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Case Report

Percutaneous Device Closure of Ductus Arteriosus in a 1.3Kg Baby

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ABSTRACT

Patent ductus arteriosus (PDA) is a common cardiac anomaly making 5%-10 % of all congenital heart diseases. The incidence increases in premature, very low birth weight neonates. Transcatheter closure is a standard procedure for treating PDA. However, in pre-term and very low birth weight neonates it presents special problems thus becoming a limitation in performing the procedure. This case report describes a PDA closure in a 1.3 Kg infant in Armed Forces Institute of Cardiology, Rawalpindi.

Keywords: Congenital heart disease, Paediatric cardiology, Patent ductus arteriosus, Transcatheter closure.

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INTRODUCTION

The incidence of Patent ductus arteriosus (PDA) in full-term neonates is about 1 in 2,000 births, making 5%-10% of all congenital heart disease.[1] There is an inverse relation of PDA with gestational age and weight. Thus it is a commonly found condition in premature neonates with a prevalence of up to 42% in infants having a weight <1.2Kg.[2] In these low birth weight premature neonates the PDA is longer, larger and more distensible than in older children and are often termed as type F or Foetal type PDA.[3] A patent ductus arteriosus increases the risk of various diseases like necrotizing enterocolitis, chronic pulmonary diseases, intraventricular haemorrhage, frequent and prolonged hospitalization and increased mortality.[4] Clinical and echocardiographic assessment is used to define haemodynamically significant PDA. Commonly such patients develop respiratory failure and need mechanical ventilation. The important criteria on echocardiography are a PDA size of 2 mm, enlarged left heart and abdominal aortic pandiastolic reversed flow. Management of PDA involves a multidisciplinary approach though often the medical treatment is ineffective and surgical ligation is required. However surgical treatment is not without the well-known risks of haemorrhage, phrenic nerve palsy, pneumothorax, vocal cord paresis and chylous effusion.[5] In patients weighing more than 5 Kg, transcatheter closure of PDA has been considered a standard treatment. However with advancing techniques and modern devices, the procedure can be performed in very low birth weight premature neonates also with little risk of complications.[6]

We are presenting this case of transcatheter closure of PDA in a term neonate weighing 1300 grams in Armed Forces Institute of Cardiology/National Institute of Heart Diseases, Rawalpindi. The case report is expected to highlight the advancing tech-niques in our set up and the possibility of managing the condition in high risk low birth weight neonates with fewer risks of complications.

CASE REPORT

A 1.5 month old baby boy born to consanguineous parents at 39 weeks gestation with a birth weight of 2.9kg presented to the local pediatrician with complaints of failure to thrive, tachypnea and diaphoresis while feeding. The baby was referred to cardiology OPD and was found to be only 1.3kg. On examination, the patient was tachypneic with a respiratory rate of 50/min, heart rate of 110/min, Spo2 of 95% in air. Chest X-ray showed cardiomegaly. Elec-trocardiography showed left ventricular hypertrophy (LVH). Echocardiography revealed a large PDA measuring 3.5 mm shunting left to right. Continuous wave Doppler showed continuous flow through the PDA. Left sided atrium and ventricle were dilated due to volume overload. There were no other associated lesions.

The baby was admitted for transcatheter PDA device closure. After giving general anesthesia, and proper draping of the femoral area, right femoral vein approach was used. After passing 5F sheath, 4F JR with terumo wire was used to cross the PDA from the pulmonary side and exchanged with 5F pigtail to delineate the duct with contrast hand injection,

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revealing 3.6 mm PDA. A size 5/4 mm ADO II was loaded in 5F delivery sheath and the sheath advanced up to the descending aorta. Then under simultaneous echocardiographic and fluoroscopic guidance, the device was deployed across the duct, successfully occluding it. Gradient across descending aorta was 19mmHg (Figure-1 & 2).

