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ASSESSING THE IMPACT OF AN ECCENTRIC EXERCISE REGIMEN ON PAIN ALLEVIATION AND GRIP STRENGTH ENHANCEMENT IN MEDIAL EPICONDYLITIS PATIENTS: A PRE-TO-POST EXPERIMENTAL STUDY

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Abstract

Background: Therapeutic eccentric exercise may offer significant functional & structural advantages during tendinopathy rehabilitation therapy. The purpose of this study is to determine whether eccentric exercise can reduce discomfort and enhance grip strength in study participants with medial epicondylitis. Methods: For the pre-to-posttest experimental design study being conducted at the lady Reading hospital (LRH) in Peshawar, 30 patients with medial epicondylitis complaints were randomly divided into two groups: Group A (CG); 15 and Group B (TG); 15. While the treatment group (TG) received 4 weeks of both conventional and eccentric exercise, the control group (CG) only received conventional physical therapy. Result: When data from the two groups were gathered and compared using the T-independent test, it became clear that there was no statistically significant difference between them in terms of the gains made in terms of grip strength and VAS scores. However, when the averages of VAS score and grip strength were analyzed using the Willcoxon signed ranked test and paired-t-test within the group with a positive percentage of change, there was a significant change. Conclusion: After 4 weeks of the eccentric exercise programme intervention in addition to conventional physical therapy for the medial epicondylitis patients in the treatment group, results showed statistically significant effects on improving patients' grip strength & reducing pain

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intensity, but the improvement obtained has shown no difference when compared with the conventional treatment for patient with epicondylitis.

Keywords: Medial Epicondylitis, Pain, Grip Strength, Eccentric Exercise, Ultrasound Therapy, Static Stretching.

INTRODUCTION

“Golfer's elbow, also known as medial epicondylitis, is caused by pathological alterations in the musculotendinous origin at the medial epicondyle and is clinically characterized by pain over the pronator teres and the flexor carpi radialis that is increased by resisted forearm pronation and wrist flexion1. Medial epicondylitis occurs less commonly than lateral epicondylitis between the ages of 12-80 years, although its peak frequency occurs between the fourth and fifth decades of life. However, when the averages of VAS score and grip strength were analysed using the Willcoxon signed ranked test and paired-t-test within the group with a positive percentage of change, there was a significant change. Medial and lateral epicondylitis have been diagnosed, and it has been reported that the incidence of medial epicondylitis accounts for up to 9.8% to 20% of all diagnosed cases[2-5]. There is no difference between males and females in terms of its incidence and prevalence, but it has been noted that 75% of patients with epicondylitis present with symptoms in their dominant arms[6]. Research on the pathophysiological causes of epicondylitis suggests that overuse or repetitive stress on the flexor-pronator muscles may be the cause[7]. The pronator teres, palmaris longus, flexor digitorum superficialis, and flexor carpi ulnaris are the muscles most frequently affected by pathological alterations. When treating tendinopathy, eccentric exercise has both structural and functional advantages due to the central adaptation of both agonist and antagonist muscles[8]. Patellar, Achilles, and lateral epicondylalgia have all been treated with eccentric exercise. [6,7,9]. Patients with medial epicondylalgia have reported improved grip strength and less severe pain after undergoing eccentric exercise for 12 weeks[7]. The therapies of eccentric exercise in conjunction with conventional physical therapy have improved DASH score, VAS score, tenderness measurement, wrist & middle finger extension exercise, and chronic lateral epicondylitis[7, 10]. Eccentric exercise should be a part of the rehabilitation programme for patients with epicondylitis because it has been observed that tendon disruption and macro and micro tearing occur in the tendon when it is subjected to specific eccentric loading conditions[7,11]. Few studies have specifically examined the relationship between medial epicondylitis pain and grip strength and eccentric exercise [12]. In order to find out whether eccentric exercise has any notable effects on pain relief or an increase in grip strength for patients with epicondylitis, we conducted this study. The purpose of this study is to determine whether eccentric exercise can reduce discomfort and enhance grip strength in study participants with medial epicondylitis. It was expected that eccentric exercises combined with conventional therapy for patients with medial epicondylitis would have statistically significant effects on pain intensity decrease and grip strength, as already documented by a study[7].

