

Carotid endarterectomy under local anesthesia in elderly: is it worthwhile?

B. Amato, A.K. Markabaoui, V. Piscitelli, G. Mastrobuoni, F. Persico, G. Iuliano, S. Masone, G. Persico

Department of General and Geriatric Surgery, University of Naples "Federico II", Naples, Italy

Abstract. Carotid endarterectomy (CEA) has a positive effect on stroke free survival in patients with either symptomatic or asymptomatic severe carotid bifurcation stenosis. However, most trials have excluded elderly patients. In addition, concerns have arisen regarding the benefits of CEA in the elderly population, especially in women. In this study, we performed an outcome analysis in patients undergoing CEA comparing those eighty and older to their younger counterparts. A total of 262 carotid operations were performed under local anaesthesia between 1998 and 2004; 76 (34%) were carotid reconstructions in 70 patients over 75 yr of age. Twenty patients (26%) presented with asymptomatic critical stenosis. Transient ischemic symptoms were the reason for presentation in 35 patients (46%). Progressive stroke was documented in two patients (3%) and a stroke with persisting neurological deficit was demonstrated in 19 cases (25%). Coronary artery disease was present in 47 patients (38%) and arterial hypertension in 55 (72%). Fifty-nine patients (84%) were classified as ASA group 3. Seventy-one thromboendarterectomies of the carotid bifurcation with direct closure were performed. Five patients had other types of reconstruction. Postoperative complications occurred in three patients. One had a transient neurological deficit and another a lethal stroke; the third patient died from myocardial infarction. The in-hospital mortality was 2.9%, which was not significantly higher than the results of the reconstructions in younger patients (1.5%). Surgery for carotid artery occlusive disease under local anaesthesia can be safely performed in selected patients of more than 75 yr of age.

Keywords: Carotid artery, surgery, complications, elderly

Introduction

The third leading cause of death in European population is stroke. The incidence of stroke increases with advancing age. By 80 years of age, stroke becomes the second leading cause of death (1). It has been shown in multiple, large, randomized, prospective, multi-institutional studies that selected patients with symptomatic or asymptomatic carotid bifurcation disease clearly benefit from carotid endarterectomy (CEA) in preventing stroke. Many physicians however hesitate to refer elderly patients for CEA, under

the assumption that these individuals are at a high surgical risk and have limited life expectancy.

Really, surgery in older patients is still associated with a higher risk for complications because of concomitant diseases. Patients with carotid occlusive disease, instead, have only a small difference between the risk of intra- or postoperative complications and the risk of cerebral ischemia under conservative treatment. Thus, the results of surgical treatment have to be excellent in order to overcome the spontaneous course of the disease. The analysis of the results of the European Society for Vascular Surgery pointed out that 8.7% of

the patients undergoing carotid surgery were older than 75 yr of age. Other authors reported that octogenarians made up 10% of the cases (2, 3). In this regard it is obvious that elderly patients play a significant role in carotid surgery. We analysed the risk of carotid surgery in elderly in the form of a retrospective study

Patients and methods

Between 1998 and 2004 in the Department for General and Geriatric Surgery at the "Federico II" University in Naples (Italy) 262 patients underwent surgery for carotid occlusive disease. The mean age of these patients was 65.4 ± 8.5 yr. Seventy patients (31%) were over 75 yr of age with a mean age of 78.9 ± 2.1 yr. The data of the 262 patients were reviewed retrospectively using a standardized protocol. All patients were examined preoperatively by neurologists and with a carotid duplex-ultrasound. Indication for surgery in asymptomatic patients was a carotid artery stenosis of about 70% according to the results of the ACAS Trial (4). Indications for surgery in symptomatic patients were according to the results of NASCET and ECST studies (5, 6). In each case the indication for surgery was discussed in collaboration with the surgeon and the referring neurologist. In a few cases emergency carotid surgery was performed in patients in which a stroke was evolving or progressing. In these cases the indication for surgery was an acute complete unilateral carotid artery occlusion or critically reduced collateral perfusion from the contralateral side. Patients with symptomatic stenosis (TIA or PRIND), or patients with good general physical condition after stroke were appropriate candidates for surgery. The preferred technique was thromboendarterectomy of all carotid bifurcation arteries. The incision was closed routinely with a direct closure. In patients with kinking of the internal carotid artery we performed segmental resection and end-to-end-reanastomosis. The same procedure was carried out in patients with a non-ending but insignificant distal plaque. An eversion thromboendarterectomy was carried out in only a small number of cases due to significant elongation or kinking of the internal carotid artery. Indications for prophylactical shunt placement were contralateral ca-

rotid occlusion, ipsi- or contralateral stroke up to 6 weeks before surgery or patients for which neuromonitoring could not be provided. Generally, in all patients routine neuromonitoring (EEG) was performed. A selective shunt (Javid shunt) was placed in patients with ischemic symptoms or alterations in EEG. Intraoperative doppler-ultrasound flowmetry confirmed the patency of the carotid artery after reconstruction and revealed local flow conditions. Postoperative extracranial doppler examination was performed in all patients to detect residual carotid artery stenosis or asymptomatic occlusion.

