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Improving patient access and clinical productivity with a new wide bore, power-efficient and AI-enabled MR system

A recent survey reports that key factors influencing the purchase of MR systems are patient satisfaction with the imaging experience and improved department workflow and productivity.[1] Technological advancements using artificial intelligence (AI), such as AIR™ Recon DL and Sonic DL™, are enabling shorter scan times and high image quality, providing an efficiency boost for many imaging departments. Shorter scan times coupled with the comfort of AIR™ Coils and wide bore systems further enhance the patient experience. In an era of increasing demand for MR imaging, these technologies are often important in the decision-making process.

This is the case at Imapôle Lyon-Villeurbanne in Lyon, France, a high-volume imaging clinic that performs 450 to 500 MR examinations each week with two MR systems.

"We wanted a 70 cm wide bore MR with the latest technology to replace our SIGNA™ Voyager 1.5T," says Samir Lounis, Executive Director. "We decided to choose SIGNA™ Champion 1.5T to benefit from the latest

AI technologies as well as the AIR Coils. What impressed us the most in this latest system is the small amount of space that the magnet and the fixed table require."

SIGNA Champion is GE HealthCare's newest 1.5T wide bore MR scanner, designed to create unparalleled access to exceptional diagnostic precision and uncompromised comfort for every patient. It's also a green magnet, requiring 70% less helium, lower power consumption and less space with a small footprint.
