How to Cite:
Kumar, N., Sen, S., Badoni, N., Patra, A., & Garg, S. (2022). Effectiveness of movement with mobilization (MWM) on pain, proprioception and muscle strength in diabetic frozen shoulder conditions. *International Journal of Health Sciences*, *6*(S1), 2630–2645.
https://doi.org/10.53730/ijhs.v6nS1.5338

Effectiveness of Movement with Mobilization (MWM) on Pain, Proprioception and Muscle Strength in Diabetic Frozen Shoulder Conditions

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***Abstract*---**The term "frozen shoulder" was first introduced by Codman in 1934. He described a painful shoulder condition of insidious onset that was associated with stiffness and difficulty sleeping on the affected side. Codman also identified the marked reduction in forward elevation and external rotation that are the hallmarks of the disease (Richard Dias et al, 2005). Brian Mulligan's concept of Mobilization with Movement (MWM) is a natural continuance of the progression in the development of manual therapy from active stretching exercise to therapist applied passive physiological movement to passive accessory mobilization technique. (Deepali Rathod et al, 2019). Aims and Objectives: To evaluate the

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Manuscript submitted: 27 Jan 2022, Manuscript revised: 18 Feb 2022, Accepted for publication: 9 March 2022

effectiveness of Mulligan Therapy along with conventional on Pain, ROM, Proprioception and muscle strength in patients with diabetic frozen shoulder. Methodology: 31 Patients were treated with Mulligan Therapy, Stabilization Exercise and Moist Heat Therapy. All the patients were selected after informed consent. These patients were interviewed by direct method. The patients were assessed in 0 (zero) week and reassessed in 4 (four) weeks and 8 (eight) weeks of treatment programme. Every 0 week 4 weeks and 8 weeks of treatment programme, pain, ROM, shoulder strength, shoulder Proprioception & disability were recorded. These treatment protocols will be given five days per week for eight weeks. Conclusion: Our study concluded that Group-A Movement with Mobilization (MWM) therapy, Stabilization Exercise and Moist Heat Therapy (MHT) in Patients with Diabetic Frozen Shoulder showed significant improvement in pain, Range of motion and joint sense in 4th weeks & 8th weeks of treatment programme. When we compared with Group-B than Group-A showed significant than Group-B in 4 weeks & highly significant in 8 weeks of treatment programme in Patients with Diabetic Frozen Shoulder in pain, Range of motion, muscular strength and joint position sense.

***Keywords*---**diabetic frozen shoulder, mulligan therapy, stabilization exercise, moist heat therapy, digital inclinometer, force gauge & NPRS.

Introduction

The term “frozen shoulder” was first introduced by Codman in 1934. He described a painful shoulder condition of insidious onset that was associated with stiffness and difficulty sleeping on the affected side. Codman also identified the marked reduction in forward elevation and external rotation that are the hallmarks of the disease. Long before Codman, in 1872, the same condition had already been labelled “periarthritis” by Duplay. In 1945, Naviesar coined the term “adhesive capsulitis” (Richard Dias et al, 2005).

Diabetic frozen shoulder is characterized by pain and severe limited active and passive range of motion of the glenohumeral joint, particularly external rotation. Diabetes is frozen shoulder is due to the effects on collagen in the shoulder, which holds the bones together in a joint. Collagen gets triggered by the presence of high blood sugars. Interestingly, collagen gets sticky when sugar molecules become attached, leading to restricted movements and shoulder starting to stiffen (Cintia Garcilazo et al, 2010).

The prevalence of adhesive capsulitis in patients with diabetes in India was reported to be 11% - 29.61 %, in Saudia Arabia 6.7%, in Iran 13.30%, in Finland 14%, in UK around 10.8%. Whereas other studies identified around 20% Australians, 38.6% Americans, 27% Indians and around 40% British reported diabetes in patients with adhesive capsulitis (Rita Rastogi, et al. 2014).
The etiology of periarthritis of the shoulder, however, is not clearly understood. Amongst the factors suggested are trauma myocardial infarction hemiplegia,

pulmonary tuberculosis, thyrotoxicosis, cerebral tumor, and epilepsy. In this paper, an association of periarthritis of the shoulder with diabetes mellitus is described. The incidence of this condition in diabetic patients is compared with that in non-diabetic medical patients seen during the same period of time (G. C. Lloyd-Roberts, et al. 1959; J. F. Bridgman, et al. 1972).

The patho-physiology of idiopathic adhesive capsulitis is poorly understood. Most authors have reported various degrees of inflammatory changes in the synovial membrane. Adhesions between the shoulder capsule and the humeral head have been noted by some, but not all, authors. The optimum management of adhesive capsulitis has been the subject of great debate, particularly since the condition tends to resolve spontaneously over months to years (Simon Carette, et al. 2003).

Brian Mulligan's concept of Mobilization with Movement (MWM) is a natural continuance of the progression in the development of manual therapy from active stretching exercise to therapist applied passive physiological movement to passive accessory mobilization technique. MWM is the concurrent application of a sustained accessory mobilization applied by the therapist and an active physiological movement to end range applied by the patient. Passive end of range over pressure or stretching is then able to be delivered without pain as a barrier (Deepali Rathod, et al. 2019).

