



Retrospective analysis of cardiac catheterization procedures in a tertiary care pediatric cardiac center



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Introduction

Congenital heart disease (CHD) occurs in almost 8–10 per 1000 live births. Diagnosis of CHD is done by clinical examination, chest radiograph and electrocardiogram and echocardiography. In earlier years of pediatric cardiology, cardiac catheterization was the major diagnostic tool.¹ Cardiac catheterization should be used in any circumstance in which the anatomy of the heart of a child with congenital heart disease is inadequately defined by non-invasive means.² Meaningful and accurate data must be acquired for the presurgical evaluation of patients with congenital heart disease to better guide clinical decisions.³

The field of interventional catheterisation is rapidly expanding as newer techniques and devices appear on the market. Interventional cardiac catheterization describes procedures where cardiac catheters are used to modify, palliate, or treat congenital or acquired cardiac disease. The success of an interventional catheterisation procedure is dependent not only on the performance of the procedure, but also on good planning prior to the procedure, coupled with anticipation and preparation for unexpected events.⁴ The advances in pediatric interventional cardiac catheterization have changed the therapeutic strategy for many patients with CHD.⁵

Interventional pediatric cardiac catheterization has evolved to include a variety of procedures, including the closure of atrial septal defect, the closure of ventricular septal defect, the closure of patent ductus arteriosus, the creation of holes such as septostomy, angioplasty, valvuloplasty, the placement of stents to open up narrowed vessels, the embolization of vessels such as collateral vessels or, more recently, the replacement of heart valves.⁶

Cardiac catheterization laboratory in Cairo University Children Hospital started to serve patients in 1990 as a part of the first pediatric cardiology division in Egypt. It offers services for around 700 children yearly. Complete registration of the patients' medical and demographic data using computerized system for data recording started in 2010. Revision and analysis of the patients' data, the procedures done to them and the outcome of these procedures is mandatory to ensure safety and upgrade our skills for the sake of our patients.

The aim of this work is to examine the profile of patients, indications of catheterization, and analyze the types, numbers and outcome of the performed cardiac catheterization procedures.

Methods

Methods

This is a retrospective review of consecutive cardiac catheterization; diagnostic and interventional; performed to 1887 pediatric patients with congenital heart disease at the Cairo University Children's Hospital between January 2010 and June 2014.

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Retrospective chart reviews (data collection from the medical records of patients) was performed. All these children were referred from various hospitals with a provisional diagnosis of congenital heart disease. Detailed clinical examination was done at our center. Echocardiography was performed in all patients. The procedure was done under general anesthesia. Informed written consent was obtained from the parents or guardian of each patient before cardiac catheterization. The study was approved by the Institutional Ethics Committee.

The cardiac catheterization register was examined to identify patients to be included. Patients' files were reviewed & the following data were collected:

- Demographic data: age, sex and residency.
- Weight, height and body surface area.
- Echocardiographic diagnosis.
- The type of the catheterization (diagnostic or interventional).
- In interventional procedures: type of intervention, type and size of the device or balloon used (if any).
- The results & complications of the catheterization.

Interventional procedures were considered successful if the procedures were completed with no harm or change in condition, or with transient change in condition, not life-threatening. In case of PDA, VSD or PDA closure, success rate includes patients with no residual shunts or with minute residual shunts less than 2 mm and for balloon dilation residual PG gradient not more than 30 mmHg. Stent implantation was successful if the stent was in proper place with no significant PG across.

The study population was classified into three age groups: below 1 year of age, between 1 year and 5 years old and above 5 years of age.

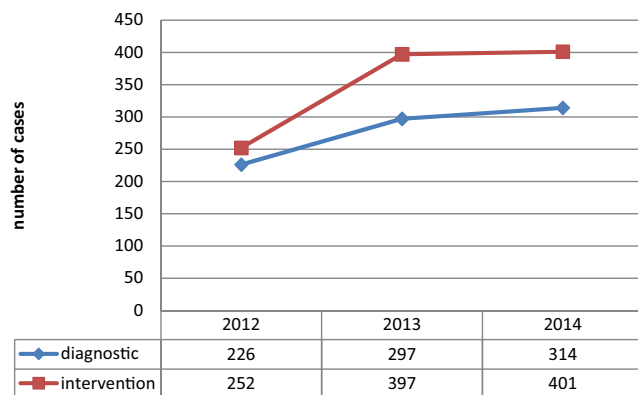


Fig. 1. Comparison between types of catheters (interventional and diagnostic) which were done in different study years.

Statistical analysis

Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation and chi-square test by SPSS V.20. Significance of the difference between two means was tested using chi square test. A p value lower than 0.05 was considered to be statistically significant

Results

Between January 2012 and December 2014, 1887 cardiac catheterization procedures were done. Indications for diagnostic cardiac catheterization in acyanotic heart diseases were: 1. To define complete anatomy where echo window was poor. 2. To assess pulmonary artery pressure so as to plan suitability for surgery. 3. To assess feasibility and plan intervention procedure. Indications for cardiac catheterization in cyanotic heart diseases: 1. To assess pulmonary artery (PA) anatomy in terms of size, confluence, any stenosis at origin or any peripheral pulmonary stenosis. 2. To assess pulmonary artery pressures. 3. To assess aorto pulmonary collaterals. 4. In postoperative patients e.g. Post PA banding, Post Glenn shunt - to assess PA pressures and in Post BT shunt- to assess PA anatomy and any distortion due to previous surgery.

Interventions performed in our institute included: atrial septostomy (Rashkind procedure), closure of atrial septal defects (ASD), patent ductus arteriosus (PDA), ventricular septal defects (VSD), balloon valvuloplasty whether pulmonary or aortic valves, stent implantation whether for pulmonary artery branches or the PDA in neonates with duct dependent circulation, radiofrequency for atretic pulmonary valve with intact septum, closure of collaterals and permanent pacemaker (PM) implantation.

Diagnostic catheterizations were performed to 837 patients while there were 1050 interventional catheterization procedures performed with no statistical difference between each year (Fig. 1). The study included 455 male and 382 female patients who had diagnostic catheterization done and 548 male and 502 female patients who had interventional procedures, with no statistical difference in different years (Table 1). No significant difference between the number of diagnostic catheterizations and interventional procedures performed in each year as shown in Table 2.

Table 3 shows the comparison between the three age groups in the three successive years regarding the types of catheterization performed.

Different types of diagnostic and interventional catheters

Fig. 2 shows the most common CHD for which diagnostic catheterization was performed in the 3 successive years. The most common CHDs in which diagnostic cardiac catheterization was

Table 1
Comparison between genders of interventional and diagnostic catheters performed in each of the study years.

Variables	Intervention		Diagnostic		p-Value	Sig.
	No.	%	No.	%		
2012 (n = 478)						
Male	118	49.8	119	50.2	0.2	NS
Female	134	55.6	107	44.4		
2013 (n = 694)						
Male	213	56.9	168	43.1	0.5	NS
Female	184	59	129	41		
2014 (n = 715)						
Male	217	56.3	168	43.8	0.9	NS
Female	184	55.8	146	44		

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