SUCCESSFUL CATHETER TEATMENT BY PREOPERATIVE SIMULATION USING 3D ORGAN MODEL FOR ATRIAL SEPTAL DEFECT WITH DEXTROCARDIA AND INTERRUPTED INFERIOR VENA CAVA TO THE SUPERIOR VENA CAVA

Masao Imai, MD, Toshiaki Toyoda , MD, Masaharu Yoshida, MD, Naritatsu Saito, MD, Takeshi Kimura, MD
Department of Cardiovascular Medicine, Graduate School of Medicine, Kyoto University, Kyoto, Japan

HISTORY AND PHYSICAL

A 31-year-old male patient with a history of dextrocardia and sick sinus syndrome with secundum atrial defect had been referred to our hospital. Physical examination revealed 2/6 systolic murmur with a fixed split, a right axis deviation and absent R-wave progression in the chest leads in electrocardiography (ECG), and a right sided enlarged heart in the chest radiograph.
Echocardiography showed 9 x 16-mm ASD with continuous left-to-right shunting, small aortic rim and malalignment. Signs of right ventricular volume overload were noted. Furthermore, no hepatic segment of the IVC could be detected, and an interrupted IVC with azygos continuation to the superior vena cava (SVC) was diagnosed.

IMAGING

In order to carry out catheter intervention for a patient with complicated anatomy, preoperative simulation using a 3D organ model was conducted successfully (Figure 1 A, C, D).
The TEE showed an ASD with a deficient aortic rim, as well as a malalignment, measuring approximately 9x16 mm.

INDICATION FOR INTERVENTION

Echocardiography showed an 9 x 16-mm ASD with continuous left-to-right shunting with signs of right ventricular volume overload.

INTERVENTION

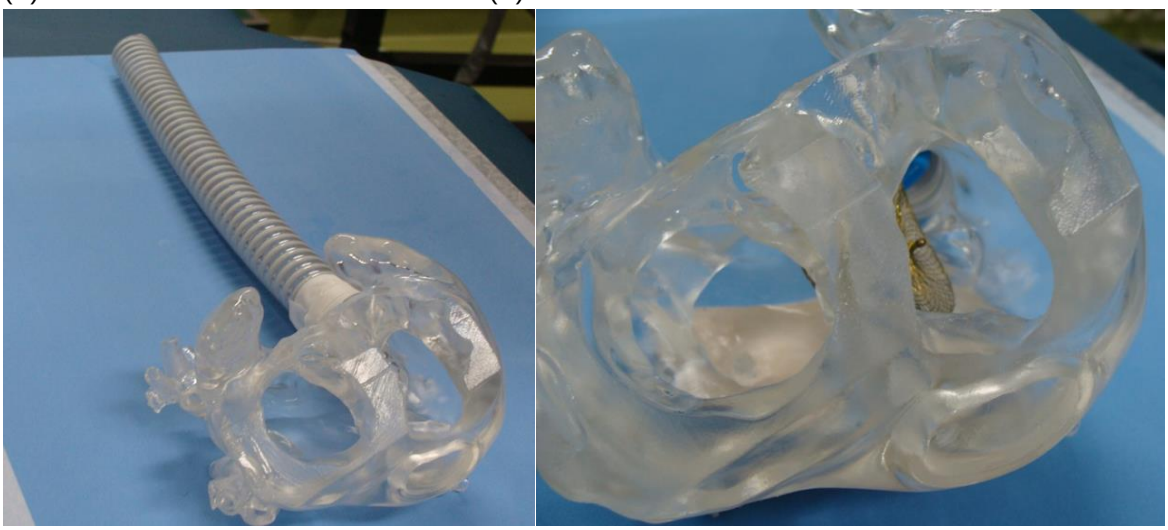
With the patient under general anesthesia, cardiac catheterization with transesophageal echocardiographic (TEE) guidance was performed. We choose a 12F FlexCath Advance ™ Steerable Sheath for Cryo Ablation Catheter (Medtronic, Inc.: Minneapolis) to pass through hole opened to the vessel at a 90 degree angle (Figure 1B).
A 12 F sheath for the device was inserted in the left jugular vein, and a 100 U/kg bolus of heparin was administered. A 21-mm Occlutech® ASD occluder was selected in accordance with the defect size on TEE. A multipurpose catheter could not pass into the defect, so a 5F JL4 catheter was used. Because of its shape, this catheter passed into the defect easily. A stiff exchange guidewire was placed in the upper pulmonary vein with this JL4 catheter. After delivery, the steerable sheath and dilator passed through the defect hole in the shape of 90 degree over the guidewire, the occluder device was introduced into the left-sided atrium. The left atrial disc of the device was extruded and pulled against the defect, the sheath was pulled back, and the central waist and right atrial disc of the device were deployed (Movie 1). The device’s shape and the flow patterns of the pulmonary veins, coronary sinus ostium, and atrioventricular valves were evaluated by means of TEE, and the occluder was then released. There was no residual defect. The patient had no major rhythm disturbances or other problems.

LEARNING POINTS OF THE PROCEDURE

In the case of the interrupted IVC with dextrocardia, the approach from the left jugular vein is desirable for procedure. The use of a steerable sheath for Cryo ablation is also useful for the procedure to sit the device safely and securely. Simulation using a 3D model was essential to verify that the device could be placed in a good form and the compatibility between the device and the sheath fits well.

Figure1:

(A) (B)



(C) (D)