

Long-Term Results After 27 Years of Surgical Treatment of Acute Type A Aortic Dissection

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Background. This study investigates the determinants of long-term outcome and modalities of late death after surgical treatment of acute type A dissection.

Methods. Between 1974 and 2001, 315 consecutive patients were operated on for acute type A aortic dissection. Operative mortality was 22.9%. A series of 243 survivors of surgical treatment were followed up for as long as 27 years. Endpoints were death, cardiovascular reoperation, and neurologic events. Median follow-up was 4.5 years. Follow-up was 99.6% complete.

Results. Cumulative survival of discharged patients was $96.4\% \pm 1.3\%$, $67.7\% \pm 4.7\%$, and $39.4\% \pm 12.0\%$ at 1, 10, and 20 years, respectively. During follow-up, 47 patients died. Cause of death was cardiac failure in 7, hemorrhage due to rupture of the distal aorta in 7, stroke in 4, respiratory insufficiency in 4, sepsis in 3, malignancy in 2, and unknown in 20 patients. Multivariate analysis revealed advanced patient age and postoperative hemodialysis as perioperative indicators of late death ($p <$

0.05). Freedom from cardiovascular reoperation was $90.7\% \pm 2.0\%$ at 1 year, $60.9\% \pm 5.1\%$ at 10 years and $41.9\% \pm 15.0\%$ at 20 years. A total of 58 patients required 86 cardiovascular reoperations; aortic root or ascending aorta replacement was performed in 20, distal ascending aorta and arch replacement in 13, descending aorta replacement in 6, thoracoabdominal aorta replacement in 7, abdominal aorta replacement in 7, and miscellaneous reoperations in 6 patients. Multivariate analysis revealed male sex and left coronary artery dissection as significant determinants for late cardiovascular reintervention ($p < 0.05$). Cumulative incidence of stroke after 20 years was 3.8%.

Conclusions. Acute type A dissection represents an emergency situation with acceptable long-term results for discharged survivors of surgical treatment.

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The long-term survival of patients after surgical repair for type A aortic dissection has improved since the early reports of Hirst and colleagues [1] and Anagnostopoulos and associates [2]. However, the early mortality rates remain still as high as 40% [3]. We have previously reported on our short-term results after surgery for acute type A aortic dissection [4]. The purpose of this retrospective study is to report our experiences in the surgical treatment of patients with acute type A dissection over a 27-year period, with special emphasis on long-term outcome and modalities of late death.

Material and Methods

Between November 1974 and December 2001, 315 consecutive patients (205 men and 110 women) were operated on for acute type A aortic dissection at the St. Antonius Hospital, Nieuwegein, The Netherlands. The mean patient age was 58 ± 12 years. If chest pain or other symptoms occurred less than 14 days before operation,

the dissection was defined as acute [5]. The type of the aortic dissection was considered, according to the Stanford classification, to be type A if the ascending aorta was involved [6]. The diagnosis of type A aortic dissection was confirmed by either aortography especially in the early experience, transoesophageal echocardiography (64%, $n = 203$), computed tomography (29.8%, $n = 94$), magnetic resonance imaging, or operative exploration. The present study reports on our experience of a series of 243 patients, who survived surgical treatment for acute type A dissection and were discharged from the hospital, to establish the long-term outcome and modalities of late death after emergency operation for acute dissection. The cohort of survivors was routinely followed up and underwent systematic imaging controls on a periodical basis. Ten patients in this series had Marfan's syndrome. All patients received anticoagulation therapy postoperatively with coumadin for 3 months and were then switched to antiplatelet therapy unless they were in atrial fibrillation or had undergone a Bentall procedure or separate aortic valve replacement.

