

An IDEAL Advantage for MSK Imaging

By Anne Cotten, MD

In the clinical practice, techniques to remove or eliminate fat are frequently employed. With spectrally selective techniques, for example fat saturation, inhomogeneity may occur when studying anatomy with a large field of view (FOV), extremities, anatomical regions with magnetic susceptibility differences at air-tissue interfaces (e.g., the lung apices, the cervical spine), and joints with surgical hardware (Figure 1). While another technique, Short Tau Inversion Recovery (STIR) sequence does provide more uniform lipid suppression than frequency-selective fat saturation techniques, it suffers from a lower signal-to-noise ratio (SNR), produces a single type of image contrast (T2W), and is not recommended with post-contrast studies.

A unique and novel technique from GE Healthcare overcomes these issues. IDEAL is a method that acquires three images at slightly different echo times to generate phase shifts between water and fat. The underlying acquisition technique makes IDEAL a particularly SNR-rich sequence that translates into very high spatial resolution potential. Compatible with the latest generations of phased-array coils, IDEAL achieves robust uniform fat suppression, even in the presence of metallic hardware, due to higher SNR and increased spatial resolution (Figures 1). In our facility, we have found IDEAL so useful that we no longer use the fat saturation sequence on these patients. In addition, IDEAL provides unique fat suppression capabilities on the fringes of a large FOV, therefore, we use it for all large FOV studies, particularly of the hips, shoulders, and spine.

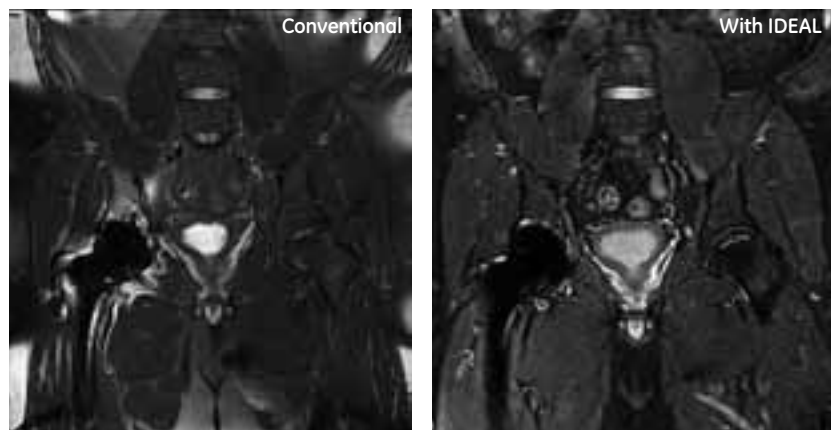


Figure 1. Patient with hip prosthesis. Note the artifacts along the neck of the prosthesis and high signal intensity of the acetabular roof indicating local failed fat saturation in the fat sat T2-weighted image on the left. The IDEAL image on the right shows good fat suppression with no artifacts, allowing the assessment of the bone and soft tissues surrounding the hip prosthesis.

All Images Courtesy of Hospital R. Salengro



Dr. Anne Cotten

Anne Cotten, MD, is Professor of Radiology and Head of the Department of Musculoskeletal Radiology at Hospital R. Salengro, Lille, France. Dr. Cotten is the past secretary and current vice president of the ESSR (European Society of Musculoskeletal Radiology).

The IDEAL technique provides the user four selectable images – water only, fat only, in-phase, and out-of-phase. When applying IDEAL, fat is consistently and reliably separated from water, and can be recombined into “in-phase” and “out-of-phase” images. With other techniques, this would require two separate acquisitions and was clinically impractical due to the length of the exam to generate these four images. Prior to IDEAL, in-phase/out-of-phase imaging was rarely performed for MSK applications in our facility. This ability represents a step forward in MSK imaging that may be useful for the evaluation of intra-articular structures, such as cartilage and the meniscus (Figure 2). Fat images may also have useful indications as shown in Figure 3. ■

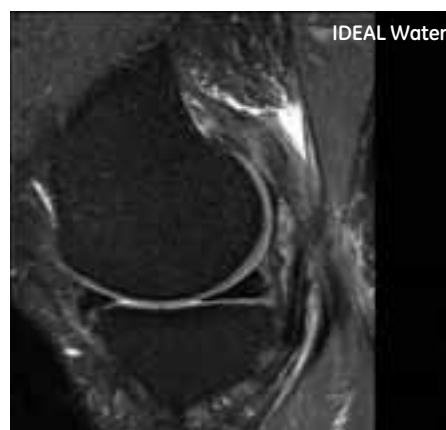
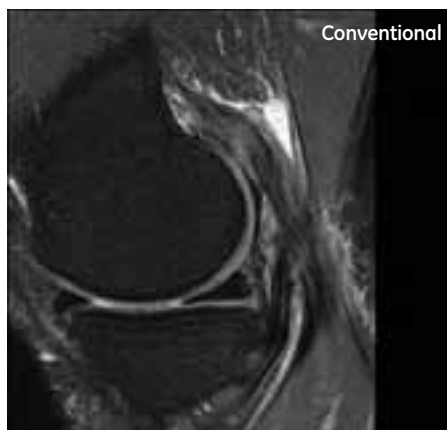


Figure 2. IDEAL produces two additional informative images – in-phase and out-of-phase – without incurring any additional scan time. Note the nice depiction of the meniscus and cartilage.

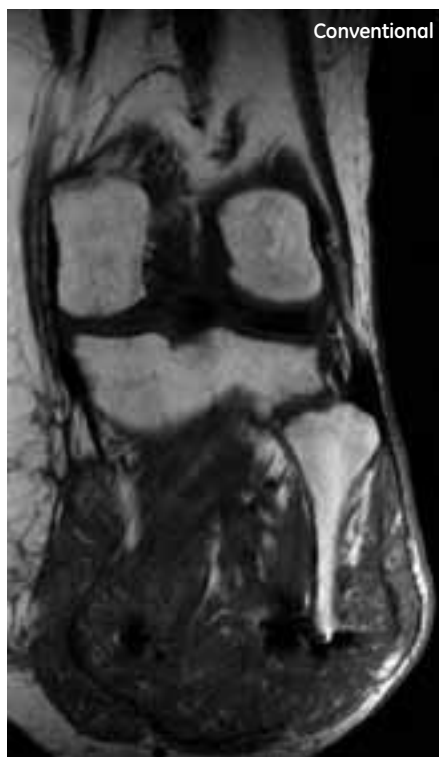


Figure 3. In this amputated leg, the distal end of the fibula is better assessed on the IDEAL fat only image (right) than on the fast spin echo T1-weighted image (left). IDEAL fat-only images may be useful to assess bony structures with fatty bone marrow.

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