TECHNOLOGY

Forward Imaging Doppler OCT Needle-type Probe for Real-time Image Guided Stereotactic Procedures

OVERVIEW

Background
Stereotactic procedures are those which require insertion of needle-based instruments into the brain. These neurosurgical procedures are employed for addressing a variety of medical conditions from biopsy of suspected tumors, to cell-based and gene therapy, to the placement of electrodes that are used for deep brain stimulation (DBS). A fundamental limitation of stereotactic procedures is that they are done blindly, such that the operator does not have real-time feedback as to what lies immediately ahead of the advancing probe. This results in two potential problems. First, numerous medium sized blood vessels which cannot be detected by CT and MRI are at risk of being lacerated by the advancing probe. Lacerated vessels in the brain can lead to stroke and death. Second, the brain may shift during surgery because of cerebrospinal fluid (CSF) leakage so that the intended target is no longer positioned at the pre-operatively determined coordinates. Misplacement of electrodes by millimeters in the brain can seriously decrease the effectiveness of DBS.

Innovative Technology
Researchers at the University of Maryland have developed a novel optical coherence tomography (OCT) probe for stereotactic neurosurgery that allows real-time imaging and identification of blood vessels and anatomic landmarks in front of the advancing probe. The tool includes Doppler OCT (DOCT) capability which provides a high signal-to-noise ratio and exceptional sensitivity in detecting and quantifying blood flow in real time. With 12 m axial resolution, an OCT-only imaging mode provides 100 frames/s with 512*160 pixels per frame, while an OCT/DOCT dual imaging mode provides 8 frames/s with 512*1024 scans per frame. OCT/DOCT dual imaging demonstrates the ability to differentiate the vessel type (artery or vein), and the location of the tip of the OCT probe can be inferred from micro-anatomical landmarks in OCT images. This real-time forward imaging feedback system allows a surgeon to avoid lacerations of at-risk intraparenchymal vessels and thereby reduce the risk of cerebral hemorrhage.

Applications
- Neurosurgery and stereotactic procedures
- Tumor biopsy
- Targeted gene therapy
- Deep brain stimulation electrode placement

Advantages
- Real-time imaging feedback
- Sub 40 mm resolution
- Vessel type differentiation
- Blood Flow Sensing

- Reduced risk of hemorrhaging

CONTACT INFO

UM Ventures
0134 Lee Building
7809 Regents Drive
College Park, MD 20742
Email: umdtechtransfer@umd.edu
Phone: (301) 405-3947 | Fax: (301) 314-9502

Additional Information

INSTITUTION

University of Maryland, College Park

PATENT STATUS

Patent(s) pending

LICENSE STATUS

Available for exclusive license

CATEGORIES

- Imaging devices

EXTERNAL RESOURCES

PS-2012-126