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RESULTS OF RETROGRADE VS PROGRADE APPROACH FOR DIAGNOSTIC CARDIAC CATHETERIZATION IN TETRALOGY OF FALLOT PATIENTS

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Abstract:

Aim: *Diagnostic cardiac catheterization in Tetralogy of Fallot (TOF) is widely used in our country. Aim of this study was to compare results and complications of prograde/antegrade and retrograde approach in diagnostic catheterizations of TOF.*

Methodology: *This prospective comparative study was conducted at the cardiology department of Mayo Hospital Lahore for one-year duration from April 2019 to April 2020. 269 consecutive patients who underwent diagnostic cardiac catheterization for TOF were included and divided in three groups. Group A: Prograde study planned, Group B: both venous and arterial accesses were electively obtained at the start and group C, where retrograde study was planned. Group A & C were subdivided: Group Aa, study completed in prograde manner and group Ab where arterial line was*

subsequently placed for completion of study. Group Ca, study completed in retrograde approach and group Cb where venous line was subsequently placed. Data analysis was computer based using SPSS 17 version.

Results: *A total of 269 patients with an average age of 7.7 years, including 169 men. Group A included 200 cases (Aa 129 and Ab 71), group B: 45 cases and group C contains 24 cases (Ca18 and Cb 6). Systemic complications included 9 episodes hyper-cyanotic spells (Gp Aa 3, Ab 4, B2), transient arrhythmias (Aa 1, 2 Ab, 2B) and transient cardiac arrest (GP B). Group percentage of local vessels complication in group B as 22.2%, group C 12.5%, group Ab 8.4% and no in group Aa.*

Conclusion: *Prograde cardiac catheterization is safe and preferred for TOF.*

Keywords: *congenital heart disease, TOFF, cardiac catheterization.*

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INTRODUCTION:

Tetralogy of Fallot (TOF) through the outflow from the right ventricle hyperemia (RVOTO) is one of the most common cyanobacteria congenital heart disease (CHD), easy to diagnose 2D echocardiography with selected more invasive tests Cases. Despite the diagnosis in developed countries Cardiac catheterization in the classical pulmonary TOF narrowing is becoming rarer, especially attributable surgical correction at an early age, including newborn and availability of new non-invasive diagnoses Methods including CT angiography and MRI. Most developing countries, including Pakistan, are lagging behind Surgical correction not only leads to increased surgery with morbidity and mortality. The number of diagnostic catheters is sometimes completely insufficient because of diagnostic methods such as echocardiography definition of surgical anatomy, especially the origin and course coronary arteries, aorto-pulmonary and main valves Aorto-pulmonary arteries (MAPCA). Even, Diagnostic cardiac catheterization for TOF carries a low risk systemic complication, but local vascular complications is one of the most common complications larger arterial covers, longer processing time and Small children. However, both venous (progression) and arterial (Retrograde) approaches are used in cardiological diagnostics TOF catheterization but no data from Pakistan specifically solves this problem with complications, feasibility and results. This prospective study was specifically undertaken to assess the two approaches and to compare the result and complications in patients undergoing diagnostic cardiac cath at our setup over 12 month of time period.

METHODOLOGY:

This study was performed prospectively at the cardiology department of Mayo Hospital Lahore for one-year duration from April 2019 to April 2020. A total of 269 consecutive patients undergoing diagnostic cardiac catheterization for RVOTO TOF or TOF without pulmonary valve syndrome (APVS) were included. The pre-catheterization evaluation included a detailed interview, physical examination, full blood view, chest radiography and two-dimensional echocardiography. Basic demographic variables were recorded. All patients were admitted on the same catheterization day and written consent was obtained. All patients were removed orally 4-6 hours prior to catheterization depending on age. Young children were given general anesthesia for surgery, while older children or adults were given local anesthesia and conscious sedation. According to the decision before surgery, vascular access was initiated in the femoral artery or vein or in both, and the reason for this approach was noted. Depending on the initial vascular access, the patient population was divided into three groups. Group A was selected from cases where only intravenous access was planned for planned catheterization, group B, patients who received initial intravenous or arterial access (planned and retrograde catheterization), and only C initially arterial access (retrograde). Groups A and C were divided into two subgroups: group Aa, the study was terminated only from the venous line and group Ab, where the arterial group was placed to complete the study later. Group Ca completed the study of the arterial line and the Cb group, where the venous line was placed later to complete the study. In most cases, 5F radial arteries for the femoral artery and 6F for the femoral vein were used. In some cases, intraarterial heparin is administered at a dose of 25 units per kg. In most cases, right heart catheterization was performed using the National Institutes of Health (NIH) catheter and left heart braid catheter. Complete anatomical assessments included right ventricular angiography (RV), RVOT injection, branched pulmonary artery anatomy, left ventricular angiography (LV), aortography, and complete identification of coronary and systemic vein anatomy (Figures 1 and 2).

