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Effect of Muscle Energy Technique on Pectoral Muscles as an Adjunct Therapy in Frozen Shoulder Patients

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Abstract: ***Background: Frozen Shoulder is a medical condition in which the shoulder joint has become rigid and movement has been restricted. The prevalence ranges from 3% to 5%, with peak intensity occurring between the ages of 35 and 65. Pectoral muscles are more prone for tightness, which may alter the biomechanics of the shoulder. Research has cited the importance Muscle Energy Technique (MET) in the treatment of Frozen Shoulder. Therefore, the need of this study was to compare the effectiveness of Pectoral muscles Muscle energy technique in patients with FS. Aim: To study the effect of Muscle energy technique in addition to conventional therapy on Pain, Pectoral Muscles Tightness, Shoulder Flexibility and Functional Disability in patients with Frozen Shoulder. Methodology: Convenient sampling was done for the selection of participants. 32 participants who met the inclusion criteria were recruited from various hospitals of Vadodara. The participants were divided into 2 groups; Only Conventional Therapy group and MET along with Conventional Therapy Group. Baseline data were collected in the form of NPRS, PMI, PML, Shoulder ROM and SPADI . After 20 sessions, the participants were evaluated again. Result: The data were analyzed using unpaired t test and there was statistically significant improvement in MET along with conventional Therapy group (p< 0.01). Conclusion: The present study concludes that Pectoral muscles MET has got an added beneficial effect for decreasing disability and improving function in patients with Frozen shoulder along with conventional therapy. The participants treated with MET added to conventional therapy recovered to a greater extent than those treated only with conventional therapy.***

Keywords: Frozen Shoulder, Muscle Energy Technique, Conventional Therapy, Pectoral Muscles

1. Introduction

The sternoclavicular joint, glenohumeral joint, scapular, and scapulothoracic joints make the shoulder complex. As the shoulder complex is the most important component of the kinetic chain, any component of the kinetic chain that is affected will have an impact on performance **(Ganesh, B.R., 2020)**.A Frozen shoulder(FS) is also known as Adhesive Capsulitis(AC). AC is characterised by restrictions in shoulder range of motion (ROM), both passive and active. **(Kumar, Y.G., 2017; Chan, H. B. Y., 2017)**. Females are more likely to get FS. The prevalence of the condition ranges from 3% to 5%, with peak intensity occurring between the ages of 35 and 65. Clinically, patients go through a pain stage, then a frozen stage, during which glenohumeral movement is lost, and then a thawing stage, during which pain gradually lessens and most of the lost movement recovers **(Vardanapu, P., 2020)**. Pectoral muscles are more prone for tightness. Which may alter the biomechanics of the shoulder. Muscle energy technique (MET) is a manual therapy. It can be used, To lengthen a shortened muscle, To strengthen a physiologically weakened muscle ,To relieve passive congestion **(Toshniwal, P., 2019; Laudner, K. G., 2015; Chaitow, L., 2006)**.Conventional exercises like capsular stretching increase the Flexibility and Strength in shoulder complex muscles and improve the muscle function in patients with FS to reduce pain **(Kumar, Y.G., 2017; Vijaya Arivazhagan, J.R., 2012)**. There is a very limited scientific evidence available on effectiveness of MET in FS patients. Furthermore, the effect of pectoral muscles MET in FS has not been directly investigated. So the purpose of this study is to compare the effectiveness of Pectoral muscles Muscle energy technique in addition to conventional therapy on pain, pectoral muscles length, shoulder flexibility and functional disability in patients with frozen shoulder.

2. Methodology

Study site: Matrushree Davalbaa Ayurvedic Hospital (Physiotherapy OPD), Vadodara, Yogini hospital, Vadodara, GMERS Hospital, Gotri, Vadodara. Study design: Interventional Comparative Study.

Study duration: 10-12 months after ethical approval Study population: Frozen shoulder patients. Sample size: 32.

Inclusion Criteria (Kumar, Y. G, 2017; Gill, M. A., 2018): Patients who willingly participate in the study, Gender: Male and Female**,** Age : 35 to 65 years**,** Unilateral frozen shoulder.

