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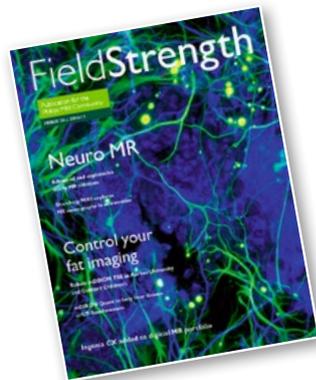
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mDIXON saves time and provides homogeneous fat saturation

Clinicians perform efficient, reliable oncology imaging with mDIXON

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Dr. Pedersen is Consultant Radiologist at Aarhus University Hospital, Department of Radiology, Aarhus, Denmark. He graduated Aarhus University, where his PhD (1993) and DMSc (2000) were later obtained. He was a full-time MR imaging researcher before becoming a specialist in Radiology in 2007. Dr. Pedersen has 113 peer reviewed publications in international journals, mainly within cardiovascular and oncology MRI.

mDIXON saves time and provides homogeneous fat saturation

Clinicians at Aarhus University perform efficient, reliable oncology imaging with mDIXON

“We definitely see improvements when exams include imaging before and after contrast, and we need to get images with and without fat suppression.”

Breast cancer with bone metastases

After six series of treatment this patient was referred to MRI. Total spine T2W mDIXON TSE and T1W TSE imaging was done in two stations to visualize the metastasis in Th11. Excellent fat suppression is seen, including the neck region. Only one mDIXON TSE scan provides images with and without fat suppression and thus saves almost half the time compared to traditional imaging.



Aarhus University Hospital (Aarhus, Denmark) serves its community and the surrounding region with both specialized and general medicine. The [radiology department](#), serving the departments of oncology, orthopedics, gastroenterology and abdominal surgery, is using [Ingenia 1.5T](#) with dStream. The department has implemented several mDIXON techniques and now benefits from the time saving, homogeneous fat suppression and consistent high quality.

No need to choose between shorter exam and more information

Consultant Radiologist Erik Morre Pedersen, MD, has been using mDIXON TSE, mDIXON FFE and mDIXON Quant on Ingenia 1.5T. “The two-point mDIXON that Philips provides is faster than the traditional three-point implementation, which makes the method suitable for routine use,” says Dr. Pedersen. “From only one mDIXON acquisition, four different kinds of images can be reconstructed: water, fat, in-phase and out-of-phase images.”

“So, mDIXON FFE may replace in-phase and out-of-phase imaging as done in abdominal imaging. One mDIXON TSE acquisition may replace

the two scans with and without fatsat, which can save time in pre- and post-contrast imaging. And in applications where time limitations make us only take either fatsat or non-fatsat (although we prefer to have both for a diagnosis) mDIXON TSE will provide the other ‘for free.’”

“Using mDIXON FFE and TSE, we are now able to use new imaging setups. We are implementing that in some head/neck and pelvic imaging. In some knee exams we use mDIXON TSE in combination with the 3DView sequence. And then we’ve done MSK cases using T1 mDIXON TSE before and after IV contrast, and that we are definitely going to pursue.”



Young girl with osteogenic sarcoma, preoperative assessment

Preoperative MRI in this young girl demonstrates the large tumor with a necrotic component and areas of fluid. The tumor extends down into the proximal part of femur. Edema is seen along the femoral shaft down to the knee and in the gluteal muscle. T2W mDIXON TSE in-phase and water images show the superb fat suppression of mDIXON TSE. The two-station MobiView also demonstrates the high quality mDIXON TSE fat suppression over a large region, and images with and without fat suppression are obtained in about half the time needed for two conventional scans.



“mDIXON provides homogeneous fat suppressed images.”

T2W mDIXON TSE water and in-phase



Breast cancer with extensive bone metastases

After three series of treatment with Xeloda and Zometa this patient was referred to MRI. Total spine T2W mDIXON TSE was done in two stations and reconstructed into in-phase and water images. The high quality of the fat suppressed mDIXON TSE images is demonstrated; note the superb fat suppression in the neck region. These images are obtained in about half the time needed for conventional imaging techniques. Total spine T1W TSE was also done but not shown here.

