SURVIVAL RATE AFTER THE REPAIRING OF TETRALOGY OF FALLOT- A REVIEW STUDY

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SUBMITTED BY

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UNDER THE SUPERVISON OF DR ASMITA DUJAWARA

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DECLARIATION

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List of Abbreviation used in this Desertion / project/ thesis report

1. **CHD –Congenital Heart Disease.**
2. **TOF- Tetralogy of Fallot.**
3. **VSD- Ventricular Septal Defect.**
4. **ASD- Atrial Septal Defect.**
5. **PAD- Patent Duct Arteriosus.**
6. **BT Shunt- Blalock Taussig Shunt.**
7. **ECG- Electrocardiogram.**
8. **ECHO- Echocardiography**
9. **CMR- Cardiac Magnetic Resonance.**
10. **RVOT – Right Ventricular Outflow Tract.**

SURVIVAL RATE AFTER THE REPAIRING OF TETRALOGY OF FALLOT- A REVIEW STUDY

ABSTRACT

Nowadays there is lot of complications has grown in which our heart is the primary organ of body that get affected. As the embryo grows in the womb of mother, during embryogenesis phase few changes has happened that changes the entire structural and functional capacity of heart. Defects that came with the birth of child is called is called as congenital heart defects as they came with the infant when he/she is born. Congenital heart defects also known as birth defect. Congenital heart defects divide into ACYANOTIC and CYANOTIC.

ACYANOTIC divides into left to right shunts and outflow obstruction. In left to right shunt is VSD, PDA, ASD and in outflow obstruction is pulmonary stenosis, aortic stenosis, Coarctation of aorta. In CYANOTIC is Tetralogy of Fallot and transposition of the great arteries.

For repairing of TOF there is two methods or techniques that is used to correct TOF those are open heart surgery and temporary method (BT shunt). Open heart surgery involves closure of VSD using Dacron patch and BT shunt is temporary fix that is used to improve the blood flow in pulmonary circulation.

Keywords: Tetralogy of Fallot, Cyanosis, Open heart surgery, temporary method.

INTRODUCTION

Tetralogy of Fallot represents almost 7 to 10% of congenital heart disease (CHD) and TOF is also the second most common form of CHD.

What is TOF (Tetralogy of Fallot)-

Tetralogy of Fallot is a congenital heart defect that combines four more cardiac defects name i) aorta dextroposition ii) Ventricular septal defects iii) RVOT (Right ventricular outflow obstruction) iv) Right ventricular hypertrophy. Severe TOF makes the appearance of infant bluish in color and early condition the infants look mild pinkish in color. Patient with TOF have cyanosis since from the time of birth. (1)

Development of TOF – TOF starts forming in the fifth week of pregnancy TOF develop due to an unequal division of the conus

1.Ventricular septal defect – in this defect there is a hole creates in the intraventricular septum that transfers the blood from left to right ventricle and right to left ventricle due to which mixing of blood happens that mixes the oxygenated and deoxygenated blood together. (2)

2.Aorta dextroposition – also called as dextro-transposition of great arteries that is pulmonary artery and aorta they switch their position. So normal position of aorta is located above the left ventricle but in this aorta is present at the site of VSD or above VSD. (3)

3.RVOT obstruction – right ventricular outflow tract also known as pulmonary atresia. This obstruction can be a reason of any abnormality at infundibulum or at right ventricle 0r at the pulmonary valve. (4)

4. Right ventricular hypertrophy- as hypertrophy stands for the enlargement of muscles so right ventricular hypertrophy is the enlargement or pathological increases of muscle mass in responses of the increased overload.(5)

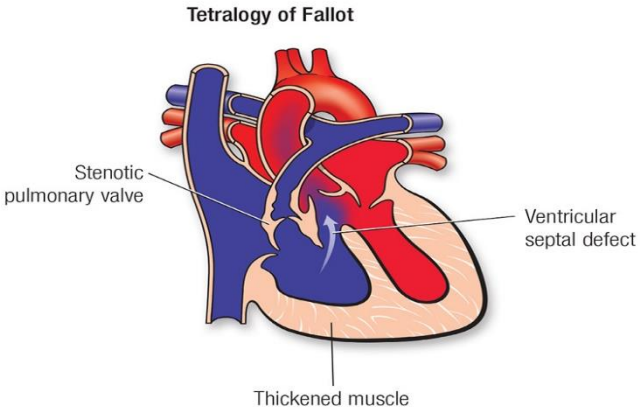

Fig 1. Diagrammatic view of Tetralogy of Fallot.