Exclusion Criteria (Kumar, Y. G, 2017; Gill, M. A., 2018): Any history of pathological shoulder fractures, Osteoporosis, Inflammatory disorders like Rheumatoid arthritis, Recent shoulder injury, Cancer/malignancy, Recent infection, Any major shoulder surgery in last 6 month, Shoulder replacement arthroplasty, Any congenital anomalies around shoulder, The participants were divided into 2 groups; Only Conventional Therapy group and MET along with Conventional Therapy Group. The participants were divided into 2 groups; Only Conventional Therapy

group (TENS, maitland mobilization of shoulder joint, pendulum exercise, wand & towel exercises, coracohumeral ligament stretch, capsular stretches, home programme & patient's education) and MET along with Conventional Therapy Group. Baseline data were collected in the form of NPRS **(Alghadir, A. H., 2018; McCaffery, M., 1989)**, PMI **(Laudner, K. G., 2015)**, PML **(Howe, L. P., 2015)** , Shoulder ROM **(Norkin, C. C., 2015)** and SPADI **(Tveita, E. K., 2008)**. After 20 sessions, the participants were evaluated again.

3. Result

Results of the study were analyzed in terms of pain relief indicated by decrease in NPRS scores, increase in length of pectoral muscles by using PMI & Pectoralis major muscle length, reduction in disability by SPADIand increase in Shoulder Flexibility which was measured using Universal goniometer. The age of the participants in this study was from 35 to 65 years. Total 32 participants participated in the study who were randomly allocated to two groups. The mean age of participants in group 1 is 46±2.63 and that of group 2 is 45.5±5.08 which is shown in Table 4.1.1

Table 4.1.1: Demographic data of age of participants of Group 1 & 2

Group	Group 1	Group 2
	Mean ± SD	Mean ± SD
Age	46±2.63	45.5±5.08

Out of 32 participants, Group 1 consisted of 9 males and 7 females while Group 2 consisted 8 males and 8 females as given in Table 4.1.2. The participants in group 1 included 56.25% of males and 43.75% of females while the participants in group 2 consisted of 50% males and 50% of females represented by Figure 4.1.2

Table 4.1.2: Demographic data of gender distribution of Group 1 & 2

Group	Group 1		Group 2	
	Male	Female	Male	Female
Frequency	9	7	8	8
Percentage	56.25%	43.75%	50%	50%

Inter-Group Analysis of NPRS, PMI, PML, ROM & SPADI in Group 1

The average NPRS score in Group 1 was 6.06±0.85 before the intervention, while after the intervention the score was 3.62±0.95.The average score of Pectoralis Minor Index (PMI) was 4.88±0.61 before the intervention, while after the intervention the score was 6.26±0.52.The average score for Pectoralis Major Muscle Length (PML) was 2.68±0.79, while after the intervention the score was 1.81±0.83. The average score for Shoulder External rotation (SER), Shoulder Internal rotation (SIR), Shoulder Abduction (SAB), Shoulder Flexion (SF) were 14.93±3.23, 24.18±4.53, 73.93±7.5, 101.68±6.68 respectively before the intervention, while after the intervention 51.31±4.11, 55.93±4.29, 140.12±10.17, 142.5±9.75 respectively.The average score for SPADI was 60.18±8.28 before the intervention, while after the intervention 27.06±4.35. Described in Table 4.1.3 The paired 't' test showed statistically significant difference in within group analysis for group 1

Table 4.1.3: Comparison of Mean Value of NPRS, PMI, PML, ROM, SPADI of Group 1

Group 1						
	Pre		Post		T-Value	P-Value
	Mean	SD	Mean	SD		
NPRS	6.06	0.85	3.62	0.95	15.49	<0.05
Pectoralis Minor Index(PMI)	4.88	0.61	6.26	0.52	-6.26	<0.05
Pectoralis major length Test (PML)	2.68	0.79	1.81	0.83	10.24	<0.05
Shoulder External rotation(SER)	14.93	3.23	51.31	4.11	-28.11	<0.05
Shoulder internal rotation(SIR)	24.18	4.53	55.93	4.29	-27.2	<0.05
Shoulder abduction(SAB)	73.93	7.5	140.12	10.17	-39.13	<0.05
Shoulder Flexion(SF)	101.68	6.68	142.5	9.75	-12.84	<0.05
SPADI	60.18	8.28	27.06	4.35	19.94	<0.05