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MATERIALS & METHODS

The study's experimental pre- and post-test design was used. The administration of the hospital in question granted ethical approval for the study, which included a total of 37 screen patients. Of these, 30 (N=30) medical epicondylitis patients were chosen and then randomly divided into two groups, each of which included 15 chronic epicondylitis patients (CG=15, TG=15). The subjects included for the conduct of this experiment were between the ages of 30 and 50 with complaints of tenderness over the medial epicondyle region of the involved side of the humerus since more than a month[7,13], symptoms of pain throughout the entire forearm that worsened with resisted wrist flexion and pronation [10,] and positive results for the golfer's elbow test[1]. Patients with ulnar neuropathy and cervical radiculopathy met the study's exclusion criteria. people who have had upper limb surgery or fractures in the past[. 7,13] d) discomfort at the elbow joint on the affected side e) individuals who have received recent medial & physiotherapeutic treatment for medial epicondylitis [15.] Patients who met the study's inclusion requirements were informed of the trial, given written consent, and randomly assigned to 1 of 2 groups (CG N=15, TG N=15).

In contrast to the control group (CG), which received only conventional physical therapy, the treatment group (TG) underwent eccentric exercise in addition to the latter (stretching & ultrasonic therapy). For a total of 4 weeks, divided into 5 physiotherapeutic sessions each week, participants in each group received the indicated interventions. The protocol for the TG involved performing eccentric exercises after warming up the corresponding muscles, which included forearm flexor and extensor movements with wrist movement for 2 to 3 minutes, followed by a static stretch of the wrist flexor and extensor muscles for 40 to 50 seconds three times. The forearm muscle's eccentric workout was performed on patients while they sat next to a table with their elbows flexed 900 degrees, wrists slightly bent, and palms pacing the ceiling outside the table while holding an ideal weight. The patient then lowers the holding weight gently (5-7 seconds per movement), the participants then brought the weight back to the starting position with the aid of the contra-upper limb, and in the same manner, 3 sets of 5 repetitions each were conducted. Patients were told to stick with their eccentric exercise programme even if they had mild to moderate pain when moving, but to stop if the pain got worse. Between each physiotherapeutic session, exercises were done in three sets of ten repetitions with a one- to two-minute rest period. Weights were subsequently raised for these patients using free weights & Theraband when their pain threshold levels improved to allow for heavier weights without an increase in intensity. Participants in the study underwent static stretching, which involved sitting next to a table with the forearm in supination and the elbow flexed 900. The patient was then instructed to stretch the wrist flexor muscles on the involved side by performing full wrist extension and holding this position for 4–50 seconds without pain, three times per day.

Pulsed ultrasound therapy with a 1:4 on-to-off ratio and a frequency of 1MHz was used in this investigation. Using an ultrasonic coupling medium from electromedical supplies, the US was administered to the chosen patients. Throughout the period, the treatment

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sessions lasted 5 to 10 minutes, with an average intensity of 1-2 W/cm^2. Apart from eccentric exercise, all of the standard physical therapy treatments (US and static starching) were administered to the CG patients for a total of 12 physiotherapeutic sessions, divided into 3 sessions/weeks. The VAS (visual analogue scale) was employed for pain assessment in this study, and a hand grip dynamometer was used to assess grip strength. Before the test, the participants received a briefing on how to operate a hand grip dynamometer. Using a typical adjustable hand grip dynamometer in a standing position with the shoulder flexed; 1800, elbow flexion; 00, and wrist; 150-300 extension, the grip strength of the affected side was assessed.

