PATENT DUCTUS ARTERIOSUS DEVICE CLOSURE IN GROWN UP PATIENTS

Zahoor Aslam Khan, Mehboob Sultan, Maad Ullah, Javeria Kamran, Aysha Siddiqa, Abdul Hameed Siddique, Tariq Hussain Khattak

Armed Forces Institute of Cardiology/National Institute of Heart Diseases (AFIC/NIHD)/National University of Medical Sciences (NUMS), Rawalpindi Pakistan

ABSTRACT

Background & Aims: Transcatheter Patent ductus arteriosus (PDA) device closure is considered as safe and first line of treatment in patients who are technically suitable for procedure. This paper is sharing of our experience of percutaneous device closure of PDAs in grown up patients (more than eighteen years of age) with review of efficacy and immediate complications encountered during PDA device closure at our setup.

Study Design: Case series, retrospective study.

Place and Duration of Study: Department of Paediatric cardiology, Armed Forces Institute of Cardiology and National Institute of Heart Diseases (AFIC-NIHD), Rawalpindi from June 2016 to Dec 2017.

Materials and methods: Consecutive twenty five patients (age more than eighteen years), who underwent attempted PDA device closure was included in the study.

Results: Total 25 patients (15 females & 10 males) were attempted PDA device closure with mean age of 29 years. In all cases PDA was successfully occluded with appropriate size devices and the mean diameter of PDA was 07 mm. Mean procedural & fluoroscopy times were 41 and 11.6 minutes respectively. There was no mortality, device embolization or residual leak in the study population.

Conclusion: Transcatheter device occlusion of PDA by various Occluder devices is safe and effective therapeutic option with high success rate and little morbidity in the hands of skilled operators.

Keywords: Patent ductus arteriosus, device closure, residual leak

INTRODUCTION

Isolated Patent ductus arteriosus (PDA) is one of the common acyanotic congenital heart disease with reported incidence of about 10% of congenital heart diseases and causes left heart volume overload[1]. Small PDAs are generally well tolerated in childhood while moderate or large ducts results in signs and symptoms of congestive heart failure and eventually pulmonary hypertension. Device closure is considered as first line of treatment in suitable patients and is generally offered at around one year of age or at time of diagnosis in older children. The general guidelines, we followed, are to close all PDAs except silent ducts, patent ducts in premature neonates, Eisenmenger ducts and where pulmonary or systemic flow is dependent on patency of the ductus arteriosus. Closure of silent ducts is still considered as controversial. Currently, transcatheter PDA device occlusion is considered as safe and effective in all age groups[2-6]. Device closure of PDA is very safe and effective practice with few complication and short hospital stay. Risks associated with PDA device closure include device embolization, residual leak, thrombo-embolism, cardiac perforations and vascular injuries.

The aim of this audit is to share our experience regarding device closure of PDA in older patients over eighteen months time period at AFIC/NIHD, with special emphasis on size & types of ducts, various types of occluder devices and immediate complications encountered during these procedures.

MATERIAL AND METHODS

This retrospective case series report analyzed the PDA device closure in grown up patients (defined as age more than eighteen years of age) done from June 2016 to Dec 2017 by reviewing the clinical records including catheterization data, echocardiography reports and follow-up record.

Correspondence: Dr Zahoor Aslam Khan, Adult Cardiology Dept, Armed Forces Institute of Cardiology, Rawalpindi Pakistan

Total 25 patients with attempted percutaneous PDA device closure were included in the study. Device closure was only attempted in isolated PDAs considered suitable after pre procedural trans-thoracic echo, ECGs and other relevant investigations. Cases with significant pulmonary hypertension were not offered device closure at first place and rather treated for underlying co-morbidities first. All cases were done by our team of paediatric cardiologists with vast experience in transcatheter intervention in congenital & structural heart diseases.

