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Correlation between Sudomotor Dysfunction, Severity, and Autonomic Dysreflexia in Patients with SCI

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Introduction
Quantitative sudomotor axon reflex test (QSART) is a test to evaluate the integrity of the postganglionic sudomotor system along the axon reflex to define the distribution of sweat loss. Sudomotor dysfunction is known to be common in patients with neurological disturbance affecting sympathetic activity. Most patients with spinal cord injury (SCI) show sudomotor dysfunction, more or less, depending on the level of injury. We investigated the correlation between quantitative sudomotor function, the completeness of SCI, and presence of autonomic dysreflexia (AD). In previous studies, sympathetic skin response (SSR) has been used as a test to predict AD in SCI. However, as SSR mostly cannot obtain the response cervical SCI, its clinical usefulness is very limited as a tool for evaluation of the sympathetic dysfunction in SCI. We purposed to investigate the effectiveness of QSART in predicting autonomic dysreflexia in patients with SCI.

Methods
Medical records of 39 patients with SCI above the level of injury T6 who performed QSART were reviewed. Peripheral polyneuropathy, diabetes mellitus, and other diseases that can affect autonomic function were considered as exclusion criteria. Neurologic level of injury was assessed by the International Standards for Neurological Classification of Spinal Cord Injury. We obtained quantitative values of volume and latency measured in the forearms from the QSART. The differences of the latency and total volume of sweat between complete and incomplete injury groups were analyzed. We also comparatively analyzed the difference of quantitative values of QSART parameters according to presence of AD.

Results
Subjects with complete injury showed statistically prolonged latencies and decreased sweat volume compared to those of the subjects with incomplete injury (Table 2.). We also found the significant differences of latency and sweat volume of QSART between subjects with and without AD. Subjects with AD showed significantly prolonged latencies and decreased sweat volumes in the forearms compared to subjects with no AD.

Conclusion

This study suggested that influence of postganglionic sympathetic cholinergic activities following SCI is strongly related with completeness of injury and presence of autonomic dysreflexia. Further studies about evaluation and quantification of altered postganglionic sympathetic activity following SCI should be performed. If efficacy of QSART for SCI is established, quantitative data of QSART may be more useful than SSR to evaluate autonomic function in patients with SCI.

Table 1. Demographics and clinical characteristics of the subjects

Variables	Number
Age (years)	56.7 ± 14.1
Gender	
Male	29 (74.4%)
Female	10 (25.6%)
Height (cm)	168 ± 8.6
Weight (kg)	63.4 ± 10.2
Neurologic level of injury	
Tetraplegia	34 (87.2%)
Paraplegia	5 (12.8%)
AIS	
A	13 (33.3%)
B	4 (10.3%)
C	7 (17.9%)
D	15 (38.5%)
Time since injury (months)	18.8 ± 48
AD symptom	11 (28.2%)

Table 2. Parameters of QSART according to completeness of injury

Variables	Complete injury	Incomplete injury	*p*-value
Number	13 (33.3%)	26 (66.7%)	
Mean of latencies in the right forearm	2 min 16 sec	1 min 33 sec	0.007
Mean of latencies in the left forearm	2 min 31 sec	1 min 55 sec	0.014
Mean of total volume of forearms	0.540 uL	1.146 uL	0.022

Table 3. Parameters of QSART according to presence of autonomic dysreflexia

Variables	SCI with autonomic dysreflexia	SCI without autonomic dysreflexia	*p*-value
Number	11 (28.2%)	28 (71.8%)	
Mean of latencies in the right forearm	2 min 30 sec	1 min 31 sec	0.002
Mean of latencies in the left forearm	2 min 59 sec	1 min 47 sec	0.001
Mean of total volume of forearms	0.544 uL	0.995 uL	0.027