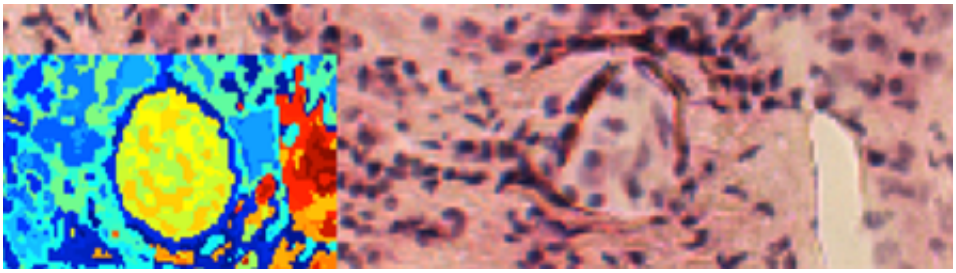
New technique could improve the outcome of breast cancer surgery

September 30 2014, by Charlotte Anscombe



A new technique will help surgeons to detect where the margins of cancerous breast tumours are during surgery, reducing the need for secondary operations in breast cancer patients.

Scientists have developed a highly accurate prototype technique which can produce a detailed 'molecular fingerprint' of breast tissues removed during surgery. This technique – which can produce detailed maps of the tissue - has the potential to improve the outcome for breast cancer surgery and to reduce unnecessary secondary operations.

The new study, which has been published in the journal *Physics in Medicine and Biology*, has been carried out by a group of researchers led by Dr Ioan Notingher in the School of Physics and Astronomy at The University of Nottingham, in collaboration with *The Breast* Pathology research Group, led by Professor Ian Ellis.

Breast cancer is the most common cancer and second leading cause of cancer-related death among women. Complete removal of cancer with or without radiotherapy is the standard treatment for all cases. Breast-conserving surgery (BCS) is now a commonplace surgical technique for the treatment of early stage cancers.

BCS aims to remover the tumour but at the same time conserve as much healthy breast tissue as possible. One of the main challenges during this type of surgery however, is the detection of tumour margins during surgery. Imaging techniques such as MRI or CT scans are not enough of a guide for a surgeon to ensure clear margins.

Dr Notingher said: "The main aim of breast-conserving surgery is to remove the cancer while ensuring a good cosmetic outcome for the patient. Currently, surgeons rely on information based on other imaging modalities (for example MRI) obtained several days before to the operation to locate the cancer during surgery. However, such information is not sufficiently accurate, and during the operation, surgeons rely on their fingers and eyes to decide on how much tissue to cut out. Our new technique can detect the presence or absence of breast tumours at the surface of the tissue removed by the surgeon."

This new technique uses an integrated optical technique based on auto-fluorescence (natural fluorescence from the tissue) and Raman spectroscopy (a highly sensitive technique using laser to identify the molecules in a tissue sample).

Although Raman spectroscopy is known to be a very slow technique, fast auto-fluorescence imaging was used to guide the Raman measurements to sample only the suspicious tissue regions. By combining these two techniques, high-accuracy detection of breast tumours can be obtained in only few minutes.

"By optimising our prototype instrument using cutting-edge optical components, diagnosis of the entire resection surface could be achieved in few minutes," adds Dr Notingher. "This technology has the potential to revolutionise the surgical treatment of breast cancers by providing accurate information to the surgeons on whether the entire tumour has been removed whilst at the same time preserving as much healthy tissue as possible."

More information: The study is available online: iopscience.iop.org/0031-9155/5 … -9155_59_20_6141.pdf.

Provided by University of Nottingham