Outcomes of limited proximal aortic replacement for type A aortic dissection in octogenarians

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ABSTRACT

Objective: The number of older patients with acute aortic dissection type A (AAD [A]) is increasing as the population ages. We evaluated clinical outcomes for octogenarians with AAD (A) treated surgically at our hospital. Whenever possible, we limited the replacement site of the ascending aorta to the supracoronary and hemiarch.

Methods: Of 436 patients with AAD (A) seen in our hospital emergency room between April 2001 and August 2015, 90 were octogenarians. Surgery was performed using a simple cardiopulmonary bypass established through the right femoral artery and venous cannulation, and distal anastomosis was performed under deep hypothermic circulatory arrest at 20°C.

Results: Of the 90 octogenarians with AAD (A), 11 required cardiopulmonary resuscitation, 9 of whom died. Four patients with stable hemodynamics refused surgery. Thus, 77 were treated surgically. Of these 77 patients, isolated replacement of the ascending aorta or hemiarch was performed in 73 (94.8%), and total arch replacement in 4 (5.2%). Five patients (6.5%) died within 30 days, and 5 (6.5%) died in the hospital more than 30 days after surgery. Seven (9.1%) had a new stroke, 5 (6.5%) had pneumonia, and 4 (5.2%) had mediastinitis. Forty-four (57.1%) patients were discharged to their homes and 23 (30%) to rehabilitation hospitals. Three patients later required endovascular stent graft repair, which was successful in each case. The overall postoperative survival was 82%, 70%, and 62% at 1, 3, and 5 years, respectively.

Conclusions: Our results suggest that our limited replacement protocol for emergency AAD (A) surgery has early and midterm survival benefits for octogenarians. (J Thorac Cardiovasc Surg 2016;152:439-46)

Survival in octogenarians with acute aortic dissection repair.

Central Message

For type A acute aortic dissection, isolated replacement of the ascending aorta provides favorable results in octogenarians.

Perspective

We evaluated surgical outcomes for 77 octogenarians with type A acute aortic dissection (AAD [A]). Our surgical strategy, applied consistently for 14 years, is to limit the procedure to isolated replacement of the ascending aorta, between the supracoronary and the hemiarch, whenever possible. This strategy led to satisfactory outcomes in octogenarians with AAD (A).

See Editorial Commentary page 447.

The *World Population Ageing 2013* report¹ by the United Nations Department of Economic and Social Affairs showed that the population of octogenarians is increasing as a result of increases in life span and birth rate and that within the older population (aged 60 years or older), the proportion of persons 80 years or older increased from 7% in 1950 to 14% in 2013. In Japan, the number of people 80 years or older increased from 4.86 million in 2000 to 9.3

million in 2013.² Although this aging of the population reflects a trend toward longer and generally healthier lives, the prevalence of chronic and degenerative diseases at older ages also increases. Thus, the number of octogenarians referred for major aortic surgery has also increased.

Type A acute aortic dissection (AAD [A]) is a severe, life-threatening disease with high overall mortality when untreated.³ The surgical treatment of AAD (A) is challenging, especially in older patients. In octogenarians with AAD (A), postoperative mortality of 45.5% to 83.3% was reported between 2001 and 2009.⁴⁻⁸ Although a less

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Abbreviations and Acronyms

AAD (A)	= acute aortic dissection type A
ER	= emergency room
CT	= computed tomography
CPA	= cardiopulmonary arrest
CPR	= cardiopulmonary resuscitation
CABG	= coronary artery bypass grafting
AVR	= aortic valve replacement
TEVAR	= thoracic endovascular aortic repair

invasive surgical strategy may benefit elderly patients with AAD (A), it has not been determined whether a limited or extended aortic replacement site produces better surgical results. In addition, the procedures for managing perfusion, temperature, and protection of the brain during surgery for AAD (A) have not been established for octogenarians. Thus far, reports of surgical outcomes for AAD (A) in octogenarians have evaluated only small numbers of patients.^{9,10}

Here we report our institution's experience in treating octogenarians who were admitted to our hospital emergency room (ER) with AAD (A) during the past 14 years, including outcomes for our institutional strategy, which covers patient selection, the surgical procedure, and perfusion and temperature management.

METHODS

Patients

We retrospectively evaluated 436 consecutive patients, including 90 octogenarians, who were admitted through our ER and treated for AAD (A) from April 2001 to August 2015. This study reports outcomes for the 90 octogenarians.

