Dr. Arnd Gerhards
Specialist MRI radiologist

AIR Technology™ coils: a three-fold improvement for patients, staff and clinical performance

The Radiologisches Institut Dr. von Essen in Koblenz, Germany, boasts one of the largest radiology practices in the Rhineland region, and prides itself on the use of state-of-the-art technologies. When it was time to upgrade an MRI suite, the institute chose GE Healthcare's lightweight, ultra-flexible AIR Technology coils to complement its new MRI instrument. This was an important development for both staff and patients, as specialist MRI radiologist Dr. Arnd Gerhards explains.

The ancient city of Koblenz – which sits at the confluence of the Rhine and Moselle rivers in western Germany – is home to the Radiologisches Institut Dr. von Essen. The practice offers a broad spectrum of diagnostic imaging techniques – including MRI, CT, digital X-ray, sonography, mammography and DXA (bone densitometry), as well as radiotherapy – and has built a reputation for providing the highest quality of radiology services, delivered by skilled specialists using cutting-edge technology.

Serving a population of around 500,000 from across the city and the wider region, the institute's busy MRI department performs almost 40,000 investigations a year. While the majority of these scans are performed on outpatients, the practice also serves a local hospital, performing approximately 4,000 MRIs on inpatients from the local stroke unit, for example. Dr. Gerhards outlines the range of MRI machines already in use in Koblenz: "We have been using GE Healthcare systems since before I joined the institute 13 years ago and, in that time, our partnership with the company has really grown. We have continued to invest in GE systems, and the whole team here is very familiar with not only the technology, but also the company. We feel that GE consistently offers unparalleled MRI technologies and services, which is why it has remained our preferred supplier. Since 2007, we have had two 3.0T systems – the first in the state of Rhineland-Palatinate – to complement our 1.5T instruments, and we are always looking for opportunities to embrace the very latest advances in sequencing times and coil technologies."

Keeping up to date

When it was time to upgrade the institute's oldest system – a 12-year old machine – Dr. Gerhards was keen to explore the latest products on the market: "To maintain the practice's 'state-of-the-art' reputation, we had to invest in innovative design and technology, which is why we chose a SIGNA™ Architect MRI platform. One of the most exciting aspects of this machine was the implementation of

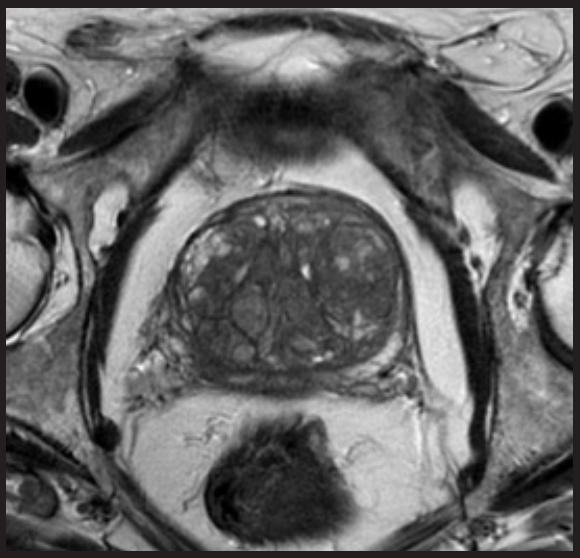
AIR Technology for the patient coils. I had been interested in this innovative coil system since it launched in 2017, and see it as a technological revolution compared to traditional copper-based coils. It represents a step into the next generation of MRI, which was why we were so eager to be one of the first practices in the region to use it."

AIR Technology

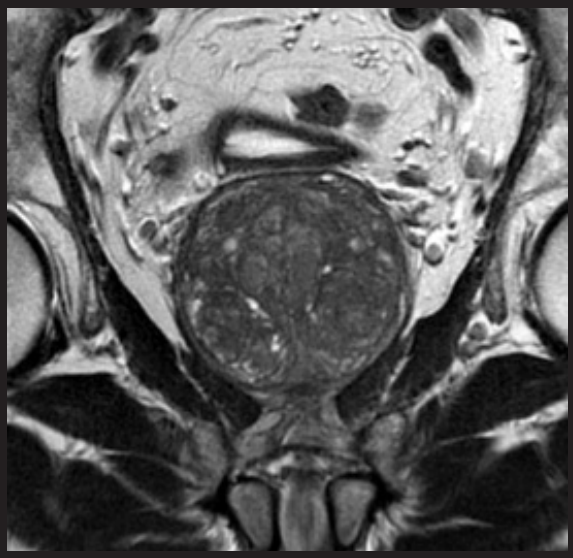
AIR Technology is an industry-first suite of flexible, durable and lightweight radiofrequency (RF) coils that offers much greater freedom and versatility for the positioning of patients and coils during an MRI scan. The new coil design is 60 per cent lighter than conventional coils, and uses a flexible conductor material that allows each coil element to conform to the patient, sitting closer to the anatomy of interest to improve signal reception, penetration depth and image quality. Dr. Gerhards explains the unique benefits this technology provides: "The shape of the coil no longer determines what we can do with it. For example, it can be wrapped around a knee for a complete image, then the same coil can be easily transferred to an elbow without having to move the patient. It's basically the closest you can get to total positioning freedom with 360 degree coverage. Because of its flexible design, it can be moved in all axes to conform to the patient's anatomy. This means it fits all ages, sizes and shapes of patient – which is especially important for the increasing number of larger patients we are seeing. There is no such thing as a 'hard-to-scan area' anymore, as the 'blanket' coil conforms to the patient's anatomy, bringing the elements closer to the body. This improves the signal quality and signal-to-noise ratio (SNR), and reduces the number of artefacts compared to conventional coil technologies."

