

Regional Myocardial Contractility In Thalassemia Major By Magnetic Resonance Tagging

**Antonella Meloni¹ (antonella.meloni@ftgm.it), Chiara Tudisca²,
Emanuele Grassettonio², Vincenzo Positano¹, Basilia Piraino³, Nicola
Romano⁴, Petra Keilberg¹, Massimo Midiri², Alessia Pepe¹.**

¹CMR Unit, Fondazione G. Monasterio CNR–Regione Toscana, Pisa,
Italy; ²Istituto di Radiologia, Policlinico "Paolo Giaccone",
Palermo, Italy; ³U.O. Genetica e Immunologia Pediatrica
Policlinico "G. Martino", Messina, Italy; ⁴S.C. Medicina
Trasfusionale – AO Arcispedale "S. Maria Nuova", Reggio Emilia,
Italy.



Objectives

Magnetic resonance (MR) tagging analyzed by dedicated tracking algorithms allows very precise measurements of myocardial motion and characterization of regional myocardial function.

Osman NF et al. Mag Res Med 1999;42:1048-60.

Axel L et al. Medical Image Analysis 2005;9:376-93.

No extensive data available in literature.

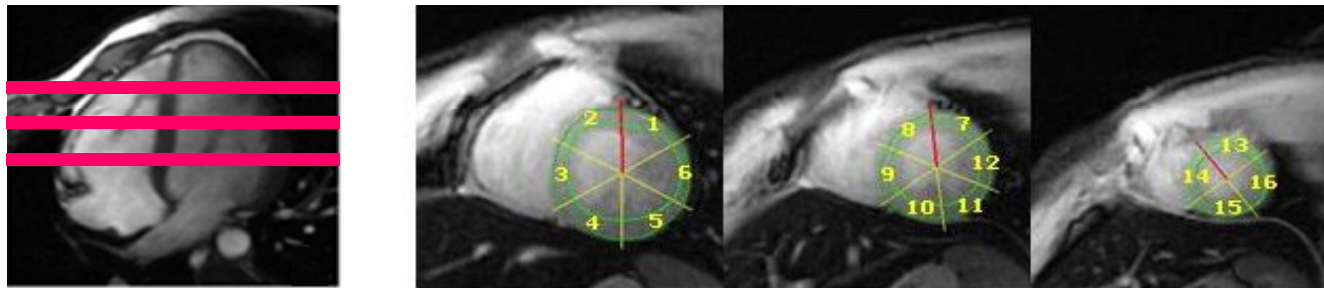
Aim: to quantitatively assess for the regional myocardial contractility in thalassemia major (TM) patients and to correlate it with myocardial iron overload (MIO) and global biventricular function.

Methods (1)

STUDY POPULATION: 74 TM patients (46 F; 31.8 ± 8.5 yrs) enrolled in the MIOT (Myocardial Iron Overload in Thalassemia) Network.

MRI:

1) Three parallel short-axis views acquired by a T2* GRE multiecho technique to assess MIO.

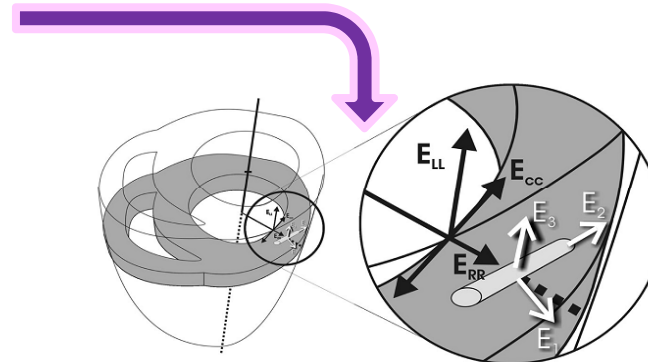
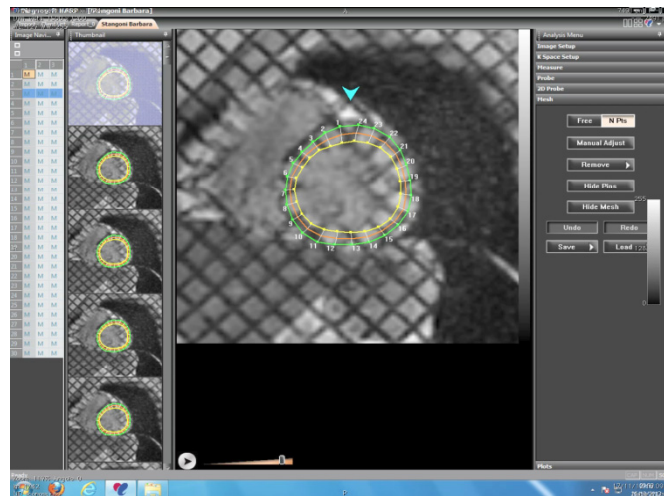


*Pepe A et al.
JMRI 2006;23:
662-8.*

2) Biventricular function parameters quantitatively evaluated by cine images.

