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Treatment of Lateral Epicondylitis with Physiotherapy during a Clinical Trial: Comparison of Mobilization Technique and Shock Wave

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ABSTRACT

***Objective**: The current study aimed to examine effect of ESWT vs. MWM in the management of tennis elbow.*

***Methods**: The study was conducted in the physiotherapy department at PAU. Sample of the study consisted of 22 patients aged between 20-50 years. Patients were selected in the orthopedic clinic and randomly separated into 2 groups. The ESWT group included (12) patients, whereas the MWM group included (10) patients. The first group underwent 3 sessions/week and the latter underwent 2 sessions/week for 4 weeks. The demographic data were assessed. VAS was used for pain intensity. A hand-held dynamometer was used for wrist strength and Quick DASH was used for a functional disability.*

***Results**: Inter-group analysis was done using t-test. Comparing pre-post treatments using VAS disclosed that there were not significant differences between groups, P= 0.25. Pre-post treatment for wrist strength uncovered that there wasn't a significant difference between groups, P= 0.47. Pre-post QUICK DASH scores, P=0.35. Therefore, there wasn't a statistically significant difference between groups with functional disabilities.*

***Conclusion**: The study found that ESWT and MWM were effective in all outcome measures.*

Keyword

ESWT, MWM, Tennis elbow.

Introduction

Tennis elbow is a common condition that is accompanied by pain and tenderness over the bone prominence of the lateral epicondyle which is the original site of the extensor muscles. Due to repeated wrist extension. it is often accompanied by pain and reduced grip strength that might manifest with resisted wrist extension Extension of the middle finger affects 1-3% of adults peaking aged between 40-50 years. It also affects 50% of tennis players due to poor swing technique and heavy racquet use. It mostly happens in patients who work with heavy tools [1].

Tennis elbow is the most common -reason underlying behind elbow pain and weakness; it is mainly resulting from repetitive gripping or wrist extension while doing multiple activities. The precise pathogenesis, to a large degree remains elusive with putative tendinitis and a symptomatic degenerative process of the local tendon. It is often diagnosed by clinical investigations. Additional visualization is sometimes required for a specific differential diagnosis. Although most cases can be self-healing, the ideal treatment strategy for chronic tennis elbow remains controversial [2].

There are fundamental principles of treatment such as pain reduction, accelerating the process of healing, avoiding arm overload and helping the patient to return to daily life activities. Conservative

treatment through rest, aggravating activities avoidance and behavioral change usually results in reducing symptoms [3]. Nonsteroidal anti-inflammatory drugs (NSAIDs) can also be used to control pain and enhance short-term functionality.

Extracorporeal shock-wave therapy (ESWT) is one of the most common physical therapy modalities used for treating tennis elbow. In spite of the conflicting outcomes in the literature available, the mechanism of ESWT has not been adequately clarified It may include direct stimulation of healing, neovascularization, direct suppressive effects on nociceptors and a hyper stimulation mechanism blocking the gate control. ESWT may not reverse the pathology of tennis elbow but may improve tennis elbow symptoms [4,5]. ESWT is not appropriate for acute tennis elbow but it is recommended when the symptoms exceed 6 months or when other conservative treatments fail [6,7].

Mobilization with movement (MWM), which is a type of manual therapy with hypoalgesic effects, enhances joint ROM, and muscle function and treats specific pathologies. MWM is effective in the management of tennis elbow patients, ankle sprains, shoulder impingement and hip osteoarthritis as well [8].

Reyhan and his colleagues investigated the effects of Mulligan's mobilization technique with movement technique in patients with tennis elbow. The results showed that the mobilization with movement, exercises and cold therapy are safe and effective alternatives leaving positive effects on elbow pain, functional capacity, pain free and maximum grip strength [9].

There are a few studies were worked in using mulligan mobilization technique and extracorporeal shock-wave in management of the tennis elbow, so the major aim of current study is to investigate which is more effective in handling tennis elbow.

Methods

Participants

The current study was operated within the theoretical framework of the comparative studies. It was conducted in the physiotherapy department of Allied Medical Science Faculty. An ethical permission was obtained from the Faculty Ethical Committee, Allied Medical Science Faculty, Palestine Ahliya University, Palestine. The sample study was calculated by following equation: $n = (Z\alpha/2+Z\beta)\ 2\ *2*\sigma^2\ /\ d^2$, where $Z\alpha/2$ is the critical value of the normal distribution at $\alpha/2$, $Z\beta$ is the critical value of the normal distribution at β, σ^2 is the population variance, and d is the difference you would like to detect. A total of 22 patients (9 males and13 females) were selected in orthopedic clinic according to inclusion and exclusion criteria.