Benefits for patients

In the six months since the MRI suite was upgraded, Dr. Gerhards has seen significant advantages of the AIR Coils in three main areas: for patients, for medical technical assistants (MTAs) and in clinical performance, where both clinical productivity and diagnostic quality have increased. "Unfortunately, there are some patients that we see on a regular basis, for example oncology patients. These individuals noticed the difference immediately with the new coils, with many commenting that it was more comfortable, or that there was less repositioning required. Other patients had not realised that we were using



AX T2 Propeller



COR T2 Propeller

the coils at all, and thought we had merely laid a normal blanket on them for warmth. This is because it's so lightweight, and the weight is evenly distributed, avoiding pressure points and allowing the coil to be placed on sensitive areas without any problems."

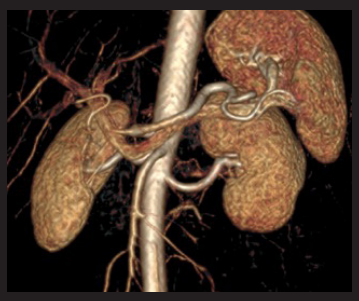
"There is also no need for clips or straps, because it lies evenly over the patient, helping them to feel more relaxed – especially children – as it really is just like a blanket. It is less than 2 cm thick, which helps us to fit larger patients in the tube bore, and gives all patients a greater sense of space. For those patients requiring a head scan, we use the new 48-channel head coil design, and a number of patients who had previously struggled with claustrophobia reported feeling much more at ease with this new coil design. All of the staff here feel it has been hugely beneficial to patients' comfort and relaxation levels, across all the coil types."

Benefits for staff

The introduction of any new technology requires a period of adjustment for staff, particularly one that makes such a significant change to daily practices. Dr Gerhards comments: "Using the new coil technology understandably took some adjustment for our MTAs, as it dramatically changed their role in terms of getting a patient ready for an examination. However, once they became familiar with the new coils, they were keen to experiment with all the possible advantages they offered. The old coils were considerably heavier and, over the duration of an eight or nine hour shift, this was quite physically demanding. Using the AIR Coils is far less strenuous, as they are so much lighter, and there is far less repositioning of the patient required. Another benefit is that they can be folded up and stored much more easily than the old coils, which is always an important consideration when space is in high demand."

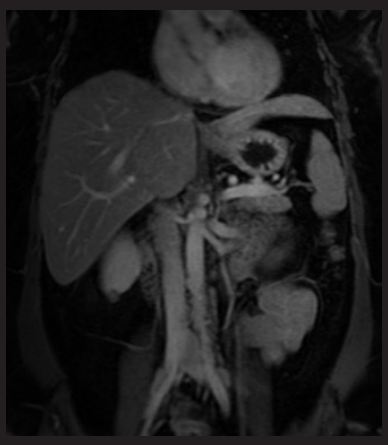
Clinical productivity

An advantageous design feature of AIR Technology is that coil coupling between elements is minimised, enabling arrays with higher element density. This allows more robust parallel imaging with higher acceleration factors, helping to increase clinical productivity. Dr. Gerhards reports on the difference this has made to his examination times: "This new coil technology, along with the new software applications, can significantly accelerate imaging. However, the really impressive feature is that speeding up the sequence does not compromise the image quality; we can accelerate scan times with diagnostically clear resolution. For example, **in our prostate clinic**, the old 3.0T system would take 25 to 27 minutes to complete the examination. **With the SIGNA Architect machine and AIR Technology coils, it now takes just 17 minutes, saving 10 minutes per patient – which potentially equates to a third more scans on any given day or week."**



3D TOF FSPGR

Sag PD FLEX
High Coverage FoV 22 cm



3D COR LAVA FLEX
Resolution = 1.4 x 2 x 3 mm
Scan time = 19 sec

COR T1
Resolution = 0.6 x 0.7 x 3 mm
Scan time = 2:54 min

"The quality of these images is also better than we could achieve with the old sequence and, while the new MRI instrument is obviously the main factor in this, the AIR Coils play a significant part in speeding up the whole process. This has given us more flexibility to choose how we spend this time; we can see more patients or, for the cases that benefit from very high resolution scans, we can use the extra time to gain even clearer images that aid our interpretation and diagnosis. For example, if you are diagnosing epilepsy, you need to be able to view the fine structures of the brain with great clarity."

Dr Gerhards sees no limits to the use of this technology: "In principle, I believe every patient is suitable for AIR Technology – we have to think more laterally for some, but the only real limit is the nature of the MRI system itself, or if the patient is too large or too anxious to enter the bore. This development is a 'win-win' scenario every time – the procedure will either be quicker, or we can produce higher quality images than previously possible, and the patient is more comfortable every single time. I believe we are only just beginning to discover the implications for the way we work, and the applications that are now possible. Now that this concept has proven such a success, I am sure it will evolve and be introduced across many more systems."

A strong partnership

Dr Gerhards emphasised that these benefits are a result of the effective working relationship the institute has developed with GE Healthcare: "We work closely with the GE team, providing constant feedback on the performance of the coils and systems, and they are always on hand to assist us with any technical challenges. It is impressive that, as a large company, we are always made to feel that they are here just for us, and we are not simply one of many. We obviously use a lot of GE equipment, and the communication is excellent, and they always keep us up to date. They welcome collaborations on new application possibilities, and we trust the company to meet our needs and help achieve the outcomes we want for our patients."

"AIR Technology is already transforming the way we perform scans, and I am sure it will play a prominent role in the future of MRI technology – it's opened a door in the world of MRI, and we don't even know what's waiting for us in the next room. It is a very exciting time to be working in radiology, I will certainly make sure any new systems we buy are equipped with AIR Technology – it really is mandatory!"