Gender differences in patients undergoing surgery for acute type A aortic dissection

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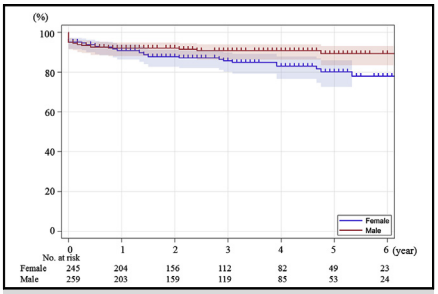
ABSTRACT

Objectives: The impact of gender on preoperative characteristics and postoperative outcomes in patients undergoing surgery for acute type A aortic dissection rarely has been investigated.

Methods: We reviewed the records of 504 patients (245 women and 259 men) who underwent surgery for acute type A aortic dissection between August 2006 and December 2013. Women were older (71.5 vs 59.7 years; $P < .001$) and smaller (body surface area 1.5 vs 1.9 m^2; $P < .001$) than men. Early and long-term outcomes were compared between men and women.

Results: Operative mortality (<30 days) was similar between the groups (4.5% vs 5.8%; $P = .646$). Multivariable logistic regression analysis demonstrated that myocardial ischemia (odds ratio [OR], 5.48; 95% confidence interval [CI], 2.00-15.00; $P < .001$), neurologic ischemia (OR, 6.64; 95% CI, 2.26-19.48; $P < .001$), and shock/tamponade (OR, 3.74; 95% CI, 1.49-9.40; $P = .005$) were independent predictors of operative mortality. At 5 years, there was no significant difference in survival between the groups (80.1% vs 89.3%; $P = .067$). Cox regression analysis demonstrated that myocardial ischemia (hazard ratio [HR], 2.40; 95% CI, 1.21-4.74; $P = .012$), nonprescription of beta-blockers at discharge (HR, 4.27; 95% CI, 2.43-7.50; $P < .001$), and nonprescription of angiotensin II receptor blockers at discharge (HR, 2.39; 95% CI, 1.14-5.01; $P = .021$) were independent predictors of late mortality. Female gender was not an independent predictor of operative and late mortality.

Conclusions: There are no differences in early and long-term outcomes between male and female patients undergoing surgery for acute type A aortic dissection. (J Thorac Cardiovasc Surg 2015;150:581-7)



Kaplan-Meier event-free survival analysis for all-cause mortality

Central Message

There are no differences in early and long-term outcomes between male and female patients undergoing surgery for AAAD.

Perspective

Female sex generally has been thought to be a risk factor in cardiac surgery, which may cause undertreatment of female patients with acute aortic dissection. Our study showed no impact of gender on the early and long-term outcomes after surgical repair for AAAD. This finding will promote adequate treatment in female patients with acute aortic dissection.

See Editorial Commentary page 587.

ACD

Supplemental material is available online.

Gender difference in postoperative outcomes after cardiovascular surgery has been a matter of debate. In particular, the impact of female gender on clinical outcomes after isolated coronary artery bypass grafting (CABG) has been well reported in multiple studies. Alam and colleagues[1] demonstrated in their meta-analysis that women who underwent isolated CABG experienced higher mortality at short-, mid-, and long-term follow-up compared with men. In the risk models of both the Society of Thoracic Surgeons and the European System for Cardiac Operative Risk Evaluation, female gender is listed as one of the risk factors for cardiac surgery.[2,3] Several reasons for a worse outcome in female patients have been proposed.[4-13] Female patients who undergo CABG are generally older and smaller than their male counterparts. Female patients also have more preoperative comorbidities, such as diabetes and anemia.

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Abbreviations and Acronyms

AAAD = acute type A aortic dissection
CABG = coronary artery bypass grafting
CI = confidence interval
CT = computed tomography
HR = hazard ratio
IRAD = International Registry of Acute Aortic Dissection
OR = odds ratio
TAR = total arch replacement

Acute type A aortic dissection (AAAD) is one of the leading causes of death in both men and women. There have been few published reports regarding gender difference in postoperative outcomes after surgical repair of AAAD. The aim of this study was to compare the early and long-term outcomes in adult male and female patients after repair of AAAD.

PATIENTS AND METHODS

Study Patients

Between August 2006 and December 2013, 504 patients underwent surgical repair for AAAD at the Sakakibara Heart Institute. The preoperative characteristics of these patients are shown in Table 1. There were 245 women and 259 men. The mean age of female patients was significantly higher than that of male patients (71.5 vs 59.7 years; $P < .0001$). Female patients were significantly smaller than their male counterparts (body surface area 1.5 vs 1.9 m^2; $P < .0001$). The level of creatinine was higher in male patients than in female patients (0.9 vs 1.2 mg/dL; $P = .0017$); however, the estimated glomerular filtration rate was not different between the groups (61.1 vs 61.4 mL/min/1.73 m^2; $P = .8921$). Other risk factors were almost identical between the groups. Intervals from symptom onset to operation and the rate of early operation (within 6 hours) did not differ between the groups.

