Advanced Neuroimaging of Traumatic Brain Injury: A Synergistic and Translational Approach
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Traumatic brain injury (TBI) has an onset rate of 1.5 million people in the United States and costs the nation over $60 billion per year. However, there is no effective treatment of TBI in clinical setting. Most of the treatment plans are symptom-based instead of curing the fundamental brain pathology after injury. One devastating type of brain injury is called diffuse axonal injury (DAI), which most likely cause long term neurocognitive and functional deficits among TBI patients. However, many DAI patients have normal appearing brain in conventional neuroimaging techniques and, consequently, clinician failed to order proper management to counter future potential physical and neurocognitive deficits in TBI patients.

To overcome the problem, an improved detection and characterization is the first step. Given the fact that brain injury pathology is heterogeneous and complex, we are taking a comprehensive and advanced magnetic resonance imaging (MRI) approach to this problem. Particularly, we use susceptibility weighted imaging (SWI) to detect bleed after injury, diffusion tensor imaging (DTI) to detect white matter injury, and MR spectroscopy imaging (MRSI) to detect abnormal metabolic level of the brain after injury. Meanwhile, we are also validating these MRI techniques in animal models and further translate them into human. This lecture will cover the basics of MR imaging techniques and how to apply them into biomedical research.

Dr. Zhifeng Kou is an Assistant Professor of Biomedical Engineering and Radiology. He received his M.S. and Ph.D. from North Dakota State University, by focusing on traumatic brain injury. He also had postdoctoral training in MRI in Wayne State University MR Research Facility. He was appointed as an Assistant Professor in Radiology since 2007 and then an Assistant Professor in both Biomedical Engineering and Radiology since 2010. His research is supported by the National Institute of Disability and Rehabilitation Research (NIDRR) and National Football League. He has served on an NIH special emphasize panel for grant reviews.

All students, faculty, and anyone interested are welcome.