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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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Liberson <sup>4</sup>

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. 1985

Waters <sup>5</sup>

, 1998

Burridge <sup>2</sup>

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, 1961

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가 3  
6 Dynamic EMG

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

(mean  
voltage)  
가 3  
dynamic  
EMG SPSS 11.0  
paired-samples t test  
p 0.05

1. 가 6  
가 4 가 2 6  
가 4 가 2  
56.7 (44~62 ) 28.5  
(10~52 )

2. Cybermedic Walking 6  
man I (Iksan-City, South Korea) 4 가 2 가  
90 1.7 2.3  
가 6 5 가  
30 Hz 1.0 2.0  
10 mA 가 (p=0.010). Ashworth  
2 20 3 ankle  
6 , 2 clonus . 10 m  
0.45±0.18 m/sec  
Ashworth 0.55±0.16 m/sec 가  
10 meter (p=0.003)(Table 1).  
가 dynamic EMG

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

Case No.	Muscle strength <sup>†</sup>		Evertor		Spasticity <sup>‡</sup>		Gait speed	
	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 ± S.D.	1.7 ± 1.0	2.3 ± 1.2 <sup>§</sup>	1.0 ± 1.3	2.3 ± 0.5 <sup>§</sup>	2.0 ± 1.9	2.0 ± 1.9	0.45 ± 0.18	0.55 ± 0.16 <sup>§</sup>

\* EST: Electrical stimulation therapy

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

<sup>‡</sup> measured by Modified Ashworth scale

<sup>§</sup> p<0.05



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 .<sup>11</sup>  
 30 Hz  
 ( )  
 가  
 dynamic EMG  
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