Preoperative Cardiovascular Assessment and Late Cardiovascular Events after Elective Abdominal Aortic Aneurysm Repair

Toshihiro Onohara, Kentaro Inoue, Tadashi Furuyama, and Tomokazu Ohno, Fukuoka, Japan

Background: Cardiovascular evaluation is performed before elective repair of abdominal aortic aneurysm (AAA) because of the high prevalence of cardiovascular disease. We investigated the association between preoperative cardiovascular evaluation and the incidence of late cardiovascular events after AAA repair.

Methods: We retrospectively analyzed 438 patients who underwent elective repair of AAA. Echocardiography, serial coronary assessment using functional myocardial scanning or coronary angiography, and carotid ultrasound scanning were performed preoperatively. Coronary revascularization after serial coronary assessment was performed preoperatively or simultaneously in 21 patients, and 54 patients had a remote history of coronary revascularization.

Results: The 5-year survival rate, incidence rate of cardiovascular events (myocardial infarction or stroke), and incidence rate of major adverse cardiovascular events (MACE; cardiovascular death or cardiovascular events) were 86.0%, 5.7%, and 11.5%, respectively. Carotid stenosis was associated with these long-term outcomes, and hypokinesis, determined by echocardiography, increased the incidence of cardiovascular events and MACE. Serial coronary assessment findings and history of previous or preoperative coronary revascularization were not associated with these long-term outcomes.

Conclusions: Preoperative cardiovascular evaluation and treatment are beneficial for reducing not only perioperative risk but also late cardiovascular events.

INTRODUCTION

Development of abdominal aortic aneurysm (AAA) is strongly associated with the prevalence of cardiovascular disease, although the pathologies of AAA and atherosclerosis appear to be different.[1] Therefore, routine cardiovascular evaluation is performed preoperatively before elective AAA repair. If significant coronary artery disease (CAD) is present, coronary revascularization, which is believed to reduce the incidence of perioperative cardiovascular events, should be performed. In a previous study by the Cleveland Clinic, in 1,135 patients who underwent open surgical repair (OSR) of AAA, active myocardial ischemia on preoperative functional myocardial imaging was identified in 16% of the patients and severe but correctable CAD was detected in 29% of the patients who underwent coronary angiography.[2] In addition to the high prevalence of concomitant CAD, the major cause of late death was cardiovascular disease (cardiac events, 23%; stroke, 3%). One of the authors had previously reported that the cumulative incidence rate of late cardiovascular events after elective OSR of AAA was 14.9% at 5 years.[3] A UK endovascular aneurysm

Conflict of Interest: The authors have no potential conflicts of interest to disclose.

Department of Vascular Surgery, Kyushu Medical Center, Fukuoka, Japan.

Correspondence to: Toshihiro Onohara, MD, Department of Vascular Surgery, Kyushu Medical Center, Jigyohama 1-8-1, Chuou-ku, Fukuoka 810-8563, Japan; E-mail: onohara@kyumed.jp

Ann Vasc Surg 2015; 29: 1533–1542
http://dx.doi.org/10.1016/j.avsg.2015.05.026

Manuscript received: February 2, 2015; manuscript accepted: May 20, 2015; published online: July 16, 2015.

repair (EVAR) trial 1 demonstrated similar results, showing that the rates of cardiovascular events after OSR and EVAR were 3.2 and 2.6 per 100 person-years, respectively.[4] Those studies found no definitive relationship between the presence of concomitant CAD and the incidence of late cardiovascular events and did not examine if preoperative cardiovascular evaluation was associated with late onset of events.

The long-term benefits of preoperative coronary revascularization before AAA repair are controversial. A prospective randomized study, the Coronary Artery Revascularization Prophylaxis (CARP) trial, demonstrated that coronary revascularization before elective vascular surgery did not alter long-term survival among the 510 patients with stable CAD.[5] On the basis of this study, preoperative coronary revascularization is not recommended for all patients with CAD. However, a subgroup analysis of the CARP trial examined the probability of death and nonfatal myocardial infarction among the 109 patients with myocardial ischemia determined by nuclear imaging before abdominal aortic vascular surgery and found that the composite outcome was significantly better for the patients who had undergone preoperative coronary revascularization than for those who had not.[6] In addition, the cohort of the CARP trial accounted for 9% of the 5,859 originally screened patients, and AAA repair represented 33% among of the vascular procedures performed. Thus, preoperative cardiovascular evaluation and intervention before AAA repair may reduce operative death, but their long-term effects on cardiovascular events are unknown among unselected patients in clinical practice.

The purpose of the present study was to investigate the association between the findings of preoperative cardiovascular evaluation (process of preoperative cardiovascular risk stratification) and the incidence of late cardiovascular events after AAA repair.

PATIENTS AND METHODS

Patients

Between 2003 and 2011, 473 elective AAA repairs were performed at the Department of Vascular Surgery, Kyushu Medical Center, which is one of the tertiary hospitals in Fukuoka city, Japan. A prospectively maintained vascular database was used to collect the data. During the same period, 41 emergency or urgent AAA repairs were performed, and these 41 patients were not included in the study population. Thirty-five (7.4%) patients developed malignancies within 2 years, and 44 (9.3%) patients had undergone curative treatment of a malignancy 2 years before AAA repair. Because concomitant malignancy affects long-term survival after AAA repair and may lead to an underestimation of the incidence of late cardiovascular events, the 35 patients with concomitant malignancies were excluded. Thus, 438 patients were analyzed in the present study. These 438 patients included 339 (77.4%) men and 99 (22.6%) women, who ranged in age from 34 to 94 years (mean, 75.3 years). One hundred thirty-one (29.9%) patients were current smokers and 70 (16.0%) were past smokers. The following underlying risk factors were documented: hypertension in 335 (76.5%) patients, pulmonary insufficiency in 252 (57.5%), dyslipidemia in 217 (49.5%), history of CAD or congestive heart failure (CHF) in 149 (34.0%), history of cerebrovascular disease (CVD) in 92 (21.0%), diabetes mellitus in 61 (13.9%), peripheral arterial disease (PAD) in 35 (8.0%), and end-stage renal insufficiency maintained on hemodialysis in 5 (1.1%). After AAA repair, the following medications were prescribed at hospital discharge: antiplatelet agents for 204 patients, angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers for 182, statins for 121, beta-blockers for 68, and anticoagulant agents for 42. Because commercial devices for EVAR that were approved by the Ministry of Labor and Welfare of Japan became available in June 2007, 105 (24.0%) patients underwent EVAR. The remaining 333 patients underwent OSR for AAA. Indications for surgery and preoperative evaluations were not distinguished between the 2 groups who underwent EVAR and OSR. EVAR was preferred when the morphology of the aneurysm was included in the indications, and the patient was considered to be at high risk for OSR.

Preoperative Cardiovascular Evaluations

Before elective surgery for AAA, echocardiography and dipyridamole—thallium myocardial scanning were performed as routine preoperative cardiac assessment. If abnormal findings in myocardial scanning indicated further examination by a cardiology consultant, coronary angiography was performed. Then, the cardiologists decided whether the coronary arterial lesions required preoperative correction or which reconstructive procedure should be used. Either percutaneous transluminal coronary interventions (PCI) or coronary bypass surgery (CABG) was performed. In addition, carotid ultrasound scanning was performed to evaluate carotid arterial stenosis preoperatively. The stenosis