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Progress in optical imaging creating opportunities

12 July 2012 | Analysis | By BioSpectrum Bureau

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Singapore: Current optical imaging technologies provide reproducible, accurate, objective, quantitative assessments of tissue structures. As the marked progress in optical imaging techniques observed in recent years is instigating a new wave of business opportunities, there are still areas to improve.

Frost & Sullivan's Emerging Trends in Optical Imaging Techniques for Drug Discovery, Clinical Diagnostics and Molecular Imaging Research analysis says that optical imaging at both the macroscopic and microscopic levels is being used intensively by clinicians for diagnosis and treatment-specific applications. Novel advances in optics, data acquisition methods, and image processing software have driven the development of optical imaging technologies, all of which can be used to image tissues and other biological entities with enhanced contrast and resolution capabilities.

"Technology trends are moving from conventional confocal microscopy to optical coherence tomography (OCT), with the adoption of newer technologies such as adaptive optics and polarization imaging in ophthalmology," said Mr Prasanna Vadhana Kannan, technical insights senior research analyst of Frost & Sullivan. "Several start-ups are developing innovative technologies, most of which are in the near completion and advanced phases of clinical approval in the optical imaging market."

OCT has gained much multidisciplinary research interest in recent years as a non-invasive optical imaging technique that can be used to perform cross-sectional in-situ imaging of microstructures in biological tissues. With OCT technology showing rapid progress, it is believed that many commercial devices addressing a plethora of clinical applications could hit the market over the next four to five years.

"OCT is truly an easy-to-use modality that provides digital cellular 2-D and 3-D imaging solutions for clinical and research pathology lab application needs on fixed or fresh tissue," said Mr Prasanna Kannan. "Further refinement could result in achieving significantly higher resolution capabilities and better differentiation of cancerous lesions, embryology studies, and stem cells (involving therapeutics research)."

However, the restricted availability of validated imaging parameters and low end-user awareness could limit the use of optical imaging technologies in research-specific applications. Moreover, the scope for alternative techniques usage and their strong presence (involving digital radiography, nuclear imaging techniques, and hybrid imaging) is likely to deter manufacturers from investing substantially in the development of novel optical imaging methods.

"From a technical standpoint, the key challenge is to address issues related to frozen sections arising from tissue processing steps," said Mr Prasanna Kannan. "This often results in freezing artifacts, which causes physical destruction of the structural integrity of tissues."

Despite such challenges, multi-modality imaging using optical imaging principles is helping drive the development of novel therapeutics and changing the course of patient management in debilitating disease care.