Results

Seventy-six reconstructions (41 operations on the left and 35 on the right side) were performed in 70 over-75 patients (male 44, female 26). A bilateral procedure was carried out in one patient simultaneously. In two patients a staged procedure was performed on both sides within one week. Twenty patients (26%) were asymptomatic for the operated side in spite of a carotid artery stenosis of more than 70%. The status of the contralateral carotid artery revealed a stenosis from 50 to 70% in two patients, high grade stenosis (>70%) in six patients and an occlusion in three. Nine patients had unilateral stenosis of more than 90%. Five patients had completed stroke or repeated transient ischemic attacks caused by a high-grade stenosis of the contra-lateral side. Computerized tomography demonstrated ipsilateral lacunar infarction in two patients. Transient ischemic symptoms were present in 35 patients (46%). Two patients suffered from a progressive stroke (3%) and 19 (25%) from stroke with persisting neurological deficits. A recurrent carotid stenosis had to be reoperated on in one patient (1.3%). The cardiac risk factors were coronary artery disease in 47 (38%), prior myocardial infarction in 16 (23%), prior myocardial revascularization in 10 (14%) and arterial hypertension in 55 patients (72%). The non-cardiac risk factors included diabetes mellitus in 14 (18%), hyperlipoproteinemia in 31 (41%), tobacco smoking in 17 (22%) and obesity in 13 (17%) patients. Additionally, 10 patients (14%) had reduced renal function and 7 (10%) suffered from chronic obstructi-

ve pulmonary disease. According to the ASA Classification 16 patients (22.8%) belonged to ASA 2, 59 (84.3%) to ASA 3 and only one patient with emergency carotid surgery for progressive stroke was amongst ASA 4. All patients were preoperative ambulators and able to take care of themselves with minimal daily support.

Operative management consisted in thromboendarterectomy of the carotid bifurcation vessels, under local anaesthesia, with direct closure in 71 patients (93.4%). In 51 of these patients the internal carotid artery had to be straightened by segmental resection. In two patients (3.8%) eversion thromboendarterectomy was carried out. In one case (1.3%) reconstruction was technically not feasible because of distal arterial thrombosis without postoperative complications.

In 8 patients (9.7%) an intraluminal shunt was used: shunt was placed for arising of neurological symptoms at carotid clamping or pathological alterations during intraoperative EEG neuromonitoring.

The mean operation time for the carotid operation was 90 ± 20 min. The mean clamping time was 34 ± 17 min in all operations (41 ± 16 for non-shunted patients and 13 ± 9 for shunted). All operations were performed under local anaesthesia, and neurological monitoring by means of "peep-toy" technique and EEG monitoring.

Three patients (3.9%) had to be reoperated on for local bleeding, without further problems. No major cranial nerve lesions or wound infections occurred postoperatively. The postoperative hospital stay lasted 7 ± 4 days in all patients. During early postoperative hospital stay two strokes (2.6%) occurred. One patient with carotid stenosis and occlusion of the contralateral carotid artery had developed a large ipsilateral cerebral infarction as a result of suture bleeding and emergency reoperation: he died due to respiratory failure from bilateral pneumonia. One other patient with a history of three repeated cerebral strokes developed transient contralateral brachiocephalic hemiparesis on the first day after surgery without correlation in cerebral computerized tomography. We observed minor and major strokes respectively in 2.4% and 3.4% of this serie of patients. Out of the patients with non-neurological complications one patient died from myocardial infarction and another developed a tran-

sient cardiac failure (2.6%). We observed a total of 1.2% cardiac complications in all patients. Three patients (3.9%) developed transient postoperative delirium necessitating sedation. A transient delirium occurred in six out of the 262 patients (3.1%).

Discussion

The increasing life expectancy has led to more frequent indications for surgery in older patients. Many studies could demonstrate that the perioperative death rate did not increase significantly with age. The results of this experience have led us to justify elective and even emergency surgery for carotid surgery. With the advancing anaesthesiological procedures and according to personal experience intraoperative complications in vascular surgery could now be reduced to a minimum.

Ascher et al. have already demonstrated that the prevalence of asymptomatic high-grade carotid artery stenosis among patients aged more than 75 yr seen by a vascular surgeon for problems other than cerebrovascular disease is high (21%). It is associated with the male gender, advanced age, diabetes mellitus and smoking (8).

