

Tips for T2-weighted TSE Shoulder Imaging with Spectral Fat Saturation

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Robust fat saturation can be achieved by different approaches including the application of inversion recovery sequences or advanced fat suppression pulses such as SPAIR. However, in some cases, such as the musculoskeletal imaging of the shoulders, the combination of a T2-weighted turbo spin echo (TSE) sequence with a conventional spectral fat saturation pulse is needed. When imaging obese or very tall patients, the shoulder has to be positioned off-center in many MR exams and therefore several factors will affect image quality with spectral fat saturation:

B_0 -inhomogeneity – if present – will cause a frequency shift, off-setting the frequency that has been implemented for spectral fat saturation relative to the fat peak. Consequently, fat will not be sufficiently suppressed. Secondly, the eddy current effect can be more serious at a very off-center position. And finally, distortions introduced by B_0 -inhomogeneity and non-linearity of the gradients at the edge of the maximum field-of-view can cause crosstalk effects. The following hints on patient positioning and sequence set-up will help you to achieve high quality spectral fat saturation:

1. Try to position the shoulder as close to the magnet center as possible. (For further information on patient positioning, including a video and application hints, please visit the MSK Advisory Board on www.siemens.com/magnetom-world).
2. Try to reduce the eddy current effect by applying a lower bandwidth, changing the phase-encoding direction and using a lower sampling density. Keep in mind that the sampling density can also be influenced by the turbo factor for TSE sequences. With a fixed TR and number of slices, reducing the turbo factor will allow you to set a lower sampling rate.
3. Try to reduce the crosstalk effect by increasing the number of concatenation e.g. 2 instead of 1.

Imaging and sequence details

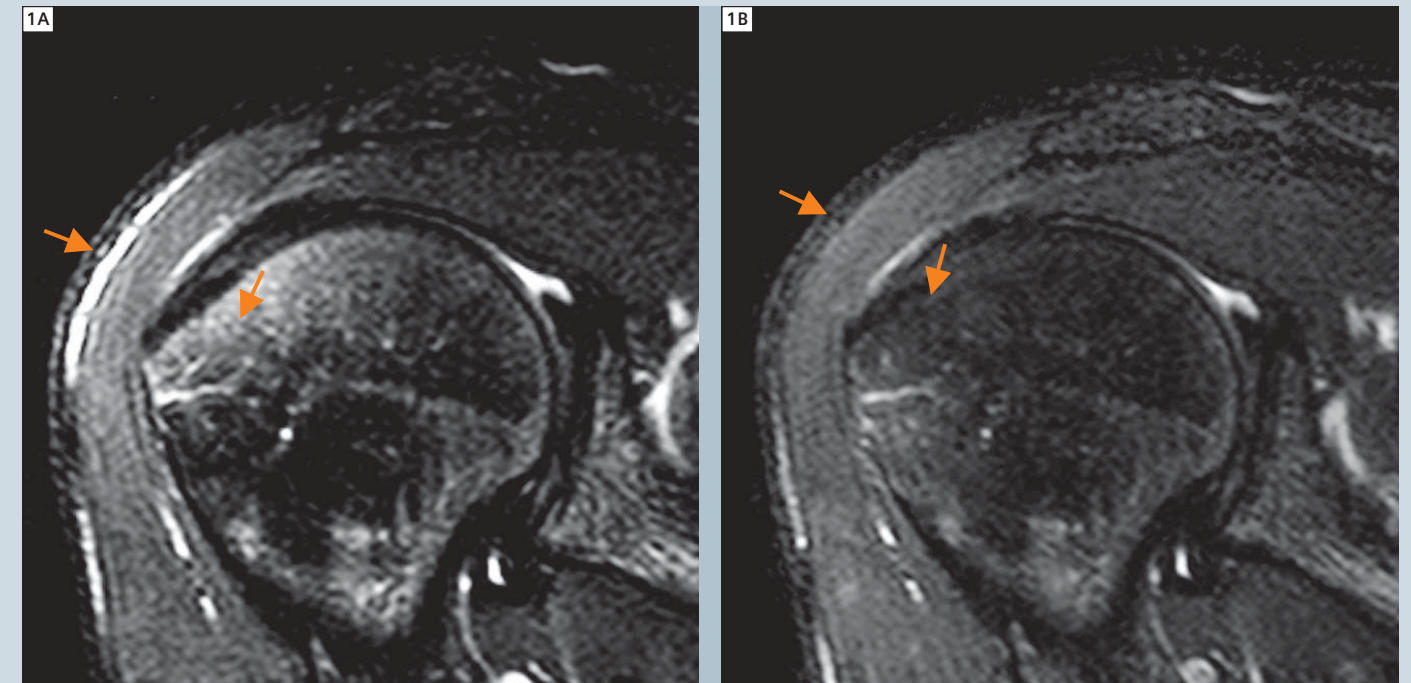
The shown images were acquired using a 1.5 Tesla MAGNETOM Symphony. Only one parameter was changed for best comparison. Sequence parameters for the shown T2-weighted TSE sequence were: TR / TE 3690 / 71 ms, slice thickness 3 mm, matrix 436 x 512 (interpolated), FOV 160 x 160; no averaging, no restore pulse used. In figure 1, the