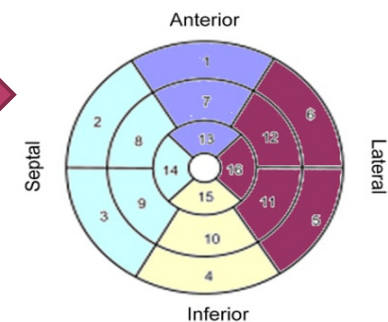
Methods (2)

3) Three short-axis tagged MR images analyzed off-line using harmonic phase methods (Diagnosoft software). Circumferential shortening (Ecc) evaluated for all the 16 myocardial segments.



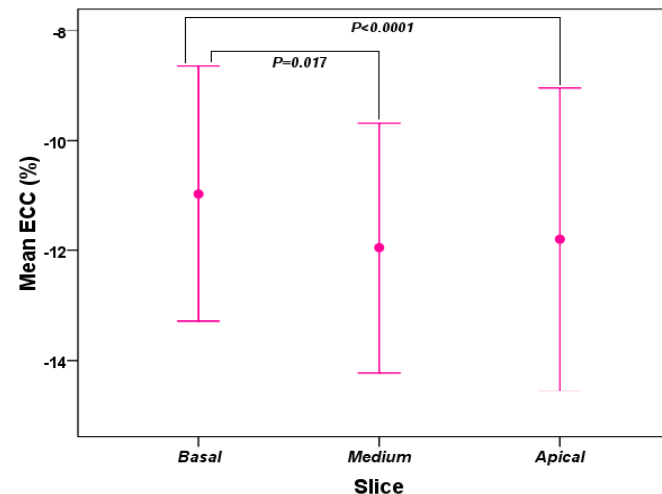
Osman NF et al. Mag Res Med 1999;42:1048-60.

Definition of 4 main circumferential regions.



Results (1)

- ✓ Segmental ECC values ranged from -9.66 ± 4.17 % (basal anteroseptal segment) to 13.36 ± 4.57 % (mid-anterior segment).
- ✓ No significant circumferential variability.
- ✓ Mean Ecc higher in basal slice than in medium and apical slices.



- ✓ Circumferential shortening not correlated with age and comparable between sexes.

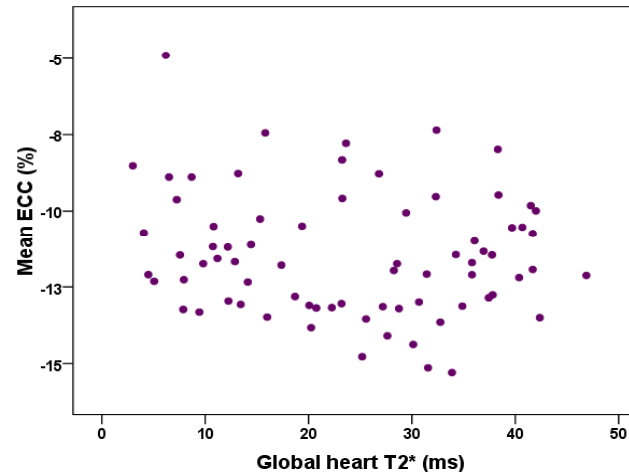
Results (2)

Comparison with the study by Moore et al (*Radiology 2000; 214: 453-66*) involving 31 healthy volunteers.

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

Results (3)

Segmental Ecc values not significantly correlated with the correspondent T2* values and no correlation detected considering the global value, averaged over all segmental values.



Three groups identified on the basis of cardiac iron distribution: no MIO, heterogenous MIO and homogeneous MIO.

Global ECC was comparable among the three groups: $-11.56 \pm 1.60 \%$ vs $-11.70 \pm 2.43 \%$ vs $-11.14 \pm 1.95 \%$; $P=0.602$.

Results (4)

Mean Ecc not associated to left ventricular (LV) volumes and ejection fraction.

Variable	R	P
<i>LV EDVI</i>	-0.045	0.704
<i>LV ESVI</i>	-0.010	0.934
<i>LV SVI</i>	-0.015	0.898
<i>LV mass index</i>	0.069	0.557
<i>LV EF</i>	-0.034	0.771

Conclusions

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