Strategy for Selecting ER Patients for Surgery

All patients were diagnosed with AAD (A) by echocardiogram or enhanced computed tomography (CT), either at our hospital or at a previous hospital. Patients who arrived at the ER with cardiopulmonary arrest (CPA) received cardiopulmonary resuscitation (CPR) and were intubated, given catecholamine, and treated by subxiphoid pericardial drainage for pericardial effusion associated with pericardial tamponade as necessary.

For patients with CPA, emergency surgery for AAD (A) was performed only after successful CPR. In patients with stroke, surgery for AAD (A) was performed only after the patient recovered from the stroke. Informed consent was obtained before surgery. Our selection process and the number of patients selected are shown in Figure 1. Of 79 patients without CPA and 2 patients successfully treated by CPR after CPA, 4 (5.1%) rejected surgical treatment and 77 (94.9%) were treated surgically. The patients' clinical characteristics are summarized in Table 1.

Surgical Strategy

Extensive aortic surgery including the aortic arch or root surgery is determined according to an aortic-tear-based paradigm for patients younger than 80 years. However, for AAD (A) in octogenarians, our strategy is to limit the procedure to isolated replacement of the ascending aorta, between the supracoarony and the hemiarch, whenever possible. Total

FIGURE 1. Selection process and number of patients. ER, Emergency room; CPA, cardiopulmonary arrest; CPR, cardiopulmonary resuscitation.

arch replacement is performed only in patients with an arch aneurysm greater than 60 mm in diameter or a rupture of the aortic arch.

Intraoperative Monitoring

The right radial artery and left common femoral arteries were cannulated for continuous blood pressure monitoring and early warning of malperfusion. Temperature probes were placed to monitor the esophagopharyngeal and bladder temperatures, and near-infrared spectroscopy was used for neurovascular monitoring to assess cerebral perfusion.

Surgical Technique

Patients were placed on cardiopulmonary bypass, established with arterial return to the right common femoral artery, which was cannulated with a flexible arterial cannula, and venous drainage through the right atrium, which was cannulated with a venous cannula from the right femoral vein, and cooled to reach a bladder temperature of 20°C or a pharyngeal temperature of 16°C. While cooling the patient, we performed a median sternotomy and inserted a left ventricular vent tube and retrograde cardioplegia cannula. Systemic perfusion was discontinued when the patient reached a bladder temperature of 20°C or pharyngeal temperature of 16°C.

The ascending aorta was transversely resected, and the segment containing the intimal tear was replaced within the limit of the supracoarony ascending aorta to the hemiarch. If the intimal tear was located in the distal arch to the descending aorta, only the ascending aorta was replaced.

Distal anastomosis was performed at the base of the innominate artery between a 1-branched graft (Hemashield Platinum [Maquet Cardiovascular LLC, Wayne, NJ], J Graft Shield Neo [Japan Lifeline Co Ltd, Tokyo, Japan], or a Triplex graft [Terumo Co Ltd, Tokyo, Japan]) and the distal ascending aorta; anastomosis was performed within 30 minutes under an open distal condition without cerebral perfusion. After completing distal anastomosis, we began rewarming the patient by an arterial return through a 1-branch graft.

The ascending aorta was transected at the sinotubular level, and gelatin resorcin formalin glue or bio-glue (CryoLife Inc, Kennesaw, Ga) was applied between the 2 dissected walls of the aorta if the dissection extended to the sinus of Valsalva. Resuspension of the aortic valve and proximal anastomosis at this reconstructed sinotubular junction level were performed.

For the distal and proximal ascending aortic anastomosis, the surgeon chose adventitial inversion¹¹ or conventional reconstruction by reapproximating the dissected aortic layers with Teflon (Impra Inc, Tempe, Ariz) felt-strip reinforcement both inside and outside the aorta.