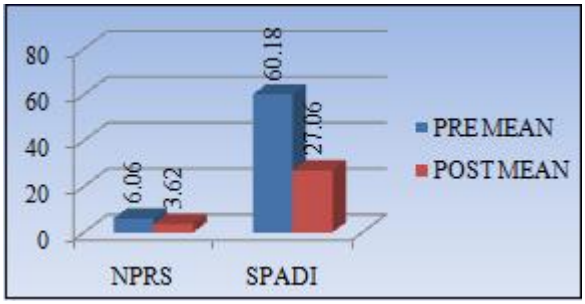

Figure 4.1.1: Comparison of scores of NPRS &SPADI in Group 1

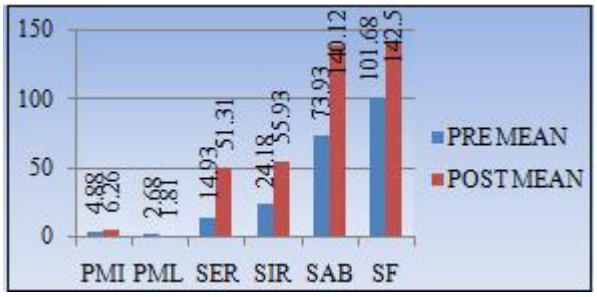

Figure 4.1.2: Comparison of PMI,PML & ROM of Group 1

Inter-Group Analysis of NPRS,PMI, PML,ROM & SPADI in Group 2

The average NPRS score in Group 1 was 6.5±0.89 before the intervention, while after the intervention the score was 2.06±0.77.The average score of Pectoralis Minor Index (PMI) was 4.88±0.61 before the intervention, while after the intervention the score was 7.71±0.32.The average score for Pectoralis Major Muscle Length (PML) was 2.5±0.81, while after the intervention the score was 0.87±0.8. The average score for Shoulder External rotation (SER), Shoulder Internal rotation (SIR), Shoulder Abduction (SAB), Shoulder Flexion (SF) were 14.5±3.14, 24.68±4.52, 80.5±10.87, 97.68±6.7 respectively before the intervention, while after the intervention 62.81±5.41, 66.62±5.5, 164.56±4.01, 162.56±6.02 respectively. The average score for SPADI was 59.62±8.7 before the intervention, while after the intervention 14.12±3.98. described in Table 4.1.4. The paired 't' test showed statistically significant difference in within group analysis for group 2.

Table 4.1.4: Comparison of Mean Value of NPRS, PMI, PML, ROM, SPADI of Group 2

Group 2						
	Pre		Post			
	Mean	SD	Mean	SD	T-Value	P-Value
NPRS	6.5	0.89	2.06	0.77	15.39	<0.05
Pectoralis minor index(PMI)	4.88	0.61	7.71	0.32	-20.51	<0.05
Pectoralis major muscle length(PML)	2.5	0.81	0.87	0.8	9.04	<0.05
Shoulder external rotation(SER)	14.5	3.14	62.81	5.41	-38.52	<0.05
Shoulder internal rotation(SIR)	24.68	4.52	66.62	5.5	-21.36	<0.05
Shoulder abduction(SAB)	80.5	10.87	164.56	4.01	-28.14	<0.05
Shoulder flexion (SF)	97.68	6.7	162.56	6.02	-26.32	<0.05
SPADI	59.62	8.7	14.12	3.98	21.35	<0.05