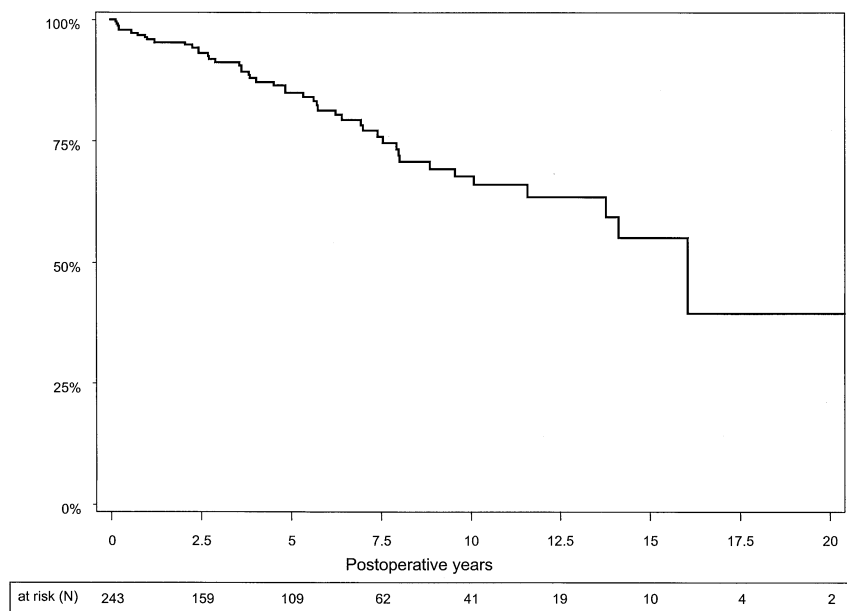
Surgical Technique

Throughout the years of the study, there was a substantial variability in cardiothoracic surgeons (15) and, owing to changed insights, in surgical technique. The following

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Fig 1. Survival of operative survivors.



reflects our general approach. The operation was performed using femoral artery cannulation, venous return through the right atrium, median sternotomy approach, total cardiopulmonary bypass, and cardiac arrest with cold oxygenated crystalloid cardioplegia. A left ventricular drain was inserted through the right upper pulmonary vein. After administration of cardioplegia, the ascending aorta was opened, and the aortic valve was inspected. Whenever possible, attempts were made to repair the aortic valve. The aortic arch was explored under circulatory arrest, and if an intimal tear was present, parts of or the complete aortic arch were replaced. The brain was protected either by deep hypothermia or antegrade cerebral perfusion. The segment of aorta containing the intimal tear was usually resected and replaced with a Dacron prosthesis, and frequently the aortic stumps were reinforced with Teflon strips. Gelatin-resorcinol-formalin (GRF) adhesive (Colle biologique; Fii, Saint Just Malmont, France) or fibrinous glue (Tissu-col; Immuno AG, Vienna, Austria) were not routinely used. In the later years, if the aorta was cross-clamped, the clamping region was always replaced.

Isolated ascending aorta replacement was performed in 132 patients (54.3%), with concomitant hemiarch replacement in 42 (17.3%), total arch replacement in 10, and elephant trunk in 1 patient. Bentall and ascending aorta replacement was performed in 28 patients (11.5%), with concomitant hemiarch replacement in 3, and total arch replacement in 1. Ten patients in the earlier series had primary repair of an intimal tear without graft replacement of the ascending aorta. Aortic valve replacement with ascending aorta replacement was performed in 15 patients (6.2%), and with concomitant total arch replacement in 1. A mechanical valve was implanted in 14 patients, and a biological valve was used in the remaining 2. In 104 patients (42.8%) it was possible to resuspend the aortic valve, in 9 patients the aortic valve was reim-

planted in a tubular Dacron graft according to David and Feindel [7] and in 2 patients according to the technique described by Yacoub and colleagues [8]. The native aortic valve remained untouched in the remaining 80 patients. Concomitant coronary bypass grafting was necessary in 9 patients.

Deep hypothermic circulatory arrest (DHCA) was used in 96 patients (39.5%) to allow for an open distal anastomosis or for arch replacement. Antegrade selective cerebral perfusion (ASCP) was applied in 81 patients (33.3%) during circulatory arrest of the body [9, 10]. We have used retrograde cerebral perfusion (RCP) only once, while the remaining 65 patients (26.8%) have been operated upon with simple aortic cross-clamping without DHCA, ASCP, or RCP.

Follow-Up

From January to April 2002, we performed a cross-sectional follow-up of all patients not known to be dead. Data were obtained by retrospective review of hospital records. Follow-up information was collected by written and telephone contacts with patients, relatives, or physicians. Follow-up was 99.6% complete. One patient re-

Table 1. Causes of Late Death

	Number	Percent
Respiratory insufficiency	4	1.6
Malignancy	2	0.8
Hemorrhage	7	2.9
Sepsis	3	1.2
Stroke	4	1.6
Cardiac failure	7	2.9
Unknown	20	8.2
Total	47	19.3

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