At the end of the procedure, additional parameters were recorded, such as Flouro time, time of surgery, contrast used, reason for changing vascular access plans, and local vascular access area and pulse status. In most cases, routine care was provided for a further 18-24 hours in the catheterization rooms. After two hours of surgery, pulseless patients in the limbs were treated with 25-50 units of intravenous heparin per kg to heal. Selected cases of cold extremity with signs of Doppler ischemia were carefully treated with intravenous streptokinase infusion. The patients were discharged the next morning when there were no complications and after 2 weeks a check-up was recommended. Data was entered into SPSS 17 and descriptive analysis was performed using qualitative tests to compare different variables.

RESULTS:

Total 269 patients underwent diagnostic cardiac for TOF with RVOTO/APVS over study period with mean age of 7.7 yrs +/- 7 (range: 10 months- 44 yrs), mean weight of 19.6 +/- 13.5 Kgs, mean height of 107 +/-30 cms and male to female ratio was 1.7:1. The average processing time was 29.9 minutes (12-80), the average fluoroscopy time was 8.6 ± 5.9 minutes and the average contrast value was 77 ml. 179 patients (66%) received general anesthesia and 127 patients (51%) were under 05 years old. In 245 patients, the basic anatomy was RVOTO and classic TOF, of which

22 were earlier palliative aorto-pulmonary valves, TOF with two APVS. Additional abnormalities included: 3 additional patents of the ductus arteriosus, atrioventricular septal defect variant, dextrocardia, inferior vena cava (IVC), and one case had situs inversus-dextrocardia. The age distribution by vascular access group in the study population is shown in Table 1. Group A: A total of 200 cases were included because only the femoral vein sheaths were placed at the beginning.

Table 1: Distribution of age in three groups

Age group	Group A		Group B	Group C		Total
	Gp Aa, vein only	Gp Ab: initially vein than artery for completion	Gp B: Both vein & artery electively	Gp Ca: Only artery	Gp Cb: initially artery than vein for completion	
< 2 years	30	12	07	01	00	50
2-5 years	45	21	12	08	02	88
5-18 years	48	23	24	09	04	108
>18 years	06	15	02	00	00	23
Total	129	71	45	18	06	269

- Aa subgroup: In 129 cases, complete catheterization through the venous sheath without local vascular complications.
- Ab subgroup: In 71 cases, LV (18) and / or aorta (53) were not available due to venous and transient pulse loss in this group (less than 12 hours and treated with heparin IV) developed in 06 cases (8.4% of this subgroup).

Group B: A total of 45 cases were included because venous and arterial casings were initially placed and the procedure was successful in all cases. Local vascular complications in this group (22.2%) were: temporary pulse loss less than 12 hours requiring intravenous heparin 05 (11%), 01 12-18-hour pulse loss, 01 case loss, 24-hour pulse rate 03 cold cases limbs, requires streptokinase for proper IV circulation. Group C: Since initially only arterial femoral sheaths were administered, a total of 24 cases were included. Local vascular complications in this group were found in 12.5% of cases and included: 01 IV temporary pulse loss, 12-18 hours pulse loss and 01 24 hours pulse loss requiring heparin. However, there were no systemic complications in this group.

- Ca subgroup: In 18 cases full catheterization was performed along the arterial line (Fig. 2).
- In the Cb subgroup: 06 cases, a venous line was created due to unavailability of RVOT and anatomy of branched pulmonary arteries by retrograde injection of RVOT.

