Label-free in-situ medical imaging

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Technology description

Summary

MARKETS ADDRESSED:
The Xie lab is developing a tissue imaging tool for high resolution, in-situ medical applications. It provides the unmatched contrast and sensitivity of Coherent Raman Scattering (CRS) in an endoscopic delivery system for use in a number of applications including real-time surgery. This technology provides an operating room tableside tool to image tissue structures down to the cellular or subcellular level. This capability allows one to instantly differentiate between cancerous and healthy cells. Tumor margin detection in areas such as brain surgery/tumor removal is one key application area.

This invention provides a system and method for applying Coherent Raman Scattering (CRS) microscopy within a patient, animal or other subject. The technique provides label-free imaging that allows samples to be visualized in-situ based on their chemical composition only. The invention provided here combines fiber scanning endoscopy with Coherent Raman Scattering (CRS) microscopy to create a 'CRS endoscope.'
The technology works by delivering near infrared picosecond pulse trains at multiple wavelengths through an optical fiber to excite a sample. The light that is emitted from the sample is then collected. Using a specific silica fiber, light of the desired color, pulse width and intensity may be delivered to a sample without significant distortion.
This endoscope is useful in medical applications, such as removing cancerous materials from living tissue, specifically including brain surgery. The tool provides precision spatial resolution and contrast to visualize tissue in-situ at the cellular or subcellular level. This is a great improvement over competing technologies such as MRIs which are capable of large-scale imaging only and traditional fluorescence microscopy which generally require photosensitive dyes and markers.
CARS image of the margin of a brain tumor, showing the infiltration of the tumor (dark) into the healthy tissue (red-orange), based on relative lipid density. An image similar to this can now be taken in-situ.

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