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Improvement of Pain and Functional Activities in Patients with Lateral Epicondylitis of the Elbow by Mobilization with Movement: a Randomized, Placebo-Controlled Pilot Study

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Abstract. [Purpose] There is little known about mobilization with movement (MWM) which is used to treat lateral epicondylitis of the elbow and its effects on functional activities. The purpose of this study was to investigate the effects of the mobilization-with-movement technique on elbow pain and functional activities of subjects with lateral epicondylitis. [Methods] Ten subjects with lateral epicondylitis of the elbow were randomly divided into an experimental group (n=5) and a placebo control group (n=5). Therapeutic intervention for both groups included general therapy such as hot packs, transcutaneous electrical nerve stimulation, ultrasound therapy, and deep friction massage. The experimental group received MWM, whereas the placebo control group received sham MWM after general therapy. All subjects received therapeutic intervention every other day for 10 days. Pain and functional activities were assessed before and after the interventions using the patient-rated tennis elbow evaluation scale (PRTEE). [Results] Significant and clinically meaningful improvements in pain, special activity, and usual activity sub-domains were found post-intervention in the experimental group. [Conclusion] The results indicate that mobilization-with-movement has a positive effect on both pain and functional activities of patients with lateral epicondyltis.

Key words: Mobilization with movement, Lateral epicondylitis, Patient-rated tennis elbow evaluation scale

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INTRODUCTION

Lateral epicondylitis of the elbow is a condition characterized by aggravation of pain in the outer part of the elbow during active wrist extension, and presentation of pain on direct palpation of the lateral epicondyle, humeroradial joint, or proximal muscle belly[1–4)]. More than 40 different therapeutic methods are recommended for treatment of this ailment[5)]. Physical therapy techniques include ultrasound treatment[6)], laser treatment [7)], electrical agents[8, 9)], therapeutic exercise[10)], deep friction massage[11)], manipulation[12)], and joint mobilization[13, 14)].

Among the physical therapy techniques, joint mobilization is a common term for a treatment method in which a physical therapist passively moves synovial joints based on arthrokinematic principles, and different physical therapists have presented their own unique methods. Recently, mobilization with movement (MWM), developed by Brian Mulligan, has been widely used clinically to treat lateral epicondylitis of the elbow[15)]. MWM is a treatment method in which continuous gliding force by a physical therapist and active osteokinematic movement by the patient are made together[15, 16)]. To treat lateral epicondylitis of the elbow, the therapist applies a laterally directed glide to the radial side while the patient actively makes a fist. Although research[13, 14, 17–19)] has reported reduced pain and increased grip strength after MWM treatment for lateral epicondylitis of the elbow, there has been no studies of changes in patients' activities of daily living (ADL), in functional terms, related to MWM. Therefore, this study examined the effects of MWM, used to treat patients with lateral epicondylitis of the elbow, on functional changes of ADL.

SUBJECTS AND METHODS

Subjects included patients with lateral epicondylitis of the elbow diagnosed within the past 3 months by an orthopedic surgeon specialized in shoulder, elbow and wrist surgery. Subjects were excluded from this study if they had a history of orthopedic disorders which would have affected the elbow joint, neurologic disorders, rheumatoid arthritis, or osteoarthritis, or injection with steroids or prolotherapy within the last 3 weeks. As a result, a total of 10 subjects were chosen for this study, and they were randomly and equally divided into experimental group (EG) and placebo control group (PCG). For the group assignment, each subject picked a numbered card from 1 to 10 from a box. If the number was odd, subjects were assigned to EG, or to PCG if the number was even. The average age, height, and weight of the EG were 49.40 ± 2.88 years old, 155.60 ± 6.18 cm, and 55.60 ± 3.78 kg, and of the PCG were 49.20 ± 5.89 years old, 157.80 ± 5.35 cm, and 54.80 ± 6.49 kg, respectively. Under identical conditions, a hot pack was applied for 10 minutes, electrotherapy for 10 minutes, and deep friction massage for 10 minutes to all patients' regions of pain. Using an electrical simulator (GM001, GINIMED, Korea) designed to deliver sinusoidal wave ultrasound at a frequency of 1 MHz and an intensity of $0.3W/cm^2$, and transcutaneous electrical nerve stimulation at a pulse rate of 50 pps and an intensity of 0.8 mA at the same. After the completion of the above treatment, MWM was performed in 2 sets of 10 times for the EG. Sham MWM consisting of passive elbow flexion for the same number of sets was performed with the PCG. A total of five treatments were administered to both groups at intervals of 48 hours. To examine the two groups' ADL-related functional changes prior to and after the experimental intervention, the Patient-Rated Tennis Elbow Evaluation scale (PRTEE) was employed. PRTEE, developed by MacDermid et al., is a questionnaire that is self-administered by patients and consists of three sub-domains of pain, special activities, and usual activities. The reliability of PRTEE ranges from 0.85 to 0.94, and it is known as a very reliable evaluation method [20]. This evaluation scale has a class interval of one point, with zero points scored for no pain or no difficulty in performing motions, and 10 points scored for extreme pain and no ability to perform motions. The data collected in this study were encoded and analyzed using SPSS for Windows (ver. 17.0). A p-value of ≤ 0.05 was considered statistically significant. The average and standard deviations of the groups' general characteristics were derived, and the paired t-test was carried out in order to compare pre- post-experimental intervention scores of PRTEE.

