Cartilage repair surgery: outcome evaluation by using noninvasive cartilage biomarkers based on quantitative MRI techniques?

New quantitative magnetic resonance imaging (MRI) techniques are increasingly applied as outcome measures after cartilage repair. To review the current literature on the use of quantitative MRI biomarkers for evaluation of cartilage repair at the knee and ankle. Using PubMed literature research, studies on biochemical, quantitative MR imaging of cartilage repair were identified and reviewed. Quantitative MR biomarkers detect early degeneration of articular cartilage, mainly represented by an increasing water content, collagen disruption, and proteoglycan loss. Recently, feasibility of biochemical MR imaging of cartilage repair tissue and surrounding cartilage was demonstrated. Ultrastructural properties of the tissue after different repair procedures resulted in differences in imaging characteristics. T2 mapping, T1rho mapping, delayed gadolinium-enhanced MRI of cartilage (dGEMRIC), and diffusion weighted imaging (DWI) are applicable on most clinical 1.5 T and 3 T MR scanners. Currently, a standard of reference is difficult to define and knowledge is limited concerning correlation of clinical and MR findings. The lack of histological correlations complicates the identification of the exact tissue composition. A multimodal approach combining several quantitative MRI
techniques in addition to morphological and clinical evaluation might be promising. Further investigations are required to demonstrate the potential for outcome evaluation after cartilage repair.

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