

Al-Mansoura Advanced
Radiology Center Improves
Image Quality While Reducing
Scan Times with Upgrade to
AIR™ Recon DL



Al-Mansoura Advanced Radiology Center Improves Image Quality While Reducing Scan Times with AIR™ Recon DL

As one of the leading private imaging centers in Egypt since 1996, Al-Mansoura Advanced Radiology Center performs approximately 150 MRI, CT, Ultrasound and X-ray exams each day. Eight of the center’s 20 radiologists are professors at local universities, each with more than 20 years of experience. In 2015, Al-Mansoura Advanced Radiology Center opened another imaging center to help meet the demand for advanced imaging services in northern Egypt.

With its reputation for excellence in diagnostic imaging, residents from surrounding cities will often travel to Al-Mansoura Advanced Radiology Center for more advanced studies, such as MRI. Both imaging centers have an MRI system – a 15-year-old GE SIGNA™ HDe 1.5T and a seven-year-old GE SIGNA™ Explorer 1.5T that was recently upgraded to SIGNA™Works AIR™ IQ Edition featuring deep learning technologies like AIR™ Recon DL and AIR x™.

According to Sabri El Mogy, MD, Professor of Radiology, Mansoura University, the biggest challenge in MRI is the time it takes to perform an

exam. A typical day involves around 25 MRI exams at both centers. During the summer months, demand for MRI services can peak to nearly 40 exams each day. Due to the center’s excellent reputation for high-quality MRI services, many of the cases are complex and require high signal-to-noise-ratio (SNR) and high spatial image resolution.

“Because of the longer time it takes to perform an MRI exam, we can only do a limited number of patients,” he says. “When the cases are exceeding our capacity, the staff is stretched and stressed to handle the case load.”

Now, however, this has changed, thanks to AIR™ Recon DL. Across all MRI imaging procedures, Al-Mansoura Advanced Radiology Center has reduced exam times by an average of 37%. This translates to 1200 minutes each month of saved time that can be used to scan additional patients by modifying the schedule to shorter scan time slots. Recently, the center can now accommodate up to 60 MRI exams per day on the upgraded system with Image quality improvement.¹

+1200 min / Month

To be spent with patients or converted in new exam Slots by changing scheduling rules

Procedure	Time Reduction (min)	Time Reduction (%)	Average # of Exams per Month (after AIR™ Recon DL)	New Available Time per Month (min)
Lumber Spine	2,7	40	128	345
Brain	5,5	45	100	550
Cervical Spine	1,5	30	52	78
Knee	1,9	30	112	212
Shoulder	2,7	40	31	83

As important, Professor El Mogy says the image quality has significant improvement in signal-to-noise ratio (SNR) based on an in-house study conducted by the team at Al-Mansoura Advanced Radiology Center.²

“Some pathologies that were previously difficult to discern have become more clear, distinctive and apparent,” Professor El Mogy adds.

The upgrade experience

Professor El Mogy was not just pleased with the upgrade process, it exceeded his expectations. Just after the installation, he and his team were asked to try out the upgraded scanner.

“The first results were amazing,” Professor El Mogy adds. “We were very happy the installation was over the weekend and two extra working days.” Now, an older MR system at Al-Mansoura Advanced Radiology Center, the SIGNA™ HDe, is also undergoing an upgrade, thanks to the success of the SIGNA™ Explorer Lift.

The impact of higher SNR

At Al-Mansoura Advanced Radiology Center, the improvement in SNR has enabled wider adjustment abilities to the critical imaging parameters, for example, the NEX encoding matrices and receive bandwidth, which allowed for better scan time and image quality controls beyond expectations. As a result, T2 imaging in the brain and spine have decreased from 2 minutes 7 seconds to 40 seconds. In musculoskeletal imaging, total exam time has decreased from ~14 minutes to 4 minutes 30 seconds.¹

