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Editorial: Advances in bio-optical imaging

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Editorial on the Research Topic
Advances in bio-optical imaging

Biomedical optics is a very large and rapidly growing field that demands proficiency across a broad range of topics, including fundamental concepts in biology, technical instrumentation in optics and applications in medicine. It covers all aspects of optical imaging and spectroscopy from subcellular scales to bulk tissue, and attracts researchers of optical physics, biophysics, biochemistry, engineering, medicine, and computer science. The field of biomedical optics continues to fascinate scientists, engineer, and users by unending production of new methods, instruments applications, and clinical implementations. Many technologies and instrumentations have been successfully translated into biomedical applications ranging from clinical diagnosis to molecular biology. Within the field of medical imaging, biomedical optics plays an increasingly important role to nondestructively reveal functional, structural, and molecular information. In clinical application, optical approaches can provide high imaging resolutions, enabling early detection of morphological changes of disease. Biomedical optics impact a very wide and disparate range of clinical specialties (ophthalmology, endoscopy, dermatology, infectious diseases, surgery, etc.). The goal of this Research Topic is to explore recent research findings and technical developments. This Research Topic includes six manuscripts that are innovative and interesting and report achievements in the field of biomedical optics.

Optical coherence tomography (OCT) is a non-contact method for imaging the topological and internal microstructure of tissue in three dimensions, which has been proven to be a powerful tool for many clinical applications, and revolutionized the diagnostic possibilities in the field of ophthalmology. In this Research Topic, four manuscripts involved in the field of OCT. Dai et al. investigate choroidal alterations in patients with thyroid eye disease (TED) using swept-source optical coherence tomography (SS-OCT) The results demonstrate that increased MCT, CVV, and CSV in TED suggest both dilated choroidal vasculature and expanded choroidal stroma. These findings demonstrated the potential of SS-OCT as an adjunctive imaging tool for the assessment of TED. Shen et al. evaluate the capability of optical coherence tomography angiography (OCTA) for imaging the microvasculature within a critical bone defect. It also could be used to longitudinally observe vascular alterations and quantify microvascular density and morphology in a model of a critical-sized defect. The OCTA imagery of blood microvasculature revealed a noticeable augmentation in the number and size of vessels. Therefore, it potentially serves as a

non-invasive experimental tool beneficial for bone regeneration research. Ke et al. presents a modified spectral domain polarization sensitive optical coherence tomography (SD-PS-OCT) system with circularly polarized light as reference combined with a quaternion approach to determine birefringence of biological tissue. The polarization properties of myocardial tissue are quantitatively reconstructed. Cheng et al. present an intraoperative optical coherence tomography angiography (iOCTA) system, which could real-time monitor retinal blood flow during intraocular surgery, by combined with GPU-based data processing pipeline. The system help surgeons to make decision during intraocular surgery.

Some optical imaging methods are more commonly used in clinical diagnostics. Ding et al. establish a rapid and effective method for *en-bloc* hematoxylin-eosin (HE) staining and paraffin embedding of human lung cancer and paracancerous tissues, which can be applied to fluorescence micro-optical sectioning tomography (fMOST). It is promising to be used in the accurate identification of structural landmarks and spatial assessment of lung cancer. Xu et al. developed a move-contrast X-ray microtomography method that achieves 3D dynamic non-destructive imaging of water refilling at the initial stage of willow branch cuttage, without the aid of any contrast agent. Since the vessel length is quite limited, the cavitation and the relay refilling mode of microvessels can be an important way to achieve long-distance water transport.

In conclusion, this Research Topic provided an overview of recent advances in the developments and application of biomedical optics, focusing on the clinical applications of instrumentation and method. Emphasizing the research on the biomedical optics could contribute to the future mitigation of optical approaches to clinical applications. Nevertheless, incredible challenges on the diagnosis and therapy need more attention, this Research Topic provided as references for collaborative research and development.

Author contributions

CL: Writing–original draft. JJ: Writing–review and editing. CL: Writing–review and editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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