The Smart Stethoscope

A collaboration between the Institute for Sound and Vibration Research (ISVR), Guy's and St Thomas NHS Foundation and Precision Acoustics Ltd (PAL).

The project

Through the Engineering and Physical Sciences Research Council (EPSRC), funding was granted to the Institute for Sound and Vibration Research (ISVR), to develop a range of ultrasound technology (#) that could be used to help industries become cleaner and more efficient. The ISVR is the world's leading centre for research and teaching in the area of sound and vibration.

The problem

If kidney stones cannot be dissolved by drugs, the favoured procedure is lithotripsy. Thousands of shock waves are projected into the body to smash up the stones. But because there is no way of monitoring progress, more than 50% of patients are sent home with their stones insufficiently fragmented. They must return for re-treatment, with commensurate costs in theatre time and patient discomfort. Conversely, some stones break up (#) before the end of the treatment, resulting in unnecessary patient exposure and wear-and-tear on the lithotripter device.

The collaboration

Working on this research project was Professor Tim Leighton from the University of Southampton's ISVR and Dr Andrew Coleman, of Guy's and St Thomas NHS Foundation as well as the industry partner, Precision Acoustics Ltd (PAL), a leading manufacturer of ultrasonic measurement equipment.

The technology developed

During this project a listening device dubbed the 'smart stethoscope' was

developed, which monitors the echoes that reverberate around the inside of the patient's body when the shock wave hits the stone.

The outcome

In clinical trials the smart stethoscope detected 94.7% of successful treatments, compared to the 36.8% detected by clinicians in theatre using the current available technology.

This has resulted in the following societal impact:

- Time and money saved by decreasing the need for repeat / further treatment (#)
- Patient comfort improved
- Wastage of staff and theatre time reduced
- Waiting lists reduced
- Unwanted damage to healthy tissue reduced
- 'Patient pathway' (a key NHS objective) improved
- Enhanced treatments in the developing world, where large numbers of patients require kidney stone treatment, through provision of low-cost automated technology.

"It's an imperfect analogy, but consider a railwayman walking along the length of a train, hitting the metal wheels with a hammer, If the wheel rings nicely, he knows that it's not cracked. If the wheel is cracked, it gives a duller sound."

Professor Tim Leighton, ISVR

The smart stethoscope in action

Related websites: ISVR

Guy's and St Thomas Health Trust, Precision Acoustics Ltd.