S1-1

Auto fluorescence Bronchoscopy - The LIFE System

Stephen Lam, M.D., FRCPC

British Columbia Cancer Agency & The University of British Columbia, Vancouver, Canada

In Bronchoscopy, instead of using the reflected and back-scattered light as in conventional white-light examination, one can make use of light induced tissue autofluorescence to improve our ability to localize small pre-invasive lung cancer. The principle of operation of the Xillix LIFE Fluorescence Imaging System is based on spectroscopic measurement of native fluorescence of normal, pre-cancerous and cancerous tissues without prior administration of fluorescence compounds such as Photofrin or HPD. Upon illumination of the bronchial surface by blue or violet light there is progressive reduction in the fluorescence intensity, especially in the green wavelength band of the fluorescence spectrum as the tissue becomes more abnormal. There is also a subtle and less consistent difference in the shape of the fluorescence spectra between normal and abnormal bronchial tissues. The marked reduction in fluorescence intensity (up to 10 times or more) in pre-malignant and malignant tissue is thought to be due to a combination of as increase in the thickness of the bronchial epithelium and a loss of fluorophore concentration or fluorescence quantum yield. The LIFE system exploits this difference in fluorescence intensity to detect pre-invasive bronchial lesions. The method is more practical and reliable than point measurement systems that are based on characterization of subtle and less robust differences in spectra shape. In comparison to imaging systems that require prior administration of fluorescence drugs, bronchoscopic examination using the LIFE system can be carried out at any time similar to standard fiberoptic bronchoscopy and without incurring additional expenses to the bronchoscopic procedure. The blue light that is used for illumination is weaker that the white-light from the usual xenon lamp and has no adverse effect on the bronchial tissues. Experience with the LIFE system in over 400 patients has shown that it can improve the detection rate of pre-invasive bronchial cancers by more than 2.5 times compared to standard white light bronchoscopy while maintaining a similar specificity. Fluorescence bronchoscopy has been found to be useful in the localization of sputum cytology positive, radiologically occult lung cancer, and in the preoperative assessment of patients with lung cancer to determine the extent of endobronchial spread and to detect synchronous cancer. It is a useful tool to educate endoscopists to recognize subtle bronchial lesions. As a research method, it offers the possibility of studying the pathogenesis of lung cancer and the effect of chemopreventive treatment. If current work for the detection of pre-invasive lung lesions using sputum specimens with quantitative image cytometry or molecular markers is successful, it would be even more important to be able to localize small pre-invasive lung lesions. By coupling a sensitive diagnostic tool and new treatment modalities such as chemoprevention and various endobronchial therapies, it is hopeful that the traditionally poor prognosis of patients with lung cancer can be altered.