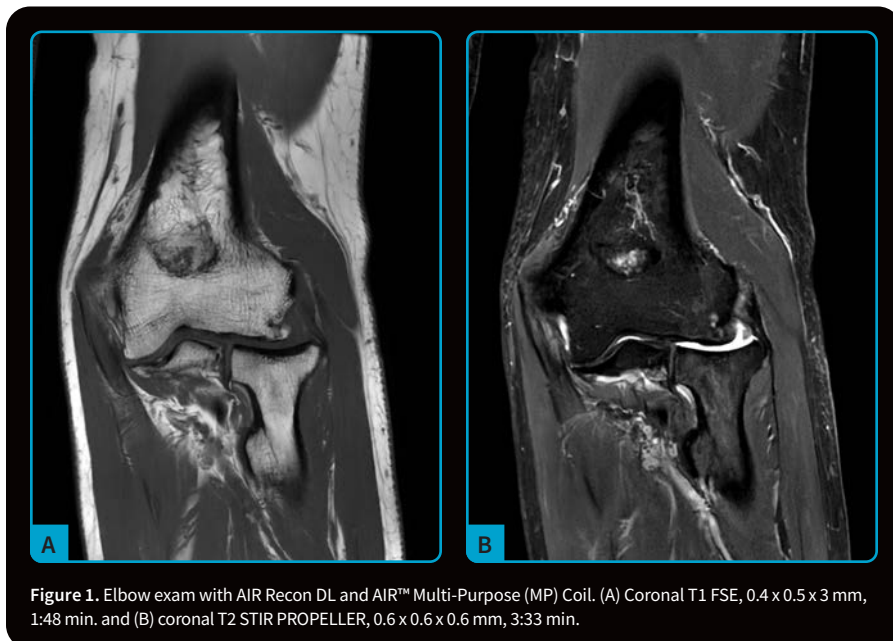
Figure 1. Elbow exam with AIR Recon DL and AIR™ Multi-Purpose (MP) Coil. (A) Coronal T1 FSE, 0.4 x 0.5 x 3 mm, 1:48 min. and (B) coronal T2 STIR PROPELLER, 0.6 x 0.6 x 0.6 mm, 3:33 min.
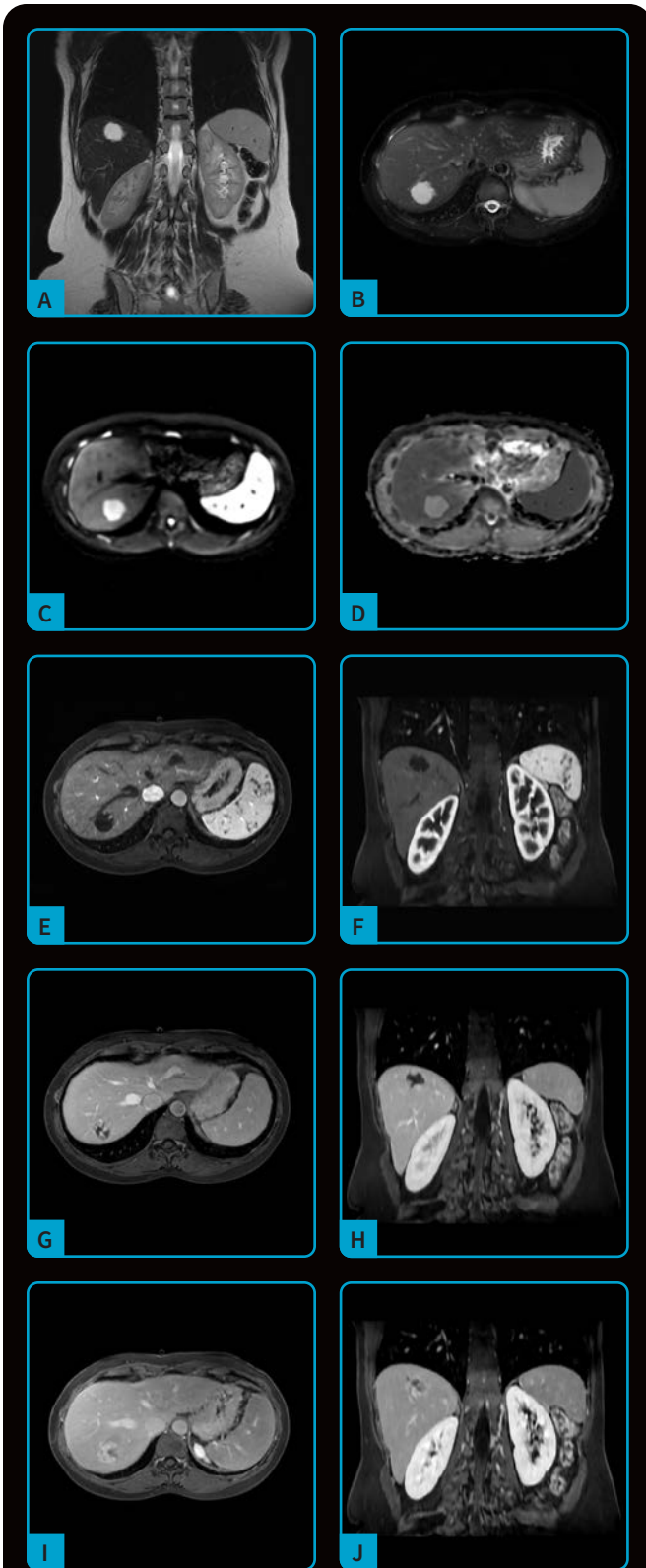
Figure 2. Liver exam in a patient with angioma using AIR Recon DL, AIR Coils and wireless respiratory gating. (A) Coronal T2 SSFSE, 1.5 x 2 x 4.5 mm, 16 sec.; (B) axial T2 SSFSE FatSat, 1.2 x 1.5 x 5 mm, 1:01 min.; (C) axial DWI b800 in free breathing with respiratory gating, 3.8 x 2.7 x 5 mm, 3:15 min. and (D) corresponding ADC map; (E) axial 3D LAVA, 3 multi-arterial phases with 1 breath hold, 1.6 x 2.5 x 4 mm, 21 sec. and (F) coronal reformat; (G) axial 3D LAVA portal phase with 1 breath hold, 1.2 x 1.8 x 4 mm, 18 sec. and (H) coronal reformat; (I) axial 3D LAVA delayed phase with 1 breath hold, 1.4 x 2 x 4 mm, 18 sec. and (J) coronal reformat.

According to Mr. Lounis, Imapôle Lyon-Villeurbanne is committed to purchasing with a corporate social responsibility approach. It was clear to him that a lighter, more energy-efficient system requiring less space would fit perfectly in the clinic. SIGNA Champion is 30% lighter than other GE HealthCare MR systems, leading to reduced CO_2 emissions during transport and lower siting costs.

As impressive as the energy efficiency and smaller siting features of SIGNA Champion was the speed of installation.

"Normally, it takes three weeks to install a new MR system. In this case with SIGNA Champion, it took only two weeks—it's a game changer."

