Conclusions: McGonagle et al. advocated the concept of synovio-enthesal complex and suggested that the inflammation occurs primarily at the enthesis and spreads to adjacent synovial tissues such as bursae in SpA patients. Our cross-sectional data indirectly indicated that RCB precedes or accompanies AT enthesitis in a narrow definition in the early phase of the RA, suggesting that the inflammation around the enthesis of RA patients occurs primarily at the synovial tissues and spreads to the enthesis in an opposite way. In addition, the isolated AT enthesitis without RCB in the established and/or treated RA patients may suggest several possibilities as follow: 1. Enthesitis is more refractory to RA treatment than bursitis; 2. Enthesitis is partially due to the degenerative changes related to damages and deformities caused by RA synovitis; 3. US-detected enthesitis in RA basically represents repair process rather than ongoing inflammation.

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THE BEACH TOOL: A QUANTITATIVE MRI-BASED METHOD FOR MEASURING OEDema AND Fat METAPlasia IN SPONDyLOArthritis
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Background: Magnetic resonance imaging (MRI) is an important part of diagnostic pathways in spondyloarthropathy (SpA), and can be used to stratify patients and assess severity. However, measurements of the burden of inflammation currently rely on qualitative assessment, which is subjective and time-consuming thus impractical for clinical practice. There is a need for a more objective, faster method for measuring inflammation and damage with potential for automation, and quantitative MRI is a candidate tool.

Objectives: We aimed to provide proof-of-principle for the BEACH (Bone OedeMA and adipositY Quantification with Apparent diffusion coefficient and Chemical shift imaging with histograms) tool, which quantifies bone marrow oedema and fat metaplasia – features of active and chronic inflammation – in the SIJs.

Methods: Fifty-three patients aged 12–24 years with either SpA or mechanical back pain were recruited prospectively, and underwent quantitative MRI consisting of ADC and FF maps. Apparent diffusion coefficient (ADC) and FF maps were compared between inflamed and non-inflamed SIJs.

Results: Use of the BEACH tool is demonstrated in figure 1(a)-(f). Example ADC histograms are shown in (g),(h). ADC75%, ADC90, and phigh(ADC) were significantly increased in inflamed SIJs (P<0.041, 0.006 and 0.003 respectively), although median ADC values did not differ significantly between inflamed and uninflamed joints (P=0.31). Diagnostic performance was superior for histographic parameters (AUC=0.59, 0.67 and 0.69) than for the median (AUC=0.54): Median FF, FF90, FF50, and phigh(FF) were all significantly increased in SIJs with fat metaplasia compared to those without (all p<0.0001). Diagnostic performance was superior for histographic parameters FF75, FF50 and phigh(FF), (AUC=0.89, 0.92 and 0.92) than for the median (AUC=0.87).

Conclusions: ADC and FF measurements can differentiate between inflamed and non-inflamed SIJs, and between joints with and without fat metaplasia. Compared to simple averages such as the median, histographic parameters can increase diagnostic performance for detecting inflammation and fat metaplasia. There is minimal subjectivity associated with ROI placement using the BEACH tool, which can potentially make inflammation scores more reproducible.

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