The primary end point of this study was operative mortality, and the secondary end points were late mortality and late reoperation. The indications for AAAD-related reoperation were rupture or impending rupture of aorta, dilatation of aorta 55 mm or greater, rapid dilatation of aorta more than 10 mm per year, graft infection, and severe aortic valve insufficiency. Computed tomography (CT) studies were obtained before discharge, 6 months after surgery, and annually thereafter.

The institutional review board approved this retrospective study and waived the need for written consent. We followed up patients by outpatient clinic visits or telephone interview in March and April of 2014.

Operations

All operations were performed through a median sternotomy; the initial arterial cannula was placed mostly in the femoral artery. The left ventricular apex or axillary artery was cannulated if the femoral artery was unavailable. Our strategy of selection of the cannulation site has been described.[14] In all patients, a combination of antegrade and retrograde cardioplegia was used, and patients were cooled to 25°C for circulatory arrest. A single-branch prosthesis was used in ascending aortic or hemiarch replacement, and a 4-branch prosthesis was used in total arch replacement (TAR). The proximal aorta was repaired with gelatin resorcinol formaldehyde glue and double strips (vascular graft strip inside and Teflon felt strip outside) at the level of the sinotubular junction. When there was an intimal tear in the aortic root or the aortic root was dilated, the aortic root was replaced without using glue. In patients undergoing ascending aortic or hemiarch replacement, the distal aortic repair and anastomosis were performed under hypothermic circulatory arrest with retrograde cerebral perfusion from the superior vena cava. The distal aorta was repaired with double Teflon felt strips and then anastomosed to the vascular graft. After the distal anastomosis, whole-body circulation was resumed through the branch of the prosthesis, and the patient was fully rewarmed to 35°C. Proximal anastomosis was performed during rewarming. In patients undergoing TAR, we introduced the stepwise distal anastomosis technique with antegrade selective cerebral perfusion and separate lower body perfusion.[15] The details of our current TAR techniques have been reported.[15] Four surgeons performed the operations throughout this study period.

Definitions

Intramural hematoma was defined as a dissecting membrane without any degree of patency of the false lumen. Cerebrovascular accident was defined as the persistent loss of neurologic function caused by an ischemic event, with or without confirmation by CT or magnetic resonance imaging. Cardiac tamponade was defined as a cardiogenic shock with a systolic blood pressure of 90 mm Hg, associated with pericardial effusion confirmed by CT or echocardiography. Operative mortality was defined as death within 30 days after surgery or before discharge. Postoperative stroke was defined as the occurrence of a new stroke confirmed by CT. In patients with preoperative stroke, postoperative stroke was defined as worsening of the neurologic deficit with new radiologic findings.

Statistical Analysis

The study by Nienaber and colleagues[16] demonstrated that the difference regarding operative death between genders was 10%. Given the sample size of 500 in total, the statistical powers to detect the group difference of 10% were calculated to be 85%, 76%, and 69% when incidence rates of a control arm were 10%, 15%, and 20%, respectively, with a type I error of 5% (2-sided). By accounting for such a variability in the incidence rate for a between-group comparison, we set the sample size of the present study at 500.

All statistical analyses were performed using the StatView 5.0 software package or the SAS program for Windows, release 9.2 (SAS Institute Inc, Cary, NC). Continuous variables are reported as the mean ± standard deviation. Continuous variables were compared using the Student *t*- test, and discrete variables were compared using the chi-square test or Fisher exact test.

Univariate and multivariate logistic regression analyses were performed to determine the significant predictors of operative mortality. The variables used for univariate analysis were the clinical variables listed in Table 1, in addition to female and male gender. Variables identified as having a *P* value of less than .1 on univariate analyses were considered for inclusion in the multivariate model.

Actuarial event-free survival curves were estimated by the Kaplan–Meier method. The log-rank test was used to assess differences in survival between groups.

Univariate and multivariate Cox proportional hazard analyses were performed to investigate the significant predictors of late mortality and reoperation. The variables compared in the univariate analysis are listed in Table 1. Variables with a *P* value less than .1 on univariate analyses were included in the multivariate model.

RESULTS

Early Outcomes

The operative data are listed in Table 2. TAR (19.2% vs 44.8%; $P < .0001$) and aortic root replacement (9.0% vs 19.7%; $P = .0010$) were performed less frequently in women than in men. Consequently, operation time (232.0 vs 273.4 minutes; $P < .0001$) and aortic crossclamp time (91.4 vs 118.0 minutes; $P < .0001$) were shorter for female