Comparison between the Early outcome of Fallot Repair with Preservation of the Pulmonary Valve Annulus versus Transannular Patch Repair

Thesis

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List of Abbreviations

Abb.	Full term
AoV	*Aortic Valve*
CBC	*Complete Blood Cell*
CPB	*Cardiopulmonary Bypass*
ECG	*Electrocardiogram*
FTT	*Failure to Thrive*
IS	*Infundibular Septum*
IS	*Infundibular Stenosis*
JVP	*Jugular Venous Pressure*
LV	*Left Ventricle*
MAPCAs	*Major Aortopulmonary Collateral Arteries*
MDCT	*Multidetector Computed Tomography*
MS	*Milliseconds*
NC	*Noncoronary Cusp*
PA	*Pulmonary Artery*
PDA	*Patent Ductus Arteriosus*
PO2	*Oxygen Partial Pressure*
PV	*Pulmonary Valve*
PVR	*Peripheral Vascular Resistance*
RC	*Right Coronary*
RV	*Right Ventricle*
RVOTO	*Right Ventricular Outflow Tract Obstruction*
TOF	*Tetralogy of Fallot*
TV	*Tricuspid Valve*
VIF	*Ventriculoinfundibular Fold*
VSD	*Ventricular Septal Defect*
VSTAR	*Valve-Sparing Transannular Repair*

ABSTRACT

Background: This disease of heart is named after Fallot who correlated the pathologic and clinical manifestations of this cardiac malformation in his description of L'anatomie pathologique de la maladie bleu by 1888. He was the first to appreciate the complex of this cardiac malformation which he coined a "Tetralogy" consisting of pulmonary stenosis, ventricular septal defect (VSD), dextroposition of the aorta, and RV hypertrophy.

Aim of the Work: to collect, review and analyze the data of Fallot patient undergoing total repair and to compare the early outcome of Fallot repair with preservation of the annulus versus transannular patch.

Patients and Methods: This is a retrospective analysis which conducted at the cardiothoracic surgery at Ain Shams university Hospital from the first of January 2014 till the end of December 2016.

Results: The majority of patients with TOF have a bicuspid or tricuspid PV, which is the most favorable surgical anatomy for preserving the PV, independent of the presence or degree of leaflet dysplasia. We believe that the preservation of the PV annulus and PV function during early repair of TOF, by combining intraoperative PV dilation and additional surgical procedures, can be extended to the majority of patients with classic TOF. The recent introduction of more-complex PV plasty techniques allowed us to further extend the applicability of PV-preservation techniques.

Conclusion: The optimal repair technique would be therefore, dictated to the anatomical substrate of the lesion, the patient's age, prevailing surgical practice and other patient preoperative characteristics which all should be taken into relevance in an effort to improve patient outcomes.

Keywords: *Transannular Patch Repair - Pulmonary Valve Annulus - Fallot*

INTRODUCTION

In ***1672, Stensen*** described for the first time the anatomic features of what is now termed tetralogy of Fallot (TOF) ***(Warburg, 1942).*** In ***1888, Chastel*** Arthur Fallot published his findings describing the four features of the congenital cardiac anomaly that bears his name: infundibular pulmonic stenosis, ventricular septal defect (VSD), and dextroposition of the aorta and right ventricular (RV) hypertrophy ***(Chastel, 1888)***. Nowadays, TOF repair is a routine practice in many pediatric cardiac centers and can be achieved with a very low surgical risk.

However, the use of a transannular patch, which is still the most common type of repair in the presence of a hypoplastic pulmonary annulus, has proven to be the long- term Achilles' heel in such patients. In fact, it often results in pulmonary insufficiency with chronic RV volume overload, leading to progressive RV dilation and dysfunction, which associated with impaired functional capacity in the long term ***(Karamlou et al., 2006).***

Vida and his colleagues have added important insight into ways that surgeons can attempt to affect long-term right heart performance through aggressive attempts to preserve native pulmonary valve function in patients undergoing TOF repair. Through meticulous attention to technical details and

native valve morphology, they have been able to ‘‘preserve’’ native pulmonary valve function in 56% of their patients undergoing TOF repair ***(Vida et al., 2015).***

We believe that the preservation of the PV annulus and PV function during early repair of TOF, by combining additional surgical procedures or intraoperative balloon, can be extended to the majority of patients with classic TOF. The recent introduction of more-complex PV plasty techniques, including delamination plasty, allowed us to further extend the applicability of PV-preservation techniques ***(Bacha, 2018).***

AIM OF THE WORK

The aim of this work is to collect, review and analyze the data of Fallot patient undergoing total repair and to compare the early outcome of Fallot repair with preservation of the annulus versus transannular patch.

