IN VIVO AND EX VIVO MICROSCOPY TECHNIQUES
Towards non-invasive diagnosis

International guest speaker

Manu Jain, MD
Assistant Attending, Optical Imaging Specialist (Dermatology)
Memorial Sloan Kettering Cancer Center, NYC, NY, U.S.A.

ORGANIZED BY:
DEPARTMENT OF PATHOLOGY
INSTITUTE OF MEDICAL SCIENCES
BANARAS HINDU UNIVERSITY

Friday 13th, March 2020
IN VIVO AND EX VIVO MICROSCOPY TECHNIQUES

INTRODUCTION

Traditionally, diagnosis of cancer and other non-neoplastic lesions rely on histopathological evaluation. Although, histopathology is the gold standard it requires time-consuming tissue processing, which often delays the diagnosis and management of the patients. Currently, frozen section is the only modality for rapid histopathological evaluation, however, it still requires tissue sectioning and freezing which may disrupt the pathology. Furthermore, some fatty tissues such as breast are not suited for frozen section evaluation.

To overcome the limitations related to tissue processing and provide rapid histopathological evaluation several optical (light-based) imaging-based ex vivo and in vivo microscopes are build including confocal microscope (CM), multiphoton microscope (MPM), and optical coherence tomography (OCT) microscopes. Ex vivo microscopes are mostly compact bench-top systems that can be placed in the grossing room or in the surgical suite for rapid evaluation of freshly excised tissue at histopathological level—without the need of tissue processing and cutting. They have the potential to be used as an adjunct or alternative for frozen section analysis and for selection of tissue for biobanking. Furthermore, as there is no tissue cutting involved, the entire tissue can be preserved for ancillary studies such as IHC and molecular analysis.

In vivo microscopes on the other hand are used to make diagnoses in patients without removing the lesions—noninvasive no biopsy approach. In vivo microscopes are either designed to be compatible with existing standard of care clinical instruments (e.g., they can be inserted into endoscope accessory ports) or as a stand-alone imaging device. The probe-based endoscopic devices are used to evaluate the luminal lining of gastrointestinal tract, cardiovascular system, bronchial airways, urethra, and bladder. They are thus suited to guide surgeon in biopsy acquisition from suspicious areas, providing pathologists tissue with diagnostic material, reducing the rate of repeat surgical procedures and complications associated with anesthesia.

In vivo confocal microscope is an example of a stand-alone tool that is currently used in dermatology and head and neck surgery to evaluate neoplastic and non-neoplastic mucocutaneous lesions. It has dramatically reduced the rate of benign biopsies. Additionally, some of the early skin cancers, when diagnosed with confocal microscope, can proceed directly to non-invasive treatment such as topical treatment or photodynamic therapy. Besides diagnosis, in vivo confocal microscopes are also used for non-invasive treatment monitoring and guide scouting biopsies. Some of these optical techniques have acquired billing codes and are used by clinicians, pathologists and surgeons in their routine workflow. As optical microscopes generate digital images they can be remotely reviewed and diagnosed by an expert reader.