Synovitis in patients with early inflammatory arthritis monitored with quantitative analysis of dynamic contrast-enhanced optical imaging and MR imaging.

Abstract:
To evaluate quantitative perfusion measurements of dynamic indocyanine green (ICG)-enhanced optical imaging for monitoring synovitis in the hands of patients with inflammatory arthritis compared with dynamic contrast-enhanced (DCE) magnetic resonance (MR) imaging and clinical outcome. This study was approved by the ethics committee at the institution. Individual joints (n = 840) in the hands and wrists of 28 patients (14 women; mean age, 53.3 years) with inflammatory arthritis were examined at three different time points: before start of therapy and 12 and 24 weeks after start of therapy or therapy escalation. Treatment response was assessed by using clinical measures (simple disease activity index [SDAI]), ICG-enhanced optical imaging, and DCE MR imaging. Dynamic images were obtained for optical imaging and DCE MR imaging. The rate of early enhancement (REE) of the perfusion curves of each joint was calculated by using in-house developed software. Correlation coefficients were estimated to evaluate the associations of changes of imaging parameters and SDAI change. Quantitative perfusion measurements with optical imaging and MR imaging correctly identified...
patients who responded (n = 18) and did not respond to therapy (n = 10), as determined by SDAI. The difference of REE after 24 weeks of treatment compared with baseline in responders was significantly reduced in optical imaging and MR imaging (optical imaging: mean, -21.5%; MR imaging: mean, -41.0%; P < .001 for both), while in nonresponders it was increased (optical imaging: mean, 10.8%; P = .075; MR imaging: mean, 8.7%; P = .03). The REE of optical imaging significantly correlated with MR imaging (r = 0.80; P < .001) and SDAI (r = 0.61; P < .001). Quantitative analysis of contrast-enhanced optical imaging allows for potential therapeutic monitoring of synovitis in patients with inflammatory arthritis.