Research article (Award paper)

Effects of muscle energy technique on improving the range of motion and pain in patients with frozen shoulder

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ABSTRACT

Introduction and Aim: Muscle Energy Technique (MET) is a type of manual treatment that utilises the energy of the muscle in the form of a mild isometric contraction to stretch the muscle and relax the muscles through reciprocal or autogenic inhibition. An idiopathic ailment of the shoulder joint known as frozen shoulder is characterised by a rapid onset of shoulder discomfort and a limitation in mobility. Much research has been conducted to determine how various manual approaches affect shoulder discomfort. This study focuses on how MET affects pain and range of motion during the initial stages of rehabilitation.

Materials and Methods: Patients who are diagnosed with frozen shoulders with fulfilling the inclusion and exclusion criteria were selected for the study. In the current study, thirty patients who had a prevalence of musculoskeletal complications of the frozen shoulder were selected. Out of which eighteen are male and twelve are female. To identify the prevalence each patient's range of motion and VAS Score for pain sensation were recorded. The same patients have been introduced to MET for another seven days. MET includes 5 repetitions/sets, 3 sets/session, and 1 session/day. A statistical test was performed to identify the significant difference between pre and post-values.

Results: Most of the patients had an average range of motion (Flexion) (of 132±18.96), range of motion (Abduction) of (107.00±12.77), range of motion (Rotation) of (63.50±9.39) and VAS score was (5.96±1.29). Most patients showed the improvement in range of motion and a decrease in pain sensation as per the VAS Score.

Conclusion: This study shows that MET effectively improves the range of motion and functional ability, relieving pain in Frozen Shoulder patients in the early stage of rehabilitation.

Keywords: MET; range of motion; pain; frozen shoulder; VAS.

INTRODUCTION

Frozen Shoulder have some pathology which is characterized by the gradual onset of pain and restriction of active movement of glenohumeral joint motion which is seen in adults aged between 40-60 years (1).Frozen shoulder results in stiffness and pain at the shoulder joint which occurs in three different phases. The first phase is known as the freezing phase which lasts for 2-8 months which is characterized by acute stage of synovitis in the glenohumeral joint. The second phase is known as transitional phase which lasts from 4-12 months, in this phase the capsular pattern of the shoulder joint is diminished, and external rotation is initiated by shoulder flexion and internal rotation. The third phase is known as the thawing phase which lasts for 12-30 months and is defined by the gradual onset of pain and decreased shoulder mobility (2). The idiopathic causes of a frozen shoulder are made when the pain is increased and movements of the shoulder joint are eliminated (3). Often, both systematic and non-systematic circumstances are linked to frozen shoulder. Diabetes mellitus is the most prevalent cause of frozen shoulders, occurring in 10–20% of people (4). A manipulative technique called Muscle Energy Technique (MET) was developed in osteopathic medicine with the aim of lengthening muscles and fascia and mobilising joints (5). MET can improve the joint range of motion and also release and relax the muscle. The use of this method is to normalize the JROM, increase the flexibility and the techniques that can be used at joints that have restricted ROM which is identified by the passive examination and assessment (6).

The focus of this study is to compare the outcomes of MET provided for one week with those of MET administered early, which includes outcomes for patients with shoulder stiffness in terms of pain, range of motion (ROM), and functionality. MET entails the patient actively contracting their muscles in a certain direction while resisting the therapist's counterforce (7). Strengthening the muscle, increasing local blood flow, lowering muscular

tension, loosening the muscle, and mobilising joint restriction are the therapeutic benefits (8).

The relaxation of antagonist muscles occurred due to the contraction of the antagonist's muscle actively. The mobility of the joint is due to its reciprocal inhibition (9). There are some early interventions for the management of frozen shoulder which includes therapeutic exercise, stretching of tight structures, strengthening of muscle activity, and other electrotherapy modalities (10).

MATERIALS AND METHODS

A data collected was done over a period of 3 months on subjects which include the aged between 40-60 years who were undergoing treatment for pain sensation included in this random sample. The randomization was done on a primary basis by the investigator before the minimal assessment.

Outcome measures

The level of the pain intensity at the shoulder joint was evaluated using the Visual Analogue Scale (VAS). A universal half goniometer was used to assess the shoulder joint's range of motion (11). VAS is a good and reliable tool for clinically measuring the intensity of pain. It also helps researcher's measure acute and chronic pain (12,13). Measuring the JROM of shoulder joint movement by using a goniometer is a simple and reliable tool clinically (14).

