

PRACTICING PAEDIATRIC CARDIOLOGY IN RESOURCE LIMITED COUNTRY LIKE PAKISTAN

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Contribution

MU, NS conceived the idea, planned the study and drafted the manuscript. SAS & AM collected data. MS & HA did statical analysis, drafted the manuscript and critically reviewed manuscript. All authors contributed significantly to the submitted manuscript.

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ABSTRACT

Objective: This study was carried out to document different modifications of standard procedures in order to reduce the cost without compromising the quality of the procedure.

Methodology: The department of Paediatric Cardiology at AFIC/NIHD Pakistan is providing medical and surgical treatment to children with congenital and acquired heart disease since 1985. Since the introduction of paediatric cardiology services, it has evolved into advanced interventions. All patients requiring diagnostic and therapeutic cardiac catheterizations from Jan 2011 to Dec 2016 were enrolled in the study. A number of local modifications were done during cardiac catheterization and all the modifications were recorded.

Result: During these 6 years, the interventions done in catheterization suit at our institution were 45.8% (2730/5957). It included 1106 duct occlusions, 271 pulmonary valve dilations, 699 atrial septal defect closures, 96 VSD Device closure, 42 mitral valve dilations, and 74 others. Most of the diagnostic as well as therapeutic cardiac catheterizations were done under local anesthesia 43% (2562) with deep sedation and saving general anesthesia fee.

Conclusion: Modifications of different standard procedures for cardiac catheterization in expert hands may overcome financial hurdles without affecting the outcome.

Key Words: Cardiac catheterization; Atrial septal defects; Ventricular septal defects; Patent ductus arteriosus.

INTRODUCTION

Pakistan is having approximately 200 million population with 50,000 children born with congenital heart diseases every year. Paediatric cardiology services are meager in our country like in any other developing country.^{1,2} The prevalence of congenital heart diseases is on rise all over the world and the prevalence varies from one geographic area to another with the highest reported in Asia. Similarly in European countries the prevalence is much higher than America. The pattern of congenital heart diseases also vary with geographic differences like obstructive lesions of right outflow are more common than left outflow in Asian countries. Accessibility to health care facilities and diagnostic tools are much advance in developed countries as compared to developing countries. The differences in prevalence may also be due to ethnic, socioeconomic, environmental and genetic factors.³⁻⁵

About one million children are born each year with congenital heart diseases all over the world and 90 percent of these children either do not have access to health care facilities or get suboptimal care. The mortality from non-communicable diseases is very high and the number reaches to about 38 million death per year. More than two third of these deaths occur in the developing countries.⁶ Mortality from congenital heart disease has decreased with time in developed countries like Canada, Europe and USA. On the other hand data available from Asian countries showed increased in mortality. Patients treated in specialized cardiac center with expert staff have lower mortality. It has also been found that mortality from congenital heart diseases is dependent on accessibility to health care facilities.⁵ Further it has been mentioned in the literature that in patients with better financial background the mortality is less as compared to ones with low socioeconomic families.⁷ For surgeons and physician, to improve the health care facilities for congenital heart disease patients in the developing world, it is imperative to be fully aware of the social, political and economic aspects of the society.⁶

The aim of our study was to document the local modifications of standard procedures for diagnostic and therapeutic purposes which we did for reducing the cost of the procedure and also to report its safety and outcome.

METHODOLOGY

This cross sectional study was performed at Department of Paediatric Cardiology AFIC/NIHD Pakistan All patients requiring diagnostic and therapeutic cardiac catheterizations from Jan 2011 to Dec 2016 were enrolled in the study. The paediatric cardiology practices in general were available only as part of general medical practice till 1985 when our paediatric cardiac center was established to deliver specialized paediatric cardiac services. Modern cardiology

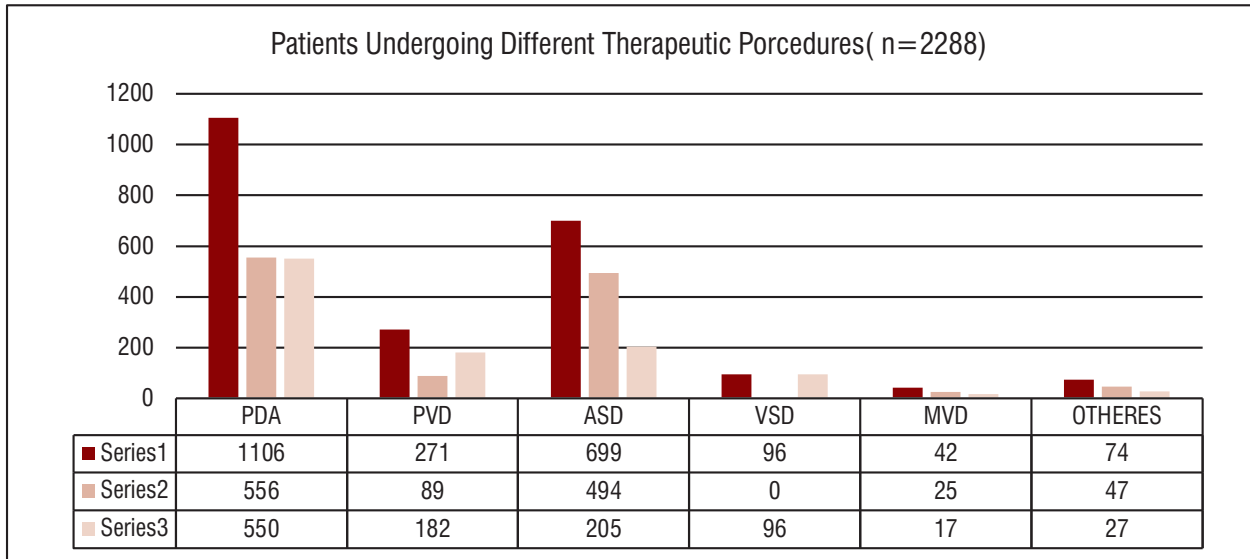
services with the introduction of echocardiography became available in 2006. The cardiac catheterization for children was initially performed by adult cardiologist and included diagnostic and some interventions like pulmonary valve dilatation. Few cases of device closure of patent ductus arteriosus (PDA) and atrial septal defect (ASD) were done by the visiting cardiologist during initial period. In 2004 we established a dedicated paediatric Cath program. Protocols for diagnostic and interventional procedures were set. Also we have anesthesiologist specially trained in cardiac anesthesia.

