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## The Effect of Intensive Functional Electrical Stimulation on the Gait in Chronic Hemiplegic Patients

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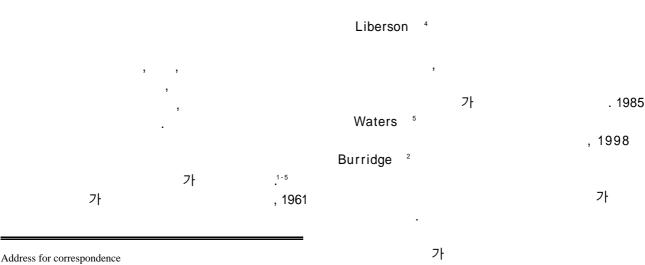
Background: The purpose of this study is to investigate the effect of the intensive functional electrical stimulation(FES) on the improvement of the gait pattern of the chronic hemiplegic patients.

Method: Six hemiplegic patients, who could walk independently but have equinovarus deformity during the gait cycle, participated in this study. The affected peroneus longus and tibialis anterior muscles of all subjects were stimulated for 2 weeks period (20 minutes duration, 6 times/day). We measured the activities (mean voltage) of those muscles during the walking, using dynamic EMG.

Results: After treatment, there were significant improvements in the strength of peroneus longus and tibialis anterior muscles and the gait speed, but there was no interval change of the spasticity of plantar flexor. The mean voltages of two muscles are significantly increased in all the patients (p<0.05).

Conclusion: The results showed that the intensive FES on affected peroneus longus and tibialis anterior muscles in chronic hemiplegic patients could be useful for the improvement of functional gait.

**Key Words**: Intensive FES, Functional gait, Chronic hemiplegic patients



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. Dynamic EMG BIOPAC System MP100 model (Goleta, United States)

(mean

Dynamic EMG

Ashworth

가

1. voltage)

가 3 가 .

6 dynamic . 가 4 가 2 EMG SPSS 11.0

714 712 . paired-samples t test 56.7 (44~62) 28.5 p 0.05

(10~52 ) .

2.

 Cybermedic Walking
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 90
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 2.3

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6 5 가 . 1.0 2.0 30 Hz 가 (p=0.010). 10 mA 3

2 20 가 ankle 6 , 2 . clonus . 10 m

0.45±0.18 m/sec

,  $0.55\pm0.16 \text{ m/sec}$ Ashworth (p=0.003)(Table 1). 10 meter dynamic EMG

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Table 1. Clinical Characteristics in Affected Ankle Joint Before and After EST\*

Case	Muscle strength <sup>†</sup> Dorsiflexor		Evertor		Spasticity <sup>‡</sup> Plantar flexor		Gait speed (m/sec)	
No.	Before	After	Before	After	Before	After	Before	After
1	2	3	0	2	1	1	0.41	0.50
2	1	2	1	2	0	0	0.79	0.83
3	3	3	3	3	4	4	0.48	0.53
4	2	3	2	3	3	3	0.42	0.61
5	0	0	0	2	4	4	0.36	0.45
6	2	3	0	2	0	0	0.26	0.37
Mean	1.7	2.3	1.0	2.3	2.0	2.0	0.45	0.55
± S.D.	± 1.0	± 1.2§	± 1.3	± 0.5§	± 1.9	± 1.9	± 0.18	± 0.16

<sup>\*</sup> EST: Electrical stimulation therapy

<sup>†</sup>measured by manual muscle test

<sup>&</sup>lt;sup>‡</sup>measured by Modified Ashworth scale

<sup>§</sup>p<0.05

0.36V 0.34V 0.40 V 0.40 V

가 (p=0.032, 0.023)(Table 2, Fig. 1).

Liberson 4 가

1960 peroneal stimulator

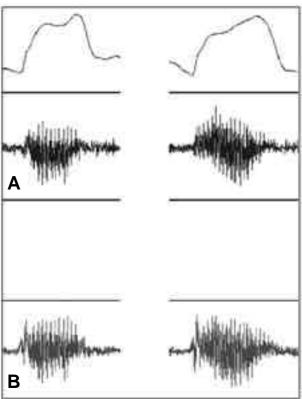


Figure 1. Dynamic EMG findings in Pre-EST(Left) and Post-EST(Right): Showed muscle activities of both tibialis anterior( $\mathbf{A}$ ) and peroneus longus( $\mathbf{B}$ ) in the ankle dorsiflexion during the gait.

1992 De Vahl<sup>®</sup> 가 가 가 가 가

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Table 2. Mean Voltages from Dynamic EMG\* Before and After EST†

Case	Tibialis ante	erior (volts)	Peroneus longus (volts)		
No.	Before	After	Before	After	
1	0.51	0.52	0.48	0.60	
2	0.33	0.37	0.38	0.38	
3	0.31	0.38	0.27	0.30	
4	0.34	0.45	0.30	0.45	
5	0.33	0.37	0.33	0.38	
6	0.32	0.32	0.26	0.28	
Mean ± S.D.	$0.36 \pm 0.08$	$0.40 \pm 0.07$ <sup>‡</sup>	$0.34 \pm 0.08$	$0.40 \pm 0.12^{\ddagger}$	

<sup>\*</sup> EMG: Electromyography

<sup>†</sup>EST: Electrical stimulation therapy

<sup>‡</sup>p<0.05

.<sup>11</sup>
30 Hz
( )

가 dynamic EMG 가 가 · 가 가

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