

Ain Shams University
Faculty of Medicine
Cardiothoracic Surgery Dept.

**VALVE DYSFUNCTION AFTER TOTAL
REPAIR OF TETRALOGY OF FALLOT & ITS
RELATION TO VENTRICULAR
ARRHYTHMIA**

Thesis

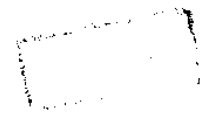
Submitted for Partial Fulfillment
of M.D. Degree in Cardiothoracic Surgery

54613

By

Reda Ahmed Abu El Maaty

M.B.B.Ch., M.S.



Supervised By

Prof. Dr. Mohamed Salem El Fiky
Professor of Cardiothoracic Surgery
Ain Shams University

Prof. Dr. Omar Salah Awwad
Professor of Cardiology
Ain Shams University

Prof. Dr. Aly Sief El-Din Maklad
Professor of Cardiothoracic Surgery
Ain Shams University

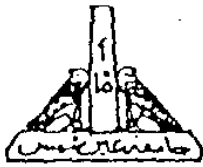
**Prof. Dr. Mohamed Mounir
Elsacid**
Professor of Cardiothoracic Surgery
Mansoura University

617.412

R.A

Prof. Dr. Adel Mohamed Kamal El Etreby
Professor of Cardiology
Ain Shams University

1996



Ain Shams University
Faculty of Medicine
Cardiothoracic Surgery Dept.

***VALVE DYSFUNCTION AFTER TOTAL
REPAIR OF TETRALOGY OF FALLOT & ITS
RELATION TO VENTRICULAR
ARRHYTHMIA***

Thesis

Submitted for Partial Fulfillment
of M.D. Degree in Cardiothoracic Surgery

By

Reda Ahmed Abu El Maaty

M.B.B.Ch., M.S.

Supervised By

Prof. Dr. Mohamed Salem El Fiky
Professor of Cardiothoracic Surgery
Ain Shams University

Prof. Dr. Omar Salah Awwad
Professor of Cardiology
Ain Shams University

Prof. Dr. Aly Sief El-Din Maklad
Professor of Cardiothoracic Surgery
Ain Shams University

***Prof. Dr. Mohamed Mounir
Elsaeid***
Professor of Cardiothoracic Surgery
Mansoura University

Prof. Dr. Adel Mohamed Kamal El Etreby
Professor of Cardiology
Ain Shams University

1996





Harefield

HOSPITAL

HAREFIELD MIDDLESEX UB9 6JH
TELEPHONE 0895 823737

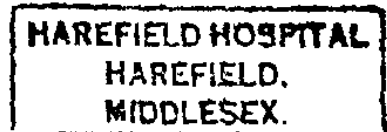
DIRECT LINE
FAX

TO WHOM IT MAY CONCERN

Dr Reda Ahmed Maaty joined the Cardiac Surgery Department at Harefield Hospital from 1st September 1993 to 30th September 1994 as honorary registrar in cardiac surgery. During this period he finished his MD thesis on "*Valve dysfunction after total repair of Fallot tetralogy and its relation to ventricular arrhythmia*". In addition he also undertook clinical and surgical work within the department. Dr Maaty worked well during his stay with us and we wish him a very successful future.



Sir Magdi H Yacoub FRCS, MRCP, PhD(Hon), DSc(Hon)
British Heart Foundation Professor of Cardiothoracic Surgery



Dedication

TO THE MEMORY OF MY PARENTS
TO MY WIFE,
TO MY SON AHMED,
TO MY DAUGHTER RAGHDA

Special Acknowledgement

I would like to express my deep thanks and sincere gratitude to **Professor sir Magdi Yacoub**, British Heart Foundation Professor of Cardiothoracic Surgery, Harfield Hospital and National Heart & Lung Institute, London, England, for his sincere help in the planning of this work, his valuable advices & his fruitful supervision. Not only that but also Professor **Yacoub** sponsored me for registration in the British General Medical Council & this enabled me to work as a registrar in three big hospitals in London which gave me practical experience beside my research work, Professor **Yacoub** has learned me how to do research work. Really,, I can't forget the generous cooperation of Profssor **Yacoub** throughout this work and during my stay in London .

