Effects of Acute Shoulder Complex Neuromuscular Facilitation Exercise on Tennis Elbow

Kyu-Bong Lim[1], Gyeong-Eun Park[2], Hye-Ju Hyun [2], Woo-Young Kim[2], Seok-Won Jeong[2], Sun-Yeong Kwon, [2] Jong-Woo Kim[2], Tae-Kyung Han[2]*
[1] Kunli Clinic, Korea; [2] Andong National University, Korea

INTRODUCTION

Epicondylitis causes microinjury as a result of multiple frequency stimuli in response to repeated stress in epicondyles, resulting in pain during the compression and contraction of related muscles due to inflammatory reactions. It is reported that the intervention of epicondylitis is mainly done by direct intervention (injection therapy, external shock waves), exercise applied to the muscles around the joints, and drug therapy, while the exercise of the shoulder complex improves the muscle strength and high capacity of the elbow joint, and the exercise therapy combined with vibration stimuli is effective in increasing joint stability. The sling exercise is reported to provide stability due to pressure and activate mechanical receptors with close kinetic chain exercise, and there are neurological connections and synergies between the joints at the upper and lower levels and their surrounding muscles that show an immediate response to change. The vibration stimulation technique using sling is a treatment technique created using gate control theory, which is applied to joints limited by pain and reflex muscle contraction, which stimulates mechanical acceptance of joints, resulting in relief of pain stimulation.

METHODS

1. Participants

This study selected patients who agreed to participate in voluntary research after hearing the purpose and significance of this study among outpatients at K Hospital in A, Gyeong sang buk-do who were diagnosed with lateral epicondylitis pain by a neurosurgeon. The 45 participants of the study were random sampling to 23 members of the Sling Exercise Group (SEG) and 22 members of the Sling + Vibration Exercise Group to compare and analyze the exercise before and after each group.

Table 1. Characteristic of participants

		SEG(N=23)	SVEG(N=22)	t	p
Years		47.48±7.86	47.36±8.03	.048	.962
Hight(cm)		164.58±8.85	165.16±8.60	-.221	.826
Weight(kg)		68.03±13.58	68.30±2.95	-.065	.949
BMI(kg/m)		24.96±3.57	24.87±3.63	.086	.932
Fat(%)		28.56±4.65	28.16±4.32	.303	.763
Mass(kg)		26.80±5.54	27.05±5.53	-.154	.878
SBP(mmHg)		128.69±18.41	128.68±18.84	.002	.998
DBP(mmHg)		77.43±11.24	77.63±11.47	-.060	.953
HR(purse)		75.39±11.47	75.18±11.70	.182	.952
VAS(point)		5.60±1.58	5.64±1.43.	.204	.754
PT	LE	6.38±2.71	7.91±3.51	-1.570	.267
	ME	9.09±3.63	9.29±3.83	-.219	.940
	URA	8.38±3.40	8.51±3.44	-.130	.962
ROM	WF	58.43±9.43	58.45±11.24	-.175	.345
	WE	66.52±7.39	63.40±8.28	1.172	.777
MMT	WF	3.39±4.99	11.14±5.79	-1.036	.351
	WE	5.99±1.95	7.98±3.10	-1.477	.074
Grip strength		24.21±11.48	27.02±10.78	-.797	.674

Data : Mean±SD, SEG;Sling Exercise Group, SVEG;Sling Vibration Exercise Group, BMI; Body Mass Index, SBP; Systolic Blood Pressure, DBP; Disatolic Blood Pressure, HR; Heart Rate, VAS:Visual Analoge Scale, PT; Pressure threshold, LE; Lateral Epicondyle, ME; Medial Epicondyle, URA; Upper Trapezius, ROM; Range Of Motion, WF; Wrist Flexion, WE; Wrist Extension, MMT; Manual Muscle Test, WF; Wrist Flexion, WE; Wrist Extension

2. Measurements

Measurements were self-stated using the VAS (Visual Analog Scale) and were taken for elbow range of motion(Wrist Flexion, WE; Wrist Extension), pressure threshold(LE; Lateral Epicondyle, ME; Medial Epicondyle, URA; Upper Trapezius) and strength(Wrist Flexion, WE; Wrist Extension) (MicroFET&ROM, Hoggan, USA), and grip strength.