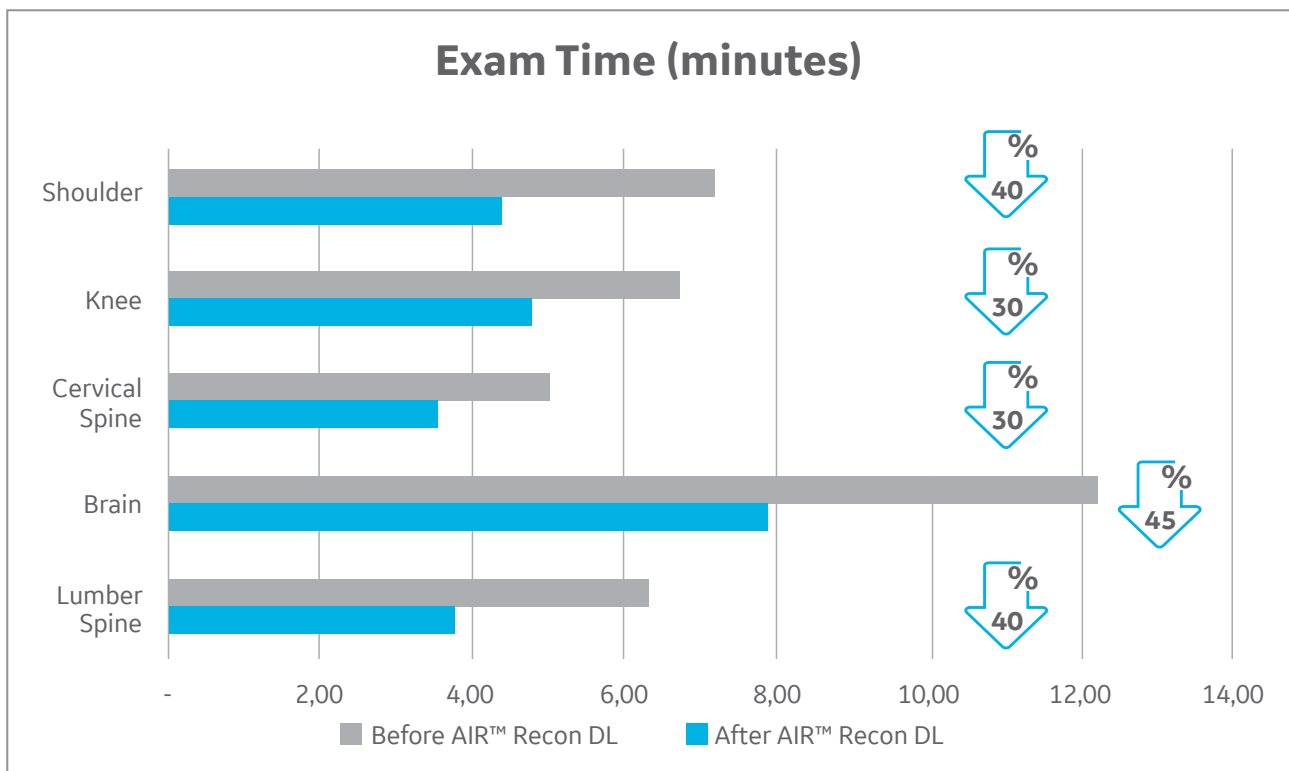


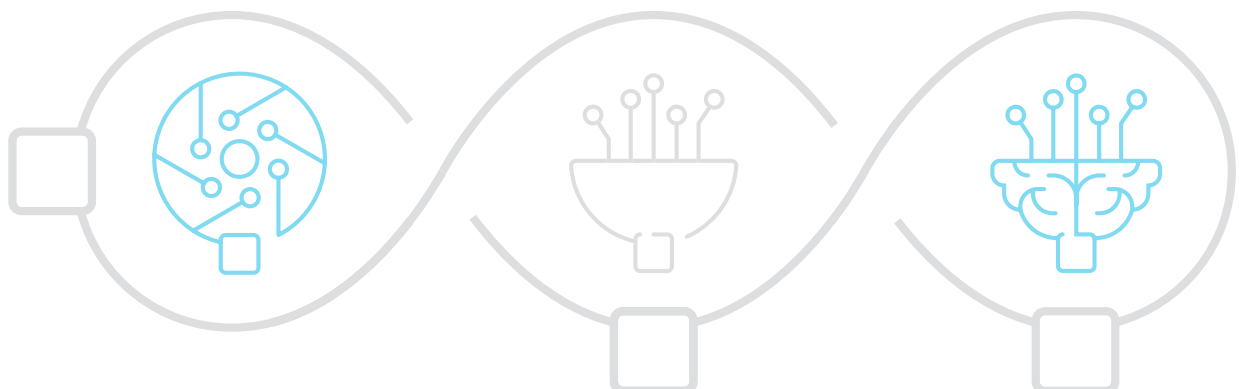
Table 1. Reduction in average exam time.

