Should emergency surgical intervention be performed for an octogenarian with type A acute aortic dissection?

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Objective: The number of octogenarians undergoing emergency surgery is increasing and may negate the impact of the beneficial advances. The aim of this study was to review octogenarians with type A acute aortic dissection and assess the prognosis.

Methods: Fifty-eight patients with acute aortic dissection, whose average age was 83.2 years, were divided into 2 groups: Group I comprised 30 patients who underwent emergency surgery, and group II comprised 28 patients who were treated conservatively. We compared the 2 groups in terms of mortality and morbidity.

Results: In group I, postoperative hospital mortality was 13.3% (4 patients). In group II, 17 patients (60.7%) died in the hospital. In group I, although emergency aortic replacement was successfully completed, 5 patients became bedridden after surgery and 2 patients died of pneumonia or stroke in the early stages of institutional care. Thirteen patients in group I died of malignancies, abdominal aortic rupture, traffic accident, heart failure, or late-stage senility in later phase. There was no difference in actuarial survivals at 5 years, which were 48.5% in group I and 35.4% in group II.

Conclusion: Emergency surgery for octogenarians with acute aortic dissection showed acceptable mortality. However, families had to take responsibility for patients who experienced unconsciousness, had dementia, or became bedridden. It is important to have consensus between the family and surgeons about emergency surgical treatment for octogenarians.

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The mortality of emergency surgical intervention for type A acute aortic dissection (AAD) has been variously reported as 15% to 30%.¹⁻⁵ Recent advances in surgical techniques, anesthesia, and perioperative medical management are likely to have decreased the mortality of emergency operations during the last few years.^{6,7} On the other hand, in the recent aging society, the number of octogenarians undergoing emergency surgery for AAD has been steadily increasing, and this may negate the impact of the beneficial advances. It is therefore sometimes difficult to obtain consent from the patient and family. Although elderly patients may survive because of advances in surgical techniques, the patient's family may be severely stressed because of postoperative complications such as stroke, depression, or bedridden status. It therefore remains controversial whether emergency surgery for octogenarians with AAD is justified. However, information comparing surgical intervention with nonsurgical care of octogenarians with AAD is limited. The aim of this study was to review octogenarians with AAD and assess the prognosis.

Abbreviations and Acronyms

AAD = acute aortic dissection
 AR = aortic regurgitation
 CT = computed tomography

Materials and Methods

Between July 1995 and July 2006, 58 octogenarians with AAD were admitted to the Nihon University School of Medicine. Institutional review board approval was provided before publication of this article and reporting of the information. All patients were admitted to the intensive care unit. Thirty-eight patients (65.5%) were female, and the average age was 83.2 ± 3.4 years, ranging from 80 to 91 years. All patients had a history of hypertension. Contrast computed tomography (CT) was performed in all patients as soon as they were referred to the hospital. Transthoracic echocardiography was then performed to detect pericardial effusion and assess aortic regurgitation (AR) and cardiac function. Contrast CT revealed a thrombosed occlusion type condition in 19 patients (37.8%). Twenty-seven patients (46.6%) were in a preshock state as the result of cardiac tamponade. Eight patients (13.8%) had moderate AR, and there was a history of old cerebral infarction in 8 patients (13.8%). We divided them into 2 groups: Group I consisted of 30 patients undergoing emergency surgery, and group II consisted of 28 patients who were treated conservatively because the patient or family refused the surgery. Although the initial CT scan revealed a thrombosed occlusion, we recommended emergency surgical treatment. We explained to all patients or families that emergency surgery was indispensable to save the patient. The patients were transferred to the operating theater as soon as possible after informed consent was obtained. However, if the surgical treatment was denied, we treated the patients with intravenous antihypertensive medication and low doses of catecholamine. We kept the medically treated patients in the intensive care unit for 7 days even though no complications such as pneumonia or heart failure occurred. We compared the 2 groups in terms of in-hospital mortality within 30 days after surgery or after the onset and the long-term outcome.