TABLE 1. Preoperative patient characteristics

Characteristic	Number (%) or median (range) (N = 77)
Age (y)	83 (80–89)
Men/women	18 (23)/59 (77)
Body mass index (kg/m ²)	20.8 (12.2–31.1)
Coronary artery disease	6 (7.8)
Old cerebrovascular disease	8 (10.4)
Low ejection fraction <35%	None
Renal failure (estimated glomerular filtration rate <30 mL/min/1.73 m ²)	5 (6.5)
Previous cardiac operation	1 (1.3)
Previous abdominal aortic aneurysm repair	7 (9.1)
Stigmata to Marfan syndrome	None
Annuloaortic ectasia/Valsalva sinus aneurysm	None
Aortic valve regurgitation > second degree	7 (9.1)
Aortic valve stenosis	1 (1.3)
Cardiopulmonary arrest	2 (2.6)
Shock (intubation or catecholamine administration)	9 (11.7)
Tamponade	28 (36.4)
Malperfusion syndrome	2 (2.6)
Entry in ascending aorta	48 (62.3)
DeBakey type I/II	60 (78)/17 (22)
Additive EuroSCORE	13 (11–20)
Logistic EuroSCORE (%)	42.3 (21.6–86.2)

When indicated, total arch replacement was performed by an elephant-trunk technique, an arch-first technique via a median sternotomy, or a clam-shell incision, at the surgeon's discretion.^{12,13} The aortic valve was replaced, if necessary, after distal aortic anastomosis. Associated coronary artery bypass grafting (CABG), if necessary, was performed after proximal aortic anastomosis.

Postoperative Mortality and Morbidity

A neurologic complication was defined as the presence of a new focal or global deficit, and was confirmed by CT or magnetic resonance imaging of the brain. Thirty-day mortality was defined as death within 30 days after surgery, whether the patient was still hospitalized or had been discharged. Hospital mortality was defined as death occurring during the initial hospitalization more than 30 days after surgery. Early postoperative adverse events were defined as 30-day mortality, hospital mortality, re-exploration for bleeding, neurologic complications, pneumonia, and mediastinitis.

Follow-up

All patients underwent a CT scan within 1 month after surgical intervention. All the living patients were then followed on an outpatient basis with annual serial CT scans or by telephone to evaluate their clinical status.

Statistical Analysis

Continuous and categorical variables are expressed as medians with ranges and as frequencies with percentages, respectively. In univariate analyses, continuous and categorical variables were compared using the Mann-Whitney *U* test and Fisher exact test, respectively. In multivariate analyses, logistic regression analysis was performed to identify risk factors for early postoperative adverse events, where variables with *P* values less than .2 in the univariate analyses were included. The following variables were examined: age, gender, CPA, shock, malperfusion, tamponade, aortic valve

regurgitation (greater than second degree), estimated glomerular filtration rate, old cerebrovascular disease, logistic EuroScores, entry site of aortic dissection, and total arch replacement. The results are shown as odds ratios, 95% confidence intervals, and *P* values. Survival curves were estimated using Kaplan-Meier methods and compared using the log-rank test. All tests were 2-sided, and statistical significance was set at .05. Statistical analyses were performed using JMP, version 7.0 (SAS Institute, Cary, NC).

RESULTS

Perioperative Results

The surgical procedures are summarized in Table 2. Following our surgical strategy, 73 (94.8%) patients were treated by isolated ascending aortic replacement, and 4 (5.2%) by total arch replacement. Aortic valve resuspension was performed in all patients except 1, who received an aortic valve replacement. Concomitant procedures were planned for only 2 patients; 1 surgery included CABG for severe isolated stenosis in the proximal left anterior descending coronary artery and the other included aortic valve replacement for severe aortic valve stenosis. Unplanned CABG with mitral annuloplasty was performed in 1 case after it became apparent that the patient could not be weaned from the cardiopulmonary bypass because of severe hypokinesis of the anterior septal part of the left ventricle and severe mitral regurgitation. Of the 4 patients treated by total arch replacement, 3 had an aortic arch aneurysm greater than 60 mm in diameter and 1 had an aortic arch rupture.

The right femoral artery was directly cannulated in 72 patients (98.6%) treated with an isolated ascending aorta replacement. Femoral artery cannulation was avoided in 1 patient because of a severely shaggy aorta. In 3 patients, the ascending aorta was also cannulated as a result of malperfusion when starting the cardiopulmonary bypass with an arterial return only from the right femoral artery cannulation. In all 4 patients with total arch replacement, both the femoral artery and the right axillary artery were initially cannulated. The right femoral vein was directly cannulated into the right atrium in 74 patients. Nine patients required additional venous cannulation into the superior vena cava because of inadequate venous drainage to the cardiopulmonary bypass. The right femoral vein could not be used in 3 patients, because of a tortuous configuration in 2 and an injury to the right iliac vein in 1.

