Short Communication

Reported Complications Post Tetralogy of Fallout Repair in One Teaching Center for Cardiac Surgery

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Abstract

Background: Tetralogy of Fallot (TOF) is a prevalent congenital heart issue with cyanosis. Despite this progress, complications after surgery persists, impacted by variables like surgery timing, approach, and patient attributes. **Objectives:** investigation TOF repair looking at forecasting complication risk factors. **Materials and Methods:** In this record-based cross-sectional study, sixty-six Tetralogy of Fallot patients received repairs at the Ibn al-Bitar center between March 2022 and May 2023. Data on patient characteristics, surgery timing, approach, and pre-op conditions were gathered. Post-surgery issues were assessed using predictive modeling techniques. **Results:** The mean age for surgeries was 2.58 years, and repairs done after age two had a heightened complication risk. The transatrial method was favored in 80.3% of instances due to its advantages in protecting right ventricular function. Key complications comprised arrhythmia (33%), pleural effusion necessitating chest tube insertion (7%), and cardiac arrest (12%). Forecasted complication factors encompassed older repair age, low birth weight, previous palliation, and extracardiac malformations. **Conclusions:** The research underscores the significance of early TOF repairs and individualized risk evaluation. Results back the transatrial technique for TOF repair and stress the need for thorough monitoring post-surgery, particularly for patients with known risk elements, to enhance TOF management results.

Keyword: Tetralogy of Fallot, complication, repair**.**

Introduction

The most frequent reason for cyanotic heart disease is tetralogy of Fallot [1], The morbidity and mortality rates of tetralogy of Fallot (TOF) have significantly decreased due to comprehensive care, which involves initial treatment, surgical correction, and postoperative complication management [2]. Right ventricular outflow tract obstruction, Ventricular septal defect (VSD), Malalignment overriding the aorta to the VSD, Concentric RV hypertrophy. The necessity for medical intervention varies based on the degree of obstruction in the right ventricular outflow tract (RVOT). [3] Patient with severe obstruction experience inadequate pulmonary blood flow and commonly exhibit noticeable blueness shortly after birth. [4] Prompt intervention may be necessary for these cases. Those with moderate blockage and a well-balanced flow between the lungs and body typically become known through routine evaluation for a heart murmur to avoid complications. [5] Surgical intervention is the ultimate solution for treating TOF. [6] The preferred treatment for the majority of individuals with tetralogy of Fallot (TOF) is primary intracardiac surgery, [6] even for asymptomatic non-blue infants (pink variant), as

this procedure enables the proper development of the right ventricular outflow tract (RVOT) and pulmonary valve. [7] The surgical outcome following the operation is influenced by the individual patient's attributes and factors within the medical facility, such as disease severity, age at surgery, oxygen levels, and any accompanying health conditions. [8] Studies indicate that conducting TOF repair during infancy leads to reduced postoperative complications and shorter durations of hospitalization. [9] Our study focuses on post-repair complications in region-specific and one-center settings, investigating TOF repair and forecasting complication risk factors.

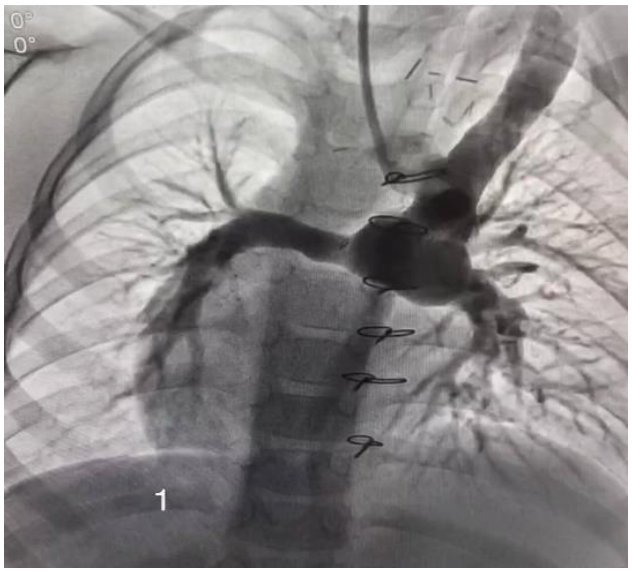

Figure 1: TOF with palliative surgery (Blalock taussing shunt).

