Acute Aortic Dissection: Experience
in Yamagata Prefecture in 2000

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ABSTRACT

Objective: Prefectural clinico‐epidemiological survey of acute aortic dissection has not been widely carried out.

Methods: We collected data of all patients with acute aortic dissection in Yamagata Prefecture, and retrospectively reviewed their primary treatments throughout 2000.

Results: There were 71 patients with an acute aortic dissection and an incidence calculated from this number was 5.7 per 100,000 people per year. Patient's age was 23-92(69+14) years. Male and female ratio was 44/27. Stanford type A aortic dissection was 35 patients and B 35. Complications of acute aortic dissection were shock in 12, cardiac tamponade in 16, rupture in 5, abdominal ischemia in 8, limb ischemia in 6 and brain infarction in 2. Two patients were in cardiac pulmonary arrest on arrival. Overall in-hospital mortality was 13%, except for 2 patients. In Stanford A type aortic dissection, surgery was done in 21 and mortality was 9.5%; among those not receiving surgery mortality was 29%. In Stanford type B aortic dissection, death occurred in 2 patients out of 5 after emergency operation, and no putients out of 30 who were medically treated.

Conclusion: Incidence of acute aortic dissection calculated from this survey was 5.7 per 100,000 people per year in Yamagata Prefecture. Seven of 71 (10%) died in the acute phase. Operative mortality for Stanford type A aortic dissection was 9.5%, while that of medical management was 29%. Operative mortality for Stanford type B aortic dissection was high, but medical treatment had no mortality. More aggressive treatment would improve initial results of acute aortic dissection.

Key words　acute aortic dissection, incidence, mortality, Yamagata

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INTRODUCTION

The population of elderly people is rapidly increasing with time in Japan, and the population of those 65 years of age or greater reached 23.3% of the general population in Yamagata Prefecture in 2000. This may suggest that an incidence of the acute aortic dissection would increase with time. Though it has been well documented how patients with acute aortic dissection were treated after hospitalization in big institutes[1], there is scant information about of regional clinico-epidermiological surveys of the acute aortic dissection. There are steep mountains between Yamagata Prefecture and all neighboring prefectures, and emergenay patients in Yamagata Prefecture always visited or were referred to the local hospitals in Yamagata Prefecture. We, therefore, investigated all the patients who arrived at the hospitals and had a diagnosis of an acute aortic dissection in Yamagata Prefecture throughout 2000 and reviewed the results.

MATERIALS AND METHODS

All patients who arrived at or were transferred to almost all hospitals in Yamagata Prefecture throughout 2000 and were diagnosed as an acute aortic dissection within 14 day after the onset were retrospectively registered in this study. We sent a registration form to 32 hospitals in Yamagata Prefecture that actually faced emergency patients and all data were obtained from 30 (94%) of the 32 hospitals. These included all emergency care units in Yamagata Prefecture. The diagnosis was made dominantly by computed tomographic (CT) scan or operation with anamne-

sis. Patients with rupture of chronic aortic dissection or aortic rupture were excluded from this study. Therefore, diagnosis of the acute aortic dissection was confirmed at least by CT scan.

The number of patients, time interval from onset to arrival at the hospitals, symptoms and complications of aortic dissection were investigated. Size of the aorta and anatomical classifications (Fig.1) were determined from CT scan or operative findings. As anatomical classification, Stanford type A and B, and DeBakey classification were used. Stanford type A aortic dissection included any aortic dissection involving ascending aorta, and type B did not involve ascending and aortic arch. DeBakey type 1 included aortic dissection from the ascending aorta to the descending thoracic aorta, type 2 aortic dissection including only ascending aorta, and type 3 was the same as Stanford type B. Patients' survivals were evaluated according to anatomical classification, complications, or surgical or medical management. When the patient underwent surgery, indication of operation, operative methods and operative results were registered.

