The study of T2*magnetic resonance imaging for the assessment of iron overload in thalassemia at Naresuan University Hospital

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Background

Iron overload is a serious complication of patients with thalassemia. This study was conducted to assess the use of magnetic resonance imaging (MRI) for the evaluation of iron overload in thalassemia patients as part of a collaborative project conducted by the Asia Pacific Iron Overload Network. The study included 10 patients with thalassemia who were followed up at Naresuan University Hospital from October 2014 to March 2016. A total of 25 MRI examinations were performed on the liver and cardiac T2* and blood samples were collected to measure ferritin levels at each visit. The liver iron concentration (LIC) values were calculated using a software developed by the Faculty of Medicine, Siriraj Hospital. The LIC values were compared with the ferritin levels using the software.

Results

Out of 25 MRI examinations, 5 showed normal LIC (<3 mg/g dw), 1 had a low LIC (3-7 mg/g dw) with a ferritin level of 279-572 µg/L, 14 had a moderate LIC (7-15 mg/g dw) with a ferritin level of 381-3,902 µg/L, and 5 had a severe LIC (>15 mg/g dw) with a ferritin level of 2,314-12,936 µg/L. The LIC values were compared with the ferritin levels using a statistical software and a significant correlation was found (r² = 0.781, p < 0.01). However, no significant correlation was found between the LIC and the cardiac T2* values (r² = -0.297, p = 0.191). Therefore, MRI can be used to evaluate iron overload in thalassemia patients, but further studies are needed to confirm these findings in a larger patient population.

Conclusions

Magnetic resonance imaging can be used to evaluate iron overload in thalassemia patients. MRI results can be compared with ferritin levels to provide a more accurate assessment of iron overload. Further studies are needed to confirm these findings and to compare MRI results with other non-invasive methods of iron overload assessment.
Iron overload is an important complication in thalassemia. This study was a part of the multicentered clinical research conducted by Asia Pacific Iron Overload Network to evaluate clinical application of magnetic resonance imaging (MRI) for the assessment of iron overload in thalassemia. Ten thalassemic patients were recruited at Naresuan University Hospital between October 2014 and March 2016. Seven of the patients were transfusion-dependent thalassemia. Two to three episodes of MRI study, at least 6 months apart, were performed in each patient to assess iron status in liver and heart. Level of iron was calculated using software developed by Siriraj Hospital, by converting MRI signal to liver and cardiac T2* value in millisecond (mSec). Serial serum ferritin was obtained according to each study episode of MRI. Among 25 MRI studies, there were 5 with normal liver iron concentration (LIC) (< 3 mg/g dw) which had ferritin values ranged from 279 to 572 µg/L; 1 mildly severe iron overload (3–7 mg/g dw), ferritin 1,046 µg/L; 14 moderately severe iron overload (7–15 mg/g dw), ferritin 381–3,902 µg/L and 5 severe iron overload (> 15 mg/g dw), ferritin 2,314–12,936 µg/L. There was one patient with ferritin values ranged from 381 to 547 µg/L but had moderately severe iron overload in liver demonstrated by MRI. No patients with cardiac iron overload (cardiac T2* < 25 mSec) were found in this study. There was a statistical significant correlation between LIC from MRI and ferritin \([r^2 = 0.781 (p < 0.01)]\). However, correlation between cardiac T2* and ferritin could not be demonstrated \([r^2 = -0.297 (p = 0.191)]\). By direct assessment of iron overload within target organs, T2*MRI could bring additional benefit upon serum ferritin in clinical practice. 

**Keywords:** T2* magnetic resonance imaging, iron overload, thalassemia