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Original Research Article

Combined Effect of Gross and Focused Myofascial Release Technique on Trigger Points and Mobility in Subjects with Frozen Shoulder- A Pilot Study

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ABSTRACT

Objective: To evaluate the combined effect of gross and focused Myofascial release technique along with Maitland mobilization and conventional treatment on trigger points, mobility and function in subjects with frozen shoulder.
Method: 18 subjects who were clinically diagnosed with unilateral frozen shoulder were randomly allocated into the control group (n=9) and the Experimental group (n=9). Control group received hot moist pack, Maitland's mobilization for shoulder joint while the Experimental group received Myofascial release along with the treatment given in control group. Intervention was given for 5 sessions consecutively. Outcome measures assessed were Pain Pressure Threshold, Functional Activity level and Shoulder Flexibility which were assessed on 1st day and 5th day of the treatment.
Results: Between the groups comparisons demonstrated that Experimental group showed significant improvement than the control group for all the outcome measures ($p < 0.05$).
Discussion: Addition of Myofascial release technique treatment as an adjunct to conventional treatment will have better benefits and faster recovery in patients with frozen shoulder.

Keywords: Periarthritis shoulder; Trigger points; Myofascial Release; Mobilization; Gross Myofascial Release; Focused Myofascial Release.

INTRODUCTION

Frozen shoulder also known as Adhesive Capsulitis is one of the common shoulder condition which is characterized by painful and limited active and passive range of motion (ROM). [1] The prevalence of frozen shoulder has been estimated to be approximately 2-3 % of adults in general population. [2] It usually develops between the age group of 40 to 70 years. [3]

The pathogenesis of frozen shoulder is said to be unknown but several authors suggest that the shoulder movement restriction is due to several factors like shoulder capsule adhesion, contracted soft tissues and adherent axillary recess. As there is absence of correlation between joint space capacity and restricted shoulder range of motion, contracted soft tissues around the shoulder joint would be one of the reasons to restrict shoulder range of motion. Impaired shoulder movements in turn affect the function. [4] Frozen shoulder is divided into two types; primary in which idiopathic causes, systemic causes such as diabetes, hypertension, age related. Secondary includes; post-operative causes like shoulder or arm surgery in cases like rotator cuff tear, CABG procedures, lung diseases, immobilization for a prolonged time. [5]

Normal functioning of shoulder complex is attained by smooth and

harmonious pattern of working of all the structures from superficial to deep i.e. skin, fascia, muscles, ligament, cartilage and capsule around the joint. [6] Myofascial tightness and muscular adhesions prevents the upward rotation and create a mechanical block of humeral elevation. [7]

In frozen shoulder trigger points are seen around the shoulder joints. Myofascial trigger points are defined as tender spots exquisitely in taut bands of hardened muscle. These points are always tender which prevents full lengthening of the muscle and cause muscle weakness. [8] In frozen shoulder the trigger points are commonly seen in subscapularis, supraspinatus, pectoralis major and minor, deltoid muscle. [9] The inferior glenohumeral capsule and pectoral fascia are often restricted. [3] As there is altered postural mechanism and also the tendency of the shoulder joint to attempt to overcome impaired and restricted glenohumeral motion with the use of accessory musculature, the pain and trigger points are seen to develop. [10] It has also shown that patients with active trigger points have high disability and also affect the sleep quality. Painful shoulder having active trigger points could have lasting result in long run. [7]

Various physiotherapy interventions for frozen shoulder consists thermotherapy like hot moist pack, pain relieving modality like IFT, TENS, stretching exercise along with Mobilization technique for pain and capsule stretch. [11-15]
Myofascial Release (MFR) is one of the important and powerful techniques that treat soft tissue dysfunction which removes the tightness and restriction that helps in efficient movement. [16]