bandwidth was set to 120 Hz/px. Areas with insufficient spectral fat suppression are marked by an arrow in figures 1 and 2A).

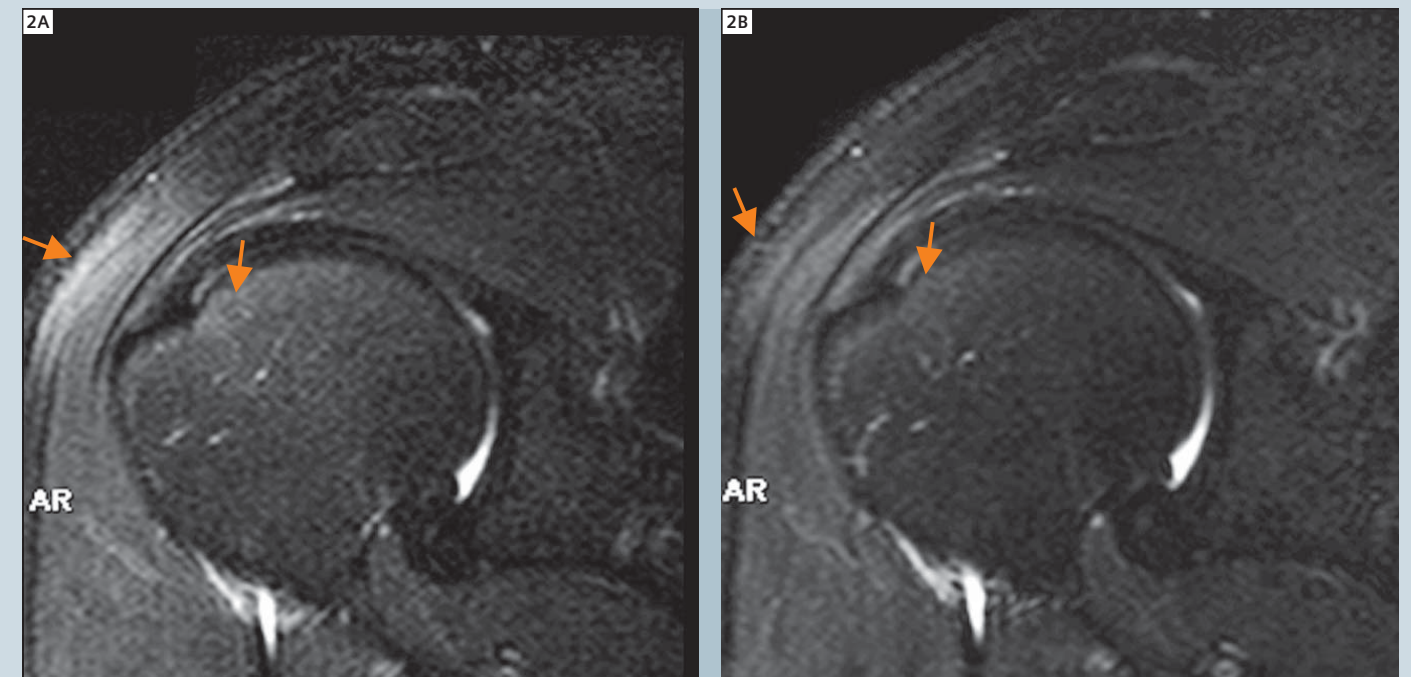
In figure 1A the shoulder was placed at the very edge of the maximum field-of-view. Just by moving the region-of-interest a bit more to the isocenter of the magnet, a clear improvement in the quality of the spectral fat suppression can be achieved (Fig. 1B). In an open-bore magnet this is no problem, but even in a tighter bore, the shoulder can be moved away from the edge of the maximum field-of-view by slightly angulating the patient's position. In figure 2A the bandwidth was set to 90 Hz/px. By reducing the sampling rate to 50 Hz/px, eddy current effects are reduced and resulting in improved fat saturation.

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1 Improving the quality of fat saturation by moving the region of interest towards the isocenter.



2 Reducing eddy current effects by decreasing the sampling rate.