The Numerical Pain Rating Scale (NPRS) is a subjective measure in which individuals rate their pain on an eleven-point numerical scale. The scale is composed of 0 (no pain at all) to 10 (worst imaginable pain). It has been shown that a composite scoring system including best, worse, and current level of pain over the last 24 hours was sufficient to pick up changes in pain intensity with maximal reliability (Jensen, et al 1999).

Range of motion (or ROM), is the linear or angular distance that a moving object may normally travel while properly attached to another. It is also called range of travel (or ROT). Range of motion refers to the distance and direction a joint can move between the flexed position and the extended position. (Wikipedia Range of motion, 2021).

A digital force gauge is a load cell (this is often combined with software and a display). A load cell is an electronic device that is used to convert a force into an electrical signal. Through a mechanical arrangement, the force being sensed deforms a strain gauge. The strain gauge converts the deformation (strain) to electrical signals. The software and electronics of the force gauge convert the voltage of the load cell into a force value that is displayed on the instrument. Test units of force measurements are most commonly newtons or pounds (Wikipedia Force gauge, 2020).

Aims and Objectives

To evaluate the effectiveness of Mulligan Therapy along with conventional on Pain, ROM, Proprioception and muscle strength in patients with diabetic frozen shoulder.

Need for the Present Study

Mulligan therapy treatment provided by physiotherapists is a common conservative treatment option for shoulder conditions. Many researchers have been done on the most common shoulder pain and stiffness, but the effectiveness of Mulligan Therapy, Stabilization exercise and Moist Heat Therapy on Pain, joints range of motion, muscular strength and Joint Position Sense in diabetic frozen shoulder conditions are not done before so the need for study are arises.

Hypothesis
Alternate Hypothesis

There will be significant differences of Mulligan Therapy along with conventional on Pain, ROM, Proprioception and muscle strength in patients with diabetic frozen shoulder.
Null Hypothesis

There will be not significant differences of Mulligan Therapy along with conventional on Pain, ROM, Proprioception and muscle strength in patients with diabetic frozen shoulder.

Methodology

Approval from the Synopsis Approval Committee (SAC) of SGRR University and Institutional Ethics Committee of Shri Guru Ram Rai Institute of Medical &Health Sciences, Patel Nagar, Dehradun was sought. The confidence level – 95% and confidence interval - 5% used to calculate sample size. In this study, Dehradun census (Uttrakhand) population (679,370 in 2018) was included (Census and Sample Survey, Dehradun 2018) (C. R. Kothari, 2004; Census and Sample Survey, Dehradun 2018).

In this study simple random sampling technique was used. A convenience sample were assigned to two groups i.e. experimental group & control group. These subjects were solicited from the Shri Mahant Indiresh Hospital, Department of Physiotherapy, Patel Nagar, Dehradun (Uttarakhand) and selected according to inclusion and exclusion criteria. Inclusion Criteria:- Patients which were diagnosed to suffer from Diabetic Frozen Shoulder, Patients with limited Range of motion of shoulder abduction, external rotation and flexion, All the patients (both males and females) between ages 40 to 70 years, All the subjects must have frozen shoulder for at least last 15 days, Affected shoulder must have not more than 90 degrees of flexion & abduction and 50% decreased external rotation& internal rotation as compared to normal side/normal ROM values. Exclusion Criteria- Subjects with Rotator cuff tears and other shoulder ligament injuries, History of any arthritis related to shoulder, RA shoulder secondary to fracture, dislocation, Reflex sympathetic dystrophy and neurological disorder, Malignancy, All the patients having any cervical or thoracic problem. If present must be treated first before including in the study, All the objects having any intra articular injection in the glenohumeral joint during last three months, Patients with fractured scapula, Any history of surgery on that shoulder and patients with tendon calcification, Patients with cervical rib, Diagnosed severely osteoporotic,

Diagnosed Rheumatoid Arthritis, Diagnosed Osteoarthritis, Prolonged immobilization and Neurological / Hemiplegics, Those patients were also excluded from the study whose ROM; Flexion was more than 90°, Abduction more than 90°, Lateral rotation and medial rotation more than 50%. Outcome Measures-Numeric Pain Rating Scale (NPRS), Digital Inclinometer, Force Gauge and Proprioception Measurement [Table 1:].

OUTCOME MEASURES	S. NO.	VARIABLES	MEASUREMENTS
Outcome measures	1.	PAIN	NUMERIC PAIN RATING SCALE
	2.	RANGE OF MOTION	INSIZE DIGITAL INCLINOMETER
	3.	MUSCLE STRENGTH	LUTRON FORCE GAUGE
	4.	SHOULDER PROPRIOCEPTION	JOINT POSITION SENSE MEASUREMENT

Table 1: Outcome Measures

Procedure

All the patients were selected after informed consent. These patients were interviewed by direct method. The patients were assessed in 0 (zero) week and reassessed in 4 (four) weeks and 8 (eight) weeks of treatment programme. Every 0 week 4 weeks and 8 weeks of treatment programme, pain, ROM, shoulder strength, shoulder Proprioception & disability were recorded. These treatment protocols will be given five days per week for eight weeks. 31 Patients were treated with Mulligan Therapy, Stabilization Exercise and Moist Heat Therapy.

