MR/Clinical Case Study

Enhanced Diagnostic Precision in Foot/Ankle MRI

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Introduction

Magnetic Resonance Imaging (MRI) serves as a vital tool for the assessment and diagnosis of various foot pathologies. MRI is particularly helpful with soft tissue contrast differences such as ligaments, cartilage, and muscles. Achieving optimal image quality and precise pathology assessment remains essential. This case study aims to highlight the benefits of Advanced intelligent Clear-IQ Engine (AiCE) reconstruction in a patient's foot/ankle MRI. AiCE is Canon's Deep Learning reconstruction technology that produces stunning MR images that are exceptionally detailed and with the low-noise properties you might expect of a higher SNR image.

History

A 55-year-old male patient presented to the imaging center with a history of benign lipomatous neoplasm of the skin and subcutaneous tissue. A non-contrast MRI of the right foot was conducted for further evaluation.

Image Findings

1. Joint effusion found in the ankle joint with proliferative synovitis (Figures 1 and 2).
2. In the area of the plantar fascia, there is a multilocular cystic lesion close to the skin with low T2 and T1 densities (Figure 3), similar to an inclusion cyst. It measures 16x14x11 mm^3.

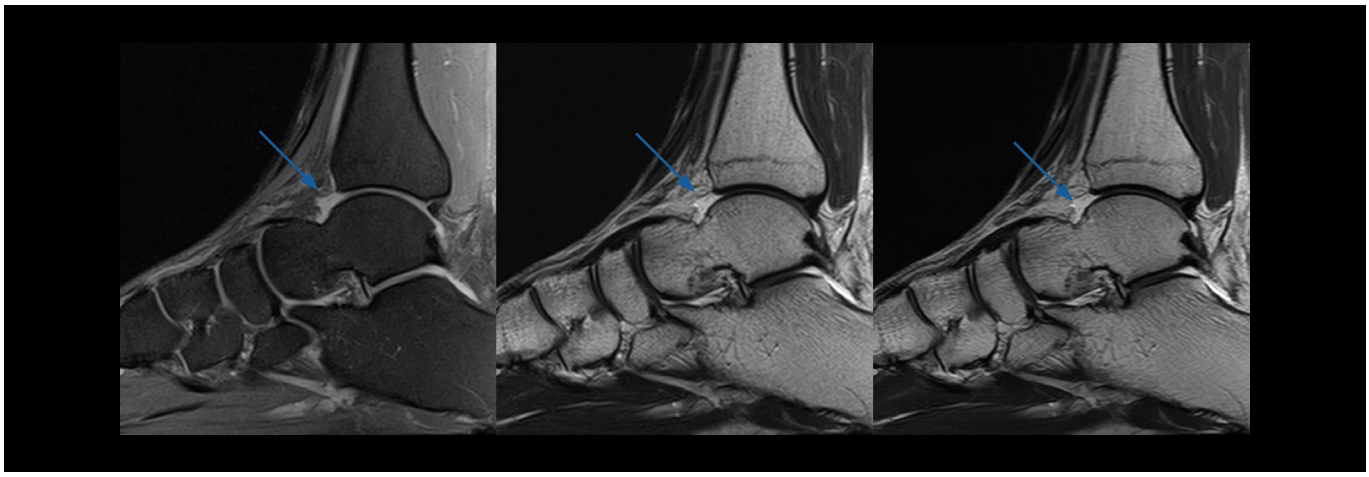

Figure 1: This is an example of the sagittal ankle joint with the effusion shown by the blue arrows. The image on the left shows a sagittal PD FS reconstructed with Canon's AiCE technology. In the middle, you have the T2 with conventional reconstruction at a resolution of 912x608, a slice thickness of 3mm and a scan time of 2:40. On the far right, another T2 acquisition with a resolution of 1152x768, a slice thickness of 3mm and reconstructed with AiCE. The scan time is 2:13 minutes. In this example, the radiologist used the signal gained from the AiCE acquisition to increase the resolution and create a sharper image.

