Applications of Non-invasive Neuromodulation for the Management of Disorders Related to COVID-19

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Background: Novel coronavirus disease (COVID-19) morbidity is not restricted to the respiratory system, but also affects the nervous system. Non-invasive neuromodulation may be useful in the treatment of the disorders associated with COVID-19.

Objective: To describe the rationale and empirical basis of the use of non-invasive neuromodulation in the management of patients with COVID-10 and related disorders.

Methods: We summarize COVID-19 pathophysiology with emphasis of direct neuroinvasiveness, neuroimmune response and inflammation, autonomic balance and neurological, musculoskeletal and neuropsychiatric sequela. This supports the development of a framework for advancing applications of non-invasive neuromodulation in the management COVID-19 and related disorders.

Results: Non-invasive neuromodulation may manage disorders associated with COVID-19 through four pathways: (1) Direct infection mitigation through the stimulation of regions involved in the regulation of systemic anti-inflammatory responses and/or autonomic responses and prevention of neuroinflammation and recovery of respiration; (2) Amelioration of COVID-19 symptoms of musculoskeletal pain and systemic fatigue; (3) Augmenting cognitive and physical rehabilitation following critical illness; and (4) Treating outbreak-related mental distress including neurological and psychiatric disorders exacerbated by surrounding psychosocial stressors related to COVID-19. The selection of the appropriate techniques will depend on the identified target treatment pathway.

Conclusion: COVID-19 infection results in a myriad of acute and chronic symptoms, both directly associated with respiratory distress (e.g., rehabilitation) or of yet-to-be-determined etiology (e.g., fatigue). Non-invasive neuromodulation is a toolbox of techniques that based on targeted pathways and empirical evidence (largely in non-COVID-19 patients) can be investigated in the management of patients with COVID-19.