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Efficacy of Movement with Mobilization followed by Tapping in Treatment of Tennis Elbow

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Abstract : This study were carried out to investigate the effect of movement with mobilization (MWM) followed by tapping[Mulligan technique]for elbow joint on pain level and pain free grip muscle strength (PFGS) in patients with tennis elbow (TE).A total 60 patients aged between 30 to 50 years old in both sexes complained by TE divided randomly into two groups ، Experimental group(n=30) received MWM plus tapping with traditional treatment only. The sample was randomly . They were evaluated before the treatment and after 4 weeks (12 sessions , 3 per week) . Pain and Pain free grip muscle strength (PFGS) were measured by VAS and digital hand held dynamometer respectively. The difference between both groups was assessed by 2x2 mixed design Manova. There was a significant improvement in pain and PFGS in both experimental and control groups . But as pain (VAS) means in experimental group were 6.07± 0.64,1.44± 1.05 pre and post treatment respectively, p= 0.0001, in control group VAS measurement means were 5.68± 0.95 ،4.52±0.97 pre and post treatment respectively, p=0.0001. PFGS means in experimental group were 12.65± 3.72, 20.93±5.24 pre and post treatment respectively, p=0.0001, in control group, PFGS means were 11.71±2.31, 13.67± 2.92 pre and post treatment respectively , p= 0.0001, but the experimental group had more significant improvement than the control group(p< 0.05). The study showed that the combination of movement with mobilization followed by tapping with traditional treatment results to better improvement in the treatment of tennis elbow.

Keywords : Tennis elbow, lateral epicondylitis, movement with mobilization, mulligan, tapping.

Introduction

Tennis elbow (TE) is a condition characterized by pain in the out part of elbow joint during active wrist extension, tender point when pressing on lateral epicondyle[1,2]. TE is five to eight times common than medial epicondylitis. Its prevalence is approximately 1%- 3% between 30 and 54 years of age[3]. Dominant arm involvement is most common[4]. Females and males are equally affected [5]but more sever and longer lasting in females than males[6]. TE usually has a gradual onset triggered by repetitive micro- trauma[7]. The pain is described as deep, aching, sometimes numbness, deficits in grip strength and functional ability of upper limb[8,9].

More than 40 different therapeutic methods are used to treat this problem[10], including non- steroidal anti inflammatory drugs[11,12], corticosteroid injection [13,14] , cryotherapy in the acute stage, followed by heat in chronic stage[15], ultrasound [15,16] , acupuncture[17], laser[18], electrical stimulation[19,20], therapeutic exercises[21], manipulation [8], and joint mobilization[22]. As Gariet et al, [23] included that the traditional methods of physiotherapy fails to

improves quality of collagen in tendons, also not bring in new vascularity to promote tissue healing. Therefore, the treatment plan should be include mulligan mobilization with movement.

Mobilization help in increasing fibroblast recruitment and activation in tendons which promote proper healing. Also, mobilization activate a regenerative response in soft tissues via induction of leakage from dysfunctional capillaries which causes fibroblast activation, macrophage mediated phagocytosis and a local release of growth factors[24,25]. Joint mobilization aims to help the tissue remodeling process, reducing the proliferation of fibrosis tissue and decreasing the crossed collagen formation, decreasing the accumulation of inflammation by products and modulate the pain process[26,27].

MWM and tapping are techniques developed by mulligan for treating TE. MWM is a kind of manual therapy that include sustained lateral glide to the elbow joint [8,29], MWM is based on mechanical dysfunction and positional fault correction[30].

A number of studies studied the effect of MWM on TE patients as Miller [31]examined the effect of MWM on changing positional faults of elbow joint and he found that pain decreased and improvement in pain free grip strength[PFGS], 2 weeks of treatment and 1 month follow up showed absence of pain and full function . other studies compare the effect of MWM with other treatment modalities. Bisset et al[32] compared the effect of physiotherapy (MWM plus exercise) with corticosteroid injection. They found that corticosteroid effect was better at first 6 weeks but after physiotherapy has great significant improvement than corticosteroid. Amro et al [33]compare the effect of MWM plus tapping with traditional treatment in TE .They found that there was reduction in pain in experimental group than control group, increasing in PFGS values during and after treatment from baseline in the placebo or control groups but in MWM group there was increasing in pressure pain.

