Analysis of Acute Type A Aortic Dissection in Japan Registry of Aortic Dissection (JRAD)

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Background. **In 2011, the Japanese Registry of Acute Aortic Dissection (JRAD) was started in accordance with the model of the International Registration of Acute Aortic Dissection. The aim of this study was to report actual clinical early and midterm outcomes of treatment for acute type A aortic dissection in Japan.**

Methods. **Between 2011 and 2016, 1217 patients (67.9 years-old, 584 male, 241 >80 years old) who had acute type A aortic dissection within 14 days after the onset of symptoms were enrolled.**

Results. **Among 75% patients managed surgically, 68% underwent surgical procedure with cardiopulmonary bypass. Surgery was not indicated in 25% patients. Overall, 12% died in the hospital, 10.8% after surgical treatment and 16.6% after medical treatment. Multivariable analysis of in-hospital mortality revealed the following risk factors: age older than 80 years (odds ratio, 2.37; $P < .01$); shock vital status on arrival (odds ratio, 1.89; $P = .01$); disturbance of consciousness, including coma (odds ratio, 3.32; $P < .01$); and cardiac arrest, for which resuscitation was needed on arrival (odds ratio, 4.86; $P < .01$).**

Conclusions. **JRAD data revealed the actual clinical setting for the treatment of acute type A dissection in Japan. Early surgical results were favorable, with a low in-hospital morality rate, and midterm outcomes in selected medically treated patients were equivalent. Preoperative severe conditions, including shock, need for preoperative cardiopulmonary resuscitation, and disturbance of consciousness, as well as advanced age, were risk factors for in-hospital mortality even though the referral interval was brief.**

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Since the establishment of the International Registry of Acute Aortic Dissection (IRAD) in 2000,[1] many informative articles have been published on aortic dissection.[2-7] Advances in surgical strategies for treating acute type A aortic dissection (AAAD) have produced dramatic improvements in outcomes in the past 2 decades.[8]

We established the Japan Registry of All Aortic Disease (JROAD) database, which enrolled more than 30,000 patients, to investigate the quality index on the treatment for aortic dissection in Japan. Indeed, each hospital was evaluated and assigned to a grade using the quality index (high, intermediate, and low).[9] In 2011, a subgroup analysis of the JROAD, the Japanese Registry of Acute Aortic

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Dissection (JRAD), was started in accordance with the model of IRAD in only 16 high–management quality institutions.

Whereas the rate of in-hospital mortality reported by IRAD is 24.4% to 29.5%,[3,4] lower rates were reported by Japanese annual reports (approximately 11% to 12%).[10]

The aims of this study were to report actual clinical early and midterm outcomes of treatment for AAAD in Japan and to investigate characteristic and compatible findings rather than Western countries.

Patients and Methods

Institutions

A total of 16 referral centers all over Japan participate in the JRAD. All patients who had acute aortic dissection within 14 days after the onset of symptoms, beginning in January 2011, were enrolled in this study. Patients were identified for the study on the basis of presentation at 1 of the referral centers or through a search of hospital records and a database of surgical treatment and echocardiography, laboratory studies, and computed tomography. The diagnosis was made on the basis of history, imaging study findings, visualization at surgery, or postmortem examination.

Patients and Data Collection

Between 2011 and 2016, 1805 patients who had acute aortic dissection, including type A (n = 1217) and type B (n = 588), within 14 days after the onset of symptoms were registered in JRAD database. Of these patients, 1217 with AAAD were enrolled in this study. Physicians filled out a questionnaire concerning 162 major variables (1522 items) with standard definitions, including demographics, history, physical findings, management, imaging studies, and outcomes. These data were collected at each patient's presentation or obtained through physicians' review of hospital records and were forwarded to the JRAD coordinating center at the National Cerebral and Cardiovascular Center, Suita, Japan.

This retrospective observational study was approved by the Institutional Review Board of the National Cerebral and Cardiovascular Center (M22-052-9) and each institution.

Definitions

Inoperable status was defined as a patient's status that emergency surgery was not indicated for the patient with double-barrel type–dissection and a patent false lumen given the presence of conditions such as preoperative cardiopulmonary resuscitation, deep coma, and advanced age (>80 years old) with severe comorbidities.