Mobilization With Movement The use of MWM for peripheral joints was developed by Mulligan. This technique combines a sustained application of a manual technique “gliding” force to a joint with concurrent physiologic (osteo-kinematic) motion of the joint, either actively performed by the subject or passively performed by the therapist. The manual force, or mobilization, is theoretically intended to cause repositioning of bone positional faults. The intent of MWM is to restore pain-free motion at joints that have painful limitation of range of movement (Dr. Jayanta Nath, 2013).

MWM” For Shoulder Abduction with Belt

The patient will be seated and the therapist stands back of the patient and place the belt around the hips and the patient shoulder. Place a hand on the scapular for fixation and lean back in such a way as to glide the humeral head back obliquely, and slightly down in the treatment plane. Your free hands fingers would secure the belt and prevent it from slipping. Ensure that the belt does not slightly elevate the humeral head as this will jam the joint and inhibit movement (Brian R Mulligan 6th Edition; Geetha Mounika Rayudu, et al. 2018). [Figure- 1 (a)]

MWM for shoulder flexion

The patient will be supine and the therapist grasp the humerus with one hand and the forearm with other on the effected side. Now push down along the shaft of the humerus while the patient tries to raise (flex) his arm (Brian R Mulligan 6th Edition). [Figure- 2 (b)].

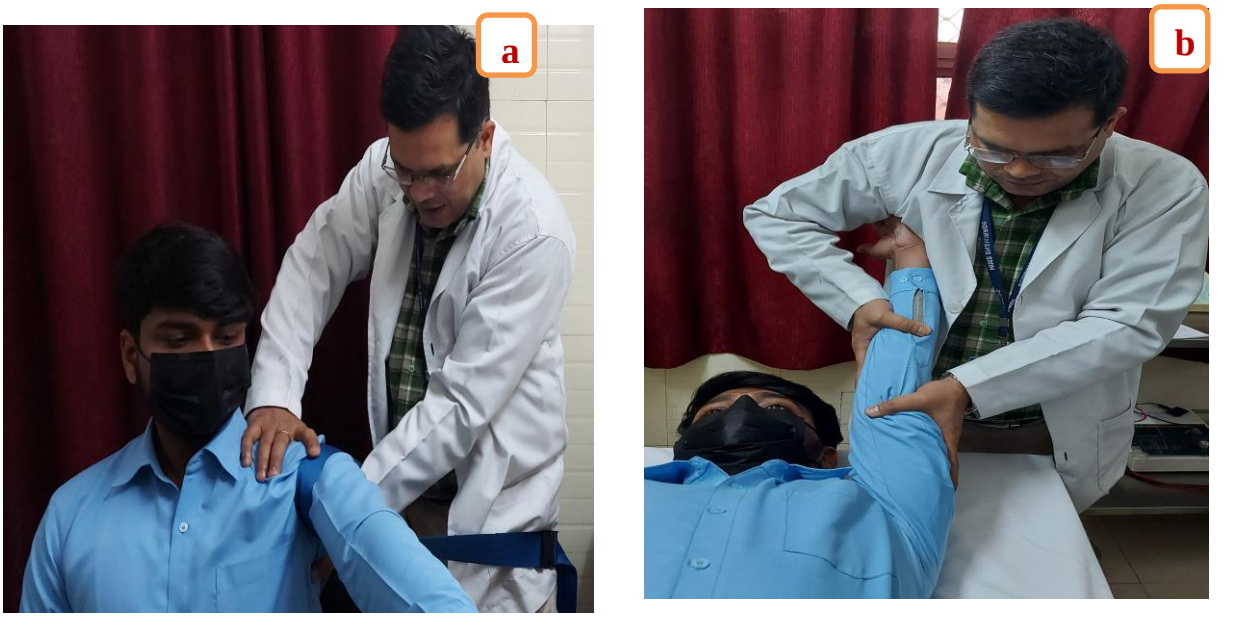


Figure- 1: MWM" For Shoulder Abduction with Belt and MWM Flexion (a & b)

MWM FOR INTERNAL ROTATION OF SHOULDER

The patient will be standing facing the patient's right side (same side as of patient's problem)). The therapist Place the right thumb in the bend of his flexed right elbow. The hand should be as far behind his back as possible. Now place the web between your finger and thumb in the patient's axilla, obliquely to stabilize the scapula. Now glide the head of the humerus down in the glenoid fossa while left hand is stabilizing the scapula. Make sure the left hand is stabilizing up and inwards. If not, place a pressure on the upper end of the humerus which is both unpleasant and ineffective. Now have the patient internally rotate his shoulder with the help of the other hand, while you adduct his upper arm using the abdomen. As you push into adduction in this way the head of the humerus is distracted laterally. The hand in the axilla acts as a fulcrum (Brian R Mulligan 6thEditionm; Shruti Patelet al.2015) [Figure- 2 (a)].

MWM for external rotation of the shoulder

Patient will be positioned in supine lying and the arm will be abducted to 90 degree and elbow flexed to 90 degree and forearm in neutral. The therapist will use mobilization belt in a figure of 8, such a way that the shaft of the humerus comes near the hands of the therapist. The patients will be instructed to rotate

the arm as much as he can while the therapist apply passive overpressure at the end range of the movement (Geetha Mounika Rayudu, et al. 2018) [Figure- 2 (b)].

