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Effect of Kinesiotaping with Maitland Mobilization and Maitland Mobilization in Management of Frozen Shoulder

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Abstract: ***Introduction:*** ***Frozen Shoulder describes the clinical entity in which person has restricted passive mobility at Glenohumeral joint, which causes functional limitations.Diabetes mellitus patients are more affected by this condition. Many techniques are found effective in treating frozen shoulder. The present study was done in frozen shoulder patients with diabetes mellitus with the aim to find out additional effect of Kinesiotaping along with Maitland mobilization in managing frozen shoulder.*** ***Objectives:*** ***To study and compare effectiveness of Maitland mobilization and kinesiotaping on functional outcome in frozen shoulder.*** ***Method:*** ***32 subjects were divided in 2 Groups. GROUP A (experimental Group) treated with Maitland mobilization and Kinesiotaping and GROUP B (control Group) treated with Maitland mobilization. Both the Groups were initially treated with hot moist packs for 20 min and Ultrasound for 5 min. Exercises were advised. Subjects received 4 weeks intervention for 3 days/ week. Outcome measures VAS, SPADI and ROM were assessed before and after intervention.*** ***Results:*** ***The results showed improvement in pain and disability in both the groups, but improvement in group A was statistically extremely significant than group B.*** ***Conclusion:*** ***Maitland mobilization with Kinesiotaping along with conventional therapy improves the pain and disability in patients with frozen shoulder.***

Keywords: Maitland mobilization, Kinesiotaping, Ultrasound, Diabetes Mellitus, Frozen Shoulder, VAS, SPADI score, ROM.

1. Introduction

The term Frozen Shoulder describes the clinical entity in which a person has restricted passive mobility at Glenohumeral joint, which often results in a loss of active range of motion and pain.[1] Frozen Shoulder or Adhesive Capsulitis is reported to affect 3% to 5% of the general population and up to 20% in people with diabetes. The occurrence of Frozen Shoulder in unilateral shoulder increases the risk of contra lateral shoulder involvement by 5% to 34%.[2, 3]

It is characterized by pain, stiffness, and limited function of the Glenohumeral joint, which adversely affects the entire upper extremity. Patients typically describe onset of shoulder pain followed by a loss of motion.[4]the most common limitations in range of motion are flexion, abduction, external and internal rotation. Approximately 70% of Frozen Shoulder patients are women; however, males with Frozen Shoulder are at greater risk for longer recovery and greater disability.[5, 6]

Frozen shoulder is classically characterized by three stages, Painful stage, Stiffness or "Frozen" Stage, and Recovery or "Thawing" Stage, with the average length of symptoms lasting 30 months.

1. Stage 1 or freezing stage or painful stage
- As described by Reeves[11] typically lasts for 10 to 36 weeks.
- Patient presents with spontaneous onset of shoulder pain which is more severe at night and with activities, associated with a sense of discomfort that radiates down the arm.

2. Stage 2 or Frozen stage or stiffening stage
- It lasts for 4 to 12 months.
- Pain at rest usually diminishes during this stage, leaving the shoulder with restricted motion in all planes.
- Activities of daily living become severely restricted.
- When performing the activities, a sharp, acute discomfort, can occur as the patient reaches the restraint of the tight capsule. Pain at night is a common complaint.

3. Stage 3 or thawing stage or resolution stage
- This phase lasts for 5 to 26 months.
- This stage is characterized by gradual recovery of range of motion.7

There are two main types of frozen shoulder idiopathic (primary frozen shoulder) and secondary frozen shoulder.[8]

Patients with Frozen Shoulder exhibit significant deficits in shoulder kinematics, including increased elevation and upward scapular rotation.[9, 10]eventually, patients with adhesive capsulitis develop the characteristic "shrug sign" during Glenohumeral joint elevation, where the scapula migrates upward prior to 60 degrees of abduction. It is likely that limitations in range of motion and the pain associated with Frozen Shoulder are not only related to capsular and ligamentous tightness, but also fascial restrictions, muscular tightness, and trigger points within the muscles. Physical therapists can address impairments and limitations associated each of these contributors to the pathology of Adhesive Capsulitis with a variety of treatment methods.[10]

Researchers have described many conservative therapeutic interventions in treatment of Frozen Shoulder. This includes thermotherapy, mobilisation, exercises, strengthening exercises, stretching.