Data Analysis

All statistical analyses were performed with JMP 13 software applications (SAS Institute Inc, Cary, NC). Nominal variables were evaluated with the Fisher exact test, whereas continuous variables were analyzed with the *t* test or the Mann-Whitney *U* test as appropriate. The logistic regression model was applied for multivariable analysis of in-hospital mortality. The Kaplan-Meier method and log-rank test were applied for patient survival. Statistical significance was represented by $P < .05$.

Results

Demographics and History

As of January 2011, 1217 patients with AAAD had been enrolled in this study (Table 1). The mean age of all patients was 67.9 years, and 584 (47.9%) of the patients were male. A total of 241 patients (19.8%) were 80 years old or older. A total of 827 patients (68.0%) initially presented to outside hospitals and were referred to JRAD centers for continued management. Of the patients referred to JRAD centers, 645 (53.0% of all patients) had received a definitive diagnosis established by contrast medium–enhanced computed tomographic angiography.

Table 1. Demographics and Histories of 1217 Patients With Acute Type A Aortic Dissection

Category	No. of Patients, N = 1217[a]
Demographics	
Age, y (mean ± SD)	67.9 ± 13.1
Age ≥80 y	241 (19.8)
Male sex	584 (47.9)
Referred from primary site to JRAD center	827 (68.0)
With contrast-enhanced CT data from referral hospital.	645 (53.0)
Median length of time from onset of symptoms to arrival at JRAD centers (min)	199 (range, 0 to 17,520)
Patient history	
Hypertension	769 (63.1)
Hyperlipidemia	170 (14.0)
Known aortic aneurysm	66 (5.4)
Prior aortic dissection	34 (2.8)
Diabetes mellitus	64 (5.3)
Chronic occlusive pulmonary disease	29 (2.3)
Chronic renal failure/undergoing hemodialysis	51 (4.2)/21 (1.7)
Ischemic heart disease	83 (6.8)
Bicuspid aortic valve	7 (0.6)
Cerebrovascular disease	104 (8.5)
Connective tissue disease	27 (2.2)
Marfan syndrome	24 (2.0)
Loeys-Dietz syndrome	3 (0.2)
Prior cardiac surgery	197 (16.3)
Cause of iatrogenic complications	9 (0.7)
Catheterization or PTCA	7 (0.5)
Cardiac surgery	2 (0.2)

[a]Values are n (%) unless otherwise indicated.

CT, computed tomographic; JRAD, Japanese Registry of Acute Aortic Dissection; PTCA, percutaneous transluminal coronary angioplasty.

