

Effect of Muscle Energy Technique versus Deep Friction Massage Combined with Eccentric Theraband Training in Chronic Lateral Epicondylitis - A Comparative Study

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Abstract: ***Background:** Lateral epicondylitis (LE), otherwise known as “tennis elbow” is often a painful, debilitating and chronic condition characterized by lateral elbow pain. It is an over use stress syndrome characterized with symptoms of pain and tenderness persisting for more than 3 months at the lateral aspect of elbow joint affecting the daily activities such as shaking hands raising a cup, using a hammer, lifting a shovel, dressing and desk or house work typify the particular movement which initiates the pain.^{1, 3} **Method:** 30 subjects diagnosed as lateral epicondylitis were divided into two groups each of 15 subjects. Group A: (n=15): Muscle energy technique and eccentric theraband training. Group B: (n=15): Deep transverse friction massage with eccentric theraband training. Patient received treatment for 3 alternative days a week for 4 weeks. The patient's pain was assessed by VAS and grip strength using hand dynamometer. Data was collected before treatment (baseline) and after 4 weeks. **Results:** The VAS score for MET group in Day 1 was 6.20 ± 0.77 and in Day 28 is 0.53 ± 0.64 . The mean difference in VAS score was 5.667 and P value shows the significance at $<0.001^{**}$. The Hand grip value is 18.27 ± 6.12 in Day 1 and 45.80 ± 11.27 in Day 28. The mean difference is of -27.533 and P value shows the significance at $<0.001^{**}$. Similarly for DFM group, VAS score in Day 1 is 6.00 ± 1.00 and in Day 28 is 2.60 ± 1.18 . The mean difference in VAS score is 3.400 and P value shows the significance at $<0.001^{**}$. The Hand grip value was 19.07 ± 8.93 in Day 1 and 34.87 ± 14.63 in Day 28. The mean difference was of -15.800 and P value shows the significance at $<0.001^{**}$. **Conclusion:** MET technique was found to be more effective than DFM for treatment of lateral epicondylitis that could be because of active muscle contraction and passive stretching causing increased flexibility of the structures. Whereas, DFM, mostly causes scar tissue releasing. Muscle contraction was not facilitated nor flexibility was increased. Hence alternate hypothesis was proved.*

Keywords: Lateral epicondylitis; Muscle energy technique, Deep transverse friction massage

1. Introduction

Lateral epicondylitis commonly known as Tennis elbow is a painful, debilitating and chronic condition characterized by lateral elbow pain condition involving the tendons that attach to the bone on the outside (lateral) part of the elbow. It was described as a chronic symptomatic degeneration of the wrist extensor tendons involving their attachment to the lateral epicondyle of the humerus.¹ It mainly affects persons performing repetitive upper limb activities such as carpenters, musicians, and computer programmers.²

Usually seen in an age group of 30yrs and above, affecting men and women equally. Dominant arm is commonly affected with a prevalence of 1-3 % in general population, but this increases to 19% in 30 to 60 of age group.³

Tennis elbow in the chronic stage causes formation of a painful scar which results from repetitive injury involving a tear of tendon at junction between muscle and bone leading to slow healing. These repetitive micro trauma may overload the repairing tissue, mechanically distort scar tissue and thus stimulate free nerve endings to evoke mechanical nociceptive pain.^{4,5} The most commonly affected muscle is extensor Carpi radialis brevis (ECRB).⁶ Lateral epicondylitis, considered as tendinitis with inflammation of the tendon. However, there is histopathologically paucity of inflammatory cells such as macrophages and neutrophils. Hence the condition is considered to be a tendinosis (degenerative process). Recent studies have suggested, Under-use or stress shielding, where the tendon regularly experiencing lower amount of

load, which may lead to structural weakening of the tendon, making it more susceptible to injury.²

The intensity of the pain can range from intermittent and mild to constant and severe, affecting all the daily activities, also disturbing sleep.⁶

There are varieties of treatment approaches used to treat the patient with lateral epicondylitis which includes pharmacotherapy, iontophoresis, ultrasound, stretching exercises and many more. However, in this study Muscle Energy Technique and Deep Friction Massage along with eccentric theraband exercises were performed to provide better insight of treatment for patient with chronic lateral epicondylitis.