Sample size

Thirty patients who had a prevalence of musculoskeletal complications after knee arthroscopy were selected, out of which eighteen were male and twelve were female. MET was given by a qualified physiotherapist who has more knowledge about post-isometric relaxation for seven days with a 4-6 second hold for 7-10 repetitions followed by passive stretching (15).

The therapeutic Exercise program was given to subjects for at least seven days as follows:

Active and passive shoulder flexion in supine lying.

Active and passive shoulder abduction in supine lying.

Active and passive shoulder external rotation in supine lying.

Active and passive shoulder internal rotation in supine lying.

Conventional therapy such as follows:

- Codman's pendular exercise
- Rope and pulley Exercise
- Finger ladder exercise
- Hot packs for 10 minutes

All the exercises should be done with about five repetitions each, three sets per session, five days per week for 3 weeks, once in a day. The pre and post-exercise assessments were done for seven days. Measurement was taken with the help of another trained physiotherapist who knows pre and post-interventions.

Inclusion criteria

subjects in the 40–60 age range who had frozen shoulders in their second and third phases. The study included participants with or without diabetes who were willing to take part.

Exclusion criteria

Subjects with stiff shoulders, rotator cuff injuries, after trauma, fracture of the shoulder complex, and tendon calcification were excluded from the study.

Statistical analysis

The 25th edition of IBM SPSS Statistics for Windows was used to analyse the collected data. The VAS scale was used for pain, and ROM (range of motion) was calculated using the data that had been gathered.

ROM (FLEXION)						
	Test Value = 30					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ROM FLEXION	37.255	29	.000*	131.6667	124.4385	138.8949

*=0.05, Result is significant at p< 0.05

ROM (ABDUCTION)						
	Test Value = 30					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ROM ABDUCTION	45.941	29	.000*	107.16667	102.3957	111.9376

*=0.05, Result is significant at p< 0.05

ROM (EXTERNAL ROTATION)						
	Test Value = 30					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ROM External Rotation	37.036	29	.000*	63.50000	59.9934	67.0066

*=0.05, Result is significant at p< 0.05

VAS SCALE						
	Test Value = 30					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
VAS	-101.303	29	.000*	-24.03333	-24.5185	-23.5481

*=0.05, Result is significant at p< 0.05

RESULTS

Table 1: The evaluation of pain using the VAS scale

	N	Minimum	Maximum	Mean	Std. Deviation
VAS Pre-test	30	4.00	8.00	5.9667	1.299
VAS Post-test	30	3.00	5.00	3.8000	0.76112

Table 2: The evaluation of ROM (Flexion) by using a Goniometer

	N	Minimum	Maximum	Mean	Std. Deviation
ROM Pre-test	30	105.00	165.00	132.000	18.964
ROM Post-test	30	115.00	175.00	147.5000	17.15799

Table 3: The evaluation of ROM (Abduction) by using a Goniometer

	N	Minimum	Maximum	Mean	Std. Deviation
ROM Pre-test	30	85.00	135.00	107.1667	12.776
ROM Post-test	30	110.00	150.00	126.1667	12.0832

Table 4: The evaluation of ROM (External Rotation) by using a Goniometer

	N	Minimum	Maximum	Mean	Std. Deviation
ROM Pre-test	30	50.00	80.00	63.5000	9.390
ROM Post-test	30	60.00	90.00	76.8333	7.367

The above study shows that there was an improvement of pain using the VAS scale. The intensity of pain was reduced significantly in post-rehabilitation when compared to the pre-rehabilitation program. The mean difference is 5.9667±1.299 in the pre-test evaluation to mean difference is 3.800±0.761 in the post-test evaluation with p <0.05(Table 1).

The above study shows that there was an improvement in Shoulder joint ROM in flexion, Abduction, and External Rotation after giving therapeutic exercise. The mean value of flexion has been changed from 132.000±18.964 to 147.5000±17.157 with p <0.05 (Table 2), whereas the mean value of abduction has been changed from 107.1667±12.776 to 126.1667±12.0832 with p <0.05 (Table 3) and the mean value of external rotation has been changed from 63.5000±9.390 to 76.8333±7.367 with p value <0.05 (Table 4).

DISCUSSION

The aforementioned study was conducted to examine the benefits of MET when used right away after one week of complaining of discomfort and after one week of rehabilitation for several criteria, including pain, shoulder joint range of motion, and muscle testing. MET has been shown to be effective in different phases of rehabilitation. In this study during the early intervention phase, there was no adverse action such as increasing pain, irritation, difficulty, and discomfort. This study concluded that MET was more effective in improving the joint stiffness, pain, and ROM, of those who had restricted shoulder joint range of motion and any injury to the shoulder joint acute condition.

