AIR™ Recon DL and AIR™ family of technologies

Enabling superior image quality in shorter scan time – Precision Imaging Center, Jacksonville, Florida

Founded almost a decade ago, Precision Imaging Center (PIC) operates four multi-modality diagnostic centers in Florida. With board certified radiologists and the most advanced equipment in the industry, PIC is a thriving practice committed to providing patients a high quality of care.

The center performs >90,000 procedures annually. Being a high-volume facility, workflow efficiency has been of paramount importance. Delivering high-definition images without impacting patient comfort has been one of their key visions.

Enabling lower scan time while enhancing image quality

"Due to AIR™ Coils and the SIGNA™ Premier Lift program, we were already at very fast scan times. We do 15 minutes patient slots at our facility even with contrast. We have very tight protocols - in 15 minutes time span the protocols run for about 11-12 minutes. That leaves a lot of time for patients to get off the table or to deal with claustrophobia."

Joe Siebert, RT(R) (MR)(CT),
Chief Technologist, PIC – Jacksonville, Florida

In 2019, Precision Imaging Center leveraged the SIGNA™ Premier Lift Program and upgraded their MRI system. The facility has also been leveraging the AIR™ family of technologies comprising of AIR™ Coils, AIR Touch™ and AIR x™. Since then, the imaging center has been running fast scan times (typically 10 – 12 minutes patient table time) with improved operational efficiency (~50 scans per day).

In 2021 the facility adopted AIR™ Recon DL - a pioneering, deep-learning based reconstruction algorithm that improves SNR and image sharpness. The deployment of AIR™ Recon DL was expected to drive shorter scan times at similar image quality. However, the stakeholders at the facility were pleasantly surprised with the boost in SNR and image resolution along with significant time gains.

"The idea behind deploying AIR™ Recon DL was to save some more time without losing any image quality; so that we could keep to those 15 minutes patient slots and provide a lot less stressful exams for the tech as well as patients."

Joe Siebert, RT(R) (MR)(CT
Chief Technologist; PIC – Jacksonville, Florida

Driving enhanced image quality in musculoskeletal scans at ~50% shorter scan time[1]

Elbows are difficult to scan; because of the way the arm has to be positioned and the way the patient might be sitting in the gantry. We went from roughly 11 minutes for an elbow to about 6 minutes. That is pretty significant.

Joe Siebert, RT(R) (MR)(CT)
Chief Technologist

MSK scans such as knee, elbow, foot, and ankle were already optimized for image quality as well as scan time. However, after the deployment of AIR™ Recon DL, the scan times were reduced further. In addition, the radiologists have observed significant improvement in the image quality with respect to sharpness and SNR. Visibility of minor tears and meniscus has improved significantly. Despite being technically challenging to position and scan, the MSK procedures are now being conducted in approximately 50% less time as compared to pre- AIR™ Recon DL.

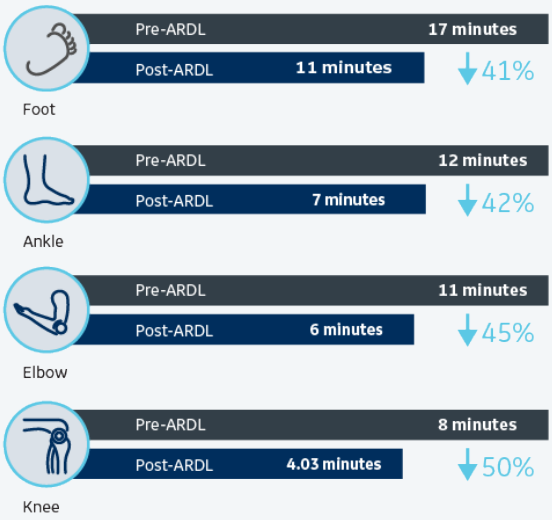
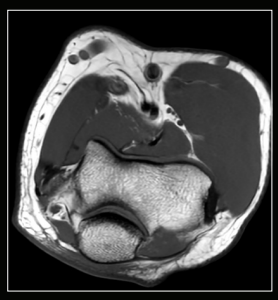


Figure 1: Reduction in scan acquisition time across MSK procedures with AIR™ Recon DL (ARDL)[1]



Axial T1 FSE; 0.4 x 0.5 x 4.0 mm; 40 sec. (32 slices)

Axial T2 FS FSE; 0.4 x 0.5 x 4.0 mm; 49 sec. (32 slices)

Coronal T2 FS FSE; 0.4 x 0.6 x 3.0 mm; 46 sec. (31 slices)

Coronal T1 FSE; 0.4 x 0.6 x 3.0 mm; 41 sec. (31 slices)

Sagittal T2 FS FSE; 0.4 x 0.4 x 3.0 mm; 44 sec. (28 slices)

Sagittal T1 FSE; 0.4 x 0.4 x 3.0 mm; 49 sec. (28 slices)

MRI of the knees can be painful for the patient with the extension of the leg from the bent position. Five minute AIR™ Recon DL protocols are a lot more tolerable while making the meniscus blurring a thing of the past. Within 5 minutes we are running full protocols with crisp resolution.

