A breakthrough in image quality for CMR

Dr. Gebker, German Heart Institute Berlin, sees high image homogeneity with Ingenia 3.0T.
Ingenia 3.0T is a breakthrough in image quality for CMR

German Heart Institute sees high image homogeneity with MultiTransmit

The German Heart Institute Berlin (Berlin, Germany) was a pioneer in using CMR in a clinical setting, and now applies CMR to a broad range of clinical indications in about 150 patients a month using Ingenia 3.0T. This includes the development of CMR to assist in detection of myocardial ischemia, and improve diagnostic image quality in patients with coronary artery disease.

"It provides excellent images with high spatial and temporal resolution."

Cardiologist Rolf Gebker, MD, PhD, Head of Cardiovascular MR, says the Institute’s previous experience with Philips scanners broadened into an opportunity to implement Ingenia 3.0T. “We already knew the advantages of our Philips 1.5T scanner, and the upgrade to MultiTransmit on our 3.0T Achieva scanner was a major breakthrough regarding image quality and robustness."

"CMR has become an integral part of our diagnostic armamentarium," he says. "It’s an excellent imaging choice for so many patients, as it provides both morphologic and functional information with high spatial and temporal resolution. Our results are highly reproducible, and deliver information that we can use immediately to guide patient management."

Ingenia benefits include MultiTransmit 4D

One of the main benefits of Ingenia 3.0T for cardiac imaging, from Dr. Gebker’s perspective, is the ability to apply modern undersampling methods such as k-t SENSE or k-t BLAST.

"Because we perform mostly functional cardiac imaging, it’s one of the most important aspects. These techniques allow us to invest in higher spatial resolution and higher coverage, and they have been very helpful in improving stress MR imaging for the visualization of regional ischemia."

Ingenia’s MultiTransmit 4D technology provides parallel RF transmission, allowing patient-adaptive shimming and a very homogeneous B1 field. “It also improves the uniformity of the flip angle over the region of interest, which is particularly important for cine imaging with B-FFE,” says Dr. Gebker. “This translates into better image quality, since the contrast between blood and myocardium increases, which has been a problem with conventional 3.0T systems. A major improvement in image quality could be seen during adrenergic stress testing. This type of testing was simply not possible on our former 3.0T system using B-FFE cine imaging, mainly because of increasing problems with dielectric shading.

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The biggest Ingenia benefit we’ve seen is clearly in B-FFE functional cine imaging. Also, the quality and homogeneity of spin echo techniques have improved tremendously. This higher quality has a real diagnostic impact, as shown by the example images on this page. Overall, we simply have much better image quality with fewer artifacts. With Ingenia 3.0T we have a higher robustness throughout our whole imaging strategy.”

“The Institute is now also able to scan larger patients thanks to Ingenia’s larger bore size,” he adds. “These kinds of patients are the ones who need our attention most, because they are at the highest risk to develop cardiovascular diseases.”

“Ingenia offers fast scanning and a very smooth workflow that could increase throughput, but we are more interested in image quality than in speed,” explains Dr. Gebker. “With MultiTransmit we’ve overcome problems in cardiac imaging such as dielectric shading and dark banding artifacts.”

**CMR easy and effective**

Dr. Gebker uses the dS Torso coil solution, which combines a lightweight anterior coil with the integrated posterior coil. “You don’t have to move the patient around on the table, you just lay the patient down and it always works. It has a very large field of view which is beneficial as well.”

It wasn’t necessary to create new ExamCards for Ingenia, because they transferred easily from the Institute’s Achieva 3.0T system. “That was a very positive experience for us,” says Dr. Gebker. “Within the first week we had our routine ExamCards at hand.”

As far as scanning protocols, he took advantage of Ingenia’s high performance to improve image quality and improve temporal resolution, as well as increasing spatial resolution for cine images.
“Previously we would do certain exams only on the 1.5T system; now we can do these on Ingenia 3.0T.”

For postprocessing Dr. Gebker uses Cardiac Explorer on a routine basis. “The tool for semiautomatic detection of endocardial contours on short axis cine images helps to speed up an otherwise time consuming method to obtain cardiac volumes,” he explains. “And we also appreciate the multi stress view functionality which allows us to look at multiple geometries as well as multiple stress levels during stress testing.”

Broadening applications with future functionality
Dr. Gebker and his team have also begun using an mDIXON fat-suppression method for peripheral angiography and for the heart*. “It’s opening up a new chapter for us, because it has the potential to delineate small amounts of fat tissue, which can be helpful in patients with cardiomyopathies like arrhythmogenic right ventricular cardiomyopathy, but also in more common diseases like pericarditis. This technique may allow the suppression of signal from the pericardial fat layer, thus being able to see more clearly what’s inflamed and what’s simply fat tissue – that can be very helpful.”

* mDIXON for vascular and cardiac imaging is not yet commercially available.

Acute myocarditis
24-year-old male with new onset chest pain for 12 hours, ubiquitous changes of the ST-segment and elevated troponin levels. Immediately performed invasive angiography did not demonstrate any obstructive coronary disease. CMR was done the day after. The cine B-FFE movie (see NetForum) demonstrates a slightly depressed global LV-function with subtle regional wall motion abnormalities. T2-weighted images show diffuse myocardial edema. Ingenia 3.0T with dS Torso coil solution. Breath hold 8-12 sec. Voxel sizes between 1.5 x 1.5 and 2.0 x 2.0 mm.