Early Outcomes and Postoperative Complications

The 30-day mortality was 6.5% (5 patients). Two of these patients required percutaneous cardiopulmonary support during surgery: one had massive pulmonary bleeding and the other had an intraoperative myocardial infarction resulting in severe ventricular dysfunction. The hospital mortality was 6.5% (5 patients). Two of these patients died from rupture of the descending aorta beyond the carina level, on the fourth and eleventh postoperative day. Both patients had a descending aortic aneurysm greater than 50 mm in diameter with aortic dissection extending to the terminal

TABLE 2. Operative and postoperative characteristics

	Isolated ascending aorta/hemiarch (N = 73) (94.8%)	Total arch replacement (N = 4) (5.2%)
Associated procedure		
Aortic valve resuspension, n (%)	72 (98.6)	4 (100)
AVR, n (%)	1 (1.4)	None
CABG, n (%)	1 (1.4)	None
CABG + MAP, n (%)	1 (1.4)	None
Aortic root surgery	None	None
Arterial cannulation site		
FA only, n (%)	69 (94.5)	0
FA + ascending aorta, n (%)	3 (4.1)	0
Ascending aorta only, n (%)	1 (1.4)	0
Axillary artery + FA, n (%)	None	4 (100)
Venous cannulation site		
FV only, n (%)	63 (86.3)	2 (50)
FV + SVC or RA, n (%)	7 (9.6)	2 (50)
SVC + IVC, n (%)	3 (4.1)	0
Operation time (min), median (range)	294 (178–539)	488 (345–580)
CPB time (min), median (range)	172 (101–381)	239 (200–341)
Myocardial ischemic time (min), median (range)	89 (39–175)	114 (89–175)
Systemic CA time (min), median (range)	29 (16–45)	

Type of total arch replacement	Arch first (N = 3)	ET (N = 1)
Lowest body temperature (°C), median (range)	20 (19–21)	24
Systemic CA time (min), median (range)	22 (14–39)	0
SCP time (min), median (range)	42 (37–111)	96
Lower body CA time (min), median (range)	70 (68–115)	38

AVR, Aortic valve replacement; CABG, coronary artery bypass grafting; MAP, mitral annuloplasty; FA, femoral artery; FV, femoral vein; SVC, supra vena cava; RA, right atrium; IVC, inferior vena cava; CPB, cardiopulmonary bypass; CA, circulatory arrest; ET, elephant trunk; SCP, selective cerebral perfusion.

aorta. The location of entry in these patients was the ascending aorta and distal arch. Table 3 lists all causes of death.

Five patients (6.5%) had to be re-explored for bleeding, and a new stroke occurred in 7 patients (9.1%). Of 5 patients (6.5%) who developed pneumonia, there were 3 cases of 30-day or hospital mortality. Of 4 (5.2%) patients with mediastinitis, there was 1 case of 30-day or hospital mortality. The median hospital stay among surviving patients was 45 (18–474) days. Eighteen patients (23.4%) had a hospital stay of more than 90 days. Many of these patients had postoperative morbidities (mediastinitis 3, re-exploration 2, pneumoniae 1, and neurologic complications 5). Forty-four patients (57%) were discharged without any care. Of

TABLE 3. Early operative results

Characteristics	Number (%) (N = 77)
Early death (≤ 30 d)	5 (6.5)
Rupture (distal arch)	2
Pulmonary bleeding	1
Perioperative myocardial infection	1
Pneumonia	1
Hospital death (>30 d)	5 (6.5)
Pneumonia	2
Mediastinitis	1
Bowel ischemia	1
Low output syndrome	1
Morbidity	
Re-exploration for bleeding	5 (6.5) (2)*
Neurologic complications	7 (9.1) (1)*
Pneumonia	5 (6.5) (3)*
Mediastinitis	4 (5.2) (1)*
Extubation within 72 hours	38 (49.3)
Tracheostomy	8 (10.4)
Acute renal failure requiring new hemodialysis	2 (2.6)
Hospital stay >90 d	18 (23.4)
Home without other care	44 (57.1)
Rehabilitation hospital	23 (29.9)
Discharge to home from rehabilitation hospital	11 (14.3)

*Number of patients with 30-day or in-hospital death.

23 (30%) patients discharged to a rehabilitation hospital, 11 were later discharged to their home.