RISK FACTORS OF TOF –

1. If a mother is consuming a lot of alcohol.
2. Or it is inherited from parent
3. Presence of Down syndrome
4. Poor nutrition of mother during pregnancy
5. German measles.
6. Mother is older than age 40year (6)

SYMPTOMS OF TOF -

1. Heart murmurs
2. Fainting
3. Clubbing of fingers
4. Infant gets easily tired while playing
5. Shortness of breath

Blue baby syndrome or blue coloration of skin caused by low amount of oxygen in blood (7)

Fig 2: Blue baby syndrome (Bluish skin coloration)

REVIEW OF LITERATURE

Christian Apitz, Gary D Webb, Andrew N Redington et al (2009) conducted a study on the tetralogy of Fallot and how the first successful surgery has taken place in 1950s, what are all the diagnosis, pre operative, surgical treatments and post operative care of tetralogy of Fallot patients they explain all the success story of modern medicines, explains the best treatments for 1% population born with this TOF and what are the late outcomes of tetralogy of Fallot. (3)

P. Syamasundar Rao et al (2009) – conducted a study on diagnosis and management of cyanotic congenital heart disease in which they observe all the cyanotic cardiac lesions namely tetralogy of Fallot, transposition of the great arteries and tricuspid atresia. They discussed all the pathology ,pathophysiology, clinical features, non-invasive and invasive laboratory studies and management. (8)

Wesley Lee, MD et al (1995) conducted a study tetralogy of Fallot: Prenatal Diagnosis and Postnatal survival so they correlate the prenatal echocardiography findings with the infants in the huge population affected with tetralogy of Fallot. Final outcome shows that the Fetuses with tetralogy of Fallot present with only ventricular septal defect and aortic septal override. Pulmonary stenosis is not always seen in the ultrasound initially but later on it become worse during late pregnancies. (9)

Seshadri Balaji et al (1997) conducted a study on QRS prolongation is associated with inducible ventricular Tachycardia after repair of tetralogy of Fallot , so prolongation of QRS duration on the ECG has been found to use as a great tool to predict the arrhythmic events in the late after the repairing of tetralogy of Fallot after completion of study they found that sudden death and ventricular tachycardia are the most serious problem in patients tetralogy of Fallot who underwent for the repairing.(10)

M. Elizabeth Brickner, M D et al, (2000) conducted a study on the congenital heart disease in adults they discuss the common acyanotic and cyanotic congenital heart conditions in adults(11)

Richard A Humes et al (1987) conducted a study on Tetralogy of Fallot with anomalous origin of left anterior descending coronary artery so they found that origin of left anterior descending coronary artery is most commonly findings of the coronary artery anomaly in tetralogy of Fallot and has seen in the patients of about 2- 9% and encountering of this artery is really important as

it is closely located across the right ventricular outflow where the lesions had create for the surgical repairing of Tetralogy of Fallot (12)

TREATMENT ADVISED FOR CORRECTION OF TETRALOGY OF FALLOT

Basically two options are available for the correction or repairing of TOF –

One is open heart surgery and second is BT shunt formation or temporary method. The surgery need to be perform during the first year of new born life. Our primary goal for performing surgery is to close the shunt that is created in between the ventricles and controls the narrowing of the pulmonary valve for the improvement in the circulation of blood in lungs. We close the shunt between the ventricles by using the patch.