“This is a breakthrough in MR technology,” Professor El Mogy says. “With AIR™ Recon DL, the sequences have gone from minutes to seconds.”

Reducing scan times not only helps reduce staff stress, particularly during the busy summer months, but it also lowers the patient’s anxiety. In pediatrics, faster scan times have enabled the center to avoid the use of sedation or anesthesia in many cases. It has also helped avoid exams that failed due to patient claustrophobia, where the patient could not tolerate the scan and it had to be aborted.

In some cases, Professor El Mogy believes the higher SNR and resolution provides images at 1.5T that are comparable to some 3.0T scanners. For example, in multiple sclerosis cases, they can perform cervical spine with sagittal views on 1.5T without a significant increase in scan time and obtain the desired quality. While more investigation is needed, he is optimistic that AIR™ Recon DL can help centers and regions that don’t have access to 3.0T MR systems perform these more complex studies.

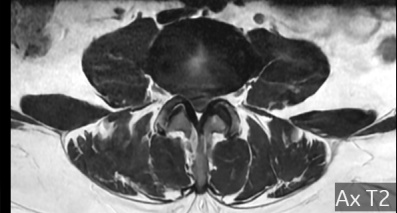
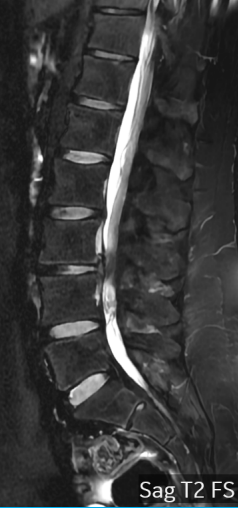
Clinical cases:



Lumbar Spine

AIR™ Recon DL

Total Scan Time
 < 7 minutes



Sag T2 FSE Res(mm): 0.8x1.2x4.0 Scan Time: 00:57	Sag T2 FS Res(mm): 0.8x1.2x4.0 Scan Time: 00:57
Sag T1 FSE Res(mm): 0.8x1.2x4.0 Scan Time: 01:00	Ax T2 FSE Res(mm): 0.7x0.9x4.0 Scan Time: 01:29

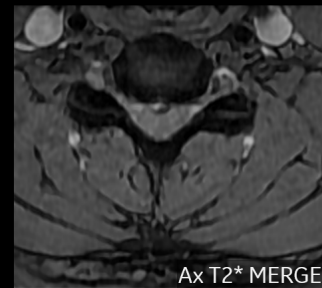
Data & images are courtesy of Prof. Sabry El Mogy | Advanced Diagnostic Center, Al Mansoura / Egypt

Cervical Spine

AIR™ Recon DL

Total Scan Time
 < 5 minutes

AIR™ Recon




Sag T2 FSE Res(mm): 0.7x1.0x3.0 Scan Time: 01:04	Sag T1 FSE Res(mm): 0.7x1.0x3.0 Scan Time: 01:01
Sag STIR FSE Res(mm): 0.8x1.0x3.0 Scan Time: 01:06	Ax T2* MERGE Res(mm): 0.6x1.1x4.0 Scan Time: 01:44