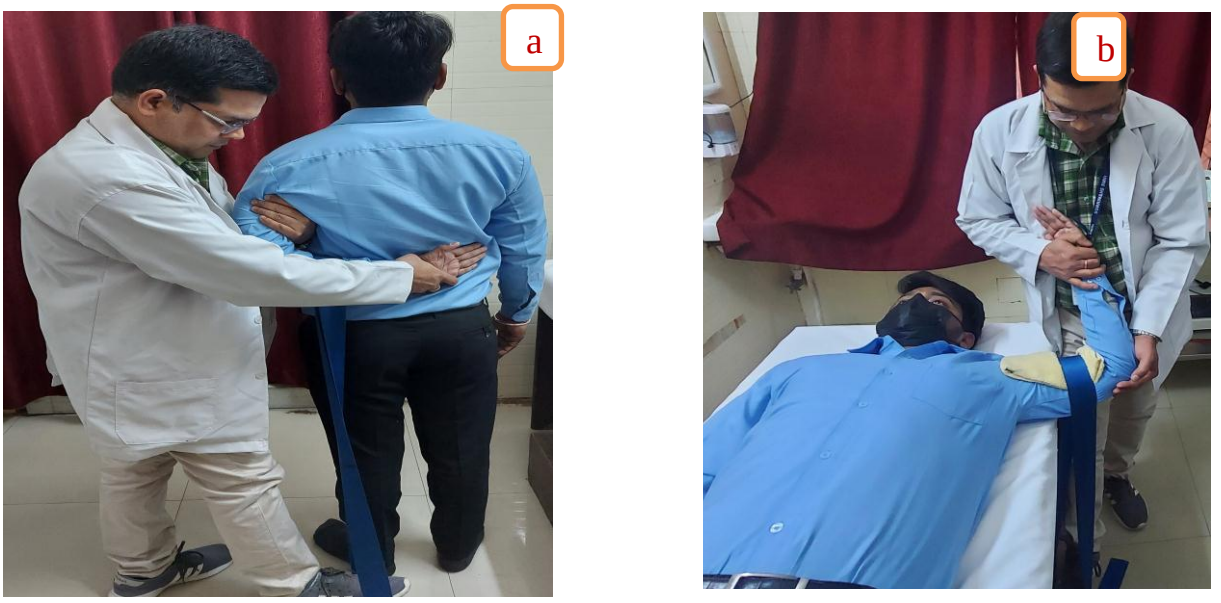


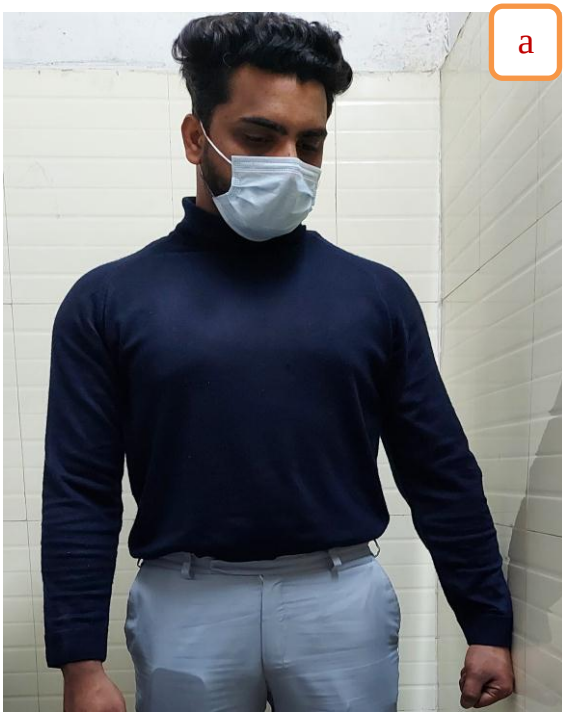
Figure- 2: MWM For Internal Rotation and External Rotation of Shoulder with belt. (a & b)

The procedure will be performed three sets of 10 repetitions, with 1 minute rest between sets. The same procedure will be performed one session per day for five days per week upto 8 weeks (P. Khyathi, et al. 2015; Geetha Mounika Rayuduet al. 2018).

Shoulder Stabilization Exercise

After manual therapy intervention, the exercises were incorporated for the training of shoulder flexors, abductors and external and internal group muscle.
Shoulder Stabilization Exercise for Abductors (Supraspinatus and Middle Deltoid)

1. Shoulder Stabilization Exercise for Supraspinatus
   Patient will be sitting position. The patient pushing out against the wall. Initially the manoeuvres are done with the shoulder in less than 0 to 10° of abduction [Figure- 3: (a)]
2. Shoulder Stabilization Exercise for Deltoid
   Patient will be sitting position. The patient pushing out against the therapist hand. Initially the manoeuvres are done with the shoulder in above than 90° of abduction (S.B. Brotzman et al. 1996; T. M. S kirven, et al. 2011) [Figure- 3: (b)].