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The Kinesio Taping Method is based on a simple principle that the body has built-in healing mechanisms and healthcare practitioners can help to positively influence their efficiency by removing barriers that impede them. The results are increased fluid flow through an injured area, better control over muscle contractions, reduced pain, and ultimately faster healing. This effect is modulated and coordinated by the nervous system by specifically stimulating the sensory motor system.[11]

Andre Labbe PT,MOMT(2010) : In his article on clinical suggestion adhesive capsulitis:USE THE EVIDENCE TO INTEGRATE YOUR INTERVENTIONS has suggested that Frozen Shoulder can be treated by using physical interventions like modalities, passive motion, manual techniques, soft tissue mobilization, therapeutic exercise, rigid and kinesio taping.[12]

2. Review of Literature

Labbe A [12](2010) in his article on clinical suggestion adhesive capsulitis: **"**use the evidence to integrate your interventions" has suggested that Frozen Shoulder can be treated by using physical interventions like modalities, passive motion, and manual techniques, soft tissue mobilization, therapeutic exercise, rigid & kinesiotaping. Because adhesive capsulitis patients often exhibit poor posture and scapular mechanics, KT may provide postural cues and assist with promoting proper scapular motion.

Abhay K, Suraj K, Aggarwal A, Ratnesh Kumar, and Ghosh P[13] (2012) Conducted a study on Effectiveness of Maitland Techniques in Idiopathic Shoulder Adhesive Capsulitis. 40 patients randomly allocated into two Groups. In Group A subjects were treated with Maitland mobilization technique and common supervised exercises, whereas subjects in Group B only received common supervised exercises. Variables used for the study were Shoulder pain and disability index (SPADI), VAS and shoulder ROM (external rotation and abduction). These were recorded before and after the session of the training. Total duration of the study was four weeks. The results revealed that within-Group comparison both Groups showed significant improvement for all the parameters, whereas between-Group comparison revealed higher improvement in Group A compared to the Group B. The study concluded that addition of the Maitland mobilization technique with the combination of exercises has proved their efficacy in relieving pain and improving ROM and shoulder function.

3. Materials & Methodology

32 participants with frozen shoulder, who were referred to physiotherapy department of Krishna hospital, Karad and willing to take treatment for 4 weeks, were recruited for the study. The subjects were screened and were put in either of two groups- group A (kinesiotaping with Maitland mobilization), group B (Maitland mobilization) by convenience method. A written informed consent was taken from each participant. Ethical clearance was obtained from university's institutional review board. Inclusion criteria were(1)Subjects willing to participate in the study were included.(2)Primary type of adhesive capsulitis in which the patients having symptoms of pain and restricted ROM which has been diagnosed and referred by physician.(3) Age 40 to 60 years.(4)Both men and women participants.(5)Both left and right handed peoples. Exclusion criteria for the study was(1)Patients having the history of: Shoulder girdle fracture, Glenohumeral dislocation, Concomitant cervical spine symptoms, Past Shoulder surgery, Rotator cuff pathology(2)Secondary type of adhesive capsulitis(3) Shoulder girdle motor control deficits associated with neurological disorders (e.g. Stroke, Parkinson's disease).

Interventions: Group A received kinesiotaping and Maitland mobilization with conventional therapy of Hot moist packs and Ultrasound. Initially ultrasound was given for 5 minutes on continuous mode which was followed by HMP for 15 minutes. Then the patient was given Maitland mobilization and kinesiotape was applied. Home exercise protocol was given. The subject was treated for 4 weeks on alternate days.

Group B received Maitland mobilization along with HMP and Ultrasound. Home exercise protocol was given. The subject was treated for 4 weeks on alternate days.

Maitland mobilization techniques used were: Glenohumeral joint traction / distraction**,** Glenohumeral caudal glide, Glenohumeral posterior glide, Glenohumeral anterior glide, Scapulothoracic mobilization.

