Treatment with a Push

Ultrasonic Propulsion to Treat Kidney Stone Disease: Research & Development

Narrator: Passing even a small piece of a kidney stone can be extremely painful. At the Applied Physics Laboratory's Center for Industrial and Medical Ultrasound, scientists, engineers, and students have developed a new way to give kidney stones a push.

Mike Bailey: We call this technology ultrasonic propulsion. In addition to finding the stones, this technology can move stones.

Narrator: The forceful pressure of ultrasound is evident in this lab demonstration. Extensive experience in lithotripsy — breaking kidney stones with shock waves — plus high-intensity focused ultrasound used to "cook" diseased tissue all adds up to a new method of speeding the natural passage of stones or stone fragments.

Bailey: All in this one system is better ultrasound imaging; it's much easier to use. It adds color to the stone. And it's ultrasound for finding stones, which is non-ionizing radiation. So it would remove some X-ray diagnosis that's currently done.

Narrator: The key is a new imaging technique called the Doppler 'twinkle' mode. Ultrasound reflections from a detected stone cause the stone to display a flickering mosaic of color.

Bryan Cunitz: Once the stone has been localized, we can then move into the push mode. We just target the stone on the screen very easily and adjust the power to the right level, press another button and move the stone right across the screen using the acoustic radiation force. And as needed, you can retarget and push the stone into whatever part of the kidney you want.

Bailey: A person comes in with small stones or has just had surgery and there are residual pieces left over, this technology would help push those pieces to the exit of the kidney so that they will more easily pass naturally.

Narrator: This new system operates at levels above regulated limits for diagnostic ultrasound.

Julianna Simon: The objective of our safety study is to show that our exposure level is actually safe. To demonstrate that, we've ramped up the intensity of the ultrasound until such time when we saw injuries. So we could say that is where the threshold is. We're below that.

Narrator: Potential commercial applications range from down-to-earth...

Bailey: This technology can help in the doctor's office or right in the O.R.…

Narrator: To out of this world...

Bailey: We also have funding from NASA – the National Space Biomedical Research Institute – to get a handheld system to deal with stones in space. As astronauts become dehydrated – as their bones demineralize – there's been evidence stones can form. They want to protect them with a simple, small, portable system and ultrasound is a nice way to do that.

So NSBRI funded that. NSBRI came up here and met with the whole commercialization community at the University of Washington and now we've tapped into all these foundations locally that want to promote transitional technology into the clinical sphere and into the commercial realm.

For more about this topic and other features on APL-UW research, visit www.apl.uw.edu/report/2011.
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