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The Effectiveness of Early Functional Electrical Stimulation for Acute Stroke Patients in ICU

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Objective
To evaluate the safety and the effectiveness of early rehabilitation using functional electrical stimulation (FES) for acute stroke patients with hemiplegia in intensive care unit (ICU).

Methods
A retrospective review of medical records was performed for group of 48 patients with acute stroke who had been admitted in ICU for at least seven days, and had been consulted or transferred to the departments of rehabilitation medicine. The power in the paralyzed upper limb of all patients were less than 2/5 according to Medical Research Council grading. All patients underwent passive range of motion (PROM) exercise, immediately as possible after admission less than 5 days. Patients were into 2 groups, 23 patients underwent the early interventional program with FES apply to supraspinatus and posterior deltoid muscles in addition to PROM exercise in ICU within A. or B. who underwent only PROM exercise in ICU. (n=25). The duration of FES was 30 minutes, passive-exercise protocol consisted of 20 minutes of flexion-extension movements for upper limb simultaneously with physical therapist 5 times a week for 8 weeks. The shoulder pain of affected side during resting, shoulder abduction's passive range of motion (PROM), was measured with visual analog scale (VAS) score. Additionally we investigated other measurements of upper limbs which include spasticity (modified Ashworth scale, MAS) and the level of ADL dependency (Korean version of modified barthel index) at the start of the rehabilitation and after 8 weeks.

Results
The mean age of group A was 61.2 years old and group B was 63.7 years old. And the mean of days after onset of group A was 3.7 days and group B was 4.1 days. (table 1) After 8 weeks, all groups showed increase in the scores ADL dependency and in PROM of hemiplegic shoulder abduction. Statically the mean numbers of spasticity and PROM were not significantly different.($P>0.05$) But pain measured by the VAS scores, and ADL in group A was significantly improved than group B statically.($P<0.05$) (table 2)

Conclusions
The Results of our study suggest that apply immediate FES treatment in addition to conventional treatment with hemiplegic patient can be helpful.

Table 1. Patient characteristics [1]passive range of motiom measured on shoulder abduction, [2]Korean version of modified barthel index

Variable	Group starts FES and PROM exercise (N=23)	Group starts PROM exercise only (N=25)
Male	13	14
Female	10	11
Age (y)	61.2 ± 5.4	63.7 ± 6.1
Days after onset	3.7±1.1	4.1 ± 1.2
PROM[1]	130.2±10.7	124.6±9.2
K-MBI[2]	31.6±2.6	29.7±3.1

Table 2. Differences between two groups, after 8 weeks of rehabilitation. Mean values and standard deviations(SD) were calculated. [1]passive range of motiom measured on shoulder abduction, [2]Korean version of modified barthel index, [3]visual analog scale, hemiplegic shoulder pain during resting, 4 modified ashworth scale

	Difference (mean ± SD)		p value
	Group starts FES and PROM exercise (N=23)	Group starts PROM exercise only (N=25)	
PROM[1]	133.1 ± 8.3	127.9. ± 10.2	0.297
K-MBI[2]	51.1 ± 4.5	41.3 ± 5.7	0.041*
VAS[3]	3.2 ± 0.9	5.5 ± 1.3	0.027*
MAS[4]	1.7 ± 0.9	2.2 ± 0.8	0.389