

Detection of early cardiac dysfunction in patients with β thalassemia major and thalassemia trait by tissue Doppler echocardiography

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Cardiac complications are the leading cause of death in β Thalassemia Major (TM) patients. The aim of this study was to investigate the impact of iron overload on ventricular functions using the conventional and tissue Doppler imaging (TDI) in patients with TM and compared to the children with thalassemia trait (TT) and healthy controls.

This prospective study included three groups; Group I: 29 patients with TM, Group II: 28 patients with TT, Group III: 29 healthy controls. All the patients and control subjects underwent 2D, M-mode, Doppler and TDI.

No differences were evident between the three groups in age, weight, gender, ejection fraction ($p > 0.05$). Relative wall thickness, left ventricular mass, and left ventricular mass index were found to be higher in the group I ($p < 0.05$). The E/A ratio determined by conventional echocardiography for the right ventricle and, left ventricle were significantly lower in TM patients than the other groups (E_r/A_r : $1.4 \pm 0.4 / 1.8 \pm 0.5 / 1.7 \pm 0.4$, $p < 0.001$; E_m/A_m : $1.7 \pm 0.3 / 2 \pm 0.4 / 1.9 \pm 0.3$, $p < 0.05$). Peak late relaxation velocity determined by TDI for the left ventricle (A_{dm} : $10 \pm 3.4 / 6.9 \pm 1.7 / 7.2 \pm 1.2$), interventricular septum (A_{di} : $8.4 \pm 2.4 / 5.9 \pm 1 / 6.2 \pm 1$), and right ventricle (A_{dt} : $13.7 \pm 2.9 / 9.2 \pm 1.8 / 10.5 \pm 2.3$) were significantly higher in TM patients than the TT patients and controls ($p < 0.001$). The early to late relaxation velocity ratio for the left ventricle (E_{dm}/A_{dm} : $1.8 \pm 0.9 / 2.5 \pm 0.4 / 2.8 \pm 0.6$), interventricular septum (E_{di}/A_{di} : $1.7 \pm 0.4 / 2.4 \pm 0.5 / 2.5 \pm 0.5$), and right ventricle (E_{dt}/A_{dt} : $1.2 \pm 0.3 / 1.9 \pm 0.5 / 1.8 \pm 0.4$) were significantly lower in the group I ($p < 0.001$). There was a negative correlation between the ferritin level and E/A ratio for the left ventricle, interventricular septum and right ventricle using the TDI ($p < 0.05$, $r = -0.378$, -0.491 , -0.448 respectively).

Our results demonstrated that indexes of diastolic function, including TDI, were significantly impaired in TM patients than the TT and healthy children. Conventional echocardiographic techniques have failed to distinguish ventricular functions asymptomatic patients with TM from the patients with TT, and normal controls when global functions were examined. The present study indicates that TDI should be used for screening of TM and TT patient's cardiac functions.