Deep transverse friction massage mainly works on connective tissues of tendons, ligaments and Muscles. The advantage of deep friction massage is that it allows pressure to be applied to greater depth in the tissue, which⁸ is helpful in soft tissue release and stretch the tissue which is impaired causing pain and dysfunction.

Muscle Energy Technique is essentially a mobilization technique using muscular facilitation and inhibition. Abnormal shortening or lengthening of muscles occurs in response to injury and pain. Muscle Energy Technique restores the muscle range and normality.¹⁰ Contraction of the facilitated muscle from the lengthened position generates sufficient tension to activate Golgi tendon endings in the tendon. This reflex inhibits both the gamma and alpha motor neuron which, results in the lengthening of the

muscle upon relaxation.¹⁰ MET is considered to be a superior approach in treating lateral epicondylitis compared to corticosteroid injections.¹¹

Eccentric exercises has been effectively used in the management of tendinopathies. It is suggested that eccentric exercise effectively lengthens the muscle tendon complex resulting in structural remodelling of the tendon with hypertrophy and increased tensile strength.¹³ Eccentric exercises have proven successful in the management of chronic tendinopathy, particularly of the Achilles and patellar tendons, where they have been shown to be effective in controlled trials¹²

Theraband resistance training with moderate intensity increases cross sectional area of muscle, force production and strength of bone¹⁴. Patients also can learn this technique easily and practice exercises at home, particularly elderly people.¹⁶

Grip strength assessment are useful and reliable measures for the assessment of lateral epicondylitis. Pain-free grip strength, is relatively easy to perform and has been shown to be associated with other measures of functional disability in patients with lateral epicondylitis.¹⁹ A hand dynamometer is used to perform the hand-grip test.^{18,19}

There is paucity of studies to prove the comparative effect of DFM and MET combined with eccentric exercises in reducing pain and hand function. Therefore, the present study is intended to compare the effect of DFM and MET combined with exercises on chronic lateral epicondylitis.

2. Material and Method

A single group pre-test and post-test experimental study design was used to examine DFM and MET effects on chronic Lateral Epicondylitis. Informed consent were taken from subjects. Ethical approval was granted by Hosmat Hospitals and Educational Institute, Bangalore, Karnataka, India.

A total 30 subjects were included after following the inclusion criteria were allotted into 2 groups.

Group A-MET WITH ECCENTRIC THERABAND TRAINING

Group B – DFM WITH ECCENTRIC THERABAND TRAINING

Both groups received intervention three times a week for 4 weeks, alternative days for 20 mins. Icing was applied after the exercise programme for 10 minutes in the form of an ice bag to the lateral epicondyle.^{34,35} The baseline measurements was compared to the predata at the end of 12 sessions, after 4 weeks.



Deep Friction Manipulation



Eccentric Resistance Training



Muscle Energy Technique



Assessment using Hand Held Dynamometer

Age in years	MET	DFM	Total
30-40	9 (60%)	9 (60%)	18 (60%)
41-50	4 (26.7%)	4 (26.7%)	8 (26.7%)
51-60	2 (13.3%)	2 (13.3%)	4 (13.3%)
Total	15 (100%)	15 (100%)	30 (100%)
Mean $\pm$ SD	39.93 $\pm$ 7.72	40.20 $\pm$ 7.66	40.07 $\pm$ 7.56

P=0.925, Not Significant, Student t test

In table 1, the chart depicts that both the group i.e, MET and DFM group consists of 60% of 30-40, 26.7% of 41-50 and 13.3% of 51-60 age group.

Gender	MET	DFM	Total
Female	6 (40%)	7 (46.7%)	13 (43.3%)
Male	9 (60%)	8 (53.3%)	17 (56.7%)
Total	15 (100%)	15 (100%)	30 (100%)

P=0.713, Not Significant, Chi-Square Test

Table 2 depicts that 40% are female and 60% are male in MET group whereas in DFM group 46.7% are female and 53.3% are male. The total female participant in this group is 13(43.3%) and male participant is 17(56.7%).

