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15 Years' Experience with Type A Aortic Dissection: Improving Results Over the Years

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Abstract

Introduction: Surgical treatment of acute type A aortic dissection is challenging and is associated with high morbidity and mortality. We began performing this surgery in 2010, and we now have 15-years of experience with this dreadful aortic syndrome. This report aims to present some short-term results of this kind of surgery in Albania.

Methods: There were 200 consecutive patients who underwent surgery for acute type A aortic dissection over a 15-year period from 2010 to 2024. Patient, procedural and follow-up information was retrieved from hospital records.

Results: The mean age of this group of patients was 58.84 years (standard deviation 11.64 years), and 82 % were male. In 112 patients, the native aortic valve was intact, 46 underwent aortic valve and root replacement with a valved conduit (modified Bentall operation), 22 separate aortic valve replacement with a mechanical/biological prosthesis and 20 patients had aortic valve repair. Overall, in-hospital and thirty-day mortality was 20.5 %, starting at 30 % in the initial period and declining to 15 % in the last two years.

Conclusions: In the current era, acute type A aortic dissection is associated with a decreasing operative mortality risk. Actually, we perform this type of surgery in Albania with optimal results and aspire to achieve even better outcomes in the future.

Keywords: ascending aorta, dissection, acute, improving results

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INTRODUCTION

Aortic dissection is currently classified as part of acute aortic syndrome together with intramural hematoma and penetrating atherosclerotic ulcer. These conditions are highly lethal and their presentation and treatment are similar. Performing surgery for acute type A aortic dissection remains a challenge for our healthcare system and is associated with important morbidity and mortality (1).

We have been performing this type of complex surgery for the past 15 years (since 2010).

In this study, we review our experience with surgery for acute type A aortic dissection and describe the applied operative techniques and short-term outcomes.

PATIENTS AND METHODS

Patient population

In this study, we included all patients who presented and underwent surgery for acute type A aortic dissection at the University Hospital Centre of Tirana from January 2010 to December 2024. Patient, procedural and follow-up information was retrieved from hospital records.

We identified 200 consecutive patients who underwent surgery for acute type A aortic dissection. There were 164 (82%) men and 36 (18%) women, whose mean age was 58.84±11.64 years, ranging from 26 to 76. Although women accounted for a minority of cases (18%), they were more prone to mortality, but the difference was not statistically significant (Figure 1).

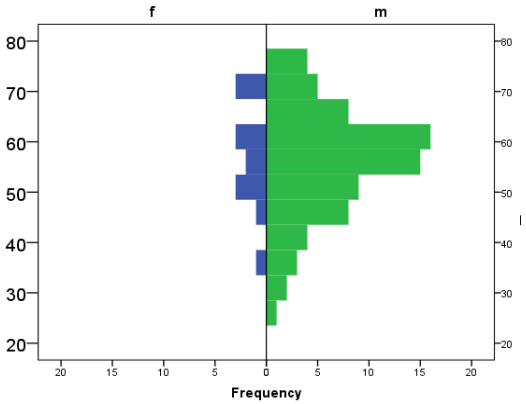


Figure 1. Age distribution of the patients according to sex

RESULTS

Preoperative data

Regarding preoperative conditions and risk factors for developing dissection and mortality, we observed that uncontrolled hypertension was present in 90 % of the patients. We had a small group of patients with inherited pathology of the aorta, such as Marfan syndrome (5%). Sixty patients were in cardiogenic shock at admission to the hospital, 24 had signs of myocardial ischemia and 30 of them had neurological disorders before surgery. All of these are important factors for postoperative mortality (Table 1).

Computed tomographic (CT) scan with contrast was the routine diagnostic imaging modality in all patients, although in a minority of cases, the diagnosis was suspected earlier through echocardiography.

