Redefining MRI:
From Image to Insight

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Educational Session 2: Basics of Physiologic MRI

SY12-1

Basic of Diffusion MRI and Clinical Application

So Hyun Park

Seoul National University Bundang Hospital, Korea

Diffusion-Weighted Imaging (DWI) has become an essential sequence in body MRI, offering critical functional insights by capturing the microscopic random motion of water molecules. This lecture provides a comprehensive overview of diffusion MRI, spanning from fundamental physics to advanced clinical applications in abdominal oncology and infection.

The session begins with the basic physics of DWI, explaining how the application of motion-probing gradients sensitizes the MRI signal to water diffusion, quantified via the Apparent Diffusion Coefficient (ADC). A critical challenge in image interpretation, the T2 shine-through effect, will be discussed. Attendees will learn how high T2 signal intensity can mimic restricted diffusion on trace images, and how to systematically counter this artifact by paired evaluation with ADC maps.

To address the inherent limitations of abdominal DWI—namely, susceptibility to artifacts and low signal-to-noise ratios (SNR)—the lecture will highlight recent technological breakthroughs. We will explore the integration of deep learning reconstruction (DLR) algorithms, demonstrating how neural networks effectively suppress image noise and sharpen spatial resolution without lengthening scan times. Furthermore, the clinical utility of synthetic imaging will be introduced, showcasing how mathematically generated high b-value images can enhance tumor-to-background contrast while avoiding the hardware constraints of long echo times.

The final segment focuses on clinical practice, specifically the differential diagnosis between malignant liver tumors and hepatic abscesses.

Keywords: *DWI, Abdomen, T2 Shine-through effect, Deep learning reconstruction, Synthetic imaging*