Redefining MRI:
From Image to Insight

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MRI 측정표준 (MRI Metrology)

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Quantitative MRI in Clinical Practice

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Quantitative MRI is gaining increasing attention as clinical imaging moves beyond visual interpretation toward objective, reproducible, and biologically meaningful measurements. Across a wide range of applications, quantitative imaging has the potential to support earlier diagnosis, disease characterization, risk stratification, treatment response assessment, and longitudinal follow-up. Rather than relying solely on qualitative image contrast, quantitative MRI aims to provide measurable imaging biomarkers that can be compared across time, patients, institutions, and clinical studies.

This lecture will provide a broad overview of the evolving role of quantitative MRI in clinical practice. The discussion will cover how quantitative approaches are being explored and implemented across major clinical areas, with representative examples from different body parts and applications.

Despite its clinical promise, the translation of quantitative MRI into routine practice remains challenging. Measurement reliability can be affected by pulse sequences, acquisition protocols, scanner platforms, reconstruction algorithms, post-processing pipelines, segmentation strategies, motion, and physiological variability. Therefore, the clinical adoption of quantitative MRI requires more than the availability of advanced sequences or color-coded maps. It requires standardization, validation, and quality assurance.

In this context, standard phantoms and reference materials play a critical role. They provide the foundation for assessing measurement accuracy, repeatability, reproducibility, and cross-site comparability. These metrological tools are essential for multi-center research, longitudinal patient monitoring, clinical trials, regulatory confidence, and the development of AI-enabled quantitative imaging workflows. This lecture will provide a clinical perspective on the current and potential role of quantitative MRI biomarkers in routine imaging practice, while acknowledging the importance of measurement reliability for broader clinical adoption.

Keywords: *Quantitative MRI, Imaging biomarkers, MRI metrology, Standardization*