The kinesiotape was applied using following techniques: Correction technique, Muscle technique for deltoid(Y method application), Muscle technique for supraspinatus, Corrective technique for scapula.

3.1 Outcome Measures

The pre and post intervention assessment was done by using Visual analogue scale, SPADI score, ROM assessment by universal goniometer (abduction, flexion, lateral rotation, and medial rotation).

4. Statistical Analysis

Statistical analysis for present study was done manually as well as using the statistics software INSTAT so as to verify the results obtained. Various statistical measures such as mean, standard deviation (SD) and paired and unpaired test of significance were utilized for this purpose. Probability values less than 0.05 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

5. Results

Age of the participants in this study was between 40-70 years. There was no statistically significant difference between mean age and standard deviation of the participants in two groups. Mean age of Group A was 53.75 years and that Group B was 52.68 years .(Table No.1) out of total 32 participants group A consisted 10 males, 6 females and group B had 7 males and 9 females

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Table 1: Baseline characteristics of participants

Groups	*Gender*	*Mean Age*
Group A	M=10, F= 6	53.75 years
Group B	M= 7, F= 9	52.58 years

On comparing the pre intervention VAS score between group A and group B, there was no statistically significant difference with p=0.7736 (Table No.1).

The pre-interventional VAS values were 8.5±0.73 in Group A and 8.5± 0.52 in Group B respectively, whereas the post-interventional VAS values were 0.5±0.63 in Group A and 4.06±0.77 in Group B respectively. (p<0.001) which was statistically extremely significant.

Table 2: Comparative evaluation of VAS scores within two groups

Groups	*Pre-treatment*		*Post-treatment*	
	Mean ± SD	Median	Mean ± SD	Median
A	8.5±0.73	9	0.5±0.63	0.000
B	8.5±0.52	8.5	4.06±0.77	4.000
'p'	0.7736		< 0.0001	

On comparing the ROM Value for shoulder flexion between both the groups there was no statistically significant difference with p=0.7321. The pre-interventional values of ROM were104.4±36.02 in Group A and 99.25±47.13 in Group B respectively, whereas post-interventional values of ROM were151.31±15.83 in Group A and 118.38±35.61 in Group B respectively. Intra Group results showed statistically significant difference in post-intervention values for both the Groups. (p=0.0020)

Table 3: Comparative evaluation of flexion ROM for both the groups

Groups	*Pre-treatment*		*Post-treatment*	
	Mean±SD	SEM	Mean±SD	SEM
A	104.4±36.02	9	151.31±15.83	3.95
B	99.25±47.13	11.78	118.38±35.61	8.90
't'	0.3455		3.381	
df	30		30	
'p'	0.7321		0.0020	

On comparing shoulder abduction ROM between both the groups there was no statistically significant difference between both the groups with p=0.6174
The pre-interventional values of ROM was 92±33.96 in Group A which increased to161.5±8.45 post intervention and 84.56±48.16 in Group B which increased to 112.63±37 in Group B .Intra Group results showed statistically extremely significant difference in post-intervention values (p<0.0001)

Table 4: Comparative evaluation of abduction ROM between both the groups

Groups	*Pre-treatment*		*Post-treatment*	
	Mean±SD	SEM	Mean±SD	SEM
A	92±33.96	8.49	161.5±8.45	2.113
B	84.56±48.16	12.04	112.63±37	9.25
't'	0.5048		5.150	
Df	30		30	
'p'	0.6174		<0.0001	

On comparing the pre interventional shoulder lateral rotation ROM values between both the groups there was no statistically significant difference between both the groups with p=0.3268(Table No.5).In Group A, the pre mean lateral rotation was 22.31±12.88 which increased to 72.06±6.84 post intervention with p<0.0001 which was statistically significant(Table No.5).In Group B, the pre mean lateral rotation was 28±18.83 which increased to 40.94±17.15 with p<0.0001 which was statistically extremely significant.