Joe Siebert, RT(R) (MR)(CT)
Chief Technologist; PIC –
Jacksonville, Florida

Coronal T1 FSE; 0.4 x 0.5 x 3.0 mm; **1:05 min.**

Sagittal PD (ACL); 0.3 x 0.5 x 2.0 mm **35 sec.**

Axial PD FS FSE; 0.4 x 0.5 x 3.0 mm **1:20 min.**

Sagittal PD FS FSE; 0.4 x 0.5 x 3.0 mm **1:03 min.**

Total Scan Time: 4:03 min.

Figure 3: Knee scan using HyperSpeed AIR™ Recon DL

Improving the access to routine multiparametric prostate scans for patients with MR Conditional implants

Multiparametric prostate scans were another area where AIR™ Recon DL has been driving scan time improvements along with image quality. In addition, the imaging center has now been extending these scans to patients with MR Conditional metal implants, thereby improving access.

We also saw an increase in quality on patients who have metal. The ability to increase the bandwidth to maximize the benefits of the AIR™ Recon DL, allowed artifacts from metal to be less pronounced. Patients who have had hip replacements are now able to get the diffusion weighted imaging, where before they weren't.

Joe Siebert, RT(R) (MR)(CT
Chief Technologist; PIC –
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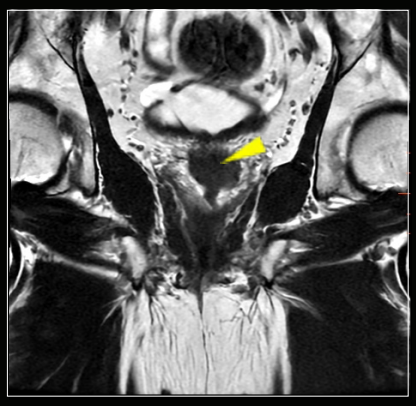
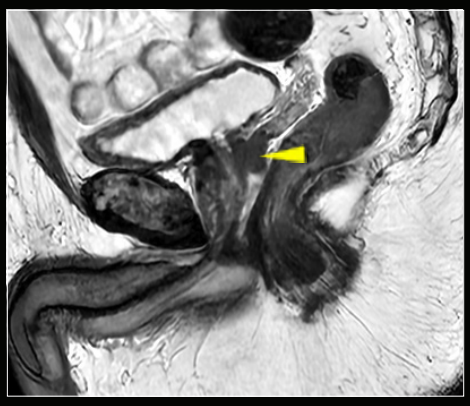
Without omitting fusion and fat saturation on the post gadolinium sequences, the patients with implants now receive routine protocols. This has further reduced the table time and improved patient comfort. With the inclusion of AIR™ Recon DL, there has been ~39% gain in time. Earlier the scan would take about 18 minutes; now with the help of AIR™ Recon DL, multiparametric scan can be seamlessly conducted in ~11 to 12 minutes.

Figure 4: Reduction in scan acquisition time for multiparametric prostate scans with AIR™ Recon DL (ARDL)[1]

Axial T2 FSE; **1:11 min.**



Coronal T2 FSE; **57 sec.**



Sagittal T2 FSE; **57 sec.**

Figure 5: Multiparametric prostate imaging with AIR™ Recon DL

Reducing motion artifacts and advancing small Field of View (FOV) imaging

Traditionally, in a dynamic contrast-enhanced series, irregular breathing may cause slight motion artifacts. However, with AIR™ Recon DL, image sharpness, SNR and CNR have improved significantly - thus rendering high diagnostic value. Furthermore, the ability to optimize protocols for a shorter scan time and higher resolution has helped technicians in reducing the number and length of breath holds.