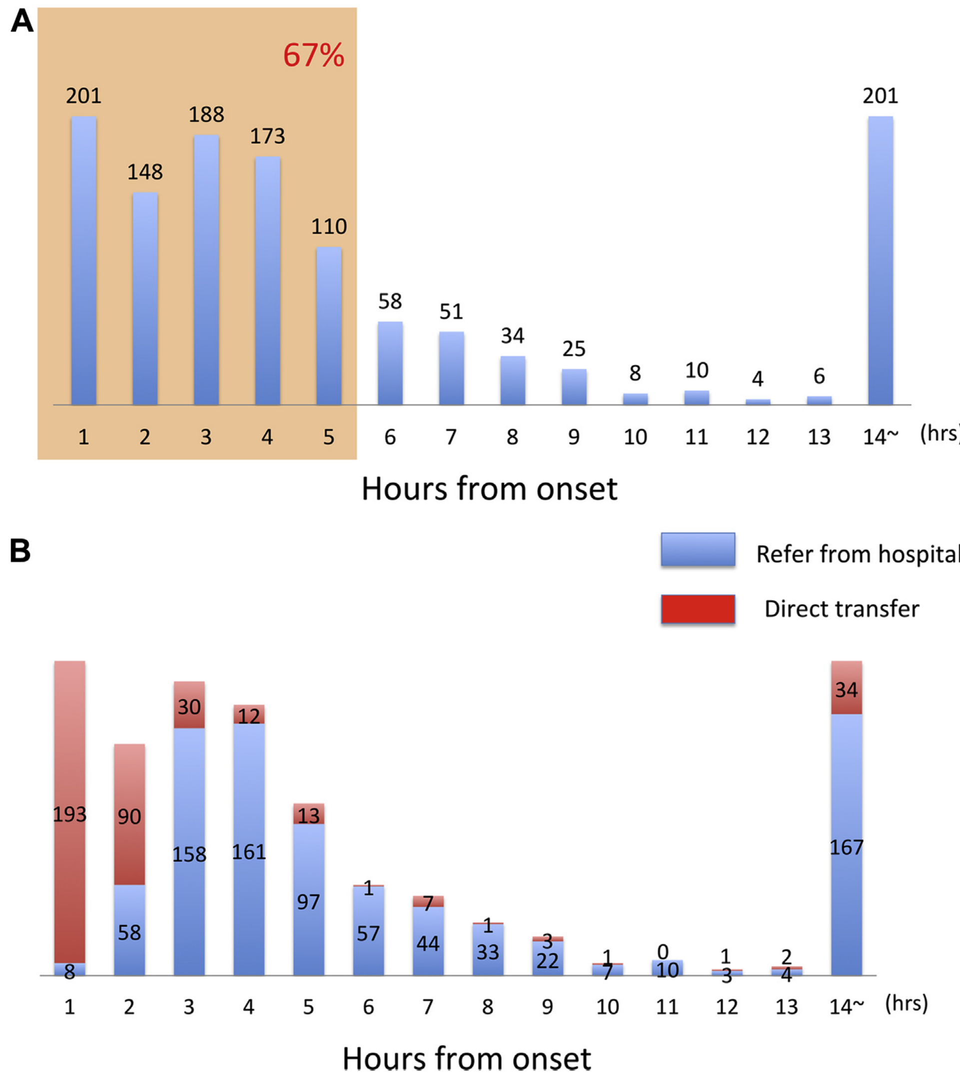


Figure 1. (A) Patient distribution for interval from onset to arrival at Japanese Registry of Acute Aortic Dissection (JRAD) centers. (B) Patient distribution for the interval from symptom onset to arrival at JRAD centers divided into transportation form.

The median referral interval from onset of symptoms to arrival at JRAD centers was 199 minutes (range, 0 to 17,520 minutes). The distribution of patients' times from onset to arrival to JRAD centers by hour is shown in Figure 1. Sixty-seven percent of all patients went to JRAD centers directly or were transported from hospitals within 6 hours from the onset of symptoms. Almost all patients transferred to JRAD hospitals (81.1%) arrived within 2 hours. A history of hypertension was elicited in 63.1% of patients, and Marfan syndrome was present in 2.2%.

Presenting Symptoms and Physical Examination

Severe pain was the most common presenting symptom (Table 2). Chest pain was most common (59.1%), followed by back pain (37.6%), even with type A dissection. Abdominal pain and lumber pain were the presenting symptoms in 5.5% and 3.5% of patients, respectively.

A total of 413 (33.9%) patients with AAAD had an initial systolic blood pressure lower than 100 mm Hg. Of those patients, 199 (16.3% of the total) presented in shock or with cardiac tamponade (systolic pressure lower than 80 mm Hg).

Neurologic deficits, including both permanent and temporary deficits, were observed in 10.0% patients.

Diagnostic Imaging

Chest roentgenograms were used to evaluate 920 patients (75.6%), and the most common finding was a widened mediastinum in 561 (61.0%) (Table 3). Electrocardiography was used to assess 1124 patients (92.3%) and showed no abnormality in 833 (74.1%) of them.

Diagnostic modalities included computed tomography and transesophageal or transthoracic echocardiography but not magnetic resonance imaging. On average, 2.67 modalities per patient were used in emergency situations.

Management

Of all patients with AAAD, 916 (75.2%) were managed surgically. Of these patients, 823 (67.6% of all patients)

Table 2. Presenting Symptoms and Physical Examination Findings in 1217 Patients With Acute Type A Aortic Dissection

Category	No. of Patients (%)
Presenting symptoms	
Pain reported	
Chest pain	720 (59.1)
Back pain	457 (37.6)
Abdominal pain	66 (5.5)
Lumber pain	43 (3.5)
Upper limb pain	11 (0.8)
Lower limb pain	33 (2.7)
Syncope	47 (3.8)
Loss of consciousness	160 (13.1)
Physical examination findings	
Hemodynamics	
Hypertensive (SBP > 140 mm Hg)	175 (14.3)
Normotensive (SBP 100 to 140 mm Hg)	575 (47.1)
Hypotensive (SBP ≤ 100 mm Hg)	413 (33.9)
Shock or tamponade (SBP ≤ 80 mm Hg)	199 (16.3)
Cardiac arrest, resuscitation needed	39 (3.2)
Not documented	54 (4.4)
Neurologic deficit	
Brain	122 (10)
Persistent	40 (3.3)
Temporary	82 (6.7)
Spinal	6 (0.5)
Complete	0
Incomplete	6 (0.5)

SBP, systolic blood pressure.