Samir Lounis
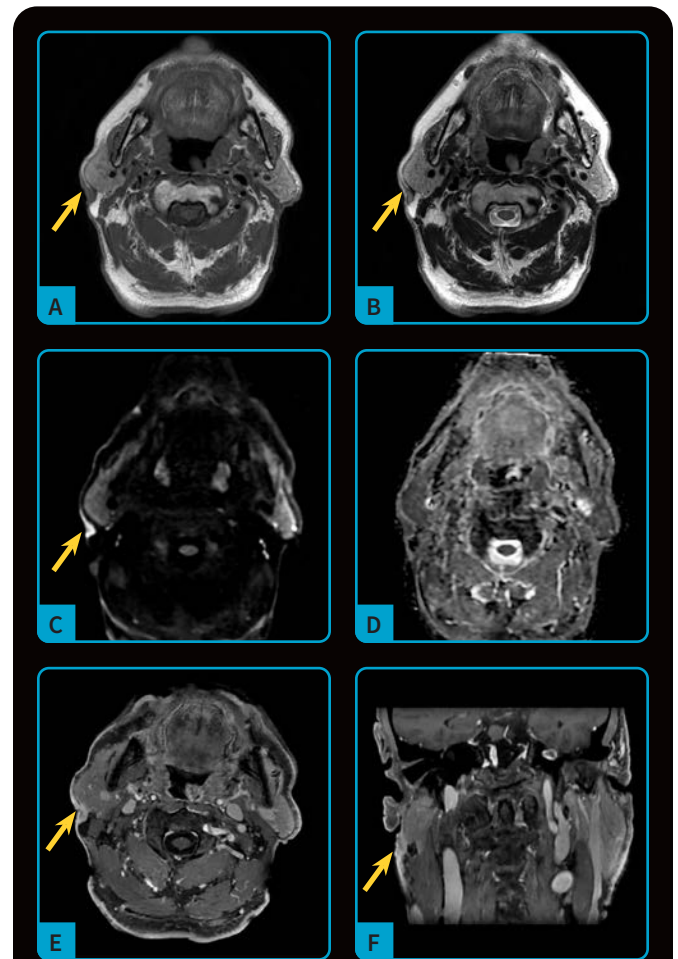
Figure 3. Neck exam in a patient with right subauricular skin cancer demonstrating improved sharpness of reconstructed planes from 3D images with AIR Recon DL. (A) Axial T1 PROPELLER, 0.9 x 0.9 x 3 mm, 2:16 min.; (B) Axial T2 PROPELLER, 0.7 x 0.7 x 3 mm, 2:57 min.; (C) Axial DWI b1000, 2.2 x 1.6 x 4 mm, 3:25 min. with (D) corresponding ADC map; and (E) post-contrast axial 3D LAVA, 1 x 1 x 1.2 mm, 2:08 min. with (F) coronal reformat.
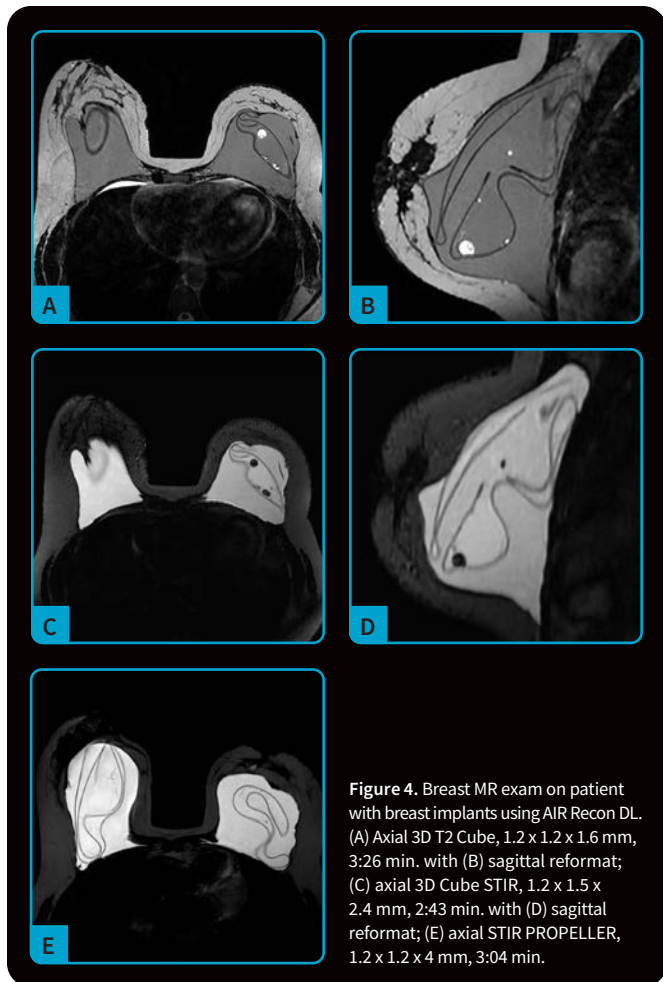
Figure 4. Breast MR exam on patient with breast implants using AIR Recon DL. (A) Axial 3D T2 Cube, 1.2 x 1.2 x 1.6 mm, 3:26 min. with (B) sagittal reformat; (C) axial 3D Cube STIR, 1.2 x 1.5 x 2.4 mm, 2:43 min. with (D) sagittal reformat; (E) axial STIR PROPELLER, 1.2 x 1.2 x 4 mm, 3:04 min.