Table 1. Preoperative conditions of patients

Condition	No (%)
Hypertension	180(90)
Atheroma	70(35)
Marfan Syndrome	10(5)
Previous cardiac operation	2(1)
Cardiogenic shock	60(30)
Myocardial ischemia	24(12)
Neurologic disorders	30(15)
Peripheral ischemia	22(11)
Aortic regurgitation	110(55)

Operative Techniques

The operation is traditionally performed via a complete median sternotomy, howewer, recently, some self-limited cases of dissection can be performed in partial upper sternotomy. The patient is placed on cardiopulmonary bypass as soon as possible. When the patient is in cardiac tamponade, we usually open a small portion of the pericardium to drain it gradually. The next step is to quickly find an adequate arterial access for cannulation.

Usually, the initial cannulation was femoral but recently we are moving more and more to axillary or innominate artery cannulation (Figure 2). Venous cannulation is achieved through a double-stage cannula in the right atrial appendicle. In all the patients, the ascending aorta was clamped, resected and replaced with a tubular Dacron graft. Usually this is the location of the intimal tear but sometimes it can extend into the aortic arch. In addition, the arch can be dilated, so partial or complete replacement of the transverse arch was performed in 42 patients under circulatory arrest with retrograde and/or anterograde cerebral perfusion. The aortic root was replaced or repaired depending on the pathology of the aortic valve. Other operative data can be observed below in Table 2.

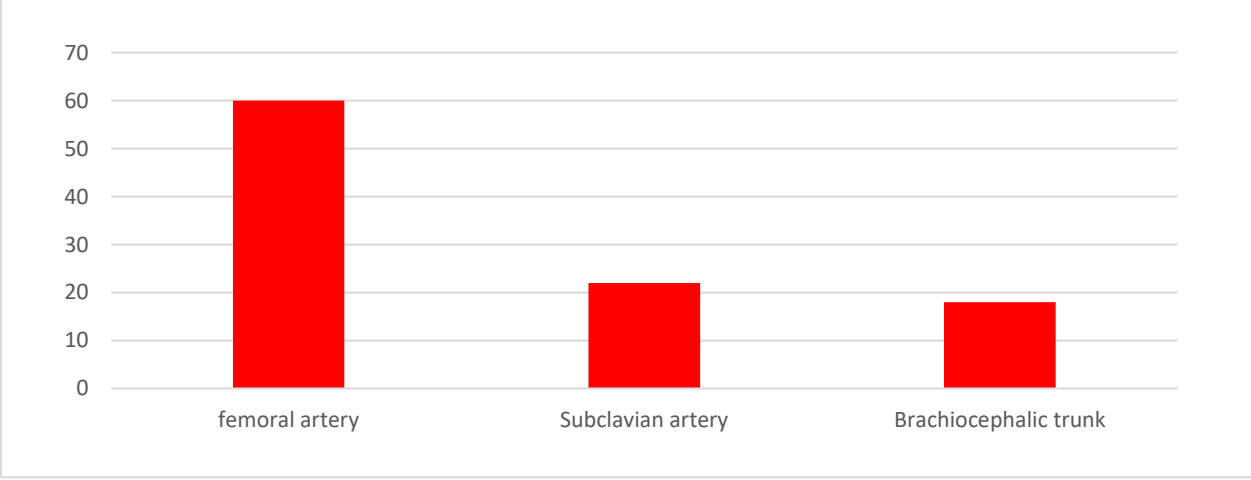


Figure 2. Arterial cannulation

Table 2. Operative data

Cross clamp time	91.59±46.51min
Cardiopulmonary bypass time	135.42±96.72 min
Ascending aorta replacement	200 pts
Arch replacement	42 pts
Aortic valve procedure Isolated replacement Aortic valve repair Modified Bentall procedure	 22 pts 46 pts 20 pts
Initial cannulation Femoral artery Axillary artery Innominate artery	 120 pts 44 pts 36 pts
Bio-Glue application	45 pts
Surgical approach-Median sternotomy	200 pts

