Regional Myocardial Contractility In Thalassemia Major By Magnetic Resonance Tagging

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Introduction. Magnetic resonance (MR) tagging analyzed by dedicated tracking algorithms allows very precise measurements of myocardial motion and characterization of regional myocardial function [1, 2]. No extensive data are available in literature.
Our aim was to quantitatively assess for the regional myocardial contractility in thalassemia major (TM) patients and to correlate it with heart iron overload and global biventricular function.

Materials and methods. Seventy-four TM patients (46 F; 31.8 ± 8.5 yrs) enrolled in the MIOT (Myocardial Iron Overload in Thalassemia) network [3] underwent MR (1.5T). Three short-axis (basal, medial and apical) tagged MR images were analyzed off-line using harmonic phase (HARP) methods (Diagnosoft software) and the circumferential shortening (Ecc) was evaluated for all the 16 myocardial segments [4]. Four main circumferential regions (anterior, septal, inferior, and lateral) were defined. The same axes were acquired by a T2* GRE multiecho technique to assess myocardial iron overload (MIO) [5]. Biventricular function parameters were quantitatively evaluated by cine images [6].

Results. Segmental ECC values ranged from -9.66 ± 4.17 % (basal anteroseptal segment) to 13.36 ± 4.57 % (mid-anterior segment). No significant circumferential variability was detected.
Compared with previous studied healthy subjects [2], TM patients showed strain values significantly lower in all the circumferential regions at each level (mean difference from 4 % to 13 %; P<0.001 for all the comparisons) (Table 1).
Segmental Ecc values were not significantly correlated with the correspondent T2* values and no correlation was detected considering the global values, averaged over all segmental values. Three groups identified on the basis of cardiac iron distribution: no MIO, heterogenous MIO and homogeneous MIO. The global ECC was comparable among the three groups (-11.56 ± 1.60 % vs -11.70 ± 2.43 % vs -11.14 ± 1.95 %; P=0.602) (Figure 1).
Global ECC values were not significantly correlated with age and were comparable between the sexes.
Circumferential shortening was not associated to left ventricular (LV) volumes and ejection fraction (with a P>0.5 in all the comparisons).

***Table 1.** Comparison with the study by Moore et al involving 31 healthy Volunteers [2].*

		Anterior	Septal	Inferior	Lateral
Basal	***Healthy***	-0.20±0.03	-0.17±0.03	-0.16±0.03	-0.21±0.03
	TM	-0.11±0.04	-0.10±0.03	-0.12±0.04	-0.11±0.03
		Diff=0.09 P<0.001	Diff=0.07 P<0.001	Diff=0.04 P<0.001	Diff=0.10 P<0.001
Medium	***Healthy***	-0.23±0.04	-0.16±0.03	-0.16±0.05	-0.22±0.03
	TM	-0.14±0.05	-0.12±0.03	-0.11±0.04	-0.12±0.03
		Diff=0.09 P<0.001	Diff=0.04 P<0.001	Diff=0.05 P<0.001	Diff=0.10 P<0.001
Apical	***Healthy***	-0.24±0.06	-0.18±0.03	-0.23±0.04	-0.24±0.04
	TM	-0.12±0.04	-0.13±0.04	-0.12±0.05	-0.11±0.04
		Diff=0.12 P<0.001	Diff=0.05 P<0.001	Diff=0.11 P<0.001	Diff=0.13 P<0.001

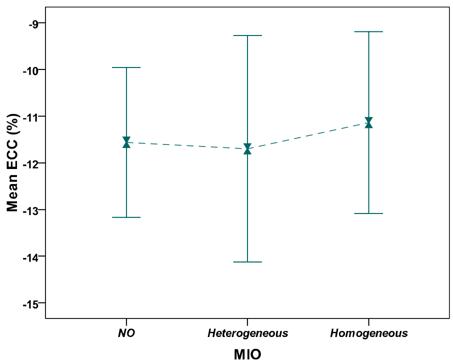

***Figure 1*.**

Conclusions. TM patients showed a significant lower cardiac contractility compared with healthy subjects, but this altered contractility was not related to cardiac iron, volumes and function.

References. [1] Castillo E et al. RadioGraphics 2003;23:S127:S140. [2] Moore CC et al. Radiology 2000;214:453-66. [3] Meloni A et al. Int J Med Inform 2009;78:503-12. [4] Osman NF et al. MRM 1999;42:1048-60. [5] Pepe A et al. JMRI 2006;23:662-8. [6] Sironi M et al. In MRI of Heart and Vessels. Lombardi M, Bartolozzi C 2005.