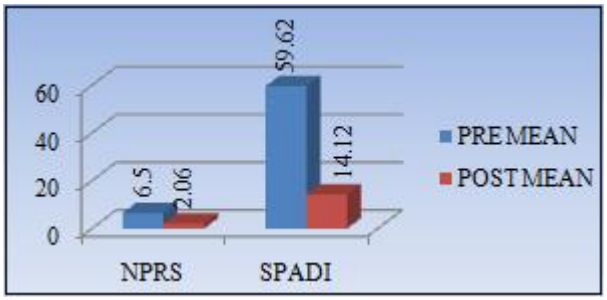

Figure 4.1.3: Comparision of scores of NPRS & SPADI in Group 2

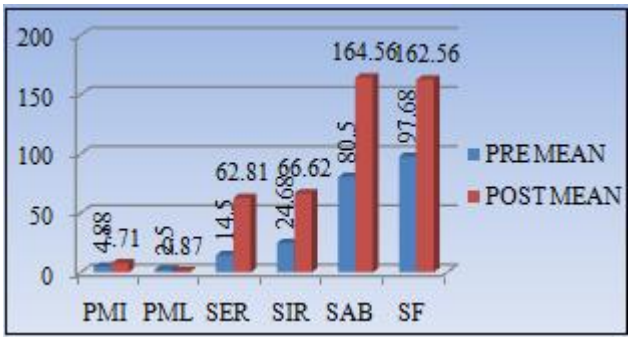

Figure 4.1.4: Comparision of PMI,PML& ROM of Group 2

Intra-Group Analysis of NPRS, PMI, PML, ROM& SPADI

Post-Intervention, the average NPRS score in Group 1 was 3.62±0.95, while the average NPRS score in Group 2 was 2.06±0.77. The average PMI score in Group 1 was 6.26±0.22, while in Group 2 was 7.71±0.32. The average PML score in Group 1 was 1.81±0.83, while in Group 2 was 0.87±0.8. The average score of Shoulder External rotation (SER), Shoulder Internal rotation (SIR), Shoulder Abduction (SAB), Shoulder Flexion (SF) in Group 1 were 51.31±4.11, 55.93±4.29, 140.12±10.17, 142.5±9.75 respectively while in Group 2 were 62.81±5.41, 66.62±5.5, 164.56±4.01, 162.56±6.02 respectively. The average SPADI score in Group 1 was 27.06±4.35, while in Group 2 was 14.12±3.98 as per Table 4.1.5. The unpaired 't' test showed statistically significant difference in between group analysis.

Table 4.1.5: Comparison of mean value of NPRS, PMI, PML, ROM, SPADI between Group 1 &2

Group 1 & 2						
	Group-1		Group-2			
	Mean	SD	Mean	SD	T-Value	P-Value
NPRS	3.62	0.95	2.06	0.77	-5.08	<0.05
PMI	6.26	0.52	7.71	0.32	9.44	<0.05
PML	1.81	0.83	0.87	0.8	-3.23	0.003
SER	51.31	4.11	62.81	5.41	6.76	<0.05
SIR	55.93	4.29	66.62	5.5	6.12	<0.05
SAB	140.12	10.17	164.56	4.01	8.93	<0.05
SF	142.5	9.75	162.56	6.02	7	<0.05
SPADI	27.06	4.35	14.12	3.98	-8.76	<0.05

Figure 4.1.5: Comparison of mean value of NPRS, PMI, PML, ROM, SPADI between Group 1 &2

4. Discussion

There is a paucity of published articles on the effect of MET on Frozen shoulder (FS). Hence, the study was undertaken to examine the effect of Pectoral muscles Muscle Energy Technique on Pain, Muscle tightness, Shoulder Flexibilty and Functional Disability in patients with Frozen shoulder.

For the purpose of this study, 32 patients were taken and divided into two groups. Group 1 was given only conventional therapy while group 2 was given MET along with conventional therapy. The result from this study suggests that there is an added effect of MET in treating patients with Frozen shoulder. MET along with conventional therapy can significantly decrease pain and functional disability alongside improving the Length of pectoral

muscles & range of motion. The changes observed in this study are noteworthy, within the group comparison showed that there was significant reduction in Pain and Functional Disability in both the groups. The Pectoralis Minor Index showed statistically significant improvement only in MET group, while Pectoralis Major Muscle length test showed statistically Equal significant difference in for both the groups. The Shoulder Flexibility showed statistically significant difference in Shoulder Internal rotation & Shoulder Flexion for both the groups while Shoulder Abduction & Shoulder External rotation showed statistically significant improvement only in MET group. It should be noted that the control group produced good outcome, but addition of the MET improved the outcomes substantially. The between group comparison of the present study shows that all the 5 outcome variables i.e. Pain, Muscle tightness, Shoulder Flexibility and Functional Disability showed statistically significant improvement in Group 2 as compared to Group 1. Though MET has found an increased audience with clinicians, very little has been published in the peer-reviewed literature on this intervention. Its widespread use makes it imperative that we determine if this technique is a viable procedure for the treatment of Frozen Shoulder. Also, focusing on the Pectoral musculature should be done while treating patients with Frozen Shoulder. Since, MET is a form of manual therapy which can be mastered by training and practice its application at the community level would be of much benefit where adequate physiotherapy and rehabilitation facilities are not available. Combinations of treatment methods rather than the delivery of any mode of therapy in isolation represent the norm for a typical Frozen Shoulder physiotherapy session.

5. Conclusion

The present study concludes that Pectoral muscles MET has got an added beneficial effect for decreasing disability and improving function in patients with Frozen shoulder along with conventional therapy. The participants treated with MET added to conventional therapy recovered to a greater extent than those treated only with conventional therapy.

6. Limitations

The sample size of present study (n=32) was small so couldn't be generalized to the whole population of Frozen shoulder. No Long-term follow-up was taken.

7. Future Scope

Large sample size can be taken for future studies. Long-term follow-up should be taken in future studies and the effects assessed.

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