Redefining MRI:
From Image to Insight

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Breast 2

SY10-2

The Value of T2-Weighted Imaging in Breast MRI

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Background & Introduction

Dynamic contrast-enhanced MRI (DCE-MRI) is the cornerstone of breast evaluation; however, concerns over gadolinium deposition and the rise of abbreviated protocols have renewed clinical interest in T2-weighted imaging (T2WI). T2WI offers direct tissue characterization independent of contrast kinetics, effectively reducing false-positive findings.
Technical Considerations
Breast T2 signal intensity is governed by fibrosis, free water content, cellularity, and mucin/myxoid stroma. Because adipose tissue yields high T2 signals that obscure pathology, optimal fat suppression via FSE with fat saturation, STIR, SPAIR, or DIXON is paramount.

Clinical Applications

T2WI definitively characterizes simple cysts (uniformly hyperintense with smooth margins, justifying BI-RADS 2) and evaluates complex cystic masses via internal architecture (mural nodules, septal thickening). For solid masses, most malignancies (e.g., invasive ductal carcinoma) exhibit low T2 signal due to high cellularity and desmoplasia. Conversely, myxoid fibroadenomas display high T2 signals with pathognomonic dark internal septations. Mucinous carcinoma presents a diagnostic pitfall with very high T2 signals due to extracellular mucin pools, requiring DCE morphologic correlation. Papillomas typically present with intermediate-to-high T2 signals associated with a dilated duct. For axillary lymph nodes, fat-suppressed T2WI delineates suspicious criteria, including cortical thickening (3 mm), fatty hilum loss, and round morphology.

Pitfalls and Limitations

A key interpretive pitfall is the T2 shine-through effect on diffusion-weighted imaging (DWI), where high T2 signals produce spurious brightness on DWI trace images independent of true diffusion restriction; strict ADC map correlation is mandatory. Additional limitations include incomplete fat suppression near the chest wall/axilla and signal overlap between benign fibrous tissue and malignancies.

Advanced Perspectives & Conclusion

The combination of T2WI and DWI forms the foundation of non-contrast abbreviated breast MRI protocols, demonstrating high sensitivity for invasive cancer detection. In conclusion, T2WI is an indispensable tool for tissue characterization in breast MRI, providing information that
DCE-MRI alone cannot offer. Its systematic integration reduces false positives in DCE-MRI and constitutes the structural basis of emerging non-contrast imaging strategies.

Keywords: *Breast neoplasms, Magnetic resonance imaging (MRI), T2-weighted imaging, Image characterization*