Homogeneous fat suppression, without adding time

“In addition to its ability to save time, mDIXON TSE shines by consistently producing very homogeneous fat suppression. We can now scan larger areas with a homogeneous fatsat. In the spine, for instance, we can now do a T2 mDIXON TSE with equivalent resolution and obtain image series with and without fatsat in the same time needed for the traditional STIR sequence. We experience flexibility in changing TE and finding the right balance between resolution and SNR,” Dr. Pedersen says.

“We are really happy with the SNR of mDIXON compared to STIR, which is otherwise a robust workhorse in T2-weighted fatsat imaging. mDIXON TSE inherently has more SNR at the same resolution and the same scan time.”

mDIXON TSE in oncology imaging

“In oncology imaging we use T2 mDIXON TSE when visualizing soft tissue and bone tumors, such as in hands, long bones, spine and bones of the pelvis,” Dr. Pedersen says. “We save time in cases where we want images both with and without fatsat, and mDIXON provides very homogeneous fat suppressed images.”

“We definitely see time improvements when exams include imaging before and after contrast, and we need to get images with and without fat suppression. mDIXON saves up to about half the time in acquiring these,

and provides excellently homogeneous fat suppression. We think it’s really a gain here, both from an image quality and a time-saving point of view.”

Boosting quality and speed in liver and whole body imaging

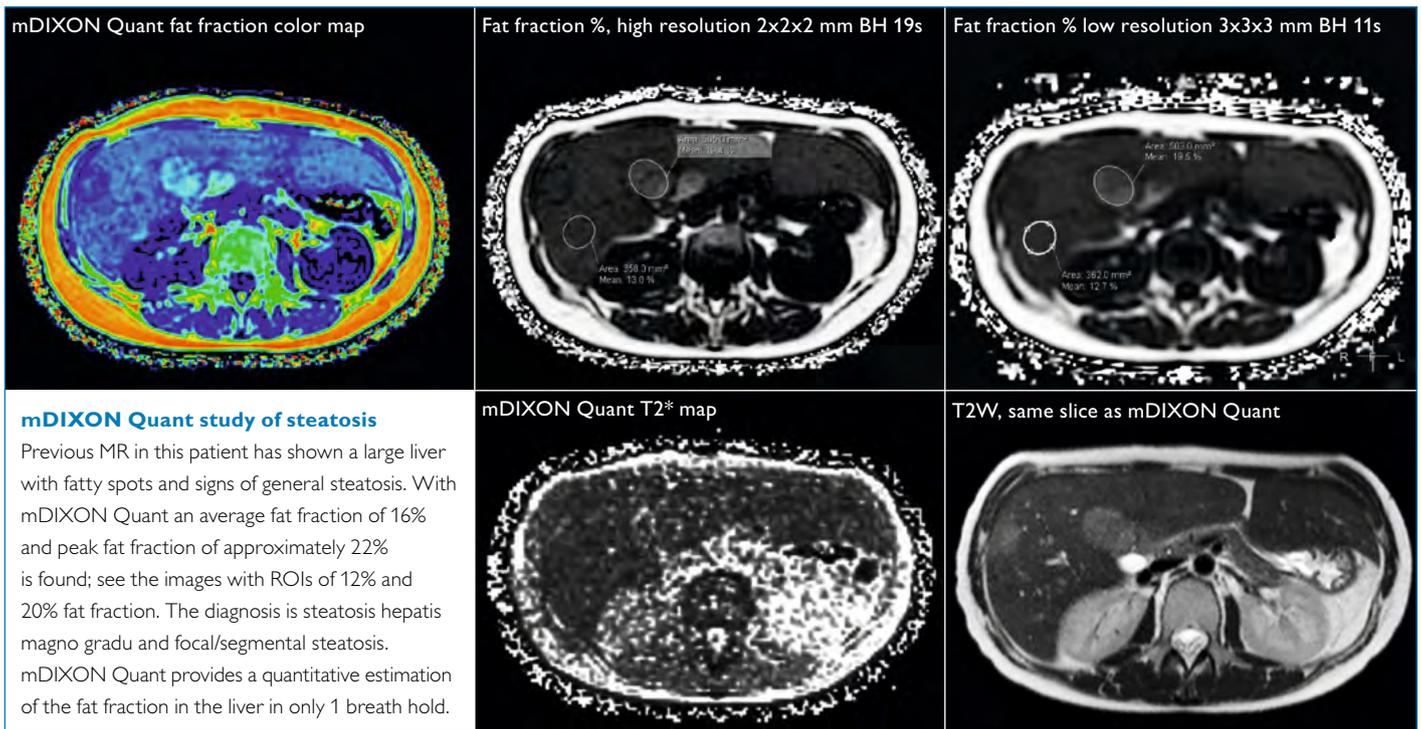
In liver imaging Dr. Pedersen uses mDIXON FFE for his T1-weighted 3D scanning. “For instance, in dynamic contrast-enhanced liver imaging with multiple phases, we prefer mDIXON FFE over the other 3D gradient echo fatsat sequences.”