Combination release is a Myofascial Release technique in which Gross Myofascial release technique is combined with Focused myofascial release. Arm pull or Leg pull is the technique used in Gross myofascial release which is used to give the initial stretch to the muscle and focused myofascial release is given by focusing on specific muscle. By focusing on smaller restrictions within the myofascial unit, the subtle malalignments which are responsible for patient's problems are detected and released. [16] A study has been conducted in which the authors have applied Gross myofascial release technique along with Maitland mobilization and exercises in frozen shoulder which has been proved to be effective. [6] Previous literature suggests positive result with application of gross myofascial release technique in conditions like nonspecific neck pain with cervical radiculopathy, nonspecific low back pain with radiculopathy. [17-18] Another study was conducted to evaluate effects of trigger point therapy and Myofascial release along with conventional treatment compared to other group which received conventional treatment only for the treatment of trigger points in subjects with second stage frozen shoulder. The authors concluded that both the group showed improvements but the group which received trigger point therapy and myofascial release showed better improvements. [19]

However a combination of both the techniques which is called as combined release technique has not been studied for its effect in patients with frozen shoulder. It was hypothesized that application of combined release technique would have added effect in treating patients with frozen shoulder targeting specific to the muscles like Deltoid and subscapularis. Hence the present study was conducted to evaluate the effect of combined release technique (gross and focused MFR) on Pain Pressure threshold, mobility and function in patients clinically diagnosed with frozen shoulder.

METHODOLOGY

Study Design and Ethical Considerations

The Present study conducted was a pilot randomized controlled trial. Institutional Research and Ethics Committee of KAHER Institute of Physiotherapy, JNMC , Nehru Nagar Belagavi , Karnataka, India (Research and Ethics Committee, KIPT/168/16-10-17). A written informed consent was obtained and acknowledged

from all the participants and was ensured that their identity was not revealed. The study was carried out in tertiary care hospital of Belagavi city, India in the facilities of the faculty of the physiotherapy department. The trial is registered under clinical trial registry of India with trial number CTRI/2018/05/014142.

Participants

All frozen shoulder patients referred to Physiotherapy OPD were screened for Inclusion criteria and Exclusion criteria. The study was single blinded where the assessor was blinded from the allocation of the patient. The sample size was 18 which were calculated based on previous literature. Eighteen subjects were than randomized using lottery method where chits were made and the patient was asked to pick up the chit. In each chit was a coded number written with each code corresponding to either of the group. The subjects were then allocated to the control group (n= 9) and Experimental group (n=9). The subjects were included if their age was between 40 - 65 years, if they were clinically diagnosed with unilateral frozen shoulder and having capsular pattern restriction where External rotation restricted more than Internal rotation and lastly flexion in shoulder joint and excluded if they gave a history of Dislocation, fractures at cervical and shoulder region, recent trauma, any shoulder surgeries. They were also excluded if they had Acute soft tissue lesions like supraspinatus tendinitis, rotator cuff tear, neurological conditions, Mastectomy, Thoracic outlet syndrome and Absolute or relative contraindications to soft tissue technique.

Intervention

Eligibility was confirmed and then the baseline measures were taken. The primary outcome measures reported in this study was pain pressure threshold using pressure Algometer, and shoulder flexibility using Apley's scratch test. Secondary outcome measure considered was the functional activity level using shoulder, pain and disability index scale (SPADI scale). All the patients were treated for same number of visits i.e. 5 days. Supervised physical therapy treatment was provided by the same therapist for both the groups. Baseline values for all the outcome measures were taken and post intervention on 5th day was recorded.

Control group - Hot moist pack, Maitland mobilization and Interferential therapy.

Experimental Group - Combined gross and focused MFR, along with the treatment given to control group.