Surgical Procedure

Cardiopulmonary bypass was implemented through femoral arterial cannulation. A 2-stage venous cannula was inserted into the right atrium, except for patients in preoperative shock (<60 mm Hg of systolic blood pressure). If a patient had evidence of shock caused by cardiac tamponade, femorofemoral circulatory assistance was initiated before the chest was opened. Deep hypothermic circulatory arrest and antegrade selective cerebral perfusion were used for cerebral protection until December of 2005. Each patient was cooled to 20°C (rectal temperature). The ascending aorta or aortic arch was then opened longitudinally under deep hypothermic circulatory arrest. The aortic segment containing the intimal tear was resected, and selective cerebral perfusion was established by introducing balloon cannulae into the 3 arch vessels. The aortic segment containing the intimal tear was resected, and gelatin-resorcin-formalin glue was applied between the 2 dissected walls

on both the distal and proximal stumps of the aorta. Antegrade systemic circulation was established through a side branch of the Dacron prosthesis after completion of the open distal anastomosis. Since January of 2006, we have used mild hypothermic arrest (28°C) without cerebral perfusion. The ascending aorta or aortic arch was then opened longitudinally under mild hypothermic arrest (28°C). Otherwise, we performed the previous method. In 2 patients undergoing this method, open distal anastomosis was completed within 20 minutes without any cerebral perfusion.

The mean duration of follow-up was 28.3 months, ranging from 1 to 124 months. Follow-up information was obtained for all patients because surgeons looked after the patients in our outpatient clinic. For parametric data, the results are expressed as the mean $\pm$ standard deviation. Statistical calculations were undertaken with StatView (SAS Inc, Cary, NC). By using parametric and non-parametric data, statistically significant differences were determined using the Student *t* test and Fisher exact test, respectively. The predictors of surgical mortality were examined using the univariate analysis with the chi-square test from 9 parameters, such as sex, thrombosed occlusion type, cardiac tamponade, moderate AR, preoperative minor stroke, preoperative cardiopulmonary resuscitation, delayed surgery (>24 hours), extended total arch replacement, and reexploration for bleeding. The actuarial survival was calculated using the Kaplan–Meier method.

Results

There was no difference between the groups in terms of age, sex, incidence of thrombosed occlusion, AR, cardiac tamponade, and cerebral infarction (Table 1). In group I, 1 patient underwent pericardial drainage before surgery and 29 patients underwent ascending to proximal hemiarch replacement. Total arch replacement was required in 1 patient. Postoperative hospital mortality was 13.3% (4 patients). Postoperative echocardiography showed trivial AR in 4 patients with preoperative moderate AR. Univariate analysis showed that delayed surgery ($P = .0138$) and preoperative cardiopulmonary resuscitation ($P = .0138$) were associated with surgical mortality. Seventeen patients (60.7%) in group II died in the hospital, significantly more than in group I ($P = .0003$, Table 2). Of these 17 patients, 15 died within 24 hours after onset of the condition and 2 died of heart failure and

TABLE 1. Patient Profiles

	Group I	Group II	
Age (year)	83.1 ± 2.5	84.3 ± 3.8	NS
Sex (male/female)	20/10	18/10	NS
Occlusion Type (case)	9 (30%)	10 (35.7%)	NS
Moderate AR (case)	4 (13.3%)	4 (13.3%)	NS
Cardiac Tamponade (case)	14 (46.7%)	13 (46.4%)	NS
Cerebral Infarction (case)	4 (13.3%)	4 (22.2%)	NS

NS, Not Significant.

