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강연제목: 삽입형 신경 전극 이식을 위한 말초신경의 생체 내 3 차원 미세구조 영상화

(In vivo 3D microstructural imaging of peripheral nerve for intra-neural interface implantation)

Abstract:

In the neuroprosthetic field, an intra-neural interface is necessary to provide amputated patients motion of high degree of freedom and natural sensation. However chronic implantation of the intra-neural interface causes signal quality degradation. To investigate the cause of signal quality degradation, an imaging device capable of in vivo cellular-level volumetric imaging of peripheral nerve is required. Unfortunately, there is no such imaging device. In this study, we have developed optical coherence tomography (OCT)-based imaging platform capable of visualizing the three-dimensional morphology of peripheral nerves in vivo. We have also developed a dual-focusing technique for extending the depth of focus. The OCT-based imaging platform with the dual-focusing technique allows the cellular-level volumetric visualization of the metal wire and microstructural changes in a rat sciatic nerve with the metal wire inserted in vivo. Further, we confirmed the feasibility of applying our imaging platform to large animals for a preclinical study through in vivo rabbit sciatic nerve imaging. It is expected that new possibilities for the successful chronic implantation of an intra-neural interface will open up by providing the three-dimensional microstructural changes of nerves around the inserted electrode.

Brief Biosketch

Dr. Min Woo Lee is currently a post-doctoral researcher at the Center for Intelligent and Interactive Robotics at the Korea Institute of Science and Technology (KIST) since 2019. He received his M.S. and Ph.D. from Hanyang University majored in biomedical engineering. Since then he had post-doctoral training at KIST. During his post-doctoral training at KIST, he focused on high-resolution optical coherence tomography for peripheral nerve imaging and a fiber-optic sensor for wearable devices and robotics. His current research topic includes label-free measurement of neural activity of peripheral nerve and vision-based tactile sensors.