

3D derived Sphericity index for early detection of myocardial remodeling, a multicentric study in iron loaded asymptomatic beta thalassemia major patients

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-Introduction:

The ventricular remodeling that occurs with left ventricular (LV) dysfunction is characterized by a LV change from an elliptical to a spherical shape and is associated with a decreased exercise tolerance, and poor outcome. There are limited data on the occurrence and importance of LV remodeling in children with LV dysfunction. Studying LV sphericity index in beta thalassemia major patients with iron myocardial load might help in the validation of this index as powerful predictor of early cardiomyopathic changes in asymptomatic patients. This may help as well to extend its usage as potent screening tool in patients liable to develop LV dysfunction including other iron load disorders or anthracycline induced myocardial insult.

*Objectives: To evaluate the effectiveness of the usage of "Sphericity Index" in measuring the degree of cardiac remodeling in iron loaded β -thalassemia major children.

-Methods: Twenty-seven thalassaemic patients (with a mean age of 11 ± 3 years) and 25 healthy control subjects matched for age and sex have been included in the study. Patients have been recruited from Pediatric Hematology Clinics in both Cairo University, Egypt ($n=14$) and Padova University, Italy ($n=13$). 3D Speckle tracking Echocardiography was performed to all patients and control subjects in addition to myocardial relaxometry ($T2^*$) by Cardiac MRI.

-Results:

Compared to normal subjects patients didn't exhibit statistical difference in LV EF; patients vs. Controls; $74.3 \pm 3.5\%$ vs. $75.4 \pm 3.9\%$, $p = 0.30$, while patients had a statistically significant reduction of left ventricular global longitudinal strain; -16.7 ± 0.8 vs. -18.7 ± 1.2 ; patients vs. controls, $p < 0.05$. Sphericity index was significantly higher in patients compared to controls; $36 \pm 6\%$ vs. $27 \pm 3\%$; $p < 0.05$. The only parameter that showed statistical significant correlation with myocardial iron load as measured by $T2^*$ was the sphericity index with a correlation coefficient of 0.9; $p < 0.05$.

-Conclusions:

3D derived sphericity index can detect early iron induced myocardial remodeling in asymptomatic beta thalassemia major patients with preserved ejection fraction. Extending the study to larger cohorts may confirm its ability to replace the relatively expensive cardiac MRI derived myocardial relaxometry in iron load disorders.