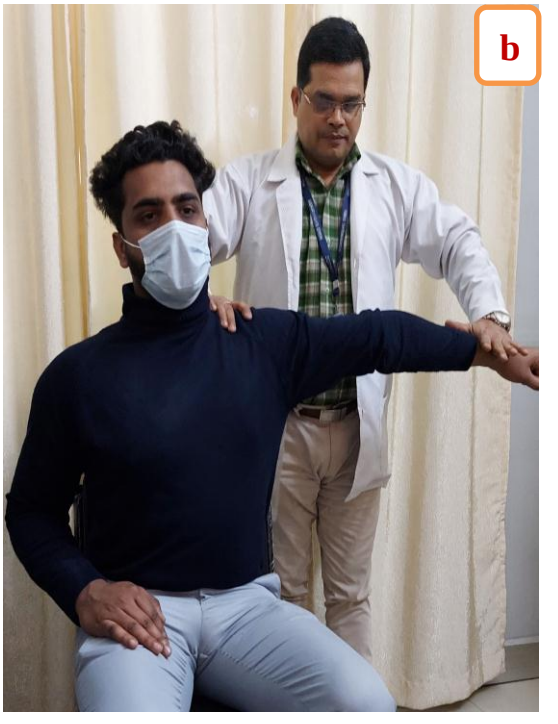


Figure- 3: Shoulder Stabilization Exercise for Supraspinatus and Shoulder Stabilization Exercise for Deltoid (a & b).

3. Shoulder Stabilization Exercise for External Rotators (Infraspinatus, Teres Minor, Posterior Deltoid).
   Patient will be stand with the involved side of his body against a wall or therapist hand. Bend your elbow to 90° and told the patient performed external rotation against the wall. The patient arm should not move (S.B. Brotzman et al. 1996; Shoulder Strengthening Exercises 2010).
4. Shoulder Stabilization Exercise for Internal Rotators (Subscapularis and anterior deltoid)
   Patient will be stand with the involved side of his body against a wall. Bend your elbow to 90° and told the patient performed internal rotation against therapist hand. The patient arm should not move (S.B. Brotzman 1996; American Academy of Orthopaedic Surgeons 2017; T. M. S kirven, et al. 2011).
5. Shoulder Stabilization Exercise for scapular muscles.
   - ❖ Patient position and procedure: standing with shoulder flexed 90° and hand supported against a wall. The patient is try to touch the wall by upper trunk.
     Progression: have the patient quadruped position with both hands on a stable surface, so that one extremity bears the body weight and stabilizes against the shifting load to increase Serratus activity and lower trapezius activity respectively.
   - ❖ Scapular elevation/depression: place your top hand superiorly and the other hand inferiorly around the scapula to provide manual resistance.

- Scapular protraction/retraction: place your top hand along the medial border and the other around the coracoid process to provide resistance.
- Scapular upward and downward rotation: place one hand around inferior angle and the other hand around the acromian and coracoid process to provide resistance (C. Kisner, et al. 2018).

The exercise will be performed 8 to 15 repetitions for 3 sets only 5 times / week for 8 weeks. It is performed with 5 to 10 second hold in each repetition a break of 1 min after each set (S.B. Brotzman, et al. 1996; Ju-hyun Lee, et al. 2018).
Moist Hot Pack (MHT)

The subject will be asked to lie down in a supine position and the shoulder is placed in the neutral position. The hot pack (standard size which had been stored in a hydro-collator tank of 74.5-80°C). Moist heat pack will be wrapped in towel with three to four folds over the affected shoulder. The pack was left in place for 10 to 15 minutes (Dhara N. Panchal, et al 2015; Kumar Neeraj, et al.2016) [Figure-4].

