Images in Pediatric and Congenital Heart Disease

Novel Approach to Transcatheter Patent Ductus Arteriosus Closure via the Internal Jugular Vein in a Patient with an Interrupted Inferior Vena Cava

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Keywords: patent ductus arteriosus, interrupted inferior vena cava

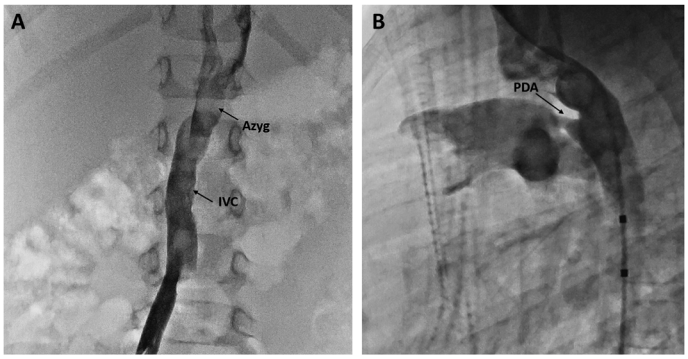

Fig. 1 (A) AP view of inferior vena cava angiogram showing IVC interruption with continuation via the azygous vein. (B) Lateral review of an aortogram showing moderate, conical type A patent ductus arteriosus. Azyg, azygous vein; IVC, inferior vena cava; PDA, patent ductus arteriosus.

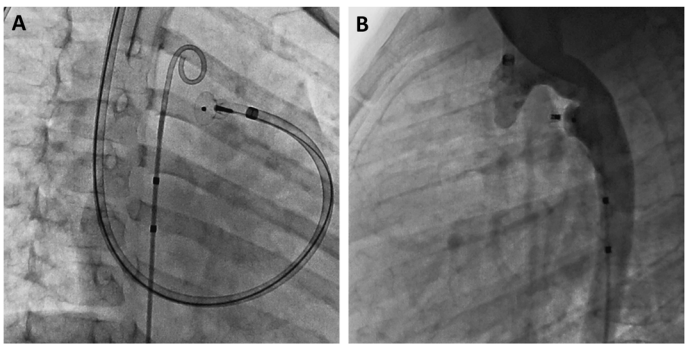

Fig. 2 (A) AP view of a 5-4 mm Amplatzer Duct Occluder device that has been deployed, but not released and delivered via an antegrade Amplatzer 180 degree delivery sheath from the right internal jugular vein. (B) Lateral aortogram following release of the Amplatzer Duct Occluder showing no residual flow through the duct and no aortic obstruction.

Received: October 27, 2020; Accepted: March 4, 2021
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doi: 10.24509/jpccs.20-038

Introduction

Transcatheter patent ductus arteriosus (PDA) closure is a common procedure and is typically performed with an antegrade approach from a femoral vein. Rare descriptions of transcatheter ductal closure via the right internal jugular vein (RIJ) exist in the setting of inferior vena cava (IVC) interruption or challenging femoral venous access.[1–5] We describe transcatheter PDA closure via the RIJ in a 2 year-old with an interrupted IVC and highlight a technical modification that facilitated procedural success.

Case Report

A 2 year-old (12 kg) female with an interrupted IVC with azygous continuation to the right superior vena cava was referred for transcatheter closure of a moderate PDA associated with left heart dilation. At catheterization, her pulmonary artery pressures were normal and her Qp/Qs was 1.7. Angiography confirmed IVC interruption and a moderate type A PDA (Fig. 1). The PDA was 7.5 mm long, the pulmonary artery end of the PDA measured 2 mm, and the aortic end measured 4.5 mm. The patient had a left aortic arch with normal branching. The PDA was crossed antegrade from the RIJ with the wedge catheter. An Amplatzer extra stiff wire (AGA Medical Corporation, Golden Valley, MN) was used to advance a 6 F 180 degree Amplatzer Torqvue delivery sheath (AGA Medical Corporation, Golden Valley, MN) across the PDA and into the descending aorta. A 5–4 mm Amplatzer Duct Occluder (ADO) (AGA Medical Corporation, Golden Valley, MN) device was chosen for closure. The delivery cable associated with this device is stiff; in the setting of a tortuous approach from the RIJ, we were concerned that this stiff cable may not reliably unscrew to facilitate device release. Thus, we took the floppier delivery cable from an Amplatzer Vascular Plug II (AVP II) (AGA Medical Corporation, Golden Valley, MN) device and attached it to the ADO device. Using the Amplatzer delivery sheath, the 5–4 mm ADO was deployed (Fig. 2A) and released without issue. Following device release, the aortogram showed no residual ductal flow and no aortic obstruction (Fig. 2B). The patient is doing well 6 months after the procedure with echocardiogram showing no residual PDA flow and no aortic or left pulmonary artery obstruction.

Discussion

PDA closure is typically performed via the transcatheter route using an antegrade approach from the femoral veins. Abnormal IVC anatomy including IVC interruption poses a challenge for transcatheter ductal closure as the transfemoral approach may not be an option. In the setting of an interrupted IVC, an IVC to azygous approach could be used via the femoral vein. However, this strategy is often unsuccessful due to the tortuous catheter course.[1] Transcatheter closure via the RIJ can be considered, but also may be challenging due to need to advance a stiff sheath along a tortuous course.

Five reports of transcatheter PDA closure via the RIJ exist in the literature in patients ranging from 6 months to 14 years of age.[1–5] All patients did well with procedural success and no complications. In 3 of the cases, an ADO device was used with the standard delivery cable.[1, 3, 4] Several authors described use of a stiff wire to facilitate passage of the braided, Amplatzer delivery sheath antegrade across the duct.[1, 4]

We describe antegrade PDA closure from the RIJ in a 2 year-old female with an interrupted IVC with a 5–4 mm ADO device. Similar to others, we used a stiff wire to facilitate passage of the delivery sheath antegrade across the PDA and had no issue with arrythmia or hypotension during sheath passage. The delivery cable associated with the 180 degree Amplatzer delivery sheath is stiff. We were concerned that the cable might not reliably unscrew from the device at the time of release given the tortuous approach from the RIJ. Thus, we used the much floppier delivery cable from an AVP II device to deliver the ADO device. Device release was uncomplicated. Although others have described successful release of the ADO device from the RIJ using the standard cable that is included with the Amplatzer delivery sheath, we were concerned that issues with device release could arise from the RIJ approach given the stiffness of the cable.

In cases of abnormal IVC anatomy or challenging femoral venous access, transcatheter PDA closure via the RIJ is safe and effective and should be considered. Our case adds to the literature in support of this approach, but also offers a novel technical adjustment that, we feel, maximizes the likelihood of successful device release.

Conflicts of Interest

The authors declare no conflicts of interest.

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