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Changes of Respiratory Function with Rehabilitation Treatment in Spinal Cord Injury Patients

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Introduction

Respiratory complications are leading causes of morbidity and mortality in the spinal cord injury (SCI) population Resulting from denervation of inspiratory and expiratory respiratory muscles. In previous studies, respiratory muscle training Resulted in significant improvement of respiratory muscle strength and endurance and less respiratory complications. However, few studies monitored the changes of respiratory muscle function according to SCI characteristics. Therefore, this study aims to reveal respiratory function changes to identify factors associated with respiratory function improvement in SCI patients after intensive rehabilitative treatment.

Method

The medical records of 133 SCI patients admitted to a tertiary university hospital for a short-term (4-8 weeks) rehabilitation from 2016 to 2017 were reviewed (Table 1). Among them, those with available Results of initial and follow-up pulmonary evaluation including vital capacity in supine (VCsup) and sitting (VCsit) position and peak cough flow (PCF) were included. The percentage of predictive value (%pre) was calculated using age and height of each patient. Past medical history, cause of injury, level and severity of injury were obtained from the chart review. Participants were classified by injury level as tetraplegia and paraplegia, by injury severity as complete and incomplete and by disease duration as acute, subacute and chronic. The change of pulmonary function was analyzed in association with patient's characteristics.

Result

Finally, total 104 SCI patients were included. The demographic and clinical characteristics are shown in table 1. At initial evaluation, patients showed compromised pulmonary function; VCsup as 62.0 %pre and VCsit as 57.5 %pre. Tetraplegia patients had more compromised pulmonary function than paraplegia ($p<0.01$). At follow-up after short-term pulmonary rehabilitation, absolute value and %pre of VCsup ($p<0.01$), VCsit ($p<0.01$), and PCF ($p<0.01$) were significantly improved in both tetraplegia and paraplegia groups (figure 1). The improvement of VCsup, VCsit and PCF showed significant correlation with initial values of %pre VCsup, %pre VCsit and PCF ($p<0.01$). The subacute group showed significant improvement of pulmonary function in VCsup, VCsit and PCF compared to acute and chronic groups ($p<0.05$).

Conclusions

Short-term rehabilitation treatment including pulmonary care Resulted in improvement of pulmonary function in all patient groups. It is likely that all patients, especially subacute and chronic groups did not experience enough pulmonary care before participating in our rehabilitation program. In SCI rehabilitation, pulmonary care should be emphasized. Further studies with large number of SCI patients with various features (level, severity, and duration) of injury are needed to find the factors related with pulmonary function improvement and ultimate effect on rehabilitative outcome.

Table 1. Demographics and clinical characteristics

Characteristics	N=104
Age (year, range)	48.7±17.5 (15-84)
Sex: M/F (%)	78/26 (75.0/25.0)
Tetraplegia/Paraplegia (%)	65/39 (62.5/37.5)
ASIA: A/B/C/D (%)	21/7/30/46 (20.2/6.7/28.8/44.2)
Complete/Incomplete (%)	21/83 (20.2/79.8)
Disease duration (day, range)	97.4±139.2 (7-993)
Acute/Subacute/Chronic (%)	14/45/45 (13.5/43.3/43.3)
Height (cm, range)	168.3±8.8 (129-186)
Body weight (kg, range)	64.6±11.4 (24-95)
Body mass index (kg/m ² , range)	22.7±3.2 (13.9-33.4)

Values are mean ± standard deviation.

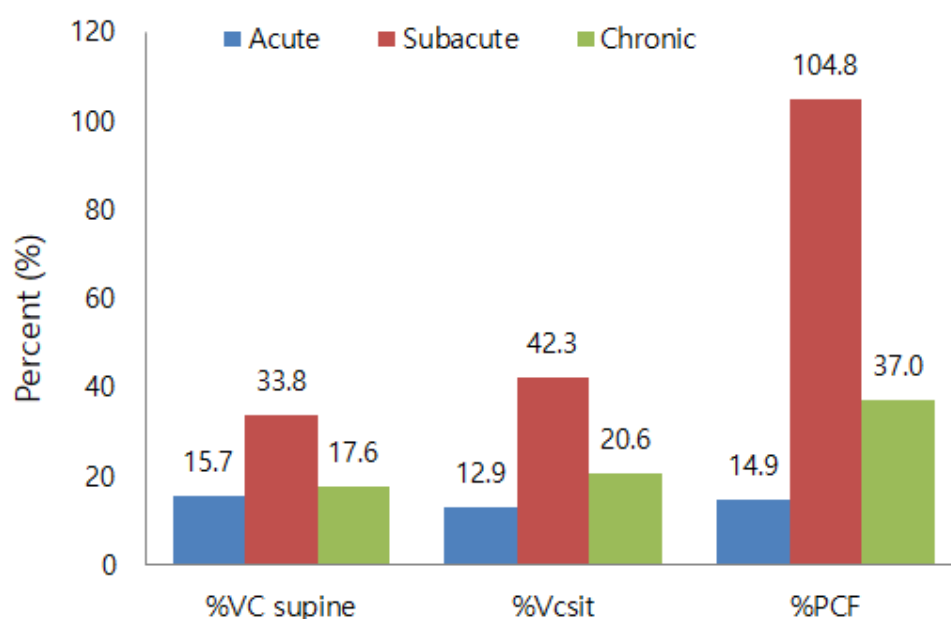


Figure 1. Percent change of pulmonary function after short-term rehabilitation treatment according to disease duration