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Brain Pediatric

AIR™ Recon DL

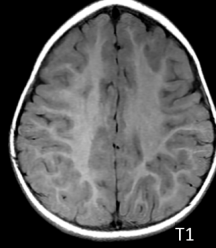


Total Scan Time
<9 minutes

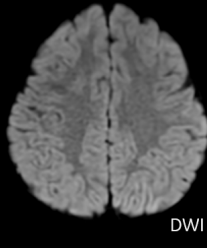
AIR™ Recon




T1



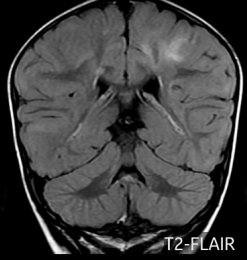
T1



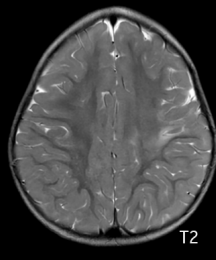
DWI



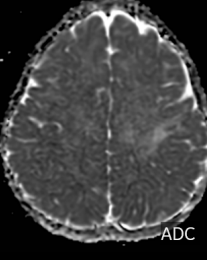
3D SWAN (Magnitude)



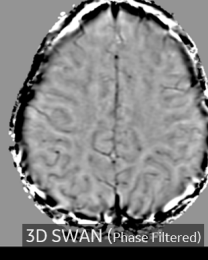
T2-FLAIR



T2



ADC



3D SWAN (Phase Filtered)

Sag T1 SE
Res(mm): 0.6x1.0x4.0
Scan Time: **01:26**

Ax T1 SE
Res(mm): 0.6x0.9x4.0
Scan Time: **01:15**

Ax DWI
Res(mm): 1.5x1.3x4.0
Scan Time: **01:00**

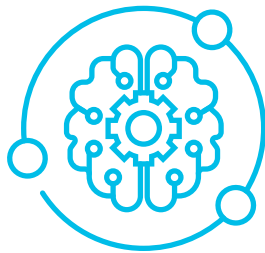
Ax 3D SWAN
Res(mm): 0.8x1.1x4.0
Scan Time: **01:27**

Cor T2-FLAIR
Res(mm): 0.7x1.0x4.0
Scan Time: **02:25**

AxT2 FLAIR
Res(mm): 0.5x0.6x4.0
Scan Time: **00:58**

*16Ch Flex Large Coil

Data & images are courtesy of Prof. Sabry El Mogy | Advanced Diagnostic Center, Al Mansoura / Egypt



Precision in brain imaging

Another key component of the SIGNA™Works AIR™ IQ Edition is AIR x™, which uses deep learning algorithms to automatically detect and prescribe slices for routine and challenging neurological exams to produce consistent and quantifiable results.

“For follow-up brain MR exams, AIR x™ is very important,” Professor El Mogy explains. “If we detect pathology or a lesion, and the scan plane or angle changes, then we may think that the size of that pathology has also changed.”

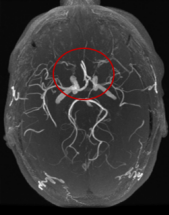
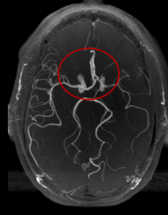
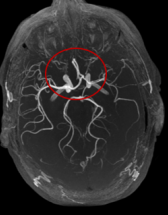
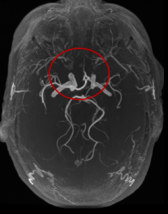
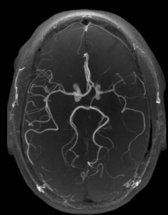
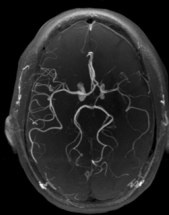
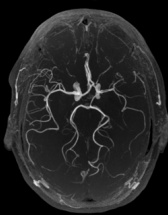
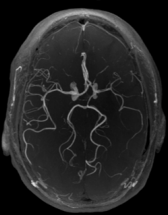
AIR x™ Intelligent slice placement Consistent results no matter how you slice it



3D TOF - COW

Get the right slice each time, regardless of who's scanning or how they are positioned

Same patient scanned by 4 different technologists over a 9 month period

	Time Point #1	Time Point #2	Time Point #3	Time Point #4
Manual (w/o AIR x™)				
AIR x™				
	Technologist 1	Technologist 2	Technologist 3	Technologist 4

NeuroWorks

With the same scan plane, the radiologists are more confident in their measurements as to whether there was a change in the pathology or not. For patients, that means the information being used to guide their treatment is more reliable and accurate, thus avoiding any unnecessary or incorrect changes to their therapy plan.