A decrease in pain, including proinflammatory conditions that may potentially desensitise the nociceptors, may follow early MET management. Due to cyclic muscular contraction, the lymphatic blood flow rates may also be impacted, and capillary blood flow may even rise (16). The muscle and joints are stimulating more and more when isometric contraction is given to their elasticity zone.

Through deep tissue stimulation and localized vasodilation, MET suppresses sympathetic tone (17). Active muscle contraction has been shown to cause some changes in neurophysiological effects, including pain and stiffness which is followed by muscle stretched further (12, 18).

CONCLUSION

When MET was administered during the early intervention phase, pain, JROM, and function at the shoulder joint improved when MET was begun right away after complaining of discomfort, and afterwards, a substantial improvement was demonstrated after the MET was administered for seven days. For treating frozen shoulder patients with a slow development of pain and stiffness, MET can be utilised as a mainstay of the rehabilitation protocol. It can be safely administered throughout the first stages of rehabilitation when the shoulder is painful, decreasing range of motion, and being stiff.

CONFLICT OF INTEREST

Authors declare no conflicts of interest.

REFERENCES

1. Chamber, A. F. W., Carr, A. J. Aspects of current management, The role of surgery in frozen shoulder. The Journal of Bone and Joint Surgery.2003;85-B: 789-795.
2. Jason, J. I., Sundaram, G.S. Subramani, V.M. Physiotherapy intervention for adhesive capsulitis of shoulder, International Journal of Physiotherapy and Research, 2015, Vol.3 (6) page no 1318-1325.
3. Harrast, M. A., Rao, A.G. The stiff shoulder. Phys Med Rehabil Clin N Am. 2004; 15:557-573.
4. Bridgeman, J.F. Periarthritis of the shoulder and diabetes mellitus. Ann Rheum Dis. 1972; 31: 69-71.
5. Kisner, C., Colby, L.A. Therapeutic Exercise Foundation and Techniques, 6th edition, New Delhi, India: Jaypee Brothers, 2012.
6. Brontzman, S., Wilk, K. Clinical Orthopedics rehabilitation; 2003,227-231.
7. Faqin, A.I., Bedkar, N., Shyam, A., Sancheti, P. Effects of MET on pain, ROM and function in patients with post-surgical elbow stiffness. A randomized control trial; Hong Kong Physiotherapy Journal. 2019; 25-33.
8. Fryer, G., Ruszkowski, W. The influence of Contraction duration in MET applied to the atlantoaxial joint, Int. Journal Osteopath Med. 2004;7(2):79-84.
9. Ylinen, J. Stretching Therapy- For sports and manual therapies. Section-I- stretching theory 1st ed Oxford, united kingdom, Churchill Livingstone, 2008; 22-102.
10. Macdermid, J.C., Vincent, J. I., Kieffer, L., Kieffer, A., Demaiter, J., Macintosh,S. *et al.,* A survey of practice patterns for rehabilitation post elbow fracture. Open Orthop J. 2012;6:429-439.
11. Prince, D. D., McGrath, P.A., Raffi, A., Buckingham, B. The validation of visual analog scales as ratio scales measures for chronic and experimental Pain. Pain. 1983; 17: 45-56.
12. Carlsson, A. M. Assessment of pain. I. Aspects of the reliability and validity of the visual analog scale. Pain. 1983; 16: 87-101.
13. Breivik, H., Borchgrevink, P.C., Allen, S.M., Rosseland, L.A., Romundstad, L., Hals, E. K. B., *et al.,* Assessment of pain. British Journal of Anaesthesia. 2008;101(1): 17-24.
14. Chapleau, J., Canet, F., Petit, Y., Laflamme, G.Y., Rouleau, D.M. Validity of goniometric elbow measurements: Comparative study with a radiography method. Clin Orthop. Relat Res. 2011;469(11):3134-3140.
15. Chaitow, L. Muscle Energy Techniques. 4th ed. Edinburgh: Churchill Livingstone 2013:94, 243,245,249,250.
16. Fryer, G. Muscle energy technique: An evidence informed approach. Int J Osteopath Med. 2011;14(1):3-9.
17. Schleip, R. Fascial plasticity – A new neurobiological explanation. Part 2. J Bodyw Mov Ther. 2003;7:104-116.
18. Phadke, A., Bedekar, N, Shyam, A., Sancheti, P. Effect of muscle energy technique and static stretching on pain and functional disability in patients with mechanical neck pain: A randomized controlled trial. Hong Kong J Physiotherapy. 2016;35:5-11.