THE LEFT VENTRICULAR GLOBAL FUNCTION INDEX BY CARDIAC MAGNETIC RESONANCE IS MORE STRONGLY NEGATIVELY AFFECTED BY MYOCARDIAL IRON OVERLOAD THAN THE GLOBAL SYSTOLIC FUNCTION

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Introduction. The Cardiovascular Magnetic Resonance by the multislice multiecho T2* technique allows to detect different patterns of myocardial iron overload (MIO).[1] Moreover, the analysis of cine images allows the quantification of the left ventricular global function index (LVGFI) that combines the LV stroke volume (SV), end-systolic and end-diastolic volumes (ESV and EDV, respectively), as well as LV mass. A LVGFI <37% was shown to be strongly predictive of cardiovascular events.[2]
We aimed to verify the association between different patterns of MIO and the LVGFI vs the LV ejection fraction (EF) in thalassemia major (TM) patients.

Methods. We considered 812 TM patients (391 M, 30.4 ± 8.6 years), consecutively enrolled in the Myocardial Iron Overload in Thalassemia (MIOT) Network.[3]
The T2* value in all the 16 cardiac segments was evaluated.[4] LVGFI[2] (Equation 1) and LVEF[5] were quantitatively evaluated by SSFP cine images. Heart dysfunction was diagnosed in presence of LVEF < 2 standard deviations (SD) from the mean value normalized to age and gender.[6]

$$LVGFI = (LVSV / LV\ global\ volume)*100$$
$$Where:\ LV\ global\ volume = LV\ mean\ cavity\ volume + myocardial\ volume\ \ and\ \ LV\ mean\ cavity\ volume = (LVEDV + LVESV)/2$$

[Eq.1]

Results. We identified 4 groups of patients: 1) 138 with homogeneous MIO (all segments with T2*<20 ms), 2) 97 with heterogeneous MIO (some segments with T2*<20 ms, others with T2*≥20 ms) and significant global heart iron (global heart T2*<20 ms), 3) 238 with heterogeneous MIO and no significant global heart iron, and 4) 339 with no MIO (all segments with T2*≥20 ms).
The mean LVFGI was significantly different among the 4 groups (Figure 1).
Compared to the group with no MIO, all the other 3 groups were significantly more likely to have a LVGFI <37%, conversely, only the groups with homogeneous MIO and with heterogeneous MIO and significant global heart iron showed a significant higher risk to have LV dysfunction.
For all the 4 groups the association between different patterns of MIO with a LVGFI <37%, was stronger than the association with a LV dysfunction (Figure 2).
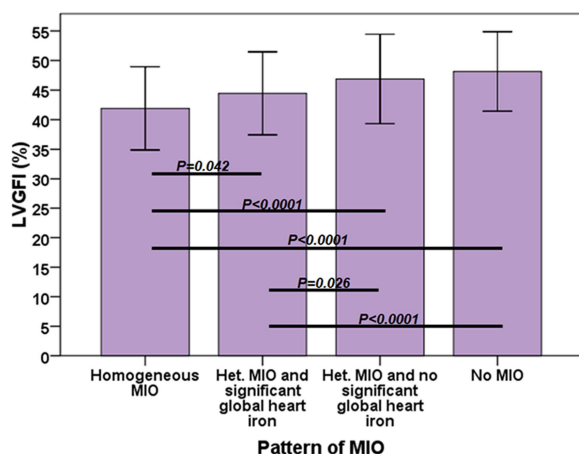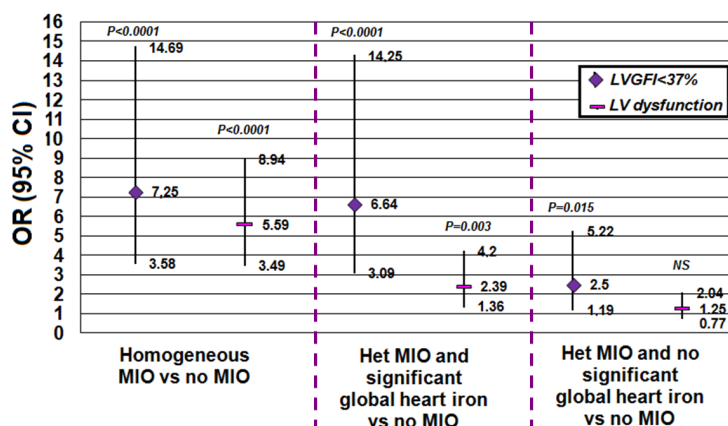

Figure 1

Figure 2

Conclusions. LVGFI is a functional parameter integrating structural as well as mechanical behaviour stronger associated to different patterns of MIO than the LVEF. Thus, a LVGFI<37% could better identify a significant higher risk of adverse cardiovascular events beyond heart failure in iron loaded patients.

References. [1] Meloni A et al. Magn Reson Med 2010;64:211-9. [2] Mewton N et al. Hypertension 2013;61:770-8. [3] Meloni A et al. Int J Med Inform 2009;78:503-12. [4] Pepe A et al. JMRI 2006;23:662-8. [5] Marsella M et al. Haematologica 2011; 96: 515–20. [6] Meloni A et al. JCMR 2011;13:P305.