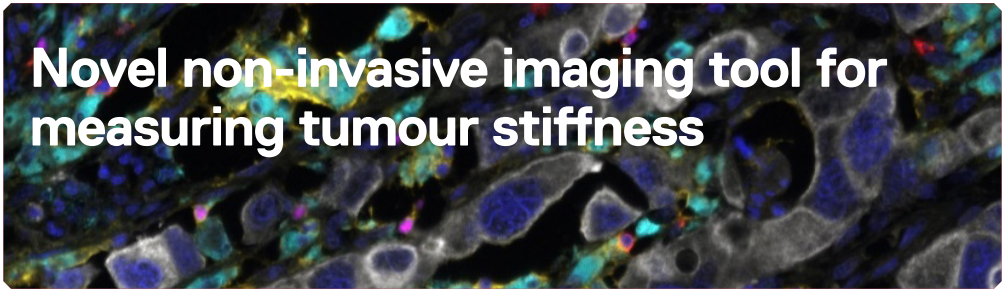
ICR The Institute of Cancer Research

Industry collaboration opportunity

Novel non-invasive imaging tool for measuring tumour stiffness



The Institute of Cancer Research, London, is seeking partners to continue the development of a new ultrasound-based imaging technique that can visualise and measure the stiffness of tumours.

A UK patent application has been filed (GB2214230.1) covering the methods and systems relating to Vibrational Shear Wave Elastography (VSWE).

The team is now developing this technique into a non-invasive imaging device – to establish a preclinical utility to support in vivo assessment of experimental cancer therapies and/or develop a clinical device that can be used to detect cancer and improve treatment monitoring in patients.

About the programme

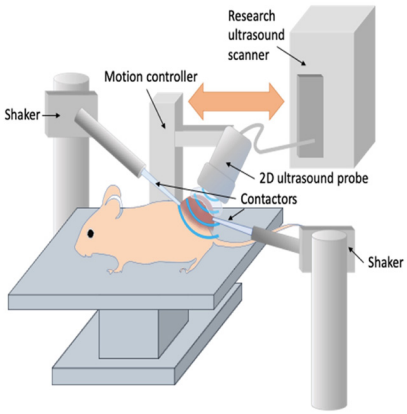
The elastic properties (or stiffness) of a tumour are known to play an important role in driving disease progression and spread. Mechanical stress associated with rapid tissue growth, compressed vasculature and lymphatics, and extracellular matrix structure and rigidity is the major contributor to this phenomenon.

In recent years, there has been substantial interest in developing innovative elastography techniques to non-invasively image and measure tumour stiffness.

These emerging methods can provide information on tumour microstructure, and how it changes during treatment, providing imaging biomarkers that will improve clinical decision-making – including for cancer diagnosis, treatment planning and monitoring.

Scientists at The Institute of Cancer Research (ICR) have developed a new ultrasound imaging technique, Vibrational Shear Wave Elastography (VSWE), that can visualise and measure the stiffness of tumours. Preclinical results have shown that VSWE is sensitive to changes in tumour integrity in response to therapy. The team proposes that compared to existing imaging technologies, VSWE can help doctors assess how well a treatment is working weeks before the tumour shrinks, helping them to quickly adjust treatment accordingly.

The team is currently developing a non-invasive clinical device based on this technique for use in preclinical studies to evaluate the effectiveness of experimental treatments – and/or in the clinic to detect cancer and improve treatment monitoring in patients. They are currently carrying out a feasibility study to assess the clinical need and barriers to its adoption in the NHS by engaging with patients, clinicians and key decision-makers.



Detail from Figure 1, *Parasaram V. et al, 2022*. Design of our 3D-vibrational shear wave elastography (3D-VSWE) platform: schematic of the apparatus used to acquire VSWE data.

Key points

ICR researchers have developed a novel non-invasive ultrasound-based imaging technique – Vibrational Shear Wave Elastography (VSWE) – that can visualize and measure tumour stiffness, along with an algorithm for data analysis.

The technology has the potential to be developed into imaging biomarkers that can help inform clinical decision-making – including for diagnosis, treatment planning and monitoring.

The ICR team is currently developing a non-invasive device based on this technique for application in preclinical studies and in the clinic.

Key publications

1. Parasaram, V. et al. Preclinical three-dimensional vibrational shear wave elastography for mapping of tumour biomechanical properties in vivo. *Cancers* 2022 14(19):4832. doi: 10.3390/cancers14194832.
2. Civale, J. et al. High Frequency Ultrasound Shear Wave Elastography for Preclinical Research. *Physics in Medicine & Biology* 2022 67:45005. doi: 10.1088/1361-6560/aca4b8.

Lead scientists/ inventors

Dr Emma Harris and her team are developing imaging techniques to increase the effectiveness of radiation oncology. Her main focus is the development of novel ultrasonic imaging techniques to locate the radiotherapy target volume, guide the delivery of radiotherapy, and predict and monitor treatment response.

Professor Jeffrey Bamber is researching ways to improve the use of ultrasound in detecting tumours. He is past president of the International Association for Breast Ultrasound.

Dr John Civale is a senior staff scientist with over 15 years of ultrasound physics and engineering experience. He has developed numerous experimental platforms which apply ultrasound to imaging and treating cancer.

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