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The Effect of Extracorporeal Shock Wave Therapy on Ankle Tightness in Stroke Patients

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Background
The tightness of ankle muscles is one of the main factors hindering in daily activities in stroke patients. Previous studies showed that extracorporeal shock wave therapy (ESWT) may decrease muscle tightness by direct action on muscle and indirect action on intramuscular connective tissue. There are few studies about this subject. The purpose of present study is to compare the effect of ESWT with that of conventional stretching exercise in ankle muscle tightness after stroke.

Methods
We enrolled hemiplegic stroke patients who had posterior ankle tightness with weak dorsiflexion, and who could ambulate with or without assist device. Subjects were randomly divided into two groups, ESWT group (EG) and conventional group (CG). In the EG, ESWT was performed for three weeks (two sessions per week). In each session, a practitioner applied 1500 shocks on affected calf muscle in prone position at energy level of 0.2mJ/mm2. Both group received stretching exercise twice a day, five days a week, for 3 weeks. In each session, 5 sets of stretching exercise for one minute with 10 seconds break. Before and after intervention, maximal passive range of motion in ankle, 6-minute walk test, functional ambulatory category (FAC) and Korean version of modified barthel index (K-MBI) were investigated to examine the functional status.

Results
Both groups had eight patients who completed the 3-week intervention. No differences were identified in any of the demographics between two groups (Table 1). After the 3-week intervention, improvement was found in all of the measurements in both groups (Table 2). There were no significant differences in change of any measurements between the two groups (Table 3). There were no complications in either group during the study.

Conclusion
After the 3-week therapy, improvement was found in all measurement items in both groups. ESWT showed no superiority to conventional stretching exercise. We studied special group called a stroke patient. So the negative effect of hemiplegic might affect

more than positive effect of ESWT. Future studies with larger number of participants should be necessary.

Table 1.Baseline characteristics of both groups

	EG (n=8)	CG (n=8)	P-value
Age (years)	59.3±9.52	62.3±1.04	0.563
Passive range of motion	14.62±1.68	15.12±1.55	0.519
6MWT	181.95±69.24	190.05±63.67	0.753
FAC	1.375±0.744	1.12±1.12	0.544

Values are presented as mean±standard deviation.

6MWT, 6 minute walk test; K-MBI, Korean version of modified barthel index; FAC, functional ambulation category.

Table2. Change of measurements between both groups after 3 weeks therapy

	EG (n=8)			CG (n=8)		
	Pre	Post	P-value	Pre	Post	P-value
Passive range of motion	14.62±1.68	16.62±0.91	**0.017***	15.12±1.55	16.62±1.06	**0.034***
6MWT	181.95±69.24	193.07±71.67	**0.012***	190.05±63.67	212.27±58.84	**0.012***
FAC	1.12±1.12	2.87±1.24	**0.008***	1.375±0.744	2.5±0.535	**0.024***

Values are presented as mean±standard deviation.

6MWT, 6 minute walk test; K-MBI, Korean version of modified barthel index; FAC, functional ambulation category.

*p<0.05 by Wilcoxon signed rank test.

Table3.Comparison of changes between both groups

	EG (n=8)	CG (n=8)	P-value
Δ Maximum angle	2±1.41	1.5±1.41	0.542
Δ 6MWT	11.12±12.87	22.22±16.19	0.059
Δ FAC	1.75±0.46	1.12±0.99	0.09

Values are presented as mean±standard deviation.

6MWT, 6 minute walk test; K-MBI, Korean version of modified barthel index; FAC, functional ambulation category.

*p<0.05 by Mann-Whitney *U*-test.