Table 5: Comparative evaluation of lateral rotation values between both the groups

Groups	*Pre-treatment*		*Post-treatment*	
	Mean±SD	SEM	Mean±SD	SEM
A	22.31±12.88	3.22	72.06±6.84	1.71
B	28±18.83	4.70	40.94±17.15	4.29
't'	0.9968		6.743	
df	30		30	
'p'	0.3268		<0.0001	

On comparing the pre intervention medial rotation values between group A and group B there was no statistically significant difference with p=0.9644(table 6). In Group A, the pre mean medial rotation was 41.56±9.34 which increased to 66.56±9.25 post intervention with p=0.0002 which was statistically significant. In Group B the pre mean for medial rotation was 41.37±13.80 which increased to 50.81±11.61 post intervention with p=0.0002 which was statistically extremely significant. (Table No. 6)

Table 6: Comparison of ROM of medial rotation in between Groups

Groups	*Pre-treatment*		*Post-treatment*	
	Mean±SD	SEM	Mean±SD	SEM
A	41.56±9.34	2.33	66.56±9.25	2.32
B	41.37±13.80	3.45	50.81±11.61	2.9
't'	0.4501		4.241	
df	30		30	
'p'	0.9644		0.0002	

On comparing the pre intervention SPADI score between both the groups there was no statistically significant difference with p=0.5333. In Group A, the pre mean SPADI values were 80.52±4.51 which reduced to a post mean of 8.12±5.33 with p<0.000i which was statistically extremely significant. In group B the pre mean SPADI values were and 81.77±3.68 which reduced to post mean of 36.34±7.37 with p<0.0001 which was statistically extremely significant with p<0.0001(table No 7).

Table 7: Comparison of SPADI values in between Groups

Groups	*Pre-treatment*		*Post-treatment*	
	Mean ± SD	Median	Mean ± SD	Median
A	80.52±4.51	80.76	8.12±5.33	7.30
B	81.77±3.68	81.53	36.34±7.37	38.46
'p'	0.5333		< 0.0001	

6. Discussion

In the findings of present study, there was an improvement in the functional outcome in frozen shoulder patients after receiving Maitland mobilization with conventional therapy. But there was more improvement seen in group receiving

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kinesiotaping with Maitland mobilization along with conventional therapy. The age and gender distribution showed no statistical difference in the groups, which represents the homogeneity of the participants.

The pre-interventional VAS values were 8.5±0.73 in Group A and 8.5± 0.52 in Group B, whereas the post-interventional VAS values were 0.5±0.63 in Group A and 4.06±0.77 in Group B. ($p<0.001$) which was statistically extremely significant. This suggests that there significant reduction in pain of participants in both the groups. Pain in group A was reduced more than Group B.

In the study the pre-interventional values of ROM for flexion were 104.38±36.02 in Group A and 99.25±47.13 in Group B, which increased to 151.3±15.83 in Group A and 118.38±35.61 in Group B with $p=0.0020$ which was statistically significant. Both the groups showed improvement in flexion ROM, but improvement in group A was more than GroupB.

In the study the pre-interventional values of ROM for abduction were 92±33.96 in Group A and 84.56±48.16 in Group B respectively whereas post-interventional values of ROM for abduction were 161.5±8.45 in Group A and 112.63±37 in Group B respectively. Intra Group changes in the ROM for abduction showed statistically extremely significant difference in values post-interventional in both the Groups and showed increase in ROM. Both the groups showed improvement in ROM but there was improved ROM of abduction in Group A.

In the study the pre-interventional values of ROM for lateral rotation were 22.31±12.88 in Group A and 28±18.83 in Group B respectively whereas post-interventional values of ROM for lateral rotation were 72.063±6.83 in Group A and 40.94±17.15 in Group B respectively. Intra Group changes in the ROM for lateral rotation showed statistically extremely significant difference in values post-interventional in both the Groups and showed increase in ROM. Both the groups showed improvement in ROM but there was improved ROM of lateral rotation in Group A.

