# Transcatheter closure of a large patent ductus arteriosus using jugular access in an infant

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**Abstract:** Trans-catheter device closure of patent ductus arteriosus (PDA) via femoral route is the commonly used, safe and effective procedure. Trans-jugular approach has been successfully used in older children with interrupted inferior vena cava. We report a case of successful occlusion of PDA using Amplatzer duct occluder (ADO) via trans-jugular approach following difficulties encountered in gaining femoral venous access. A 6-month-old male infant, weighing 8 kg was admitted for percutaneous catheter closure of PDA. Echocardiogram showed a 4.5 mm duct and left heart dilatation. Femoral venous access was not possible; therefore, we decided to use a trans-jugular approach. The duct was occluded using 8/6 mm ADO. Successful closure of the duct was confirmed with an aortogram. Post procedure echocardiogram showed no residual shunt across the duct. We highlight that trans-catheter closure of PDA using jugular venous access is safe and effective even in infants.

Keywords: Patent ductus arteriosus (PDA); transjugular route; device closure

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## Introduction

Patent ductus arteriosus (PDA) is a common congenital heart defect accounting to 5–10% of all congenital heart diseases (1). Trans-catheter occlusion using Amplatzer duct occluder (ADO) is nowadays considered to be a safe and effective method (2,3). Femoral venous access is the commonly used route as it allows delivery of larger sheath if necessary. In case femoral route is not feasible transjugular access may be used as an alternative. However, only few cases have been reported in children with interrupted inferior vena cava (4-7). We report a case of transjugular approach in an infant with large PDA.

#### **Case presentation**

A 6-month-old male infant, weighing 8 kg was admitted for percutaneous catheter closure of PDA. On examination, a continuous murmur was heard beneath the left clavicle. The echocardiogram at admission showed a 4.5 mm diameter and high velocity 5 m/s by continuous wave Doppler duct. The left atrium and left ventricle were significantly dilated.

We obtained written and informed consent from the parents for trans-catheter device closure of the duct. At cardiac catheterization, femoral venous access was not possible. On the left, there was a swelling noted at the inguinal region, which was presumably a hernia. On the right groin, femoral vein access could not be obtained despite successful arterial access. We then decided to use the right internal jugular vein for the procedure. After a 6-French short sheath was successfully implanted in the right internal jugular vein, a lateral aortic angiogram was performed through a 4-French pigtail catheter. The duct measured 4.5 mm. A 4-French right Judkins catheter was used to catheterise the right heart cavities. The duct was successfully crossed and a 0.035 J tip guidewire (Wholey hi torque, Medtronic Inc., Minneapolis, MN, USA) was advanced in the descending aorta (Figure 1A). An 8/6 mm



**Figure 1** Lateral angiogram in descending aorta showing the PDA and the wire through the PDA from the right internal jugular vein (A). (B) Another lateral angiogram in descending aorta demonstrates a well-positioned 8/6 ADO device and an acute angulation of the delivery system. After release of the device another lateral aortic angiogram shows no residual shunt (C). PDA, patent ductus arteriosus.

Reference	Age (years)	PDA diameter (mm)	Device type/size (mm)	Result
(4)	9	12	ADO 12/10	Mild residual flow through the device
(5)	14	5	ADO 12/10 heart <sup>™</sup> duct occluder	No residual shunt
(6)	1.7	4.7	Device 12/10	No residual flow
(7)	3	3	ADO 6/4	No residual flow

Table 1 Previous published cases of patent ductus arteriosus device occlusions via internal jugular vein

ADO, Amplatzer duct occluder; PDA, patent ductus arteriosus.

ADO (AGA Medical Corporation, Golden Valley, MN, USA) was advanced and positioned inside the duct through a 6-French Amplatzer Torqvue long sheath (*Figure 1B*). After the device was released, an aortic angiogram demonstrated successful closure with tiny residual shunt (*Figure 1C*). There were no complications. Post procedure echocardiogram showed no residual shunt across the duct. The patient was discharged after 24 h. At 3 months' follow up patient was well and echocardiogram showed intact device with no residual shunt.

## Discussion

The jugular vein is larger than the femoral vein therefore a large bore sheaths can be safely introduced. However, the trans-jugular approach for PDA occlusion can be more challenging and potentially poorly tolerated as compared to femoral access. This is due to the angulations of the catheter from the right atrium to the pulmonary artery and pulmonary artery to the aorta. Indeed, the tortuosity of a large sheath alongside the rigidity of the delivery system and of the loaded device may transiently compromise the function of the right ventricle, tricuspid and pulmonary valve. In this setting the risk of "mechanical" ventricular arrhythmia is not negligible (8). Finally, in case with such difficult femoral access ultrasound guidance is safe and more effective (9). Unfortunately, this was not available in the centre where the case was performed.

To our knowledge this is the fifth case described. The 4 previously published cases (*Table 1*) of successful transcatheter occlusion of the PDA through jugular access were due to interrupted inferior vena cava (4,5,7) and pseudo interrupted inferior vena cava (6). Aggarwal *et al.* described the technical difficulties while attempting to close the duct via the inferior vena cava-azygous route. They used J tip terumo wire as a snare through the femoral artery to

#### Journal of Thoracic Disease, Vol 10, No 3 March 2018

stabilise the catheter and had a difficult tract for the delivery sheath with two angulations. The PDA was subsequently closed successfully via trans-jugular route (7). In our case the use of a relatively soft wire (Wholey hi torque, Medtronic Inc., Minneapolis, MN, USA) instead of a super stiff wire was helpful to carefully advance the long sheath through the PDA.

The youngest child undergoing trans-jugular closure was 19-month-old described by Subramanian *et al.* (6). Our case is the first to describe the trans-jugular approach in an infant with a large PDA. Despite small weight and size of the patient we found that the trans-jugular approach was well tolerated in terms of crossing the duct with a large sheath and deploying the device.

## Conclusions

The trans-jugular approach seems to be a good alternative to femoral access for trans-catheter closure of PDA in infants. Experience is however necessary to perform this procedure safely and effectively.

#### Acknowledgements

None.

## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

*Informed Consent:* We obtained written and informed consent form the parents for trans-catheter device closure of the duct.

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