All patients were underwent detailed pre procedural assessment including detailed history & physical examination, ECG, Chest X-ray, blood complete picture and detailed trans-thoracic echocardiography. After taking informed consent, patients were taken to the catheterization lab. Both femoral vein and artery entered with short sheaths. By using a pigtail catheter, aortogram were performed in lateral / shallow RAO position to determine size and shape, narrowest diameter of the PDA & the aortic diameter of the ampulla. For device closure, an end hole catheter (Judkin right or multipurpose catheter) was advanced through the PDA from the pulmonary side into the descending aorta and was exchanged for a delivery sheath, over a 0.035" exchange length. The appropriate device was advanced through the delivery sheath into the descending aorta and the aortic retention disk was deployed. The sheath and the retention disk were pulled back as a single unit, and rest of the device was then uncovered within the duct. Post procedural aortogram was performed to verify device position and to evaluate residual leak. Device was released only if acceptable positioning was ascertained. Post procedural care included two doses of intra venous antibiotics, heparin, vital signs monitoring, examination & echocardiography after 4 hours and before discharge next day. Data was systematically entered in SPSS 23 and descriptive analysis done; student's t or Chi-square tests were used as appropriate.

Table: Types and sizes of devices used in study population

Name of device	Numbers (percentage)	Sizes used	Numbers
PDA occluders (ADO I)	07 (28%)	8/6	01
		10/8	03
		12/10	02
		14/12	01
VSD occluders muscular	17 (68%)	06 mm	02
		07 mm	01
		08 mm	01
		09 mm	02
		10 mm	04
		12 mm	02
		14 mm	01
		16 mm	01
		20 mm	03
ASD device	01 (04%)	12 mm	01

RESULTS

Total 25 patients (15 females & 10 males) were attempted PDA device closure with mean age of 28.7 +/- 8.5 years and mean weight was 54 +/- 8.3 Kgs and mean height was 159.6 +/- 15.7 cms. In all cases PDA was successfully occluded with appropriate size devices and the mean diameter of PDA was 7 mm (range 3-16 mm).

Various occluder devices were used including PDA occluders 07 (28%), VSD occluders 17 (68%) & in one case ASD device was used. Table is showing various types & sizes of Occluders used in 25 cases.

The mean procedural & fluoroscopy times were 40.6 +/-15.6 and 11.6 +/- 7.3 minutes respectively. Mean dose of radiation in study population was 18632 mGycm2. There was no mortality, device embolization or residual leak in the study population. During early follow-up there were no complications reported. At one month follow up no residual leak was detected on transthoracic echocardiography in any patient.

DISCUSSION

PDA is one of the common acyanotic congenital heart diseases, and is defined as persistence of fetal communication between pulmonary artery & descending aorta. Small PDAs may remain asymptomatic but moderate to large ducts causes significant volume load on left heart, failure to thrive and repeated chest infections. If left untreated, large PDAs eventually results in Eisenmenger physiology. Percutaneous device closure is a safe and very effective option in the experienced hands, and is now widely accepted as an attractive alternative to surgery[2-6]. In this study, we are reporting 100% success in 25 grown up patients with PDAs who were attempted device closure over 18 months time period. In comparison, Brunetti etal reported in their article that out of 359 attempted device closure the success was in 357 in patients with diameter was 2.1 mm[7]. In our study, the narrowest PDA diameter was 7 mm, significantly larger, primarily due to age of the patients. Determinants of occluder are age & weight of the patient, size & morphology of the duct according to Krichenko classification[8]. The Krichenko type A (conical) ductus were present in 68% of our cases, that is in concordance to a report from Spain, where type A ducts were present in 64% of the cases[5]. We determined the size of duct on angio and echo with no problems. There are recent reports of using balloon sizing especially in adult patients[9]. In our study, there were few cases, when snare was used to track the exchange wire from aorta into PA across PDA as attempts from pulmonary artery were unsuccessful. In adults patients it is some time very difficult to cross the duct ante grade so one has to cross it from aorta and then snare it to for arteriovenous loop, as documented by other studies[10]. The overall incidence of major and minor complications reported by Brunetti etal was 2.2 % and 2.2% respectively3. In our small study there were no major or minor complications as was reported by Putra etal in their small study[3]. In adult patients, it's very important to document pulmonary artery pressures & pulmonary vascular resistance before and after PDA device closure. Transcatheter PDA closure offers number of advantages over surgical PDA ligation / interruption including shorter hospital stay (as documented in our study of less than 24 hours), avoidance of mechanical ventilation, surgical scar. It is worth mentioning that in our study, all cases were done by our team of paediatric cardiologists with vast experience in trans-catheter intervention in congenital & structural heart diseases

CONCLUSION

PDA device closure is a safe and effective percutaneous intervention in all age groups with high success rate and low complication rate especially in hands of skilled and experienced interventionist trained in Paediatric / congenital heart interventions.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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