

## Transhepatic Approach for Device Closure of Secundum Atrial Septal Defect in Patient with Interrupted Inferior Vena Cava

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### Abstract

Transcatheter device closure of secundum atrial septal defect is a well known option since 1974. The procedure is routinely performed through femoral vein approach but rarely inferior venacava (IVC) may be interrupted or blocked so transfemoral approach cannot be an option in these patients. In such rare cases surgical closure can be performed but in cases of percutaneous closure of secundum atrial septal defect the viable options are transjugular and transhepatic routes. We used transhepatic approach in this patient for device closure of secundum atrial septal defect. A 27mm occluder was used for the defect and two flipper free coils were used to seal the tract and there were no major complications. The patient was discharged home after 36 hours of the procedure with normal liver functions and ultrasonography.

**Keywords:** Device closure; Transhepatic; Coil occlusion

### Introduction

The incidence of congenital heart disease (CHD) in the general population is 8-9 per 1000 live births [1-3]. Atrial septal defect (ASD) accounts for 8%-10% of CHD while secundum ASD comprises 70% of all ASDs. We have started percutaneous closure of secundum ASD since 2001 at our institution and to our knowledge this is the first ever case in Pakistan in which transhepatic approach was used for device closure of secundum ASD.

### Case description

A 24 years old female patient presented with history of dyspnea on exertion (NYHA class II). Clinical examination revealed thin built young girl weighing 38 Kg and height 152 cm. There was wide fixed splitting of 2<sup>nd</sup> heart sound and ejection systolic murmur in 2<sup>nd</sup> left intercostal space and mid diastolic rumbling murmur at lower left sternal edge. Transthoracic and transesophageal echocardiography revealed 24 mm secundum atrial septal defect with adequate margins and interrupted inferior vena cava. She was planned for percutaneous closure of secundum atrial septal defect with transhepatic approach. A written consent was taken and general anaesthesia was given for the procedure. The transhepatic puncture was done with 18 G chiba needle in the upper part of inferior third of liver at the level of anterior axillary line. The needle was directed towards the spine and kept approximately 2 cm away from it and stylet was removed and needle was attached with 5cc syringe. The needle was gradually withdrawn with gentle suction till blood began to flow in the syringe freely and then contrast injection was given that clearly visualized the hepatic vein. Then a guide wire passed and 6F sheath entered the hepatic vein (Figures 1 and 2). The Judkin right catheter passed through the sheath into hepatic vein to right atrium to left atrium and right upper pulmonary vein. The contrast injection was given in LAO35 CR 25 to define the septal alignment. A 12F sheath passed over the superstiff guide wire parked in right upper pulmonary vein and 27mm occluder device was loaded and deployed successfully under transesophageal and fluoroscopic guidance (Figures 3 and 4). There was no residual leak or malpositioning of device after release. After the release of device the tract was sealed with 2xMWCE flipper free coils, one coil was deployed at the interface of liver parenchyma and hepatic vein and the other more distally in the tract (Figures 5 and 6). There was no bleed or hematoma formation at the puncture site and complete hemostasis was achieved with the free coils.

The patient was discharged home after 36 hrs of procedure without any complications and the device was well in place. The patient was advised to continue antiplatelet for 6 months.

### Follow up

She was reviewed in outpatient department after 2 and 8 weeks. She was asymptomatic and the device was well in place and liver functions were normal. She was advised further follow ups at 6 and 12 months.

### Discussion

The percutaneous closure of secundum atrial septal defect is safe, effective and alternative to surgical closure in selected cases [4]. The procedure has been performed routinely by using femoral vein puncture with normal connection of IVC to right atrium. When conventional approach is not possible the percutaneous closure of secundum ASD can be done using transjugular [5-9] or transhepatic approach [10].

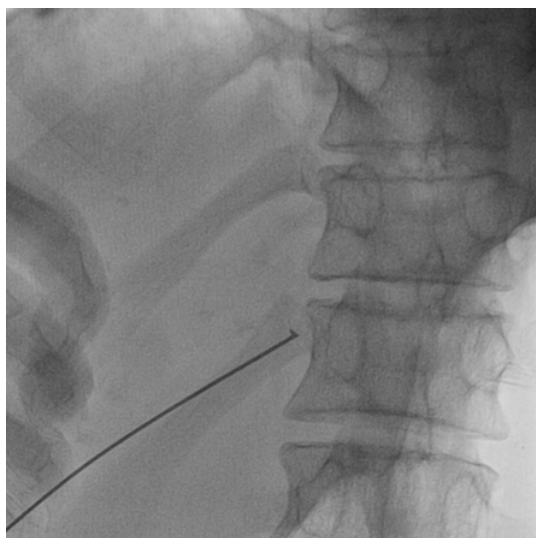
Ozbarlas et al. [7] reported percutaneous closure of secundum ASD in a 8 year old child with interrupted IVC and heterotaxia using transjugular approach but the device used was 10 mm. During transjugular route it is very difficult to manipulate the catheter and large sheath across the septum towards right pulmonary vein. There is increased risk of air embolism with transjugular approach. The transhepatic route is good alternative route for diagnostic as well as interventional cardiac catheterization in premature, young children and adults [11,12] as hepatic vein is large. We also preferred to use the transhepatic approach as the defect size was large and transjugular approach would be technically difficult [7]. The transhepatic puncture can be performed for repeated myocardial biopsies [13,14], pacemaker implantation [12]. It can be used as first option in smaller infants

