

Successful Transcatheter PDA Device Closure in an Adult with Retrograde Wiring and Antegrade Snaring Approach

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Authors' contributions

This work was carried out in collaboration among all authors. Author AG designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors GS, VP, RS and AJ managed the analyses of the study. Author NOB managed the literature searches. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Patent ductus arteriosus accounts for 5 – 10% of all congenital heart disease in children. Currently, transcatheter closure is standard of care. Device closure in PDA is usually done by an antegrade technique where PDA is crossed from the PA side. In some patients, this universal procedure may not be successful due to anatomical differences. In such patients, the retrograde technique with retrograde wiring and antegrade snaring approach followed by PDA device closure may be used successfully to close PDA. We report such a case of difficult PDA device closure where the antegrade technique was not successful and PDA device closure was completed by retrograde approach.

Keywords: *Congenital heart disease; patent ductus arteriosus; device closure.*

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ABBREVIATIONS

PDA : Patent Ductus Arteriosus
PA : Pulmonary Artery
RA : Right Atrium
RV : Right ventricle
IVC : Inferior vena cava

1. INTRODUCTION

Patent ductus arteriosus (PDA) is a congenital heart defect in which the ductus arteriosus, a vascular structure between the pulmonary artery and the aorta that normally closes shortly after birth, remains open. The incidence of PDA is approximately 1 in 2000 in full-term infants and consists of 5 to 10% of all congenital heart disease in children [1,2]. Females are more commonly affected by PDA than males.[3] PDA is usually encountered and treated in childhood. But sometimes it can go undetected and present in adulthood. Transcatheter device closure of PDA has been the standard of care for such patients. However, sometimes transcatheter closure in adults can pose unique challenges due to anatomical differences. In such cases, using different views for defining the defect and use of different catheters can be helpful. Also, sometimes it may not be possible to cross the PDA by the routine antegrade approach. Here we present a rare case of difficult PDA device closure where it was closed using a different retrograde approach.

2. CASE

28-year-old female, third para with day 6 Postnatal care, presented antenatally with breathlessness and on examination was found to have a continuous murmur in left 2nd intercostal space. She was referred to the tertiary care centre for evaluation of murmur and echocardiography. Echocardiography revealed 7 mm PDA with the left to right shunt. So the patient was planned for hemodynamic study followed by PDA device closure. Right femoral arterial and venous access obtained. The hemodynamic study revealed Qp/Qs-2:1 with PA pressure of 36/18 (mean-24) mmHg and PVR of 3.6 WU. So it was decided to go for PDA device closure. Pigtail shoot revealed 12 mm PDA at the aortic end with a relatively poor ampulla. The PDA was tried to cross from pulmonary end to Aorta with Terumo wire but despite multiple attempts, it could not be crossed, using MPA and JR 3.5 catheters. It was observed that the

Terumo wire was getting buckled at the entry point of the PDA repeatedly (Fig. 1). So we decided to cross the PDA from aortic side and snare it out from pulmonary side akin to VSD device closure. So we tried to cross PDA from the aortic side and were able to cross it easily with Terumo wire 0.035 inches. This suggested some valve-like mechanism which was preventing the passage of the wire and catheter from the pulmonary end since angiography was done in multiple angulations ruled out any tortuosity of the PDA.



Fig. 1. LAO 70 showing coiling of wire while passing through the pulmonary end

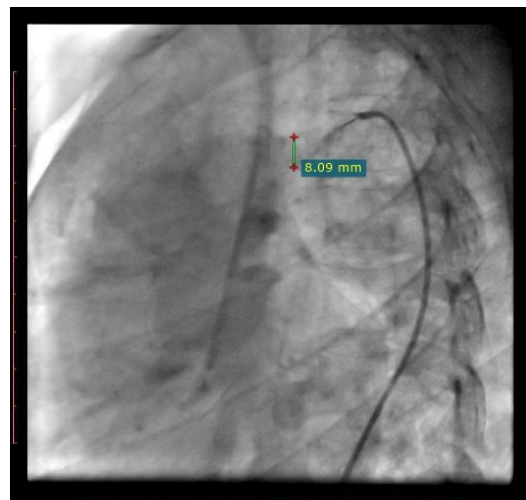


Fig. 2. LAO 70 view showing the size of PDA

Terumo wire was used to cross the PDA retrogradely from the aortic side with the help of JR 3.5 6 F catheter. The wire was advanced