RESULTS

Regarding changes in pain, the EG showed significant improvement, from an average of 5.52 ± 0.62 before the intervention to an average of 3.12 ± 1.82 after the intervention (p=0.02). Particular improvements were seen in the items "When doing a task with repeated arm movement" and "When your pain was at its worst" ($p<0.05$). The PCG's score was an average of 5.44 ± 2.14 before the intervention and an average of 4.88 ± 2.81 after the intervention, with no significant difference between prior to and after the intervention (p=0.17); there were no significant changes in any of the individual items ($p>0.05$).

Regarding changes in special activities, the EG's average score prior to the intervention was 6.60 ± 1.10, which significantly improved to an average of 3.33 ± 2.85 after the intervention (p=0.03). There were significant functional improvements in the three items of "Turn a doorknob or key", "Open a jar", and "Wring out a washcloth or wet towel" ($p<0.05$). The PCG's average scores prior to and after the intervention were 5.90 ± 2.45 and 5.16 ± 3.38, respectively, with no significant difference (p=0.26). There were no significant differences in any of the individual items ($p>0.05$).

With regard to changes in usual activities, the EG's average scores before and after the intervention were 6.40 ± 1.82 and 3.40 ± 2.56, respectively, with significant improvement after the intervention (p=0.02). There was a significant functional improvement in the item of "Work (your job or everyday work)" ($p<0.05$). The PCG's average scores prior to and after the intervention were 5.70 ± 2.76 and 5.20 ± 3.13, respectively, with no significant change (p=0.07). There were no significant changes in any of the individual items ($p>0.05$) (Table 1).

DISCUSSION

MWM's major treatment focus is the correction of a positional fault. A positional fault means a condition in which the joint surface is not in a natural and congruent position, and it is not easily palpated nor readily detected by radiological examination. Such positional faults result in damage or strains. Therefore, the correction of positional faults through MWM encourages normal joint motion and joint fluid flow, inducing recovery[15]. In this study, the EG's pain significantly decreased by 25.00–48.57%, while the PCG did not see much change, with just 8.69–14.81% reduction in pain. This finding is consistent with the results of previous studies[14,17–19], in particular, those of Kochar and Dogra [21], who showed that MWM applied to the lateral epicondylitis of the elbow was effective at reducing pain, and that the treatment group, which received a combined therapy of ultrasound and MWM, reported a significantly greater reduction in pain than the control group, which received only ultrasound therapy. Regarding specific activities, the EG reported significant improvements of 39.13–51.42%, but the PCG did not report any significant changes, with only 10.71–19.35% improvement. This result was similar to those of the studies by Radpasand and Owens[22] and Radpasand[23], who reported that specific activities improved by 71.1–100% on the PRTEE.

As for usual activities, the EG reported significant improvements of 42.85–51.42%, whereas the PCG reported small improvements of just 3.84–12.50%. This result was similar to those of previous studies[22, 23] that reported subjects' usual activities improved by 36.3–96.87% on the PRTEE.

