

DEVICE CLOSURE OF LARGE PDA WITHOUT ARTERIAL PUNCTURE IN 40 DAYS OLD INFANT FAILING TO THRIVE

Amjad Mahmood, Khurram Akhtar, Hina Waheed, Nadeem Sadiq, Mahmood Sultan, Andaleeb Ara, Hajira Akbar, Sana Imtiaz

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

ABSTRACT

Patent ductus arteriosus (PDA) is one of the common cardiac lesion present at birth. This communication is essential in fetal life and closes at birth with few exceptions which result in. It may be closed by surgery or by transcatheter device closure. Surgical ligation is an operative procedure and has more complications, scar formation and more hospital stay especially at neonatal age. Transcatheter patent ductus arteriosus device closure although challenging but is likely to avoid surgery, less hospital stay and no scar so very useful in low birth weight patients. We are presenting a case of 40 days old male baby with large patent ductus arteriosus (4.5mm) having significant left to right shunt presented to us with history of respiratory infections, fast breathing and failure to gain weight. He successfully underwent patent ductus arteriosus device closure with 6mm VSD SHSMA (Lipu medical) device.

Keywords: Arterial puncture, Infant, Patent ductus arteriosus.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Patent ductus arteriosus (PDA) is one of the most common congenital heart defects. The PDA is present in 1 in 2,000 live births, accounting for 5-10% of all congenital heart diseases¹. The patent duct usually closes in initial 3 days², but its patency results in significant infant morbidity and mortality³. Potential complications of a persistently PDA in neonates include heart failure, renal dysfunction, necrotizing enterocolitis (NEC), intraventricular haemorrhage, and altered post natal nutrition and growth^{4,5}. In addition, PDA is a risk factor for the development of chronic lung disease (CLD)⁶.

In this case report we are presenting a case of 40 days old male child with 4.5mm PDA, low weight for age (3.5kg) and presentation of failure to thrive. His duct was closed successfully by catheter.

CASE REPORT

Forty days old male infant was brought by parents due to increased work of breathing and feeding difficulties. His weight was 3.5 kg (<50th percentile of weight for age, WHO chart). When examined patient had pulse of 120 beats/min with BP 90/54mm of Hg. He had grade IV/VI continuous murmur in left second intercostal space. Transthoracic echocardiography (2D TTE) was done which showed 4.5 mm of PDA with left to right shunt.

Patient was planned for device closure of PDA and taken to cath lab. Procedure was done under

general anaesthesia. Under all aseptic precautions, right femoral vein access was taken with 5F sheath. Femoral artery was not used with a plan to close the PDA under echo guidance in order to avoid femoral artery thrombosis which is likely in small babies. 5F Right Judkins (JR) catheter was used to cross PDA from pulmonary artery side and parked in descending aorta, Terumo wire was introduced through JR and replaced with 5F pigtail catheter. Aortogram was done using pigtail in left anterior oblique (LAO) 90 degrees with 8ml contrast at 8ml/sec at 500 PSI which showed 4.5 mm PDA (fig-1) with adequate ampulla. Terumo



Figure-1: Aortogram in LAO 90 view done from antegrade approach without arterial puncture showing significant PDA.

wire was replaced with 0.035" stiff wire and 6F delivery sheath was mounted over this wire. Out of 6mm VSD device (SHSMA) was loaded and passed through delivery system. Initially aortic end of device was released and brought back to PDA, then pulmonary end was released and PDA position was confirmed on fluoroscopy (fig-2) and echocardiogram simultaneously

Correspondence: Dr Amjad Mahmood, Department of Paediatric Cardiology, AFIC/NIHD Rawalpindi Pakistan

before release. After confirmation device was released and final position confirmed on fluoro (fig-3). Echocardiogram simultaneously showed unobstructed aorta (fig-4) and left pulmonary artery (fig-5). The baby was monitored for 24 hours post procedure in intensive care and discharged next morning uneventfully with advise to follow after two weeks, 3 months, 6 months and then yearly.



Figure-2: Muscular VSD device 6mm positioned at aortic and pulmonary end of PDA before disengagement.



Figure-3: Final position of device closing PDA confirmed on echo.

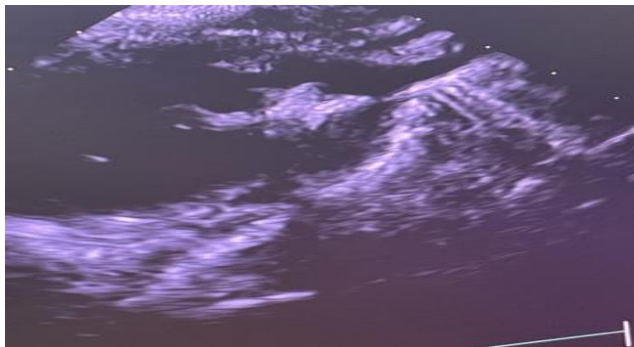


Figure-4: Final position of device after disengaging, no obstruction at juxtradotal position of descending aorta.

