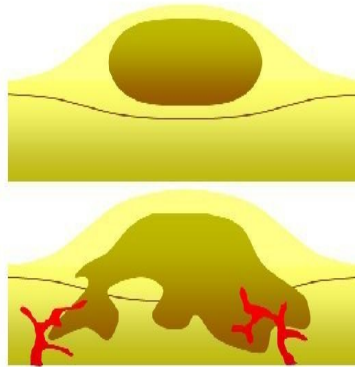




Imaging System Improves Effectiveness of Cancer Surgery



Scientists have invented a new imaging system that will make it easier for surgeons to detect malignant tissue during surgery and hopefully reduce the rate of cancer recurrence. The inventors say the imaging system causes the tumours to “light up” when a hand-held laser is directed at them.

“A surgeon’s goal during cancer surgery is to remove the tumour, as well as enough surrounding tissue to ensure that malignant cells are not left behind,” said Aaron Mohs, PhD, assistant professor of regenerative medicine at Wake Forest Baptist Medical Center and a co-inventor of the system. “But how do they know when they’ve removed enough tissue? Our goal is to provide better real-time information to guide the surgery.”

A prototype system combines a fluorescent dye that localises in tumours with a real-time imaging system that allows the surgeon to simply view a screen to distinguish between normal tissue and the “lighted” malignant tissue.

When the prototype was tested in both mice and companion dogs with tumours, Prof. Mohs and colleagues observed that the fluorescent dye accumulated at higher levels in tumours than in the surrounding tissue and the system was able to detect a distinct boundary between normal and tumour tissue.

The research is published online in *IEEE Transactions on Biomedical Engineering (TBME)*. Prof. Mohs' team is working to further develop the system so it can be tested in human patients.

Current technology allows cancer surgeons to scan tumours prior to surgery with magnetic resonance imaging (MRI) and other systems. However, to scan the tumour during surgery involves moving the patient from the operating table and into the machinery, which prolongs the surgery.

The ideal system, the researchers noted, would find tumour boundaries with high sensitivity, have minimal impact on operative time and surgical technique, present findings in an intuitive manner and avoid the use of ionising radiation or a specialised imaging environment, such as MRI machines.

“Being able to quickly scan a tumour during surgery to visualise tumour tissue from non-tumour tissue is an unmet clinical need,” Prof. Mohs pointed out. “Pathology techniques that examine tumour tissue during surgery can take up to 20 minutes and they focus on the tissue removed during surgery, not the tissue that remains in the body.”

The new imaging system, developed by Prof. Mohs, Michael C. Mancini at SpectroPath Inc., and Shuming Nie with Emory University and Georgia Institute of Technology, combines two types of imaging. A surgeon-

controlled laser can be directed at any area of interest. In addition, an imaging system with three cameras sits above the surgical field. The images recorded by both systems are processed to display a composite image.

Using this system, a cancer surgeon would scan the tumour prior to surgery to determine its boundaries. The tumour would then be surgically removed and the area would be re-scanned to check for any remaining malignant tissue. If diseased tissue is found, it would be removed, and the process would be repeated until diseased tissue could no longer be detected.

In the prototype system used in their research, Prof. Mohs et al. used indocyanine green dye as the source of fluorescence. They said that future studies will focus on higher performance fluorescent dyes and nanoparticles that can be targeted to specific tumours.

A new \$1.37 million research grant from the National Institute of Biomedical Imaging and Bioengineering will help Prof. Mohs' team undertake a project to optimise the system and to test it in rodents. Under the four-year project, the team will develop nanoparticles based on hyaluronic acid, a substance naturally present in the human body. These nanoparticles will have the ability to entrap near infrared fluorescent dyes. The team will investigate invasive ductal carcinoma, the most common type of breast cancer.

Source: [Wake Forest Baptist Medical Center](#)

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