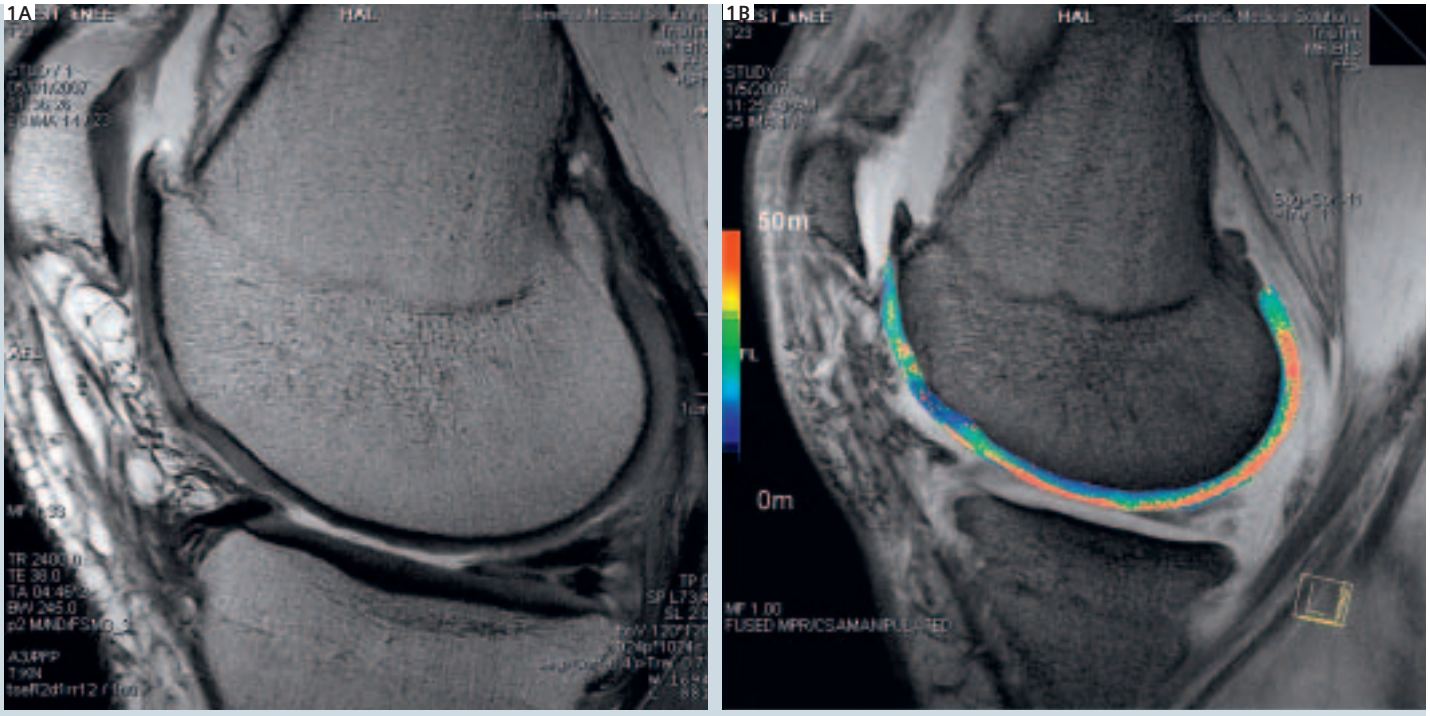
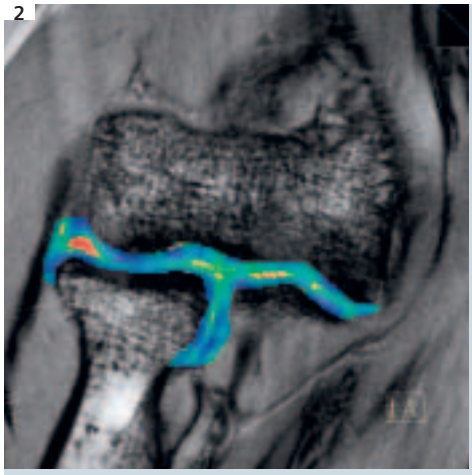
Biochemical Imaging

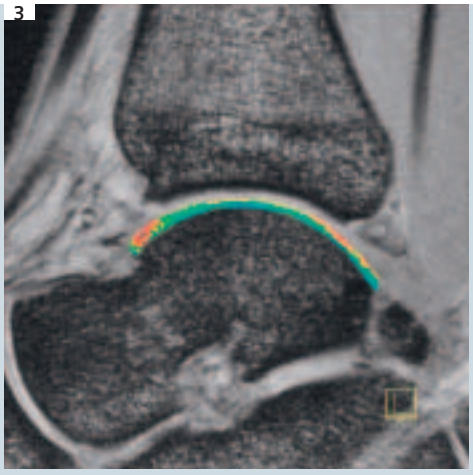
Besides improvements in morphological imaging, the ability to assess and quantify biomarkers is increasingly important in MSK imaging. The use of biochemical imaging instead of morphological imaging is gaining importance as a means of both improving accuracy of diagnosis and of planning and monitoring the effectiveness of therapy.
Based on the different biomarkers, there are several approaches to biochemical imaging described and used for clinical imaging. The different biomarkers can be obtained by contrast and non-contrast examination techniques resulting in T1-, T2- and T2*-maps. Thanks to *syngo* MapIt today it is possible to obtain parametric mapping results automatically. *syngo* MapIt can be used fro all joints in the body (Figs. 1–5). All of the images were prepared within the *syngo* environment from maps which were created automatically, using Inline Technology. These maps can then be retrieved and post-processed using any of the standard *syngo* tools, such as Region of Interest (ROI), pixel lens, etc. Furthermore, it is possible to use *syngo* Fusion to overlay these maps with their corresponding anatomical image and to conduct manual carti-