TABLE 2. In-hospital Outcome

	Group I	Group II	
Mortality (case)	4 (13.3%)	17 (60.7%)	$P = 0.0003$
Bedridden (case)	5 (16.7%)	2 (7.1%)	NS
Family claim (case)	5 (16.7%)	0	NS

NS, Not Significant.

pneumonia 7 days after onset. No patients underwent pericardial drainage because the consent could not be obtained. In group II, 10 of 11 survivors presented a thrombosed occlusion, but 2 of them were also in a state of shock caused by cardiac tamponade. Those 2 patients' conditions were complicated by pneumonia and heart failure, and they required a mechanical ventilator, and the other 2 patients became bedridden (Table 2). In group I, although the emergency aortic replacement was successfully completed, 5 patients became bedridden because of cerebral damage or severe depression after surgery, and 2 of those patients died of pneumonia or stroke 3 months after surgery in a care institution where nursing care, such as feeding and changing diapers, was provided (Table 2). A preoperative history of old cerebral infarction did not affect the postoperative neurologic outcome. In 4 operative death cases, the family expressed their appreciation, but in 5 cases in which the patient survived and was subsequently bedridden, the families voiced their complaints and refused to pay for treatment. On the other hand, no family in group II made such claims (Table 2). Thirteen patients in group I died of malignancy, abdominal aortic rupture, traffic accident, heart failure, or late-stage senility (Table 3). Of the 11 survivors in group I, dementia developed in 5 patients and late life depression developed in 2 patients (Table 4). In group II, 1 patient died of pneumonia 3 months after onset and 1 patient died of a cerebral infarction 16 months after onset (Table 3). Of the 9 survivors in group II, dementia developed in 3 patients and depression developed in 1 patient (Table 4). There was no difference in actuarial survivals at 5 years, which were 48.5% in group I and 35.4% in group II (Figure 1).

TABLE 3. Late Death

	Group I	Group II
Total case	13 patients	2 patients
Cerebral infarction	1	1
Malignancy	2	
Abdominal aortic rupture	2	
Pneumonia	2	1
Heart failure	1	
Traffic accident	1	
Senility	4	

TABLE 4. Quality of Life for survivors

	Group I	Group II	
Dementia (case)	5 (45.5%)	3 (30%)	NS
Depression (case)	2 (18.2%)	1 (11.1%)	NS

NS, Not Significant.

Discussion

With the ever-increasing human lifespan, cardiovascular surgeons are faced with treating an increasing number of elderly patients. The efficacy of emergency surgical intervention for AAD is well accepted, but its role in the treatment of octogenarians with AAD remains unclear. Surgical mortality and morbidity rates are especially high in the elderly compared with younger patients.^{2,3,8,9} Therefore, controversy still exists as to whether surgical intervention should be avoided in elderly patients who have little chance of survival. In the present study, emergency surgery was recommended as soon as possible for all patients unless the patient or patient's family refused the surgery, even though the patient presented with a thrombosed occlusion. In this series, cardiac tamponade developed at the time of surgery in 2 of 7 patients (28.6%) in group I who had a thrombosed occlusion-type condition without hemopericardium in the initial CT finding. In these cases, approximately 400 mL of blood and hematoma were actually presented at the time of surgery. In group II, 10 patients with thrombosed occlusion-type condition survived, but 2 patients (25%) were in a state of shock because of cardiac tamponade. Those 2 patients' conditions were complicated by pneumonia and heart failure, and they required mechanical ventilator. Although the patients survived, dementia and depression developed in 4 patients as the result of bed-rest management. Therefore, it is considered that the thrombosed type is not associated with long-term patients' quality of life. Although CT or echocardiography scans on admission did not show any

Figure 1. Actuarial survival curves. There was no difference in actuarial survivals at 5 years: 48.5% in group I (upper line) and 35.4% in group II (lower line) ($P = .128$).

pericardial effusion, blood oozing may have developed gradually. Therefore, even though an initial CT scan may reveal a thrombosed occlusion-type condition, emergency surgery is recommended even for octogenarians.