Figure 5. Complete standard shoulder exam in 5:16 min. using AIR MP Coil and AIR Recon DL PROPELLER for a full motion-insensitive protocol. (A) Axial T2 FatSat PROPELLER, 0.6 x 0.6 x 3 mm, 1:33 min.; (B) coronal T2 FatSat PROPELLER, 0.6 x 0.6 x 3 mm, 1:21 min.; (C) sagittal T2 FatSat PROPELLER, 0.6 x 0.6 x 3 mm, 1:27 min.; and (D) sagittal T1 PROPELLER, 0.6 x 0.6 x 3 mm, 54 sec.

It didn't take long for the technologists at Imapôle Lyon-Villeurbanne to be up and running with SIGNA Champion once the installation was complete. As an existing GE HealthCare MR site, the team was familiar with the user interface and how to maximize the use of AIR Recon DL. As the first worldwide installation of SIGNA Champion, GE HeathCare's clinical applications team worked with Cédric Poullaouëc, lead technologist, to review any new features and optimize protocols.

New to Mr. Poullaouëc and his team of technologists is the curved table that facilitates patient positioning and increases patient comfort. The table goes very low, down to 49 cm from the floor, which helps his team get elderly or immobilized patients onto the table.

Imapôle Lyon-Villeurbanne is now performing 50 MR exams per day on SIGNA Champion. With SIGNA™ Hero 3.0T also operating at a similar high level of productivity, the clinic can image up to 100 patients in a 12-hour day, opening up access to more people who need an MR imaging study.

### Exceptional high-performance, quality imaging

SIGNA Champion's unique combination of generous patient clearance inside the bore, short scan times and GE HealthCare's award-winning AIR Coils support a more natural and comfortable patient experience. This is especially beneficial for patients experiencing significant pain and discomfort, including pregnant and bariatric patients, patients unable to lie on their backs, and patients with breathing difficulties. AIR Coils wrap around the patient like a blanket, offering a thinner, lighter solution compared to conventional RF coils, enhancing patient comfort with exceptional image quality.

With the installation of SIGNA Hero in 2022, technologists were already familiar with advantages of AIR Coils, allowing for an optimal workflow and offering less restrictive handling and maximum comfort for patients. On SIGNA Champion, radiologists are seeing improvements in image quality due to the use of AIR Coils and AIR Recon DL, particularly in osteoarticular and body imaging. Diffusion imaging is very sensitive, particularly in body imaging, such as the pancreas.

"On SIGNA Champion, we can perform up to six knee MR examinations in 1 hour."