I am also obliged to **Dr. Rosemary Radley-Smith**, Consultant Paediatric Cardiologist, Harefield Hospital, London for her agreat care & guidance during Conduction of this work .

I am specially grateful to **Dr. Obed Onuzo**, Registrar in Paediatric Cardiology, Harefield Hospital, London for his

Continuous support & help in Performing the echocardiographic aspects of this work .

I shall remain deeply grateful to ***Dr. Derek Robinson***, Ph.D, School of Mathematics & physical science, Brighton University, England, for his energetic help in doing the statistical analysis of the results of this thesis .

I would like to extend my sincers gratitude to ***Terry Dilon***, ECG technician, Harefield Hospital for his help in doing 24 hour ECG & excercise ECG .

I would also like to thank all the sisters, technicians & Colleague fellows who had facilitated my stay in London & made it one of the most useful & enriching experiences in my life .

Reda A. Maaty

1996

Acknowledgment

I would like to express my deep gratitude & sincere thanks to ***Professor Mohamed El-Fiky***, Professor of Cardiothoracic Surgery, Ain Shams University who supervised this work & Kindly gave me his recommendation letters which were of great value during my stay in London . Professor ***El-Fiky*** asked me to add some arabic references to this work and this was an excellent idea which enriched the thesis & made it more valuable . ***Professor El-Fiky*** was very cooperative & very helpful in reviewing every part of this thesis . His continuous guidance, objective criticism & encouragement are deeply appreciated .

No words could express my deep feeling & sincere appreciation to ***Professor Ali Sief El-Din Maklad***, Professor of Cardiothoracic Surgery, Ain Shams University, who kindly supervised this work, for his utmost support & encouragement throughout this thesis & for his skillful revision of this study to put this work in its best way . I am deeply grateful to him for his great help, kind cooperation & encouragement .

I wish to express my gratitude to ***Professor Omar Salah Awwad***, Professor of Cardiology, Ain Shams University for his kind supervision & sincere help .

Also, I wish to express my sincere appreciation to ***Professor Mohamed Mounir El-Saeid***, Professor of Cardiothoracic Surgery, Mansoura University, for his continuous guidance & Marvellous support . ***Professor Mohamed Mounir*** was very cooperative & helpful to me during my work within Cardiothoracic Surgery department, Mansoura University, I shall remain very grateful to him throughout my life .

My greatest thanks to ***Professor Adel M. Kamal El-Etrby***, Professor of Cardiology, Ain Shams University for his assistance & valuable advices .

Lastely, my deep thanks and gratitude to all members, nurses & workers of my Cardiothoracic Surgery department, Mansoura University for their Continuous help .

Reda A. Maaty
1996

Contents

• Introduction & Aim of the work	1
• Review of Literature :-	3
* <u>Historical note.</u>	<u>4</u>
* <u>Morphology :-</u>	<u>5</u>
- R.V. outflow tract obstruction .	5
- Ventricular septal defect .	11
- Aorta .	12
- Right Ventricle .	14
- Left ventricle .	14
- Coronary arteries .	15
- Associated Cardiac anomalies .	15
* <u>Embryology of TOF.</u>	<u>17</u>
* <u>Pathophysiology of "TOF".</u>	<u>18</u>
* <u>Clinical features & diagnosis :-</u>	<u>21</u>
- Squatting.	22
- Hypercyanotic spells .	23
- Physical examination .	24
- Laboratory studies .	25
- Chest radiography .	26
- Electrocardiography .	26
- Echocardiography .	27
- Cardiac Catheterization.	27
* <u>Natural History :</u>	<u>29</u>
* <u>Surgical Treatment of TOF :-</u>	<u>31</u>
- Indications for operations .	<u>31</u>