Other researchers compared the effect of MWM against control or placebo groups as Vicenzino et al [34] showed that there was no change in PFGS values during and after treatment from baseline in the placebo or control groups but in MWM group there was increasing in pressure pain threshold. On the other hand Kochar and Dogra [35] showed that improvement in grip strength and decreasing pain level in MWM group and most of patients in this group reached to full recovery.

Tapping technique described by mulligan, often applied after mobilization. It is placed around elbow joint over the extensor carpi radialis muscles, it reduces the load over the muscles and increase grip strength of the hand[36]. Vicenzino,[37]provided that tapping significantly improved PFGS by 24% from baseline better than for control or placebo group. Vicenzino and Wrigth,[38]concluded that MWM plus tapping have significant improvement in PFGS and pain visual analogue scale (VAS) than traditional treatment. The aim of this study is to assess the effect of MWM followed by rigid tapping on pain (VAS) and PFGS in TE patients in combination with traditional treat

Materials and methods

Subjects

Sixty patients (35 to 50 years ago) participated in this study complain with TE and diagnosed by orthopedist. Patients were divided randomly into groups: group A (n=30, 12 males and 18 females) received MWM followed by tapping plus traditional treatment ultrasound, TENS, therapeutic exercises (stretching and eccentric strengthening exercises) and a group of subjects (n=30, 11 males and 19 females) received traditional treatment only. Patients diagnosed by orthopedist, pain onset is more than 3 months appear either with use or rest or in both, also it appear with deep palpation of lateral epicondyle. All patients read and signed a constant form prior to the beginning of treating. This study conducted in Health Insurance Institute Clinics, Beni Suef, Egypt. Patients were excluded who have Rheumatoid Arthritis, history of elbow surgery, neurologic deficit in upper extremity, elbow dislocation. Plica synovialis and patients receiving any other treatment modality for duration of study.All participants read and signed a consent form prior to the beginning of testing. This study was approved by the Institutional Ethics Committee of the Faculty of Physical Therapy, Cairo University, Egypt by number P.T REC/012/001017

Procedures

Patients assessed pre and post treatment sessions

1- Pain assessment

Pain assessed by visual analog scale (VAS). This scale allows continuous data analysis and uses a 10 cm line with 0 (no pain) and 10 (killing pain). The patient places a mark along the line to detect his pain level [39].

2- Grip muscle strength by measuring pain free grip strength(PFGS)

PFGS was measured by digital hand held dynamometer . It is portable, small in size, easy to use, minimally time consuming and relatively in expensive [40]. It is reliable and valid method for measuring upper extremity muscle strength [41]. The patient was positioned in supine with the tested elbow in relaxed extension and pronation. The patient was instructed to maximally squeeze the dynamometer on the affected side but stop when the instant pain is experienced, the average of 3 repetitions with 20 second rest intervals was used [42].

Treatment procedures for group A(experimental group).

The patient took movement with mobilization of elbow. It was be given with subject lying in supine position having their elbow extended and forearm pronated. The therapist was stand at side of subject to be treated .placing the belt around therapist shoulder and subject's forearm , belt placed closed to elbow joint line. The therapist was perform the lateral glide of forearm using belt sustaining this glide, subjects was be asked to perform fist without pain,[43] then using rigid tap to restore the gliding effect of MWM .Dosage 10 mobilizations with movement in one set.3sets was be given per session . Treatment was given for 12 sessions. Patients were be given conventional treatment regime includes ultrasound (3MHz, 100% duty cycle, 7 min)[44], TENS for 15 min ، static stretching exercises to forearm extensors for 30 sec , 6 repetitions with 30 sec rest between each session [45], strengthening exercises performed for wrist extension slowly and maintain the position of extension for 2 seconds and gradually return to starting position . Active motion of wrist extension with elbow flexed 90 degrees, 2-3 sets of 10 repetitions will be started, progressing to 5 sets of 10 repetitions as tolerated .When subject can perform 50 repetitions without overcompensation of other muscles 1 pound of weight is added and performed 3 sets of 10 repetition progress to 5 sets . Then add 1 pound of weight and progress to 5 sets. Then add 1 pound of weight and progress to 5 sets. Then add 1 pound of weight and progress till 3 pound weight [46]

Treatment procedures for group B(control group)

The patient took conventional treatment include ultrasound, TENS, stretching and strengthening exercises as group A only.

