FieldStrength

SPECIAL ISSUE
MR in oncology

MR-guided prostate biopsy boosts accuracy of diagnosis

MR-guided prostate biopsy enables fewer core biopsies at RWTH Aachen University Hospital

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PHILIPS
sense **and** simplicity

MR-guided prostate biopsy boosts accuracy of diagnosis

MR-guided prostate biopsy enables fewer core biopsies at RWTH Aachen University Hospital

Felix Schoth, MD

With the advent of MR guidance, prostate biopsy is easier for both patients and physicians. At RWTH Aachen University Hospital (Aachen, Germany), clinicians are performing their first prostate biopsies using the Achieva 3.0T with DynaTRIM prostate biopsy device and DynaCAD prostate biopsy software. Initial results are extremely encouraging.

"Some time before the biopsy we perform a high resolution diagnostic exam to identify potential lesions," says Felix Schoth, MD, Department of Diagnostic Radiology at RWTH. "We use our Achieva 3.0T scanner, along with the SENSE Torso coil and the 3.0T endorectal coil for diagnostic imaging."

For the biopsy procedure the patient lies prone with the DynaTRIM biopsy device and appropriate receive coil in place. DynaTRIM is a fully MR-compatible device for trans-rectal MR biopsy of the prostate. Dr. Schoth performs an anatomical T2 TSE scan and overlays it onto the diagnostic scans acquired previously. Then he identifies the regions of interest in the anatomical scan that he selected from the diagnostic scan.

"After a calibration scan we adjust the DynaTRIM device if necessary, and then perform a control scan, which shows us whether we correctly moved the shaft, now pointing toward the region we want to biopsy," explains Dr. Schoth. "The DynaCAD biopsy planning software also helps us decide which needle to use, and whether to use a spacer to ensure the correct distance from the shaft to the region we want to target. It's all quite easy to use and intuitive."

He punctures up to three regions of the prostate, and usually takes two cores at each location. When moving to the next puncture site he repeats the control scan.

RWTH Aachen University Hospital

"I exactly know where I want to position the needle."

T2-weighted axial

T2-weighted coronal

Diagnostic MRI data analysis
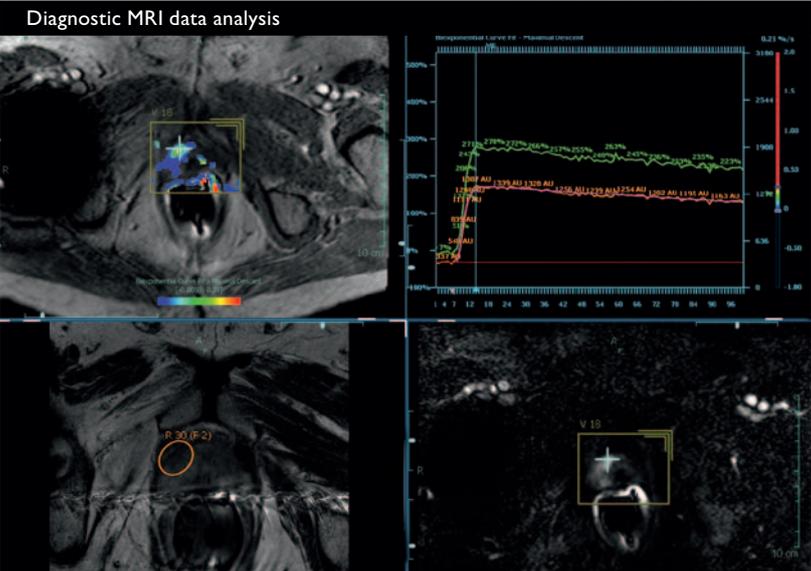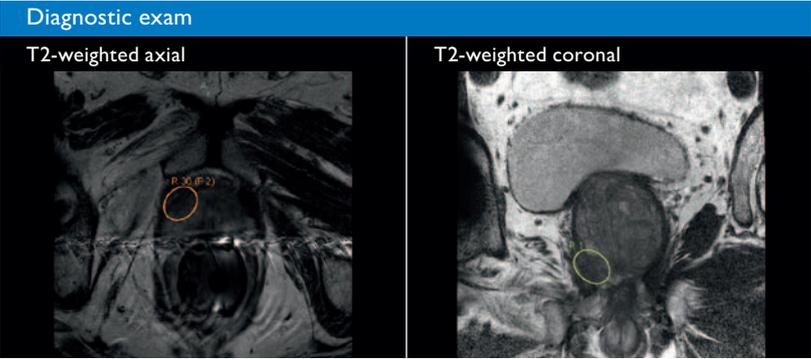
"With MR guidance, especially with a diagnostic scan before, you can better target the lesions."

