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Women Tend to Have the Ascending Aorta Involvement and the Rupture in Acute Aortic Dissection

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Abstract

Objective: Acute Aortic Dissection (AAD) is a highly lethal cardiovascular emergency. The ratio of female has increased in the ageing generation and gender-related differences in AAD might provide clinical implications on the management of AAD. The purpose of the present study was to evaluate current status of female patients with AAD.

Materials and Methods: We analyzed 235 consecutive AAD patients and divided all patients with AAD into two groups (109 male patients and 126 female patients) and compared their clinical features. Mean age of all patients was 72.3 ± 12.0 years.

Results: Women were older at initial diagnosis than men (mean ± SD age, 74.8 ± 10.6 years vs 69.4 ± 12.8 years; *P*=0.0005). The prevalence of type A was higher in female (65.9%) than in male (47.7%, P=0.005). Pericardial effusion (P=0.002), cardiac tamponade (P=0.001) and aortic rupture (P=0.04) were more common in women than in men. The involvement of the ascending aorta and the aortic rupture occurred more frequently in female patients with AAD than in male patients with AAD, and the number of female patients with AAD was not less than male.

Conclusion: We could suggest that ascending aorta was pathologically more fragile in aged women than in men.

Keywords: Acute Aortic Dissection; Aorta; Women; Gender

Introduction

Acute Aortic Dissection (AAD) is a highly lethal cardiovascular emergency [1]. In our ageing society, the number of elderly patients with AAD has been steadily increasing. The previous studies suggest an incidence of 2.6 to 3.5 cases per 100 000 person-years [2-4]. However, we wondered whether these data might not apply to ageing society in Japan. The ratio of female has increased in the ageing generation and gender-related differences in AAD might provide clinical implications on the management of AAD. In this study, we conducted an observational study to evaluate current status of female patients with AAD.

Materials and Methods

Patients

From January 2006 to December 2010, 287 patients with AAD were treated at our hospital. Patients with Marfan syndrome, iatrogenic dissection and prior aortic dissection were excluded. The remaining 235 patients were enrolled to this study. The diagnosis was confirmed by clinical and diagnostic evaluations consisting of combinations by imaging modalities such as Computed Tomography (CT), Magnetic Resonance Imaging (MRI), transthoracic/transesophageal echocardiography, direct visualization at surgery, or postmortem examination. We invited all patients with AAD into two groups (male and female) and compared their clinical features.

Data collection

We retrospectively reviewed the medical records of the patients. We collected clinical data, which included information on patient demographics, history, clinical presentation, imaging study results. Aortic dissection was defined as acute if chest pain or other related symptoms were present less than 14 days before admission. The 14-day period after the onset has been designated the acute phase, because

morbidity and mortality rates are highest and surviving patients typically stabilize during this time [5]. Type A aortic dissection was defined, according to the Stanford University classification, as involving the ascending aorta and/or aortic arch, progressing distally towards the descending thoracic aorta, differing from type B, involving only the descending thoracic aorta. Blood pressure on admission was recorded as shock or tamponade, hypotensive, normotensive and hypertensive when systolic blood pressure was <80 mmHg, 80–99 mmHg, 100–149 mmHg and >150 mmHg, respectively. Cardiac tamponade was defined as hypotension with pericardial fluid by echocardiographic or CT. Myocardial infarction defined myocardial ischemia with ECG change or reduced LV wall motion by echocardiography. Cerebral infarction/ischemia was confirmed by CT. Renal ischemia were demonstrated less opacification with contrast than another kidney. Mesenteric ischemia included ileus. Upper and lower limb ischemia included weakness of extremities, pain, pulse weakness or deficits and necrosis.

Statistical analysis

Data are expressed as mean ± SD or as proportions. Univariate analysis was performed on all clinical and demographical variables with χ^2 test and Fisher exact test used for categorical variables and Student *t* test used for continuous variables. A probability value <0.05

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was considered statistically significant. JMP6.0.3 (SAS Institute Inc) was used for statistics analysis.

Results

Mean age of all patients was 72.3 ± 12.0 years. Of the 235 patients in the database, 109 (46.4%) were men and 126 (53.8%) were women. Women were significantly older at initial diagnosis than men (mean ± SD age, 74.8 ± 10.6 years vs. 69.4 ± 12.8 years; P=0.0005). Whereas 52.6% of male with AAD were over 70 years old, 74.5% of female were in this age group (P<0.0001) (Table 1). TypeA dissection was identified in 57.4% of all patients. The prevalence of type A was significantly higher in female (65.9%) than in male (47.7%, P=0.005). A history of hypertension and ischemic heart disease was elicited in 75.7% and 12.3% of all patients, respectively.