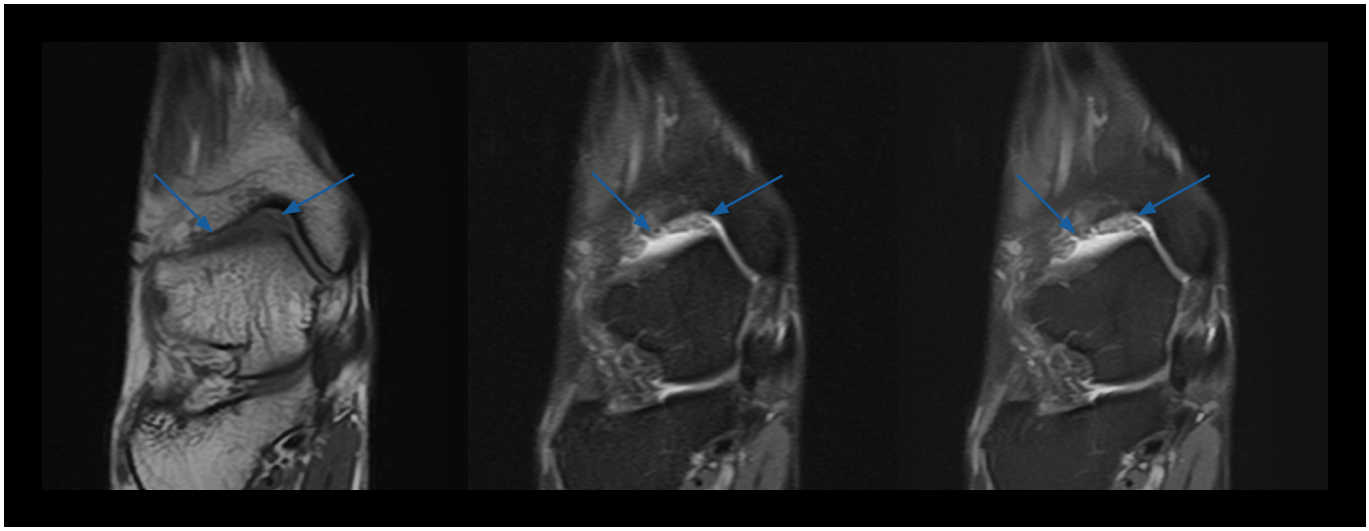

Figure 2: Above is the same joint effusion (blue arrows) as previously seen in the sagittal images now shown in the coronal plane. The left image is a T1 acquisition with AiCE reconstruction. The next two images are PD with fat saturation. The middle image is reconstructed conventionally and has a resolution of 528x608, a slice thickness of 4mm and a scan time of 3:02. The far-right image takes advantage of AiCE and demonstrates a resolution of 556x640, a slice thickness of 4mm and the identical scan time of 3:02. In this example, GO Imaging again decided to use the additional signal gained to increase imaging resolution while maintaining the same scan time.

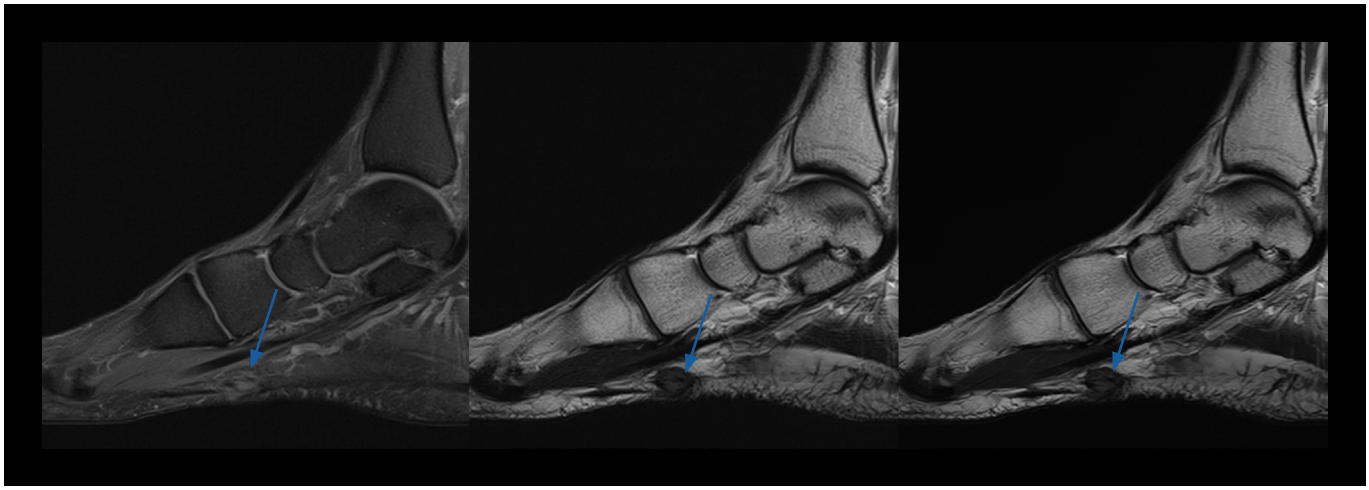

Figure 3: This is an example of the Sagittal T2 showing the multilocular cystic lesion (blue arrows). The left image is a PD FS Sagittal with AiCE reconstruction. The middle image is a T2 Sagittal acquisition using conventional reconstruction with a resolution of 912x608, a slice thickness of 3mm and a scan time of 2:40. The far-right image is a T2 Sagittal acquisition with a resolution of 1152x768, a slice thickness of 3mm and is reconstructed with AiCE. The scan time is 2:13 minutes. The AiCE image has less noise and a higher signal to noise which allows the depiction of detail in the bone and tissue.

Discussion

GO Imaging performed two routine foot sequences without AiCE and repeated them after optimizing the protocol for AiCE. This allowed for a direct comparison of the image quality between the two scans. The two sequences with Canon's AiCE DLR showed an increased signal-to-noise ratio (SNR) by effectively removing noise. The additional gain in SNR was utilized to increase imaging resolution, resulting in improved sharpness and detail.

Conclusion

This case study emphasizes the significance of advanced imaging in foot/ankle MRI, particularly for the detailed assessment of soft tissue. This case is a great example of how Canon's AiCE Technology can produce a higher signal-to-noise ratio in the image allowing sites to strategically alter their protocol and provide the radiologist with higher-quality images than their routine imaging sequences without AiCE. In this example, the site used the additional signal to reduce scan time and increase its resolution to improve image quality.

Acknowledgments

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The clinical results, performance, and views described in the 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.

AiCE provides higher SNR compared to typical low-pass filters

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