Survey of operative outcome for aortic dissection

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ABSTRACT

Objective: To survey the results of operative outcome for aortic dissection.

Methods: A retrospective study on 46 patients, admitted for operation in Shahid Madani Heart Hospital in Tabriz, Iran from 1994-2003. A questionnaire was used for collecting data. Statistical analysis was performed and was carried out through a descriptive statistical methods.

Results: We included 30 males (65%) and 16 females (35%). Seven (15.2%) died in the operating room before surgery, while 39 patients (59% male and 41% female) underwent surgery. The mean age of patients was 48.9 ± 2.3 years old. Pre-operative diagnosis was carried out by transesophageal echocardiography and angiography. All patients were operated in an emergency situation. In 42% of patients aortic valve replacement (AVR) with ascending aorta was replaced. In 24% only the ascending aorta was replaced, and in 10% the aortic valve was repaired with acute aortic dissection. In 10% of patients, the ascending aorta with aortic arch was replaced. Four patients (14%) had distal aortic dissection and replacement. Major complications were hemorrhage (31%) and respiratory failure (13.8%). A total of 20.7% died in hospital, and only 21 patients (45.5%) could be followed for 10 years.

Conclusion: Acute aortic dissection is a fatal disease. With early diagnosis and surgical intervention, we can save approximately 75% of patients with very good functional class and survival in the mid term.

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Acute aortic dissection (AAD) is seen in approximately 3 people in every 100,000. Blood penetration in the medial layer of the aortic wall due to intimal tearing leads to dissection of the aorta, which can involve only the ascending aorta, or the ascending aorta with aortic arch, and in some cases the whole length of the aorta. In most of these patients, aortic regurgitation (AR) can be found. Aortic dissection had been diagnosed after death with autopsy up to the beginning of the 20th century, but with progress in open heart surgery and the use of cardiopulmonary devices, it is now operable. The most common reasons for mortality in such patients include: delayed diagnosis, emergent nature of disease, lack of operation possibility in some centers, despite having a pediatric surgery unit. In a recent research,[1] it was reported that 30% of patients were admitted with other diagnoses at first, but after evaluation they were diagnosed with dissection of the aorta. Upon diagnosis, medical support must be introduced to reduce blood pressure and to prepare the patient for operation. Surgical treatment is carried out in several techniques, and these operations must be performed immediately to reduce complications.[2] If the aortic valve is involved, it must be replaced by a dacron graft coated by collagen.[3] In all cases atrial cannulation was carried out from the femoral artery and venous cannulation, via right atrium, and all of the patients were operated upon using cardiopulmonary bypass (CPB). In other centers, total circulatory arrest (TCA) was used for distal anastomosis of the involved aortic arch and attempted total excision of the dissective part.[4] In some cases, due to unknown reasons, some changes exist that are more than normal growing age (senile) process leading to dissection.[5,6] Senility and hypertension are 2 main factors in the occurrence of disease, which is particularly common in the 5th and 6th decades of life. It involves males twice more than females and in 80% of males there is a history of hypertension.[7,8] If the diagnosis of the aortic dissection is delayed, the possibility of mortality will increase from 3-20%. Bleeding is one of the most common complications of aortic dissection. The purpose of this research was to assess the results of surgical operations performed on patients with dissection of the aorta over a 10-year period from 1994 to 2003 in Shahid Madani Heart Hospital Tabriz, Iran.

Methods. Undergoing surgery for this research was performed retrospectively on patients with AAD in Tabriz Shahid Madani Hospital between 1994 to 2003. From the patient charts, the informations was collected as questionnaires. All patients underwent atrial cannulation via the right atrium after midsternotomy and then they were made cold. Aortic clamp was placed at the upper most point of the dissected part and after injection of cold cardioplegia and cardiac arrest, the aorta was opened longitudinally, then aortic valve and coronary arteries were evaluated. According to age and gender, the presence or absence of vascular disease, the dissection was repaired. After operation, the patients were sent to the intensive care unit and after checking the arterial blood gas (ABG), echocardiography, electrocardiogram (ECG) and physical exam, questionnaires were completed, and the information collected was analyzed using the Statistical Package for Social Sciences software and descriptive statistical methods.

Results. Among 46 patients undergoing surgery, approximately 65% were male and 35% were female. Of the total patients, 15.21% were excluded for chronic dissection of aorta, dissection of descending aorta or died while under anesthesia. The main complaint of patients was pain and was detected in all patients referred in an acute condition. Other complaints included: dyspnea 15.4%, syncope 7.7%, cerebral symptoms 7.7%, renal failure 5.1% and cardiac infarction 2.6%. In these patients, approximately 5.1% had Marfan syndrome, 7.7% of them had aortic stenosis, 2.6% had a history of cardiac surgery, 7.7% had bicuspid aortic valve and 2.6% of them were pregnant simultaneously. Echocardiography of patients showed 69.3% of ruptured intimal layer was in the proximal part, 2.6% in the aortic arch, and 2.6% of cases were unspecified, also there were aortic deficiency in 56.4% and pericardial effusion in 20.1% of cases. On chest x-ray of patients, cardiomegaly was found in 62.2% and mediastinal widening in 30.7%. Magnetic resonance imaging and CT scan was carried out for all patients. There were evidence of left ventricular hypertrophy in ECG of most of the patients with normal sinus rhythm. Angiography was performed only on patients in stable condition, but most of the diagnoses were based on echocardiography. Surgery was performed on these patients. **Table 1** shows the type of operations carried out on the patients, while post operation complications are shown in **Table 2**. In 9 patients premature re-operation was performed due to bleeding 15.4% (6 cases). The reasons for deaths are shown in **Table 3**.

