

Magnetisation Transfer Contrast imaging of Synovitis in Arthritis.

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Introduction:

Synovitis is an important feature of rheumatoid (RA) and osteoarthritis (OA) and is well assessed by MRI. In RA, synovial volume on MRI corresponds to histological markers of disease activity, predicts erosive progression, demonstrates response to treatment and is useful for early detection and diagnoses of the disease. In osteoarthritis, while the role of synovitis is less clear, MRI of synovitis has been shown to correlate with histological change, pain or its progression and structural progression, with a resultant increased interest in targeting synovitis in OA treatment.

Currently, the gold standard for assessing synovitis with MRI requires intravenous contrast agents which are associated with discomfort, cost and potential patient complications including Nephrogenic Systemic Fibrosis (NSF). Imaging of synovitis without the need for intravenous contrast agents would allow patients with poor renal function to be scanned, remove the potential of complications, allow more joints to be imaged at one visit and improve patient acceptability.

Previous work suggested Magnetisation Transfer Contrast (MTC) may be helpful in the assessment of synovitis [1]. The aim of this study was to compare magnetisation transfer imaging with T1 weighted imaging after intravenous contrast for quantification of synovitis.

Method:

20 patients with arthritis (15 OA, 5 RA) with symptoms affecting the knee joint were imaged with MRI pre and post gadolinium using an 8 channel rf coil on a 3T Siemens Verio MRI scanner. Sagittal SPGR (TR=450ms TE=2.5ms, flip-angle=30°) images were acquired with and without MT. 0.1 mmol/kg Gd-DOTA was administered intravenously and sagittal 3D VIBE images were obtained (TR=9.3, TE= 4.9, FA=30°). A subtraction image was calculated using the SPGR images with and without MT. The 3D VIBE images were reconstructed to slices matching the MT images. Two experienced consultant MSK radiologists, blinded to the selection process of the images, independently assessed randomised MT and post GAD images from each patient. The total extent of enhancing synovitis and synovial fluid in the suprapatellar region was outlined on a mid-sagittal slice and the area of synovitis calculated. Correlation between post gadolinium and MTC images and inter-observer agreement were assessed using Pearson's Correlation Coefficient.

Results:

Agreement between the MTC and post gadolinium images was high for assessing synovitis ($R=0.82$, $p<0.001$). Inter-observer correlation was 0.92 for enhanced images and 0.63 for magnetisation transfer images. One patient was excluded following a diagnosis of lipoma aborescens.

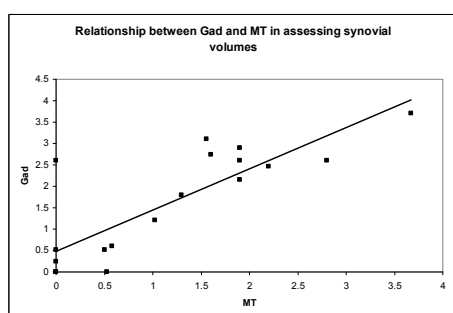


Fig 1. Sagittal MTC image

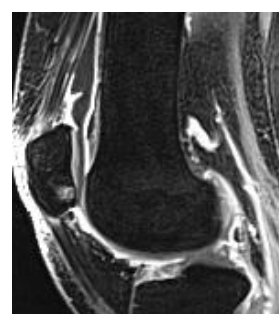


Fig 2. Sagittal Vibe image post gadolinium

Discussion:

A previous study assessing synovitis with and without intravenous contrast agent [2] used conventional imaging sequences and showed only low to moderate agreement of unenhanced and contrast enhanced imaging. The results of this study using magnetisation transfer showed good correlation between enhanced and unenhanced direct measurement of synovitis. However, inter-reader agreement for MT images, while moderately good, was considerably less than that for enhanced images. MT tended to underestimate the full extent of synovitis seen on enhanced images. This study only used magnetisation transfer to attempt to delineate synovitis, which is likely to be good at differentiating synovitis and fluid but less good for separating synovitis from adjacent muscle. Combination with other sequences such as T2 fat suppressed or STIR images may allow further improvement.

In conclusion, magnetisation transfer imaging appears useful for assessing synovitis without the use of intravenous contrast agents.

References:

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