In the present study, 4 patients (13%) in group I died after surgery. This hospital mortality rate was low compared with previous studies^{3,10} of elderly patients with AAD. In group I, 28 patients (93.3%) underwent emergency surgery within 24 hours of onset. Earlier referral to the operative theater has been improving surgical results before dissection-related complications become irreversible. In 2 of 4 operative death cases, the local physician actually referred the patient to our unit more than 24 hours after onset. At that time, the patients' conditions were already complicated by renal failure and severe coagulopathy before surgery. The other 2 patients required cardiopulmonary resuscitation just before the chest was opened. In fact, these 2 factors were associated with surgical mortality. On the other hand, 15 of 17 group II hospital deaths occurred within 24 hours after onset. In particular, 9 of these 15 patients died within 6 hours. If the patients' families hesitated to go ahead with surgery, the patients died. Therefore, even though the patient may be elderly, performing surgery as soon as possible is considered to be a key factor of success.

In the present study, all patients underwent femoral cannulation because it was considered quicker and safer.¹¹ In particular, if the patient had pulseless shock state, we could establish the femorofemoral cardiopulmonary bypass under cardiopulmonary resuscitation. In this series, no patient had malperfusion by femoral access. However, antegrade blood perfusion should be switched with the side arm to ensure blood perfusion in the true lumen after excision of the intimal tear. In all patients, we used side-arm prosthesis for blood perfusion after the open distal anastomosis.

Elderly patients are a high-risk group for neurologic complications, and sometimes dementia also develops in the elderly even though the surgery is successful. This is another issue for emergency surgery on octogenarians. Most Asian people usually have to look after an elderly parent. If patients are completely bedridden, the family must continuously look after them. Therefore, in this era of diminishing economic resources for health care, it is still controversial whether such expensive surgery should be offered to elderly patients.¹² In the present study, 5 patients became bedridden as the result of cerebral damage or severe depression after surgery even though emergency aortic replacement was successfully completed. In the present study, although the patient died on the operating table, the patient's family was satisfied that they had not elected to go ahead with the surgery and expressed their appreciation. However, if the patient had complications such as cerebral damage, depression, pneumonia, or renal failure and ultimately became bedridden, the family had significant mental, physical, and economic stress. In 5 cases in which the patient survived the surgery but subsequently became bed-

ridden, the family voiced their complaints about their situation and refused payment. On the other hand, in nonoperative death cases in which the family elected not to authorize emergency surgery, the family accepted the patient's death. In 5 postoperative bedridden cases, 2 patients died of pneumonia and stroke in the early stage of institutional care after surgery. Both patients experienced severe depressive state complications and did not walk, eat, or drink. Finally, dehydration developed, with the subsequent complications. Emergency surgery and age more than 70 years were found to be significant predictors for postoperative depression.¹³ Therefore, it is important to maintain mental support for elderly patients undergoing emergency surgery. On the other hand, dementia developed in 5 patients in group I and 3 patients in group II during the follow-up stage. This is not surprising. Although elderly patients have been doing well in the outpatient clinic, they could not come to the hospital themselves. Therefore, regardless of whether an octogenarian undergoes surgery, after care provided by the family is important.

In the present study, there was no difference in actuarial survivals at 5 years, which were 48.5% in group I and 35.4% in group II. These results were comparable to previous reports describing 5-year survivals of 50% to 80% in all age groups with AAD.^{2,4,14} The in-hospital survival for octogenarians with AAD was definitely better when emergency surgical treatment was provided compared with nonsurgical treatment. However, significant improvement in long-term mortality is considered difficult because the older age of the patient includes physiologic and pathologic factors related to the normal degenerative process of senescence. Furthermore, impaired autonomy or bedridden status after emergency surgery is another concern, and therefore fully informed consent that describes the prognosis after emergency surgery is mandatory for aggressive surgical treatment for octogenarians with AAD.

Conclusions

Emergency surgery for octogenarians with AAD showed acceptable mortality. However, postoperative patient quality of life was not completely satisfactory for the family of the patient. Some families had to take responsibility for patients who experienced unconsciousness, had dementia, or became bedridden. It is important to reach a consensus between the family and the surgeons on emergency surgical treatment for octogenarians.

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