Contrast enhanced short and ultrashort echo time MRI of the Achilles tendon in spondyloarthritis

R. Hodgson1, R. Evans1, C. Burnett1, A. Grainger2, P. O’Connor2, L. Coates1, P. Helliwell1, P. Emery3, D. McGonagle3, and M. Robson4

1Leeds Musculoskeletal Biomedical Research Unit, University of Leeds, Leeds, Yorks, United Kingdom, 2Chapel Allerton Hospital, United Kingdom, 3University of Leeds, 4University of Oxford

Introduction
MRI is useful in the assessment of the Achilles tendon which is commonly involved in spondyloarthritis (SpA). However, the short T2 of the normal tendon means that conventional MRI is limited to the detection of relatively severe changes when the tendon becomes swollen or the T2 increases into the range where signal is visualized on T1 weighted images. Ultrashort echo time imaging overcomes this limitation, but is not implemented on all scanners. The aim of this work was (i) to determine the appearance of the Achilles tendon in SpA on high resolution T1W, short echo time and UTE images and (ii) to determine which sequences are most sensitive for detecting tendon abnormalities.

Methods
Achilles tendons were imaged in 10 symptomatic SpA patients and 5 asymptomatic volunteers.

Results
In all asymptomatic volunteers, all sequences except UTE showed predominantly dark tendon with reticular high signal which was most prominent anteriorly just superior to the superior boarder of the calcaneus. This pattern was reversed in UTE images which showed predominantly high signal throughout (not shown). The reticular high signal showed mild enhancement with a few enhancing vessels. Images from SpA patients showed a subtle increase in the reticular signal on T1W images which tended to extend further posteriorly than in the normal volunteers. On 2ms echo time images there was extensive abnormal signal extending superiorly from the enthesis. The extent of abnormal signal intensity was greatest on the TE=2ms images followed by the TE=5ms images and least on the TE=16ms images. UTE images showed high signal throughout as in normal volunteers (not shown). After administration of contrast, abnormal enhancement was greatest on the UTE difference images followed by the TE=2ms, then the TE=5ms with the TE=16ms images showing least abnormal enhancement. The extent of abnormal enhancement on the UTE images was less than the extent of abnormal signal intensity on the unenhanced TE=2ms images.

Discussion
These results suggest that short echo time images with TE=2ms are the most sensitive for detecting abnormality in the Achilles tendon in patients with spondyloarthritis. This reflects the T2 of the normal tendon (~ 2ms [1]). UTE images are most sensitive for the detection of abnormal enhancement after intravenous contrast, as the short T2 of the tendon limits enhancement on other sequences with longer TE's. Short echo time imaging demonstrates a greater extent of abnormality than contrast enhanced UTE (although CE-UTE may provide complementary information about vascularity). This is clinically important as short TE 3D SPGR images can be readily acquired using conventional scanners without specialized UTE sequences.

References: