Quantitative T2* MRI for bone marrow iron overload assessment in a large cohort of thalassemia major patients.
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Introduction. Multiecho T2* MRI is a well-established technique for cardiac and hepatic iron overload assessment [1], but there are limited data on its potential to quantify iron in organs other than the liver and heart. The aims of this study were to describe for the first time the T2* values of the bone marrow in patients with thalassemia major (TM) and to investigate the correlation between bone marrow T2* and iron deposition in myocardium, liver and spleen.

Materials and Methods. 283 TM patients (139 men and 144 women, 8-57 years old, mean age 32.25±8.28 years) enrolled in the Myocardial Iron Overload in Thalassemia (MIOT) network [2] underwent MRI (1.5T GE Signa/Excite HD, Milwaukee, WI, USA). For the measurement of iron overload, fast-gradient-echo multiecho T2* sequence was used [3]. Bone marrow T2* values were obtained on a circular regions of interest (ROI) located in the visible body of the first or second lumbar vertebra. The left ventricle was segmented into a 16-segment standardized model and the T2* value on each segment was calculated as well as the global value [3]. In the liver the T2* value was assessed in a single ROI defined in a homogeneous area of the parenchyma [4] and it was converted into liver iron concentration (LIC). Splenic T2* was estimated in a circular ROI located at the periphery of the posterior segment of splenic parenchyma.

Results. Bone marrow T2* values increased with age in a significant manner (R=0.343, P<0.0001) and were significantly lower in females than in males (Figure 1). A weak positive association was found between bone marrow and heart T2* values. Bone marrow T2* values were negatively correlated with LIC values and mean serum ferritin levels (Table 1). 166 patients (58.7%) were splenectomised and splenectomised patients showed significantly higher bone marrow T2* values than non splenectomised patients (9.78±6.78 ms vs 4.61±3.85 ms, P<0.0001; Figure 2). The difference remained significant also correcting for the age, significantly higher in splenectomised patients. For the 87/117 patients with the spleen, the splenic T2* value was assessed (mean value: 17.54±11.76 ms). A significant correlation was detected between bone marrow and spleen T2* values (R=0.448; P<0.0001).

Conclusions. In TM patients bone marrow T2* values increased with age. Males showed significantly higher bone marrow T2* values than non splenectomised patients (9.78±6.78 ms vs 4.61±3.85 ms, P<0.0001; Figure 2). The difference remained significant also correcting for the age, significantly higher in splenectomised patients. For the 87/117 patients with the spleen, the splenic T2* value was assessed (mean value: 17.54±11.76 ms). A significant correlation was detected between bone marrow and spleen T2* values (R=0.448; P<0.0001).