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A minimally invasive needle endoscope for the visualization of deep brain tissues *in vivo*

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Optical imaging of the cells of the brain in live mice is a powerful approach to gain insights into the mechanisms of neuronal diseases, as well as insights into normal neuronal functions. However, many significant brain diseases arise from and affect deep brain that is beyond the reach and thus difficult to investigate with conventional instruments. Here, we describe a small-diameter (22-28 Gauge) needle endoscope enabling minimally invasive interrogation of brain tissues over a large area up to several millimeters deep *in vivo*. The rotational side-view probe, which has only 0.35 mm wide, allows for the visualization of the vertical network of neurons spanning from the L1 to the L5 layer of the cortex, hippocampus, thalamus, and hypothalamus of a live mouse. We applied the tool to examining pathogenesis at the cellular level in mouse brain disease models such as neuronal degeneration. When a toxic chemical such as mercury and TMT was introduced continuously, cellular density in cerebella granules was decreased up to about 50% in 2 weeks. The demonstrated ability to probe deep brain *in vivo* extends the utility of optical microscopy into the basic/translational studies of brain diseases and enlarges the accessibility of deep brain tissue to high resolution imaging and other optical techniques.

Biography

Jun Ki Kim has completed his PhD degree from Gwangju Institute of Science and Technology (GIST) in 2008 and postdoctoral studies from Fraunhofer Institute in Jena, Germany for pursuing new project concerning to the integrating high power fiber laser system with micro-optic devices. After pursuing his project there, he joined Wellman Center for Photomedicine, Massachusetts General Hospital and Harvard Medical School in Boston, USA. Now he has been developing optical imaging system and specialized endoscope for *in vivo* mouse imaging in Korea basic science and technology (KBSI), Daejeon, South Korea. He has published more than 30 papers in reputed journals and 80 papers in international conferences.

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