1**.Open heart surgery** (CARDIO- PULMONARY BYPASS) – open heart surgery or intracardiac repair is perform to correct the tetralogy of Fallot as soon as the baby is born or after the infancy. In open heart surgery we close the shunt that is present in case of VSD that is ventricular septal defect in which a hole or a shunt is created in between the intraventricular septum, so we use a patch between the right and left ventricle known as a Dacron patch, after closing the hole we improve the quality of blood as there is no mixing of oxygenated and deoxygenated blood. In this surgery our second step is to close the RVOT by correcting the infundibular tissue and the third step is pulmonary valvotomy. (13)

2. **BT shunt or temporary method** -in some new born babies the open heart is not possible like if the baby is immature or the new born is born with some other medical problems, so for them we create an artificial path for the improvement in the pulmonary circulation by creating a shunt. This shunt plays a role of ductus arteriosus. Shunt is created in between the subclavian artery and the ipsilateral pulmonary artery. This stunting is mostly useful in the infants older than 3 months because chances of getting thrombosed is maximum in young infants. (14)

COMPLICATIONS OF SURGERY –

1. Excess bleeding while performing the procedure.
2. Chances of pulmonary regurgitation.
3. ECG findings shows Right bundle branch block.
4. Ventricular arrythmias are rare.
5. Complete heart block is rare. (15)

COMPLICATIONS OF INFANTS AFTER SURGERY- 1. Right heart failure, 2. Ventricular and atrial arrythmia 3. Sudden death, 4. Endocarditis. (16)

COMPARISON BETWEEN OPEN HEART SURGERY AND TEMPORARY METHOD –

A) OPEN HEART SURGERY - Mortality rate in open heart surgery is about 2 to 3% in the patient with uncomplicated TOF during the initial years of infants not more than 2years. Older age patients are at high risk of mortality rate. age pf patient could be younger than 3 months and older than 4 years. (17)

B) BT shunt – mortality rate of temporary shunting is 1% or less. (17)

In 2015 > 90% of neonates with CHD will live until they reach their adulthood. But follow ups after surgery is important. (17)

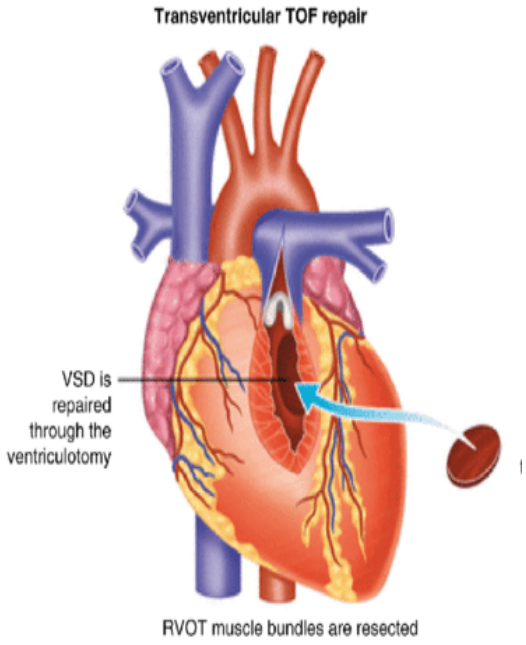

Fig 3. Showing repaired VSD.

SURVIVAL RATE

After surgery the children with mild tetralogy of Fallot has good survival rate with good quality of life. About around 75% of infants who underwent for the TOF surgery will survive to reach their second to third decade of their life without any serious complications. If the complications start appearing it could be pulmonary regurgitation after the first two decades of life. But some of them remains asymptomatic by the end of their fourth decade. (18)

Second surgery decreases the rate of death, majority of these patients have short lifespan. Sudden death from ventricular arrythmia has reported in almost 1- 5% of patients at a later stage in life. One study has also found that the left ventricular dysfunction to be associates with huge risk of developing arrythmia that is life- threatening. Continued cardiac monitoring is important in adult life because sometime in the childhood people develops long QT syndrome.

Individuals who survived to the age of 30 years may develops congenital heart failure. while on the other hand individuals who went for stunt procedure shows minimal compromise of hemodynamic changes and individual achieves normal life span.

Due to advance in surgical techniques, we observe 40% reduction in death with tetralogy of Fallot was noted from 1980 to 2004.

CONCLUSION

Lot of complications came with the new born nowadays called as congenital heart defects. Congenital heart defect divides into acyanotic and cyanotic. Tetralogy of Fallot is cyanotic congenital heart defect and its components are right ventricular hypertrophy, ventricular septal defect, aortic overriding, right ventricular obstruction. Infant born with TOF shows symptoms like blue coloration of skin, they get tired easily, clubbing of fingers, etc.