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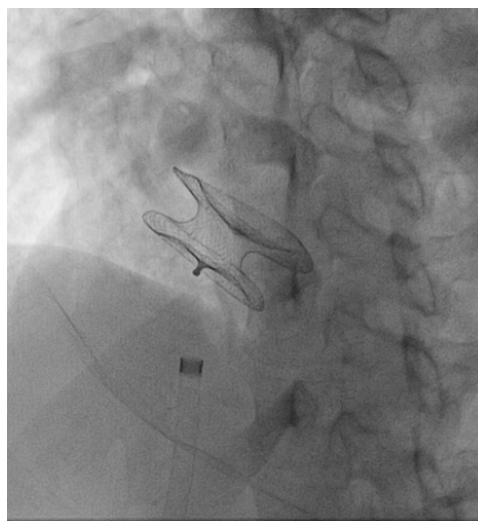
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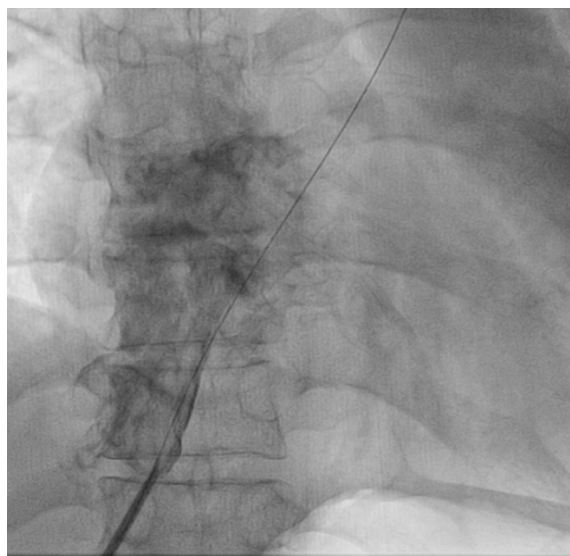
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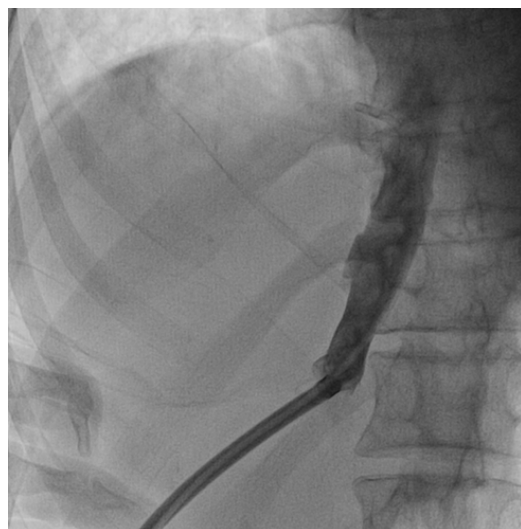
**Figure 1:** Showing Chiba needle in Hepatic vein.



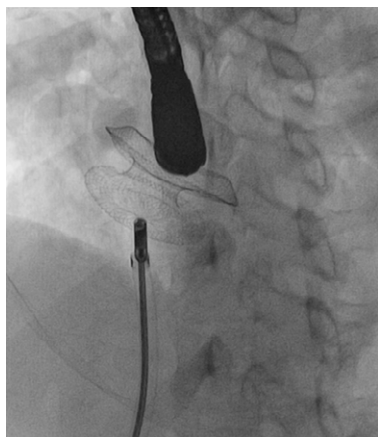
**Figure 4:** Well placed ASD Device.



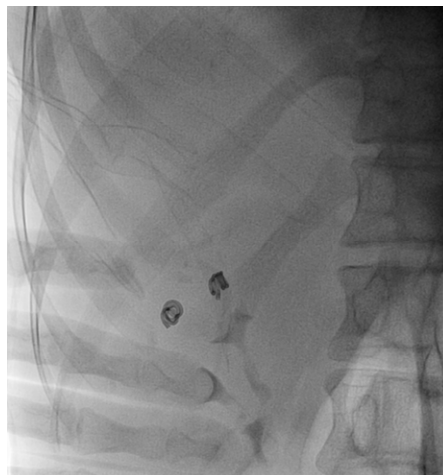
**Figure 2:** A guide wire through hepatic vein to right Atrium to left atrium.



**Figure 5:** Guidance for coil occlusion of tract.



**Figure 3:** Device deployment.



**Figure 6:** Free coils *in situ*.

for diagnostic and therapeutic cardiac catheterization as it allows larger sheaths. The puncture can be guided by abdominal ultrasound or passing a catheter from superior vena cava to hepatic vein but we did it under fluoroscopic guidance and it took 7-8 minute for hepatic vein puncture. Transhepatic puncture can lead to a number of complications including hemobilia, retroperitoneal bleeding, hepatic abscess, cholangitis, pneumothorax, hepatic vein thrombosis and rarely pulmonary embolism [10] but we did not encountered these complications in our patient. Some authors recommend application of pressure and maintenance of right lateral decubitus position to prevent bleeding, however others favor in slow removal of sheath with injection and once it is out of hepatic vein and at interface of hepatic parenchyma gelfoam or coils to be inserted to prevent bleeding. As we occluded the tract with free coils and there were no major complications and the procedure time was also comparable with the conventional route.

## Conclusion

Transhepatic route for percutaneous closure of secundum ASD is a good viable option as it accommodates larger sheath and the tract can be sealed comfortably with the coils.

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