

Upper Extremity Neuropathies following Severe COVID-19 Infection: A Multicenter Case Series

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INTRODUCTION: About a third of patients with COVID-19 progress to acute respiratory distress syndrome (ARDS) and 26% of COVID-19 patients require transfer to an intensive care unit (ICU). Previously rare cases of intensive care unit (ICU)-related plexopathy following prone positioning draws concern as to whether these are related to the higher volume of patients with ARDS requiring prone positioning or whether this is a direct or indirect effect of the viral infection. The purpose of the study was to examine presentation, injury patterns, and clinical course, for COVID-19 related peripheral nerve injury following mechanical ventilation.

METHODS: A multicenter retrospective study of patients with COVID-19 complicated by ARDS that required mechanical ventilation was undertaken. Patient demographics, hand dominance, comorbidities including obesity, lung disease, diabetes, and tobacco use as well as infection, ARDS, and intubation characteristics, prone or lateral decubitus positioning, and onset of neuropathy diagnosis were queried. Upon referral to peripheral nerve/brachial plexus specialists, associated clinical examination, advanced imaging, electrodiagnostic studies, and treatment plans were then collected. Continuous and categorical variables were reported with means, standard deviations, ranges, frequencies, and percentages.

RESULTS:

Between September 2020 and January 2022, 11 patients were diagnosed with upper extremity neuropathy following severe COVID-19 infection. The mean age of these patients was 48.7 (± 12.9 , range 27-68) with 9 males (81.8%). The mean BMI was 33.8 (± 7.14) with six patients (54.5%) considered obese with a BMI > 30. Seven patients (63.6%) had dominant hand-sided injuries. All patients progressed to ARDS and required mechanical ventilation with six (54.5%) undergoing prone positioning for ARDS, one with lateral decubitus positioning, and four maintaining supine position (Table 1). The median length of intubation was 39 days (range 18-60 days).

The mean time from infection to the diagnosis of neuropathy was 2.82 months (± 2.04 , range 1 – 7 months). Of the 11 patients, 5 demonstrated brachial plexopathies, 2 demonstrated incomplete brachial plexopathies, 2 demonstrated lower trunk plexopathies, 1 radial mononeuropathy, and 1 with bilateral ulnar neuropathies (Table 2). Of the 5 patients with brachial plexopathy, 2 had deficits of both upper extremities. The patient who developed a radial mononeuropathy was placed in lateral decubitus positioning (patient no. 10 in Table 3).

Mean follow-up from neuropathy was 10.2 months (± 6.79 months). Resolution of plexopathies and neuropathies have been variable. Patients with brachial plexopathy have shown gradual improvement in function starting proximally with shoulder function followed by elbow flexion (Table 3, Patient No. 1, 2, 3). Patient No. 4 demonstrated resolution of initial bilateral brachial plexopathy which resolved to a right radial mononeuropathy at 3 months. Patient No. 11 with initial bilateral ulnar neuropathy resolved on the left side at 6 months, but continued on the right side, with plans for cubital tunnel release. A majority of patients have demonstrated minimal clinical improvements.

DISCUSSION AND CONCLUSION: Our series of patients demonstrates that peripheral neuropathies and especially brachial plexopathies have been diagnosed following mechanical ventilation for ARDS related COVID-19 infections. Contrary to other COVID-19 studies, only 54.5% of these patients underwent prone positioning. This finding gives credence to the hypothesis that there is a multifactorial compromise of the peripheral nerves secondary to a hyperinflammatory environment imposed by the viral infection, prolonged ICU courses, as well as patient comorbidities (e.g. diabetes, obesity, and age) that causes these nerves to be vulnerable to injury. Taken together, there may be an interplay of traumatic and atraumatic etiologies whereby the traumatic disturbance of the plexus from prone positioning and shoulder abduction align with the physiologic vulnerability of the peripheral nerves during infection. Such physiologic vulnerability may stem from a hypercoagulation state and the development of microthrombotic angiopathy with vascular compromise, a direct viral invasion, or an auto-antibody targeting of the nervous tissue. As we proceed further in the recovery process for patients infected with COVID-19, recognizing long-term complications and optimal treatments for these pathologies will become increasingly necessary.