> **The number and extent of breathholds needed are lower because time between imaging is faster. As a result, our cardiac imaging and dynamic contrast enhanced images have improved significantly.**

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Chief Technologist; PIC –
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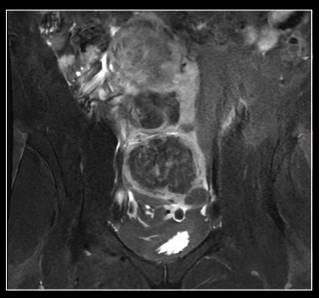

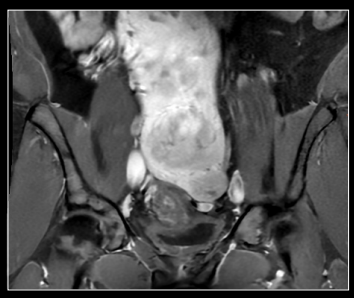

Figure 6: Female pelvis scan with AIR™ Recon DL, 30 channel AIR™ AA Coil and 60 channel AIR™ PA Coil

AIR™ Recon DL is now being deployed across all anatomies, protocols, applications, and pulse sequences. With AIR™ Recon DL, the system has pre-loaded protocols with optimizations for scan time reduction, such as fewer NEX and increased use of parallel imaging acceleration all leading to reduced scans with better image quality.

> **We are finding the most success in smaller field of views with AIR™ Recon DL.**

Joe Siebert, RT(R) (MR)(CT)
Chief Technologist; PIC –
Jacksonville, Florida

Resolution and lesion detectability in small field of view imaging has also improved significantly. Earlier, achieving higher resolution in small FOV imaging meant long scan time. However, with AIR™ Recon DL, the scan times have been halved and small lesion detectability has been improved significantly.

Providing flexibility to add more sequences without disrupting the schedule for technologists

> **With AIR™ Recon DL the scan times are significantly lower. Thus, we now have the flexibility to add more sequences without impacting the patient's table time. We have the time to add in a sequence without the stress of running behind. The technologists are less stressed and can add value by counselling the patient or by spending more time with them.**

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Chief Technologist; PIC –
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Post AIR™ Recon DL, the technologists at Precision Imaging Center have been able to add more sequences and to enhance image quality without any impact on the patient's table time. After completing multiple T2 images with and without fat saturation at shortened scan time, the technologists now can also include Flex sequence to gather more clinically relevant data. Similar additional sequences across other MSK scans such as fingers, knees, elbow, etc. have heightened the diagnostic value of the images.

Marching towards operational efficiency and clinical excellence with AIR™ Recon DL

With AIR™ Recon DL and the associated shorter patient table time, the imaging center has been able to schedule 50-55 patients per day. Despite the increase in the number of contrast enhanced exams conducted per day, the per day procedural volume at the center has been improving.

Prior to AIR™ Recon DL, the center conducted ~18 contrast enhanced exams per day. However, now with faster scan times, the facility can easily accommodate 24-25 contrast enhanced exams per day. The technologists can now complete 4 scans per hour without worrying about disrupting the scan schedule. The technologists can now complete the scans at an average of eight to nine minutes; thus, allowing them to use the rest of the time towards improving the patient experience.

> **I just see that the technologists are a lot less stressed and can work more with the patients in terms of claustrophobia. Our throughput has gone high, but the stress level on the techs who have to perform scans back-to-back, continues to go down. With AIR™ Recon DL we can keep such a rigid schedule yet have more flexibility.**

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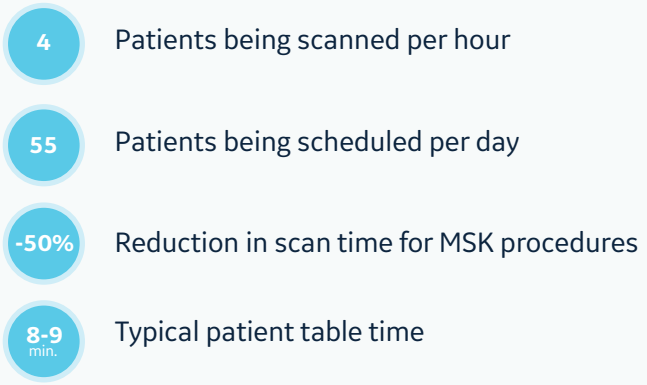

Figure 7: Impact of the SIGNA™ Lift Program and AIR™ at Precision Imaging Center[1]

The technologists are now applying AIR™ Recon DL to all the scan types. As the procedural volume improves, the facility is envisioning an increase in the referrals for cardiac exams and other contrast enhanced exams that typically have higher reimbursement rates.

1- Based on discussion with various stakeholders at Precision Imaging Center.

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