MedicalXpress

Researchers use infrared imaging to detect lung tumors

September 25 2014, by Lee-Ann Donegan

Penn Medicine researchers are now able to identify cancerous tumors of the lung using infrared imaging that makes hidden tumors glow during surgery. In a pilot study, researchers performed the first in-human demonstration of this technology to identify lung tumors during surgery without prior knowledge of their location or existence. Their complete findings are available in the Annals of Thoracic Surgery.

Lung cancer is one of the deadliest of cancers, with more than 250,000 newly diagnosed cases in the United States each year. Approximately 80,000 patients with non-small cell lung cancer (also known as adenocarcinoma) undergo thoracic surgery each year to remove their nodule. Ten to 15 percent often have additional nodules that are unable to be seen on preoperative imaging or identified by the surgeon, visually or by finger palpation during surgery. New findings suggest that infrared technology, or near infrared imaging (NIR), has the ability to identify these tumors and save many of these patients from a cancer recurrence.

The Penn team tested the technology on 18 patients between the ages of 29 to 78 from January to July 2012 with a diagnosis of a single pulmonary nodule. Each patient was injected with an FDA-approved dye, indocyanine green, 24 hours before surgery. The properties of the dye allow it to bind with receptors on cancerous tumors, causing them to fluoresce neon green under infrared light. During surgery, an infrared camera was placed above the chest to search for any fluorescing tumors. In this study, the camera correctly located 16 of the 18 primary tumors (91 percent). The rest of the lung was then imaged and five additional

nodules were identified that could not otherwise be seen or felt by the surgeon. Two of the five were located in the same lobe of the lung as the primary nodule and three were located in other lobes. All five additional nodules were removed.

"To our knowledge, NIR imaging has not been used in thoracic surgery to identify pulmonary nodules that have not been diagnosed preoperatively," says senior author Sunil Singhal, MD, assistant professor of Surgery and director of Penn Medicine's Thoracic Surgery Research Laboratory. Singhal's team previously showed the technology to be successful in identifying unknown tumors in dogs.

"By removing these we were able to prevent a local cancer recurrence and also reduced these patients' chances of their cancer spreading and developing into metastatic disease," says Singhal.

The team also examined the two tumors that did not fluoresce and found that the non-fluorescing nodules were deeper in the lung than those that fluoresced. The team pinpointed the size that tumors needed to be in order to be detected by this technology, and suggested that those buried too deep within the lung tissue would go undetected.

"This technology eliminates any second-guessing by the surgeon, is safe—it gives off less energy than the lights in the operating room—is easy-to-understand and offers essential information to the surgeon in real-time, giving it the ability to make a real difference for patients," says Singhal. Next, the team plans to apply this technology in a minimally-invasive setting and expand into other cancer types such as breast and renal cancer with the aim of identifying deeper nodules that are difficult to locate since they cannot be felt by the surgeon.

Provided by University of Pennsylvania School of Medicine