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Patterns of nerve conduction studies in patients with hyperesthesia and diabetic peripheral neuropathy

Prof Kee Ho Song

[1]1Division of Endocrinology and Metabolism, Konkuk University Medical Center, Konkuk University School of Medicine, , South Korea

Objectives:
In the early stage of diabetic peripheral neuropathy (DPN), diagnosis is difficult as there are no symptoms and signs. However, hyperesthesia is known as early manifestation of DPN. Although the nerve conduction studies (NCS) have been suggested as a surrogate markers and confirmative methods for diagnosis of DPN, it has a limitation in evaluation of early sensory change and small-fiber neuropathy. Measurement of current perception threshold (CPT) using Neurometer® at 2000, 250 and 5 Hz suggested as a comprehensive way of assessing patients' symptoms of DPN. The aim of this study was to compare the parameters of NCS in patients with normal NCS but having hyperesthesia determined by Neurometer®.

Methods:
We retrospectively enrolled the patients with type 2 diabetes who underwent both CPT test and NCS from January 2014 to December 2016. Results of Michigan Neuropathy Screening Instrument (MNSI) were collected to determine a subjective symptom score. CPT using the Neurometer® was applied at right index finger (C7 dermatome) and right great toe (L4/5 dermatome). If a study was not testable at the right side, left side was performed. Two hundred forty-two patients with type 2 diabetes were included in our final analysis. DPN diagnosed by symptoms (MNSI score ≥ 3) and/or sign, and NCS.

Results:
The grade score of CPT in lower extremities was significantly correlated with the diagnostic stage of DPN. The relationships between the CPT at 5 Hz, 250 Hz, and 2,000 Hz show significant inverse correlations conduction velocities of tibial, peroneal, and sural nerve. Among 242 patients, fifty-three (21.9%; NCS normal and abnormal, 22 and 31, respectively) were found to be hyperesthesia based on grade scores of CPT. All measures of CPT at 5 Hz, 250 Hz, and 2,000 Hz showed significantly lower thresholds in hyperesthetic patients compared to asymptomatic patients. Parameters attributed to conduction velocities were not different between asymptomatic and hyperesthetic patients with normal NCS. However, ulnar sensory nerve action potential and sural nerve amplitude were significantly increased and decreased, respectively, in hyperesthetic patients compared to asymptomatic patients.

Conclusion:
The CPT is a useful instrument to detect hyperesthetic patient in the course of DPN. And sensory action potential or amplitude of extremities in NCS could be complementary to detect minimal changes in these patients even in normal NCS results. The results of the current study may prove useful in monitoring of patients in the course of DPN