Thyroid T1 value increase in patients with hypothyroidism

Min Liu[1], Fangfang Yu[2], Guang Wang[3], Tianjing Zhang[4], and Jing An[4]

[1]the department of Radiology, Beijing Chaoyang Hospital of Capital Medical University, Bei Jing, Bei Jing, China, [2]the department of Radiology, Beijing Chaoyang Hospital of Capital Medical University, Bei Jing, China, [3]the department of Endocrinology, Beijing Chaoyang Hospital of Capital Medical University, Bei Jing, Bei Jing, China, [4]MR Collaborations NE Asia, Siemens Healthcare, Bei Jing, Bei Jing, China

Introduction: MR T1 mapping is promising to improve disease detection and monitoring. Thyroid T1 mapping in patients with hypothyroidism has not been described. The aim of this study was to investigate thyroid T1 value in patients with hypothyroidism (HT)

Methods: We prospectively included 21 untreated women with clinical hypothyroidism (age 32.4±8.0 ys) and 21 healthy control women (age 31.8±4.2 ys) matched by age. All subjects underwent the thyroid hormone (free T3, free T4, and TSH) test and thyroid T1 maps with Modified Look-Locker Inversion Recovery (MOLLI) technique (TE 2.50 ms, TR 860 ms, slice thickness 5mm, voxel 2.2×1.4×6 mm^3) at 3T MR (Siemens TimTrio). All HT patients received levo-thyroxine therapy and were followed after 6 months.

Results: There was no significantly difference of age between HT group and healthy control group. T1 value of the right lobe (RLT1) and left lobe (LLT1) respectively is (1053.8±275.3)ms and (1051.6±263.4)ms. There was no significantly difference between RLT1 and LLT1 (Z=0.054, P=0.957). A Bland–Altman plot (Fig. 1a) of RLT1 measurements twice showed that the bias was only 3.1 and the interclass correlation coefficient is 0.98 (p<0.001). A Bland–Altman plot (Fig. 1b) of RLT1 measurements by two observers showed that the bias was only -10.5 and the interclass correlation coefficient is 0.99 (p<0.001).

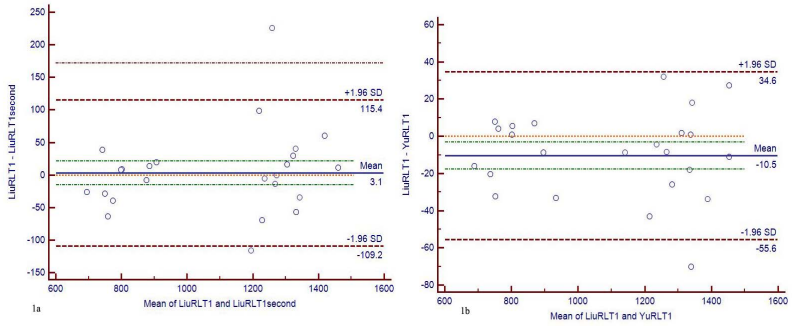

Figure 1

In HT patients, pretreatment thyroid RLT1 (1314.6±90.7)ms （Figure 2a）is significantly higher than post-treatment thyroid RLT1 （Figure 2b） of (888.1±198.4)ms (Z=3.826, P<0.001). Thyroid RLT1 in control group is (794.8±75.7)ms（Figure 2c）. Figure 2d showed there were significantly differences among three groups; moreover, RLT1 in the HT group before and after treatment also was significantly higher than RLT1 in controls.

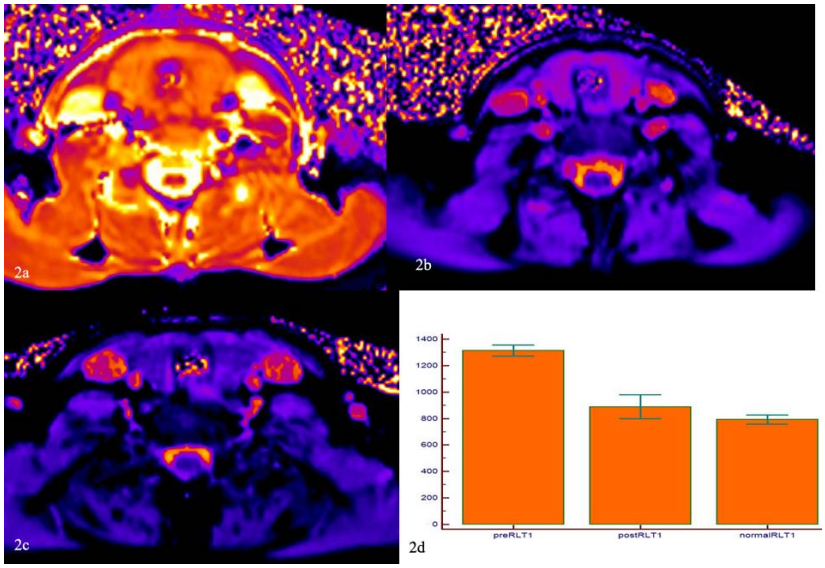

Figure 2

(a-b) 34-year-old woman with hypothyroidism ,2a pretreatment thyroid T1 map ,RLT1=1340ms ,LLT1=1356ms ,2b post-treatment thyroid T1map ,RLT1=980ms , LLT1=975ms; 2c a-33-year-old healthy control women, thyroid T1map , RLT1=737ms , LLT1=775ms; 2d Comparison of thyroid T1 value of right lobe in pre-, post-treatment patients and normal control

Discussion and Conclusions: In this work, we first demonstrated the feasibility of applying MOLLI for evaluating thyroid T1 value. T1 value significantly increases in patient with hypothyroidism and decreases after levothyroxine treatment. These suggest T1 mapping is promising to improve disease detection and quantitatively monitoring thyroid disease. In the future, we will analyze the correlation of thyroid T1 value with thyroid hormone levels