

## High-resolution $^{18}\text{F}$ -FDG PET with MRI for monitoring response to treatment in rheumatoid arthritis

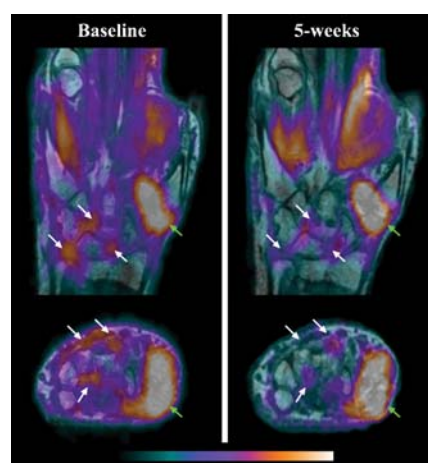
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Molecular imaging can potentially provide means for monitoring response to therapy in rheumatoid arthritis (RA) early in the course of disease [1]. Quantitative measurements of RA disease activity made in the wrist by whole-body PET scanners, however, have inadequate accuracy because of limited spatial resolution [2]. A high-resolution PET/CT scanner for imaging extremities has been built at our institution [3]. In conjunction with a clinical MRI scanner, high-resolution PET/MR images can be obtained for the wrist. The CT image is used for PET/MR image coregistration.

A 57-year-old female with established RA was stable until a recent clinical flare-up in the right wrist. Clinical examination revealed synovitis, swelling, and diminished range of motion. The patient also had a history of osteoarthritis (OA). An extremity  $^{18}\text{F}$ -FDG PET/CT scan immediately following MRI at baseline was performed on this patient. Tumor necrosis factor alpha (TNF- $\alpha$ ) inhibitor (etanercept) therapy was then initiated as a part of the patient's standard of care. The patient was re-scanned 5 weeks after starting treatment.

The figure shows high-resolution  $^{18}\text{F}$ -FDG PET images (pseudocolor) overlaid on pre-contrast MRI images (gray



scale) at baseline (left column) and 5 weeks (right column). Significant reduction in PET signal (suggesting reduced inflammation) in the synovium and at sites of erosions (white arrows) is visible. The green arrow shows inflammation due to OA. Physician examination at 3 months confirmed that this patient responded positively to etanercept. This case illustrates the potential of high-resolution PET with MRI for quantitative visualization of early response to therapy in RA.

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