In total, in 251 cases, venous access to the right femoral vein was established in 96 or 96% of cases, and in 97% of cases venous line was established in one or two studies. On the other hand, 134 cases required the arterial line alone or in addition to the venous line, and the right femoral artery was achieved in 90% of cases, and 90.7% did not require more than two interventions to access the artery. cases. Table 2 shows the results of comparing processing time and fluoroscopy in three groups. Systemic complications associated with the study population are: 9 hyperchiotic episodes during or after catheterization {Gp Aa 3, Ab 4, B2}, SVT (02 in Gp B), transient arrhythmias (03 in Gp A). Local vascular complications include 12 cases of transient pulse loss requiring intravenous heparin for less than 12 hours, 05 patients with temporary pulse loss requiring intravenous heparin for 12-24 hours, and 04 patients requiring intravenous streptokinase for cold extremities and evidence of Doppler ischaemia. All these complications occur in patients under six years of age.

Table 2: Comparison of procedural and fluoroscopy time in three groups

	Group A		Group B	Group C	
	Gp Aa, vein only	Gp Ab: initially vein than artery for completion	Gp B: Both vein & artery electively	Gp Ca: Only artery	Gp Cb: initially artery than vein for completion
Mean +/- Sd Fluoroscopic time in minutes	8.0 +/-5.5	11 +/-7.0	6.8+/-3	5.5 +/-4.6	14.5 +/-0.7
Mean +/- Sd amount of contrast used in ml	91+/28	107 +/-41	96 +/-39	89 +/-25	130 +/-99

DISCUSSION:

Unlike developing countries, diagnostic TOF catheterization is still widely practiced in developing countries such as Pakistan, because, above all, the age of full correction in most cases goes beyond childhood. With the presence of more sophisticated non-invasive diagnostic methods, such as MRI [6]. The average age in our study group is 7.7 years, and the male-female ratio is from 9 months to 44 years, with a ratio of 1.7: 1. Diagnosis of TOF is easy with echocardiography, but accurate assessment of surgical anatomy may require invasive testing, in some cases, such as cardiac catheterization, to clearly identify the anatomy of older children, especially branched, coronary and pulmonary arteries. presence of MAPCA with a natural risk of complications, exposure to radiation and contrast. Although CT angiography is better than echocardiography in defining the anatomy of pulmonary and collateral arteries, without the help of hemodynamic data. During TOF diagnostic catheterization, both the venous side and the right heart are used to approach each other (by overloading the aorta from the aorta to both ventricles) with their own values and defects. While the proportional approach carries the risk of cyanosis attacks with catheter manipulation in the RVOT and sub-aortic region, vascular complications are an important retrograde approach problem. In our study, both retrograde catheterization and planned cardiac catheterization were needed to completely define TOF surgical anatomy in 47.9%, 6.7% retrograde, and the remaining 45.3% in planned cardiac catheterization. The main systemic complications were found in 5.6% of cases and were cyanosis attacks, rhythm problems and short circulatory arrest. In a recent UK report, 72% of TOF catheterized patients reported a serious complication rate of 23% compared to our study. The risk of serious complications in the group was 3.1% Aa, 8.5% in the Ab group, 11.1% in the B group, and in our patients, there is no C. However, the most common complications of cardiac catheterization are undoubtedly the local vascular assessment point, especially the long duration of arterial protection in young children. There have been several haematological problems that tend to bleed in patients with TOF and worsened local vascular complications after catheterization studies. The percentage of local vascular complications in our study was 22.2% in group B, 12.5% in group C, 8.4% in group Ab, and local vascular complications in group Aa.

The problem of full identification of TOF surgical anatomy before complete correction is quite complex, especially in older children or adults. Vascular access remains a critical point for successful catheterization to begin. We believe that the venous line should be placed at the beginning of the cardiac catheterization, and attention should be focused on the LV and aorta at the end of the right side. PFO, which should be sought before the aorta, should try to pass through the RV (anatomy will already be removed on the RV angiogram). If the aorta crosses the descent path, try to cancel the catheter and immerse it in LV. In some cases, the LV injection aortogram in the AP view may be sufficient, especially in young children.

CONCLUSION:

Given that the prograde approach has no local vascular complications, we recommend establishing venous access as the first option, especially for young

children. If surgical anatomy is not completely defined by programmed cardiac catheterization, this is a very fast retrograde approach.

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