“We also use it where we used to do in-phase and out-of-phase, like in adrenal imaging and other abdominal imaging where we want to be sure whether there’s fat or not; we can now acquire both in one acquisition.”

Using dS SENSE to speed up scans, shorten breath holds, reduce artifacts

In abdominal imaging, Dr. Pedersen also exploits the benefits of the high dS SENSE acceleration factors that Ingenia 1.5T with dStream offers. “We do some of our coronals – where phase encoding is left-right – with a dS SENSE factor of 4, with good results,” he explains. “In other directions we can generally push our dS SENSE factors at least 25% to 50% higher, in order to shorten breath holds or reduce the number of breath holds.”

“Even when using dS SENSE factor 2 (our standard on older systems), we notice that we can save more time using Ingenia, as we do not need



mDIXON Quant study of steatosis
 Previous MR in this patient has shown a large liver with fatty spots and signs of general steatosis. With mDIXON Quant an average fat fraction of 16% and peak fat fraction of approximately 22% is found; see the images with ROIs of 12% and 20% fat fraction. The diagnosis is steatosis hepatis magno gradu and focal/segmental steatosis. mDIXON Quant provides a quantitative estimation of the fat fraction in the liver in only 1 breath hold.

“The great potential of mDIXON Quant lies not only in its results, but also in the fact that these can be obtained in a fast and efficient breath hold and are postprocessed immediately.”

to make the FOV as large as we used to for avoiding fold-over effects. And a smaller FOV corresponds to increasing the acceleration.”

“Also in some of our mDIXON sequences we push the dS SENSE factors a little higher, especially to save a few seconds in FFE sequences for abdominal imaging done with breath holds, or to get a little increase in resolution.” he adds.

Where dS SENSE particularly helps

“We have had some pediatric abdominal patients where we could actually shorten the breath holds to 10 seconds without sacrificing resolution. We also have older patients where we have to have short breath holds. In other cases, we use dS SENSE to increase resolution in the same breath hold time.”

“Basically, I think we have taken the opportunity to create a set of more robust protocols with short breath holds, because that is very important in scanning, especially in the elderly.”

mDIXON Quant provides more information in less time

Dr. Pedersen has just begun to use mDIXON Quant, which provides quantitative fat fraction mapping. “This allows us to look at specific portions of the liver that might be diseased,” he says. “It used to be a very tedious task to quantify anything in the liver. Now, with mDIXON

Quant, we can do a full 3D acquisition in one breath hold. The results are immediately reconstructed on the scanner and we can work with them right away without time-consuming post-processing.”

Dr. Pedersen is working with the hospital’s gastroenterologists to select patients for the mDIXON Quant technique. “We are looking at patients with known fatty livers who need to be followed over time. Another group could be patients where a needle biopsy is not a good option, for instance due to problems with coagulation. mDIXON Quant opens a window for these patients, allowing to follow the status of the liver over time without needle biopsies.”

“The great potential of mDIXON Quant lies not only in the results it gives, but also in the fact that these can be obtained in a fast and efficient breath hold and are postprocessed immediately.”

Conclusion

Dr. Pedersen believes mDIXON is a genuine improvement, especially in fat suppressed MRI. “It’s not just stronger gradients or a wider magnet, it’s really a whole new way of doing things. It’s fast enough that we are willing to use it, and it’s flexible enough to adopt it to our clinical questions. I think that will really make a difference in the way we do a lot of MRI in the future.” ■