Lateral epicondylitis of the elbow results mainly from changes in the origin of the extensor carpi radialis brevis muscle, resulting from damage to the extensor carpi radialis longus, extensor carpi ulnaris, and/or extensor digitorum. The origin of all these muscles is the lateral epicondyle, and the accumulation of micro-traumas at their origin causes the symptoms of lateral epicondylitis. Therefore, it is thought that protective muscle-guarding against pain after this damage obstructs the normal alignment of the humerus, possibly causing a positional fault at the elbow. Further, patients who develop lateral epicondylitis triggered by such positional faults are considered to perceive pain from abnormal arthro-

Table 1. Self-rated PRTEE scores of the experimental and placebo control groups

Items	Variables	Group	Pre	Post
Pain	When you are at rest	Experimental	3.20 ± 2.16	2.20 ± 1.92
		Placebo control	4.60 ± 2.07	4.20 ± 3.11
	When doing a task with repeated arm movement	Experimental*	6.60 ± 1.67	3.40 ± 1.81
		Placebo control	5.60 ± 2.07	5.20 ± 2.58
	When carrying a plastic bag of groceries	Experimental	7.00 ± 2.12	3.60 ± 2.88
		Placebo control	5.40 ± 2.50	4.60 ± 3.04
	When your pain was at its least	Experimental	1.60 ± 1.81	1.20 ± 1.30
		Placebo control	4.60 ± 3.36	4.20 ± 3.42
	When your pain was at its worst	Experimental*	9.20 ± .44	5.20 ± 2.04
		Placebo control	7.00 ± 1.87	6.20 ± 2.77
Specific Activities	Turn a doorknob or key	Experimental*	6.80 ± 1.63	2.80 ± 2.58
		Placebo control	5.60 ± 2.70	5.00 ± 3.67
	Carry a grocery bag or briefcase by the handle	Experimental	7.00 ± 1.87	3.40 ± 2.70
		Placebo control	6.40 ± 1.81	5.20 ± 3.27
	Lift a full coffee cup or glass of milk to your mouth	Experimental	6.60 ± 1.94	3.80 ± 3.11
		Placebo control	6.20 ± 2.38	5.00 ± 3.60
	Open a jar	Experimental*	8.00 ± .70	3.60 ± 3.36
		Placebo control	5.60 ± 3.36	5.20 ± 3.49
	Pull up pants	Experimental	4.60 ± 2.70	2.80 ± 2.77
		Placebo control	5.60 ± 2.70	5.00 ± 3.39
	Wring out a washcloth or wet towel	Experimental*	6.60 ± 1.81	3.60 ± 3.04
		Placebo control	6.00 ± 2.54	5.60 ± 3.20
Usual Activities	Personal activities (dressing, washing)	Experimental*	6.00 ± 1.41	3.40 ± 2.70
		Placebo control	5.20 ± 2.94	4.60 ± 3.36
	Household work (cleaning, maintenance)	Experimental	7.00 ± 1.87	3.40 ± 2.60
		Placebo control	6.40 ± 2.07	5.60 ± 2.88
	Work (your job or everyday work)	Experimental*	7.00 ± 2.00	3.60 ± 3.04
		Placebo control	6.00 ± 3.67	5.60 ± 3.64
	Recreational or sporting activities	Experimental	5.60 ± 3.91	3.20 ± 2.16
		Placebo control	5.20 ± 2.94	5.00 ± 3.08

*; significant difference between pre-test and post-test (p≤0.05).

kinematic movement during elbow movement accompanying forearm muscle contraction. MWM performed for lateral epicondylitis takes place in two stages. First, a therapist applies lateral gliding force to the patient's elbow, which has the effect of stretching the origin muscles of the lateral epicondyle. Second, the therapist applies passive lateral gliding force to the elbow while the patient actively makes a fist, and the patient's motion stretches the origin muscles of the lateral epicondyle. Therefore, muscle stretching using these two treatment elements is considered to stimulate the Golgi tendon organs (GTO) in the tendons of these muscles. GTOs are positioned in series against contractile elements, and therefore they are stimulated both when the muscles are stretched and when they are contracted. GTO signals are transmitted to the spinal cord through the Ib afferent fiber, and suppress motor neurons through the synapses by means of inhibitory interneurons[24)]. Therefore, these two treatment elements are considered to suppress excitation of the muscular origins of lateral epicondylitis, and correct the positional fault of the humerus resulting from protective muscle spasms, thereby inducing normal arthrokinematic movement. Moreover, protective muscle spasms due to post-injury pain lead to compression of capillaries, and the resulting poor blood circulation delays the cure of the damaged region. Thus, the treatment method of MWM is judged to facilitate relaxation of muscles, prompting cure of the damaged tissue by decompressing capillaries. A limitation of this research is that the results cannot be generalized to all patients with lateral epicondylitis of the elbow, because it was a preliminary experiment which studied the effect of MWM in only 10 subjects with lateral epicondylitis of the elbow. Further studies should investigate the effect of MWM on a large number of subjects without use of general therapy modalities as was employed for both the EG and PCG in this study.

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