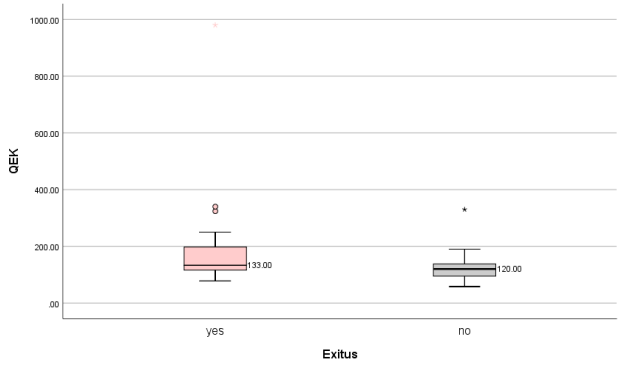
In patients without a tear in the transverse arch, the ascending aorta was transected just below the origin of the innominate artery, and replaced with a tubular Dacron graft. In patients with an intimal tear in the arch or an aneurysmatic arch, the transverse arch was replaced partially or completely. In the recent years, we have also shifted to an open distal anastomosis even with an intact aortic arch (25 patients). This technique prevents cross-clamp injuries and allows for a better-quality anastomosis to improve the postoperative results, but requires circulatory arrest with brain perfusion which ca be done safely nowadays. Circulatory arrest details can be found below in Table 3.

Table 3. Circulatory arrest data

Selective anterograde cerebral perfusion *body temperature 28º C* *mean time 22.2 ± 11.5 min*	44 patients
bilateral	6 patients
unilateral	38 patients
Retrograde cerebral perfusion *body temperature 20º C* *mean time 25.4 ± 8.8 min*	18 patients

RESULTS

There were 10 intraoperative and 31 postoperative deaths (20.1 %) among these patients. The causes of death were uncontrollable bleeding and stroke in the majority of the patients. Regarding risk factors for postoperative mortality, statistical analysis identified cardiopulmonary bypass time as the only independent risk factor (Figure 3).



Variable	r*	P Value
Sex	0.029	0.706
Age	-0.080	0.305
XCl time	-0.085	0.267
Bypass time	-.189*	0.021
Type/cannulation	0.067	0.384

Figure 3. Mann-Whitney test p=0.021

We can now report only short-term mortality and we are working to gather long term results in a partial group of these patients due to the difficulty of contacting the patients and collecting the data. We have observed some patients with a residual false lumen in the thoracic aorta but no reoperations are documented in this patient population. We can also observe that the hospital mortality has declined to 15 % in the last two years of this period (Figure 4).

Table 4. Mortality

IMMEDIATE RESULTS	
Intraoperative deaths	10 pts
Postoperative deaths	31 pts
Stroke	13 pts
Sepsis	3 pts
Multi-organ failure	5 pts
Renal failure	5 pts
Bleeding	15 pts
OVERALL HOSPITAL MORTALITY 20.5 %	

DISCUSSION

Classically, acute aortic dissection involving the ascending aorta and/or the aortic arch is the most common acute aortic condition with a very high spontaneous mortality on its natural course (1). Nowadays, different data are reported from the IRAD (International Registry on Acute Aortic Dissection), indicating a mortality rate of 0.5 % per hour compared to the historically reported 1% per hour (during the first 48 hours) for this pathology. However, the value of emergency surgery in the treatment of type A Stanford aortic dissection is unquestionable (2).

Recent literature reports a surgical mortality rate for acute type A aortic dissection ranging between 15-25% (3). In 2015, we reported our results for the first 13 patients, showing a mortality rate of 30 % (4). Over the years, we have observed a gradual increase in the number of patients, reaching a stable number of 30 cases of surgical interventions per year. We believe that

the increased awareness of this pathology among primary care medical doctors, emergency doctors and cardiologists, as well as the higher number of computed tomography scans performed even in peripheral hospitals, has contributed to this increase. On the other hand, the postsurgical mortality has declined to 15% over the last two years and we hope to mantain this trend and improve it further in the future (Figure 4). Brain monitoring methods recently applied at our clinic, along with the use of recombinant factors for coagulation, promise even better results next year.

include age >70 years, hypotension or shock at presentation, cardiac tamponade, migrating pain and myocardial ischemia or infarction (5). An important determinant of mortality is malperfusion, which correlates with the number of affected organs.