Post Procedure

Follow up echo and evaluation after two weeks revealed no residual flow across PDA device. The infant was feeding normally with uneventful post procedure course.

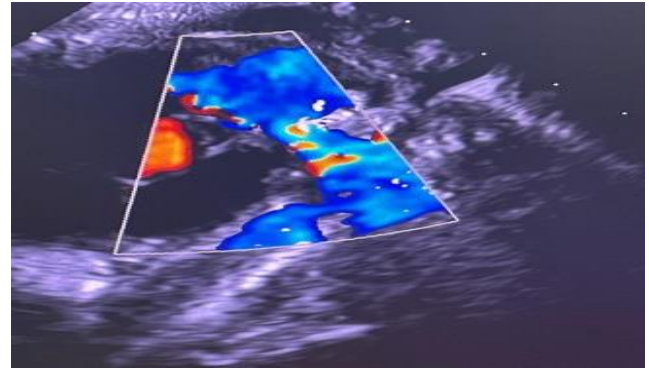


Figure-5: Short axis medially angulated view showing no obstruction of left pulmonary artery.

DISCUSSION

Large patent ducts result in poor weight gain, pulmonary hypertension, left ventricular failure (LVF) and infective endocarditis necessitating its closure either by surgery or catheter based. Transcatheter PDA closure is safe with less morbidity and short hospital stay. Initially surgical PDA ligation was the only option and device closure was not yet started. However post ligation cardiac syndrome, a significant drop in blood pressure 6-12 hr after ductal ligation is experienced by upto 50% of low birth weight infants^{7,8}. If PDA is large, VSD device can be safely used by antegrade approach without arterial puncture to avoid obstructing the aorta and saving from femoral artery thrombosis simultaneously.

The prerequisites of PDA device closure are ductal morphology, aortic arch morphology, variety of PDA devices available in cath lab⁹. Sometimes bulky PDA devices tend to obstruct the aorta requiring VSD devices to close PDA which has less tendency to block descending aorta. As transcatheter option has less morbidity, less expensive and hospital stay, this procedure is becoming more favourite choice in small babies with large defects.

CONCLUSION

Low weight for age infants with significant PDA are candidates for PDA device closure technique without arterial puncture. Now a days transcatheter PDA device closure has become more suitable, cost effective, scarless and relatively complication free. More over antegrade approach under echo guidance avoiding arterial puncture has even promised this method more advantageous by skilled operators.

CONFLICT OF INTEREST

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

Patent Ductus Arteriosus

REFERENCES

1. Schneider DJ, Moore JW. Patent ductus arteriosus. *Circulat* 2006; 114(1): 1873-1882.
 2. Clyman RI. Ibuprofen and patent ductus arteriosus. *New Engl J Med* 2000; 343(2): 728-739.
 3. Pegoli W. Pericardium and great vessels. In: Oldham KT, Colombiani PM, editors. *Principles and Practice of Pediatric Surgery*. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2005. p. 1019. et al., editors.
 4. Hajjar ME, Vaksmann G, Rakza T. Severity of the ductal shunt: a comparison of different markers. *Arch Dis Child Fetal Neonatal Ed* 2005; 90(2): F419-22.
 5. Koch J, Hensley G, Roy L. Prevalence of spontaneous closure of the ductus arteriosus in neonates at a birth weight of 1000 grams or less. *Pediatr* 2006; 117(2): 1113-1121.
 6. Rojas MA, Gonzalez A, Bancalari E. Changing trends in the epidemiology and pathogenesis of neonatal chronic lung disease. *J Pediatr* 1995; 126(2): 605-610.
 7. Noori S, McNamara P, Jain A, Lavoie PM, Wickremasinghe A, Merritt TA, et al. Catecholamine-resistant hypotension and myocardial performance following patent ductus arteriosus ligation. *J Perinatol* 2015; 35(2) 123-127.
 8. Gray MA, Graham EM, Atz AM, Bradley SM, Kavarana MN. Preoperative echocardiographic measures of left ventricular mechanics are associated with postoperative vasoactive support in preterm infants undergoing patent ductus arteriosus ligation. *J Thorac Cardiovasc Surg* 2017; 154(2): 2054-2059.
 9. Francis E, Singhi AK, Venkateshaiah SL. Transcatheter occlusion of patent ductus arteriosus in pre-term infants. *J Am Coll Cardiol Cardiovasc Interv* 2010; 3(5): pp.550-55.
 10. Morville P, Akhavi A. Transcatheter closure of hemodynamic significant patent ductus arteriosus in 32 premature infants by amplatzer ductal occluder additional size-ADOIIAS. *Catheter Cardiovasc Interv* 2017; 90(4): 612-617.
-