Evaluation of the Usefulness of T2 map Images by using 3.0T MRI

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1. Introduction

The T2 map technique, which verifies changes in the cartilage component due to the pressuring and relaxation of cartilage via T2 mapping, could prove useful for the early diagnosis of cartilage disease [1,2]. For this reason, in this study we measured changes in the T2 values of cartilage among healthy people without ankle and knee arthritis and patients with ankle and knee arthritis in order to evaluate the shape of ankle and knee joint cartilage and damage to the ankle and knee joint cartilage, and also to evaluate the utility of the T2 map images.

2. Materials and Method

At the same time, the study intended to assess the utility of the T2 map image. The multi-echo technique was used for 20 healthy individuals who had experienced no clinically diagnosable ankle and knee arthritis in the past or in the present, and 20 patients who were found to have ankle and knee arthritis in order to obtain T2 SE images of knee joint cartilage. Based on the images obtained, we measured changes in signal intensity (SI) for each area of the ankle joint cartilage. Additionally, we divided the talotibial joint into medial position, middle position, and lateral position in order to calculate the mean values of T2 in 18 spots including the anterior part, middle part, and posterior part of the cartilage of the neck bone and ankle bone. Beside, we calculate the mean values of T2 in 6 spots including the femoral part, tibial part, medial femur part, medial tibia part, lateral femur part, and lateral tibia part of the cartilage of the Knee bone. Mean T2 values were measured in the healthy group and the ankle arthritis patient group.

3. Result

According to the measurement results, the mean T2 value of the ankle arthritis patient group was higher than that of the healthy group in the anterior part, middle part, and posterior part of the neck bone and ankle bone in the medial position of the talotibial joint. In the middle position of the talotibial joint, the mean T2 value of the ankle arthritis patient group was higher than that of the healthy people group in the anterior part, the middle part, and the posterior part of the neck bone and ankle bone. Also in the lateral position of the talotibial joint, the mean T2 value of the ankle arthritis patient group was also found to be higher than that of the healthy group in the anterior part, middle part, and posterior part of the neck bone and ankle bone. The mean T2 value of the knee arthritis patient group was higher than that of the healthy group in the femoral part, tibial part, medial femur part, medial tibia part, lateral femur part, and lateral tibia part of the cartilage of the knee joint.

4. Discussion

the MR imaging techniques mentioned thus far have limitations in terms of resolution, because of a restriction on the spatial resolution required to describe the thickness and volume of the cartilage, as well as insufficient information regarding the physiological mechanisms inherent to the cartilage [3]. Some recent techniques such as delayed gadolinium-enhanced MRI of cartilage (deGRMRIC), sodium MR imaging, T2 mapping, diffusion-weighted MR imaging, and magnetization transfer are in use in order to assess biochemical changes before structural changes are made in case of early damage to the cartilage [4]. The T2 map technique among such recent techniques for the assessment of cartilage employs the features of cartilage components. The technique involves the analysis of collagen, which is an extracellular matrix, and the transformation of its structure. In general, normal articular cartilage consists of cartilage cells and the extracellular matrix. The extracellular matrix is made of water (75%), electrolyte (sodium), collagen II fibril (20%), and proteoglycan (5%). The proteoglycan is composed of glycosaminoglycan (GAG), which is attached to the protein core, and is negatively charged. Water exists in the matrix, which consists of the collagen-proteoglycan solid matrix. Since articular cartilage contains a lot of water, it is possible to conduct clinical studies using magnetic resonance. The thickness of the articular cartilage in an ordinary adult is around 1.2 ~ 7 mm, whereas the thickness of the knee cartilage is the greatest among various cartilages in the human body [5].

5. Conclusion

Along with the morphological MR imaging technique previously used, the T2 map technique seems to help patients with cartilage problems, in particular, those with the arthritis of the knee for early diagnosis by quantitatively analyzing the structural and functional changes of the cartilage.

6. References

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