The approximate average annual occurrence of stroke for patients aged less than 44 yr is 30/100,000 and increases to 1230/100,000 for patients aged over 75 yr (9). It is estimated that 30–60% of these strokes are secondary to carotid bifurcation disease (10). The incidence of stroke increases dramatically with age, as do stroke-related morbidity and mortality (11), so that by the age of 85, stroke is the second leading cause of death, exceeding malignancies. Stroke appears to be especially devastating in the elderly and approximately half the patients who suffer a stroke are permanently severely handicapped (12). The results of the North American Symptomatic Carotid Endarterectomy Trial (NASCET) (6), the European Carotid Surgery Trial (ECST) (5) and the Asymptomatic Carotid Artherosclerosis Study (ACAS) (13) have established the role of carotid endarterectomy for stroke prevention in symptomatic and asymptomatic patients with internal carotid artery occlusive disease. NASCET results showed a high risk of stroke in patients with

symptomatic carotid artery stenosis >75% (6), whereas recent published data (14) describe a low rate of stroke in patients with asymptomatic carotid artery disease. ACAS trial (4,13) has shown that in patients with asymptomatic carotid artery stenosis of 60% or greater the 5-yr risk of ipsilateral stroke is reduced when carotid endarterectomy is performed with less than 3% perioperative morbidity and mortality with concomitant aggressive management of modifiable risk factors. The guidelines of the European Society for Vascular Surgery recommend surgery for stenosis of more than 70% when the rate of complications is low (15).

In our own experiences we observed 3 strokes among 262 asymptomatic patients (1.4%). Two patients died as a result of perioperative stroke (0.8%) (unpublished data).

NASCET results (16) described carotid endarterectomy as a durable procedure for treatment of carotid artery disease, with an overall rate of stroke and death of 6.5% and a rate of permanent disabling stroke and death of 2.0%. The ECST trial (5) recommended carotid endarterectomy for most patients with a recent non-disabling carotid-related ischaemic event when the symptomatic stenosis was greater than 80%. If those criteria can be fulfilled the question arises if carotid surgery can be safely performed in very old patients. On one hand there is the perioperative risk of concomitant diseases and on the other the risk of a stroke during the spontaneous course of the disease and related costs for treatment of patients after stroke.

Elderly patients cannot per se be excluded from carotid surgery as some authors have done in the past (17, 18). NASCET and ECST studies have excluded octogenarians from randomization as unsuitable candidates for surgery because of their high surgical risk and limited life expectancy (5, 6). Hallett et al. reported the results of a population-based outcome with 10% octogenarians and observed a significantly higher 30-day postoperative stroke rate for patients older than 80 yr (2). In an earlier study Ballotta et al. reported the results of carotid surgery performed in 96 patients aged over 75 yr (19). Twenty-eight percent of the patients showed perioperative EEG abnormalities but there was only one transient ischemic attack with spontaneous recovery and no stroke or death. Relati-

vely often there have been reports of peripheral nerve injuries (10,6%) and wound bleedings requiring re-exploration (8.7%). Only one of the patients experienced a postoperative myocardial infarction. In that follow-up 24% of the patients died from cardiac or pulmonary diseases or malignancy. Many other authors have demonstrated their positive experiences with carotid surgery in the elderly (20–25). Also, in patients with concomitant cardiovascular and carotid surgery a recently published European study has shown no significant increased risks in elderly patients (26). Our own experiences have shown similar results.

The number of risk factors in older patients is not significantly higher than in the group of all patients. One reason may be that selected patients with acceptably good general health aged over 80 yr were referred to the surgeon. The percentage of stroke in octogenarians is not significantly higher than in all patients undergoing carotid surgery at the same time. The one major stroke occurring was more related to intraoperative technical problems and not to the age of the patient. Postoperatively we observed only one myocardial infarction with a lethal outcome. Only the rate of transient postoperative delirium is substantially higher in elderly patients.

In conclusion, age does not seem to be a contraindication for surgery in patients with symptomatic or high-grade asymptomatic carotid artery occlusive disease. The complication rate in a selected group was not substantially higher than in all our patients undergoing carotid surgery.

References

1. Treiman RL, Wagner WH, Foran RF. Carotid endarterectomy in the elderly. *Ann Vasc Surg* 1992; 6: 321-4.
2. Hallett, JW, Pietropaoli JA, Ilstrup DM, et al. Comparison of North American Symptomatic Carotid Endarterectomy Trial and population-based outcomes for carotid endarterectomy. *J Vasc Surg* 1998; 27: 845-51.
3. Meyer FB, Meissner I, Fode NC, et al. Carotid endarterectomy in elderly patients. *Mayo Clinical Procedure* 1991; 66: 464-9.
4. Executive Committee for the asymptomatic carotid arteriosclerosis study, Endarterectomy for asymptomatic carotid artery stenosis. *JAMA* 1995; 273: 1421-8.
5. European Carotid Surgery Trialists' Collaborative Group. Randomised trial of endarterectomy for recently symptoma-

