

Evaluation of T2-weighted WARP sequences in Patients with Spinal Prosthesis

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Target audience: Researchers and radiologists interested in metal implants imaging.

Purpose: MRI is an important modality for imaging the spine as it allows assessment of the spinal cord, adjacent soft tissues and osseous structures. In this study, we compared images quality and diagnostic sensitivity between WARP with standard TSE sequences in interbody fixation patients with titanium screws.

Methods: 30 patients (11 males and 19 females; age range, 35-72 years) who were clinically examined discomfort after interbody fixation surgery with titanium screws were scanned at a 1.5T MR scanner (MAGNETOM Aera, Siemens). The T2-weighted sagittal and axial images were acquired using a standard TSE sequence and a WARP TSE sequence implemented the SEMAC and VAT techniques as well as increased bandwidth for radiofrequency and readout pulses. SEMAC factor was 6 for all WARP imaging. The cumulative area of signal void was measured on the axial image, which was defined as the area without discernible anatomic information for both low and high-signal-intensity artifacts induced by the prosthesis (Fig. 1A). Length of spinal canal obscuration on the sagittal image was also measured (Fig. 1B).

Results: On axial T2-weighted images, the area of signal void at the level of the prosthesis (mean \pm standard deviation) was $10.4 \text{ cm}^2 \pm 4.5$ for WARP and $26.6 \text{ cm}^2 \pm 10.2$ for standard TSE images (Fig. 1C). On sagittal T2-weighted images, the length of spinal canal obscuration at the level of the prosthesis was $1.8 \text{ cm} \pm 0.3$ for WARP and $5.4 \text{ cm} \pm 1.2$ for standard TSE images (Fig. 1D). Visualizations of all periprosthetic anatomic structures were significantly better for WARP compared with standard imaging. Interobserver agreement for visualizations of anatomic structures was good for both WARP ($k = 0.73$) and standard ($k = 0.71$) imaging. The number of abnormal findings noted on WARP images (28 findings) was significantly higher than the number of findings detected on standard images (10 findings) with all abnormal imaging findings detected on standard images were also noted on WARP images.

Discussion and Conclusion: MR images with WARP sequences significantly reduced metal-related artifacts and improved delineation of the prosthesis and periprosthetic region therefore increased the diagnostic sensitivity in patients with clinical abnormalities.

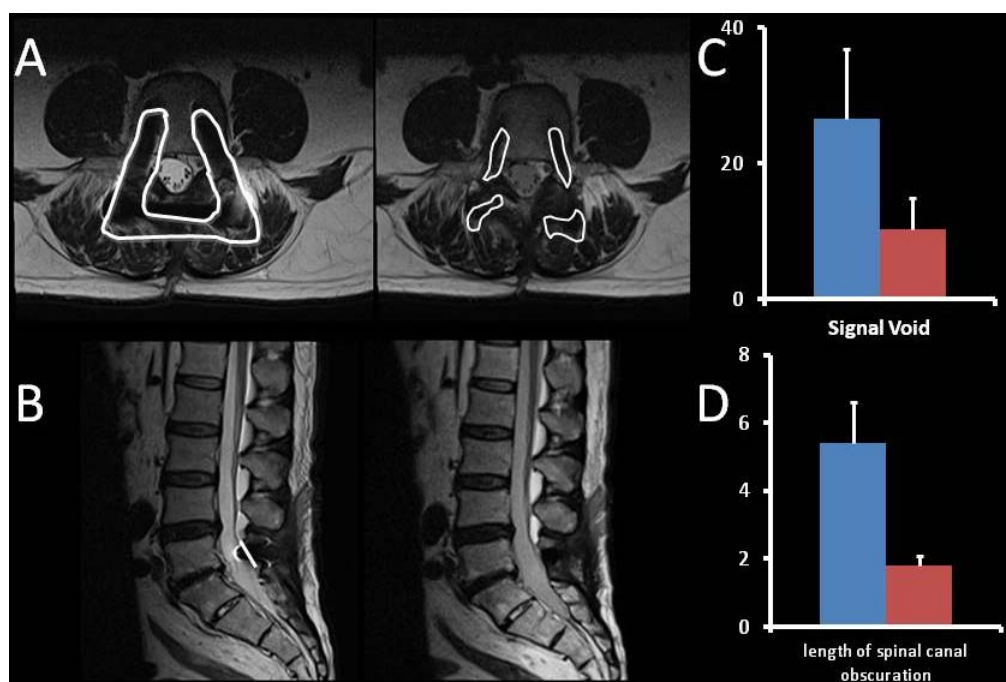


Fig1. Quantitative evaluation of WARP and standard TSE sequences in spine imaging. Signal void area in the axial images (A), and length of spinal canal obscuration measurement in the sagittal images (B). Statistic analysis showed the signal void was significantly reduced in WARP than standard TSE images (C, $p < 0.001$), and the length of spinal canal obscuration was also significantly reduced (D, $p < 0.001$).