

THE ROLE OF MULTIPARAMETRIC MAGNETIC RESONANCE IMAGING (MMRI) IN THE DIFFERENTIAL DIAGNOSIS AND GRADING OF SOFT TISSUE TUMORS

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Abstract. Soft tissue sarcomas (STS) are a heterogeneous group of rare mesenchymal tumors that account for approximately 1% of all adult malignancies but represent a significant diagnostic and therapeutic challenge due to their biological diversity (Stiller et al., 2021). Accurate differentiation between benign and malignant soft tissue lesions and reliable histological grading are essential for appropriate treatment planning, surgical strategy, and prognosis assessment. Conventional magnetic resonance imaging (MRI) provides excellent anatomical detail; however, it is often limited in its ability to reliably distinguish between benign and malignant lesions based solely on morphological characteristics.

Recent advances in functional imaging techniques have significantly improved the diagnostic capabilities of MRI. Multiparametric MRI (mMRI), which combines morphological imaging with Diffusion-Weighted Imaging (DWI) and Dynamic Contrast-Enhanced MRI (DCE-MRI), provides valuable information regarding tumor cellularity, vascularity, and microenvironment (Messiou et al., 2017; Koh & Collins, 2007). Diffusion restriction observed on DWI reflects increased tumor cellularity, while dynamic contrast enhancement patterns help evaluate tumor perfusion and neoangiogenesis, both of which are important indicators of tumor aggressiveness.

According to current clinical guidelines for the management of soft tissue sarcomas (Gronchi et al., 2023), advanced imaging plays a crucial role in preoperative evaluation, tumor characterization, and biopsy planning. Multiparametric MRI has therefore emerged as a powerful non-invasive tool for improving diagnostic accuracy and guiding clinical decision-making.

The present study evaluates the diagnostic efficacy of multiparametric MRI in differentiating benign and malignant soft tissue tumors and investigates the correlation between MRI-derived parameters, including Apparent Diffusion Coefficient (ADC) values and dynamic enhancement patterns, with histological tumor grading. By integrating functional MRI biomarkers with histopathological findings, this research aims to demonstrate the clinical value of multiparametric MRI in improving diagnostic confidence and facilitating more precise preoperative assessment of soft tissue tumors.

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