We found that gender was not effective on mortality, but age, symptoms of central nervous system (CNS), aneurysm rupture and renal failure before surgery were the main factors in mortality. Aorta clamping time with total pumping time was the main influence on mortality during surgery. Also, respiratory failure increased the post operation mortality rate increased. For follow-up of patients, one of the patients had graft infection and was treated by medication. Three cases was referred due to anticoagulant complications and were treated by controlling the international normalized ration (INR). As 7 cases had no files in the clinic, follow-up was not possible.

Discussion. In recent decades, most patients with acute dissection of the aorta died due to lack of diagnosis. Patients with symptoms of aortic dissection must be diagnosed and undergone surgery operation as soon as possible. Surgical treatment must include resection of the part that has been damaged severely with excision of

Table 2 - Post operation complications.

Type of complications	N	(%)
Bleeding	9	(23.07)
Respiratory	4	(10.26)
Cardiac infarction	2	(5.12)
Renal failure	2	(5.12)
Cerebral complications	2	(5.12)

Table 1 - Types of operations performed on patients.

Type of operation	N	(%)
Replacement of ascending aorta and aortic valve	29	(74.35)
Replacement of ascending aorta only	4	(10.26)
Replacement of ascending aorta and repair of valve	3	(7.69)
Replacement of ascending of aorta and repair of arch	3	(7.69)

Table 3 - Reasons of death in patients.

Reasons	N	(%)
Bleeding	2	(5.12)
Different organs failure	2	(5.12)
Stroke	1	(2.56)
Left heart failure	1	(2.56)

the intimal teared area, if possible, and by blocking the entrance of false lumen with sutures and establishing the strength of the aorta with a Dacron graft.[9] After resection of the damaged part of the aorta, fiber glue can be used between 2 separated layers, and then stitch Dacron between the 2 edges of aorta.[10] But careful use of these glues must be observed as abuse will lead to necrosis of the aortic wall and re-dissectioning after some years. During aortic arch operation, it is better to supply the brain with cold circulation of blood by cannulations in the brachial or auxiliary artery, however, if the operation takes a long time it is not necessary to make the patient cool more than usual.[11,12]

In Kallebenbach group[12] the results of valve repair were excellent, and only 16% of patients who underwent repair of the valve had first degree failure after operation, and none of the patients needed replacement of valve or reoperation.[13] Only 3 patients underwent operation in this center and one case had first degree failure. Analyzing these studies, one can conclude that if we can reduce pumping time and clamping aortic time, the rate of mortality decreases in these patients, however, if pumping time takes more than an hour, the chance of exodus of pumping and complications of post operative bleeding will increase due to decrease of coagulants and platelets, and pulmonary failure will occur by activation of neutrophils and release of inflammatory factors. The mortality rate in our center (approximately 20.07%) compared with other reports (20%) is similar. In this study, in 3 cases was used to total circulatory arrest (TCA) but at other centers, TCA was used to remove distal part of dissection in most patients and then after distal anastomosis, circulation of blood was established. Bleeding is the most common post operative complication, which occurred in 9 cases, and we needed to re-operate to control bleeding. In one case, bleeding led to renal failure and death. We can reduce post operation bleeding by decreasing pumping time and using the double patch sandwich technique, which we recently used in this center, and post operative bleeding decreased. Bleeding is also the most common post operative complication in other centers. Renal failure due to hypotension before, during or after operation appears in most cases. By hemodynamic protection of patient we can prevent it. Respiratory failure occurred in 2 cases, which can be reduced by diminution of pumping time. There was one case of endocarditis, which was treated by medication. There were also 3 cases of bleeding due to warfarin usage, which was treated. To reduce mortality and operative complications and recurrence of the disease, we recommend that it is necessary to prepare patients for operation immediately after diagnosis to prevent anticoagulant complications and to reduce aortic clamping time, its better to repair the valve instead of replacement. In older patients, a biologic valve should be used. For distal anastomosis, use TCA to remove dissection completely and reduce the rate of its recurrence. According to the high incidence of post operative bleeding, using the double patch sandwich technique is recommended.[14] A composite graft must be provided for these patients. The patient's blood pressure should be controlled carefully. In following up, these patients must be evaluated for recurrence of dissection and aortic aneurysm, and function of aortic valve, and the aortic diameter must be checked every 6 months in the first year by echocardiography, spiral CT scan or MRI, and it is recommended that it should be evaluated every year from the second year after operation.

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