PURPOSE: To prospectively compare high-spatial-resolution T1-weighted, T2-weighted, and intermediate-weighted spectral fat-saturated magnetic resonance (MR) imaging for the differentiation of tumor from fibrosis and for delineation of rectal wall layers in rectal cancer specimens. MATERIALS AND METHODS: The local ethics committee approved the protocol, and written informed consent was obtained from each patient. Thin-section high-spatial-resolution MR imaging was performed in specimens obtained from 23 patients (16 men, seven women; median age, 64 years; age range, 39-84 years) immediately after resection. Seven patients underwent neoadjuvant treatment. T1-weighted spin-echo, T2-weighted fast spin-echo, and intermediate-weighted spectral fat-saturated MR images were obtained in the transverse plane. Differences in signal intensity between tumor and fibrosis and between tumor and rectal wall layers were evaluated by using visual scoring and measurements of T2 relaxation time. Statistical differences were evaluated by using the Wilcoxon signed rank test and a mixed-model regression analysis. All images were compared with whole-mount histopathologic slices (n = 86). RESULTS: T2-weighted MR images provided the best differentiation between tumor and fibrosis (P< .001). Mean visual signal intensity scores were -1.8 for
T2-weighted MR images, -1.4 for intermediate-weighted spectral fat-saturated MR images, and -0.2 for T1-weighted MR images. T2 relaxation times were 97 msec +/- 4.6 for tumor and 70 msec +/- 3.8 for fibrosis (P< .001). Substantial overlap was noted between the tumor and the circular layer of the muscularis propria (97 msec +/- 2.1), and less overlap was noted between the tumor and the longitudinal layer of the muscularis propria (88 msec +/- 1.6). CONCLUSION: T2-weighted MR imaging provides superior delineation of rectal wall layers and better differentiation of tumor from fibrosis in rectal cancer specimens compared with T1-weighted MR imaging and intermediate-weighted spectral fat-saturated MR imaging by using thin-section high-spatial-resolution sequences.