**Case Report**

**Transcatheter percutaneous device closure of a large PDA closed in a 3 kg infant**

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**Abstract**

Patent ductus arteriosus (PDA) is common congenital heart disease which may require treatment as transcatheter percutaneous device closure (PDA device closure) or surgical ligation in symptomatic full-term patients. Surgical ligation is an invasive procedure and has more complications especially in the neonates. Problems in PDA device closure are difficult vascular access, manipulation of catheters and sheath, residual shunts, residual obstruction of major arteries etc and these complications increase in low birth weight babies, but it is a less invasive procedure and has fewer complications than surgery, so should be tried in low birth weight patients also. We are presenting a case of 3 kg infant with large PDA (8 mm) presented with failure to thrive, lower respiratory tract infection and heart failure. He successfully underwent PDA device closure with 10 \times 12 \text{ mm} Cocoon PDA device. To the best of our knowledge, this is the first case of the use of such a large device in a 3 kg child with good results.

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**1. Introduction**

Patent ductus arteriosus (PDA) is one of the common congenital acyanotic heart disease with incidence reported to be 1 in 2000 full-term births. The clinical presentation, its timing vary with size of PDA. Patient generally presents with signs and symptoms of cardiac failure due to left ventricular volume overload. For symptomatic full-term patients, transcatheter percutaneous PDA device closure (PDA device closure) and open surgical ligation are modalities to treat PDA.

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PDA device closure is the treatment of choice in all patients except if PDA is window type (type B) PDA, distorted ductal anatomy (e.g. aneurysm or endarteritis). Common problems in PDA device closure are low weight for age, vascular access, residual shunts, manipulation of catheters and sheath etc.

We are presenting a case of one-year old male child with 8 mm PDA, significantly low weight for age (3 kg) and presentation of failure to thrive. He underwent successful PDA device closure.

2. Case

One-year old male infant was referred to our hospital with complaints of suck rest cycles, recurrent cold, cough, fever, increased precordial activity and failure to gain weight since birth. His weight was 3.0 kg (less than 3rd percentile of weight for age, WHO chart). When examined patient had pulse of 124/min, BP of 96/62 mm of Hg in right upper limb. On auscultation, he had grade IV/VI continuous murmur in left second intercostal space. 2D transthoracic echocardiography (2D TTE) was done which showed 6 mm of PDA (Fig. 1) with left to right shunt. Systolic and diastolic gradients across PDA were 50 and 15 mm of Hg respectively.

Surgical closure was the first option to be considered but since the child was very low birth weight, so he was a high risk candidate for surgery. On 2D TTE, PDA had sufficiently long length with good ampulla which would have accommodated whole device without much protrusion into aortic or pulmonary arteries preventing their obstruction by the device. So, it was then decided to attempt PDA device closure percutaneously.

Patient was taken up for procedure under general anesthesia. Under all aseptic precautions, right femoral artery access was taken with 4F sheath and right femoral vein access was taken with 5F sheath. 4F pigtail catheter then passed through right femoral artery and kept in aortic arch. Shoot was taken in left lateral view with pressure injector which showed PDA of 8 mm (Fig. 2) with left to right shunt.

It was then decided to use PDA device of 10 × 12 mm to occlude this PDA. It is worthwhile noting that Amplatzer ductal occluder II (ADO II, St Jude Medical Inc., Minnesota, USA), made for low weight patients, was not an option as it is available in sizes to occlude PDAs of 5.5 mm. 5F multipurpose catheter A1 was then passed through right femoral vein up to main pulmonary artery and then through PDA into descending aorta. Catheter was exchanged with 0.035 inch 260 cm super stiff wire. 7F delivery system was placed in the descending aorta. A 10 × 12 mm Cocoon PDA device (Vascular Innovations Co. Ltd, Thailand) was then passed through the delivery catheter into the descending aorta and pulled back into the ampulla and the device was positioned across the ductus by withdrawing the sheath as usual. A check aortogram was taken in lateral view which showed device in proper position with no obstruction in the aorta. There was no flow across the device into the pulmonary artery (Fig. 3). 2D TTE was carried out in the catheterization laboratory to ensure that there was no pulmonary arterial obstruction. PDA device was then released from delivery system. Again check aortogram taken after 10 min confirmed device in position with no residual shunt. The pressure recording taken during a pullback from ascending to descending aorta showed no gradient across the aorta at the level of the device.

Post procedure 2D TTE was done which showed device in situ with no flow across PDA, no gradient across left pulmonary artery (LPA) and aorta at the site of PDA device. Patient was given weight adjusted dose of aspirin.

3. Discussion

Large PDA in pediatric patient causes failure to gain weight which poses risk for intervention and surgery. PDA device
closure is a less invasive procedure and has fewer complications in full-term and normal weight children. The specific problems faced during PDA device closure in low weight for age pediatric patients are difficult vascular access, catheter manipulation, protrusion of device in aorta and pulmonary artery causing flow obstruction, device embolization etc. Therefore, surgical PDA ligation is generally preferred over device closure, in these patients. However, if the PDA is sufficiently long to accommodate the device as in our case, chances of aortic and pulmonary obstruction as well as that of embolization are very low. Food And Drug Administration of USA has approved Amplatzer duct occluder (ADO) for pediatric patients with weight ≥ 6 kg.5

The most important factors determining the success of PDA device closure are the weight of the baby, ductal size and anatomy, and the availability of suitable hardware.6 Because of less complications, comparable success rates, less invasiveness, availability of suitable devices as compared to surgical ligation, PDA device closure is rapidly becoming a popular method in low weight for age pediatric patients with PDA which has favorable anatomy for device closure as in our case.

4. Conclusion

Low weight for age pediatric patients of significant PDA are candidates for PDA device closure technique. Surgical closure of PDA is generally the chosen option because of being less technically demanding procedure as compared to PDA device closure but it is more invasive. Though a technically demanding procedure but PDA device closure is a relatively safer procedure and also has good success rate. In case of favorable anatomy like long length and no aneurysm or constriction in PDA, device closure can definitely be attempted. To the best of our knowledge, this is the first case of the use of such a large device in a 3 kg child with good results.

Conflicts of interest

All authors have none to declare.

REFERENCES