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Effect of Extracorporeal Shock Wave Therapy on Hemiplegic Shoulder Pain Syndrome in Stroke Patients

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Objective
Hemiplegic Shoulder Pain Syndrome (HSPS) is one of the common problems after stroke. One pathology alone cannot account for shoulder pain after stroke. In general, the causes of HSP are subluxation of the shoulder, rotator cuff problems, adhesive capsulitis and complex regional pain syndrome. Focused Extracorporeal Shock Wave Therapy (fESWT) has been suggested as a non-invasive and alternative treatment for shoulder pain, and the effects of fESWT on various musculoskeletal disorders have been reported. This study is to evaluate the beneficial effects of fESWT on HSPS in subacute stroke patients.

Methods
This study was designed as a pilot randomized controlled trial. Among the subacute stroke patients, those diagnosed as HSPS were enrolled. They were randomly assigned to one of the two groups study group and control group. Study group received fESWT on 3 separate sites. Treatment sites were anterior-to-posterior direction at anterior shoulder joint lateral to the coracoid process, posterior-to-anterior direction at posterior shoulder joint beneath the lateral border of the scapular spine and a greater tuberosity as the insertion site of supraspinatus muscle. 500 shots were given in each area, with a total of 1,500 shots in one treatment session. The energy density was approximately 0.06mJ/mm2. Control group received sham stimulation. The ESWT therapy sessions were applied 1 session per week for 3 weeks. Both group received conventional range of motion exercise therapy for 3 weeks. All enrolled patients were evaluated at before and after the treatment. Spasticity was measured using modified Ashworth scale (MAS). Passive Range Of Motion (ROM) and Manual Muscle Test (MMT) of the shoulder were recorded. Pain was measured using Visual Analogue Scale (VAS) during passive external rotation,. Hand Function Test (HFT) of shoulder in affected side was recorded.

Results
Eight patients were assigned to study group and 10 patients were assigned to sham group. There were no significant differences in baseline characteristics (Table 1). After 3 weeks of treatment, both groups showed significant improvement in ROM. Study group showed significant improvement in MAS and VAS after the treatment (Table 2). When comparing changes between two groups, MAS and VAS and ROM of external rotation and abduction in ROM showed more improvement in the study group (Table 3).

Conclusion

Our Results showed that fESWT can be an alternative and effective treatment for pain, spasticity and ROM in subacute stroke patients with HSPS.

Table 1. Baseline characteristics of subjects at the initial evaluation

	Study (n=8)	Sham (n=10)	p-value
Sex (Male/Female)	5/3	5/5	
Stroke type (Infarction/hemorrhage)	6/2	7/3	
Age (year)	66.25±11.63	65.00±16.83	0.545
Stroke duration (day)	24.03±8.63	26.03±7.85	0.752
MMT on hemiplegic shoulder (MRC)			
0	3	5	
1,2	4	4	
3,4	1	1	
5	0	0	
VAS	6.75±1.28	6.24±1.36	0.698
MAS	1.23±1.14	1.36±1.37	0.379
ROM			
Flexion	135.13±25.24	140.41±28.64	0.886
Abduction	92.54±24.42	95.12±31.17	0.842
External rotation	65.24±11.81	71.15±14.45	0.754
Internal rotation	58.27±10.24	61.26±11.34	0.546
HFT in affected side	4.13±3.73	4.88±3.35	0.682

Values are mean ± standard deviation.

MMT, Manual Muscle Test; MRC, Medical Research Council; VAS, Visual Analogue Scale; MAS, Modified Ashworth Scale; ROM, Range of Motion; HFT, Hand Function Test.

*p<0.05, Mann-Whitney U test for between-group comparison.

Table 2. Changes of measurements after treatment

	Study			Sham		
	pre	post (3wks)	p-value	pre	post (3wks)	p-value
VAS	6.75±1.28	3.85±1.46	**0.026***	6.24±1.36	4.53±1.28	0.132
MAS	1.23±1.14	0.43±0.41	**0.029***	1.36±1.37	1.13±0.85	0.254
ROM						
Flexion	135.13±25.24	154.08±18.98	**0.027***	140.41±28.64	156.04±20.27	**0.035***
Abduction	92.54±24.42	111.13±21.99	**0.032***	95.12±31.17	108.88±19.73	**0.047***
External rotation	65.24±11.81	79.48±13.15	**0.028***	71.15±14.45	80.63±12.78	**0.041***
Internal rotation	58.27±10.24	69.45±10.24	**0.036***	61.26±11.34	71.75±11.74	**0.044***
HFT	4.13±3.73	6.23±4.47	0.221	4.88±3.35	6.67±5.21	0.368

Values are mean ± standard deviation.

VAS, Visual Analogue Scale; MAS, Modified Ashworth Scale; ROM, Range of Motion; HFT, Hand Function Test.

*p<0.05, Wilcoxon signed-rank test for within-group comparison,

Table 3. Comparison of changes between two groups

	Study	Sham	p-value
Δ VAS	2.90±1.13	1.70±0.95	**0.028***
Δ MAS	0.81±0.21	0.23±0.27	**0.045***
Δ ROM			
Flexion	18.75±5.67	15.59±6.02	0.064
Abduction	19.85±4.04	13.67±6.46	**0.043***
External rotation	14.26±5.67	9.85±5.67	**0.038***
Internal rotation	11.15±4.67	10.85±6.67	0.102
Δ HFT	2.11±1.67	1.85±1.34	0.234

Values are mean ± standard deviation.

VAS, Visual Analogue Scale; MAS, Modified Ashworth Scale; ROM, Range of Motion; HFT, Hand Function Test.

*p<0.05, Mann-Whitney U test for between-group comparison.