Hydro-collator Pack: 20 minutes/ session, 5 sessions per week – 1 week

For hot moist pack Patient was positioned in supine or sitting position. Hot moist pack was wrapped in the towel with three to four folds and then placed over the affected shoulder for 20 minutes. [11]

Maitland's mobilization: 3 sets for each joint, 30 repetitions, 5 sessions per week

Maitland mobilization was given for joints constituting a shoulder joint. For glenohumeral joint: Anterior glide, posterior glide, caudal glide, For acromioclavicular joint- Anterior glide, For sternoclavicular joint - posterior glide, superior glide, anterior glide and caudal glide . All the above mentioned glides were given for three sets with thirty repetitions each. [20]

Interferential Therapy: 15 minutes/ session, 5 sessions per week

At the end of the session interferential current therapy (IFT) was given where the Position of the patient was supine or sitting position as per the comfort of the patient. It was given for 15 minutes. 2 channel IFT was used. Placement of electrodes was 2 electrodes were placed anterior to the shoulder and 2 posterior to the shoulder. 4000 Hz carrier frequency and amplitude module frequency was at 0 to 250 Hz. [12]

Combination release: 15 minutes, 90 seconds each stretch, 5 repetitions / session, 5 days per week

In Experimental group along with the above treatment combination release consisting of

Gross and Focused Myofascial release was given (Figure 2a, 2b, 2c, 2d)

Gross Myofascial Release: The patient was in supine position in which the Initial stretch was given by arm pull technique depending on the feedback received through the patient's tissue. The arm was abducted to the end range and the pull was given by grasping the patient wrist with one hand by the therapist. The stretch was held for 90 seconds each.

Focused Myofascial Release: This was given along with the arm pull where the focus was on smaller restrictions within the myofascial unit. The subtle mal-alignments were detected and released. It was given for the muscles like pectoralis major and minor muscle, deltoid muscle, subscapularis and trapezius. 5 repetitions were given. Each stretch position was held for 90 seconds. Total duration was 10 to 15 minutes. [16-17]

Outcome Measures

Primary outcome measures were Pain pressure threshold and shoulder flexibility and secondary was Functional activity level.

Pain pressure threshold

It was measured using an instrument called Pressure Algometer which is a valid and reliable tool for measuring pain intensity where sufficient pressure is applied to the preselected points at 90 degree angle is applied. The pressure threshold meter is a force gauge with a rubber disc of 1 kg/cm2/s perpendicular to the skin. This instrument is proven to be useful in clinical practice for quantification of deep muscle tenderness. The validity and reliability was 0.9. [21] Deltoid muscles and subscapularis muscle were assessed for the pain pressure threshold for the trigger point's pain intensity. Only 1 reading was taken.

Shoulder flexibility

It was evaluated with Apleys scratch test. Abduction, external rotation and flexion and also adduction, internal rotation and extension are the movements performed to check the flexibility of upper limb. To assess abduction, external rotation and flexion the participant has to take the affected hand from above reaching down over the shoulder and other one from down reaching up the middle of his or her back. The distance was measured between the extended fingers of both the hands. For adduction, internal rotation and extension the affected shoulder was placed down and other hand above and distance was measured of the extended finger. Dewhurts and Bampoura (2014) found the reliability of Apley's scratch test to be greater than 0.8. Tape method was used and the data was collected in centimetres. [23-24] It was measured three times and then average of three was considered.

Functional activity level

It was checked using Shoulder Pain and Disability Scale (SPADI scale). The shoulder pain and disability index is developed to measure the pain and disability associated with shoulder pathology. This is a self-administered index consisting of 13 items divided into two subscales i.e. Pain and disability. It takes approximately 10-15 minutes to complete. The reliability and validity of this scale is 0.89. The score is measured as percentage. [22]

Statistical Analysis

All the analysis was done using SPSS version 21.0 statistical software. Normality of within the group scores was done using Kolmogorov Simonov test and all scores follow normal distribution therefore the parametric tests were applied. All the variables were assessed in which within group analysis was done using paired t test and between the group analyses was done using unpaired t test. The power was set at 80% having alpha level 0.05.

There was no statistical difference between 2 groups for demographic profile as well as the baseline characteristics of outcome measures. The level of significance was set at $p < 0.05$.

