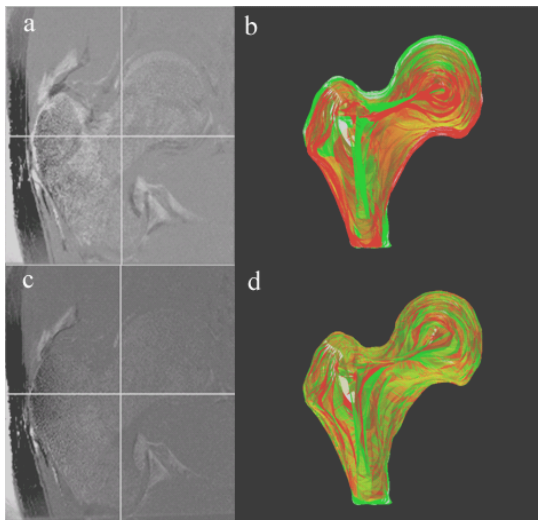


3-D image registration of MR images for the analysis of trabecular bone parameters

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Osteoporosis is a metabolic disorder that results in bone with decreased mechanical strength and increased fracture risk. It primarily targets trabecular bone, which is spongy bone found in skeletal sites such as the vertebrae and the proximal and distal parts of the appendicular skeleton, with both thinning and loss of structure. Trabecular bone micro-architecture is of particular importance to bone strength. Studies have confirmed that MRI can be used to detect differences in trabecular bone due to age, bone mineral density and osteoporotic status.

Longitudinal studies conducted to assess changes in bone quality in the tibia impose strict requirements on the reproducibility of data acquired. The same region must be consistently scanned between baseline and follow-up image acquisition. Image registration may be able to ensure correct volume of interest (VOI) selection. Image registration involves aligning two images by adjusting the parameters of a transformation which maps one image to the other. The parameters are adjusted until a metric function is optimized. Registration is important for ensuring that the same region is analyzed in both the baseline and the follow-up magnetic resonance (MR) images when characterizing trabecular bone.



Comparison of aligned follow-up versus unaligned follow-up hip images. (a) Subtraction of baseline and follow-up without registration (automatic alignment). (b) 3-D rendering of unaligned hip surfaces. (c) Subtraction of baseline and aligned follow-up. (d) 3-D rendering of aligned hip surfaces (green = baseline, red = follow-up).