

Integrating Restriction Spectrum Imaging into Prostate MRI for Focal Therapy Planning: A Single-Center Experience

Andrea Lopez Sanmiguel, Anthony Zhang, Sandeep Arora, Jessica Lee, Michael S. Leapman, Preston C. Sprenkle

Department of Urology, Yale University School of Medicine, New Haven, CT, USA

Introduction: Multiparametric MRI interpretation varies across readers, making consistent lesion localization and treatment planning in focal therapy (FT) challenging. Quantitative imaging approaches, such as restriction spectrum imaging (RSI), may provide a more objective assessment. RSI is an advanced diffusion MRI technique that emphasizes areas of restricted diffusion in hypercellular tissue. We have initiated a program incorporating RSI into prostate MRI to evaluate its potential role in cancer localization, ablation planning, and follow-up.

Methods: Patients undergoing transurethral ultrasound ablation (TULSA) for localized prostate cancer are imaged using RSI sequences as part of an early implementation effort at our institution. RSI restriction maps are overlaid on T2-weighted MRI and qualitatively assessed for lesion conspicuity and spatial alignment. A clinical collaborative team at UC San Diego reviews the image characteristics and technical limitations.

Results: RSI demonstrated focal regions of increased restriction signal corresponding to lesions identified on T2-weighted MRI, supporting qualitative lesion-level concordance. The RSI signal clearly delineated the target lesions, providing additional contrast compared with the surrounding prostatic tissue. In the representative case presented here (Figure 1), the RSI restriction score overlay highlights a focal region of increased signal corresponding to the suspected tumor, which is visually distinct from adjacent tissue. Post-ablation images showed no signal within the ablation area.

Conclusion: We have successfully initiated the integration of RSI into the prostate MRI workflow for FT planning. Early experience shows concordance with lesions and enhanced lesion borders relative to conventional imaging. Ongoing prospective data collection will evaluate whether incorporating RSI improves targeting and oncologic outcomes in FT, with continued technical optimization of the protocol.

Figure 1. A representative case of an RSI restriction overlay in a focal region of increased signal corresponding to the suspected tumor.

