Neuroimaging of Peripheral Nerve Degeneration and Repair

Richard Dortch, Ph.D.
Associate Professor of Imaging Research, Barrow Neurological Institute

Friday, October 8, 2021
3:05 p.m. SCOB 228

Bio Sketch

Richard Dortch, PhD, is an associate professor of imaging research in the Neuroimaging Innovation Center in the Department of Translational Neuroscience at Barrow Neurological Institute. Dr. Dortch earned his master’s and doctorate degrees in biomedical engineering from Vanderbilt University in Nashville, Tennessee. He completed a postdoctoral research fellowship in the Department of Radiology and Radiological Sciences at Vanderbilt University Medical Center, where he served as assistant professor before joining the faculty at Barrow in 2019. His research has been funded through the National Institutes of Health and the Department of Defense. Dr. Dortch’s research interests include developing, optimizing, and validating quantitative MRI methods for neuroimaging applications beyond the brain. More specifically, Dr. Dortch focuses on developing MRI methods to overcome specific challenges of nerve and spinal cord imaging, translating these methods to clinical populations (e.g., to guide surgery, improve diagnostics, and serve as biomarkers of therapeutic response), and validating these methods in relevant preclinical models. He applies these methods to evaluate the pathological underpinnings (e.g., demyelination, axonal degeneration) of nerve and spinal cord trauma, peripheral neuropathies, and multiple sclerosis.

Abstract

The peripheral nervous system is primarily composed of nerves that transmit motor and sensory information between the spinal cord and the body. Damage to these nerves results in a wide array of symptoms, ranging from temporary numbness, tingling, and pricking sensations to burning pain, muscle weakness, paralysis, organ failure, and death. Although clinicians have tools for assessing peripheral neuropathies (e.g., nerve conduction studies), they provide limited information in proximal and/or transected nerves. Quantitative MRI techniques may overcome these limitations by providing assays of myelin and axon pathologies throughout the peripheral nervous system. Unfortunately, few studies have applied these techniques in humans in vivo. This can be attributed to the technical challenges associated with peripheral nerve MRI, including the need for higher spatial resolution in feasible scan times, a lack of contrast on standard anatomical images, and the influence of surrounding fat. In this talk, I will discuss quantitative MRI methods that overcome these technical challenges. Research findings in both clinical and preclinical models of peripheral neuropathies will also be discussed.