Neuroplasticity and Neuromodulation after Severe Stroke: Teasing Out the Unknowns
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Stroke is a leading cause of long-term disability in the US. Approximately 40% of stroke survivors have severe impairments. Yet, interventions to improve recovery in individuals with severe motor impairments are underrepresented in stroke research. Addressing this unmet need, our research focuses on motor recovery from severe impairment. New rehabilitative approaches to enhance motor recovery involving intensive motor training, such as constraint-induced therapy, have produced promising results only in stroke patients with mild motor deficit. Intensive motor training has not benefited patients with severe motor deficit, suggesting that training alone is unable to increase hand motor function and/or cortical plasticity in such patients. Our extensive experience with stroke patients with severe motor deficit demonstrates that motor function can be improved when an adjuvant neuromodulatory intervention such as peripheral nerve stimulation or transcranial direct current stimulation is combined with intensive motor training. Additionally, it has been thought that individuals with an absence of motor evoked potentials (MEP) in response to transcranial magnetic stimulation have less potential for corticospinal reorganization and therefore less motor recovery. However, our group has shown that absence of MEPs does not invariably indicate a poor prognosis. This presentation will demonstrate that individuals with severe stroke can achieve meaningful functional improvements, defined as the minimal clinically important difference. We will discuss the effects of different neuromodulatory interventions and the role of baseline corticospinal integrity for the trajectory of functional recovery. Finally, we will discuss potential future directions.