Materials and Methods

The research used information from a single-tertiary center of sixty-six patients with Tetralogy of Fallot (TOF) in record-based cross-sectional study at the Ibn al-bitar tertiary center from March 2022 to May 2023.

Ethical approval

The study was registered and approved by College of Medicine -Al Fallujah University and informed consents were taken from the parents.

Inclusion criteria

- Patients with confirmed Tetralogy of Fallot (based on echocardiography and CATH) undergoing repair (primary or staged).
- Patients who completed surgical correction during the study period.
- Patients with available and complete pre and postoperative echocardiographic data.

Exclusion criteria

- Patients who died before completing Tetralogy of Fallot repair.
- Patients with extracardiac malformation, chromosomal abnormalities, or significant comorbidities.

Data collection entailed acquiring pre-operative echocardiograms and perioperative medical examination for patient. Evaluating the right ventricular function included different measurements such as the peak velocities of tricuspid E, A, and e' using tissue Doppler, as well as the E/e' ratio to assessing right ventricle diastolic function. The research centered on post-operative cardiac complications. Cardiac catheterizations were considered complications as they are unexpected after uncomplicated TOF repair, indicated by ongoing hypoxemia, low cardiac output, residual lesions, or pulmonary artery stenosis. Chest drainage was required for significant pleural effusion unresponsive to medication. Post-operative standardized echocardiograms were conducted between days 0, 2 and 5 after surgery. Patients were part of the study only if they underwent TOF surgery as scheduled; those who passed away before or after a palliative procedure without completing the repair were excluded.

Statistical analysis

Predictive modeling was assessed to identify the risk factors for complications in binary logistic

classification, independent variable including the age of the studied patient, birth weight, previous palliative surgeries, and extra-cardiac malformations. Odds ratios, coefficients, and p-values were calculated to identify the statistical significance of these factors.

Results

This study is record-based cross-sectional study at Ibn Al-Bitar specialized center for cardiac surgery in Baghdad, from March 2022 to May 2023, our study involved sixty-six patients were diagnosed as TOF. The average age for repairs is around 2.58 years, with the middle age being 1.5 years based on the given age categories, 42 (63.63%) patients are male and the remainders are female, most of the included patients (86.36%) have normal birth weight and half of them have onset of symptoms in 4 to 6 months age. Regarding surgical repair only 37.87% have previous palliative surgery (Table 1).

Table 1: Patient and pre-operative characteristics

Characteristics	Details	No.	Percentage %
Age of Repair	Below (1) year	12	18.18%
	Between 1&2 years	31	46.96%
	Between 2&5 years	8	12.12%
	Above (5) years	15	22.72%
Repair with Prior palliative surgery		25	37.87%
Repair Without palliative surgery		41	62.12%
Sex incidence	Male	42	63.63%
	Female	24	36.36%
Birth wight	Extreme low birth wt	3	4.5%
	Low birth wt	6	9%
	Normal birth wt	57	86.36%
Onset of symptoms	4months-6 months	33	50%
	6months-12 months	21	31.8%
	1year-2 year	15	22.7%

The pulmonary valve anatomy conditions seen in patients, the most frequent condition was pulmonary valve stenosis about 71.21%, pulmonary valve atresia was 19.6% while absent pulmonary valve about 9%. Aorto-Pulmonary Collaterals Found in 22.7% of cases. Extra-cardiac Malformation Identified in 27.2% of patients.

Table 2: Pre-operative interventions.

Characteristic	No.	%
Blalock-Taussig shunt	13	19.6%
Central aortopulmonary artery shunt	3	4.5%
Right ventricular outflow tract stent	2	3%
PDA stent	6	9%
Pulmonary valve balloon dilation	1	1.5%

The surgical approaches used for intracardiac repair of TOF transatratrial approach in about 80.3%, transventriclular approach was 16.6% while both in about 3%.

Table 3: Outflow tract repair.

