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Relationship Between Injury Severity and Electrophysiological Changes of PNS in subacute SCI

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Objective

To investigate the characteristics of patients with and without electrophysiological abnormalities of the peripheral nervous system after spinal cord injury and factors affecting such differences, and to determine whether they affect the patient's functional prognosis.

Subjects & Methods

We conducted retrospective chart review of 151 patients who underwent electrodiagnostic study to diagnosis cervical & thoracic myelopathy in our rehabilitation facility from January 2014 to June 2018. Patients 18 years of age or older with complete or incomplete limb paralysis due to spinal cord injuries and had an injury level higher than T10 were included. Patients who had undergone a test for less than 21 days or more than 180 days after the injury, who had history of cancer, who had insufficient test Results, or who had no suspicion of myelopathy during MRI imaging studies were excluded. Patients with denervation potential in three or more myotomes on bilateral limbs were classified as generalized denervation potential(GDP) group (27 patients), and those with denervation potential in two or less myotomes on uni- or bilateral limbs were classified as non-GDP group (28 patients). The functional status and electrodiagnostic data of the peripheral nervous system were compared between two groups in order to confirm the relationship between the electrophysiological abnormality of the peripheral nervous system and the function and prognosis of the patients.

Results

Subject ages ranged from 25 to 85 years with a mean (SD) of 59.21(12.53) years and the average time since injury to test (SD) was 58(38) days. There was no statistically significant differences in age, sex, level of injury, average time from injury to electrodiagnostic evaluation and history of trauma. Patients with abnormal electrical physiologic change in peripheral nerves showed clinically severe spinal cord injury scale, and low Korea version of spinal cord independence measure score. (Table 1) In comparison of electrodiagnostic data between two groups, the amplitude of peroneal, tibial, and sural nerve in GDP groups were statistically significantly low, and latency of the tibial nerve was significantly delayed. (Table 2). The number of patients showing an absent response as a Result of motor evoked potential study and somatosensory evoked potential study in the GDP group was significantly higher.

Conclusion

The Results showed that generalized denervation of the lower limbs occurred in the group with severe spinal cord injury. This study shows that central nervous system injury can also affect the peripheral nervous system, which is thought to be proportional to the severity of central nervous system injury. This overlapping nervous system abnormality is thought to be a factor that may interfere with the functional recovery of the patient.

Table 1. Demographic and clinical characteristics

	non-GDP group (27)	GDP group (28)
Sex (n)	M:18 F:9	M:20 F:8
Age (years)	61.74±12.43	56±12.36
BMI (Kg/m ²)	22.89±2.85	21.77±3.82
Height (meter)	1.64±0.87	1.66±0.84
Level of Injury	C:20 T:7	C:17 T:11
ASIA impairment scale	A : 0 B : 0 C : 5 D : 22	A : 10 B : 3 C : 13 D : 2*
K-SCIM	50.89±28.70	20.57±15.54*
Average time from injury to electrodiagnostic evaluation (days)	59.78±34.11	75.82±39.21
Presence of Diabetes Mellitus (n)	7	6
History of Trauma (n)	19	23

GDP, Generalized denervation potential; C, Cervical myelopathy; T, Thoracic myelopathy; ASIA, American Spinal Injury Association; K-SCIM, Korea version of spinal cord independence measure score; *, P-value < 0.05

Table 2. Data of electrophysiological evaluation

		non-GDP group (27)	GDP group (28)	
NCS	Peroneal nerve	Latency	3.96 ± 0.84	4.22±0.86
		Amplitude	2.79 ± 1.76	1.32 ± 1.23*
	Tibial nerve	Latency	3.53 ± 0.86	4.20±1.02*
		Amplitude	9.56 ± 4.05	4.30±2.43*
Sural nerve	Latency	2.58 ± 0.48	2.68 ± 0.52	
	Amplitude	9.93 ± 5.15	6.15 ± 2.83*	
SEP	Presence of evoked potential	42	11*	
MEP	Presence of evoked potential	41	8*	

The case was measured at twice the number of patients by evaluating the patient's denervation potential and evoked potential in both lower limbs. GDP, Generalized denervation potential; NCS, nerve conduction study; SEP, somatosensory evoked potential; MEP, motor evoked potential; * p-value < 0.05