Feasibility Assessment of Atrial Septal Defect by 3D Echocardiographic Vritual Endoscopy

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Congenital heart disease is the most common cause of death in infants. Conventional two-dimensional echocardiography (2DE) is a safe and nonin-vasive diagnostic tool providing spatial cardiac information. However, 2DE images only provide two-dimensional plane information. The cardiologists make analysis and diagnosis from multiple 2DE images requires a mental 3D reconstruction. Three-dimensional echocardiography may provide reliable information than two-dimensional methods and improve comprehension of anatomic relationship, especially in the case of complex congenital heart dis-eases. However, it's a puzzle how to establish an optimal method for 3D echocardiography on reconstruction of inner heart structure by which quickly presentation of various heart malformations and defining complex spatial relationships. Employing virtual endoscopy to capture realistic views of the cardiac anatomy, VE is expected to solve this difficult problem. This paper introduces a novel visualization method which we call three-dimensional echocardiographic intracardiac endoscopic simulation system (3DE IESS) using 3D echocardiography images. The purpose of the study was attempted to evaluate the feasibility and accuracy of the 3D echocardiographic virtual endoscopy in Atrial Septal Defect (ASD). In this study an improved fuzzy C-means clustering algorithm brFCM was adopted to accelerate the speed of the FCM algorithm, as well as the equivalent calculation results of the traditional method. 3DE measurements for ASD were performed in 10 of porcine heart models and 16 patients. All data compared with independently measured data. The results show that all heart models are reconstructed successfully and the image visualization are satisfied. Good correlations were obtained between area measured by VE and actual area. The maximum and minimum diameter measured by VE were also correlated well measured data.($r>0.95$, $P<0.01$)In conclusion, 3DE IESS is a new technique in the field of mea-surement of ASD in congenital heart disease.