Side	MET	DFM	Total
Left	6 (40%)	5 (33.3%)	11 (36.7%)
Right	9 (60%)	10 (66.7%)	19 (63.3%)
Total	15 (100%)	15 (100%)	30 (100%)

P=0.705, Not Significant, Chi-Square Test

Table 3 display the percentage distribution of sides. 40% were having lateral epicondylitis in left hand and 60% right lateral epicondylitis in MET group. Similarly, 33.3% were left LE and 66.7 %were right LE in DFM group. The overall left- handed LE were 36.7% whereas 63.3% right LE.

VAS Score	Pre	Post	% difference
MET (n=15)			
• 0	0 (0%)	8 (53.3%)	53.30%
• 1-3	0 (0%)	7 (46.7%)	46.70%
• 4-6	9 (60%)	0 (0%)	-60.00%
• 7-10	6 (40%)	0 (0%)	-40.00%
DFM (n=15)			
• 0	0 (0%)	1 (6.7%)	6.70%
• 1-3	0 (0%)	10 (66.7%)	66.70%
• 4-6	9 (60%)	4 (26.7%)	-33.30%
• 7-10	6 (40%)	0 (0%)	-40.00%
P value	1	0.005**	-

Table 4 depicts the % difference of pre and post treatment for VAS score. MET group shows that 53.3% were having VAS 0 in day 28, followed by 46.7% falling under VAS 1-3 and 0% above VAS score 3. Comparatively, only 6.7% had VAS score 0, 66.7% had VAS 1-3, 26.7% had 4-7 in day 28. This shows that the mean percentage difference in MET group is higher as compared to DFM group.

Handgrip	Pre	Post	% difference
MET (n=15)			
• 1-10	2 (13.3%)	0 (0%)	-13.30%
• 11-20	6 (40%)	0 (0%)	-40.00%
• 21-30	7 (46.7%)	2 (13.3%)	-33.40%
• 31-40	0 (0%)	4 (26.7%)	26.70%
• 41-50	0 (0%)	3 (20%)	20.00%
• >50	0 (0%)	6 (40%)	40.00%
DFM (n=15)			
• 1-10	4 (26.7%)	0 (0%)	-26.70%
• 11-20	5 (33.3%)	4 (26.7%)	-6.60%
• 21-30	4 (26.7%)	3 (20%)	-6.70%
• 31-40	2 (13.3%)	2 (13.3%)	0.00%
• 41-50	0 (0%)	4 (26.7%)	26.70%
• >50	0 (0%)	2 (13.3%)	13.30%
P value	0.417	0.161	-

Table 5 shows the hand grip distribution in MET and DFM group. The pre- treatment value of Hand grip in both the groups does not show much difference whereas the post treatment value shows significant difference. The Hand grip strength is divided into range as 1-10,11-20,21-30,31-40,41-50 and >50. In day 28, 0% of the patient inMET group were having hand grip strength below 20 whereas 26.7% of the patient in DFM group were having hand grip strength less

than 20. MET group is having the hand group strength higher in day 28 at 13.3% of 21-30,26.7% of 31-40, 20% f 41-50 and 40% of >50 strength score. Similarly, for DFM group, 0% were in range 1-10 post treatment,26.7% in 11-20,20% in 21-30 ,13.3% in 31-40,26.7% in 41-50,13.3% in >50. The mean percentage difference between pre and post treatment is high in MET group when compared to DFM group.

Variables	MET	DFM	Total	P value
VAS				
• Pre	6.20±0.77	6.00±1.00	6.10±0.88	0.545
• Post	0.53±0.64	2.60±1.18	1.57±1.41	<0.001**
• Difference	5.667	3.4	4.533	-
• P value	<0.001**	<0.001**	<0.001**	-
Handgrip				
• Pre	18.27±6.12	19.07±8.93	18.67±7.54	0.777
• Post	45.80±11.27	34.87±14.63	40.33±13.99	0.030*
• Difference	-27.533	-15.8	-21.667	-
• P value	<0.001**	<0.001**	<0.001**	-

Table 6 shows the comparison of VAS and Handgrip in two groups. The VAS score for MET group in Day 1 is 6.20±0.77 and in Day 28 is 0.53±0.64. The mean difference in VAS score is 5.667 and P value shows the significance at <0.001**. The Hand grip value is 18.27±6.12 in Day 1 and 45.80±11.27 in Day 28. The mean difference is of -27.533 and P value shows the significance at <0.001**. Similarly, for DFM group, VAS score in Day 1 is 6.00±1.00 and in Day 28 is 2.60±1.18. The mean difference in VAS score is 3.400 and P value shows the significance at <0.001**. The Hand grip value is 19.07±8.93 in Day 1 and 34.87±14.63 in Day 28. The mean difference is of -15.800 and P value shows the significance at <0.001**.