Patients with congenital heart disease were selected in outpatient department for diagnostic or therapeutic procedures. A careful history and clinical examination along with complete blood count was done before the procedure to rule out infection. A written consent and approval from ethical committee of institute was also taken prior to the procedure. A number of local modifications were done to complete the procedure without compromising the quality. The diagnostic as well as therapeutic cardiac catheterization where ever possible was done under local anesthesia and with single vascular access (like pulmonary valvuloplasty only venous line). We performed valvuloplasties by hand-inflation with a syringe instead of inflation device and saved the inflation device charges without compromising the final results. Shanghai shaped memory alloy (shsma-china) devices were used for ASD, PDA and ventricular septal defects. A single venous sheath with arterial canula was used for used for calculation of Qp/Qs ratio and PVR in patients with congenital septal defects. JR was used for pressure measurement and injections with self-made 3-4 side holes in the catheter. We used JR for visualization of size and shape of PDA and the same catheter passed to right heart and crossed the PDA with the exchange wire and then JR again inserted into arterial side and the device deployed at appropriate with repeated injections with JR. It was also considered routine to re-sterilize septostomy balloons and needles (PTMC) and re-use them.

RESULTS

A total of 5957 patients underwent cardiac catheterization during 6 years period. Number of patients undergoing diagnostic cath were 3669 (62%) and those undergoing therapeutic cath were 2288 (38%) as shown in figure 1. About 43% (2562) patients had the procedure with deep sedation and local anesthesia without any major complications including PDA device closure (n=556), ASD device closure (n=494), pulmonary ballooning (n=89), percutaneous trans catheter mitral commissurotomy (PTMC) (n=25), major aorto- pulmonary collateral arteries (MAPCAS) coiling (n=47), TOF (n=678) and other diseases (n=673). In only 4 patients we switched to general anesthesia as the patients had apnea, bradycardia and went resuscitation. About 187 patients had successful pulmonary

Figure 1: Different Therapeutic Procedures Done In Our Department



Series 1 shows total no of procedures: **series 2** shows procedures done under local anesthesia: **series 3** shows procedures done under general anesthesia. **PDA-** patent ductus arteriosus, **PVD-** pulmonary valve dilation, **ASD-**atrial septal defects, **VSD-**ventricular septal defects, **others**include mostly major aortopulmonary collateral arteries coiling.

Figure 2,3 and 4: Pictures Showing Procedures Done With Local Modifications



ballooning with single venous sheath, one exchange wire and specified balloon instead of two sheaths, one arterial sheath and floating balloon catheter, marker pigtail, curved tip Terumo glide wire, Super Stiff wire. We used 1046 Chinese devices for PDA, ASD and VSD closure with good results. About 599 patients with VSD and 876 patients with TOF had complete diagnostic cardiac catheterization with single sheath without any complications (Figures 2,3 and 4).

DISCUSSION

In developing countries where the paediatric cardiology services are scrumpy as well as financial issues supervene saving small amount makes huge differences.¹² The cardiac catheterization for congenital heart diseases in resource limited country can be performed without general anesthesia and under deep sedation with local anesthesia and in this way we can save lots of money without compromising the quality of procedure. We used ketamine along with

midazolam in these patients and did not have any complications as supported by other international studies.¹⁰⁻¹² During our study period we performed 43% (n=2562) cases with local anesthesia and included PDA device closure, ASD device closure , Pulmonary ballooning, PTMC, MAPCAS coiling , TOF and others. In these cases we did not find any problem during the procedure and had smooth recovery from sedation. In only 4 patients we switched to general anesthesia as those patients had apnea and bradycardia and resuscitated and recovered well. We also changed the brand of device for ASD, PDA, VSD with good results but saved large amount of rupees (\$450-700). In a number of procedures like diagnostic cardiac catheterization for ventricular septal defect (VSD,) we used a single venous sheath instead of two sheath (arterial and venous)^{13,14} Cannula was used for artery. We also preferred to use JR with self-made side holes for a number of procedures in which normally 2-3 catheters are used like in pulmonary valvuloplasty (two venous sheaths, one arterial

sheath and floating balloon catheter, marker pigtail, curved tip Terumo glide wire, Super Stiff™ wire).¹⁵ In the same way we used JR for visualization and crossing the duct and then same catheter was introduced into arterial side and with repeated small injection the PDA device deployed at appropriate position. So we used only one JR and also small amount of contrast for PDA device closure that is safe for patients. Likewise we had successful RVOT perforation in 2 patients (PA-IVS) with mechanical wires as we do not have laser/ RF ablation system for neonates and saved the life. As radio frequency valvotomy and balloon dilatation has become the standard of care for pulmonary atresia with intact ventricular septum in many institutions today but we do not have the facilities.¹⁶ The safety of patients remained our extreme concern along with the economization as catheter related deaths remained 0.25% which is comparable with the a number of international studies.¹⁷⁻¹⁹

CONCLUSION

In resource limited countries a number of procedures in paediatric cardiology practice can be performed with modifications without compromising on the quality, thus reducing the financial burden.

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