Analysis of Risk Factors for Adverse Events

The influence of patients' preoperative characteristics on early postoperative adverse events was examined. Multivariate analysis showed male gender and preoperative tamponade to be the only significant risk factors for postoperative adverse events (Table 4).

Additional Surgery Associated With Aortic Dissection

There were no cases of proximal redissection during the follow-up. Additional procedures associated with aortic dissection were performed with endovascular stent graft repair in 3 patients (Table 5); these procedures were successful in all cases. In 1 patient, thoracic endovascular aortic repair (TEVAR) was performed for sudden-onset malperfusion in the right lower extremity 16 days after the initial AAD (A) operation. Another patient required endovascular aortic repair for an abdominal aortic aneurysm 9 months after the initial AAD (A) operation. One patient required 2 debranching TEVARs for a distal arch aneurysm 27 months after the initial AAD (A) operation.

Late Survival

Table 5 shows the causes of late deaths. No deaths were known to be related to the aortic dissection, although 3

TABLE 4. Risk factors for early postoperative adverse events

Variables	Univariate analysis			Multivariate analysis		
	No adverse events (N = 55)	Adverse events (N = 22)	P value	Odds ratio	95% confidence interval	P value
Age (y)	83 (80–89)	84 (80–87)	.390			
Male	9 (16)	9 (41)	.0215	6.341	1.767–22.755	.0046
Cardiopulmonary arrest	2 (4)	0 (0)	1.000			
Shock	5 (9)	4 (18)	.2622			
Malperfusion	2 (4)	0 (0)	1.000			
Tamponade	14 (25)	14 (64)	.0017	6.206	1.835–20.992	.0033
Aortic valve regurgitation >2 degree	6 (11)	3 (14)	.7094			
Estimated glomerular filtration rate (mL/min/1.73 m ²), median (range)	58.4 (17.4–105)	55.1 (7.3–104)	.1713	1.003	0.9755–1.031	.8344
Old cerebrovascular disease	5 (9)	3 (14)	.4117			
EuroSCORE, % median (range)	40.6 (21.6–72.8)	43.1 (28.7–86.2)	.3283			
Entry in ascending aorta	34 (62)	14 (64)	.8818			
Total arch replace	2 (4)	2 (9)	.5735			

Values are number (%).

patients died of unknown causes. The first 6 late deaths occurred within 15 months after AAD (A) surgery; all 6 patients had been discharged to a rehabilitation hospital. The survival rates were 82%, 70%, and 62% at 1, 3, and 5 years, respectively (Figure 2). By gender, the survival rates for women were 85%, 74%, and 63% at 1, 3, and 5 years, and those for men were 71%, 57%, and 57% at 1, 3, and 5 years, respectively (Figure 2). The age at the time of surgery was similar for women (n = 59; age, 82.5 (80–87) years) and men (n = 18; age, 83.0 (80–89) years;

P = .28). Survival after surgery was slightly better for women than for men, but the difference did not reach statistical significance (P = .3155) (Figure 2).

DISCUSSION

This study shows that our surgical strategy for AAD (A) led to satisfactory outcomes in octogenarians. This strategy involves limiting the replacement area of the ascending aorta to the supracoronary and the hemiarch whenever possible.

TABLE 5. Additional aorta-related procedures and causes of late operative mortality

Age (y)	Sex	AAD operation	Diagnosis	Procedure	After initial operation (mo)
Additional aorta-related procedure					
80	F	Ascending aorta	Malperfusion (lower extremity)	TEVAR	0.5
83	F	Ascending aorta	AAA	EVAR	9
81	M	Ascending aorta	Arch aneurysm	2 debranching TEVAR	27.5
Age*	Sex	AAD operation†	Discharge after AAD operation	Cause of death	Survival after AAD operation (mo)
Cause of late mortality					
82	M	Ascending aorta	RH	Pneumonia	3.6
80	F	TAR	RH	Pneumonia	4.0
82	F	Ascending aorta	RH	Pneumonia	6.0
84	F	TAR	RH	Unknown	12.4
83	M	Ascending aorta	RH	Unknown	13.5
86	M	Ascending aorta	RH	Unknown	13.6
83	F	Ascending aorta	Home	Pneumonia	16.9
87	F	Ascending aorta	RH	Pneumonia	19.3
80	F	Ascending aorta	Home	Cerebral bleeding	20.7
86	F	Ascending aorta	Home	Aging	36.3
80	F	Ascending aorta	Home	Aging	40.1
86	F	Ascending aorta	Home	Pneumonia	70.3
84	F	Ascending aorta	RH	Aging	78.4

AAD, Acute aortic dissection; F, female; TEVAR, thoracic endovascular aortic repair; AAA, abdominal aortic aneurysm; EVAR, endovascular aortic repair; M, male; RH, rehabilitation hospital; TAR, total arch replacement. *Age at initial AAD (A) operation. †Types of initial operation of acute aortic dissection.

