Prognostic CMR parameters for heart failure and arrhythmias in large cohort of well treated thalassemia major patients

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Introduction. Cardiac complications are the main cause of death in thalassemia major (TM) patients [1]. Cardiovascular Magnetic Resonance (CMR) plays a key role in the management of TM, allowing to assess cardiac iron burden, biventricular dimension and function, atrial dimensions, and myocardial fibrosis.
The aim of this study was to determine the predictive value of CMR parameters for heart failure and arrhythmias in TM.

Materials and methods. We followed prospectively 537 white TM patients enrolled in the Myocardial Iron Overload in Thalassemia (MIOT) network [2]. In the MIOT Network CMR is performed using standardized techniques: myocardial iron overload (MIO) is assessed by a multislice approach [3, 4], biventricular function parameters and are quantitatively evaluated by cine images and myocardial fibrosis is detected from late gadolinium enhancement (LGE) images.
Fifty patients were excluded from the analysis because a cardiac complication was present at the time of the first CMR.
The prognostic variables analyzed were retrieved from the MIOT database. All variables showing an association with the outcome at the univariate Cox proportional hazards model were placed in the multivariate model and were ruled out only if they did not significantly improve the adjustment of the model

Results. At baseline the mean age of the patients was 29.5±9.0 years, 222 were males and the mean serum ferritin level were 1742.49±1592.72 ng/l. The mean follow-up time was 58±18 months. After the first CMR scan only the 37.8% of the patients did not change the chelation regimen or the frequency/dosage of the chelators.
We recorded 19 episodes of heart failure. Male sex, heart iron, ventricular dysfunction, ventricular dilation, atrial dilation, and myocardial fibrosis were significant univariate prognosticators. In the multivariate analysis the independent predictive factors were an homogeneous pattern of MIO (compared to no MIO) (HR=5.81, 95%CI=1.42-23.74, P=0.014), myocardial fibrosis (HR=4.93, 95%CI=1.71-14.71, P=0.003) and ventricular dysfunction (HR=3.45, 95%CI=1.19-9.98, P=0.022) (Kaplan–Meier survival curves in Figure 1).

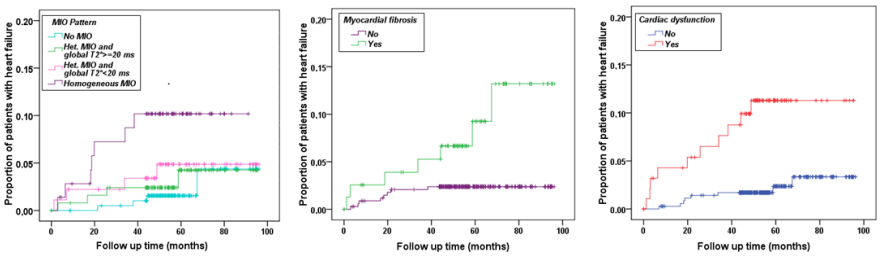

Figure 1.

Arrhythmias (all supraventicular hyperhyperkinetic) occurred in 19 patients. Male sex, atrial dilatation and ventricular dysfunction were significant univariate prognosticators. In the multivariate analysis the independent predictive factors were male sex (HR=3.17, 95%CI=1.02-9.87, P=0.047) and atrial dilation (HR=3.07, 95%CI=1.14-8.23, P=0.026) (Kaplan–Meier survival curves in Figure 2).

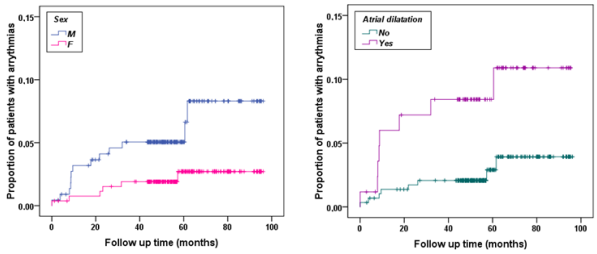

Figure 2.

Serum ferritin and liver iron were not predictive factors for heart failure or arrhythmias.

Conclusions. We detected few cardiac events thanks to a MR-guided, patient-specific adjustment of the chelation therapy. Severe and homogeneous MIO, myocardial fibrosis and ventricular dysfunction identify patients at high risk of heart failure. Heart T2* doesn't have any power in predicting arrhythmias while male sex and atrial dilation are independent prognosticators.

References. [1] Borgna-Pignatti C et al. Haematologica 2004;89:1187-93. [2] Meloni A et al. Int J Med Inform 2009;78:503-12. [3] Pepe A et al. JMRI 2006;23(5):662-8. [4] Positano V et al. NMR Biomed 2007;20(6):578-90.