In the study the pre-interventional values of ROM for medial rotation were 41.56±9.34in Group A and 41.37±13.80 in Group B respectively whereas post-interventional values of ROM for lateral rotation were 66.56±9.26 in Group A and 50.81±11.61 in Group B respectively. Intra Group changes in the ROM for medial rotation showed statistically extremely significant difference in values post-interventional in both the Groups and showed increase in ROM. Both the groups showed improvement in ROM but there was improved ROM of flexion in Group A.

The pre intervention SPADI score between both the groups there was no statistically significant difference with $p=0.5333$. In Group A, the pre mean SPADI values were 80.52±4.51 which reduced to a post mean of 8.12±5.33 with $p<0.000i$ which was statistically extremely significant. In group B the pre mean SPADI values were and 81.77±3.68 which reduced to post mean of 36.34±7.37 with $p<0.0001$ which was statistically extremely significant with $p<0.0001$. Both the groups showed improvement but the participants of group A showed more improvement functionally as compared with Group B.

Use of modalities and other physical agents in patients with adhesive capsulitis helped in pain relief and affected scar tissue (collagen extensibility).[14]

The conventional approach showed extremely significant results in pain reduction and ROM improvement because:
Joint motion/mobilization techniques help to relieve pain due to its neurophysiologic effect on the joint and also help to maintain extensibility of the articular and periarticular structures due to its biomechanical effect which is focused directly on the tension of periarticular tissue to prevent complications resulting from immobilization and trauma.

Range of motion exercises also help to improve joint and soft tissue mobility to minimize loss of tissue flexibility and contracture formation. Stretching exercises given as home programme were also incorporated at the end range limits helping in breaking the collagen bonds and realignment of the fibres for permanent elongation or increased flexibility and mobility of the soft tissues that have adaptively shortened and become hypo mobile over time in Frozen Shoulder.[15, 16]

The other Group i.e. the Maitland mobilization and Kinesiotaping Group also showed extremely significant results in pain reduction and ROM improvement because the patients here received conventional treatment benefitted with the same physiological effects as the other Group.

Group A patients received additional benefit of Kinesiotaping. The corrective taping technique helped in postural correction and provided postural cues and the joint was held in correct position.Kinesiotaping approach in Frozen Shoulder improves joint mobility & relieves pain making patient more functionally independent.

Kinesiotaping helps in providing tactile cues and thus provide correction of scapular position.Kinesiotaping, when applied correctly, can help minimize fascial contraction during soft tissue injury and help to reorganize the fascia during chronic injury. Kinesio Tape has expanding and contracting properties which provides gentle sensory stimulation to various types of sensory receptors in the skin during movement. This activates the spinal inhibitory system through stimulation of touch receptors and activates the descending inhibitory system to decrease pain via the Gate Control Theory, proposed by Melzack and Wall and help to decrease pain, hence Group A has benefitted from this effect and showed more decrease in pain as compared to Group B. Joint function was improved by stimulating the proprioceptors in the joints with the application of tape.[17-20]

Rationale behind improvement in functional independence might be due to ease in pain and increased range of motion, consequently lessened suffering in daily activities, pain with specific tasks, and difficulty in moving arm and lifting actions.

In summary, both the groups were benefitted from the treatment but group A participants should faster recovery

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were improved more functionally as compared with group b.ROM also improved significantly in the Group A than in Group B receiving only mobilization.ER ROM was improved by 80.06% Abduction by 89.4% and, IR by 66.56% in Group A.

- Group B ER improvement was 45.48%, abd-62.57%, IR-50.81%,
- As compared to Group B, Group A showed improvement in ROM.

7. Conclusion.

Thus, from all the above results it is concluded that Maitland mobilization and Kinesiotaping therapy together has a better effect than Maitland mobilization alone.

8. Future Scope

The study was conducted on very small sample size. Objective measure for pain and functional activity was not taken; subjective scales were used in this study.Further follow up of the patients were not taken. Therefore, studies could be conducted with large sample size in order to generalize the results. Future studies could be done by including third group which can be treated by exercises only which was advised as home programme in this study. The further studies can be carried out by using non-invasive technique like ultrasonography to record the changes that have took place within the joint after the interventions which will become an objective and reliable method.

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