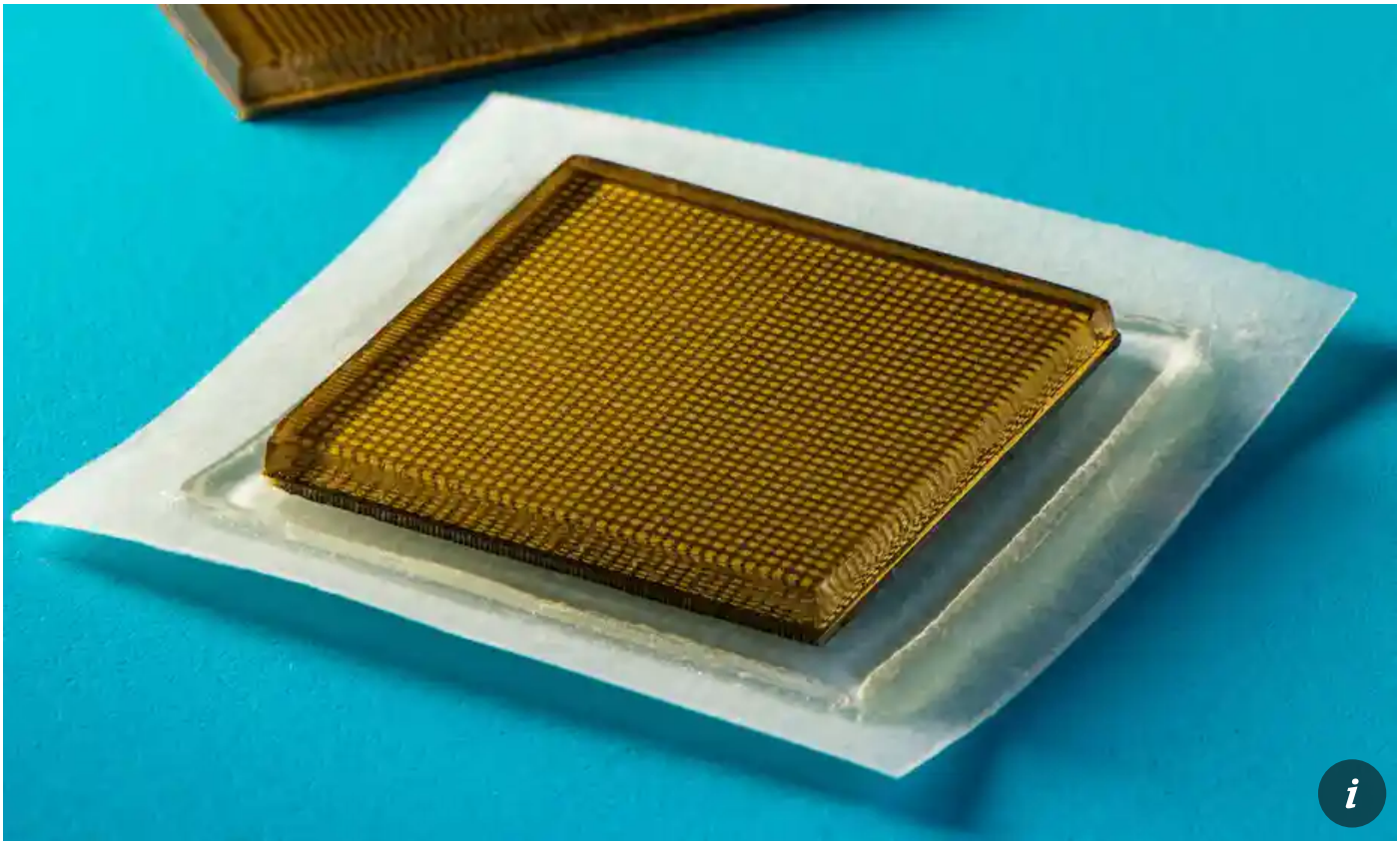

Medical research

Stick-on ultrasound patch hailed as revolution in medical imaging

Wearable technology can scan a person's insides for up to 48 hours as they go about their daily life

Ian Sample *Science editor*

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A stick-on patch that can take an ultrasound scan of a person's insides as they go about their daily life has been hailed as a revolution in medical imaging.

The wearable patch, which is the size of a postage stamp, can image blood vessels, the digestive system and internal organs for up to 48 hours, giving doctors a more detailed picture of a patient's health than the snapshots provided by routine scans.

In laboratory tests, researchers used the patches to watch people's hearts change shape during exercise, their stomachs expand and shrink as they drank and passed drinks, and their muscles pick up microdamage when weightlifting.

Prof Xuanhe Zhao at Massachusetts Institute of Technology, who led the research team, said the patches could “revolutionise” medical imaging because existing scans are very brief, sometimes lasting only seconds, and usually have to be performed in hospitals.

Ultimately, Zhao envisions people buying boxes of the patches over the counter and using them, with help from smart algorithms on their mobile phones, to monitor their heart, lungs and digestive systems for early signs of disease or infection, or their muscles during rehabilitation or physical training.

The bioadhesive ultrasound (or Baus) patch contains an array of tiny sensors (piezoelectric transducers) that beam ultrasonic waves through the skin and into the body. These waves bounce off blood vessels, tissues and internal organs are detected by the same elements in the patch. At the moment, the patch has to be connected to an instrument that turns the reflections into images, but the researchers are developing a wireless patch to work with software on a mobile phone.

“We are working hard on the wireless version,” Zhao said. “Because there are already wireless point-of-care handhold ultrasounds, we are confident that we will be able to achieve the wireless version in a few years.” Details of the patch are published in Science.

Even without a wireless version, the patches could make an immediate difference in hospitals, the researchers say, by monitoring patients’ insides while they lie in bed, much as stick-on electrodes are used to monitor their heart activity.

Ultrasound scans are extremely common, with NHS England performing more than 8m last year. But the technique has major limitations, requiring highly trained sonographers to place and orient the probes on patients’ bodies to get high-quality images. For this reason, most ultrasound scans are brief and performed on patients who are required to keep still while the images are taken.

Wireless patches could sidestep some of these problems, as they can be fixed in position and left to take images for hours, and even days, at a time, the researchers say. Beyond scanning organs for early signs of disease, the “set and forget” patches could monitor bladder function, tumours, and the development of foetuses in the womb.

Dr Nanshu Lu, a biomedical engineer at the University of Texas at Austin who was not involved in the study, said the patch was a “significant breakthrough toward mobile and ambulatory ultrasound imaging”.

“Without needing a sonographer, wearable and accessible ultrasound sensors would open many future possibilities such as heart imaging during the exercise stress test, at-home lung imaging for early detection of pneumonia, and many more,” she added.

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