retrogradely through MPA, right ventricle, RA into the IVC and was snared out from right femoral vein to complete AV loop (Figs. 3, 4). This was followed by antegrade placement of 10F delivery system from the right femoral vein through the IVC, RA, RV, PA, through the PDA into the Aorta. A Cocoon PDA device 16/18 was passed through the delivery system and successfully deployed. Angiographic check shoot and echocardiographic evaluation confirmed precise deployment of the device with no residual flow across PDA (Fig. 5). Finally, the device was delivered which retained its

position across the PDA, rechecked in X-ray 24 hours later. The patient was started on antiplatelets and observed for 24 hours. Echo showed the device in situ across PDA with no flow across PDA (Figs. 6, 7). The patient was discharged after 48 hours. The patient is asymptomatic on subsequent follow-ups.

3. DISCUSSION

Transcatheter PDA closure options have expanded significantly since the first report of this approach in 1979 [4]. Since that time several

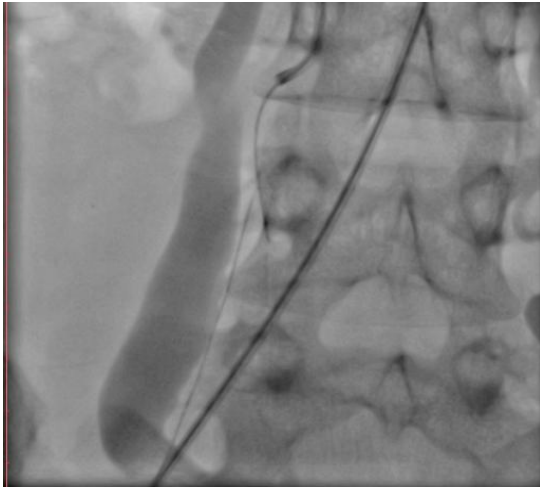


Fig. 3. AP view showing snaring of Terumo wire in IVC

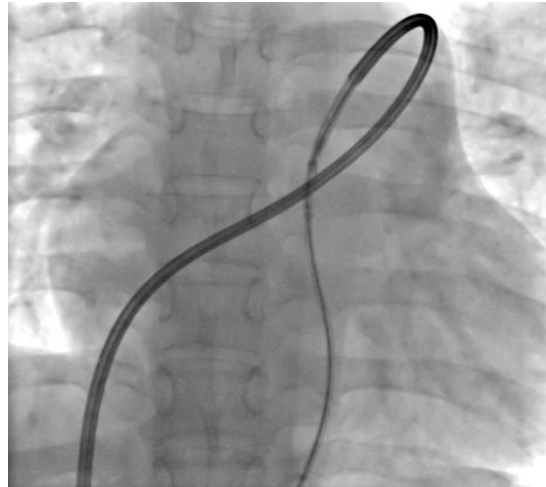


Fig. 4. AP cranial view showing the crossing of PDA with cocoon PDA sheath

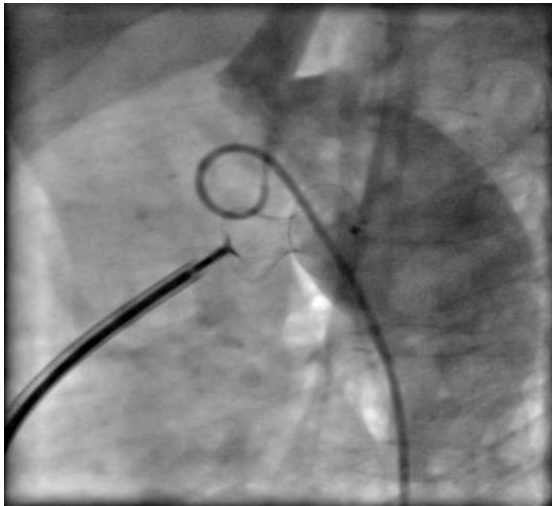


Fig. 5. LAO 70 view showing device across PDA with no residual shunt

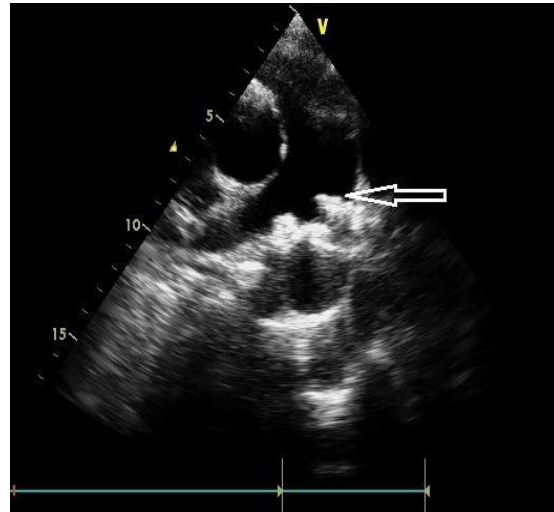


Fig. 6. 2D echo showing PDA device in situ

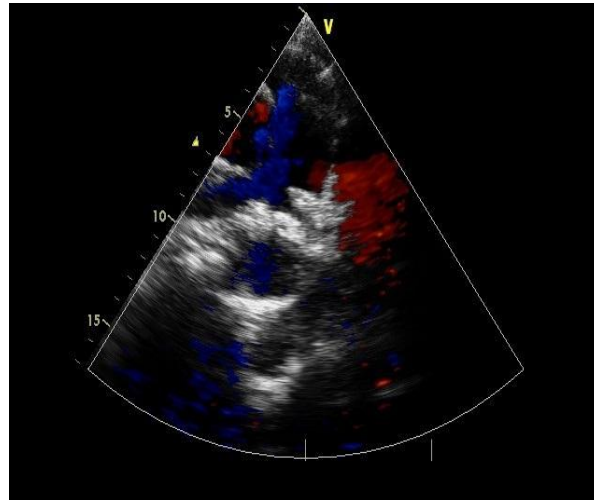


Fig. 7. Color Doppler showing no shunt across PDA device

devices have been used for PDA closures including coils, vascular plugs and devices specifically designed for PDA closure. Currently, transcatheter closure is standard of care beyond the neonatal period [5]. With appropriate patient and device selection, transcatheter PDA closure is a very safe and effective procedure [6,7]. Mortality is rare in this procedure. PDA device closure is a well-established procedure, in which after crossing the PDA from the pulmonary end, the