Results

In this study, statistical analysis was conducted using spss for windows , version 18 (spss, Inc, Chicago, IL). 2X2 mixed design MANOVA was used to compare the tested variables of interest at different tested groups and measuring periods. With the initial level set of 0.05.

Descriptive analysis of patients

Descriptive analysis using histograms with the normal distribution curve showed that the data were normally distributed and not violates the parametric assumption for each of the measured dependent variables. Additionally, testing for the homogeneity of covariance revealed that there was no significant difference with p values of > 0.05.

Physical characteristics

The mean of age, weight, height and BMI for group A were 39.13± 5.04، 84.2± 8.94, 166.4± 5.58 and 30.41± 3.05 respectively. The mean of age , weight, height and BMI for group B were 39.6± 5.37 , 81.33± 12.14 , 166.5± 8.64 and 29.29 ±3.49 respectively. There was no significant difference between the means of age, weight, height and BMI of two groups $p> 0.05$.

Overall effect

Statistical analysis using 2x2 mixed design MANOVA indicated that there was significant effects of the tested group (the first independent variable) on the all tested dependent variables : VAS and grip muscle strength . In addition, there were significant effects of the measuring periods (the second independent variable) on the tested dependent variables (F= 102.512 ،p= o.ooo1). However, the interaction between the two independent variables was significant , which indicates that the effect of the tested group (first independent variable) on the dependent variables was influenced by the measuring periods (second independent variables) (F= 55.94 , P= 0.0001).

Pain level

In group A, the mean values of pain level in pre and post treatment were 6.07± 0.64 and 1.44± 1.05 respectively .Multiple pairwise comparison tests (post hoc tests) revealed that there was significant reduction of pain level (VAS) post treatment comparing with pre treatment, $p < 0.05$. In group B , the mean values of pain level in pre and post treatment were 5.89± 0.95 and 4.52± 0.97 respectively . Multiple pairwise comparison tests (post hoc tests) revealed that there was significant reduction of pain level post treatment in comparing to pre treatment $p < 0.05$. Between both groups post hoc tests revealed that there was significant difference of mean values between groups post treatment with p= 0.0001 and this means that there was significant reduction in pain in group A more than group B.

Table1 : Mean ±SD and p values of Pain level pre and post test at both groups.

Pain level	**Pre test**	**Post test**	**MD**	**% of change**	**P- value**
	Mean± SD	**Mean± SD**			
Group A	6.07±0.64	1.44±1.05	4.6	75.78	0.0001*
Group B	5.68±0.95	4.52± 0.97	1.16	20.42	0.0001*
MD	0.387	-3.087			
p- value	0.071	0.0001*			

Grip muscle strength

Comparison means of grip muscle strength in pre and post treatment for group A were 12.65±3.72 and 20.93± 5.24 respectively. Multiple pairwise comparison tests (post hoc tests) revealed that there was significant increase in PFGS post treatment $p < 0.05$ ، as well, the mean values of PFGS pre and post treatment in group B were 11.71± 2.31 and 13.67± 2.92 respectively . This means that there was significant increase in grip muscle strength in both groups but with comparing the means of two groups post treatment by post hoc tests, there was significant difference of the mean values of the post treatments between two groups ($p < o.o5$) and this means that there was significant increase in grip strength in group A more than group B.

Table 2: Mean ±SD and p values of grip muscle strength pre and post test at both groups.

Grip muscle strength	**Pre test**	**Post test**	**MD**	**% of change**	**p-value**
	Mean± SD	**Mean± SD**			
Group A	12.65± 3.72	20.93± 5.24	-8.28	65.45	0.0001*
Group B	11.71± 2.31	13.67±2.92	-1.96	16.73	0.0001*
MD	0.933	7.253			
P- value	0.248	0.0001*			

