has shown overall in-hospital stroke and death rate of 1.8%.[12] Perioperative stroke and death of 1.5% was reported in patients with symptomatic ≥ 70% ICA stenosis in Cologne, Germany.[13] The first published Iranian CEA data belong to Fazel et al team which works in both Taleghani university hospital and Iranmehr private hospital.[7,8] They had a perioperative stroke and death rate of 10.2%.[7,8] Fazel et al team have been the pioneer of CEA in Iran; this complication rate belongs to their learning cure period and probably after 2001 they have had lower perioperative stroke and death rate.[7,8] However, the overall reported perioperative stroke and death rate of CEA in Iranian centers is more than 3%. Based on the NASCET, ESCT and ACAS trials[2,3,5] and Iranian CEA data, CEA is recommended in Iranian vascular surgery centers only in patients with symptomatic ≥ 70% ICA stenosis and preferably in patients with symptomatic ≥ 90% ICA stenosis.[14,15] In other words, performance of CEA in asymptomatic patients with carotid stenosis is contraindicated in Iranian hospitals, due to superiority of its hazards than its benefits in asymptomatic candidates.[16] Patients undergoing CEA by vascular surgeons had lower adverse outcomes compared to neurosurgeons in the United States.[17] Data of CEA performed by neurosurgeons in Iranian hospitals is limited. A dozen of CEA has been performed by neurosurgeons in the men-

tioned hospitals with two postoperative deaths; however, these patients were not included in our study.

We recommend that CEA should be performed in Iran only by vascular surgeons who have considerable skill and experience for this operation.

Conflict of Interests

Authors have no conflict of interests.

References

1. Clagett GP, Robertson JT. Surgical consideration in symptomatic disease. In: Barnett HJM, editor. Stroke: pathophysiology, diagnosis, and management. Philadelphia: Churchill Livingstone; 1998. p. 1209-19.
2. Beneficial effect of carotid endarterectomy in symptomatic patients with high-grade carotid stenosis. North American symptomatic carotid endarterectomy trial collaborators. N Engl J Med 1991; 325(7): 445-53.
3. MRC European carotid surgery trial: interim results for symptomatic patients with severe (70-99%) or with mild (0-29%) carotid stenosis. European carotid surgery trialists' collaborative group. Lancet 1991; 337(8752): 1235-43.
4. Regli L, Meyer FB, Bogousslavsky J. Carotid endarterectomy. In: Ginsberg MD, Bogousslavsky J, editors. Cerebrovascular disease: pathophysiology, diagnosis, and management, Volume 2. Massachusetts: Blackwell Science; 1998: 1908-16.
5. Endarterectomy for asymptomatic carotid artery stenosis. Executive committee for the asymptomatic carotid atherosclerosis study. JAMA 1995; 273(18): 1421-8.
6. Mozaffar M, Kazemzadeh G, Ghaheri H, Radpey M, Zeinalzadeh M, Behjoo Sh. Determining changes in diameter of internal carotid artery before and after primary repair in carotid endarterectomy. Shiraz E-Medical Journal 2007; 8(4): 1-6.
7. Fazel I, Lotfi J, Seyedian M. Complication rates of carotid endarterectomy in Taleghani and Iranmehr hospitals, Tehran, Iran. Journal of Medical Council of Islamic Republic of Iran 2005; 23(1): 30-6.
8. Salehian MT, Nikoomaram B, Fazel I, Valaie N. Study of peri, intra, post operative and long term follow up of carotid endarterectomy, Iranmehr hospital. Pejouhandeh 2004; 9(2): 71-6.
9. Goldstein LB, McCrory DC, Landsman PB, Samsa GP, Ancukiewicz M, Oddone EZ, et al. Multicenter review of preoperative risk factors for carotid endarterectomy in patients with ipsilateral symptoms. Stroke 1994; 25(6): 1116-21..
10. Reed AB, Gaccione P, Belkin M, Donaldson MC, Mannick JA, Whittemore AD, et al. Preoperative risk factors for carotid endarterectomy: defining the patient at high risk. J Vasc Surg 2003; 37(6): 1191-9..
11. Mozes G, Sullivan TM, Torres-Russotto DR, Bower TC, Hoskin TL, Sampaio SM, et al. Carotid endarterectomy in SAPPHIRE-eligible high-risk patients: implications for selecting patients for carotid angioplasty and stenting. J Vasc Surg 2004; 39(5): 958-65.
12. Shah DM, Darling RC, Chang BB, Paty PS, Kreienberg PB, Roddy SP, et al. Analysis of factors contributing to improved outcome for carotid endarterectomy. Semin Vasc Surg 2004; 17(3): 257-9.
13. Aleksic M, Rueger MA, Sobesky J, Heckenkamp J, Jacobs AH, Brunkwall J. Immediate CEA for symptomatic carotid disease preferably performed under local anaesthesia is safe. Vasa 2007; 36(3): 185-90..
14. Biller J, Feinberg WM, Castaldo JE, Whittemore AD, Harbaugh RE, Dempsey RJ, et al. Guidelines for carotid endarterectomy: a statement for healthcare professionals from a special writing group of the stroke council, American heart association. Stroke 1998; 29(2): 554-62.
15. Press MJ, Chassin MR, Wang J, Tuhrim S, Halm EA. Predicting medical and surgical complications of carotid endarterectomy: comparing the risk indexes. Arch Intern Med 2006; 166(8): 914-20.
16. Paciaroni M, Caso V, Acciarresi M, Baumgartner RW, Agnelli G. Management of asymptomatic carotid stenosis in patients undergoing general and vascular surgical procedures. J Neurol Neurosurg Psychiatry 2005; 76(10): 1332-6.
17. Hannan EL, Popp AJ, Feustel P, Halm E, Bernardini G, Waldman J, et al. Association of surgical specialty and processes of care with patient outcomes for carotid endarterectomy. Stroke 2001; 32(12): 2890-7.