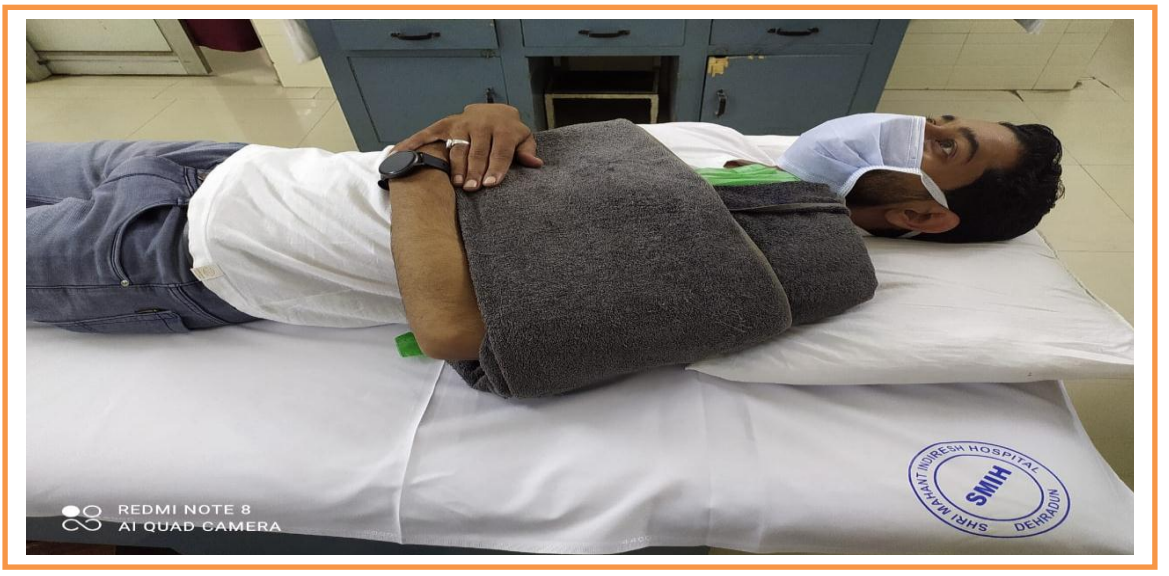


Figure-4: Application of Moist Heat Therapy in Shoulder joint

Results

The data were analyzed using the statistical software SPSS 15 version. Pain, Range of Motion, Shoulder proprioception and Muscle strength were measured by NPRS, Digital Inclinometer, Joint Position Sense measurement and Force Gauge. The result was analysed by Repeated Measure ANOVA & Independent t- test after 0 week, 4 week & 8 week of treatment.

To analyze the difference of Group A and group B the repeated measure ANOVA was used. Repeated measure ANOVA within-subject factor of timeline (week-0, week-4 & week-8) examined the within-group differences for the change of score

in Range of Motion. In Group-A study Flexion ROM F–Value 2100.895. Abduction ROM in. F–Value 2188.065. External Rotation in F–Value 1102.609. Internal Rotation in F–Value 2167.880. Group-B Flexion ROM F–Value 156.075. Abduction F–Value 128.972. External Rotation in F–Value 159.724. Internal Rotation in F–Value 622.456 and its significant level is .000 in 0 week, 4 week, and in 8 week of all outcome measure (ROM, Muscle strength and joint proprioception).

In this study our results of within the group difference showed greater improvement in 8 weeks than 4 weeks in Group-A & B. It was found that significant level was less than 0.05 with showed significant difference and implies that there is improvement in ROM, Muscle strength and joint proprioception score within the Group A & B (Table-2).

Outcome Measures	Group-A					Group-B				
	0 Week (Mean ±SD)	4 Week (Mean ±SD)	8 Week (Mean ±SD)	F - Value	Sign. level	0 Week (Mean ±SD)	4 Week (Mean ±SD)	8 Week (Mean ±SD)	F - Value	Sign.l evel
FL. ROM	50.16 ±.6.06	155.05 ±.14.96	169.68 ±.6.92	2100.895	.000	47.49 ±.6.39	65.41 ±.12.88	83.35 ±.15.31	156.075	.000
ABD. ROM	48.76 ±.6.26	142.92 ±.11.37	155.05 ±.4.49	2188.065	.000	45.06 ±.9.10	69.09 ±12.32	86.53 ±13.36	128.972	.000
EXT. ROT. ROM	39.37 ±.3.47	77.07 ±.6.68	87.55 ±.1.74	1102.609	.000	40.31 ±3.95	49.39 ±.5.72	55.40 ±5.06	159.724	.000
INT. ROT. ROM	29.20 ±.3.68	63.24 ±.3.44	68.01 ±.924	2167.880	.000	28.20 ±3.73	38.84 ±3.11	47.30 ±3.45	622.456	.000
FL. STRENGTH	30.89 ±13.88	60.06 ±8.77	67.04 ±6.07	178.250	.000	31.24 ±10.67	48.42 ±8.37	57.63 ±6.85	220.147	.000
ABD. STRENGTH	33.79 ±14.93	54.18 ±7.02	71.67 ±3.81	115.456	.000	31.46 ±11.35	52.26 ±8.24	64.63 ±5.72	236.737	.000
EXT. ROT. STRENGTH	21.01 ±9.40	49.89 ±5.49	71.67 ±7.81	268.049	.000	19.67 ±7.28	47.16 ±1.19	63.88 ±6.62	417.702	.000
INT. ROT. STRENGTH	36.42 ±9.63	55.93 ±1.75	76.05 ±6.24	239.289	.000	38.19 ±9.05	53.88 ±4.7	68.89 ±4.93	215.115	.000
FL. PROPRIOCEPTION	17.74 ±4.94	7.09 ±2.93	2.22 ±1.30	294.184	.000	18.93 ±5.20	15.70 ±4.26	12.64 ±3.43	125.000	.000
ABD. PROPRIOCEPTION	22.09 ±4.15	6.03 ±2.12	1.87 ±.88	530.691	.000	23.61 ±3.74	19.36 ±3.45	14.83 ±3.49	249.195	.000
EXT. ROT. PROPRIOCEPTION	14.51 ±3.65	5.83 ±2.01	2.19 ±1.108	237.206	.000	15.93 ±3.45	11.67 ±2.63	7.45 ±2.35	247.860	.000
INT. ROT. PROPRIOCEPTION	14.38 ±3.56	5.09 ±2.18	1.74 ±.818	285.533	.000	14.54 ±2.82	11.16 ±2.60	7.87 ±2.74	252.334	.000

Table 2: Comparisons within Group A & B ROM, Muscle Strength & Joint sense of obtained by repeated measure ANOVA.