MR-guided biopsy procedure

T2-weighted axial

Biopsy planning screen
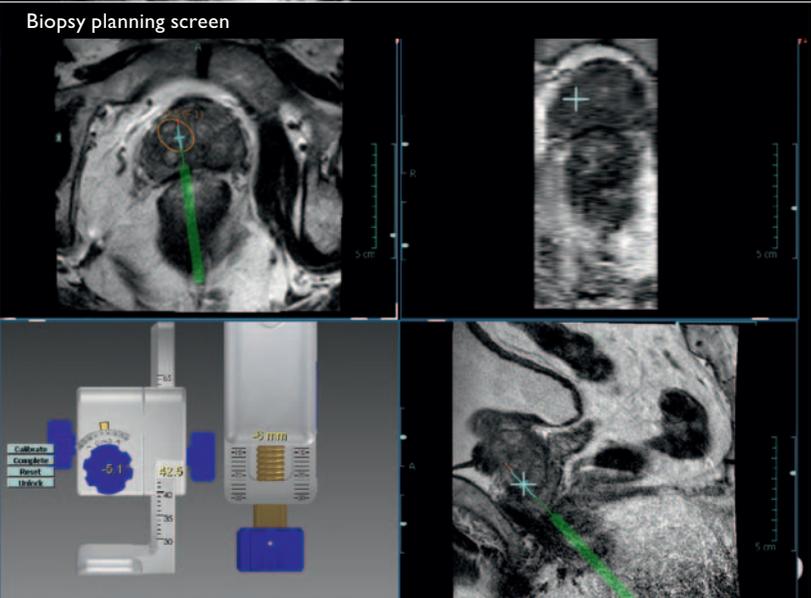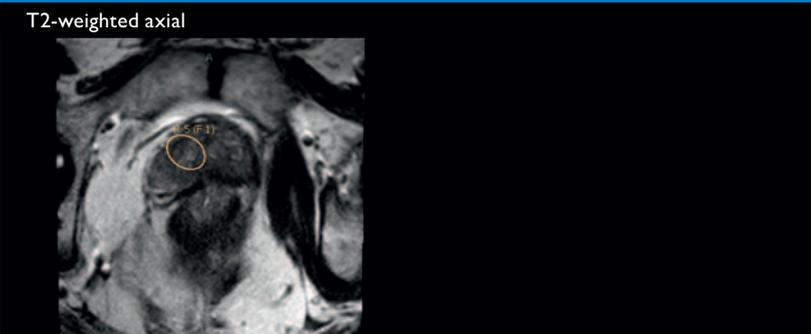
MR-guided biopsy shows Gleason 3+4

73-year-old male with PSA level rising for 5 years, even after short drop following Finasterid therapy. Previous TRUS biopsies were negative. Diagnostic MR images were made with the Endorectal and SENSE Cardiac coil. Images show a suspicious T2-hypointense area in the right apical peripheral zone of the prostate.

The biopsy procedure again starts with an anatomic scan to visualize the right apical lesion (marked in image). The biopsy planning screen provides the settings for the biopsy device and the pre-calculated position of the biopsy needle overlaid on the anatomical scans. A Gleason score 3+4 prostate carcinoma was diagnosed from this biopsy. Findings from other biopsied lesions were negative for cancer, some showed prostatitis. In the follow-up, histology of pelvic lymphadenectomy revealed lymph node involvement despite negative abdominal CT. The proposed treatment was external beam radiation therapy.

The Achieva 3.0T at University Hospital Aachen is used for prostate biopsy

> "After three more negative TRUS biopsies, he was referred to me. With MR guided biopsy we were able to demonstrate the carcinoma."

MR helps better visualize regions of interest

Dr. Schoth says that MR is superior to ultrasound for visualizing the region of interest and the lesions. "For image-guided biopsies, I believe MR is the best modality for overlaying the anatomic scans on the diagnostic scans, to help define the region for the puncture," says Dr. Schoth. "I actually see the lesions and suspicious areas in the prostate, so I exactly know where I want to position the needle."

"With ultrasound, you can collect any number of punctures, but still have a substantial chance that you won't hit the lesion (if it is small), as you're doing it more or less blind. With MR guidance, especially with a diagnostic scan before, you can better target the lesions," he adds. "You need fewer core biopsies, so there is a lower risk of complications. You're doing it the intelligent way."

First results demonstrate MR benefits

One of the first patients who underwent an MR-guided prostate biopsy at RWTH had recurrent negative biopsies and a very high PSA of about 20 for several years.

Dr. Schoth explains: "In 2006 he had a PSA level of 12.5 and he received an ultrasound-guided biopsy, where it was found that he had an adenomyomatosis and atrophy, and discrete chronic interstitial prostatitis, but they found no carcinoma. After receiving treatment with an anti-androgen medication, his PSA went down to 3.6 but then went up again. His PSA at one point was up to 27.8. After three more negative biopsies, he was referred to me."

Dr. Schoth selected three regions of interest to biopsy with MR guidance, and one proved to indeed have carcinoma. "We were able to demonstrate a Gleason score of 7, sampled from a region in the transition zone. Most cancers don't develop there, but in the peripheral zone; even with MR, it is more challenging to image a lesion in the transition zone. Nevertheless, with the histology at hand, a diagnosis was reached and the patient was able to get appropriate treatment."

MR-guided prostate biopsy routine in future

"I think MR-guided prostate biopsy will become widespread for patients who received a number of negative ultrasound guided biopsies, and still have elevated PSA levels," says Dr. Schoth. "It could certainly lead to a better workup for the patient."

He also envisions a probability map of sorts. "Diffusion-weighted imaging is becoming more and more commonly used, and I think we could pull together information from the dynamic scans, the T2 image scans and the DWI scans, and form a probability map for carcinoma. It would be very helpful."