Bentall Operation, Early and Short Term Postoperative Outcomes

Thesis
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بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

وقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ ورَسُولُهُ والْمُؤْمِنُونَ

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List of Abbreviations

AA : Ascending aorta
AAA : Ascending aortic aneurysm
AADA : Acute aortic dissection type A
AAS : Acute Aortic Syndrome
ACE : Angiotensin Converting Enzyme
ACP : Antegrade cerebral perfusion
AD : Aortic Dissection
AD : Anoo domini
AF : Atrial Fibrillation
AR : Aortic Regurgitation
ATN : Acute Tubular Necrosis
AV : Aorto Ventricular
AV : Atrio Ventricular
AVJ : Aorto Ventricular Junction
BAV : Bicuspid aortic valve
BC : Before Christ
BR : Basal Ring
BSA : Body Surface Area
CABG : Coronary Artery Bypass Grafting
CDC : Center for Disease Control
CIN : Contrast Induced Nephropathy
COPD : Chronic Obstructive Pulmonary Disease
CPB : Cardiopulmonary Bypass
CT : Computed Tomography
CTA : Computed tomographic aortography
CVL : Central venous line
CVS : Cerebro Vascular Stroke
DHCA : Deep Hypothermic Circulatory Arrest
DVT : Deep Venous Thrommbosis
ECG : Electrocardiogram
EDS : Ehlers-Danlos Syndrome
EF : Ejection Fraction
FBN : Fibrillin1

List of Abbreviations (Cont.)

GCA : Giant cell arteritis
GRF : Gelatin resorcinol formal
HB : Heart Block
HCA : Hypothermic circulatory arrest
IA : Innominate artery
IABP : Intra Aortic Balloon Pump
ICU : Intensive Care Unit
IMH : Intramural Hematoma.
INR : International Normalized Ratio
IVUS : Intravascular Ultrasound.
LAD : Left Anterior Descending artery
LCA : Left coronary artery.
LIMA : Left Internal Mammary Artery
LV : Left Ventricular
LVEDD: Left Ventricular End Diastolic Diameter
LVESD : Left Ventricular End Systolic Diameter
LVOT : Left ventricular outflow tract
MDCT : Multi-detector Computed tomography.
MRI : Magnetic Resonance Imaging
NYHA : New York Heart Association
OR : Operation Room
PBS : Perioperative blood salvage.
PE : Pericardial Effusion
PH : Pulmonary Hypertension.
RAA : Right axillary artery.
RBC : Red blood cell.
RCA : Right Coronary Artery
RCP : Retrograde cerebral perfusion
SD : Standard Deviation
SGS : Shprintzen Goldberg syndrome.
STJ : Sino Tubular Junction.
SVC : Superior Vena Cava
SVG : Saphenous Vein Graft

List of Abbreviations (Cont.)

TAA **:** Thoracic aortic aneurysms
TGFBR1: Transforming Growth Factor B Receptor1
TEE **:** Trans Esophageal Echocardiography
TTE **:** Transthoracic Echocardiography
VAJ **:** Ventricular Aortic Junction.
VF **:** Ventricular Fibrillation
VSD **:** Ventricular Septal Defect
VSP **:** Valve Sparing Procedure
VRP : Valve Replacement Procedure

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Introduction

The aortic root is a complex functional unit situated between the left ventricular outflow tract (LVOT) and the ascending aorta. It supports the leaflets of the aortic valve and gives origin to the coronary arteries **(Saremi et al., 2011)**.

Arterial dilations were first described in the ancient Ebers Papyrus, a medical scroll written in Egypt in 2000 B.C. The first accurate description of arterial aneurysms is credited to the Greek physician Galen. This was based on his observation of false aneurysms in gladiators injured during battle in the 2nd century (**Kampmeier, 1938)**.

Thoracic aortic aneurysms (TAA) and its associated complications are life threatening clinical entities that rank in the top 20 leading causes of mortality in the United States (15th leading cause of death in people over 65 years old) **(Saliba et al., 2015)**.

Recent advances in imaging modalities, aging of the population, increased use of transthoracic echocardiography and routine screening have resulted in a twofold increase in the incidence. According to the CDC, the incidence of ascending TAA is estimated to be around 10 per 100, 000 person-years **(Saliba et al., 2015)**.

Different studies have shown that the ascending aorta diameter significantly correlates with age, waist circumference, smoking history and hypertension; the latter being the most prevalent risk factor for acute aortic dissection **(Howard et al., 2013)**.

Many patients with thoracic aortic aneurysms are asymptomatic at presentation and the aneurysms are detected during testing for other disorders **(Nicholas et al., 2004)**.

Aortic dissection should always be considered in the setting of severe, unrelenting chest pain, which is present in most patients **(Reece et al., 2008)**.

The most important diagnostic tools encompass; chest radiography, computed tomographic scan with contrast (CT), magnetic resonance imaging (MRI), transthoracic and trans-esophageal echocardiography (TTE&TEE) and aortography **(Svenson and Crawford, 1995)**.

Computed tomographic aortography (CTA) remains one of the most frequently used imaging techniques for diagnosis and follow-up of aortic conditions in acute as well as chronic presentations. Multidetector CT (MDCT) provides extensive z-axis coverage (in the long axis of the body), with high spatial resolution images acquired at modest radiation exposure within a scan time lasting a few seconds **(Hiratzka et al., 2010)**.

Transesophageal echocardiography (TEE) is currently the second most frequently utilized study for making the diagnosis of acute aortic dissection **(Green and Kron 2003)**.

MR angiography is an imaging modality that provides accurate measurement and definition of the entire aorta anatomy. Combined with cardiac MRI, this technology can better assess ventricular function, aortic valve function and aortic root anatomy **(Saliba et al., 2015)**.

Aortography provides precise delineation of the aortic lumen, and certain diseases have very characteristic arteriographic patterns **(Guthaner, 1994)**.

Aortic root surgery with a valved composite graft is used to modify thoracic aortic abnormalities in the aortic root. In 1968, Bentall and De Bono were the first to describe the surgical procedure for the reconstruction of the aortic root with a valved composite graft. For years, this technique became the practice standard for surgical treatment of dysfunctions of the aortic valve, root and ascending aorta (**Nezafati et al., 2015)**.

Subsequent modifications helped surgeons avoid tension on the button coronary anastomosis, preventing excessive bleeding and kinking of the coronary arteries and decreasing operation times (**Yakut, 2001**).

Nowadays, there are several conduits with mechanical valves available and very few with biological valves. Implantation of a conduit with biological valve prosthesis is not very widely used because in cases of reoperation, due to a structural degeneration of the xenograft, usually the entire conduit has to be replaced (**Dossche et al., 1999**).

The primary causes of significant morbidity in the early postoperative period are neurologic injury and bleeding. Stroke has been reported in 1.8 to 5.9% of patients in various series **(Stowe et al., 1998)**.

Contemporary surgical series on ascending aortic disease using modern grafting techniques and methods of cerebral and myocardial protection report hospital mortality rates of 1.7 to 17.1% (**Fleck et al., 2004)**.