Real-time three-dimensional echocardiography in evaluating Libman–Sacks vegetations

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Libman–Sacks endocarditis, characterized by sterile fibrofibrinous vegetations that have the potential to develop anywhere on the endocardial surface, was originally reported in 1924. The mitral valve is most commonly affected, followed by the aortic valve, whereas tricuspid and pulmonary valves are seldom involved. Libman–Sacks vegetations can be found in 1 of 10 patients with systemic lupus erythematosus by transoesophageal echocardiography (TTE), and they are variably associated with lupus duration, disease activity, anticardiolipin antibodies, and antiphospholipid syndrome manifestations. The capability to perform real-time 3D (RT3D) imaging in the evaluation of Libman–Sacks vegetation size may strengthen the already established role of transthoracic echocardiogram and TTE. The exact estimation of vegetation size may influence therapeutic interventions. Therefore, we are trying to highlight the role of RT3D echocardiography in assessing vegetation size in a patient with Libman–Sacks endocarditis.

Keywords

3D echocardiography • Libman–Sacks endocarditis

A 50-year-old woman with a 12 years history of systemic lupus erythematosus coexisting with antiphospholipid syndrome was admitted to our department for a routine evaluation of her cardiac function and structure. A standard transthoracic two-dimensional (2D) echocardiogram performed with a Vivid 7 system (GE Medical Systems, Milwaukee, WI, USA) revealed normal biventricular size and systolic function, mild left ventricular diastolic dysfunction, and an echogenic subtricuspid mass measuring 0.65 × 0.65 cm (Figure 1A). The patient underwent transoesophageal echocardiography (TEE) which revealed a similar vegetation size of 0.66 × 0.65 cm (Figure 1B). Complementary tricuspid valve (TV) assessment by transthoracic real-time three-dimensional echocardiography (RT3DE) was carried out, using the same ultrasound system and a 3V full matrix array transducer capable of on-line, real-time, non-gated 3D imaging and rendering as well as of full volume 3D imaging with gated acquisition (Figure 1C). The resultant 3D data were then processed using dedicated software package (EchoPAC, GE Medical Systems). On the real-time 3D images, the vegetation’s size was measured with Image J software (NIH, Bethesda, MD, USA), and was found to be 0.73 × 0.66 cm. We also used a novel navigation/cropping tool incorporated into the dedicated software, which allowed for optimization of cut planes and thus provided the true dimensions of the vegetation measuring 0.98 × 0.63 cm (Figure 1D).

Libman–Sacks vegetations appear as valvular masses of varying size (≥2 mm in diameter) and shape with irregular borders and echodensity, firmly attached to the valve surface and exhibiting no independent motion.1–3 They involved either the valve or the subvalvular apparatus. The clinical impact of the presence of Libman–Sacks vegetations is associated with the probable progression to more severe valve dysfunction and a probable tendency to develop thrombotic events. The size of a vegetation is a predictor for embolic events, congestive heart failure, and death, and is important for the assessment of treatment. Because of the importance of intracardiac mass size, it is now standard of care to measure maximum mass diameter from the 2D echocardiogram or TEE to determine mass size, guide treatment options, and assess treatment response over time.4 However, 2D echocardiography is limited to planar images that provide true measurements for symmetric masses but not structures with asymmetric geometry. In our patient, RT3DE allowed the direct measurement of shape and size of tricuspid vegetation. RT3DE is a new modality that acquires a pyramidal volume of information that can then be visualized from different angles and...
cropped on any desired plane to focus on any region of interest contained in the volume.\textsuperscript{5} Volumetric measurements or true maximal diameter measurements across an infinite number of planes can be obtained. As it is the case for infective vegetations, the size of a Libman–Sacks vegetation may also be a predictor for embolic events, congestive heart failure, and death and therefore may define the need of a more aggressive therapeutic approach.

**Author contributions**

S.T.T. had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. S.C.P, C.A.P., M.T., and S.T.T. are responsible for acquisition of data. C.A.P. and S.C.P. are responsible for analysis and interpretation of data. S.C.P., CAP., and S.T.T. involved in the manuscript preparation.

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**References**