Protocol

To address the issue of tennis elbow, a special announcement was released by the Palestine University's physical therapy department. By which it invited patients to participate and specialists to a carry out free examination. A Written informed consent was also obtained and the study procedures were explained as well. A detailed musculoskeletal evaluation was done to screen the patients. The participants were equally and randomly divided into 2 groups. Group A was given extracorporeal shock-wave therapy (N=12, M=5, F=7), whereas group B was given mulligan mobilization technique (N=10, M=4, F=6). All patients were divided randomly. The sessions were carried out two times a week for 4 consecutive weeks. Inclusion criteria were as follows: (1) Both male and female, (2) Age group 20-50 years, (3) Resisted wrist extension and wrist extensor stretching tests are positive, and (4) History of tennis elbow for 3 months. Exclusion criteria were as follows: (1) Suffering from heart problems or Hypertension or diabetics, (2) Complaining of any neurological problems, (3) Rupture of the elbow tendon or any serious elbow injury during the time of treatment, (4) Pregnancy, (5) Those who have taken physical therapy sessions at least during the last 3 months, (6) Osteoporotic and rheumatoid arthritis patients.

Resisted wrist extension and wrist extensor stretching tests were used to diagnosis patients with tennis elbow. The outcome measures were used to assess tennis elbow, Hand held dynamometer was calculated and found to be reliable in the measurement of hand grip strength in tennis elbow. These dynamometers typically consist of an adjustable handle that can be placed in several grip positions and a calibrated gauge to uncover the measured value of force in kilogram [10].

Visual Analogue Scale (VAS) is a graphic rating scale commonly interpreted as a valid report of pain intensity. It was used to record pain intensity degree. Scores were based on self-reported measures of the symptoms recorded with a single handwritten mark placed at one point along the length of a 10-cm line representing a continuum between the two ends of the scale— “no pain” on the left of the scale (0 cm) and the “worst pain” on its right end (10 cm). Each subject was asked to mark and score on the line at the point representing the intensity of pain [11].

The Quick DASH score represents the disability/symptom score including 11 items out of the original DASH’s 30 questions. In addition, both the answer and evaluation of time were shorter than with DASH. These were merits for both patients and evaluators. The Quick DASH has been reported to have a high correlation with the DASH and it is therefore convenient and effective for evaluating function of the upper extremities. There was no set age limit for DASH and Quick DASH, and the general guidelines recommend to carried it out for patients aged between 18 to 65 [12].

All measurements used were pre and post treatment for all patients. The interventions were used in management patient with tennis elbow, group A (ESWT Group), the patient was on supine position, arms in the right - angled flexion in the elbow, comfortably supported, preferably with a soft elastic pad. For group (A), ESWT was applied with a BTL-5000SWT equipment using the W-0108 program for tennis elbow. The settings used were continuous shocks with 2 bar pressure and a frequency of 10Hz (2000 shocks).

The treatment was performed within 3 sessions a week for a period of 4 weeks and with 1-day break in-between. After detecting the painful sites, ESWT was started with 400 shocks at 2 bars with a frequency of 5Hz around the most painful area. Subsequently, the painful spot was treated with 1000 shocks and another 400 shocks were successively applied to the forearm muscles and group B (MWM), manual lateral glide MWM was used with gripping, the patient lies supine with the elbow extended and pronated, the distal homers is stabilized laterally with one hand and the proximal ulna is glided laterally and painlessly with the other hand. While the glide is sustained, the patient grips a dynamometer to first onset of pain. It was finished with the lateral glide applied and sustained during several repetitions (approximately 10) of pain-free elbow flexion/extension to prevent elbow pain on first moving after MWM. It was applied 6-10 repetitions in a set, with 3-5 sets in a treatment session. Group (B) underwent 2 sessions per week for 4 weeks.

Statistical Analysis

Data of the study was reviewed in preparation to be inserted into the computer. It was entered to the computer by giving specific figures. The data was statistically processed by extracting the numbers and the percentages as well. The hypotheses were examined at the level of $\alpha = 0.05$ by the following statistical tests-test.

Results

For this study thirty (n=22) subjects, the males represented 41% of the overall [percentage of the participants and the females were 59%. Most of the participant 46% were more than 34 years, 36% aged between 27-33 years, and 18% were less than 26 years old. The participants were selected to compare the effectiveness of extracorporeal shock-wave therapy versus mulligan mobilization technique in decreasing pain intensity, increase muscle strength and improving functional disability for tennis elbow patients. These subjects were randomly divided into 2 groups, group A (n=12) and group B (n=10).

