Transjugular closure of a two-hole atrial septal defect in a child with iliac vein thrombosis

Osman Baspinar, Khaleel Ibrahim Al-Hadidy, Mehmet Kervancioglu
Department of Pediatric Cardiology, Gaziantep University Medical Faculty, Gaziantep, Turkey

ABSTRACT

The internal jugular vein is not a typical vascular access line during the percutaneous closure of an atrial septal defect. We report the closure of a double atrial septal defect with a single device, using a transjugular venous approach, in a child with an inferior vena cava obstructed by a thrombosis due to previous cardiac catheterization. That the transjugular venous approach can be used as a possible alternative during the transcatheter closure of an atrial septal defect in children, when the inferior vena cava access is not possible.

Keywords: Device closure, percutaneous atrial septal defect closure, transjugular access

INTRODUCTION

The transcatheter closure of a secundum atrial septal defect (ASD) is a well-established procedure. It is currently considered the procedure of choice due to the good outcomes and low morbidity and mortality. The procedure is routinely performed through the inferior vena cava. However, this access route is not always possible due to obstruction or the congenital absence of the inferior vena cava. The other alternatives for access include the transhepatic or transjugular routes.[1,2] There are few case reports in adults regarding the transjugular approach during the percutaneous transcatheter closure of ASD.[3-5]

Herein, we report the closure of a two-hole secundum atrial septal defect in a four-year-old girl using a single occlusion device. A transjugular approach was used due to an inferior vena cava obstructed by a thrombus.

CASE REPORT

A 4-year-old girl, who weighted 13 kg, presented to our department for a scheduled follow-up for the transcatheter closure of a multiple secundum ASD. She also had a history of a transcatheter closure of a large patent ductus arteriosus at the age of 10 months, because of congestive heart failure. A transthoracic echocardiographic examination revealed two atrial septal defects measuring 12 and 4 mm, respectively, thatwere 5 mm apart. The total septum was 32 mm in length and had adequate surrounding rims [Figure 1]. In addition, a dilated right ventricle and tricuspid valve regurgitation were present, and no remarkable findings were observed in the other investigations.

Cardiac catheterization was performed under general anesthesia using transesophageal echocardiography control. We originally intended to place a 5-French (Fr) sheath in the right femoral vein and the right femoral artery for hemodynamic measurements and monitoring. However, we could not pass the guidewire into the inferior vena cava. Manual contrast injection was performed in the femoral vein, and an obstruction in the inferior vena cava was observed and identified as a thrombus. Catheterization was continued by using the right internal jugular venous access with a 5 Fr sheath. Heparin 100 units per kilogram of body weight was administered, and a 5 Fr Judkins right catheter with a hydrophilic guidewire was introduced, under transesophageal echocardiographic control through the larger defect into the left atrium and the left lower pulmonary vein instead of the left upper pulmonary vein. A manually curved, stiff exchange guidewire then replaced the catheter in that position, over which a 7F long sheath and a 16 mm Amplatzer septal occluder (St. Jude Medical, Inc.; Plymouth, MN, USA) device were glided into the left atrium. The left and right device discs were opened

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Address for correspondence: Prof. Osman Baspinar, Gaziantep University, Medical Faculty, Department of Pediatric Cardiology, 27310 Gaziantep, Turkey.
E-mail: osmanbaspinar@hotmail.com

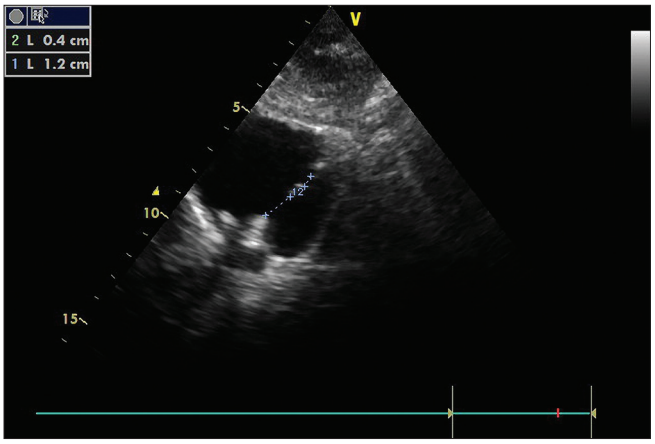

Figure 1: A subcostal transthoracic echocardiographic view showing the two-hole atrial septal defect separated by a small portion of the septum

