J Cardiovasc Imaging. 2023 Oct;31(4):188-190
https://doi.org/10.4250/jcvi.2023.0077
pISSN 2586-7210·eISSN 2586-7296

Journal of Cardiovascular Imaging JCVI

Editorial

Clinical Implication (Application) of Measurement of Device Size in Patients With Atrial Septal Defects (ASD) by 3-Dimensional Transesophageal Echocardiography (3D TEE)

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▸ See the article "Utility of 3D Echocardiography for Device Sizing During Transcatheter ASD Closure: A Comparative Study" in volume 31 on page 180.

Received: Aug 11, 2023
Accepted: Sep 7, 2023
Published online: Sep 26, 2023

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Atrial septal defects (ASDs) are one of the most common congenital heart defects and account for approximately 6–10% of congenital heart disease cases.[1] The assessment of atrial septum abnormalities and associated complications requires a systematic and standardized approach, including the use of 2-dimensional (2D) transthoracic echocardiography, 2D transesophageal echocardiography (TEE), and real-time 3-dimensional (3D) TEE.[2] And, TEE is an integral part of the assessment of patients with ASD undergoing transcatheter and operative treatment and in those with nondiagnostic transthoracic imaging.[3-5]

The interatrial septum (IAS) is a very dynamic and complex 3D anatomic structure. Although 2D TEE has widely been used for the assessment of ASD, it is often unable to provide reliable information on the minimal and maximal diameters and the size of the area of defect.[6] Moreover, 2D echocardiography has limitations in evaluating the IAS, as it does not exist in a flat plane that can be easily aligned or interrogated by 2D echocardiography. The recent introduction of real-time 3D matrix array TEE transducers could provide unique views from the left atrial or right atrial perspective of the IAS.

When trying to device closer for ASD treatment, a small size occluder could lead to residual shunts or device embolization, and could even require emergency surgical operation. Therefore, the determination of the right occlusion device size is crucial for transcatheter closure. For Sizing the ASD, two major approaches exit, TEE sizing or balloon sizing (BS). The appropriate ASD device selection is based on real-time 3D TEE and 2D stretched balloon diameter (SBD) measurements. SBD measuring and BS are complicated and time-consuming processes, and thus exploring the reliability of 3D TEE imaging for selecting the ASD device size is highly desirable. Until now, several studies have found a relationship between the ASD diameter, size, and area assessed by 3D TEE, and the SBD measured with the BS method.[7]

So, the comprehensive ASD imaging information provided by 3D TEE, including location, shape, size, area, and the neighboring residual rim conditions is imperative for successful transcatheter closure.

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3D TEE appears to have an advantage in accurately measuring the ASD size in complex-shaped ASD.[8)9)] When the measurements in all four TEE planes (0, 45, 90, 135) are similar (1–2 mm) the largest is taken as the ASD size. If the measurements are significantly different (≥ 3 mm) a mental reconstruction will allow an understanding of the overall 3D shape, although 3D TEE has superseded this requirement. When the defect is circular a single diameter measurement is taken. When oval in shape the short and long axes are averaged and correlate with device sizing. For circular-shaped ASD, the measurements of ASD size are similar, both by 2D and 3D TEE, while in oval-shaped and bizarre-shaped ASD, the 3D measurements were larger than those secured by 2D TEE. Septal rims are more clearly characterized by 3D than by 2D TEE.[8)9)]

In summary, in measuring the defect size of ASD, 2D TEE can measure the defect size using distance, while 3D TEE can measure the defect size using area or circumference. It is known that using 3D TEE to measure the defect size of ASD in terms of area or circumference shows a good correlation with device size.

Therefore, to accurately determine the size and shape of the ASD defect, 3D TEE is conducted, allowing for a comprehensive assessment of the size and shape from various directions.

And, in general, the device size chosen is the measured ASD size plus 20%.[10)11)] If additional features exist (such as atrial septal aneurysm or absent aortic rim) we usually add 25% to the measured size of the defect thereby allowing for adequate grip of the surrounding rims.

Add to, as for the advantage of 3D TEE, 3D TEE imaging, could further reduce fluoroscopy time and radiation exposure. And, 3D TEE guidance is feasible in right heart catheterization without the use of fluoroscopy.[12)]

However, good quality 3D imaging acquisition requires operators' expertise, and analyzing 3D data sets requires additional time to process. When the quality of the real-time 3D TEE imaging is unsatisfactory, it is important to first guarantee the imaging quality of 2D TEE.[9)] In addition to the previously mentioned advantages, the disadvantages of 3D echocardiography are low temporal and spatial resolution and the need for offline processing. However, the newest software allows one to demonstrate 3D images during the initial recording of the images.

Therefore, this study of "Utility of 3D Echocardiography for Device Sizing During Transcatheter ASD Closure: A Comparative Study" has the limitations of being a small study, but shows the advantages of 3D TEE in ASD examination.[13)]

Therefore, further large-scale studies are needed in the future.

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Conflict of Interest
The author has no financial conflicts of interest.

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