

“Optical Imaging of the Pulmonary Airways in the Assessment of Lung Cancer”

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Lung cancer is the leading cause of cancer related death, accounting for 29% of all cancer deaths in the US and 17% worldwide. Despite recent efforts to reduce the mortality associated with this disease, patient prognosis remains poor, with the current 5-year survival rate under 15%. Squamous cell carcinoma (SCC) is the most malignant of all lung cancers and accounts for 30% of all cancers in the lung. Arising in the bronchial mucosa, it is currently difficult to detect early in the disease process, both endoscopically and radiographically, and as a result is typically well advanced upon discovery. Further compounding the formidable problem of detection is that SCC may develop as a multifold disease. The prevalence and high mortality rate associated with the disease gives impetus to the need for new highly accurate and sensitive screening tools with the objective of early detection and diagnosis.

Autofluorescence bronchoscopy (AFB) has recently received significant attention as a screening tool for DCC and its precursor lesions. AFB, like other screening tools, does not have adequate sensitivities for detecting dysplasia, carcinoma in situ or microinvasive cancer (61.2% sensitivity, 75.3% specificity), and is incapable of rendering a diagnosis. ***The goal of this work is to develop an accurate screening and assessment tool for the detection and diagnosis of dysplastic changes and early SCC in the bronchial mucosa.*** This research project is based on a newly developed optical imaging technique termed optical frequency domain imaging (OFDI). OFDI is a noninvasive imaging technique that provides cross-sectional images of biological tissues in resolutions comparable with histopathology. We hypothesize that OFDI will be capable of comprehensively imaging the pulmonary airways and will be able to accurately differentiate and diagnose SCC and its precursor lesions. During the mentored phase of this award, OFDI diagnostic criteria for the evaluation of bronchial pathology will be established, and an OFDI imaging probe will be developed and tested. The mentored phase will provide the necessary foundation for the success of the studies proposed throughout the independent phase of this award, including the implementation and validation of an OFDI based guided-biopsy imaging paradigm and a subsequent clinical study.