RESULTS

A total of 71 patients were diagnosed to have an acute dissection of the aorta, indicating an incidence calculated from the above number of at least 5.7 per 100,000 people per year in Yamagata Prefecture. There were 44 men and 27 women. Patients' ages at the time of arrival were 23-92 (69+14) years. Forty-one patients (58%) were more than seventy years of age (Fig.2). Time interval from onset to arrival at the hospital was from within 30 minutes to 14 days, and 47 (66%) arrived at hospital within 6

Sanford type   A   A   B
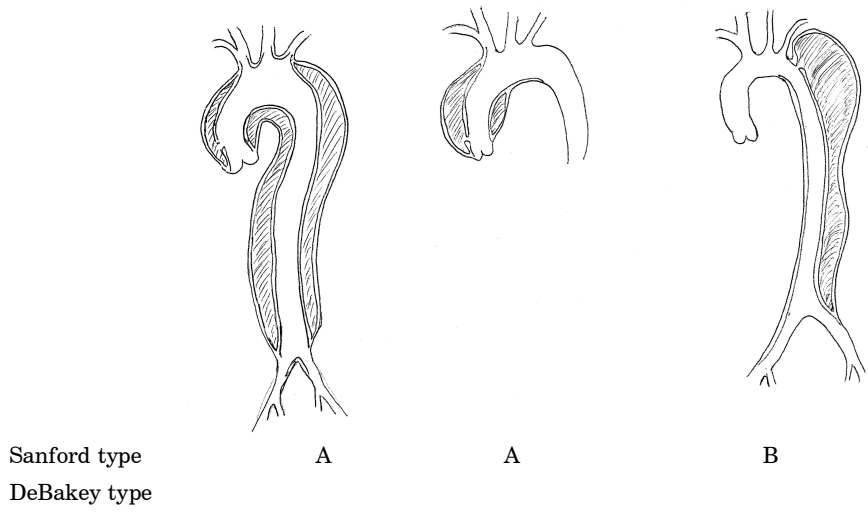DeBakey type

Fig. 1. Anatomical classifications
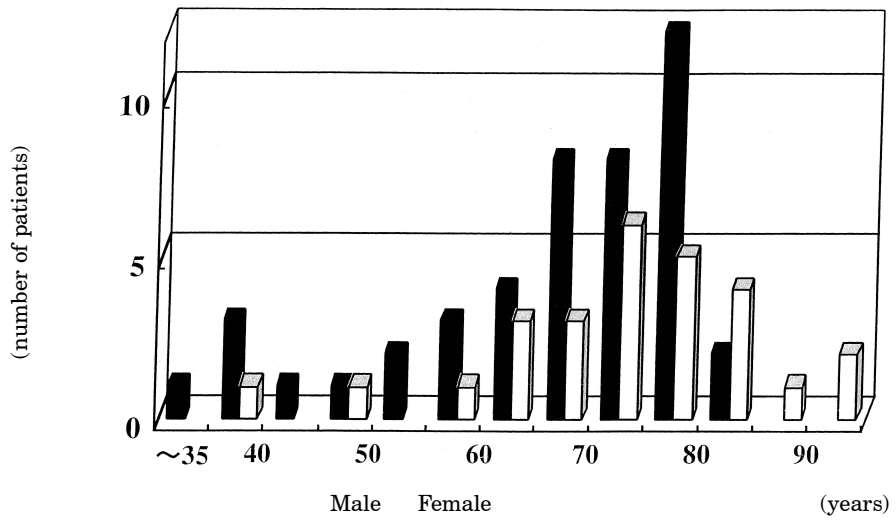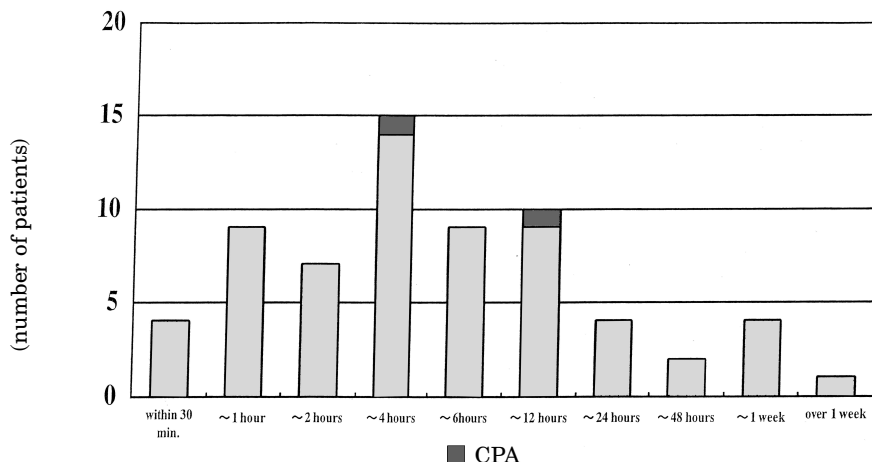Scheme of anatomical classifications of aortic dissection