Table 3. Initial Diagnostic Imaging Results for 1217 Patients With Acute Type A Aortic Dissection

Category	No. of Patients (%)
Radiographic findings (n = 920)	920 (100)
No abnormalities noted	113 (12.3)
Widened mediastinum	561 (61.0)
Abnormal aortic contour	156 (17.0)
CTR >50%	574 (62.4)
Displacement or calcification of aorta	25 (2.7)
Pleural effusion	45 (5.4)
Electrocardiographic diagnosis (n = 1124)	1124 (100)
No abnormality noted	833 (74.1)
Any arrhythmia was noted	145 (12.9)
ST-segment change	198 (17.6)
Diagnostic modality (N = 1217)	
Computed tomography (taken by referral hospital or JRAD hospital)	1174 (96.5)
Echocardiography (TEE and TTE)	1037 (85.2)
TEE	167 (13.7)
TTE	992 (81.5)
Magnetic resonance imaging	0
Diagnostic modalities used per patient	2.67

CTR, cardiothoracic ratio; JRAD, Japanese Registry of Acute Aortic Dissection; TEE, transesophageal echocardiography; TTE, transthoracic echocardiography.

underwent surgery with cardiopulmonary bypass (Table 4).

Surgical procedures for the remaining 93 patients were miscellaneous, including extraanatomic arterial bypass to resolve the malperfusion syndrome or pericardial drainage for cardiac tamponade. In patients who underwent cardiopulmonary bypass, optimal surgical procedures were selected according to each institutional policy. Methods of cerebral protection were mainly divided into 2 strategies: isolated retrograde cerebral perfusion in 8.8% and isolated or combined antegrade selective cerebral perfusion in 90.6%. Isolated deep hypothermic circulatory arrest was selected only in 5 cases.

Aortic arch surgery was indicated for 43.5% of patients (partial arch replacement in 12.7% and total arch replacement in 30.8%). Concomitant procedures, including coronary artery bypass grafting, aortic valve replacement, and extraanatomic bypass, were carried out in a limited number of patients (5.5%, 2.1%, and 3.0%, respectively).

Surgery was not indicated in 301 patients (24.8%) (Table 5). In 123 patients (40.8%), indications for medical treatment were not documented, but 49 patients (16.3%) had inoperable conditions, 14 (4.7%) were of advanced age, 18 (6.0%) had comorbidities, and some patients refused treatment. In 129 other patients (42.8%), extremely stable condition, thrombosed false lumen with an ulcer-like projection, limited patency of a false lumen around the entry tear, and a completely thrombosed false lumen at the ascending aorta were reported.

The median length of hospital stay among surviving patients after both medical therapy and surgical treatment was 26 days (range, 1 to 492 days).

Early Outcomes

Overall, 141 patients (11.6%) died in the hospital: 10.8% after surgical treatment and 16.6% after medical treatment. The leading cause of death in surgically treated patients was the cerebral, including hypoxic encephalopathy and cerebral bleeding (Table 6). In contrast, in medically treated patients, bleeding from aortic rupture or redissection was the leading cause. In-hospital mortality did not differ significantly among JRAD hospitals.

The relationship between in-hospital mortality and the interval from symptom onset to arrival at JRAD centers (Figure 2) revealed that in patients who were transferred within 150 minutes, in-hospital mortality was higher than in patients who arrived at JRAD centers later than 150 minutes after symptom onset (16% vs 8.8%; $P < .01$).

The univariable and multivariable analyses of putative risk factors for in-hospital mortality (Table 7) revealed that age 80 years or older (odds ratio [OR], 2.37; $P < .01$], shock vital status on arrival (OR, 1.89; $P = .01$), disturbance of consciousness including coma (OR, 3.32; $P < .01$), and cardiac arrest for which resuscitation was needed on arrival (OR, 4.86; $P < .01$) were the risk factors by logistic regression multivariate analysis.