A more efficient workflow

A reduction in scan time enables the clinic to do more cases per day, improve the patient experience and reduce the stress felt by technicians. The shorter exam time is providing greater patient comfort and cooperation during the scan. According to Professor El Mogy, it also decreases the possibility of motion artifacts, which impacts image quality.

For the radiologists, better image quality with fewer motion artifacts translates to more confidence in reading and the ability to read more cases in the same amount of time.

For technicians, prior to the upgrade their biggest challenge was the ability to obtain the highest resolution exam in a reasonable scan time. According to the lead technician, Mohammed Medhat, this was particularly stressful when faced with a very full workload of cases.

“After our initial training and learning how to use these new technologies, we loved this system upgrade,” says Mohammed. “We were taught how to use AIR™ Recon DL and it was very easy to implement in a few days.”

He adds that patients no longer need to wait for their MRI exam, because the scan times are shorter now. And, when the patient comes out of the scanning room sooner than expected, Mohammed believes it lowers the next patient’s anxiety and they are more comfortable and relaxed to undergo their own exam.

Further simplifying the technician’s workflow is AIR x™. While it is certainly useful to provide efficient and reproducible planning to ensure exam consistency in patient follow-up studies, Mohammed says it is also helpful when the patient needs to go back on the table for additional sequences, or if they need to fully come out of the bore for contrast injection.

“AIR x™ is faster, simpler and very helpful for the technician, especially for the novice staff when they need more experience for certain anatomy scans,” Mohammed says. “Yet, it is also helpful for the senior technicians, like me. I always depend on AIR x™, when I’m working.”

Improved staff and patient satisfaction

Physician burnout appears to have permeated many different fields in healthcare and it is particularly pervasive in the radiology community. A recent Medscape survey found that 47% of radiologists polled are suffering from burnout.³ The combination of increased imaging volume, declining reimbursements and shortages in the radiology workforce due in part to increased retirements and insufficient radiology residency positions also leads to an undeniable domino effect with burnout, according to Amy K. Patel, MD, the medical director of the Breast Care Center at Liberty Hospital in Liberty, Missouri.⁴

Professor El Mogy adds, “Thanks to this upgrade and AIR™ Recon DL and AIR x™, we now see the technicians are finishing the exam sooner than the allocated scheduled time. So, they are under less pressure with repeated tasks as well.” He hopes this will alleviate the staff stress and burnout that often occurs in very busy MR imaging centers. Moreover, the technicians will be able to spend more time with the patients, which will increase patient satisfaction.

Conclusion

As a result of the SIGNA™ Explorer system upgrade to SIGNA™Works AIR™ IQ Edition featuring deep learning technologies such as AIR™ Recon DL and AIR x™, Al-Mansoura Advanced Radiology Center has expanded patient capacity and throughput, and simultaneously improved image quality and shortened scan times. The upgrade has made it easier for radiologists to deliver more precise reports with enhanced diagnostic confidence. Overall, the upgrade was quick and easy for the staff at Al-Mansoura Advanced Radiology Center thanks to the support and expertise of GE’s clinical applications teams, leading to an excellent experience for all involved.

References:

1. iCenter report, AIR RECON DL @Al-Mansoura Advanced Radiology Center ARDL Analysis, May 2022
2. Based on the customer testimonial during the interview conducted on May 31st, 2022.
3. Baggett SM, Martin KL. Medscape radiologist lifestyle, happiness & burnout report 2022. Medscape. Available at: <https://www.medscape.com/slideshow/2022-lifestyle-radiologist-6014784#1> . Published February 18, 2022. Accessed March 24, 2022.
4. <https://www.diagnosticimaging.com/view/has-burnout-become-an-epidemic-in-radiology->

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