Cédric Poullaouëc

Mr. Lounis adds that in MSK examinations, SIGNA Champion is providing very good image quality with impressive fat homogeneity in a 3-minute STIR sequence of the elbow, even in cases when the arm is imaged along the side of the body. Mr. Poullaouëc can use the 21-channel AIR MP Coil for brachial plexus with excellent image quality and fat homogeneity. In the shoulder using AIR Recon DL
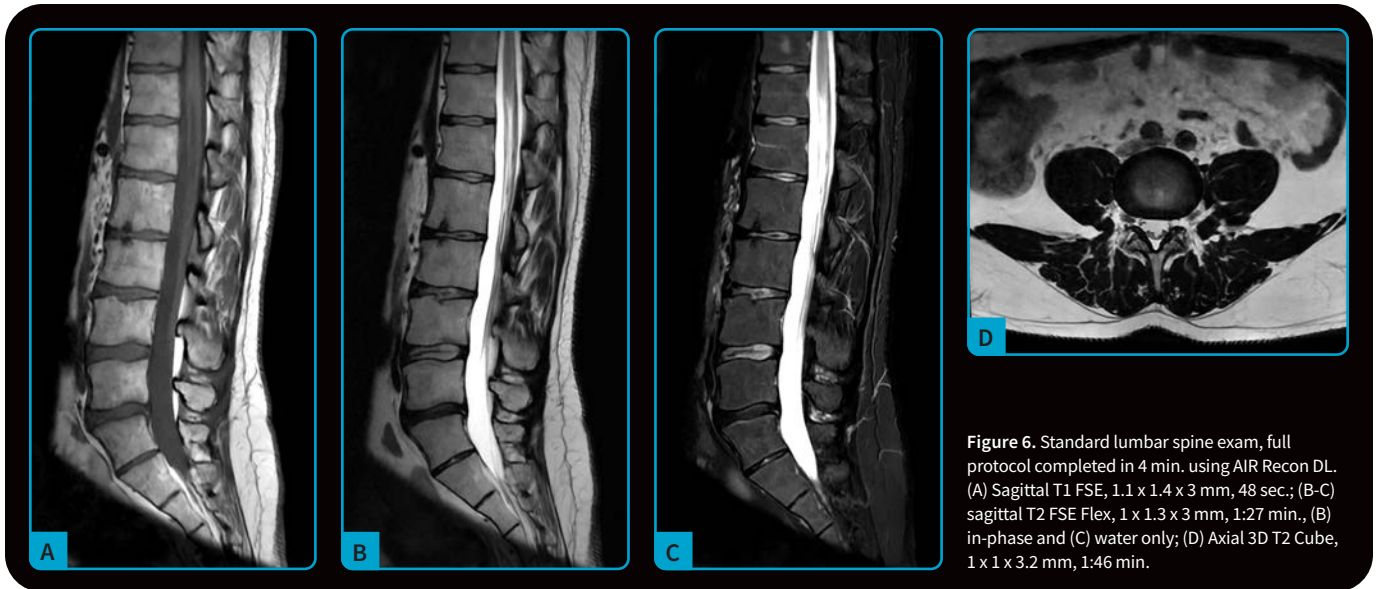
Figure 6. Standard lumbar spine exam, full protocol completed in 4 min. using AIR Recon DL. (A) Sagittal T1 FSE, 1.1 x 1.4 x 3 mm, 48 sec.; (B-C) sagittal T2 FSE Flex, 1 x 1.3 x 3 mm, 1:27 min., (B) in-phase and (C) water only; (D) Axial 3D T2 Cube, 1 x 1 x 3.2 mm, 1:46 min.

and PROPELLER, Mr. Poullaouëc can acquire a coronal and sagittal T2 FatSat and sagittal T1 in 5 minutes. In the spine, a sagittal T1, sagittal T2 Flex and axial 3D Cube, all with AIR Recon DL, takes just over 5 minutes to acquire.

The clinic can acquire sagittal Proton Density FatSat, coronal Proton Density FatSat, axial Proton Density FatSat and sagittal T1 all in a total scan time of 2:32 minutes.

"For cardiac MR, we are now using Sonic DL, which provides higher quality images than FIESTA and allows us to reduce the examination time by a factor of 2. So this allows us to now provide more cardiac imaging time slots, as well as quickly add cardiac during an urgent exam without modifying or postponing other scheduled MR examinations," adds Mr. Poullaouëc.

"We were surprised how good the cardiac imaging is at 1.5T—the images are outstanding," says Mr. Lounis, including the SnapShot MDE that provides a homogeneous image of the myocardium.

Patient comfort has increased due to the shorter and fewer breath-holds required with Sonic DL. It is also possible to obtain free-breathing exams with Sonic DL. SIGNA Champion features a new wireless physiologic gating technology that improves respiratory triggering by up to four times, PG triggering by two times and reduces the ECG triggering delay compared to the wired product. These features improve imaging performance for cardiac and abdominal applications.

"Wireless respiratory and cardiac gating are big advantages of SIGNA Champion. They allow faster setup time and reduce cable management. We can also achieve quicker acquisitions, which positively impact the overall examination time," says Mr. Poullaouëc.

