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Optical Coherence Tomography of the Lung and Lower Airwa

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Abstract

BACKGROUND: Current modalities for imaging the lung and lower airway have relatively low resolution and have limitations in the ability to accurately characterize pleural, lung, or lower airway malignancies and other abnormalities. Optical Coherence Tomography (OCT) is a rapidly developing high resolution (near histologic level) imaging modality that has many potential advantages for early diagnosis. In order to assess the potential for OCT real-time imaging of pleural or peripheral lower airways, lungs in various states of inflation were imaged with OCT.

PURPOSE: To evaluate the potential of OCT to provide accurate real-time high resolution imaging of the lung, pleura, and lower airway.

METHODS: Freshly excised lungs were obtained from pigs and New Zealand White rabbits and imaged (inflated, deflated, and fluid filled) by OCT, using a prototype super-luminescent diode system constructed in our laboratory (10μm resolution and center wavelength of 1300nm). After OCT images were obtained, the samples were processed for standard H&E histology for comparison to OCT.

RESULTS: The OCT imaging offered high resolution of the lung, and lower airway, with approximately 10 μm resolution, to depths of about 2 mm below the lung surface. The OCT images closely matched histological images, showing detailed structure including the pleura, alveoli, and respiratory bronchioles.

CONCLUSIONS: OCT, using NIR interferometric methods to enable near histological level imaging with the potential for ‘optical biopsy’ capabilities, has demonstrated high-resolution imaging feasibility in excised lung and lower airway, both along pleural surface and in superficial lung tissue.

CLINICAL IMPLICATIONS: This imaging modality can be adapted to potentially obtain *in vivo* real time imaging for minimally invasive diagnostic purposes. With further advances, OCT may provide an accurate *in vivo* method for early diagnosis of pulmonary abnormalities.

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