Canon

Case Study

Clinical Benefit of AiCE Deep Learning Reconstruction Compared to the Conventional Reconstruction in Cervical Spine Imaging

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Introduction

Magnetic Resonance Imaging (MRI) has been relied upon for the diagnosis of neurologic conditions due to its ability to better delineate soft tissue contrast.[1] MRI can produce images in multiple planes, with high resolution, and excellent soft tissue contrast. Traditionally the fundamental tradeoff between scan time, resolution, and SNR in MRI could result in long scan times.

Canon Medical's Advanced Intelligent Clear-IQ Engine (AiCE) Deep Learning Reconstruction (DLR) removes inherent noise which enables you to alleviate the fundamental tradeoff between SNR, resolution, and scan time. Through the denoising process, SNR gain could assist in providing flexibility in scan parameters and allow you to make a choice to improve resolution and/or shorten scan time. This case study evaluates the benefit of AiCE DLR compared to the conventional reconstruction in cervical spine imaging at GO Imaging—Humble, Texas.

Case Study

History: A 52-year-old female patient arrived at the imaging center for a Cervical spine MRI. She is presenting with increasing cervical spine pain which radiates down her right upper arm. The patient denies having prior surgery on her neck area.

Image Findings: There is a straightening of the mid-cervical lordosis. Type 2 changes are seen in the bone marrow adjacent to the C6-7-disc space posteriorly. The C1-2 articulation is unremarkable. There are disc protrusions at every level from C2/C3 through C7/T1, but no spinal stenosis is noted. Disc height is adequate.

1. Straightening of the mid-cervical lordosis can be seen with spasm or strain.

2. Multilevel disc findings of the cervical spine are seen as described with no spinal stenosis at any cervical level.

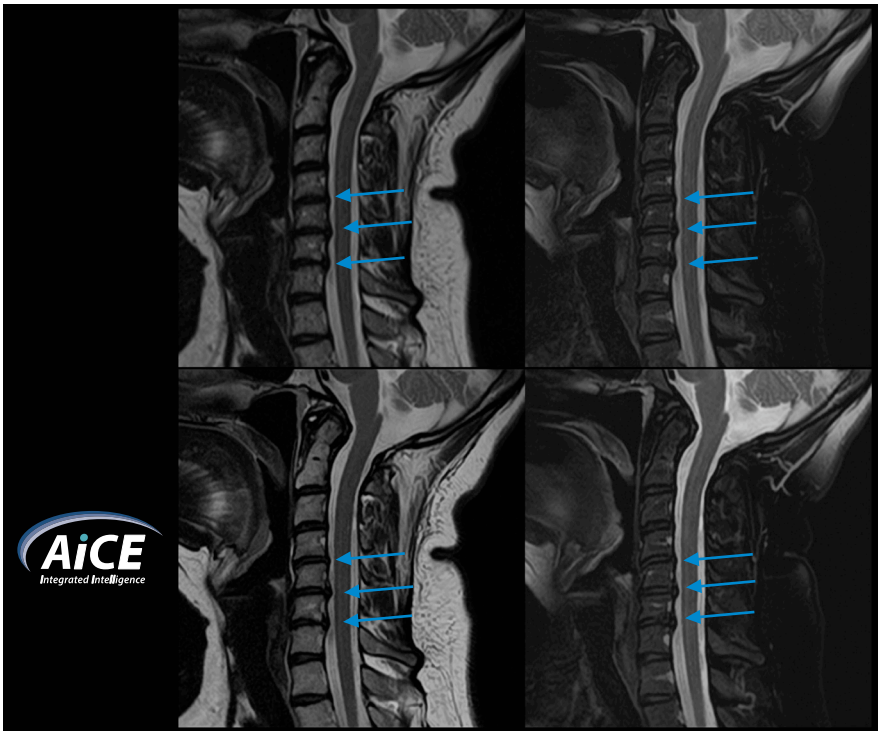

Figure 1 The top row shows the Sagittal T2 and the T2 fat saturation without AiCE reconstruction and the bottom row shows the same weighted images with AiCE reconstruction. Arrows indicate disc findings. AiCE images are sharp with higher SNR. Delineation of the disc protrusions posteriorly is clearly visualized.

	T2		T2 FS		T1	
	Resolution	Time	Resolution	Time	Resolution	Time
Without AiCE	1.0 x 0.8	2:36	1.0 x 0.8	1:54	1.0 x 0.8	2:02
AiCE	**0.8 x 0.7**	**1:43**	**1.0 x 0.8**	**1:27**	**1.0 x 0.8**	**1:02**

Discussion

The site performed three routine cervical spine sequences without AiCE and repeated them after adjusting the protocol for optimized AiCE performance, allowing them to directly compare the image quality of the two scans. The three sequences with Canon's AiCE DLR showed an increased signal by removing noise. The additional gain in signal was utilized to improve image quality while reducing the scan time. The increase in image quality provided sharp and clear images to support the radiologist in visualizing pathologies and boosting clinical confidence.

Conclusion

This case shows a great example of how Canon's AiCE Technology can produce a higher signal-to-noise ratio in the images allowing sites to strategically alter their protocol and provide the radiologists with higher-quality images than their routine imaging sequences without AiCE. In this example, the site used the increase in signal to reduce scan time and increase their resolution to improve image quality.

Acknowledgments

The author would like to thank Dawn Berkeley, Hung Do Ph.D., Wissam Al Ghuraibawi Ph.D., and Mo Kadbi Ph. D. for their support when preparing this case study.

Reference

1. *Kilcoyne RF, Richardson ML, Porter BA, Olson DO, Greenlee TK, Lanzer W. Magnetic resonance imaging of soft tissue masses. Clin Orthop Relat Res. 1988 Mar;(228):13-9. PMID: 3342555.*

AiCE provides higher SNR compared to typical low-pass filters.

The clinical results, performance and views described in this paper are the experience of the author. Actual results and performance of Canon Medical's product may be materially different due to clinical setting, patient presentation and other factors.

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