

Project Title: Real-Time Endoscopic Guidance using Near-Infrared Fluorescent Light for Thoracic Surgery

Abstract: Lung cancer is the leading cause of cancer death in the United States, accounting for 28% of all cancer deaths. Standard of care for potentially curable lung cancer involves preoperative radiographic or invasive staging, followed by surgical resection. With recent adjuvant chemotherapy and radiation studies showing a survival increase in node-positive patients, it is crucial to accurately surgically stage these patients in order to identify those who may benefit. However, lymphadenectomy in lung cancer is currently performed randomly, mainly due to the lack of tools permitting real-time, intraoperative identification of sentinel lymph nodes (SLNs). Given the implications of inadequate staging underlying the high recurrence rates reported in early stage lung cancer, it is imperative to develop new tools to improve surgical nodal assessment.

Optical near-Infrared (NIR) fluorescence imaging has the potential to solve this clinical problem by providing real-time, intraoperative guidance for lymphadenectomy. Previous studies have shown that injection of a safe, FDA-approved fluorescent tracer such as indocyanine green (ICG) into a tumor permits accurate intraoperative identification of lymphatic drainage and SLNs. In this project, we propose to design, validate and translate an NIR-compatible endoscopic fluorescence imaging system in combination with a fluorescent tracer for intraoperative guidance. This system will be tested preclinically using Yorkshire pigs in our laboratory and translated to a pilot human study in lung cancer with our clinical collaborator. Together, this study aims to solve an unmet clinical need and has the potential to profoundly impact the management of lung cancer patients.