FIGURE 2. Survival rates after surgery for acute aortic dissection. A, Overall patient survival rate. B, Survival rate by gender. Although the age at the time of surgery was similar for women ($n = 59$; age, 83 years; range, 80–89 years) and men ($n = 18$; age, 82.5 years; range, 80–87 years; $P = .28$), women had a slightly better survival rate. However, the difference did not reach statistical significance ($P = .3155$). CI, Confidence interval; M, men; W, women.

Thirty-Day Mortality

Since 2001, several studies^{4–10,14,15} have reported outcomes for the surgical treatment of AAD (A) in octogenarians. Reports from 2001 to 2009 found unsatisfactory survival rates, ranging from 45.5% to 83.3%, for octogenarians after surgery for AAD (A), and significantly higher in-hospital mortality for octogenarians than for younger patients.^{4–7} Therefore, the surgical treatment for AAD (A) in octogenarians is controversial. However, since 2010, excellent surgical outcomes for AAD (A) have been reported even for octogenarians, with an in-hospital mortality of 0% to 3.7%.^{9,10} These reports cannot be compared strictly based on in-hospital mortality; other factors such as sample size, the number of patients who presented with CPA or declined surgery, and each patient's clinical status on admission to the ER can strongly affect surgical outcomes and survival.

Preoperative Patient Status

The preoperative clinical severity, including such factors as shock, CPA, or malperfusion syndrome, deeply affects

the morbidity and mortality after surgical treatment for AAD (A).^{16,17} El-Sayed Ahamed et al.¹⁵ reported a 30-day mortality of 26% in 39 octogenarians surgically treated for AAD (A); these patients included 7 cases (18%) of shock, 7 (18%) with malperfusion, and 2 (5%) with CPA. Tang et al.¹⁰ reported excellent surgical outcomes in 21 octogenarians with AAD (A); however, their report included only 2 cases (9.5%) of shock, 1 (4.8%) with malperfusion, and none with CPA. Following our strategy for octogenarians with AAD (A) in critical condition, we performed standard CPR and intubation, catecholamine administration, and subxiphoid pericardial drainage for pericardial effusion associated with pericardial tamponade, as necessary. Even when patients were in critical condition, we did not transport them to the operating room until they had recovered from CPA, and we did not operate without obtaining informed consent. Consequently, the percentage of high-severity cases was low, with only 9 patients (11.7%) with shock, 2 (2.6%) with malperfusion, and 2 (2.6%) with CPA recovery among the 77 patients who received surgical treatment; this probably contributed to our satisfactory surgical result outcomes.

Risk Factors for Early Postoperative Adverse Events

Malperfusion and CPA are known risk factors for postoperative adverse events after surgery for AAD (A).^{16,17} However, in our study, both univariate and multivariate analysis showed male gender and preoperative tamponade as the only significant risk factors for postoperative adverse events. This was probably because of the low percentage of high-severity cases, including those with CPA or malperfusion, resulting from our patient selection process.

Surgical Procedure in Octogenarians

In octogenarians, extensive surgical procedures for AAD (A) are associated with a high incidence of postoperative complications and considerable operative mortality.⁷ Generally, surgical procedures for AAD (A) are determined by both the extent of the dissection and the location of the entry tear.¹⁸ One study¹⁹ reported that 20% to 30% of AAD (A) cases required additional aortic arch repair according to 4 indications: the presence of an intimal tear in the arch, rupture of the arch, fragile tissue in the false lumen of the arch, or a fragmented false channel. Moreover, aortic root surgery, such as the bio-Bentall, David, or Yacoub technique, might be indicated when there are pathologic changes in the aortic valve or root.²⁰ In recent reports of AAD (A) in octogenarians, Ryłski and colleagues¹⁴ reported 8 patients (9.4%) who were treated by total arch replacement and 11 (13.3%) by aortic root surgery, with a 30-day mortality of 34.9%. El-Sayed Ahamed and colleagues¹⁵ reported 7 cases (18%) of total arch replacement and 8 (21%) of aortic root surgery, with a 30-day mortality of 26%. However, Hata and colleagues⁹ reported 27 AAD

