SentiMag: Detecting cancer cells effectively

Cancer specialists may be able to monitor the spread of cancer cells more easily, thanks to research carried out in the labs of Professor Quentin Pankhurst of the Department of Physics & Astronomy at UCL. This pioneering work led to the spin-out company Endomagnetics Ltd (www.endomagnetics.com), which was set up in 2007 to commercialise the technology. A detecting device, SentiMag, is now available for use in breast cancer patients, and the team is looking at how the technology can be used in patients with other forms of cancer.

One method of checking for cancer cells is to use a sentinel lymph node biopsy (SLNB). Cancer spreads as cells break off the tumour and are carried by the lymph – the watery fluid that surrounds the cells in the body. Lymph nodes clean the fluid, and it is here that a second tumour will often form as the cells are trapped by the node nearest the primary tumour. Clinicians face the challenge of finding this – the sentinel node – and surgically removing it for testing to see what treatment is required.

Currently the main method for SLNB is to use radioactive tracers. However, there are issues surrounding the use of radiation: the material – molybdenum-99 – is costly and has a short half-life, with hospitals needing a new supply weekly. Safety procedures are restrictive too, meaning that relatively few breast cancer patients are offered this treatment. By contrast, magnetic tracers are relatively inexpensive, have a significantly longer shelf life and are not subject to stringent regulations. This makes the use of a magnetic sensor a simple and cost effective method for diagnosing these types of cancer cells.

‘We already use magnetic sensors to measure heartbeats and brain activity, for example, using techniques like MRI,’ Pankhurst says. ‘We wanted to create something that was smaller and more versatile for routine use.’

For the sensors to work efficiently, the researchers had to use a material that would generate a signal that the device could easily pick up. The solution came in the form of iron oxide particles, which according to Professor Pankhurst ‘are ideal as they give strong magnetic signals, and as they are already used in MRI contrast agents, they are known to be safe.’

The iron oxide particles are injected into the tissue close to the tumour, and are carried in the lymph fluid to the nodes, where they accumulate. The resulting magnetic signal can be picked up using a hand-held detector, making it easy to determine which lymph nodes the tumour is draining into. The physician can then make an informed decision as to which lymph nodes might be affected, and which should be removed for testing.

SentiMag received CE marking last summer, and the company is now starting to look at other applications, as Pankhurst believes it should be relatively easy to translate the technology from one cancer to another. ‘We are working with a group in the Netherlands on colorectal cancer, and also looking closely at melanoma,’ he says. ‘We have been very active in engaging with clinicians, and the response to the technology has been enthusiastic, as it gives greater confidence that the right nodes are being checked.’
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