

AN OPTIMISTIC VIEW TOWARDS THE REAL TIME 3D ECHOCARDIOGRAPHY IN CONGENITAL HEART DISEASE: A SIMPLE 'CROP BOX' SHOULD GIVE AN INFINITE INFORMATION IN THE NEAR FUTURE!

JIN-HEE OH, MD, PHD

DEPARTMENT OF PEDIATRICS, COLLEGE OF MEDICINE, THE CATHOLIC UNIVERSITY OF KOREA, SEOUL, KOREA

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Recent advancement of technology of medical imaging systems has enabled in-depth real time spatiotemporal diagnosis of human heart disease. It is regardless to mention that prognosis of cardiac disease is based critically on prompt 3 dimensional (3D) diagnosis of a structural anomaly, functional analysis and followed by a proper treatment. Although we are in current era of 3D skills in the spotlight, yet real time 3D echocardiography (RT3DE) is not so appealing to very busy pediatric and adult cardiologists. Mental reconstruction of harvested 2 dimensional (2D) echocardiographic images is a still much faster and simpler way to understand complex cardiac structural anomaly than doing a few more steps for subsequent data analysis with a software program of RT3DE. On the other hand, considering superiority of function of volume assessment, RT3DE can be very useful in clinical application as it can provide numeric data more precisely than morphologic visual assessment of each cardiac chambers that enables assessment longitudinally during the clinical course. In congenital heart disease (CHD), volume or pressure overloaded condition frequently results in distortion of septal planes followed by a geometric change in either ventricles that hampers precise ventricular volume assessment using conventional 2D echocardiography.^{1,2)} There are many reports on the reproducibility of RT3DE in clinical application to adults population without a complex heart disease.³⁾ It is known that current RT3DE has relatively a high intraobserver and interobserver variability.⁴⁾ In pediatric cases with a complex CHD, additional time consuming effort is required for the assessment of detailed anatomical defect during navigation of intriguing small cardiac structures to acquire optimal planes for secondary 3D reconstruction.

Novel imaging tools including RT3DE always require its validation steps. Many studies on the left ventricular volume and ejection fraction compared to cardiac magnetic resonance imaging (MRI) data, currently a gold standard method of cardiac volume assessment have been published during the last ten years.^{5,6)} It is known that the results acquired by RT3DE of left ventricular volume assessment has strong correlation with cardiac MRI although ventricular volume by RT3DE has tendency of underestimation.⁶⁻⁸⁾ Studying with cardiac MRI in pediatric patients in critical condition with CHD has several limitations as to its long scanning time and practical issues on patient's sedation and infeasibility in patients with pacemaker. If we mention about volumetric assessment of right ventricle considering its 3 dimensionally distorted morphology compared to left ventricle, there should be no doubt on the superiority of RT3DE to 2D echocardiography and related issues are published.^{9,10)} As RT3DE is a noninvasive method, if it can overcome current several issues of its limitation, it might be the most useful tool to examine children with CHD. Many experts in the field of echocardiography believe that its clinical application by skillful clinicians will provide infinite derivative outcomes in longitudinal monitoring of functional abnormality especially in cases with surgically corrected complex CHD.^{11,12)} However in reality, likewise cardiac MRI, RT3DE is still a secondary option to conventional 2D echocardiography with its limitations and infeasibility to pediatric populations with CHD. Therefore, further studies on this issue are strongly encouraged for further analysis.

An inspiring outcome shown here titled 'Assessment of left ventricular volume and function using real-time 3D echocardiography versus angiocardiology in children with Tetralogy of Fallot' is that RT3DE can be practically and convincingly used in volumetric assessment in CHD patients with real time

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• Address for Correspondence: Jin-Hee Oh, Department of Pediatrics, St. Vincent's Hospital, College of Medicine, The Catholic University of Korea, 93 Jungbu-daero, Paldal-gu, Suwon 16247, Korea Tel: +82-31-249-8220, Fax: +82-31-257-9111, E-mail: jeany@catholic.ac.kr

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and non-invasive scanning.¹³⁾ Authors tried to validate RT3DE comparing with angiographic data. Considering hard working in assessment of complicated geometric deformation of left ventricle in tetralogy of Fallot and technical difficulty in handling pediatric patients, this study is deserved the spotlight. They showed that there was a strong correlation between the mean value of the left ventricular end diastolic volume and its index measured by RT3DE and angiography with good intra- and inter-observer reliability. With training time and experience, unquestionably a simple 'crop box' will give us an infinitely useful information with simplified off-line analysis of harvested images with a cutting-edge software program. With an optimistic view towards the RT3DE in CHD, current doubt on values of RT3DE hopefully should be faded with an accelerated speed with the help of advancement of technology in the near future.

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