(A) cases in which no patient underwent total arch replacement or aortic root surgery; their in-hospital mortality was 3.7%. Tang and colleagues¹⁰ also reported AAD (A) cases in which none was treated by total arch replacement and 1 (5%) by aortic root surgery, with no in-hospital deaths. Similarly, in our study, only 4 (5.2%) patients underwent total arch replacement and none was treated by aortic root surgery; the 30-day mortality was 6.5%. These results suggest that when treating octogenarians for AAD (A), techniques that limit the aortic replacement site to the isolated ascending aorta may contribute to early survival benefits.

Postoperative Aortic Events

Although extensive procedures such as total arch replacement or aortic root surgery are intended to promote aortic remodeling and to reduce late complications associated with a patent false lumen,^{18,20} some reports indicate that replacing the arch during AAD (A) repair increases surgical risks such as bleeding or cerebral complications.^{18,20-22} However, there are no data indicating whether a limited or extended surgical strategy provides better early, mid-, and long-term results in octogenarians. Our strategy is to perform the simplest possible limited replacement procedure in initial AAD (A) surgery. Although we had 2 cases of postoperative aortic rupture of the distal arch within 30 days after the initial surgery, the total 30-day mortality was only 6.5% (5 patients). Moreover, there were no proximal redissection cases. Only 3 patients required additional surgery related to the aortic dissection, and all 3 were successfully treated using endovascular techniques. Therefore, when treating octogenarians, a simpler, limited replacement procedure in the initial AAD (A) operation and endovascular techniques for treating later complications may improve both early and long-term outcomes.

Mid- and Long-Term Survival

When treating AAD (A), the postoperative quality of life is an important consideration, especially for octogenarians. Two reports^{9,10} quantitatively assessed octogenarian patients' postoperative quality of life using the RAND SF-36 health survey questionnaire and the Mini-Mental State Examination. Tang et al.¹⁰ reported that octogenarians who survived surgery did well emotionally and socially but had lower physical functioning scores than their younger counterparts. Although we did not quantitatively assess patients' postoperative quality of life, 44 patients (57%) were discharged without additional institutional care, and 11 of the 23 patients discharged to rehabilitative hospitals were later discharged to their home. Moreover, our study showed favorable overall survival rates after emergency surgery for AAD (A), with 82% surviving at 1 year and 62% at 5 years. The mean age of our surgery-treated patients was 83 years, and the predicted life expectancy of Japanese people at 83 years is 6.92 years for men and 9.36 years for women.²³ Thus, a

limited replacement surgical strategy may contribute to favorable midterm postoperative results in octogenarians.

Limitations

This study was conducted as a retrospective analysis of clinical experience over a 14-year period in a single suburban hospital in Japan. Japanese patients are more likely to have a lower body mass index than do Western patients, which may affect the frequency of operative comorbidities. We did not assess the octogenarian patients' postoperative quality of life quantitatively. We also did not perform a randomized comparison between isolated ascending aortic replacement and total arch replacement. Moreover, we did not perform randomized comparisons of surgical techniques with versus without cerebral perfusion, with deep versus moderate hypothermia, or use of an axillary versus femoral artery arterial cannulation site. The sample size was relatively small, although it is the second largest sample size among published studies of octogenarians with AAD (A).

CONCLUSIONS

Although more precise data are needed regarding the quality of life, long-term survival, and risk of an aortic event in octogenarians after the initial surgery for AAD (A), our surgical strategy for AAD (A) provided survival benefits for octogenarians. This strategy is to limit the replacement site of the ascending aorta to the supracoronary and the hemiarch whenever possible. Although our results do not deny the necessity of extensive surgery in some cases, such as total arch replacement or an aortic root operation, a meticulous patient selection strategy and simple limited replacement surgical procedures may improve the early and midterm results for octogenarians with AAD (A).

Conflict of Interest Statement

Authors have nothing to disclose with regard to commercial support.

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Key Words: aortic dissection, octogenarian, proximal aortic replacement

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