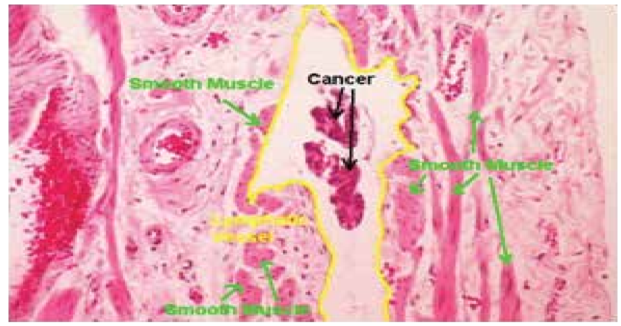
Medical News

Pen-sized microscope which identifies cancer cells in the operating room, out of animal studies



Over the past century, the most reliable method of diagnosing diseases has been the microscopic visualization of thinly sectioned tissues mounted on glass slides. This practice of histopathology is universally accepted as a gold-standard diagnostic method. However, preparing histology slides from freshly excised tissues is labour intensive and time-consuming, where time is of the essence. Now, researchers at the University of Washington, Memorial Sloan Kettering, Stanford University and the Barrow Neurological Institute are developing a handheld, miniature microscope to allow surgeons to see cancer cells at a cellular level in the operating room and determine where to stop cutting. The team state that the handheld microscope, roughly the size of a pen, combines technologies in a novel way to deliver high-quality images at faster speeds than existing devices, and will begin testing it as a cancer-screening tool in clinical settings next year. The opensource study is published in the journal 'Biomedical Optics Express'.

Previous studies show that various devices have been developed for clinical microscopy applications, many of which have been based on the technology of the relatively inexpensive confocal microscopy. Previous handheld and endoscopic confocal microscopy prototypes have largely utilized a point-scanned configuration in which an image is generated one pixel at a time by scanning a focal volume in two dimensions within the sample. However, the physical limits of a two-dimensional scanning mechanism often results in limited frame rates and common image features. Therefore, the microscope technologies that have been developed over the last couple of decades are still pretty large. Making microscopes smaller, however, usually requires sacrificing some aspect of image quality or performance such as resolution, field of view, depth, imaging contrast or processing speed. The device in the current study does one of the best jobs ever, compared to existing commercial devices and previous research devices, of balancing all those tradeoffs.

The current study shows that the miniature microscope uses an innovative approach called 'dual-axis confocal microscopy' to illuminate and more clearly see through opaque tissue. Results show that it can capture details up to a half millimeter beneath the tissue surface, where some types of cancerous cells originate.

The lab states that the microscope also employs a technique called line scanning to speed up the image-collection process. They go on to add that it uses micro-electrical-mechanical, also known as MEMS, mirrors to direct an optical beam which scans the tissue, line by line, and quickly builds an image. Data findings show that the miniature microscope has sufficient resolution to see subcellular details. Results show that images taken of mouse tissues compare well with those produced from a multi-day process at a clinical pathology lab, the universal method for identifying cancerous cells in tissues.

The team surmises that for brain tumour surgery, there are often cells left behind that are invisible to the neurosurgeon and their device will be the first to allow surgeons to identify these cells during surgery to determine exactly how much further to reduce the residual. For the future, the researchers hope that after testing the microscope's performance as a cancer-screening tool, it can be introduced into surgeries or other clinical procedures within 2-4 years.

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