Few diagnostic test are perform at the time of pregnancy and after the delivery of infant. To check the tetralogy of Fallot severity. After diagnosis the doctor decide the better option for the correction of TOF and also look after for the complications and follow ups

REFERENCES

1. Tetralogy of Fallot Christian Apitz, Gary D Webb, Andrew N Redington. Lancet 2009;374:1462-71.
2. Ventricular septal defect, Daniel J Penny, G Wesley Vick III, Lancet 2011;377:1103-12.
3. What is aortic overriding, Robert H Anderson, Diane E. Spicer, G. William Henry, Cynthia Rigsby, Anthony M. Hlavacek, Timothy J. Mohun. Cardiology in the young (2015), 25, 612-625.
4. Dynamic right ventricular outflow tract obstruction in cardiac surgery, Andre Y, Denault, MD, FRCPC, Miguel Chaput, MD, Pierre Couture, MD, FRCPC," Yves Hebert, MD , FRSCS, Franccois Haddad, MD, FRCPC, Jean- Claude Tardif, MD , FRCPC.
5. Relation between age at surgery and regression of right ventricular hypertrophy in tetralogy of Fallot; M.A. Seliem MD, Y.-T.Wu &K. Glenwright :Pediatric cardiology, 16, 63-55(1995).
6. Risk factors for morbidity in infants undergoing tetralogy of Fallot repair ; Alexander C Egde, Alexander J Mittnacht, Khanh Nguyen, Umesh joashi.
7. Symptomatic Neonatal Tetralogy of Fallot: Repair or Shunt? ; Kirk R. Kanter, MD, Brian E. Kogon, MD, Paul M. Kirshbom, MD, and Pamela R. Carlock , RN, Ann Thorac Surg 2010;89:858-63.

8. Diagnosis and Management of Cyanotic Congenital Herat Disease: Part 1, Division of Pediatric Cardiology, Department of Pediatric University of Texas-Houston Medical school/ children's Memorial Hermann Hospital, Houston, texas, USA.

9.Tetralogy of Fallot: Prenatal Diagnosis and Postnatal Survival; WESLEY LEE, MD, RAMADA S. SMITH, MD, CHRISTINE H, COMSTOCK, MD, JANET S. KIRK, MD, THOMAS RIGGS, MD, AND ELLIOTT WEINHOUSE, MD.

10.QRS prolongation is associated with inducible ventricular tachycardia after repair of tetralogy of Fallot; Seshadri Balaji, MRCP, Yung R. Lau, MD, Christopher L. Case, MD, and Paul C. Gilllette , MD, Am J Cardiol 1997;80:160-163.

11. Congenital heart disease in adults M. Elizabeth Brickner, M.D., David Hillis, M.D., and Richard A. Lange, M.D.

12. Tetralogy of Fallot with anomalous origin of left anterior descending coronary artery Surgical options , Richard A. Humes, MD, David J. Driscoll, MD , Gordon K, Danielson, MD, and Francisco J. Puga, MD, Rochester, Minn.

13. Outcome after open heart surgery in infants and children; Geoffrey Miller, MD; Johanna R. Tesman, PhD;Jeanette C. Ramer, MD; Barry G. Baylen, MD; John L. Myers, MD: J Child Neurol 1996; 11;49-53.

14. Systemic pulmonary shunts in infants and children; John J. Lamberti, MD, James Carlisle, B.S, J Deane Waldman, MD, Frederick A. Lodege, M.D, Stanley E. Kirkpatrick, M.D, Lily George, M.D, James W. Mathewson, M.D. Searle W. Turner, M.D. and Stanley J, Pappelbaum , M.D. San Diego, Calif : J THORAC CARDIOVASC SURG 88:76-81,1984.

15, 16 – Surgical insight: late complications following repair of tetralogy of Fallot and related surgical strategies for management; Tara Karamlou, Brian W McCrindle and William G Williams.

17. Long term evaluation (12 to 22 years) of Open Heart Surgery for Tetralogy of Fallot; Valentin Fuster, MD, Dwight C. McGoon, MD, Margaret A. Kennedy, Donald G, Ritter, MD. John W, Kirklin MD.

18. Late survival and symptoms after Repair of Tetralogy of Fallot; Nevin M. Katz, M.D., Eugene H. Blackstone, M.D., John W. Kirklin, M.D., Albert D. Pacifico, M.D., and Lionel M. Bargeron, Jr., M.D.