Different patterns of myocardial iron overload by multislice T2* Cardiovascular MR as markers of risk for cardiac dysfunction in thalassemia major.

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Introduction. The multislice multiecho T2* CMR technique allows to detect different patterns of myocardial iron overload (MIO) [1]. The aim of this study was to verify the risk of biventricular dysfunction related to different patterns of MIO in a large cohort of thalassemia major (TM) patients.

Materials and Methods. 1135 TM patients (538 M, mean age 30 ± 19 years) enrolled in the Myocardial Iron Overload in Thalassemia (MIOT) network [2] underwent CMR (1.5 T). For the assessment of MIO, three short-axis views of the left ventricle (LV) were acquired and the myocardium was segmented into a 16-segments standardized LV model [3]. The T2* value on each segment was calculated as well as the global T2* value. A conservative cut off of 20 ms was considered the limit of normal for the segmental and global T2* values. Biventricular function parameters were quantitatively evaluated by SSFP cine images. The lower limit of normal for the LVEF and the RVEF were established from CMR in a large cohort of well-treated TM patients without myocardial iron overload and cardiac diseases.

Results. Four groups of patients were identified: homogeneous MIO (all segments with T2* values <20 ms) (N=173, 15%), heterogeneous MIO (some segments with T2* values≥20 ms and other segments with T2* values < 20 ms) and global heart T2*<20 ms (N=160, 14%), heterogeneous MIO and global heart T2*≥20 ms (N=337, 30%) and no MIO (all segments with T2* values≥ 20 ms) (N=465, 41%). The LV ejection fraction (EF) was significant different among the groups (P<0.0001) (figure 1A). Odds Ratio for LV dysfunction (LV EF<57%) was 4.8 (3.1-7.3 OR 95% CI; P<0.0001) for patients with homogeneous MIO vs patients with no MIO and 1.9 (1.2-3.2 OR 95% CI; P=0.007) for patients with heterogeneous MIO and global heart T2*<20 vs patients with no MIO. The right ventricular (RV) EF was significant different among the groups (P<0.0001) (figure 1B). Odds Ratio for RV dysfunction (RV EF<55%) was 2.1 (1.4-3.2 OR 95% CI; P=0.001) for patients with homogeneous MIO vs patients with no MIO.

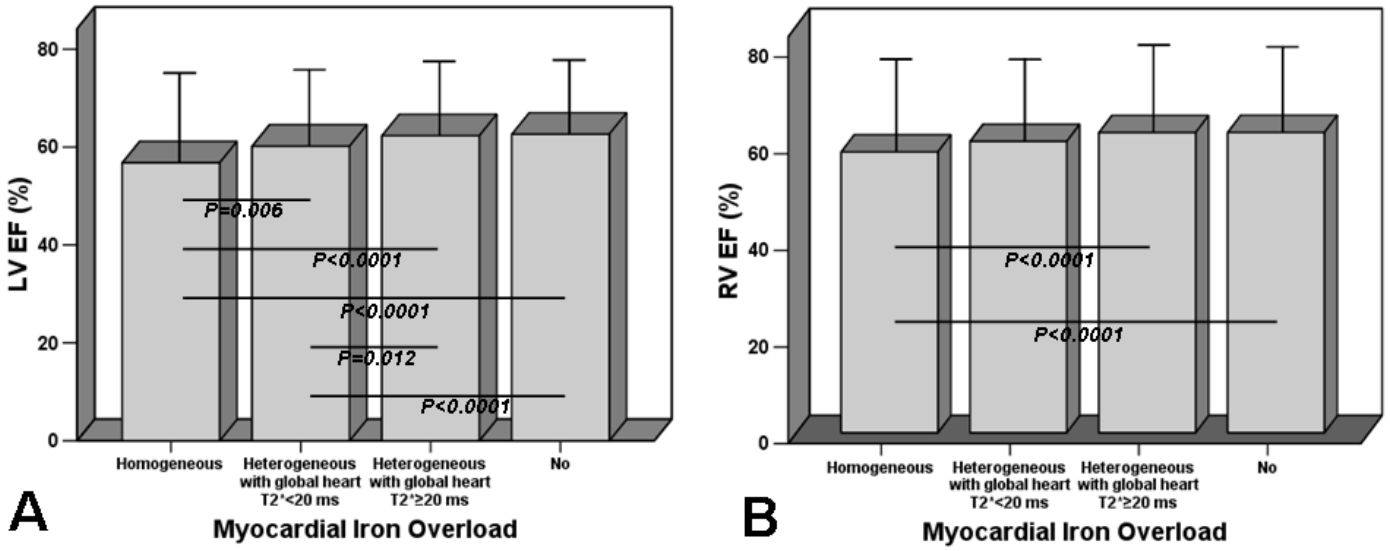

Figure 1: *Mean LV EF (A) and RV EF (B) in the 4 groups defined on the basis of the pattern of MIO. The SD for each group is reported. The horizontal lines indicate a significant difference between 2 groups.*

Conclusions. Biventricular dysfunction is correlated with MIO distribution decreasing from the patients with homogeneous MIO to the patients with no MIO. Homogeneous MIO and heterogeneous MIO with a global heart T2*<20 predicts a significantly higher risk to develop cardiac dysfunction suggesting an intensive chelation therapy in this group of patients.

References. [1] Pepe A et al. JMRI 2006;23(5):662-668. [2] Meloni A et al. Int J Med Inform 2009;78(8):503-512. [3] Cerqueira MD et al. Circulation 2002;105:539-542.