Device Closure of Ventricular Septal Defect by a Unique Technique

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Abstract
In the current era where percutaneous coronary interventions are increasingly performed day by day can device closure of congenital heart defects be far behind. We describe one unusual case of ventricular septal defect (VSD) in a child with absent inferior vena cava which was tackled in a novel way using hemiazygous vein as the conduit (access) to the right side of heart.

Introduction
Interrupted IVC is mostly an incidental and unexpected finding during cardiac catheterization. IVC provides access to right side of heart for right heart catheterization. IVC drains the lower half of the body and many viscerae and hence it is a large venous channel. All these features make it a ideal conduit for cardiac interventions. Interrupted IVC makes the job of an interventionalist tedious but not impossible as other venous conduits can give the answer.

Case Report
A eight year old male child who was diagnosed with VSD at the age of five years was referred to us for therapeutic intervention. The child was evaluated. Echocardiogram showed a perimembranous ventricular septal defect of about 8 mm size with left to right shunt. The pulmonary artery pressure (PASP) was 46 mm Hg. There was no aortic regurgitation. There was no other associated cardiac anomaly. Unfortunately the subcostal window was not demonstrated by the operator, hence there was no comment on IVC. The patient was planned for device closure for the above. Right groin arterial puncture was taken and 6Fr sheath was introduced. A 7 Fr venous sheath was introduced after taking vein puncture. A 6Fr Pigtail catheter was placed in left ventricle and LV angiogram was done which showed the defect. The 6Fr JR catheter was taken over the standard J-tip guidewire and was advanced; but it was getting stuck somewhere. With repeated manipulation it was advanced and an angiogram was taken. To our utter surprise the catheter had entered hemiazygous vein which was draining into azygous vein and IVC was found to be interrupted (Figure 1). Subsequently we decided to complete the procedure through the same route and hence the guidewire was taken via the hemiazygous vein to azygous vein and the JR catheter was tracked over the same (Figure 2). With further advancement it was taken in azygous vein and further into SVC and right atrium and further into right ventricle. With the help of a snare the double length J-tip extrastiff wire was snared (Figure 3) and pulled back into RV, RA, SVC, azygous vein, hemiazygous vein, common iliac vein, superficial vein and pulled back outside from within the sheath. Over the same guidewire the long sheath 7Fr and loader with the device screwed at its tip was introduced and further crossed across the defect (Figure 4). It was positioned and pulled across the sheath. Check left ventriculogram showed no leak across the defect (Figure 5). The device was unscrewed and released.

Discussion
Device closure for congenital heart disease PDA, ASD and even VSD have been established as a standard form of therapy and evidences supporting

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them are ample except in case of a
perimembranous VSD in which case,
according to ACC/ AHA it is a class 2a recommendation. As we all know this lesser invasive form of therapy reduces the morbidity associated with thoracotomy and open heart surgeries. However even these procedures are not without complications which range from groin/neck complication (Haematomas, AV Fistulas, thrombosis of vessels, aneurysms, etc) due to large sheath to device embolization, air embolism, thrombosis, residual leaks and so on. There are various approaches (access) described in the literature for these procedure including femoral, jugular and transhepatic. Even periventricular closure of VSD has been described. Usually the preferred route is using the right groin via the femoral vein for antegrade approach or femoral artery for retrograde approach. However alternative approach may be needed in patients with unfavourable anatomy and associated anomalies. In case of Interrupted IVC or associated stenosis or thrombosis of the same, jugular and transhepatic route can be accessed.

Interrupted IVC is commonly associated with left isomerism or it can be an isolated finding, though uncommon.1 Device closure of PDA and ASD using jugular vein access in patients with unfavourable anatomy has been described in a number of cases2 but to the best of our knowledge no such report is available for device closure of VSD by using hemiazygous vein as the conduit in a case of Perimembranous VSD with IVC interruption with Hemiazygous vein draining into Azygous vein.

Abbreviations

SVC: Superior vena cava; IVC: Inferior vena cava; RA: Right atrium; RV: Right ventricle; VSD: Ventricular septal defect.

References