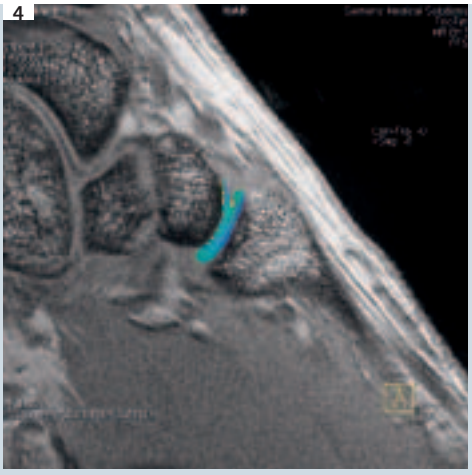


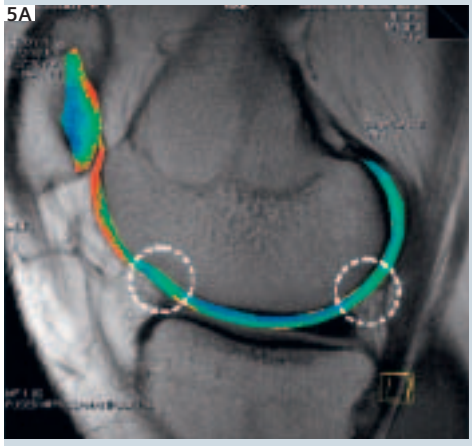
1 Example of a high in-plane resolution (0.3 x 0.3 x 2 mm) protondensity-weighted (PD) TSE image and the corresponding biochemical (T2*) high-resolution image in a patient with cartilage lesion.

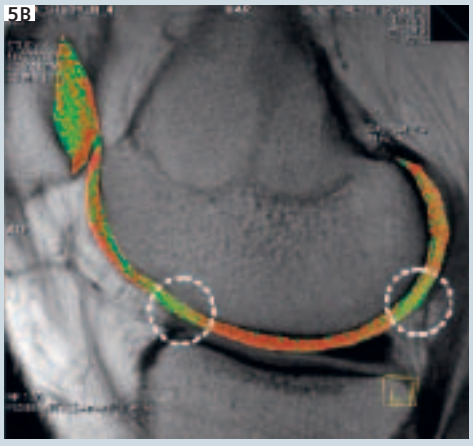
lage segmentation. There is now no need to transfer any data offline, as everything can be accomplished on the measurement console.
It is also necessary to expand the biochemical imaging capabilities. To this end new sequence techniques are being examined to evaluate the cartilage. One of the most promising candidates for this is Steady State Free Procession (SSFP) diffusion imaging using a PSIF sequence, with of course Inline mapping. An alternative approach is to use Echo Planar Imaging (EPI) diffusion which has also delivered good results making advanced techniques such as tensor imaging possible. First examples of the use of SSFP diffusion are shown in Fig. 5 in a patient with cartilage degeneration in comparison to a T2-mapping.

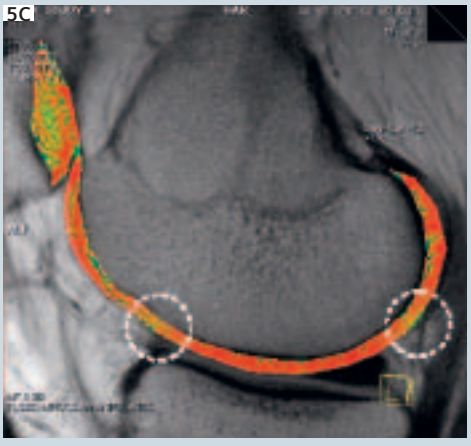












2 **Elbow imaging with the small flex coil. High-resolution T2*-map.**

3 **The 8-channel foot-ankle coil is used to produce high-resolution T2* cartilage mapping at 3T (0.3 x 0.2 x 2 mm) under load restriction over time.**

Courtesy of Prof. Siegfried Trattnig, Medical University Vienna, Austria

4 **T1-mapping in the carpometacarpal (CMC) joint for diagnosis of rheumatoid arthritis.**

5 **A–C: Comparison of a T2-mapping (4A) with the diffusion map in read (4C) and phase (4B) direction (qualitative mapping based on SSFP diffusion sequence).**