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THE OUTCOME OF PALLIATIVE STENTING IN CYANOTIC CONGENITAL HEART DISEASES

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ABSTRACT

Objective: To determine the outcome of palliative stenting in children with cyanotic congenital heart diseases.

Methodology: From February 2018 to October 2020, the Department of Paediatric Cardiology at Lady Reading Hospital in Peshawar conducted a cross-sectional study on patients who underwent right ventricular outflow tract blocked Blalock Taussig shunt stenting or patent ductus arteriosus stenting for cyanotic congenital heart disease. The patients' information was gathered using a pre-formatted proforma. Pre- and post-procedure oxygen saturations were recorded for 48 hours. The favorable outcome was defined as an increase in oxygen saturation of at least 15%.

Results: The mean age of the sample (n=49) was 20±29 months. The etiology was Pulmonary Atresia (PA) with Patent ductus arteriosus (PDA) in 23 patients, followed by blocked Blalock Taussig Shunt (BT-Shunt) in 9 patients. The number of patients who underwent PDA stenting was 32, 9 patients had stenting of blocked BT-Shunt and 8 patients had RVOT stenting. The mean pre-intervention oxygen saturation was 43% ±8.9% and the mean post-intervention oxygen saturation was 81% ±5.3%. The number of patients who died was 2, one patient for RVOT stenting died on the table due to cyanotic spell while other post-PDA stenting died because of stent thrombosis.

Conclusion: RVOT, Patent Ductus arteriosus, and blocked Blalock Taussig shunt stenting was found effective in increasing oxygen saturation in children with cyanotic PDA.

Key Words: Right Ventricular Outflow Tract; Patent Ductus Arteriosus; Palliative Stenting; Blalock Taussig Shunt

INTRODUCTION

Children with patent ductus arteriosus, who have duct-dependent pulmonary blood flow may require an early emphasis on palliative surgery to sustain or establish a constant source of pulmonary blood flow until a more suitable surgical procedure can be performed.¹ Transposition of the ductus arteriosus, simple valvular obstructive diseases such as critical pulmonary stenosis, and complex obstructive diseases such as Tetralogy of Fallot or pulmonary atresia with an intact ventricular septum are examples of cyanotic congenital heart diseases that can be managed with interventional treatments.² The most frequent type of cyanotic congenital cardiac disease is the Tetralogy of Fallot (TOF), which affects 3 out of every 10,000 children and accounts for 7% to 10% of all cardiovascular diseases.³ The degree of right ventricular outflow tract (RVOT) obstruction detected at birth or shortly thereafter determines the initial presentation of the patient with Tetralogy of Fallot (TOF).⁴ In case of severe cyanosis where corrective surgery is not possible, palliative BT shunt, RVOT stenting, and if PDA is present, PDA

stenting is performed.⁵ In patients with Pulmonary Atresia and Critical pulmonic stenosis where PDA is present, PDA stenting is a non-invasive and effective mean of palliative treatment.⁶ For a wide range of cyanotic congenital heart disease most commonly Modified BT shunt is performed which is an invasive palliative treatment option. Morbidity and mortality as a potential of BT shunt are known.⁷ PDA stenting is introduced as an alternative for BT Shunt in 1992.⁸ Many studies have been published on safety complications and the efficacy of Stenting.⁹⁻¹¹ This study was conducted to share the experience of stenting in various forms of cyanotic cardiovascular disease, as studies are limited and there is only one government sector facility in the province of Khyber Pakhtunkhwa providing cardiac interventions in pediatric patients.

METHODOLOGY

From February 2018 to October 2020, a total of 49 individuals were enrolled in this cross-sectional study at the Department of Paediatric Cardiology at Lady Reading Hospital in Peshawar.

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Patients with cyanotic congenital heart disease who received right ventricular outflow tract obstructed BT shunt stenting or patent ductus arteriosus stenting were included in the study, regardless of age or gender. Patients' clinical information, echocardiographic results, and radiologic data were collected on prefabricated proforma. Oxygen saturations were measured before the surgery. A consultant pediatric cardiologist performed the procedures. All procedures were performed while the patient was sedated. For recognized issues, the availability of emergency medications was ensured before the procedure. Post-procedure oxygen saturations were recorded for 48 hours. The favorable outcome was defined as an increase in oxygen saturation of at least 15%. SPSS version 22 was used to analyze the data. Descriptive statistics such as mean SD were computed for numerical data, whereas frequency and % were computed for categorical variables.

