T2 Quantitative Magnetic Resonance Imaging Identifying Femoral Head Cartilage Degeneration As A Result Of Corticosteroid Treatment And Osteoporosis

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Introduction: High-dose corticosteroid therapy is often applied for the treatment of inflammatory conditions, including systemic lupus erythematosus (SLE), and induce osteoporosis and osteonecrosis of the femoral head. However, the effect on the degeneration of joint cartilage is not clear. T2 mapping is a novel technique for evaluating early cartilage degeneration using magnetic resonance imaging (MRI). The purpose of this study was to quantify the effect of high-dose corticosteroid treatment on hip joint cartilage degeneration in patients with SLE using T2 mapping.

Methods: T2 mapping, with a 3.0T Discovery MR750 (GE Healthcare) MRI scanner, was performed in 12 volunteers without hip pathology (control group, 12 hips), in 11 patients with SLE without osteonecrosis, who were receiving corticosteroid therapy (corticosteroid-ON group, 17 hips), and in 15 patients with SLE receiving corticosteroids who had noncollapsed and asymptomatic osteonecrosis (corticosteroid+ON group, 26 hips). The distribution of T2 values in the femoral head and acetabular cartilage were compared among the three groups. Multiple regression analysis was performed to determine the prognostic factors for T2 values indicative of femoral head cartilage degeneration.

Results: Median T2 values of femoral head cartilage were significantly higher in the corticosteroid-ON (40.3 msec) and corticosteroid+ON (35.2 msec) groups than in the control group (30.1 msec). T2 values of acetabular cartilage were significantly higher in the corticosteroid-ON group (41.8 msec) versus the control (33.4 msec) and the corticosteroid+ON groups (37.0 msec). Multiple regression analysis revealed that low bone mineral density was a significant prognostic factor for high T2 values of cartilage at the femoral head in patients treated with corticosteroids, regardless of whether they had osteonecrosis.

Discussion: T2 values increase with the loss of collagen anisotropy and the increase in water content. Several prior studies have reported corticosteroid therapy inhibit collagen expression in vitro and the important role osteoporosis can play in the progression of osteoarthritis.

Significance: The T2 data from this study suggests that corticosteroid therapy and osteoporosis are independent risk factors for cartilage degeneration at the femoral head in patients with SLE.
T2 values of femoral head cartilage

- Control: 30.1
- Corticosteroid-ON: 40.3
- Corticosteroid+ON: 35.2

T2 values of acetabular cartilage

- Control: 33.4
- Corticosteroid-ON: 41.8
- Corticosteroid+ON: 37.0

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