A scanner for all exams and patients
With two advanced MR imaging systems, Imapôle Lyon-Villeurbanne can handle nearly any type of MR imaging exam—from routine to advanced. Although patients with MR-Conditional implants are
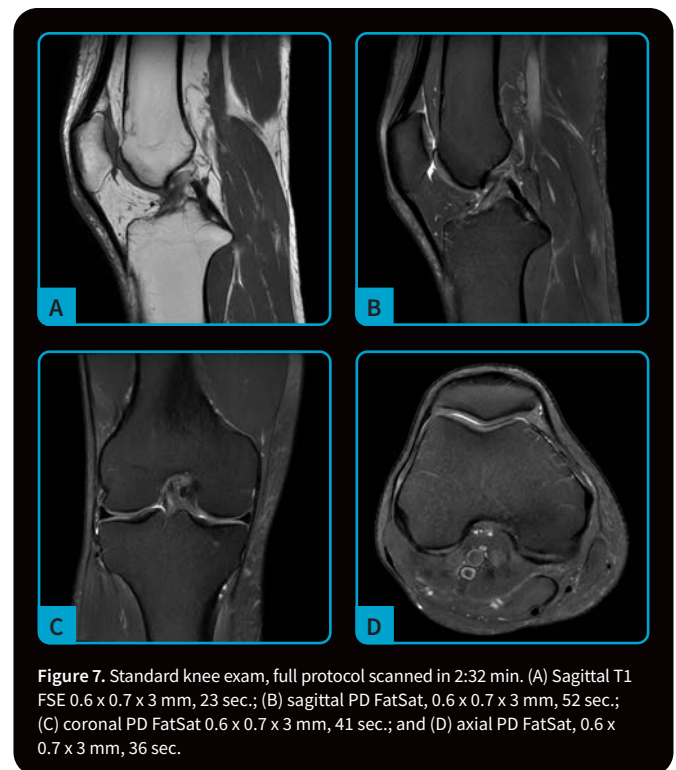

Figure 7. Standard knee exam, full protocol scanned in 2:32 min. (A) Sagittal T1 FSE 0.6 x 0.7 x 3 mm, 23 sec.; (B) sagittal PD FatSat, 0.6 x 0.7 x 3 mm, 52 sec.; (C) coronal PD FatSat 0.6 x 0.7 x 3 mm, 41 sec.; and (D) axial PD FatSat, 0.6 x 0.7 x 3 mm, 36 sec.

typically imaged on the SIGNA Champion 1.5T, the center does not otherwise adjust the scheduling based on the system.

"We perform all types of examinations on SIGNA Champion and we have not changed our organization's scheduling requirements following the new system installation," says Mr. Lounis. "We just have a priority to schedule spinal examinations and patients with MR-Conditional implants on SIGNA Champion."