The handle of the hand grip dynamometer was correctly set so that the base of the instrument rested on the first metacarpal and the handle rested on the other four fingers of the affected hand. The patients were instructed to apply isometric pressure to the hand grip dynamometer and to maintain that hold or contractions for a period of five seconds. Patients were cautioned to apply isometric pressure only once per measurement, but they were encouraged to exert their greatest contractions over the hand grip dynamometer during isometric contraction. To prevent the patient from becoming tired throughout the process, the concerned therapist took 3 readings with a 30 second gap between them. Before each examination, a hand grip dynamometer was calibrated for all patients who had signed up. The hand grip dynamometer's three consecutive readings were averaged, and the results were then recorded [7,16,17.] The means and standard deviations (Means +- SD) of the gathered data were evaluated, and the P-value cutoff was chosen at 0.05. The variables' relationships to the pre-intervention and post-intervention states were examined using the paired-t test and the Willcoxon test, and the percentage of change was calculated. The means of the variables for the two groups were then compared using the independent-t-test and the Mann Whitney, with the percentage difference between the means of the groups being calculated. SPSS versions 8 were utilised for the study's statistical analysis.

RESULTS

The CG (N=15) group had a mean age of 38.60 years, 4 males, and 11 females, while the TG (N=15) group had a mean age of 38.47 years. There were seven males and eight female patients. However, Table 1 shows that there was a significant change in the means of VAS and grip strength measured by hand grip dynamometer from pre to post interventions within the groups, with the positive percent of change indicating an increase in the post-means and the negative percent of change indicating a decrease in the post-means. In terms of mean age, the difference between the groups (TG & CG) was significant (Table-2). The means of the two groups do not differ statistically significantly (pre-interventions of VAS & grip strength to the means of the post-interventions; Table-3).

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Table 1: Basic characteristics of the study's participants

		Control Group	Treatment Group	Significance between the groups
Number of study's participants (N)		15	15	-----
Age in Years		37.62± 5.87 (32-48)	38.45±6.37 (96-79)	P_{Valu}-0.955 (Non-significant)
Gender Male/Female	Male	4	7	Person-chi square
	Female	11	8	
	Significance	0.000	0.000	
Side	Right	7	9	
	Left	8	6	
Total		15	15	30

Table 2: Group analysis of the variables VAS score and grip strength (control & treatment group)

Outcomes	(Mean SD) prior to intervention (Max-Min)	(Mean SD) Post-intervention (Max-Min)	z-value [a]	t-value [b]	Significance 1-tailed –P-values	% of the change	Effects size (r)	95 percent of the difference is within this range.
VAS (cm)	5.93±0.88	1.73±0.96	-3.437	12.322	0.00	-70.82%	+0.91	3.469
Grip strength (lbs)	58.73±22.04	69.93±24.80	-3.413	-8.929	0.000	19.07%	+0.22	-13.890
Treatment Group								
VAS (cm)	5.73± 1.03	1.47± 0.64	-3.473	23.482	0.000 **	-74.34%	+0.92	3.877
Grip strength (lbs)	67.35± 29.09	86.08±26.93	-3.408	-5.596	0.00	31.26%	+0.39	

Statistically significant difference P 0.05, NS (Non-significant), a Willcoxon signed ranked test, and b paired t test

Table 3: The grip strength and VAS scores of the groups are contrasted

Outcome measure		% of difference	Effect size	z-value [a]	t-value [b]	Significance 1-tailed–P-values
VAS (cm)	Pre	-3.43%	0.10	-0.457, P=.648	0.570	P=.573 (NS)
	Post	-16.25%	0.15	-1.266,P=0.067	0.894	P=.379 (NS)
Grip strength	Pre	12.15%	0.17	-1.88, P=0.067	-0.987	P=.332 (NS)
	Post	21.83%	0.30	-2.263, P=0.024	-1.776	P=.087 (NS)

Discussion; According to the study's findings, patients in the treatment group significantly improved their grip strength dynameters and VAS scores when compared to patients in the control group. When the post-intervention means of the two groups are compared, this study found that there is significant improvement of the percent of change and no improvement. In the TG group, however, there is a statistically significant decrease in VAS score for the study's patients with a percentage of change of 74.34 percent and an increase in the grip strength score with a recorded percent change of 31.26 percent. According to several research, epicondylitis is a degenerative or failed tendon healing

