MedicalXpress

High-energy ultrasound sharpens view of liver tumors

January 7 2008

A high-energy form of ultrasound imaging developed by researchers at Duke University's Pratt School of Engineering produces pictures of liver tumors that are better than those made with traditional ultrasound, according to results of a clinical study.

The study suggests that the imaging method known as Acoustic Radiation Force Impulse (ARFI) ultrasound might offer a new tool for screening patients at increased risk for liver cancers, according to the researchers. They say it might also play a useful role in guiding biopsy procedures and minimally invasive therapies aimed at destroying cancerous tissues found deep in the abdomen.

The researchers reported their findings Jan. 7 in the journal *Physics in Medicine and Biology*. The work was funded by the National Institutes of Health with system support from Siemens Medical Solutions.

First developed six years ago by Duke biomedical engineers Gregg Trahey and Kathy Nightingale, ARFI uses high-energy sound waves to push on tissues like sonic fingers. A tracking beam then captures the movement of the tissue, providing a measure of its elasticity or stiffness.

"To our knowledge, these are the first images of abdominal malignancies in humans that show tissue elasticity," said Trahey, professor of biomedical engineering, radiology and medical physics at Duke. The preliminary findings, which represent the Ph.D. thesis work of Trahey's former graduate student Brian Fahey, have already led Siemens to

pursue a product prototype that will combine traditional ultrasound with ARFI, he added.

In general, primary liver cancers are soft while those that have spread from other organs are hard. ARFI may be able to tell the difference between hard and soft tumors, Trahey said. "If borne out in further studies, [that discriminating ability] suggests that ARFI may be useful in guiding treatment decisions."

"All current imaging methods—including CT, MRI and ultrasound—have mediocre performance in the detection of early liver cancers," he added. "There is a potential role for ARFI because it is low cost and can be built on conventional ultrasound machines."

Traditional ultrasound is now the guidance method of choice in many hospitals for procedures targeting the liver, kidneys, pancreas and lymph nodes, Trahey said. Ultrasound has advantages in that it is widely available, low cost and doesn't expose patients to ionizing radiation. However, a significant number of tumors are difficult to see with this method, requiring physicians to resort to alternatives such as CT and MRI, which add to the complexity and cost.

In the new study, the researchers captured ARFI images of 12 tumors in nine patients, including seven liver and two kidney tumors, and compared them to traditional ultrasound. The ARFI pictures showed greater contrast than standard ultrasound, providing clearer definition of the edges of cancerous masses.

Source: Duke University