Last Updated: Saturday, 30 October, 2004, 23:00 GMT 00:00 UK

'Stethoscope' hears kidney stones

Scientists have developed a "smart stethoscope" that can hear when a kidney stone has been successfully broken down by treatment.

The device listens to echoes created by shock wave therapy (lithotripsy) to let the doctor know if therapy has worked.

Trials at Guy's Hospital in London have showed promising results, saving patients unnecessary repeat therapy and x-ray monitoring.

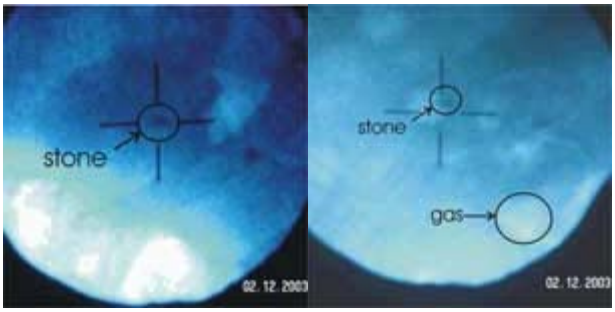
The device was developed along with scientists from Southampton University.

Hearing echoes

Lithotripsy works by focusing thousands of shock waves onto the kidney stones in an effort to break them into pieces small enough to urinate out of the body or be dissolved by drugs.

But there is no way of monitoring how the process is getting on.

Doctors can take an x-ray before and after treatment to see if there is any change in the appearance of the stone.



X-ray image before treatment

X-ray image after treatment

But it is often difficult to tell from these pictures and is more a case of trial and error - if the symptoms return then the patient will need more shock wave therapy.

Professor Tim Leighton and colleagues at the Institute of Sound and Vibration Research at Southampton University, along with kidney experts at Guy's, decided to see whether the echoes produced by the shock waves could be interpreted in some way.

Prof Leighton said: "It's a bit like the man on the railway who walks along the length of the train, hitting the metal wheels with a hammer to find out if any are cracked.

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"If the wheel is cracked it gives a duller sound.

"What we are looking for is a stone to go from being intact at the start of treatment to fragmented at the end of the treatment."

The sounds

The smart stethoscope is a small probe, similar to those used to trace heart patterns using an ECG, which is taped to the flank of the patient.

Just like a normal stethoscope, it picks up sound. From here, the sounds are transmitted to a box the size of a packet of biscuits which amplifies and changes the frequency of the sounds so the doctor can hear them.

> **"At the start of treatment you can hear a 'tick' and at the end it should sound like a 'tock'"**
>
> Professor Tim Leighton, Device inventor

When the stone is intact the sound given off is a 'tick'. When it has been shattered into small pieces the sound changes to a 'tock'.

'Non-invasive'

Prof Leighton said the device could also be wired up to a computer that would analyse the sounds and display the results using a traffic light system - red for no success, amber for some success and green for fully successful treatment.

So far, they have used the device to monitor treatment in 50 patients with kidney stones.

With funding from the Engineering and Physical Science Research Council, the researchers have developed a prototype they say works extremely well.

Prof Leighton said: "It's been superbly successful. I have been astounded by how effective it is as a monitor.

"Plus, it's completely non-invasive. It does not expose you to any radiation."

He said it would reduce rather than replace the need for x-rays, which would still be used to locate the stone within the kidney.

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