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response that is defined pathologically by the presence of fibroblasts, disordered collagen, and vascular hyperplasia [7,15,17]. According to studies, eccentric exercise helps individuals with epicondylitis strengthen their wounded tendons by stimulating the tenocytes' mechanoreceptors, which in turn helps the tendons heal by forming collagen [4,5]. Additionally, it has been suggested that eccentric exercise in individuals with epicondylitis may correct the rise in glycosaminoglycan concentration, which may enhance collagen alignment and tendon tensile strength at the site of the injury [4,5]. It has been suggested that post-injury exercise in tendinopathy patients may result in a positive outcome that may be due to either the effect of stretching, with the lengthening of the muscle-tendon unit of the involved and stretched muscles, and consequently less pain & strain is experienced by the patient during the joint movement, or its due to the effects of loading within the muscle tendon unit, with the hypertrophy & increased strength in the involved muscles. Additionally, it has been suggested that eccentric exercise causes a reduction in blood supply to the damaged area, which may result in neovascularization and tendon recovery[4]. When treating tendinopathy in patients with epicondylitis, eccentric exercise benefits patients through central adaptation of both structural and functional benefits4. According to reports, eccentric exercise has been utilised successfully in the rehabilitation of patellar tendinopathy and lateral epicondylalgia in addition to tendon rehabilitation in patients with epicondylitis [4,16,26].

Patients with medial epicondylalgia have reported improved grip strength and less severe pain after doing eccentric exercise for 12 weeks [14,15]. The interventions of eccentric exercise in conjunction with traditional physical therapy have improved DASH score, VAS score, tenderness measurement, wrist & middle finger extension exercise in chronic lateral epicondylitis[15,16]. A therapy programme for individuals with epicondylitis must incorporate eccentric exercise as a component of the rehab programme since it has been found that tendon disruption and macro and micro tearing in the tendon occur under particular conditions of eccentric loadings [17.] Few studies have particularly examined the relationship between medial epicondylitis pain and grip strength and eccentric exercise[1,20-23]. The TG group patients in the current investigation may have improved in VAS & grip strength as a result of the aforementioned factors[1,24-25]. According to reports, ultrasound therapy improves blood flow to the application site, connective tissue extensibility, membrane permeability, and nerve transmission in the treated tissue[7.] Acoustic micro streaming and unidirectional fluid movement along cell membranes are caused by variations in mechanical pressure inside the US field [1]. The micro streaming induced by the US may change the permeability, functionality, and structure of cell membranes, which will cause the damaged tissues of the affected tendon to heal.

Cavitations and microspinning have a stimulating effect on fibroblast healing, collagen formation, tissue regeneration, and bone remodeling. US interact with one or more inflammation-related components at the site of the injured tendon and set off a chain of events that results in the inflammation being downgraded, accelerated fibrinolysis and macrophage stimulation, accelerated angiogenesis, increased matrix synthesis, formation of denser collagen fibrils, and increased tissue tensile strength [1,7]. According to

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a study done by Kaliman et al., US decreased the patient's pain score and increased pressure tolerance in the tendon injury tissues. It's possible that applying static stretching to the wounded tendon for a while had a significant impact on how extensible the tendon was. Stretching may also increase the flexibility of the affected muscles, which improves range of motion (ROM) due to potential viscoelastic changes in the area[1,15]. It may help relieve the affected nerve and reduce neuropathy signs and symptoms.

LIMITATIONS

It contains the following: 1) Small sample size 2) A complicating element was the activity of the involved upper limb. 3) The majority of the patients were from Pakistan's rural areas, despite the fact that the groups studied were mixed in terms of gender. 4) The eccentric exercise was not standardised for the study. 5) The study's findings were restricted to the VAS score and grip strength at the affected wrist; additional clinical outcomes were not taken into account.

RECOMMENDATIONS

It entails the following: 1) A sizable and multi-centered sample should be obtained with a fairly extensive follow-up schedule. 2) Additional research can be conducted utilising standardised outcomes other than static stretching and US in the control group. 3) Using any standardized outcome, the study's population may be changed to reflect epicondylitis related to sports or gender.

CONCLUSION

The eccentric exercise programme for 4 weeks has shown significant improvement in the reduction of pain intensity and the improvement of grip strength for patients with medial epicondylitis along with conventional therapy. However, the improvement obtained has no difference when compared to the control conventional rehabilitation interventions in these patients.

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