The goal of surgery in patients with acute type A aortic dissection is to resect the ascending aorta to eliminate the risk of intrapericardial rupture and prevent coronary artery dissection or aortic valvular insufficiency. More extensive operative repair depends on the extent of dissection, the site of the primary entry tear, the presence of

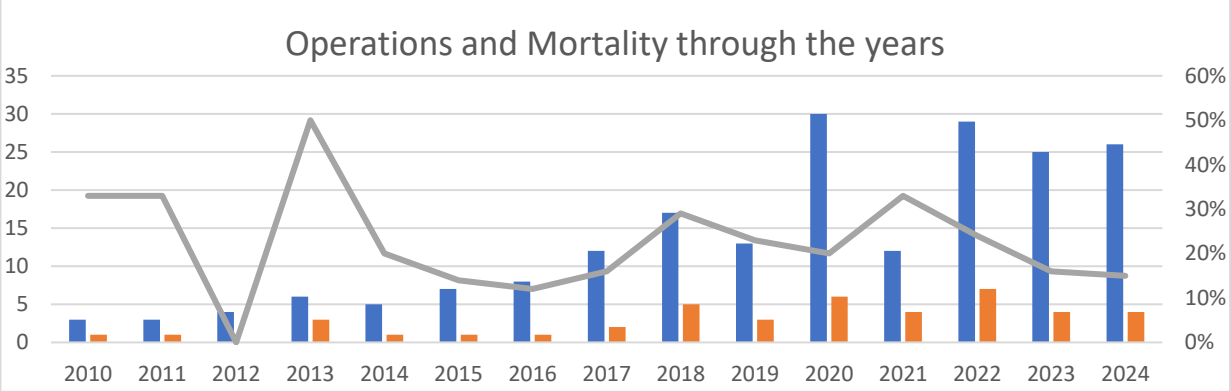


Figure 4. Mortality rate over the years

The experience and assembly of the aortic team, improved quality of the imaging modalities with earlier recognition of dissection, special Dacron grafts, effective hemostatic agents, and safety of extracorporeal circulation have all contributed to the improved quality of our surgical results.

Many reports pointed out that surgical results depend on preoperative conditions, which are the primary determinants of early outcomes. Independent preoperative predictors of mortality

concomitant disease, and the surgeon's experience.

More extensive root replacement interventions were not associated with increased hospital mortality. This supports such an approach in young patients and those with connective tissue diseases and bicuspid aortic valves (6). Root replacement is typically performed using a modified Bentall procedure or a valve leaflet–sparing aortic root resection.

The presence of aortic dissection or aneurysm into the arch aorta mandates determining the need for arch resection. The distal anastomosis can be constructed in a blood-less field under circulatory arrest with brain protection even in the absence of arch involvement in order to improve postoperative results (1).

Regarding brain protection, moderate or profound hypothermia with periods of circulatory arrest and/or selective antegrade brain perfusion and/or retrograde brain perfusion are the common strategies for achieving brain protection. The variability of techniques among surgical centers makes direct comparison difficult. Some form of cerebral perfusion, whether antegrade or retrograde, has been shown to improve neurologic outcomes compared with deep hypothermic circulatory arrest alone (7). However, most studies involving some type of antegrade arterial brain perfusion report outcomes that are comparable to or better than those using retrograde brain perfusion. Antegrade cerebral perfusion is associated with both lower long-term mortality rates and neurologic dysfunction rates. Despite the additional supply, patients undergoing bilateral anterograde cerebral perfusion during acute type A aortic dissection repair did not have superior outcomes in terms of neurologic function and mortality compared with those undergoing unilateral anterograde cerebral perfusion (8). However, in cases of prolonged circulatory arrest over 60 minutes, bilateral perfusion appears to be superior (9).

CONCLUSIONS

Surgery for acute dissection of the ascending aorta and aortic arch can be performed with optimal results at our clinic in Albania. Surgical techniques include all the spectrum of the routine procedures applied nowadays widely.

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Conflict of Interest Statement: The author declares that have no conflict of interest.

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