device is deployed. The procedure is relatively simple and an excellent alternative to surgical PDA closure with a success rate of about 92% [8]. In adults, the orientation of the patent ductus arteriosus may not be the same as in patients presenting in the paediatric age group. Anatomical differences may contribute to unique difficulties in these patients taken up for device closure. In the present case, we were not able to cross from pulmonary end despite multiple attempts. This led us to hypothesize that there must be a physical structure or valve-like mechanism preventing the passage of wire. This is an unusual situation which led us to rethink our strategy and reattempt crossing via aortic end and snaring it out from the pulmonary end. Such retrograde wiring and antegrade snaring were also reported by Feyza Aysenur Pac, et al. in 2011, where PDA ostium could be engaged in 17 of 18 adult patients by retrograde wire-guided assisted approach [9]. One such case of Retrograde wiring and antegrade snaring approach to close the PDA was reported in a 6-month infant by SK Sinha, et al. in 2018 [10]. Thus in patients with difficult PDA device closure, the retrograde approach should be tried instead of opting for surgical closure.

4. CONCLUSION

Percutaneous device closure of PDA is now the treatment of choice in isolated PDAs. Device closure in PDA is usually done by an antegrade technique where PDA is crossed from the PA side. In some selected patients this universal procedure may not be successful. In such patients, the retrograde technique with retrograde wiring and antegrade snaring approach followed by PDA device closure may be used successfully to close PDA.

CONSENT

Written informed consent was obtained from the patient for publication of this report and any accompanying images.

ETHICAL APPROVAL

As per international standard, ethical approval has been collected and preserved by the author.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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