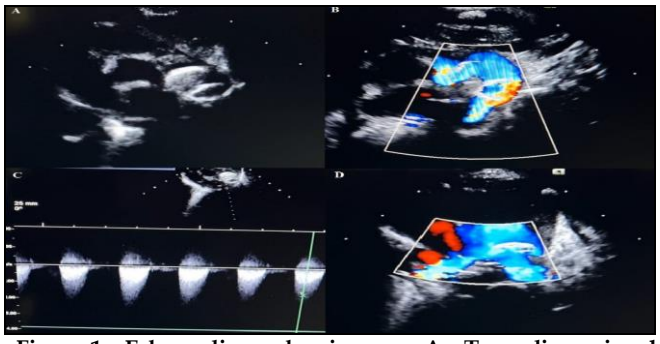

Figure-1: Echocardiography images. A. Two dimensional Echocardiography image showing device in Situ. B. Laminar flow through the Descending Aorta with device in Situ. C. Gradient across Descending Aorta D. Laminar flow through Left Pulmonary Artery

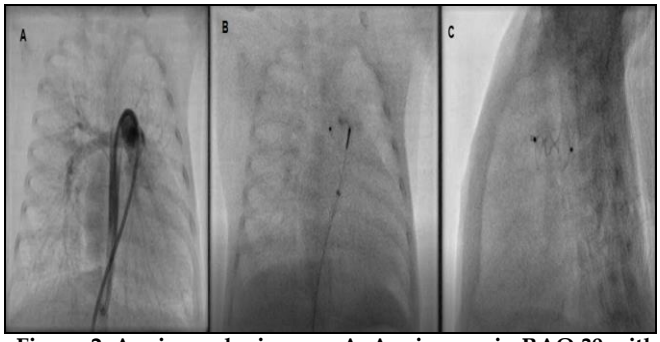

Figure-2: Angiography images. A. Angiogram in RAO 30 with 4F Pigtail showing a Tubular PDA shunting Left to Right. B. Well placed device in RAO 30 Position (confirmed by Echo guidance) C. LAO 90 projection showing ADO II in the Ductus

After the procedure the baby was shifted to the high dependency unit for monitoring and subse-quently discharged the following day.

The patient was followed up after 2 weeks. There was marked clinical improvement with a weight of 1.45 kg. Echocardiography showed well placed device with no leak, laminar flow and no gradient across LPA. The gradient across the descending aorta had reduced to 9 mmHg.

DISCUSSION

At present transcatheter closure of PDA is considered a standard procedure though in very low birth weight special consideration is required because of the low body weight, difficult vascular access, the oft associated prematurity with its accompanying problems, and suitable device selection.[1] Often such neonates require an approach based on coordination among specialists in neonatology, cardiology, pulmonology and cardiac surgery because of the vulnerability of these patients who cannot tolerate complications. Although preterm infants with a body weight as low as 478 g has been reported, however the lowest body weight for successful closure of PDA in neonates in our setup has been 1800g.[7]

Transcatheter PDA closure in very low birth weight neonates present with special problems. Device selection in these patients can be tricky because of the special anatomical features of the PDA. Amplatzer Piccolo Occluder is the first choice for very low weight neonates.[8,9] Amplatzer duct Occluder II (ADO II) device is a softer device and the next best we can get in Pakistan as Piccolo device is not available here.[10]

Device associated left pulmonary artery stenosis and obstruction of aorta are known to occur and need to be taken care of. There is slight iatrogenic gradient produced by the device across the descending aorta which improves with time as the device takes better shape. Venous cannulation can be difficult, however a 4F sheath can be successfully used in these patients. Echo guidance has been described to facilitate venous puncture.[11] Arterial approach is more prone to complications and should be avoided.[6]

Radiation exposure is also considered a hazard in these vulnerable patients and effort should be made to reduce fluoroscopy time. Using venous approach, using an easy to use device help in reducing the time. In our experience ADO II fluoroscopy time was around 9 minutes and was useful in reducing the fluoroscopy time. Echocardiography guided catheter techniques have also been described and represent significant development in neonatal care.[12]

The important factors in carrying out the procedure successfully include early referral, precision and accuracy in measurements and reduce procedure time. The manufacturers dealing with equipment production have a role to play in producing smaller catheters and devices. A meticulous follow up and record keeping is essential to see long term effect and outcome.

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Conflict of Interest: None.

Author,s Contribution

Following authors have made substantial contributions to the manuscript as under:

AA: Intellectual contribution, concept and final approval

AM: Critical review,concept and final approval

KA: Intellectual contribution, concept and final approval

SI: Review of article, formatting and critical review

TA: Proof reading, Intellectual contribution, final approval

AF: Intellectual contribution, concept and final approval

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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