RESULTS

The total number of patients was 49, 29 were males, and 20 patients were female shown in table 1. The age of the patients ranged from 9 days to 12 years with a mean

age of 20 months ±29 months. The etiology was Pulmonary Atresia with PDA in 23 patients, Tetralogy of Fallot (TOF) in 8, Tetralogy of Fallot with Patent ductus arteriosus in 7, blocked BT-Shunt in 9 and 1 patient each of Transposition of great arteries with pulmonary stenosis/ patent ductus arteriosus and severe pulmonary stenosis with patent ductus arteriosus as shown in table 2 and bar graph 1. 32 patients underwent PDA stenting, 9 patients had stenting of blocked BT-Shunt and 8 patients had RVOT stenting and the mean pre-intervention oxygen saturations were 43% ± 8.9% and the mean post-intervention oxygen saturations were 81% ±5.3%, with the improvement of 47 patients (95.9%). Two patients (4.1%) died one due to a Cyanotic spell during the procedure and the other with PDA stent thrombosis on the first post-procedure day. Patients' oxygen saturations were observed for 48 hrs after the procedure in the ward and labeled as a positive outcome after documenting an oxygen saturation difference of more than 15%. A common complication after the procedure was fever due to contrast use and was relieved with symptomatic care. 2 patients had an infection at the cannulation site which resolved with antibiotics therapy.

DISCUSSION

Maintaining optimal pulmonary blood

flow in most cyanotic patent ductus arteriosus is mandatory for survival and further palliative or corrective repair. Our study was conducted on all patients with different forms of cyanotic congenital heart diseases who underwent stenting of either patent ductus arteriosus, right ventricle outflow tract, or blocked Blalock Taussig Shunts. In our study, 49 patients were included who underwent palliative stenting out of which 47 patients had a positive outcome in the form of improved oxygen saturation. Out of 49 patients 2 patients died, one patient for RVOT stenting died on the table due to cyanotic spell while another post PDA stenting died because of stent thrombosis. In our study, a total of 32 patients underwent PDA stenting out of which 1 patient (3.1%) died during a hospital stay due to Stent thrombosis and 31 patients (96.9%) had positive outcomes while in a study by Glatz et al¹² conducted on 106 patients reported death in 7 patients (6.6%) and 12 patients (11.3%) required re-intervention for cyanosis. Most of the procedures in our study were planned for patients with cyanosis, this difference in outcome was probably because many cases reported by Glatz et al¹² were unplanned interventions for cyanosis. In another study conducted by Alwi et al⁵, 143 patients who underwent PDA stenting reported no procedural death, 2 patients (1.3%) had early hospital deaths owing to low cardiac output

Table 1: Type of cyanotic congenital heart disease.

Type of congenital heart disease	No of Patients	Positive Outcome	Death
Pulmonary Atresia with PDA	23	22 (96.9%)	1 (3.1%)
Tetralogy of Fallot	8	7 (87.5%)	1 (12.5%)
Tetralogy of Fallot with PDA	7	7 (100%)	0
Blocked BT-Shunt	9	9 (100%)	0
TGA with pulmonary stenosis and PDA	1	1 (100%)	0
Severe pulmonary stenosis with PDA	1	1 (100%)	0

Table 2: Type of stenting done.

Type of procedure stented	No of patients
PDA stenting	32
Blocked BT-Shunt Stenting	9
RVOT Stenting	8

syndrome. In our study, 8 patients underwent RVOT stenting out of which 7 patients (87.5%) had a positive outcome and 1 patient (12.5%) with TOF and cyanotic spell died on the procedure table, while a study conducted by Quandt et al¹³ reported 76 patients who underwent RVOT stenting documented 1 procedural death and one emergency surgery while 74 patients had a positive outcome. Another study conducted by Sandoval et al¹⁴ reported that 42 infants who underwent RVOT stenting were 100% successful. In our study, 9 patients had Blocked BT Shunt stenting with 100% results while a study conducted by Moszura et al¹⁵ reported 22 of 23 (96%) successful re-cannulation of Blocked BT Shunt.

Local studies are deficient and data from local hospitals are mostly not published. Our study differs from other international studies as we have included all modalities of stenting rather than individual types.

■ LIMITATION

The limitation of our study is the small sample size and single-center data. More studies with bigger sample size and data from multiple centers are needed to be published to establish the safety and efficacy of stenting in patients with cyanotic congenital heart diseases.

■ CONCLUSION

Right ventricular outflow tract, patent ductus arteriosus, and blocked Blalock-Taussig shunt stenting were found effective in increasing oxygen saturation in children with cyanotic congenital heart diseases.

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Author's Contribution

AK conceived the idea, designed the study and supervised the project. IH wrote the manuscript. SI analyzed the data and kept liaison among the authors. YR, TA, AM, AA and ZR helped in data collection, reviewed the draft critically and carried out subsequent changes. All authors contributed significantly to the submitted manuscript.

Conflict of Interest

Authors declared no conflict of interest

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None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.