The majority of patients complained of chest pain (48.5%) and back pain (54.9%) (Table 2). Abdominal pain was observed in 9.4% of patients and lumbago in 6.8%. Pain of Limbs was observed in 6.4% of all patients. Coma/altered consciousness were present in 9.4% of patients. Other atypical symptoms such as dyspnea and nausea were observed in 4.7% and 8.9%, respectively. Any pain was observed in 79.4%. Classic presentation with chest or back pain was similar in both group, but women were less likely to lumbago than men (P=0.01). Coma/altered

consciousness at the time of presentation were significantly more common in female than in male (P=0.01). Shock vital was significantly more frequent among female (P=0.02). Hypertension was more frequent in male (P=0.02).

As shown in table 3, pericardial effusion and cardiac tamponade on admission occurred in 31.9% and 14.5% of all patients. ECG evidence of new myocardial ischemia or infarction was observed in 3.8%. Aortic rupture/impending rupture occurred in 23.4%. Pericardial effusion (P=0.02), cardiac tamponade (P=0.001) and aortic rupture (P=0.04) were significantly more common in women than in female (Figure 1). In contrast, aortic regurgitation and ischemia of lower limbs were observed more frequently in men than in female (P=0.01, P=0.06).

Discussion

We investigated the differences in demographics, clinical characteristics of male and female patients with AAD. Although gender-related difference of acute coronary syndromes was well documented such information might be not available in patients with AAD in our ageing society [6]. The prevalence of type A was higher in female than in male. Coma/altered consciousness and shock vital at the time of presentation were more frequent in female than in male.

Type A was more frequent in female patients with AAD than in male patients with AAD. Of 1078 patients with AAD in the International Registry of Acute Aortic Dissection (IRAD), the ratio of type A versus type B dissection was approximately 2:1 in both genders, with 61.0% type a dissection in men and 65.9% in women [7]. Contrary to previously reported findings, the prevalence of women was higher than men in this study. Most important reason of the high prevalence of women in this study could be from the older age population. The

Category	Total n=235	Male n=109	Female n= 126	P
Age, mean (SD), y total	72.3 ± 12.0	69.4 ± 12.8	74.8+10.6	0.0005
Type A	73.2 ± 10.9	67.4 ± 11.7	77.0 ± 8.5	<.0001
Type B	71.0 ± 13.3	71.2 ± 13.5	70.9 ± 13.1	0.9259
History				
Hypertension	178	77(70.6%)	101(80.2%)	0.0896
IHD	29	16(14.7%)	13(10.3%)	0.3107
Classification				0.0050
Type A	135	52(47.7%)	83(65.9%)	
Type B	100	57(52.3%)	53(34.1%)	
IHD: Ischemic Heart Disease				

Table 1: Comparisons of the Patients characteristics Between Male and Female.

	Total	Male	Female	P
Manifestations (n)		109	126	
Chest pain or back pain	177	81(74.3%)	96(76.2%)	0.7391
Chest pain	114	58(53.2%)	56(44.4%)	0.1799
Back pain	129	56(51.4%)	73(57.9%)	0.3135
Abdominal pain	22	13(11.9%)	9(7.1%)	0.2093
Lumbago	16	12(11.0%)	4(3.2%)	0.0174
Pain of limbs	15	9(8.3%)	6(4.8%)	0.2744
Coma/altered consciousness	22	5(4.6%)	17(13.5%)	0.0194
Syncope	23	9(8.3%)	14(11.1%)	0.4627
Shock	14	5(4.6%)	9(7.1%)	0.4091
Dyspnea	11	7(6.4%)	4(3.2%)	0.2399
Nausea/vomiting	21	6(5.5%)	15(11.9%)	0.0863
Blood Pressure				
(SBP>150mmHg)n=	81	45(41.3%)	36(28.6%)	0.0282
(SBP 100–149 mmHg)n=	92	41(37.6%)	51(40.5%)	0.7551
(SBP<100 mmHg)n=	16	7(6.4%)	9(7.1%)	0.8635
Shock or tamponade (SBP<80 mmHg)n=	38	11(10.1%)	27(21.4%)	0.0222

Table 2: Comparisons of the Manifestations on admission Between Male and Female.