Repair of outflow	No.	%
Patch by Transannular	31	46.9%
Non transannular patch	10	10.5%
RV to PA conduit	16	24.2
Pulmonary valvotomy	7	10.6%
Closing of VSD (without outflow tract augmentation)	2	3%

Table 4 shows types of complications we phased, the most common complication is arrhythmia which is reported in 22 out of 66 patients.

Table 4: Type of cardiac complication

Type	No.	%
Arrhythmia need treatment	22	33%
ECMO	3	4%
exploration of mediastinal	4	6%
Pleural effusion need chest tube	5	7%
Chest leftward open (delayed sternal closure)	1	1.5%
Redo operation	8	12%
CPR for cardiac arrest	8	12%
pericardiocentesis for pericardial effusion	2	3%
Placement of Pacemaker	4	6%

The most significant risk factors for reported complications were illustrated in Table 5,

including age repair beyond 2 years age, low birth weight and the presence of extra-cardiac manifestations.

Table 5: Predictive modeling for complication post TOF repair

Factor	Odds Ratio	coefficient	P-value	Predictive significance
Age repair above 2 year	2.11	0.75	0.015	significant
Presence extracardiac manifestation	2.86	1.05	0.004	significant
Previous palliative surgery	1.92	0.65	0.038	Marginally significant
Low birth weight	2.41	0.88	0.023	significant

Discussion

Your study on TOF repair outcomes at Ibn al-Bitar compared to other research reveals similar and contrasting points:

Surgical Timing and Age Factors:

Our Research Suggests that delaying repairs past age 2 increases complication risks, endorsing early intervention for better results like Sarris et al study advocated early TOF repairs during infancy to reduce complications and hospital stays, emphasizing age's impact on post-operative success. [9]. Pigula et al is Highlighting the advantages of very early intervention in newborns or young babies, they imply that postponing even slightly could heighten the chances of complications. This viewpoint indicates that any delay past infancy could result in negative consequences, in contrast to your study linking higher risks specifically to surgeries performed after infancy. [3]

Surgical Approach Preferences:

Our Research Favors the transatrial approach in 80.3% of cases for minimal scarring and preserved right ventricular function similar to Parry et al and McElhinney et al research Supported the use of the transatrial approach for improved long-term ventricular function preservation over transventricular methods, indicating a consensus on its benefits. [4] While Gatzoulis et al. unlike our study, he bring attention to the long-term risks of arrhythmias related to the transatrial method, proposing that the transventricular method may provide certain advantages in reducing these long-term arrhythmia risks. [10]

Types and Frequency of Complications:

Our Research Identifies common complications like arrhythmia (33%) and pleural effusion (7%), with factors like low birth weight influencing risks like Valente et al Confirm similar complications like arrhythmia and pleural effusion as significant post-TOF surgery risks, underlining the need for thorough monitoring. [5]

Predictors of Complications

Our Research Points to older age at repair, low birth weight, and prior palliative surgeries as indicators of higher post-operative risks like Mouws et al agree on patient-specific factors like age at surgery and birth weight predicting complication rates, reflecting consensus on how these factors influence outcomes. [2] Bailliard et al and Anderson et al propose a flexible strategy where patients with particular risk factors, such as severe right ventricular outflow tract obstruction, undergo a preliminary palliative procedure before the complete TOF repair. This staged approach may help lessen complication risks in high-risk scenarios, differing from your study's conclusion that primary repair is the preferred option even for asymptomatic individuals. [6]

Long-term follow-up was not conducted in most of the cases which was a limitation of our study.

Conclusion

The research at Ibn al-Bitar cardiac center emphasizes early and precise surgical intervention to manage Tetralogy of Fallot

(TOF) effectively and minimize post-operative complications. Results indicate that delaying repairs, especially after the age of two, raises the risk of complications, reinforcing the preference for the transatrial approach to protect right ventricular function. Common complications like arrhythmia and pleural effusion stress the importance of vigilant monitoring, particularly in high-risk patients with factors such as low birth weight and prior palliative procedures. This study highlights the significance of individual-ized risk assessment to inform surgical timing and post-operative care for optimal outcomes in TOF management.

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