Redefining MRI:
From Image to Insight

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Abdomen 2

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Optimizing Rectal MRI Protocols: From Acquisition to Interpretation

Jeongin Yoo

Seoul Nantional University Hospital, Korea

Rectal MRI has evolved from a staging examination to a decision-support tool that guides neoadjuvant treatment, surgical planning, and organ-preservation pathways. For the practicing radiologist, optimization requires more than adherence to a sequence checklist: acquisition geometry, image quality, and reporting language must be aligned with the clinical questions that determine risk-adapted care. This advanced course reviews protocol refinements and interpretive priorities that maximize the clinical value of rectal MRI.

High-resolution 2D T2-weighted imaging remains the technical cornerstone. A small field of view (16–18 cm), in-plane resolution of approximately 0.6 × 0.6 mm, 3-mm contiguous slices, and correctly angled oblique axial and coronal planes are essential to depict the relationship of tumor to the muscularis propria, mesorectal fascia, levator complex, and anal sphincters. Protocols should be lean: routine T1-weighted, fat-suppressed T2-weighted, and contrast-enhanced sequences do not add value for standard primary staging or post-neoadjuvant restaging. Diffusion-weighted imaging is most useful as a targeted complement to T2-weighted imaging in the treated tumor bed, where high b-value small-FOV images and the ADC map help resolve residual viable tumor from fibrosis.

Interpretation should prioritize features that alter management. In addition to tumor height and T category, radiologists should report extramural depth of spread, peritoneal reflection and sphincter involvement, and the distinction between anatomic MRF and the anticipated circumferential resection margin in the context of the planned operation. MRF involvement by primary tumor, EMVI, or tumor deposits carries different implications from nodal proximity alone. EMVI and tumor deposits should be actively sought as adverse prognostic features; when they cannot be confidently separated, their combined description is more informative than a forced distinction. Nodal assessment should integrate morphology with size, and lateral pelvic nodes should be separately evaluated in low rectal cancer. Size-based risk stratification before and after treatment is particularly relevant for internal iliac and obturator nodes.

At restaging, the interpretive challenge is to distinguish fibrosis, mucin, and treatment-related change from residual disease while preserving clinically meaningful anatomic detail. MRI tumor regression grade (mrTRG) provides a reproducible framework based on the relative proportions of tumor signal and fibrosis, but should be integrated with endoscopy and clinical examination when considering clinical complete response. A structured report that consistently captures T and N stage, MRF/CRM risk, sphincter involvement, lateral pelvic nodes, EMVI, tumor deposits, and mrTRG enables clear communication across the multidisciplinary team and supports individualized treatment decisions.

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