- tic carotid stenosis: final results of the MRC European Carotid Surgery Trial (ECST). *Lancet* 1998; 351: 1379-86.
6. North American Symptomatic Carotid Endarterectomy Trial Collaborators Group, Beneficial effect of carotid endarterectomy in symptomatic patients with high-grade carotid stenosis. *New England Journal of Medicine* 1991; 325: 445-53.
 7. Ritter R, Grabitz K, Godehardt E, et al. Langzeitergebnisse nach Operation eines Bauchaortenaneurysmas im Alter über 80 Jahre. *Gefasschirurgie* 1997; 2: 5-10.
 8. Ascher E, De Pippo P, Salles-Cunha S, et al. Carotid screening with duplex ultrasound in elderly asymptomatic patients referred to a vascular surgeon: is it worthwhile? *Ann Vasc Surg* 1999; 13: 164-8.
 9. Berlit, P, Schlaganfall-Möglichkeiten der Primär prevention. *Nervenarzt* 2000; 71: 231-7.
 10. Gelabert, HA, Moore WS. Carotid endarterectomy: current status. *Current Problems in Surgery* 1991; 3: 181-62.
 11. Robins M, Baum HM. National survey of stroke incidence. *Stroke* 1981; 12 (Suppl. 1): 45-7.
 12. Silliman RA, Wagner EH, Fletcher RH. The social and functional consequences of stroke for elderly patients. *Stroke* 1987; 18: 200-3.
 13. Asymptomatic Carotid Artherosclerosis Study Group. Study design for randomized prospective trial of carotid endarterectomy for asymptomatic artherosclerosis. *Stroke* 1989; 20: 844-9.
 14. Inzitari D, Eliasziw M, Gates P, et al. The causes and risk of stroke in patients with asymptomatic internal-carotid-artery stenosis. North American Symptomatic Carotid Endarterectomy Trial Collaborators. *New England Journal of Medicine* 2000; 342: 1693-700.
 15. Zehle A. Leitlinien zu Stenosen der Arteria carotis. Leitlinien zu Diagnostik und Therapie in der Gefäßchirurgie, ed. V.d.D.G.f. Gefäßchirurgie. Deutscher Ärzteverlag, Köln, 1998.
 16. Ferguson GG, Eliasziw M, Claggett GP, et al. The North American Symptomatic Carotid Endarterectomy Trial: surgical results in 1415 patients. *Stroke* 1999; 30: 1751-8.
 17. Fischer ES, Malenka DJ, Solomon NA, et al. Risk of carotid endarterectomy in the elderly. *American Journal of Public Health* 1989; 79: 1617-20.
 18. Plecha FR, Bertin UJ, Plecha EJ. The early results of vascular surgery in patients 75 years of age and older: an analysis of 3259 cases. *J Vasc Surg* 1985; 2: 769-74.
 19. Ballotta E, Da Giau G, Saladini M, et al. Carotid endarterectomy in symptomatic and asymptomatic patients aged 75 years or more: perioperative mortality and stroke risk rates. *Ann Vasc Surg* 1999; 13: 158-63.
 20. Coyle KA, Smith RBI, Salam AA, et al. Carotid surgery in the octuagenarian. *Ann Vasc Surg* 1994; 8: 417-20.
 21. Favre JP, Guy JM, Frering V, et al. Carotid surgery in the octuagenarian. *Ann Vasc Surg* 1994; 8: 421-6.
 22. Perler BA, Williams, GM. Carotid endarterectomy in the very elderly: is it worthwhile? *Surgery* 1994; 116: 349-483.
 23. Pinkerton JA, Gholkar VR. Should age be a consideration in carotid endarterectomy? *J Vasc Surg* 1990; 11: 650-8.
 24. Schultz RD, Sterpetti AV, Feldhaus RJ. Carotid endarterectomy in octagenarians and nonagenarians. *Surgery Gynecology and Obstetrics* 1988; 166: 245-451.
 25. Treiman RL, Wagner WH, Foran RF. Carotid endarterectomy in the elderly. *Ann Vasc Surg* 1992; 6: 321-4.
 26. Busch T, Sirbu H, Aleksic I, et al. Die simultane Operationsstrategie bei kardiovaskularer Erkrankung und begleitender Karotisstenose in der Alterschirurgie. *Zeitschrift Herz-, Thorax- Gefäßchirurgie* 1999; 13: 107-13.
 27. Rosenthal D, Rudderman RH, Jones DH. Carotid endarterectomy in the octuagenarian: is it appropriate? *J Vasc Surg* 1986; 3: 782-7.
 28. Ouriel K, Penn TE, Ricotta JJ, et al. Carotid endarterectomy in the elderly patient. *Surgery Gynecology and Obstetrics* 1986; 162: 334-6.