Fig. 2. Age distribution

Fig.3. Time interval between onset and arrival

Table 1　Symptoms and CT findings of acute aortic dissection

	Type A (n=35)	Type B (n=35)
chest　back pain	31(89%)	33(92%)
syncope	8(23%)	0(0%)
abdominal pain	2(6%)	8(23%)
general fatigue	1(3%)	0(0%)
size of the aorta(mm)	35　60(49± 6)	30　85(45± 11)
thrombosed false lumen	13(37%)	20(57%)

hours after onset (Fig.3). There was no Marfan patient. The underlined diseases were hypertension in 61 (86%), hyperlipidemia in 6 (8%), and diabetes mellitus in 2 (3%). The associated diseases were coronary artery disease in 8 (11%), and cerebrovascular disease in 7 (10%). Primary symptom was back pain in 64 (90%), syncope in 8 (11%), abdominal pain in 9 (13%) and general fatigue in 1 (1%)(Table 1).

It was possible to classify the anatomy of the dissection in 70 patients, and it was impossible in one who was dead at arrival. Stanford A type aortic dissection was found in 35 patients (49%), and B type was in 35 (49%). DeBakey type 1 was 26 (37%), type II 3 (4%), and type

III 41 (58%). Complications of Stanford A type aortic dissection were shock in 12 (34%), cardiac tamponade in 16 (46%), aortic regurgitation in 13 (37%), aortic rupture in 4 (11%), myocardial infarction in 2 (6%), ischemia of abdominal organs in 5 (14%), limb ischemia in 3 (9%), and cerebral infarciton in 2 (6%) (Table 2).

Complications in Stanford B type aortic dissection were rupture in 1 (3%), abdominal ischemia in 3 (9%) and limb ischemia in 3 (9%). Size of the largest aorta was 30-85 (46+9) mm, and thrombosed occlusion of the false lumen was found in 33 patients (46%) (Table 1).

There were 2 patients (2.8%) who were dead

at the time of arrival. Their time interval between the onset and arrival at the hospital was 3 hours in one and 8 hours in one. In the remaining 69 patients, excluding two who was cardiac pulmonary arrest on arrival, surgical intervention was carried out in 26 patients with 4 deaths (15.3%), 42 patients being medically managed in an acute phase with no death within 2 weeks after hospitalization. One patient died during waiting for referral to another hospital. Therefore, 5 of 69 patients

(7.2%) died, and 92.8% of patients survived atleast 2 weeks after hospitalization (Fig.4).

Stanford A aortic dissection (Table3): 21(60%) of the 35 patients underwent surgical intervention. Patient's age at the time of operation was 23-92 (65±16) years. Total aortic arch replacement was done in 17 patients and replacement of the ascending aorta in 4. The associated operations were aortic root replacement in 5, coronary artery bypass grafting in 2 and aortic valve replace-