Table 4. Operative Procedures Using Cardiopulmonary Bypass and Variables

Procedure	No. of patients, N = 823[a]
Graft replacement	
Root (with or without ascending aorta)	63 (7.7)
Ascending aorta or hemiarch	422 (53.7)
Partial arch	103 (12.5)
Total arch	254 (30.8)
Concomitant procedures	
CABG	45 (5.5)
AVR	17 (2.1)
EAB to limb	25 (3.0)
Operative variables	
Operation time (mean ± SD) (min)	407 ± 165
Cardiopulmonary bypass time (mean ± SD) (min)	218 ± 102
Heart ischemic time (mean ± SD) (min)	149 ± 129
Selective cerebral perfusion time (mean ± SD) (min)	98 ± 67
Lower body circulatory arrest time (mean ± SD) (min)	57 ± 35
Lowest core temperature (mean ± SD) (°C)	24.3 ± 3.1
Cerebral protection	
Isolated deep hypothermic circulatory arrest	5 (0.06)
Isolated retrograde cerebral perfusion	72 (8.8)
Isolated antegrade selective cerebral perfusion	631 (76.7)
Combined cerebral perfusion (ASCP, RCP)	115 (14.0)
Lowest core temperature (mean ± SD) (°C)	24.3 ± 3.1

[a]Values are n (%) unless otherwise indicated.

ASCP, antegrade selective cerebral perfusion; AVR, aortic valve replacement; CABG, coronary artery bypass grafting; EAB, extraanatomic bypass; RCP, retrograde cerebral perfusion.

Table 5. Patient Demographics in Medically Treated Group

Category	No. of Patients, N = 301[a]
Demographics	
Mean age, y (± SD)	67.9 ± 12.5
Age ≥80 y	51 (16.9)
Male sex	146 (48.5)
History of previous cardiothoracic surgery	11 (3.6)
Physical examination	
Shock or tamponade (systolic blood pressure ≤80 mm Hg)	56 (18.4)
Cardiac arrest, resuscitation needed	10 (3.3)
Neurologic deficit	30 (10.0)
Brain	27 (8.9)
Persistent	13 (4.3)
Temporary	14 (4.4)
Spinal	3 (1.0)
Complete	1 (0.3)
Incomplete	2 (0.7)
Reason for medical treatment	
Inoperable condition	49 (16.3)
Advanced age	14 (4.7)
Cardiac arrest, resuscitation needed	6 (2.0)
Shock with severe comorbidities	18 (6.0)
Neurologic dysfunction	11 (3.7)
Extremely stable condition	129 (42.8)
Thrombosed false lumen with ulcer-like projection	36 (12.0)
Thrombosed false lumen at ascending aorta (similar to IMH)	93 (30.8)
Not specific reasons documented	123 (40.8)

[a]Values are n (%) unless otherwise indicated.

IMH, intramural hematoma.

Midterm Outcomes

Of 1217 patients, 1106 (90.8%) patients, including in-hospital deaths, were followed up for 18 months (range, 0 to 55 months). Overall survival rates in hospital survivors at 1 and 3 years were 95% and 93% after surgical treatment and 97% and 89% after medical treatment, respectively (Figure 3).

Comment

Acute aortic dissection has not been recognized as a common disease. However, in Japan, the need for thoracic aortic surgery has been gradually increasing; in particular, the incidence of surgery for AAAD has dramatically increased in recent years.[10] In response to the data reported by IRAD concerning successful treatment, JRAD was established in 2011 to report AAAD-related data in Japanese high-quality aortic centers.

Basic data in JRAD, including proportion of patients with shock status, percentage of patients undergoing surgical treatment, and age at onset, were similar to IRAD data. However, in this study, the predominant features in Japan differed in 4 aspects: (1) demographics, including more octogenarians (19.8% vs 6.7% in IRAD)[10]; (2) shorter referral interval (199 minutes [median]); (3) lower mortality (17% vs 50% in IRAD[8]) in patients who received medical therapy; and (4) a higher rate of total arch replacement (30.8% vs 12% in IRAD[3]) in patients who underwent surgery with cardiopulmonary bypass.

About the role of age in AAAD, IRAD documented that in-hospital mortality rates tended to be higher among the patients older than 70 years of age. [11] However, some investigators have achieved successful surgical outcomes in octogenarians with AAAD.[12,13] Especially in Japan, octogenarians with AAAD were already common, and several reports documented equivalent surgical outcomes compared with patients younger than 80 years of age.[12] Conversely, according to current JRAD data, age 80 years or older was a strong risk factor for in-hospital morality. Advanced age was still the major risk factor for in-hospital mortality even in top-level hospitals in Japan.

