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**TITLE:** MRI T2 mapping in desmoid tumors: a quantitative imaging biomarker of tumor response with high inter-reader reliability

**AUTHORS:**

Felipe Souza, MD<sup>1</sup>; Gina D'Amato, MD<sup>2</sup>; Emily Jonczak, MD<sup>2</sup>; Philippos Costa, MD<sup>2</sup>; Jonathan Trent, MD, PhD<sup>2</sup>; Andrew Rosenberg, MD<sup>3</sup>; Pradip Pattany, PhD<sup>1</sup>; H. Thomas Temple, MD<sup>4</sup>; and Ty K. Subhawong, MD<sup>1</sup>

**AUTHOR AFFILIATIONS:**

<sup>1</sup> Department of Radiology, Sylvester Comprehensive Cancer Center and the University of Miami Miller School of Medicine, Miami, FL 33136, USA

<sup>2</sup> Department of Hematology/Oncology, Sylvester Comprehensive Cancer Center and the University of Miami Miller School of Medicine, Miami, FL 33136, USA

<sup>3</sup> Department of Pathology, Sylvester Comprehensive Cancer Center and the University of Miami Miller School of Medicine, Miami, FL 33136, USA

<sup>4</sup> Department of Orthopaedics, Sylvester Comprehensive Cancer Center and the University of Miami Miller School of Medicine, Miami, FL 33136, USA

**Background:** T2 signal intensity is an important imaging feature of desmoid-type fibromatosis (DF) reflecting its collagenous and fibroproliferative composition. Quantification of DF T2 relaxation time could prove an effective imaging biomarker of disease activity and therapeutic response.

**Methods:** This IRB-approved retrospective study included 11 patients with DF, managed by observation or systemic therapy, assessed by MRI. Tumor maximum diameter, volume, and T2-weighted signal intensity were derived from manual tumor segmentations, and tumor signal intensity was normalized to muscle. 2D regions of interest were also constructed around the tumor on corresponding T2 maps by two readers to enable inter-reader reliability. Results were compared with objective response rates based on Response Evaluation Criteria in Solid Tumors (RECIST1.1).

**Results:** Mean patient age was 52.9 years; 8 subjects were female (73%). Longitudinal assessment was available for 9 subjects, followed for an average of 314 days, with a total of 37 unique timepoint assessments. Baseline mean tumor diameter was 8.0 cm, range 4.4 to 18.2 cm. Only one subject achieved RECIST1.1 partial response. Mean baseline T2 relaxation time was 61.4 ms (std dev = 17.7 ms), and mean value at last follow-up was 49.6 ms (std dev = 18.5 ms; -15% from baseline). Tumor T2 relaxation times derived from T2 maps showed good correlation with conventional T2 signal ratios, Pearson  $r = 0.71$ . T2 mapping showed high inter-reader reliability, ICC = 0.84. The best response as a percentage change in T2 values was directionally concordant and larger in 8/9 cases (89%) than the corresponding best response in tumor diameter.

**Conclusions:** T2-mapping of DF provides a compelling quantitative MRI biomarker of tumor collagenization and behavior, with a strong response signal and high inter-reader reliability.