Discussion

The purpose of this study is to evaluate the effectMWM followed by tapping(mulligan technique)in TE patients comparing with traditional treatment alone. We found that when adding MWM plus tapping results in better improvement in pain and grip muscle strength than traditional treatment alone . As mobilization help in

activation of tendon healing and activate tendon regeneration via induction of leakage of dysfunctional capillaries, improve phagocytosis and releasing growth factor [24,25]. Also , mobilization reducing the fibrosis proliferation and crossed collagen formation by products[26,27]. The neural system responsible for pain modulation as mobilization might provide an adequate non- noxious sensory input to activate descending pain inhibitory system as a major component of pain relief [47]. Those are responsible for reducing pain level in TE patients which already affects on PFGS improvement. These results were agreed with other studies as Anap et al[48] provided that there was significant reduction in pain level (VAS) in MWM group than conventional therapy group as means of MWM group were 6.07±0.46,2.2±0.62 pre and post treatment respectively but means of control group were 5.95±0.69, 2.85±0.81 pre and post treatment respectively, while Amero et al [33] agreed also that MWM is more effective than conventional treatment in reducing pain as the mean difference of MWM group was 5.3±0.9 but mean difference in control group was 3.2±2.1. In Bisset et al [49], they concluded that there was pain reduction in MWM plus exercises better than corticosteroids injection at 52 weeks post treatment by 68% of participants, also Kocher et al [35] agreed with the positive effect of MWM when compared with ultrasound as pain level decreased by 5.9 cm in MWM group to 1.67 cm in ultrasound group. Not all studies agreed us in these results such as Slater et al [22] as they diagnosed the positive effect of MWM on pain reduction where pain level increased in the common extensor tendon and at the extensor carpi radialis brevis, there were no significant between group differences in VAS profiles, pain distributions, induced deep tissue hyperalgesia. This data suggest that MWM doesn't activate mechanisms associated with analgesia in subjects with experimentally TE. These difference in the results between the present study and Slater et al study return to the difference in the effect of MWM in patients with clinical TE as opposed to subjects with experimentally induced features of TE that may indicate that different neural mechanisms are operating to modulate pain associated with prolonged central sensitization as suggested to occur in patients with clinical TE[50] also because the lateral MWM while indicated for use in movement related pain or stiffness in musculoskeletal disorders may be effective in chronic cases like present study cases not acute cases like slater et al [51].For grip muscle strength , Arora et al [18] proved that MWM with low level laser therapy (LLLT) have highly significant improvement in grip strength than LLLT alone as means difference in experimental group were 69.41±22.01,91.19±23.27 pre and post respectively but in control group were 71.64±21.15, 82.18±20.17 pre and post respectively . Anap et al [48] there was significant increase in PFGS with MWM treatment (12.15±0.95, 26.05±1.76) mean differences pre and post treatment respectively while in conventional treatment, the means differences were 12.15±0.87, 25.45±1.28 respectively. Paungmali et al [52] agreed also these results as they found that the magnitude of PFGS increased during MWM procedure by 2.96%, p=0.02 for each session and by 3.06% per session after the technique application (p=0.05). Kocher et al [35] found that there was significant increase in grip strength from 22.7g to 31.57g in MWM group than US group while Paungmal et al [52], PFGS was increased from 127.1 N to 166.2 N during treatment and further increased to 174.1N immediately after treatment. Vicenzino et al [34] PFGS was increased by 45.67% for MWM group to 9.74 increase for placebo group to 2.69% reduction in control group . Slater et al [22]disagreethese present results as they found that decreasing in maximal grip strength in MWM group from 313±17 to 267±12 versus decreasing in placebo group from 316±23 to 256±18. This is due to provoked muscle damage combined with inhibition force of contractile apparatus via saline induced acute pain will compromise the contractile ability of extensor carpi radialis brevis muscle . Maximum voluntary force is affected by experimental pain induced by saline injection so maximal voluntary force decreased[53]. So the results of Slater differs than the results of the present study which dealing with clinical TE and not using saline injection.

Limitation

We need some trends towards the effectiveness of MWM in TE. High quality longitudinal Rct_s which will assess the outcome measures over a period of long term follow up are needed to confirm the clinical effectiveness of MWM in TE. The neurophysiological mechanisms thought to be responsible for the effects of MWM also need to be explored further.

Conclusion

In this study, adding MWM followed by tapping (Mulligan technique) to the traditional treatment will decrease pain level and increase grip muscle strength (PFGS) more than using the traditional treatment alone.

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