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Neurovascular Ultrasonic Imaging & Transcranial Doppler with Spectral Analysis of Cerebral Blood Flow and Microbubble Resonance for Blood-Brain-Barrier Passage of Regenerative Cell Therapies & Neuroprotective Agents in Traumatic Brain Injury, Neurodegenerative Diseases, Cerebrovascular Disease & Stroke

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Numerous agents are under investigation for their therapeutic, neuroprotective, and regenerative capabilities for many injuries and pathologies of the central nervous system (CNS), which will require not only optimization of the agents themselves, but also optimization of delivery methods to target the underlying multimodal pathologies. Delivery approaches may include intralesional or intrathecal delivery, but many neural injuries and pathologies also involve significant neurovascular flow changes, including traumatic brain injury, concussion, stroke, cerebrovascular disease, and neurodegenerative diseases. Neurotoxic insults may arise from trauma, hemorrhage, vasospasm, excitotoxic ischemia, atherosclerosis, oxidative damage or toxin exposure. In these cases, intravascular delivery can also safely provide dual benefits to the vasculature and neural tissue, but the blood-brain barrier (BBB) presents a significant impediment particularly for large structures like stem cells. New research seeks to study the ability of ultrasonic imaging & transcranial doppler with spectral analysis of cerebral blood flow and microbubble resonance to enhance delivery of regenerative cellular therapies and neuroprotective agents across the BBB. This may provide advantageous CNS delivery methods by temporarily opening windows through the BBB, and applications may include passage and infusion of neuroprotective agents, pharmaceuticals, neurotrophic growth factors, peptides, biologics, neuroglial or mesenchymal stem cells, and other cellular therapies that optimally target both vascular and neural repair.

Biography

Dr. McMurtrey is an accomplished physician, surgeon, scientist, and engineer, with clinical expertise in complex minimally-invasive regenerative interventions. He holds degrees with highest honors in medicine and surgery, biomedical engineering, and neuroscience, and he has led new advancements in image-guided procedures for complex spine, brain, nerve, and orthopedic conditions to provide optimized recovery and regenerative repair of many types of injuries, pathologies, and disorders. He was distinguished as one of the top innovators for his work at the University of Oxford where he pioneered new tissue engineering techniques for growing mini-organs and tissues from stem cells using functionalized nanofiber scaffolding within 3D patterned architecture. Dr. McMurtrey has published high-impact research in tissue engineering and stem cell biology in several prestigious academic journals, focusing on the synthesis of stem cell constructs in biomaterial scaffoldings with biochemical cell signaling cues that can be used in minimally-invasive tissue repair procedures.