Combined analysis of ultrafast and DWI MRI sequences

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Breast Magnetic Resonance Imaging (MRI) has become an increasingly prevalent tool for breast screening. Enhanced by greater accessibility to MRI technology and the recent findings of the DENSE trial, the number of annual exams has risen significantly, focusing on targeted assessment of the mammary gland.

Abbreviated protocols and diffusion-weighted imaging (DWI) are now routine practices, further supported by a recent consensus from the European Society of Breast Radiology (EUSOBI), which advocates for DWI's inclusion in all MRI protocols, regardless of the clinical indication.

Despite these advancements, several challenges persist, including protocol inconsistencies, image artifacts, histological variability, and a lack of standardization.

This presentation aims to offer a comprehensive overview of the techniques and methodologies employed in abbreviated MRI and DWI, along with an examination of their advantages, disadvantages, and current controversies, as substantiated by the existing literature.

Indeed, the majority of breast cancers show enhancement within the first 30 seconds, bolstering the use of ultrafast protocols. However, certain histologies, such as breast papillomas, lymph nodes, or adenofibromas, may also display early enhancement.

Additionally, some low-grade ductal carcinoma in situ (DCIS) and mucinous carcinomas may not exhibit enhancement in ultrafast sequences.

Conversely, DWI sequences are influenced by multiple factors including signal-to-noise ratio, fat saturation, spatial resolution, and b-values, as well as the methodology used for ROI measurement and lesion size. Certain histological subtypes like DCIS, mucinous carcinoma, and necrosis also affect DWI results.

We will present the findings of our recent study, which validates the synergistic use of ultrafast and diffusion-weighted sequences in breast MRI. Specifically, we will demonstrate the efficacy of two criteria — early enhancement under 30 seconds on ultrafast MRI and an ADC cut-off value of 1.5 x 10-3 mm2/s — in enhancing diagnostic accuracy.

The added value of early enhancement in abbreviated protocols is comparable to the significance of washout criteria in conventional protocols. Additionally, the inclusion of ADC value analysis appears to be at least as accurate as, and potentially more accurate than, conventional methods.

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To provide practical insight, we will discuss implementation strategies based on experiences in our own radiology department, illustrated through real-world clinical scenarios. An overview of our workflow will also be provided, detailing how these MRI sequences integrate into the comprehensive management of breast cancer. This will include their interplay with second-look mammography, ultrasound, and contrast-enhanced mammography.

Finally, the presentation will explore potential pitfalls of both MRI techniques, utilizing actual case scenarios to emphasize the added value of integrating both anatomical and functional data. This multidimensional approach aims to improve diagnostic accuracy and minimize unnecessary biopsies.

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