

심폐재활

발표일시 및 장소 : 10 월 26 일(금) 13:25-13:35 Room D(5F)

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CIPN and Phrenic Nerve Conduction Study in Patients with Prolonged Mechanical Ventilation

Won Jun Kim^{1*}, Won Kim^{1†}, Suk Kyung Hong², Nak Jun Choi², Sae Rom Park²

Asan Medical Center, Department of Rehabilitation Medicine¹, Asan Medical Center, Department of Surgery²

OBJECTIVE

Critical illness polyneuropathy (CIPN) is frequent and important complication in intensive care unit (ICU) patients. Prolonged mechanical ventilation has been associated with the prevalence of CIPN. Phrenic nerve conduction Results are highly relevant to the date of weaning from the ventilator. However, there are few studies on the occurrence of CIPN and phrenic nerve conduction study (NCS) in case of critically ill surgical patients. In addition, it is hard to perform a full electrophysiologic study for CIPN diagnosis in critically ill patients. The aim of this study is to investigate the incidence of CIPN and to recognize the correlation between the CIPN and patient's prognosis when simplified diagnostic criteria are applied. In addition, we investigate the characteristics of phrenic NCS in critically ill patients and investigate the association between the Results and patient's prognosis.

METHODS

This study was performed between November 2016 and May 2018 in surgical ICU of our hospital. Critically ill patients over 18 years of age, who were mechanically ventilated for ≥ 3 weeks were included. At 3 weeks of mechanical ventilation on ICU patients, they were subjected to the NCS in upper, lower extremities including phrenic nerve and tested muscle strength by using the Medical Research Council (MRC) scale. We employed three versions of the diagnostic criteria depending on the MRC scale and NCS result. (Table 1). We used ventilator-free days at 40 days — defined as days alive and free from mechanical ventilation — to compare patient's prognosis. Ventilator-free days were then calculated post-nerve conduction study. A ventilator-free day ≥ 1 day was defined as a good prognosis and 0 day was defined as a bad prognosis. Then, we evaluate the correlation between the prevalence of CIPN and patient's prognosis.

RESULTS

A total of 50 patients were enrolled in the study — the diagnosis of CIPN yielded as the following: 7 of 50 according to criteria A; 13 of 50 according to criteria B; 16 of 50 according to criteria C. As the authors diagnose CIPN on patients by criteria A, B, and C, respectively, the Results bring forth the following: CIPN patients according to criteria A

yields an odds ratio of 12.1, regarding the prognosis detrimental to patients; an odds ratio of 24.0 by criteria B, and an odds ratio of 12.4 by criteria C. Furthermore, when the amplitude of phrenic nerve compound muscle action potential(CMAP) divided into more than 0.3mV and less than 0.3mV, the prognosis was better in more than 0.3 mV group, though it was not statistically significant.

CONCLUSION

Our Results suggest that CIPN is common in critically ill patients and the diagnostic criteria of MRC in conjunction with the tibial and sural nerve conduction study show the most predictive value on the patient’s prognosis. Although there is no statistical significance, it seems like the low value of phrenic CMAP amplitude might be correlated with the poor prognosis.

Table 1. Diagnostic criteria for critical illness polyneuropathy

| Criteria A | Criteria B | Criteria C |
|---|--|--|
| MRC sum score of <48 | MRC sum score of <48 | Dependence on mechanical ventilation |
| Dependence on mechanical ventilation | Dependence on mechanical ventilation | CMAP amplitudes are decreased to <80% of the lower limit of normal in posterior tibial nerve |
| CMAP amplitudes are decreased to <80% of the lower limit of normal in ≥ 2 nerves | CMAP amplitudes are decreased to <80% of the lower limit of normal in posterior tibial nerve | SNAP amplitudes are decreased to <80% of the lower limit of normal in sural nerve |
| SNAP amplitudes are decreased to <80% of the lower limit of normal in ≥ 2 nerves | SNAP amplitudes are decreased to <80% of the lower limit of normal in sural nerve | |

Table 2. Clinical Illness Polyneuropathy versus Ventilator-free day

| | Ventilator Free day = 0 | Ventilator Free day \geq 1 | <i>p-value</i> (<i>odds ratio</i>) |
|---------------------------|----------------------------|---------------------------------|---|
| CIPN + (by Criteria A) | 5 (41.7%) | 2 (5.6%) | |
| CIPN – (by Criteria A) | 7 (58.3%) | 34 (94.4%) | .002 (12.14) |
| CIPN + (by Criteria B) | 9 (75.0%) | 4 (11.1%) | |
| CIPN – (by Criteria B) | 3 (25.0%) | 32 (88.9%) | <.001 (24.00) |
| CIPN + (by Criteria C) | 9 (75.0%) | 7 (19.4%) | |
| CIPN – (by Criteria C) | 3 (25.0%) | 29 (80.6%) | <.001 (12.43) |

p values were calculated using the χ^2 -test, $p < .05$ was considered to be statistically significant

Table 3. Phrenic Nerve Amplitude versus Ventilator-free day

| | Ventilator Free day = 0 | Ventilator Free day \geq 1 | <i>p-value</i> (<i>odds ratio</i>) |
|---|----------------------------|---------------------------------|---|
| Phrenic nerve Amplitude < 0.3 (mV) | 6 (66.7%) | 10 (33.3%) | |
| Phrenic nerve 0.3 \leq Amplitude (mV) | 3 (33.3%) | 20(66.7%) | .075 (4.0) |

p values were calculated using the χ^2 -test, $p < .05$ was considered to be statistically significant