The short interval from the onset of symptoms to arrival at JRAD centers (median, 199 minutes) was 1 of the remarkable features of JRAD. This short time could reflect geographic and sociomedical factors such as size of land,

Table 6. In-Hospital Mortality Rates and Causes of Death

In-Hospital Mortality	Overall No., N = 1217, (%)	No. Patients Treated Surgically, n = 916 (%)	No. Patients Treated Medically (n = 301 (%)	*P* Value
Overall	141 (11.6)	91 (11.0)	50 (16.6)	…
Main causes of death				
Cerebral or cerebellar	31 (2.5)	24 (2.6)	7 (2.3)	.14
Cardiac	14 (1.2)	8 (0.9)	6 (2.0)	.57
Respiratory	12 (1.0)	7 (0.8)	5 (1.7)	.75
Renal	3 (0.2)	2 (0.2)	1 (0.3)	1
Liver	3 (0.2)	1 (0.1)	1 (0.3)	1
Bowel	11 (0.9)	8 (0.9)	3 (1.0)	.54
Rupture	18 (1.5)	9 (1.0)	9 (3.0)	.30
Infection	12 (1.0)	9 (1.0)	3 (1.0)	.33
MOF or others	37 (3.0)	23 (2.5)	14 (4.7)	.84

MOF, multiorgan failure.

quality of the emergency medical system, and high availability of computed tomography per inhabitants. According to the IRAD data, the interval from diagnosis to surgical intervention is 4.3 hours.[14] Simple comparison of intervals between IRAD and JRAD is difficult because the definition of interval is different.

IRAD investigated the estimated rate of in-hospital mortality after the onset of AAAD. The mortality rate tended to be higher within the first 24 hours after the onset of symptoms (the "hyperacute phase") than during the time after that period.[3] Early transfer of patients with AAAD to a high-quality aortic treatment center would allow early intervention within the hyperacute phase and lower the in-hospital mortality rate. In this study, however, the in-hospital mortality rate was higher among patients transferred faster because such patients tended to be those with severe conditions, including coma, cardiac arrest, and shock status. A short interval from the onset of symptoms to arrival at JRAD centers may have 2 possible effects: (1) early diagnosis and treatment for patients in unstable conditions improves prognosis; or (2) early transfer is related to patients' deterioration after

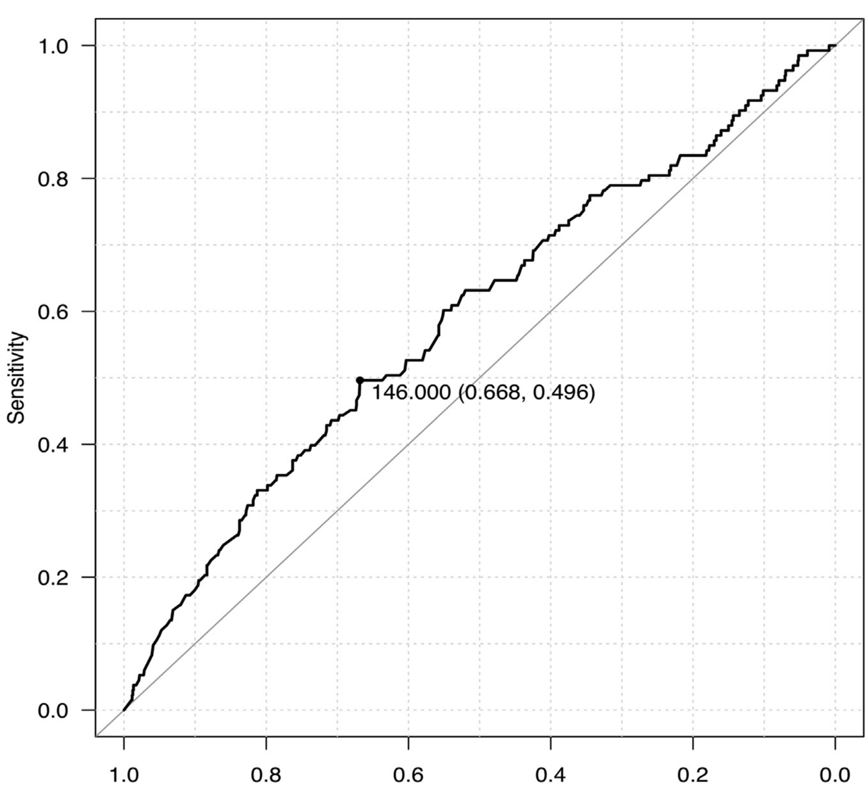


Figure 2. Receiver operating characteristic curve between in-hospital mortality and time interval from symptom onset to arrival at Japanese Registry of Acute Aortic Dissection centers.

