

## Three-Dimensional Printing Model-Guided Percutaneous Closure of Atrial Septal Defect

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A 32-year-old female with a 2-year history of chest distress was admitted to our department due to exacerbation for 3 days. On physical examination, we found fixed splitting second heart sounds on the patient's pulmonic area. An echocardiography was performed and showed a 15-mm atrial septal defect of the inferior vena cava type. After obtaining the patient's consent, a three-dimensional printing cardiac model was printed out. We tried various sizes of ASD occluders on the model to completely cover the defect, which indicated that a 28-mm occluder was appropriate. Thus, we placed a 28-mm ASD occluder during the operation and succeeded after only one attempt. The patient was re-assessed by echocardiography, which showed a favorable position of the ASD occluder without any left-to-right shunt.

Three-dimensional printing (3D printing) is a new technology that converts two-dimensional medical images into a tangible object, allowing not only a comprehensive view of the cardiac anatomical structures but also

preoperative simulation to choose the optimal size of ASD occluder. Although it has been applied to orthopedics, general surgery and so on, the use of 3D printing in cardiology is still at its infancy. Our case showed the feasibility of using a 3D printing cardiac model to guide the percutaneous closure of ASD. It is likely to increase the success rate and reduce the operation time for interventional cardiology, especially the complex ASD cases, and more studies should be carried out to extend its fields of application.

### Author contributions

Conception and design of the research: Luo H; Acquisition of data: Luo H, Xu Y; Analysis and interpretation of the data: Wang Z, Liu Y; Writing of the manuscript: Luo H; Critical revision of the manuscript for intellectual content: Liu Y, Gao C.

### Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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### Study Association

This study is not associated with any thesis or dissertation work.

### Keywords

Heart Septal Defects, Atrial / surgery; Echocardiography / methods; Imaging, Three-Dimensional.

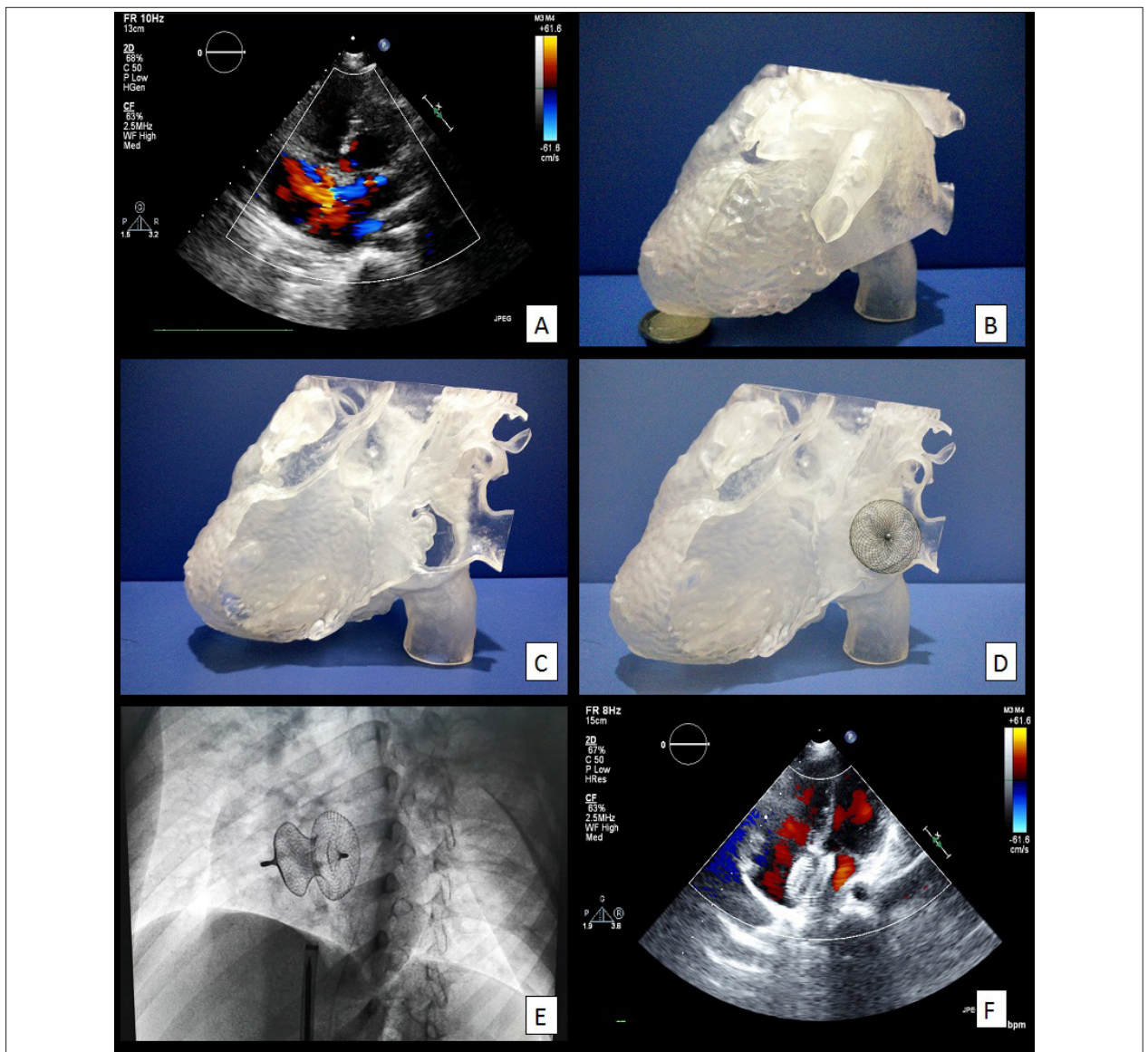
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**Figure 1** – Echocardiographic apical four-chamber axis view showing a 15-mm ASD with left-to-right shunt (A). Three-dimensional printing cardiac model in whole view (B) or being separated to show the ASD (C). A 28-mm occluder was placed to completely cover the ASD (D). Intraoperative placement of a 28-mm ASD occluder after one trial (E). Postoperative echocardiographic apical four-chamber axis view showing no left-to-right shunt (F).