	Total	Male	Female	P
Pericardial effusion	75	24(22.2%)	51(41.2%)	0.0021
Cardiac tamponade	34	7(6.5%)	27(21.8%)	0.0010
AR(>moderate)	21	15(13.9%)	6(4.8%)	0.0149
Neurological deficit	29	11(10.2%)	18(10.2%)	0.3426
Myocardial ischemia	9	6(5.5%)	3(2.4%)	0.2134
Ischemia of lower limbs	16	11(10.1%)	5(4.0%)	0.0631
Paraplegia	2	0(0.0%)	2(1.6%)	
Renal ischemia	12	6(5.6%)	6(4.8%)	0.7838
Mesenteric ischemia	5	1(0.9%)	4(3.2%)	0.2318
Aortic rupture/impending rupture	55	19(17.4%)	36(28.6%)	0.0443

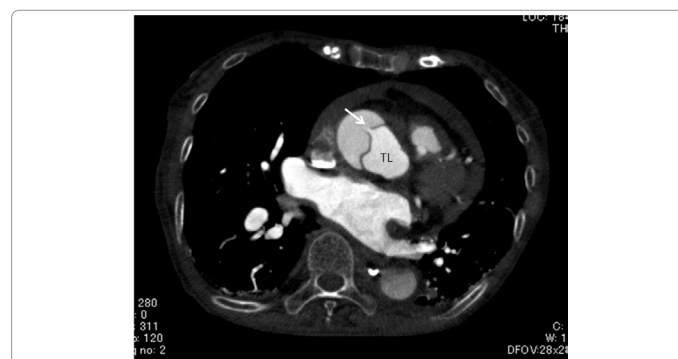**Table 3:** Comparisons of the Complications on admission Between Male and Female.

Figure 1: 78 years-old female. Contrast enhanced computed tomography scan demonstrating acute type A aortic dissection with intimal flap and an entry (arrow) in the ascending and cardiac tamponade. TL: true lumen.

mean age in this study was higher than the mean age of IRAD 62.4 ± 14.1 years] [7]. In fact, 50% of women with aortic dissection were 80 year of age or older. Whereas Raghupathy et al showed that patients from North America with Type A-AAD were more likely to be older than non-Caucasian patients from Europe [8]. The patients from Japan with type A-AAD were even older. Nienaber et al evaluated gender differences in AAD and showed that nearly twice as many women as men older than 70 years experienced an AAD [7]. Our results were consistent to remark that the prevalence of female patients was high in the elderly population.

A ninefold increased risk of type A aortic dissection in patients with Bicuspid Aortic Valve (BAV) has been reported in necropsy studies [9]. Although aortic regurgitation are associated with aortic dilation in patients with BAV, an intrinsic aortic wall pathologic finding appears to be responsible for aortic enlargement beyond that predicted by hemodynamic factors [10-12]. Kaji et al. reported that 85% of female patients with type-A AAD had an intimal tear in the proximal aorta and 69% of male patients with type-A AAD had a tear in the proximal aorta [13]. Grubb et al. mentioned a difference in presentation, management, and outcome for women with thoracic aortic disease although the mechanism has not been achieved completely [14]. Ailawadi et al. investigated the potential for a molecular gender difference and reported evidence that gender- related differences in AAA development might reflect an estrogen-mediated reduction in matrix metalloproteinase-9 production [15]. Considering the post-menopause period, estrogen may have some role in the high-age onset AAD in our aged population.

In this study, pericardial effusion and cardiac tamponade occurred more commonly among women. These were compatible with previous studies [7,16]. And moderate to severe aortic regurgitation was observed less frequently in women. It might associated that dissection originated from an intimal tear tended to extend into pericardium in women, while, a retrograde fashion into aortic valve tended to occur in men. The difference of aortic root pathology may have each impact on gender.

In this study, while the ratio of type A versus type B dissection was approximately 1:1 in men, the prevalence of type A dissection in women was high. There had been no report that the prevalence of type A dissection in female was higher than in male. Nienaber et al. showed that fewer women than men presented within 6 hours of symptom onset, and 40% of women waited more than 24 hours before first medical contact [7]. Dissection of ascending aorta could lead to lethal complications such as cardiac tamponade and obstruction of cerebral vessels. These evidences might lead to that not a few female patients or type A patients could die before presentation to the hospital.

This report is limited in several ways. First, this was a retrospective analysis of a single center. There were a few hospitals with cardiovascular surgery department in our region including a population of about 1.8 million. We guessed majority of patients with acute aortic dissection presented to our emergency department and were treated medically in other hospitals. Second, we studied only patients who were alive at the time of admission. Orihashi pointed that it should be noted that a larger number of patients die at the onset of acute type A aortic dissection [17]. Not a few patients with aortic dissection could die before presentation to the hospital or prior to diagnosis. We have data of 47 patients diagnosed AAD or ruptured aorta by autopsy imaging during 26 months. There might be some bias in the patients. We could suggest that an incidence of acute aortic dissection from previous studies might be underestimated in the ageing society.

Conclusion

The involvement of the ascending aorta and the aortic rupture occurred more frequently in female patients with AAD than in male patients with AAD. Gender could be a prognostic risk factor in AAD. In ageing society, the number of female patients with AAD was not less than male. We could suggest that ascending aorta was pathologically more fragile in women than in men and an incidence of AAD from previous studies could be underestimated in current ageing society.

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