The significant level of NPRS of Group-A and Group-B study in Baseline (0 Week) 0.574 that showed insignificant but after 4 week of treatment programme the significant level 0.036 showed significant & 8 week 0.012 that showed highly significant [Table-3]

To analyze the difference in the Flexion, Abduction, External Rotation and Internal Rotation Range of motion (ROM) between two groups (Group-A & Group-B), independent t- test was used. Group-A and Group-B flexion in Baseline 0 week significant level 0.321 in 4 week Significance level 0.0001 and in 8 week significant level 0.000. Abduction in Baseline (0 week) significant level 1.97 in 4 week significant level 0.001 and in 8 week significant level 0.000. External Rotation study in Baseline 0 week significant level 0.686 in 4 week Significance level 0.003 and in 8 week significant level 0.000. Internal Rotation study in Baseline (0 week) significant level 0.067 in 4 week significant level 0.028 and in 8 week significant level 0.000.

To analyzed the difference in the Measurement of shoulder Strength between two groups, (Group-A and Group-B), independent t test was used. When we compared with Group-A and Group-B, 4 weeks results showing significant as compared to 0 week .But in 8 weeks study our result showed greater improvement than 4 weeks and 0 week. significant level of Group-A and Group-B study in Baseline (0 Week) FL-0.761, ABD-0.087, ER-0.585 & IR-0.457 that showed insignificant but after 4 weeks of treatment programme the P value of FL-0.031, ABD-0.003, ER0.013 & IR-0.031 showed significant & in 8 weeks FL-0.041, ABD-0.000, ER-0.001 & IR-0.001that showed highly significant.

To analyzed the difference in the Measurement of Joint Position Sense score between two groups, (Group-A and Group-B), independent t test was used. The significant level of Group-A and Group-B study in Baseline (0 Week) FL-0.065, ABD-0.013, ER-0.457 & IR-0.675 that showed insignificant but after 4 weeks of treatment programme the significant level of FL-0.003, ABD-0.29, ER-0.010 & IR-0.014 showed significant & in 8 weeks FL-0.001, ABD-0.000, ER-0.001 & IR-0.000 that showed highly significant.

It was found that significant level was less than 0.05 with showed significant difference and implies that there is decrease the error of Joint Position Sense score between Group-A and Group-B post intervention 4 weeks and 8 weeks. In 4 weeks results showing significant as compared to 0 week. But In 8 week's results showing extremely significant as compared to 0 week & 4 weeks [Table- 3].

In this study our result showed greater improvement in 8 weeks than 4 weeks and 0 week. It was found that significant level was less than 0.05 with showed significant difference and implies that there is improvement in pain score between the Group A than Group B

Outcome Measures	Duration	Group-A	Group-B		
		Mean ±SD	Mean ±SD	t- Value	Signi. level
NPRS	0 Week	7.54 ±.722	6.93 ±2.997	1.10	0.574
	4 Weeks	3.70 ±.782	3.90 ±4.106	2.79	0.036
	8 Weeks	.77 ±.8444	1.22 ±7.956	3.93	0.012
	0 Week	50.16 ±.6.06	47.49 ±.6.39	1.05	0.321

FLEXION ROM	4 Weeks	155.05 ±.14.96	65.41 ±.12.88	25.32	0.000
	8 Weeks	169.68 ±.6.92	83.35 ±.15.31	22.57	0.000
ABDUCTION ROM	0 Week	48.76 ±.6.26	45.06 ±.9.10	1.86	1.97
	4 Week	142.92 ±.11.37	69.09 ±12.32	24.52	0.001
	8 Week	155.05 ±.4.49	86.53 ±13.36	27.08	0.000
EXTERNAL ROT. ROM	0 Week	39.37 ±.3.47	40.31 ±3.95	0.752	0.686
	4 Week	77.07 ±.6.68	49.39 ±.5.72	28.81	0.003
	8 Week	87.55 ±.1.74	55.40 ±5.06	33.48	0.000
INTERNAL ROT. ROM	0 Week	29.20 ±.3.68	28.20 ±3.73	1.06	0.067
	4 Week	63.24 ±.3.44	38.84 ±3.11	29.32	0.028
	8 Week	68.01 ±..924	47.30 ±3.45	32.30	0.000
FLEXOR STRENGTH	0 Week	30.89 ±13.88	31.24 ±10.67	0.11	0.761
	4 Week	60.06 ±8.77	48.42 ±8.37	5.51	0.031
	8 Week	67.04 ±6.07	57.63 ±6.85	5.73	0.041
ABDUCTOR STRENGTH	0 Week	33.79 ±14.93	31.46 ±11.35	0.72	0.087
	4 Weeks	54.18 ±7.02	52.26 ±8.24	2.75	0.003
	8 Weeks	71.67 ±3.81	64.63 ±5.72	6.76	0.000
EXTERNAL ROT. STRENGTH	0 Week	21.01 ±9.40	19.67 ±7.28	0.629	0.585
	4 Weeks	49.89 ±5.49	47.16 ±1.19	2.8	0.013
	8 Weeks	71.67 ±7.81	63.88 ±6.62	4.23	0.001
INTERNAL ROT. STRENGTH	0 Week	36.42 ±9.63	38.19 ±9.05	0.74	0.457
	4 Weeks	55.93 ±1.75	53.88 ±4.7	2.52	0.031
	8 Weeks	76.05 ±6.24	68.89 ±4.93	5.04	0.001
FLEXION. PROPRIOCEPTION	0 Week	17.74 ±4.94	18.93 ±5.20	0.915	0.065
	4 Weeks	7.09 ±2.93	15.70 ±4.26	9.77	0.003
	8 Weeks	2.22 ±1.30	12.64 ±3.43	15.83	0.001
ABDUCTION PROPRIOCEPTION	0 Week	22.09 ±4.15	23.61 ±3.74	1.56	0.013
	4 Weeks	6.03 ±2.12	19.36 ±3.45	18.86	0.29
	8 Weeks	1.87 ±.88	14.83 ±3.49	20.09	0.000
EXTERNAL. ROT. PROPRIOCEPTIO	0 Week	14.51 ±3.65	15.93 ±3.45	1.52	0.457