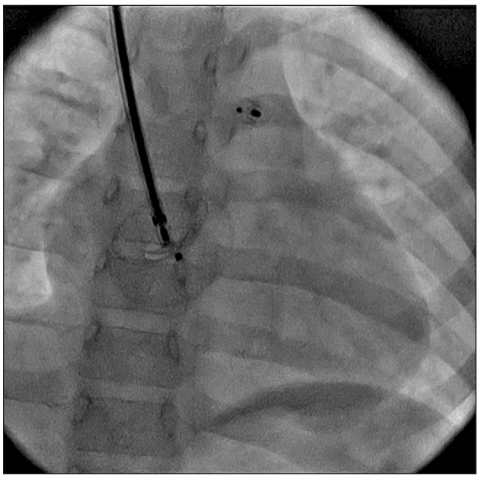

Figure 2: A fluoroscopic image showing the Amplatzer atrial septal defect occluder device deployment using the transjugular approach

sequentially under fluoroscopic and transesophageal echocardiographic guidance, and a successful deployment of the device was accomplished after several and repeated trials, aiming for an ideal device orientation [Figure 2]. Transesophageal echocardiography revealed no residual shunts, normal atrioventricular valve function, and normal superior and inferior vena cava blood flow. The next day, a transthoracic echocardiographic examination was normal. Aspirin therapy was started with a six-month course, and a follow-up was planned for the patient. The coagulation profile tests were normal, and the patient was discharged the next day.

DISCUSSION

The standard vascular access for an ASD closure in pediatric and adult patients is the femoral vein, due to the low incidence of associated complications and easier manipulation of the device compared to other access routes. However, this is not always possible if the inferior vena cava is interrupted or obstructed.

In our case, it was difficult to use the femoral approach due to an inferior vena cava thrombus, which occurred as a complication related to a previous cardiac catheterization performed to close a patent ductus arteriosus in infancy. The incidence of venous thrombosis in children was reported to be 0.6% in more than 1000 catheter-related procedures.[6]

Transhepatic or transjugular venous access for the transcatheter closure of septal defects has been reported.[1-5] ASD closure in a child using a transjugular venous approach is in frequently reported. Ozbarlas, *et al.*[3] reported an ASD closure using a transjugular venous approach in an eight-year-old child, with an interrupted inferior vena cava and heterotaxia. The difficulties associated with the transjugular approach include placing a large sheath in the jugular vein, directing the catheter through the septum, manipulating it past the defect, and placing a catheter or guidewire in the upper left pulmonary vein. Furthermore, there is a risk of air embolism during the procedure. We preferred the transjugular access over the transhepatic access due to the complications potentially associated with the latter, including retroperitoneal bleeding, hemobilia, and hepatic abscess, which can be avoided using the transjugular approach.[1,7] We believe that the jugular approach provides a simpler and safer alternative to the transhepatic approach.

The procedure was straightforward in our case. The only drawback was the slightly longer time required for the deployment of the device due to the perpendicular alignment of the discs in relation to the atrial septum and the presence of a two-hole defect that needed to be covered by one device. We thought that a single occluder would be sufficient because the distance of the the rim of tissue between two defects was 5 mm. Experience in performing the standard procedure and accessing the transjugular vein are mandatory to perform the procedure through the transjugular vein, because the direction is reversed compared to the femoral venous approach. Moreover, caution is required, due to the risk of air embolism. Otherwise, the transjugular approach is a good alternative to the femoral venous approach.

We conclude that the percutaneous transjugular approach for a transcatheter ASD closure in pediatric patients is an alternative method when femoral venous access is not possible.

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