3. Exercise equipment


Sling Exercise tool (redcord, Norway)

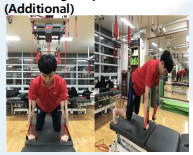

Stimula+ (redcord, Norway)

4. Exercise program

①Kneeling Push-up

②Kneeling Elbow Extension

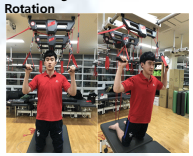
③Kneeling Scapular Protraction (Additional)



④Supine Full-up(supine row)

⑤Supine Elbow Flexion

⑥Kneeling Shoulder Internal Rotation



- All exercises maintain the completed movement for 1 second as shown in the picture. We set 1 set for 5 times to go back to the first position and conducted 4 sets in total.
- The SVEG was exercised at 50 Hz using a Stimula+ (redcode, Norway) equipment that provides frequencies up to 15 to 99 Hz in order to carry out nerve root control campaigns in the shoulder complex.

RESULTS

1. Comparison of Acute Slings Exercise Group (SEG)

VAS has significantly decreased after exercise compared to before (p<.001), with a lateral epicondyle (p<.001), and upper trapezius muscle, pressure threshold was a significant increase(p<.002). The results of the manual muscle test showed a significant increase in muscle strength in wrist flexion (p<.05), a significant increase in wrist extension (p<.001), the grip strength test also increased significantly after exercise compared to before exercise (p<.003).

Table 2. Comparison of Acute Slings Exercise Group (SEG)

SEG(n=23)

Variation		Pre	Post	t	p
VAS		5.6±1.58	3.13±1.66	8.06	.001
PT	LE	6.38±2.71	8.55±3.64	-1.81	.001
	ME	9.09±3.63	9.76±3.92	-3.60	.084
	URA	8.38±3.40	9.87±4.24	-4.07	.002
ROM	WF	58.43±9.43	60.86±11.33	-1.27	.216
	WE	66.52±7.39	69.43±7.26	-1.95	.063
MMT	WF	9.39±4.99	10.90±4.84	-2.67	.014
	WE	5.99±1.95	9.11±3.42	-7.04	.001
Grip strength		24.21±11.48	27.46±11.46	-3.36	.003

Data : Mean±SD, p<05, p<.01, p<.001, SEG:Sling Exercise Group, VAS:Visual Analoge Scale, PT: Pressure threshold, LE: Lateral Epicondyle, ME: Medial Epicondyle, URA: Upper Trapezius, ROM: Range Of Motion, WF: Wrist Flexion, WE: Wrist Extension, MMT: Manual Muscle Test, WF: Wrist Flexion, WE: Wrist Extension

2. Comparison of Acute Slings Exercise Group (SEG)

VAS has significantly decreased after exercise compared to before (p<.001), the pressure threshold is the lateral epicondyle (p<.001), the medial epicondylitis(p<.01), and the upper trapezius muscle (p<. 001), increased significantly after exercise compared to before exercise. The change in the range of motion has significantly increased wrist extension (p<.001), the results of the manual muscle test showed a significant increase in wrist flexion muscle strength (p<.01).

Table 3. Comparison of Acute Slings Vibration Exercise Group (SVEG)

SVEG(n=22)

Variation		Pre	Post	t	p
VAS		5.64±1.43	3.05±1.46	8.46	.001
PT	LE	7.91±3.51	9.46±4.14	-4.91	.001
	ME	9.29±3.83	10.48±4.07	-3.12	.005
	URA	8.51±3.44	10.15±4.32	-5.50	.001
ROM	WF	58.45±11.24	60.31±12.02	-1.15	.259
	WE	63.40±8.28	70.86±7.34	-5.23	.001
MMT	WF	11.14±5.79	11.98±5.67	-1.62	.120
	WE	7.98±3.10	9.95±4.22	-3.45	.002
Grip strength		27.02±10.78	28.21±10.88	-1.93	.066

Data : Mean±SD, p<05, p<.01, p<.001, SEG:Sling Exercise Group, VAS:Visual Analoge Scale, PT: Pressure threshold, LE: Lateral Epicondyle, ME: Medial Epicondyle, URA: Upper Trapezius, ROM: Range Of Motion, WF: Wrist Flexion, WE: Wrist Extension, MMT: Manual Muscle Test, WF: Wrist Flexion, WE: Wrist Extension

CONCLUSION

In acute SEG and SVEG pain, functional movement and muscle improvement, and shoulder complex neuromuscular facilitation exercise, a closed chain movement(CKC) that provides an unstable support surface without vibration application, has a more positive effect on pain and muscle enhancement. Acute Shoulder Complex Neuromuscular Faciltation Exercise will be the basis for the change of base-based physiology in patients with lateral epicondlitis.

❖ This study was approved by the Research Ethics Committee of Andong University. (approval number: 1040191-201706-HR-004-01)