

Accuracy and Feasibility of Two- and Three-Dimensional Transthoracic Echocardiography for Morphological Assessments of Secundum Atrial Septal Defect in Pediatric Patients

Saki SHIRAKI*, Naka SAITO*, Sayaka IKEDA*, Sachie YUKIYOSHI*,
Takuya WAKAMIYA**, Shin ONO**, Sadamitsu YANAGI** and Hideaki UEDA**

Abstract

Purpose: Transesophageal echocardiography (TEE) is widely used to assess the morphology of atrial septal defects (ASDs); however, it is relatively invasive and can be challenging in pediatric patients. This study aimed to evaluate the accuracy of three-dimensional transthoracic echocardiography (3D-TTE) for morphological assessment of ASDs in children.

Subjects and Methods: We retrospectively analyzed 34 pediatric patients with ASD who underwent percutaneous closure. Defect size measurements obtained by transthoracic echocardiography (TTE) were compared with those from TEE. Parameters included maximum and minimum diameters, circumference, and area, measured using a 3D volume dataset of the atrial septum with multiplanar reconstruction. The estimated balloon sizing diameter, derived from circumference, was compared with the measured balloon sizing diameter.

Results and Discussion: In both TTE and TEE, 3D echocardiography provided larger maximum diameter measurements compared with conventional 2D methods. Measurements of maximum diameter, minimum diameter, circumference, and area obtained by TTE showed strong correlations with those from TEE, with Bland-Altman analysis demonstrating excellent agreement. The estimated balloon sizing diameter calculated from TTE correlated significantly with the measured balloon sizing diameter, although a fixed bias was noted, with measured values being slightly larger.

Conclusion: TTE yielded defect size measurements comparable to those of TEE in the morphological assessment of ASDs. These findings suggest that 3D-TTE is a feasible and reliable tool for defect sizing and device selection in pediatric patients undergoing ASD closure.

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Department of Clinical Laboratory, Kanagawa Children's Medical Center*, Department of Pediatric Cardiology, Kanagawa Children's Medical Center**

Kanagawa Children's Medical Center, 2-138-4 Mutsukawa, Minami-ku, Yokohama-shi, Kanagawa-ken, 232-8555, Japan

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