The study results will help us to assess where we stand regarding this surgical problem and provide basis to improve care provided to our patients and establish treatment protocols.

Chapter 1
HISTORICAL BACKGROUND

This disease of heart is named after Fallot who correlated the pathologic and clinical manifestations of this cardiac malformation in his description of *L'anatomie pathologique de la maladie bleu* by 1888. He was the first to appreciate the complex of this cardiac malformation which he coined a "Tetralogy" consisting of pulmonary stenosis, ventricular septal defect (VSD), dextroposition of the aorta, and RV hypertrophy ***(Fallot, 1888).***

Recently, Van Praagh and his associates have termed the Tetralogy a Monology, stressing the importance of under development of the pulmonary infundibulum as the essential feature leading to the distinct anatomy.

They have characterized the Tetralogy as a group of congenital cardiac lesions resulting from underdevelopment of the distal pulmonary conus. This hypoplasia of the conus is associated with poor posterior expansion of the crista supraventricularis, leaving a junctional ventricular septal defect lying between the two divisions of the septal band and the crista. Distal conal hypoplasia is also associated with hypertrophy of those structures making up the proximal conus and these results in infundibular narrowing. The aorta may be more or less dextroposed (or overriding). The combination of

right ventricular outflow tract obstruction and a ventricular septal defect approximately the size of the aortic annulus results in equal peak systolic pressures in both ventricles ***(Van Praagh et al., 1965).***

Operative treatment of Tetralogy of Fallot was begun in the 1940's by Blalock and Taussig who were able to achieve significant palliation in "blue babies" using a subclavian artery-pulmonary artery anastomosis ***(Blalock and Taussig 1945)***.

In 1955 total open intra-cardiac correction of Tetralogy of Fallot (TOF) with Cardiopulmonary bypass (CPB) was begun by ***Lillehei and co-workers (1955)*** in Minneapolis and Kirklin and colleagues at the Mayo Clinic.

At the present time, total correction with mortality of fewer than 10% may be offered to all patients with Tetralogy ***(Stewart et al., 2005).***

Chapter 2
SURGICAL ANATOMY

The basic anatomical features of the tetralogy of Fallot are widely recognized and its variants have been all well documented. Despite disagreement regarding the interpretation and nomenclature of the muscle bands surrounding the ventricular septal defect and the developmental genesis of the stenosis, there is a little controversy concerning the fact that ventricular septal defect, aortic overriding, infundibular pulmonary stenosis and right ventricular hypertrophy are the essential anatomical components ***(figure 1) (Anderson et al., 1981).***

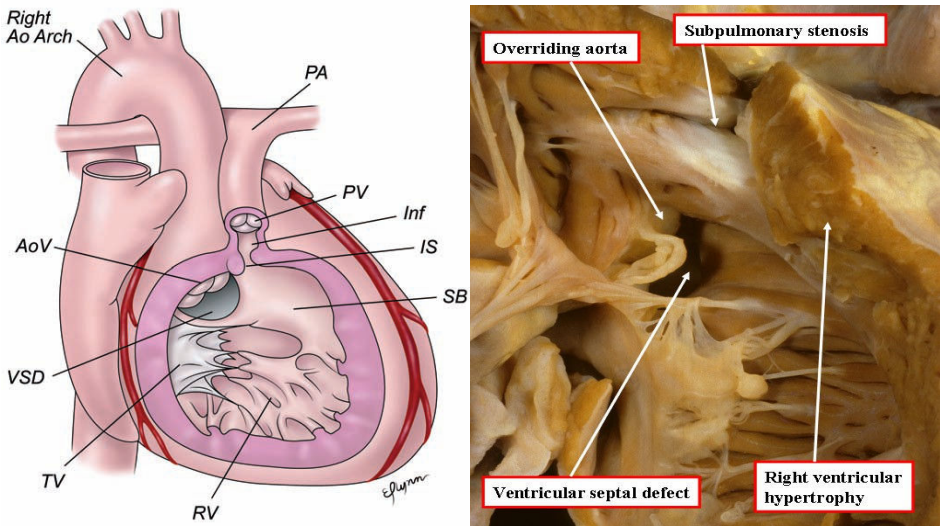

Figure (1): Anatomy of Tetralogy of Fallot ***(Kean et al., 2006)***
AoV: aortic valve, Inf: sub pulmonary infundibula, IS: infundibular stenosis, PV: pulmonary valve, PA: pulmonary arteries, TV: tricuspid valve and Ao: aortic (Ao) arch**.**