Do Octogenarians Still Have a High Risk of Adverse Outcomes after Carotid Endarterectomy in the Era of a Super-aged Society? A Single-center Study in Japan

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Background: The aim of this study was to evaluate the safety and feasibility of carotid endarterectomy (CEA) in Japanese octogenarians. *Methods:* This study prospectively included 157 consecutive CEA procedures in 145 patients treated at Fukuoka University Hospital between May 2008 and April 2013. Clinical and radiologic findings were obtained from the medical records and by telephone interview. Major events and outcomes were compared between patients 80 years of age or older (octogenarians) and those less than 79 years of age (nonoctogenarians). *Results:* The rate of major adverse events (major stroke, myocardial infarction, or death) in the perioperative period was 1.2%. Follow-up data were available for 142 patients (97.9%). Only 1 case (.7%) of ipsilateral stroke occurred during the follow-up period. Thirteen patients died of causes other than stroke. The estimated 1-, 3-, and 5-year overall survival rates were 98.5%, 96.9%, and 93.1%, respectively. Nineteen (13.4%) of the patients were octogenarians. There were no significant differences in baseline characteristics between octogenarians and nonoctogenarians, except for age. In octogenarians, there were no major adverse events during the perioperative period and no cases of stroke or stroke-related death during the follow-up period. The estimated 1-, 3-, and 5-year overall survival rates in octogenarians were 92.9%, 92.9%, and 61.9%, respectively. There was no significant difference in overall survival between octogenarians and nonoctogenarians ($P = .371$). *Conclusions:* The results of this study suggest that CEA can be safely performed in Japanese octogenarians. Midterm outcomes were relatively good, but long-term outcomes require further study. **Key Words:** Carotid endarterectomy—long-term follow-up—octogenarian—elderly.

The population of Japan includes an estimated 9,440,000 octogenarians, accounting for 7.4% of the total population.[1] As the proportion of older individuals increases, the incidence of stroke also increases, and prophylactic treatment for stroke is attracting increased interest.

Carotid endarterectomy (CEA) is an established surgical treatment for the prevention of stroke in patients with significant carotid artery stenosis and low surgical risk.[2] In prospective randomized clinical trials, such as the North American Symptomatic Carotid Endarterectomy Trial and the Asymptomatic Carotid Atherosclerosis

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Study,[3,4] being an octogenarian was considered to be a risk factor for adverse outcomes after CEA. Furthermore, it is not yet clear whether CEA should be performed in older patients, especially octogenarians, with carotid stenosis.

It has been reported that elderly patients with symptomatic carotid stenosis could benefit from CEA.[5] However, the Asymptomatic Carotid Surgery Trial found that CEA did not improve outcomes in patients with asymptomatic carotid stenosis who were 75 years of age or older. In recent randomized studies, such as the Stenting and Angioplasty with Protection in Patients at High Risk for Endarterectomy trial, Carotid ACCULINK/ACCUNET Post Approval Trial to Uncover Rare Events, and Carotid Revascularization Endarterectomy versus Stenting Trial,[6-8] advanced age was identified as a risk factor for adverse perioperative outcomes, including death and stroke.

We previously documented long-term outcomes after CEA in patients receiving hemodialysis and correlations between CEA and systemic vascular diseases.[9-11] In this study, we investigated perioperative adverse events and outcomes in patients who underwent CEA and compared these between octogenarians and nonoctogenarians.

Methods

This study prospectively included 145 patients who underwent CEA at Fukuoka University Hospital between May 2008 and April 2013. Decisions regarding the treatment of carotid stenosis by medication or CEA were made as previously reported.[9-11] Symptomatic carotid stenosis was defined as carotid stenosis causing ipsilateral hemispheric stroke, transient ischemic attack, or amaurosis fugax within the previous 120 days. Clinical and radiologic findings were obtained from the medical records and by telephone interview. Risk factors for atherosclerotic disease were recorded, including hypertension, hypercholesterolemia, diabetes mellitus, current smoking, and coronary artery disease. The perioperative major adverse events recorded were major stroke, myocardial infarction, and death from any cause. Major stroke was defined as a new neurologic deficit resulting in an increase in the National Institutes of Health Stroke Scale score by 4 points or more. Patients underwent carotid ultrasonography 6 months postoperatively and yearly thereafter. In patients who did not return for follow-up visits, strokes and deaths were tracked by telephone survey.

All CEA procedures were performed by the same neurosurgical team.[9-11] Conventional CEA was performed under general anesthesia, using an operating microscope and electroencephalographic monitoring. Shunts were used in all patients. No patients underwent patch closure.

Statistical Analysis

Results were first analyzed for the group overall and were then compared between octogenarians and nonoctogenarians. The Statistical Package for the Social Sciences (SPSS), version 21.0 was used for all analyses (SPSS Inc, Chicago, IL). Continuous data are shown as the median value, and categorical data are reported as percentage and absolute number. Categorical variables were compared between octogenarians and nonoctogenarians using Fisher's exact test, and continuous variables were compared using the Mann–Whitney *U* test. A *P* value of less than .05 was considered statistically significant. Survival rates were compared between octogenarians and nonoctogenarians using Kaplan–Meier analysis.

Results

Overall

The clinical outcomes after CEA are listed in Table 1. Between May 2002 and April 2013, 157 CEA procedures were performed in 145 patients at our institution, including 19 octogenarians. Follow-up data were available for 142 of the 145 patients (97.9%). The 3 patients lost to follow-up (one 66-year-old male and two 77-year-old males) were excluded from the outcome analysis.

During the 30 days after CEA, stroke occurred in 2 patients (1.2%): ipsilateral stroke causing hemiparesis and dysarthria in 1 patient and pontine lacunar stroke in the other patient. There were no cases of perioperative myocardial infarction or death.

One patient (.7%) developed an ischemic stroke during the follow-up period that was unrelated to the carotid lesion. Thirteen patients died of causes unrelated to

Table 1. *Comparisons of clinical characteristics between octogenarians (OC) and nonoctogenarians (NO)*

	OC	NC	*P* value
N (%)	19 (13.4)	123 (86.6)	
Median age	82.0	71.0	.000
Female, n (%)	5 (26.3)	19 (15.4)	.320
Symptomatic, n (%)	15 (78.9)	66 (53.7)	.130
NASCET	82	80	.814*
Hyperlipidemia, n (%)	12 (63.1)	82 (66.6)	.795
Hypertension, n (%)	13 (68.4)	101 (82.1)	.329
Diabetes mellitus, n (%)	8 (42.1)	49 (39.8)	1.000
Ischemic heart disease, n (%)	6 (31.5)	42 (34.1)	1.000
Peripheral arterial disease, n (%)	3 (15.7)	14 (11.4)	.703
Current smoker, n (%)	2 (10.5)	30 (24.4)	.243
Atrial fibrillation, n (%)	5 (26.3)	13 (10.6)	.070

Abbreviation: NASCET, North American Symptomatic Carotid Endarterectomy Trial.

*Mann–Whitney *U* test.