Table 2   Complications of acute aortic dissection

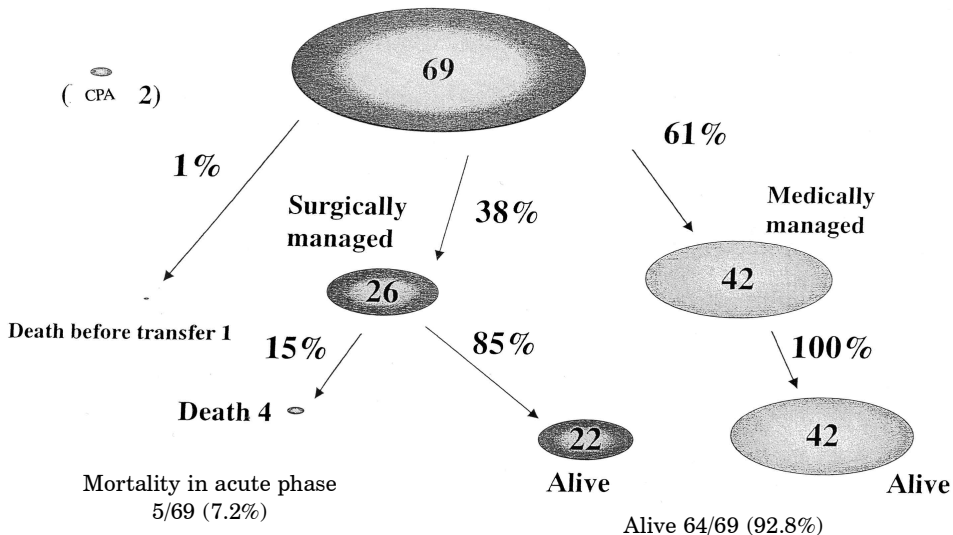|	Type A (n=35)	Type B (n=35)
shock	12(34)	0(0)
cardiac tamponade	16(46)	0(0)
MI	2(6)	0(0)
AR	13(37)	0(0)
rupture	4(11)	1(3)
cerebral infarction	2(6)	0(0)
abdominal ischemia	5(14%)	3(9)
limb ischemia	3(9%)	3(9)

MI: myocardial infarction, AR: aortic regurgitation

Fig.4. Outcome of 69 patients, except for 2 patients who were cardiac pulmonary arrest on arrival

Table 3　Management and outcomes of acute aortic dissection

	Type A (n=35)		Type B (n=35)	
	surgical	medical	surgical	medical
No.	21(60)	14(40)	5(14)	30(86)
in hospital mortality	2(10)	4(29)	2(40)	0(0)
total	6(17.1)		2(6)	

ment in one. There were 2 operative deaths (9.5%). One patient died of heart failure after mitral valve replacement for severe mitral regurgitation due to papillary muscle rupture 3 days after total aortic arch replacement. The other patient had a misdiagnosis of the left ventricular free wall rupture or rupture of the coronary artery after coronary artery intervention instead of acute aortic dissection, leading to a wrong operation and death. Fourteen patients were medically managed with 4 deaths (29%) including one due to ventricular arrhythmia during waiting for referral to another hospital for surgery. The reasons of medical management were small size of the aorta, thrombosed false lumen and no complications in the 10 patients. The other 3 deaths were as follows; one prior to planned surgery, one disability due to previous multiple cerebral infarctions, and the remaining patient due to refusal because of her advanced age of 85 years. Finally, 6 of the 35 patients died in the hospital (17.1%).

Stanford B type aortic dissection (Table 3): Five of the 35 patients (14%) underwent operation within 2 weeks after hospitalization. Indications of surgery were ischemia in abdominal organs and/or limb ischemia in 4 patients and larger size of the descending thoracic aorta in one. An axillo-femoral bypass was done in 4 patients and graft replacement of the descending thoracic aorta in 2. There were 2 hospital deaths (40%). One was a patient under hemodyalysis for severe diabetic renal failure and previous graft replacement for abdominal aortic aneurysm had ischemia of abdominal organs and lower extremities. He underwent an emergency axillo-femoral bypass but died of increasing acidemia. Autopsy showed entire necrosis of the intestine. The other patient had ischemia of abdominal organs and lower extremities. He underwent a graft replacement of the descending thoracic aorta and an axillo-femoral bypass, emergently, but died of renal failure. Thirty patients were conservatively managed with no death within one month after hospitalization. But 5 patients required intervention several months later. Two patients underwent an endovascular stenting for ulcer like projection lesion of the descending thoracic aorta. Two underwent graft replacement of the descending thoracic aorta with one death due to rupture of the aneurysm. The remaining one with Turner syndrome and coarctation of the aorta had dissection of the descending thoracic aorta underwent a graft interposition between the aortic arch and descending thoracic aorta for repair of coarctation of the aorta. Therefore, 3 of the 35 patients died in the hospital (9%).