difference	MET	DFM	Total	P value
VAS	5.67±0.98	3.40±1.12	4.53±1.55	<0.001**
Hand grip	27.53±5.76	15.80±6.79	21.67±8.60	<0.001**

Table 7 depicts the difference in VAS and Hand grip in two groups where the total difference in VAS is 4.53±1.55 and for Hand grip is 21.67±8.60.

3. Discussion

The purpose of the study was to compare the effectiveness of MET versus DFM combined with eccentric theraband training to reduce pain and to improve hand grip in subjects with chronic lateral epicondylitis. Results obtained from the study showed that the incidence of lateral epicondylitis is more in males as compared to females. This could be because of the definite lateral epicondylitis seen in males.²²

When the mean reduction values of VAS and hand grip were analyzed within the groups, it was statistically significant in both the groups. VAS score assessment for pain showed significant improvement in both the groups after the treatment. As the study was done on chronic lateral epicondylitis, similar study done by Yoeng-Taek Oh⁴⁶ in patients with chronic low back pain has found out that the Muscle Energy Technique on pain and Functionality has significant change in VAS score post intervention. Kucuksen et al (2013)¹¹ had shown that MET has better result over corticosteroid injection in treating

lateral epicondylitis. The increase in the hand grip is because of the eccentric theraband exercise. This is supported by Stanish et al¹³ where they suggested that eccentric exercise effectively “lengthened” the muscle-tendon complex resulting in structural remodeling of the tendon with hypertrophy and increased tensile strength of the tendon. This is further supported by Pensini et al⁴⁷ where voluntary torque was significantly increased following eccentric resistance training on their study on central versus peripheral adaptations following eccentric resistance training.

In inter group analysis, there was significant improvement in hand grip for both the groups. However, Group A receiving MET was found superior than Group B receiving DFM. This statement is supported by Sonakshi et al (2016)⁴⁸ where they found remarkable improvement in strength of athletes. The statement is further supported by HyeMiJeong et al (2017)⁴⁹ where they stated that MET improves strength because this technique inhibits the motor activation of Golgi tendon organs and isometric contraction causes lengthening of viscoelastic and plastic changes in myofascial connective tissue. MET technique was found to be more effective than DFM for the treatment of lateral epicondylitis as MET cause increased blood circulation to the part, active muscle contraction and passive stretching causing increased flexibility of the structure. In contrast, only scar tissue was broken down which was followed by increased circulation and therefore neither muscle contraction was facilitated nor flexibility increased. Walker H. (1984)⁵⁰ As most epicondylitis is related to restriction of the radial head at the radio-humeral and proximal radioulnar joint. MET can release articular restrictions, lengthen muscle fibers and increase range of motion. MET is a non invasive, painless, safe and easy treatment option without adverse events.⁵¹

Therefore, all the above literature supports the efficacy of MET over DFM in reducing pain and improving hand grip in subject with chronic lateral epicondylitis.

4. Limitations of the Study

As lateral epicondylitis is considered as a self limiting disorder, in some cases it is not possible to determine if this self limiting factor led to the improvement of pain levels and ability to work instead of work administered. Sample size was also small. Efficacy of treatment was not followed up for a given time period.

5. Conclusion

The study was as a COMPARATIVE STUDY to see the efficacy of MET over DFM on chronic lateral epicondylitis, where MET technique was found to be more effective than DFM for the treatment of lateral epicondylitis. Hence this study supports that MET is found to be more efficient and beneficial in treating chronic lateral epicondylitis than DFM.

Author Disclosures

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immediate family, has no commercial association (i. e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript. Compliance with Ethical Standards Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the HOSMAT HOSPITAL AND EDUCATIONAL INSTITUTE.

Data Availability:

The data associated with the paper are not publicly available but are available from the corresponding author on reasonable request.

Conflicts of Interest

The author certifies that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript and publication of this paper.

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