

MR imaging of arthroplasty

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Abstract

Joint arthroplasty is a widely successful clinical operation performed in millions of patients worldwide, resulting in pain reduction and functional improvement. Implant failure, however, due to such factors as loosening, infection or adverse tissue reaction, requires revision surgery, which is associated with increased morbidity. Prompt recognition of complications around hardware is thus clinically relevant. The optimization of pulse sequences requires a combination of effective fat suppression in the presence of regional field inhomogeneity, as well as acquisition of nonfat-suppressed, high resolution, fluid sensitive techniques that allow for detection and characterization of periprosthetic fluid collections. Traditional MR techniques are limited by susceptibility artifact and poor signal to noise. The etiology and result of susceptibility artifacts will be discussed, including T2* dephasing, distortions in the slice and read out encoding, signal loss and in plane distortions. A variety of techniques that result in artifact reduction when visualizing both the bone and soft tissue envelope around joint replacements will be discussed, including newer pulse sequences specifically devised for reduction of artifacts, such as Slice Encoding for Metal Artifact Correction (SEMAC) and Multi-Acquisition Variable-Resonance Image Combination (MAVRIC). The clinical application of these imaging techniques will be described, with examples of the characteristic appearances of common complications around orthopaedic instrumentation and arthroplasty, including infection, loosening, adverse local tissue reaction, and neurovascular impingement. The biology of adverse tissue reactions to implants will be discussed and data will be presented demonstrating the high predictive value of MRI as a biomarker of adverse tissue reactions to implants.

Biography

Hollis G. Potter, M.D. holds The Coleman Chair in Magnetic Resonance Imaging Research, and is the Chief of Magnetic Resonance Imaging and Director of Research for the Department of Radiology and Imaging at the Hospital for Special Surgery in Manhattan. Dr. Potter is professor of Radiology at the Weill Medical College of Cornell University. She is the author of over 165 peer-reviewed articles and is funded for research utilizing quantitative MR techniques that provide noninvasive assessment of cartilage biochemistry, prototype MR sequences as biomarkers of meniscal structural integrity, as well as adverse host reactions to metallic implants.