DISCUSSION

Incidence

It was impossible to estimate an exact incidence of acute aortic dissection from this

survey. Because, all emergency patients were not examined by thoracic CT scan and all of the dead patients did not have autopsy. In addition, we do not know how many other patients were dead before they arrived at hospitals. However, there are steep mountains between Yamagata Prefecture and all neighboring prefectures, and all emergency patients visited or were referred to local hospitals in Yamagata Prefecture. Therefore, this survey showed that acute aortic dissection occurred at least in 5.7 per 100,000 people in Yamagata Prefecture. As only one distinctive estimation, a report from Mie Prefecture documented that acute aortic dissection occurred in 3.7 per 100,000 people between June 1998 and July 1999[2]. The present study showed a higher rate of incidence than that of the Mie study. Age of the patients, male to female ratio, anatomical types of aortic dissection in the Mie study were not different from this stndy. People 65 years of age or greater in the population was 23.3% in Yamagata Prefecture in 2000, while it was 18.3% in Mie Prefecture in 1999. This difference may relate to difference of the incidence of acute aortic dissection between Yamagata and Mie Prefecture. However, reports from USA estimated that its incidence was about 10 per 100,000 people[3]. In our study, the highest incidence rate was 7.1 per 100,000 people in one area where included metropolitan Yamagata City while the lowest one was 3.6 per 100,000 people in one of the countryside areas. It is reported that only one third of fatal aortic dissections originating from the aortic arch are diagnosed before death[4]. Another study reported that incidence of rupture of the thoracic aorta was 5 per 100,000, and that 41 of 158 patients were alive on the arrival at an emergency hospital[5]. Therefore, we speculate

that the incidence would be close up to 7.1 or more per 100,000 people, which is higher than the average reported in this study.

Diagnosis

Diagnosis of acute aortic dissection was made by anamnesis, symptoms, and computed tomographic scan in almost all patients[1] and operative findings in the operated ones. Dissection is often difficult to diagnose, and a high clinical index of suspicion is mandatory[1]. Trans-esophageal echocardiography was not frequently used although it provides much information on the anatomy, extension of the dissection and cardiac complications. One patient was misdiagnosed to have a rupture of the coronary artery after PTCA instead of Sanford type A aortic dissection. Though the patient complained of chest and back pain with abnormalities of ST-T segments in EKG tracing before PTCA, neither trans-echocardiogrpahy nor CT scan was taken.

Management

Stanford A type aortic dissection: Surgical mortality of 9.5%, 2 deaths among 21 patients, would be justified when reviewed with current improvement in surgical challenge on acute aortic dissection[1]. The mortality would greatly decrease to 5% in the event all patients would be diagnosed adequately, unlike in the misdiagnosed case mentioned above. One patient refused the operation because of her age (85) and died within one month after onset. However, the oldest patient, 92 years of age, had a successful total aortic arch replacement in this series, and she is leading a comfortably active life after operation[6]. Though the operative mortality would be high in the elderly patients more than 80 years of age[7], this may encourage those in their nineties to hove surgery, and more aggressive surgical

treatment would result in a better outcome. Seventeen (81%) of the 21 patients underwent total arch replacement and only 4 remaining had a replacement of the ascending aorta. This rate of extending a surgery into the aortic arch may be higher[1]. Whether or not the aortic arch should be repaired in acute Stanford A type aortic dissection is a controversy. When the entry is in the aortic arch or the arch wall is thin, total aortic arch replacement would be recommended[8]. Lack of the condition mentioned above may justify replacing only the ascending aorta. However, the false lumen of the aortic arch would possibly extend late after the repair if the aortic arch was not replaced. Re-operation on the extended aortic arch may have a significant mortality. We believe that cumulative mortality would be lower when the aortic arch is replaced in one operation than when the second operation is expected after the first replacement of the ascending aorta, even if some patients need ascending aorta replacement only at emergency. Total aortic arch replacement is safe and simultaneous elephant trunk procedure would decrease the mortality when the descending aorta requires operation in the future. In Stanford B type aortic dissection, majority of the patients were medically managed in the early stage after onset, except patients complicated with ischemic abdominal organs or limb ischemia. Surgical results were poor in this series though operative cases were difficult ones. Early fenestration of the septum should be recommended. Stenting in acute B type aortic dissection has been reported with satisfactory results[9], though it was applied to two patients in chronic stage in this series. These suggested that even in Stanford B type aortic dissection, more aggressive surgical treatment might be needed.

CONCLUSION

This report suggested that the increasing number of elderly people may increase the incidence of this disease. Surgical results in Stanford A type aortic dissection was satisfactory. More aggressive surgical treatment would be recommended even in elderly patients with this disease.

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