Within groups analysis of VAS score was done using t-test. The result of group A test uncovered that the P value is 0.001 which is less than P = 0.05. The Findings also revealed that the average on pain pre-treatment was 7.40, while the post- treatment decreased to (1.40). The results in group B test revealed that P is equal to 0.001, In addition, the result uncovered that the average pain of pre mulligan mobilization technique was 7.60, whereas the average pain post-treatment reduced to 4.40. We thus infer that extracorporeal shock wave and MWM reduce tennis elbow pain significantly. These findings are illustrated in Table 1 below.

Table 1: Results of t-test for the differences effect of the ESWT and MWM on the VAS scale within group.

	VAS	No.	Mean	Std. deviation	DF	T	Sig.
Group A	Before	12	7.40	1.14	8	9.258	0.001
	After	12	1.40	0.89			
Group B	Before	10	7.60	0.89	8	6.822	0.001
	After	10	4.40	0.54			

Between groups analysis of VAS score was done using t-test for the pre and post-results of both groups. The results of the two groups indicated that the P value in posttests was equal to 0.25, which is more than 0.05. These results indicate that that there is no statistically significant difference between the two groups. Table 2 below illustrates these findings.

Table 2: Results of t-test for the differences effect of the ESWT and MWM on the VAS scale between groups.

	Group	No.	Mean	Std. Deviation	DF	T	Sig.
VAS	**Group A**	12	1.40	0.89	8	-6.396	0.25
	Group B	10	4.40	0.54			

Within groups wrist strength was done using t-test. Comparing the pre- and post-results of wrist strength in group A showed that the P value is equal 0.010. This means that there was statistically significant difference between pre- and post- of wrist strength. The average wrist strength pre- ESWT in group A was 18 %. While post- treatment increased to 43%. Therefore, ESWT can improve wrist strength significantly. Similarly, in group B, the P value was 0.008, which is less than 0.05. Hence, there was statically significant difference between pre- and post in wrist strength. Examining the average score of wrist strength before and after the MWM revealed that the average wrist strength in group B before the treatment was 12%. In the post measures, the average was 25%. This also means that MWM can enhance wrist strength significantly. Table 3 below illustrates these findings.

Table 3: Results of t-test for the differences effect of the ESWT and MWM on the wrist strength within group.

	Wrist Strength	No.	Mean	Std. Deviation	DF	T	Sig.
Group A	**Before**	12	18.0	8.36	8	-3.362	0.010
	After	12	43.0	14.37			
Group B	**Before**	10	12.0	4.47	8	-3.474	0.008
	After	10	25.0	7.07			

The t-test was used to compare pre- and post- wrist strength in between groups. On the post treatment, the test revealed that the P value was 0.47, which is than 0.05, and thus there is no statistically significant difference between group A and group B in wrist strength. Table 4 illustrate these findings.

Table 4: Results of t-test for the differences effect of the ESWT and MWM on the wrist strength between groups.

	Group	No.	Mean	Std. Deviation	DF	T	Sig.
Wrist Strength	**Group A**	12	43.00	14.37	8	2.513	0.47
	Group B	10	25.00	7.07			

Within groups QUICK DASH was done using t-test. When comparing the pre- and post-results of functional disability in group A, the results uncovered that the P value is equal 0.002. This indicated that there was statistically significant difference between pre- and post-results in QUICK DASH. The average functional disability pre- ESWT in group A, was 57.26%, where as it was decreased to 6.35in the post- treatment Consequently,

ESWT can improve wrist function significantly. Similarly, the P value in group B was 0.041, which is less than 0.05. Hence, we conclude that there is statically significant difference between pre- and post in wrist function. Examining the average score of wrist function before and after the MWM revealed that the average wrist function in group B before the treatment was 50.96%. In the post measures, the average was 26.35%. This indicates that MWM can significantly improve wrist function. Table 5 below presents these results.

Table 5: Results of t-test for the differences effect of the ESWT and MWM on the QUICK DASH within group.

	Quick DASH	No.	Mean	Std. Deviation	DF	T	Sig.
Group A	**Before**	Before	12	57.26	8	6.669	0.002
	After	After	10	6.35			
Group B	**Before**	Before	12	50.96	8	2.434	0.041
	After	After	10	26.35			

The t- Test was used to compare the pre- and post- QUICK DASH in between groups. The P value was 0.35 on the post treatment scores test, which is more than 0.05. Thus, there is no statistically significant difference between group A and group B in wrist function. Table 6 illustrates these findings.

Table 6: Results of t-test for the differences effect of the ESWT and MWM on the QUICK DASH between group.

	Groups	No.	Mean	Std. Deviation	DF	T	Sig.
Quick DASH	**Group A**	12	6.35	4.37	8	-3.131	0.35
	Group B	10	26.35	13.59			

Discussion

The current study aims at to comparing the effectiveness of mulligan mobilization technique and extracorporeal shock-wave therapy in the management of patients with tennis elbow.