N	4 Weeks	5.83 ±2.01	11.67 ±2.63	9.86	0.010
	8 Weeks	2.19 ±1.108	7.45 ±2.35	11.28	0.001
INTERNAL .ROT. PROPRIOCEPTIO N	0 Week	14.38 ±3.56	14.54 ±2.82	0.196	0.675
	4 Weeks	5.09 ±2.18	11.16 ±2.60	9.95	0.014
	8 Weeks	1.74 ±.818	7.87 ±2.74	12.01	0.000

Table 3: Comparisons between NPRS, ROM, Muscle Strength & Joint sense of Group A and Group B obtained by independent t- test.

Discussion

The findings of the present study highlights that Group-A and Group-B are equally effective in reducing pain. The calculated value of within group Group-A NPRS 3.93 and Group-B 10.950. But significant level of Group-A and Group-B 0.012. The significant level of Group-A and Group-B study within group showed significant but Group-A showed highly significant than Group B for reducing pain in 4 week & 8 week obtained by non-parametric test.

The term frozen shoulder refers to a common shoulder condition characterized by the global restriction in the shoulder range of motion in a capsular pattern. The capsular pattern in the shoulder is characterized by most limitation of passive lateral rotation and abduction. Neviaser called it adhesive capsulitis, as he, under arthroscopy, observed that the capsule looked thickened and adhered to underlying bone and could be peeled off from the bone (Rizwan Haider et al.2014).

In our study we used numerical pain rating scale (NPRS) for measurement of pain in Diabetic Frozen Shoulder Patients. Childs J et al in 2005 did study on responsiveness of the Numeric Pain Rating Scale in Patients with Low Back Pain. The NPRS shows adequate responsiveness for use both in the clinical and research settings. They found out that a two-point change in NPRS represented clinically and meaningful changes in pain levels, though there were not much statistically significant difference. (Childs J et al, 2005)

In this study we found that in Group-A there are significantly increase joint AROM of Shoulder Joint than control group. Range of motion is the capability of a joint to go through its complete spectrum of movements. Measurement of range of motion can be used to evaluate available motion, determine joint stability, and determine soft-tissue elasticity as well as response to therapy over time. *Sandra Hudson, (2009).* In our study for measure the joint ROM of shoulder joint we used Digital Inclinometer. Digital inclinometer is used for measuring active shoulder (Morey J. Kolber, et al. 2012).

In this study we found that in Group-A there are significantly increase muscle strength of Shoulder Joint than control group. J. Sokk, H. Gapeyeva, et al. 2007 stated Frozen shoulder syndrome (FSS) is typically characterized by shoulder pain, a limited range of motion (ROM) and gradual loss of strength of the shoulder muscles. 4-week individualized rehabilitation on shoulder muscle

function in patients with FSS. There are significant changes in shoulder muscle strength. (J. Sokk, H. Gapeyeva, et al. 2007)

In this study we found that in Group-A there are decrease of error of Shoulder Joint proprioception than control group. Amanda L. Ager, et al. 2017 stated that shoulder Joint proprioception is essential for the optimization of shoulder neuromuscular control throughout the movement, yet continues to be a quantitative challenge today. Due to the lack of standardization of proprioception terminology and complexity of evaluation methods, it remains an area of psychometric contention. The purpose of this systematic review was to identify and summarize the current methods used for quantifying shoulder proprioception, specifically JPS and kinesthesia. Although shoulder proprioception impairment is very important to evaluate and treat during rehabilitation, the protocols currently being used have not been thoroughly psychometrically tested. A proprioceptive outcome that is being used in a clinic without known psychometric qualities can lead to erroneous clinical decisions and provide a false impression that an evidence-based approach is being used (Amanda L. Ager, et al. 2017).

In our study Group-A showed greater improvement pain, range of motion, muscle strength decrease error of shoulder joint proprioception than Group-B study. When we compared with Mean ±SD it was found that 0 week showed insignificant, 4 weeks showed significant and 8 weeks showed highly significant in diabetic frozen shoulder patients.

Conclusion

Our study concluded that Movement with Mobilization (MWM) therapy, Stabilization Exercise and Moist Heat Therapy (MHT) in Patients with Diabetic Frozen Shoulder showed significant improvement in pain, Range of motion , muscle strength and joint sense in 4th weeks & 8th weeks of treatment programme but 8 weeks results showing extremely significant as compared to 4 weeks at p values (<0.0001). On comparing group A and group B the results were significant in group A and there is insignificant improvement was seen in group B in pain, Range of motion, muscle strength and joint position sense in 4th weeks & 8th weeks of treatment programme.

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