- Two stage & one stage correction .	32
- Decision of Transannular Patching .	38
- Repair of TOF Via Right Ventricle.	44
- Transatrial repair of TOF.	46
- Initial Palliation by propranolol .	49
- Palliation by balloon Valvotomy .	49
- Postoperative Care .	50
* <u>Prognosis :</u>	<u>53</u>
* <u>Risk Factors for Premature death :-</u>	<u>55</u>
1- Age .	55
2- Severity of Annular Hypoplasia .	58
3- Small size of Right & Left Pulmonary arteries .	59
4- Transannular Patch .	59
5- Postrepair Prv/Lv .	60
6- Previous Palliative operations .	60
7- Associated anomalies .	60
8- Haematocrite value .	61
9- Heart block .	61
10- Left Ventricular dysfunction .	62
11- Tricuspid regurgitation .	62
12- Pulmonary Regurgitation . (PR)	66
* Methods of measurement of (PR).	66
* Transannular Patch & (PR)	69
* Hazards of Pulmonary Regurgitation .	69

* Measures to decrease severity of (PR) .	70
* Treatment of Pulmonary Regurgitation .	73
13- Right Ventricular dysfunction after repair of Tetralogy of Fallot "TOF" .	76
14- The problem of sudden death & Ventricular arrhythmias .	76
* Risk factors of ventricular arrhythmias .	79
* How can we avoid Ventricular arrhythmia & Sudden death after repair of (Tetralogy of Fallot).	83
* Management of Ventricular Tachycardia after repair of Tetralogy of Fallot .	84
15- Reoperation after total repair of (TOF) .	90
16- Impaired Lung Function after repair of TOF.	94
17- Functional Status & Exercise Performance after total repair of Tetralogy of Fallot .	94
• Patients & Methods .	96
• Results .	103
• Discussion .	113
• Summary & Conclusion .	129&132
• References .	135
• Arabic Summary .	

List of Figures

<i>Figure (1) :</i>	Diagram of normal Heart
<i>Figure (2) :</i>	Diagram of Tetralogy of Fallot "TOF"
<i>Figure (3) :</i>	Diagram of Tetralogy of Fallot "TOF" with small main pulmonary artery .
<i>Figure (4) :</i>	Diagram of Tetralogy of Fallot "TOF" with supravalvular stenosis .
<i>Figure (5) :</i>	Diagram of "TOF" with right aortic arch .
<i>Figure (6.a & b) :</i>	Measurment of normal size of right ventricular outflow tract .
<i>Figure (7.a, b & c) :</i>	Transventricular repair of "TOF" .
<i>Figure (8.a, b & c) :</i>	Transatrial correction of "TOF" .
<i>Figure (9) :</i>	Pathophysiology of postoperative tricuspid regurgitation .
<i>Figure (10) :</i>	Measurement of pulmonary regurgitation using pressure - volume loop .
<i>Figure (11.a & b) :</i>	Preservation of pulmonary valve annulus .
<i>Figure (12) :</i>	The use of homograft monocusp as a transannular patch .
<i>Figure (13) :</i>	Technique of pulmonary valve replacement for pulmonary regurgitation after correction of Tetralogy of Fallot "TOF"

List of Figures
"Continue"

Figure "I" :	Number of patients in NYHA classes .
Figure "II" :	Histogram of cardiothoracic ratio .
Figure "III" :	Number of patients with different degrees of pulmonary regurgitation .
Figure "IV" :	Number of patients with different degrees of tricuspid regurgitation .
Figure "V" :	Holter & Lown's Criteria : number of patients .
Figure "VI" :	Mean age against Lown's criteria .
Figure "VII" :	Mean pulmonary regurgitation versus Lown's criteria .
Figure "VIII" :	Percentage less & greater than predicted exercise time .
Figure "IX" :	Percentage less & greater than predicted maximum heart rate .
Figure "X" :	Percentage less & greater than maximum systolic Blood Pressure .