Imapôle Lyon-Villeurbanne has a large oncology referral base and routinely uses AIR x™ on SIGNA Champion and SIGNA Hero for reproducibility across annual or bi-annual neuro-oncology exams.
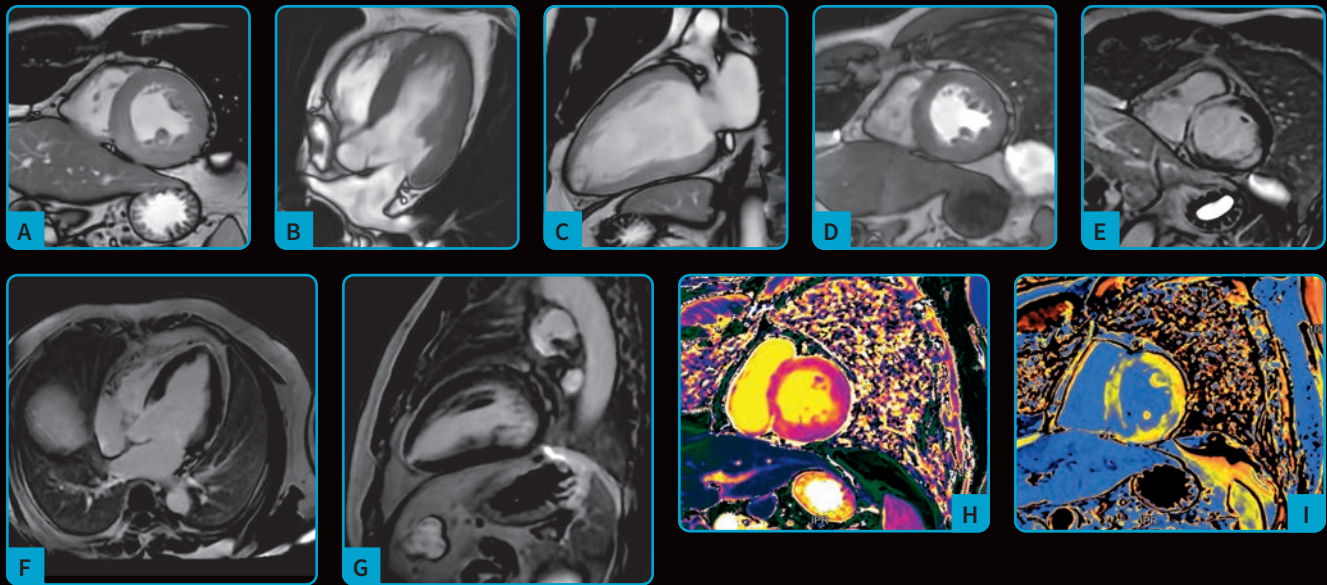
Figure 8. A 30-minute cardiac exam using Sonic DL, AIR Recon DL, AIR Coil and wireless cardiac gating. (A) Short axis Sonic DL post-contrast, 3 R-R, 1.6 x 1.6 x 8 mm, temporal resolution 33 ms, 1:15 min., 20 Slices (full LV stack); (B) 4 chamber Sonic DL, 6 R-R, 1.6 x 1.6 x 8 mm, temporal resolution 24 ms, 20 sec., 3 slices; (C) 2 chamber Sonic DL post-contrast, 6 R-R, 1.6 x 1.6 x 8 mm, temporal resolution 16 ms, 19 sec., 3 slices; (D) short axis FIESTA-TC perfusion with motion correction, 2.7 x 2.7 x 8 mm, 57 sec., 4 slices, 64 phases; (E) short axis SnapShot MDE, 2.8 x 3.2 x 7 mm, 32 sec., 14 slices; (F) 4 chamber SnapShot MDE, 2.8 x 3.2 x 7 mm, 22 sec., 10 slices; (G) 2 chamber SnapShot MDE, 2.8 x 3.2 x 7 mm, 23 sec., 10 slices; (H-I) short axis T1 mapping MOLLI with motion correction, 2.4 x 2.7 x 8 mm, 28-31 sec., 2 x 3 slices, (H) T1 native and (I) post-contrast.
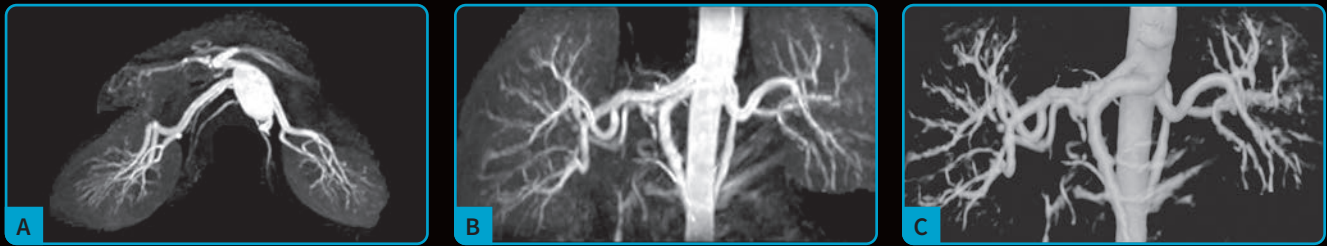
Figure 9. Non-contrast enhanced MR angiography of renal vasculature with Inhance Suite using AIR Recon DL, AIR MP Coil and wireless respiratory gating. (A-C) Axial 3D Inhance Inflow IR in free breathing with respiratory gating, 1.2 x 1.2 x 1.2 mm, 5:26 min., (A) axial 3D MIP, (B) coronal 3D MIP and (C) volume illumination.

"SIGNA Champion is like a Swiss knife, we can do every exam with it, without compromise."

Samir Lounis

"We are very happy with this new system that brings together the various advanced technologies from GE HealthCare—AIR Coils, AIR Recon DL, Sonic DL, AIR x and wireless gating—to consistently provide us with the best possible examination in terms of image quality and patient experience," Mr. Lounis adds. **S**

Reference

1. Korstjens D. MR departments seek to leverage AI to improve workflow, productivity. IMV. Available at: https://imvinfo.com/blog/page/2/.