Table 7. Univariable and Multivariable Analyses of In-Hospital Mortality

	Univariable		Multivariable	
Variable	*P*	OR (95% CI)	*P*	OR (95% CI)
Age ≥80, y	<.01	2.45 (1.63-–3.63)	<.01	2.37 (1.57-3.58)
Male sex	.46	0.88 (0.63-1.22)	…	…
Shock	<.01	3.68 (2.45-5.50)	.01	1.89 (1.12-3.18)
Preoperative CPR	<.01	12.8 (6.29-26.7)	<.01	4.86 (2.30-10.3)
Disturbance of consciousness	<.01	5.15 (3.43-7.70)	<.01	3.32 (2.12-5.18)
Pericardial effusion	<.01	2.33 (1.51-3.54)	.66	0.88 (0.52-1.50)
Connective tissue disease	.36	0.28 (0.01-1.79)	…	…
DeBakey type I	.69	1.09 (0.73-1.69)	…	…
Chronic kidney disease	.03	2.19 (0.99-4.48)	.15	1.744 (0.61-17.3)
COPD	1	0.88 (0.16-1.92)	…	…

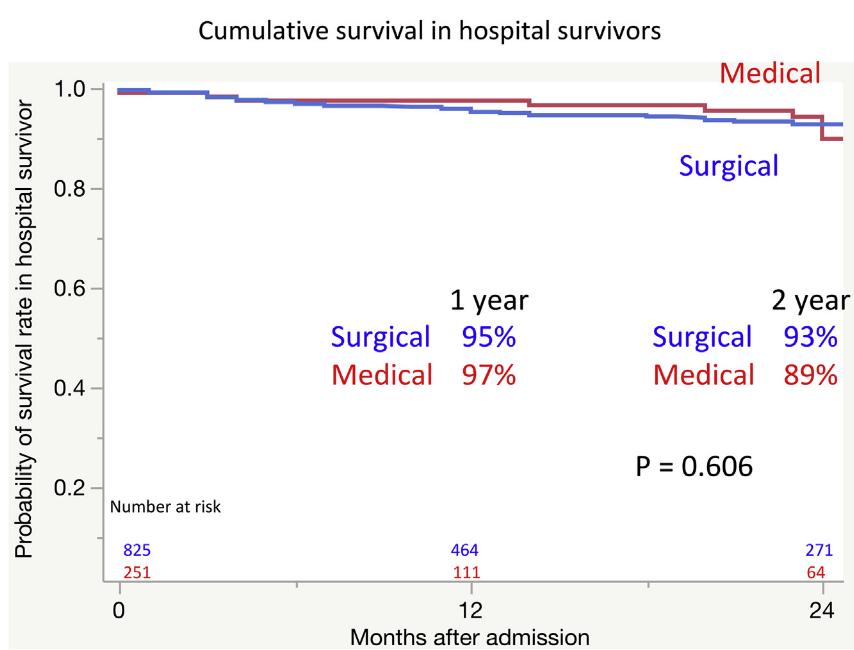
CI, confidence interval; COPD, chronic obstructive pulmonary disease; CPR, cardiopulmonary resuscitation; OR, odds ratio.

surgery. The JRAD data should be interpreted carefully because early transfer may not always produce better outcomes.

IRAD data revealed far higher in-hospital mortality rates among medically treated patients[1,3] than did current JRAD data (58% vs 17%). In IRAD data, medically treated patients included patients who could not undergo surgery because of advanced age, preoperative fatal conditions, patients' refusal of treatment, and patients with stable conditions such as intramural hematoma. However, the proportion of each category was not documented. In this study, patients who received medical therapy included those with inoperable conditions (16.3%) and those in stable condition (42.8%), which, for more than 70% of patients, were the reasons for medical treatment; for 40.8% of patients, the reasons were not documented. In subgroup analysis, in operable patients, the 1-year survival rate after symptom onset was 45% (Supplemental Figure 1), which seems equivalent to IRAD data. The JRAD study had no consistent protocol for the selection of medical therapy; selection bias was not completely eliminated, and this could have contributed to the lower in-hospital mortality in the medical treatment group.

