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Research

Ultrasound in Breast Biopseas:Research Aims to Improve Cost-Effectiveness

When performing breast biopsies doctors often need to combine MRI and ultrasound to obtain tissue samples with a fine needle, as around a third of tumours are invisible to ultrasound. Imaging takes place inside the MRI scanner, and the biopsy needle is inserted separately when the patient is outside the scanner. This process is often repeated several times before the sample is finally taken. This exhausts patients and is also costly in terms of scanner use.

In the MARIUS project (Magnetic Resonance Imaging Using Ultrasound – systems and processes for multimodal MR imaging), experts from the Fraunhofer Institute for Biomedical Engineering IBMT in St. Ingbert and the Fraunhofer Institute for Medical Image Computing MEVIS in Bremen are working towards a quicker and gentler alternative.

The new technique would require just one scan of the patient's entire chest, with the subsequent biopsy guided by ultrasound. Doctors would have both the live ultrasound scan and a corresponding MRI image available to guide the biopsy needle and display exactly where the tumour is located.

The biggest challenge is that the MRI is performed with the patient lying prone, while during the biopsy she lies on her back. This change of position alters the shape of the patient's breast and shifts the position of the tumour significantly. To track these changes accurately, researchers have found a novel solution. While the patient is in the MRI chamber, ultrasound probes attached to the patient's skin provide a succession of ultrasound images. This produces two comparable sets of data from the two separate imaging techniques. When the patient undergoes a biopsy, the ultrasound probes continually record volume data and track the changes to the shape of the breast. Special algorithms analyse these changes and update the MRI scan accordingly. The MR image changes analogously to the ultrasound scan. When the biopsy needle is inserted into the breast tissue, the doctor can see the reconciled MRI scan along with the ultrasound image on the screen, greatly improving the accuracy of needle guidance towards the tumour.

Fraunhofer researchers are developing a range of new components to realise this vision, including an ultrasound device that can be used in an MRI scanner, ultrasound probes that can be attached to the body to provide 3D ultrasound imaging and new software.

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