Redefining MRI:
From Image to Insight

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AI Vendor Session

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AI-Driven MRI Systems: Shaping the Next Paradigm in Medical Imaging

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Magnetic resonance imaging (MRI) is entering a new phase in which artificial intelligence (AI) is no longer limited to offline image quality enhancement but is increasingly integrated across the entire imaging chain, from acquisition and reconstruction to motion correction and advanced post-processing. This presentation introduces Canon Medical's latest AI-driven MRI technologies and discusses how they are shaping the next paradigm in clinical and research imaging.
At the core of this evolution is Advanced intelligent Clear-IQ Engine (AiCE), a deep learning reconstruction technology designed to distinguish MR signal from noise and reconstruct low-SNR data into images with higher apparent SNR. By preserving anatomical detail while reducing noise, AiCE helps address the fundamental MRI tradeoff among image quality, spatial resolution, and scan time. Importantly, AiCE is expanding beyond conventional Cartesian imaging to support non-Cartesian acquisitions, including radial-based techniques such as ultrashort echo time (UTE) imaging and JET, thereby broadening its clinical utility in applications affected by motion artifacts, short-T2 signal decay, and challenging acquisition trajectories. When combined with accelerated scan technologies, AiCE provides greater flexibility to reduce acquisition time while maintaining diagnostic image quality.

Precise IQ Engine (PIQE) further extends super-resolution deep learning reconstruction to 3D high-resolution MRI. PIQE increases matrix size, suppresses noise, and reduces resolution-related artifacts such as Gibbs ringing, enabling sharper depiction of fine anatomical structures. With its expansion to 3D pulse sequences, PIQE supports high-resolution volumetric imaging across a broader range of clinical protocols, improving multiplanar visualization and supporting more efficient examinations.

Motion remains a major source of image degradation and repeat scans in MRI. Iterative Motion Correction (IMC) addresses this challenge by using deep learning–based reconstruction to reduce motion artifacts. Its compatibility with parallel imaging allows IMC to be integrated into accelerated clinical protocols, and its target regions are expanding beyond the head and neck to include the shoulder, pelvis, and breast. This broader coverage is expected to improve robustness in anatomies where patient motion, respiratory motion, or involuntary movement frequently compromise image quality.

Finally, advanced post-processing from Olea solution complement AI-enabled acquisition and reconstruction by supporting quantitative analysis, visualization, and intelligent diagnostic decision-making. Together, these technologies represent a comprehensive AI MRI ecosystem that enhances image quality, improves workflow efficiency, reduces the need for repeat examinations, and expands the clinical value of MRI. Canon Medical's AI-driven MRI platform therefore points toward a future in which intelligent reconstruction, motion correction, and post-processing work together to deliver faster, sharper, and more reliable medical imaging.

Keywords: *Artificial intelligence, Deep learning reconstruction, Super-resolution reconstruction, Motion correction*