Aoyama and colleagues[15] presented other data on patients with AAAD in Japan. Propensity-matched analysis revealed that the in-hospital mortality rate in medically treated patients was almost twice that in surgically treated patients. However, in this study, the proportion of patients at high-volume treatment centers accounted for

Figure 3. Probability of cumulative survival rates in hospital survivors divided into surgical and medical treatment groups.



10% of each group, a finding that was completely different from that in JRAD study. Simple comparison is difficult because of different backgrounds of the databases.

The present study was retrospective and observational. In addition, JRAD data were collected from the institutions with medical staff who were experts on treatment of aortic dissection and who could have contributed to the lower overall mortality. These several factors may be related to the discrepancy on mortality after medical treatment reported by IRAD or other groups.

IRAD data documented that 72% of patients with AAAD underwent surgery with cardiopulmonary bypass. This percentage was similar to that in JRAD data. However, the types of operation seemed to differ. In this study, 43.5% of patients underwent surgical repair of the aortic arch; these percentages were higher than those in IRAD data (eg, 30.8% vs 11.5%).[16]

The strategy of cerebral perfusion has been reported by several investigators[17-19] and may contribute to the relatively high numbers of aortic arch repairs performed using moderate hypothermia with antegrade cerebral perfusion. Actually, isolated or combined antegrade cerebral perfusion with moderate hypothermia was performed in as many as 90% of operations in JRAD centers. A simple comparison is not possible between IRAD and JRAD data concerning selection bias and the controversy about the indications of extended aortic arch repair in the emergency setting.

In IRAD, midterm outcomes were excellent in patients who underwent surgery, but the survival rate among medically treated patients was lower.[20] In JRAD, rates of survival among patients who underwent surgery were similar to survival rates in patients who underwent medical treatment. Rates of survival after in-hospital medical treatment were quite high. This finding may reflect the difference in study periods between IRAD and JRAD; 2 decades of medical advances and the proportion of patients with extremely stable conditions could have influenced the acceptable midterm outcomes in medically treated patients.

Study Limitations

The JRAD is an observational study, reflecting care at certain aortic centers, and the results cannot be generalized to all patients who undergo surgery in a given institution. In addition, no consistent criteria for selection of patients for medical treatment were established, and, eventually, selection bias cannot be eliminated in this study. Further studies are needed to address the optimal surgical approach for evaluating the predictors of short-term and long-term survival.

Conclusion

JRAD data revealed the actual clinical setting for the treatment of AAAD in Japan. Early surgical results were favorable, with a low in-hospital morality rate, and midterm outcomes in carefully selected medically treated patients were equivalent. Preoperative severe conditions, including shock, need for preoperative cardiopulmonary resuscitation, and disturbance of consciousness, as well as advanced age, were risk factors for in-hospital mortality even though the referral interval was brief.

Other than 9 of the authors' facilities, the following 7 facilities contributed to JRAD; (1) Sakakibara Heart Institute, Tokyo, Japan; (2) Department of Cardiovascular Surgery, Shizuoka City Shizuoka Hospital, Shizuoka, Japan; (3) Saiseikai Kumamoto Hospital, Kumamoto, Japan; (4) Department of Cardiovascular Surgery, Iwate Medical University, Morioka, Japan; (5) Department of Cardiovascular Surgery, Hokkaido University Graduate School of Medicine, Sapporo, Japan; (6) Department of Thoracic and Cardiovascular Surgery, Mie University Graduate School of Medicine, Tsu, Japan; and (7) Department of Thoracic and Cardiovascular Surgery, Keio University School of Medicine, Tokyo, Japan. Prof Ogino organized JRAD and is responsible for the data management. JRAD has been carried out as a part of the study; "The establishment of the index to visualize the evidence practice gap in acute aortic dissection", which was supported by Japan Agency for Medical Research and Development (19ek0210086h0003). The authors wish to thank Ms Yoko Sumida (data manager) and Dr Yoshihiro Miyamoto, Center for Cerebral and Cardiovascular Disease Information, National Cerebral Cardiovascular Center, Suita, Japan, for their support in the data collection for JRAD.

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