Results of the current study showed that mulligan mobilization technique and extracorporeal shock-wave therapy are effective to reduce pain, improve wrist strength and the ability of the upper extremity for patients with tennis elbow. This indicates that both leave effect on reducing pain, improving the wrist strength and wrist function.

Kocjan and his friends reported that there are effects of extracorporeal shock-wave therapy (ESWT) versus mulligan technique concept of manual therapy on treating lateral epicondylitis. Results of the study also disclosed that ESWT and mulligan technique are effective treatment of lateral epicondylitis. Both groups made improvement in all of the analyzed variables; night pain, rest pain, pressure pain, Thomsen test, Chair test and Mill's test. Pre intervention mean for VAS in night pain was 6,6 and the post intervention mean was 1.2 in shock-wave therapy group. Other side, pre intervention mean for VAS in pressure pain was 6,3 and the post intervention mean was 3.1 in mulligan technique group. Results were obtained in ESWT group are better in 5 out of 6 analyzed variables - compared to mulligan technique group. Similar results were found in Chair test, where improvement was found to be very significant. Although after treatment in mulligan technique group, the mean values in VAS scale were admittedly lower than the output values in each cases. However, statistically significant improvement was not found in case of rest pain and pressure pain [13].

Researcher have also reported that the effects of mulligan mobilization with movement and taping techniques on pain, grip strength, and function in patients with lateral epicondylitis. The study results further indicated that statistically significant improvement in all the outcomes of both groups; the experimental and control ones. In addition, the mean improvement in visual analogue scale and maximum grip strength was significantly greater in the experimental group than that in the control group, so the experimental group pre intervention mean for VAS was 6.3 and the post intervention mean was 1. On other hand in the control group pre intervention mean for VAS was 6.6 and the post intervention mean was 3.4. In grip strength for experimental group, pre intervention mean was 35.8 and the post intervention mean was 11.1. but in control group pre intervention mean for grip strength was 57.7 and post intervention mean was 30.0. Thus, they found that the combination of Mulligan techniques with traditional treatment results in better outcomes in lateral epicondylitis treatment than traditional treatment alone [4,7,14,15].

Compared to the current study results of extracorporeal shock-wave therapy versus mulligan technique concept with tennis elbow on pain with the shock-wave therapy group at VAS, the pre intervention mean was 7.4 and the post intervention mean was 1.4. However, concerning the mulligan technique group, the pre intervention mean was 7.60, the post intervention mean was 4.40. Comparing the post-intervention for both groups, it was concluded that the two treatments were effective for reducing pain after comparing group A, shock-wave therapy group with group B, mulligan technique group have significant difference on pain threshold. It was also found that the shock-wave therapy and Mulligan technique were effective in reducing pain on VAS.

Rahman et. al., compared the effectiveness of mulligan mobilization technique with movement to supervised exercise program in subjects with lateral epicondylitis. They found that both techniques showed improvement in hand grip strength and VAS, pre intervention mean for hand held dynamometer was 23.88 and the post intervention mean was 55. The group that performed mulligan mobilization with movement also showed significantly greater improvement in reducing pain and increasing hand grip strength than the supervised exercise program (Rahman et al,.2016).

Compared to current study as the results of mulligan's mobilization technique with tennis elbow on wrist strength by using the hand-held dynamometer, the pre intervention mean was 12.0 and the post intervention mean was 25.0. By comparing pre-intervention and post-intervention of both groups, it was concluded that the two treatments were effective in improving wrist strength. After

comparison, group A and group B do not have significant difference on wrist strength threshold.

Aldajah and his colleagues examined the analgesic effect of extracorporeal shock-wave therapy on individuals with lateral epicondylitis. They found the ESWT leaves a superior impact on reducing pain and enhancing functions of the upper-extremity and grip strength in people with lateral epicondylitis. They indicated that five sessions of ESWT are optimal to obtain a significant difference [16].

Compared to current study as the results averages score of the Quick DASH shows the mean function score before the shock waves treatment was 57.26 while after the treatment it decreased to 6.35. This means that shock-wave therapy improves upper extremity function significantly. Also, the averages score of the Quick DASH shows that the mean function score prior to Mulligan mobilization technique was 50.96, while it decreased to 26.35 after the treatment. This means that mulligan mobilization technique improves upper extremity function significantly. Our study showed a positive effect of shock wave therapy and Mulligan mobilization technique in improving functional abilities in patients with upper extremity disabilities.

Conclusion

Strength of the current study lied in that tennis elbow is a common condition. In contrast, the weakest point is the small size of the sample, which is due to the short duration. Results of the study indicated that extracorporeal shock wave therapy and mulligan mobilization technique are both a line for physiotherapist for handling with tennis elbow patients. Further studies are indeed strongly needed to verify these findings.

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