RESULTS

Within group comparison: Pain pressure threshold for deltoid muscle was statistically significant in control group ($p = 0.0064$) and

in Experimental group (p= 0.0002), for subscapularis muscle control group having (p=0.0019) and Experimental group (p<0.0001) which were statistically significant. In SPADI scale for pain component control group had (p= 0.0001) and in experimental group (p=0.0001) which proved to be significant, the disability component of SPADI scale in control group had (p= 0.0012) in control group and (p=0.0007) in experimental group which was also statistically significant. In Apley's scratch test for flexion, abduction, external rotation the control group had (p=0.0001) and (p=0.0001) in Experimental group and for extension, adduction and internal rotation (p=0.0479) in control group and (p=0.0001) in Experimental group where both the groups proved to be statistically significant.

Between group comparison: Pain pressure threshold for deltoid muscle had p=0.0002, for subscapularis p=0.0001. In SPADI the pain component had p=0.0001 and disability components having p= 0.0073. For Apleys scratch test the first component i.e. flexion, abduction, external rotation had p= 0.0016 and the second component which is extension, adduction and internal rotation with p= 0.0018. All the above mentioned values were statistically significant. (Table 1, 2, 3)

Table 1- Pain Pressure Threshold for Deltoid and Subscapularis muscle

Groups	Pretest Mean SD	Posttest Mean SD	Difference Mean SD	Percentage change	P value
	Pain Pressure Threshold of Deltoid Muscle				
Control group	2.20 ± 0.59	2.48 ± 0.60	0.28 ± 0.23	12.63%,	p=0.0064*
Experimental group	2.07 ± 0.62	3.33 ± 0.64	1.27 ± 0.57	61.29%,	p=0.0002*
t-value	0.4682	-2.9260	-4.8003		
P-value	0.6460	0.0099*	0.0002*		
Pain Pressure Threshold of subscapularis muscle					
Control group	2.11± 0.64	2.31 ± 0.65	2.11 ± 0.64	9.47%	p=0.0019*
Experimental group	2.31 ± 0.55	3.60 ± 0.78	2.31 ± 0.55	55.77%	p=0.0001*
t-value	-0.7085	-3.8125	-5.9779		
P-value	0.4888	0.0015*	0.0001*		

*p <0.05

Table 2- Pain and Disability component of SPADI scale

Groups	Pretest Mean SD	Posttest Mean SD	Difference Mean SD	Percentage change	P value
	Pain Component of SPADI scale				
Control group	31.56 ± 5.64	27.67 ± 5.45	3.89 ± 1.54	12.32%	p=0.0001*
Experimental group	43.56 ± 15.17	27.78 ± 14.75	15.78 ± 6.59	36.22%	p=0.0001*
t-value	-2.2249	-0.0212	-5.2699		
P-value	0.0408	0.9833	0.0001*		
Disability component of SPADI scale					
Control group	44.13 ± 5.16	40.89 ± 4.37	3.24 ± 1.98	7.35%	p=0.0012*
Experimental group	50.11 ± 13.52	41.50 ± 10.06	8.61 ± 4.85	17.18%	p=0.0007*
t-value	-1.2389	-0.1672	-3.0744		
P-value	0.2332	0.8693	0.0073*		

*p <0.05

Table 3- Apley's scratch test

Groups	Pretest Mean SD	Posttest Mean SD	Difference Mean SD	Percentage change	P value
	Flexion-Abduction- External Rotation				
Control group	16.67 ± 3.77	14.56 ± 3.68	2.11 ± 0.33	12.67%	p=0.0001*
Experimental group	17.44 ± 2.65	13.00 ± 3.16	4.44 ± 1.81	25.48%,	p=0.0001*
t-value	-0.5058	0.9621	-3.8025		
P-value	0.6199	0.3503	0.0016*		
Extension-Adduction- Internal Rotation					
Control group	18.00 ± 4.56	16.67 ± 4.45	1.33 ± 1.71	7.41%	p=0.0479*
Experimental group	21.00 ± 3.61	16.44 ± 4.10	4.56 ± 1.94	21.69%	p=0.0001*
t-value	-1.5492	0.1102	-3.7303		
P-value	0.1409	0.9136	0.0018*		

*p <0.05

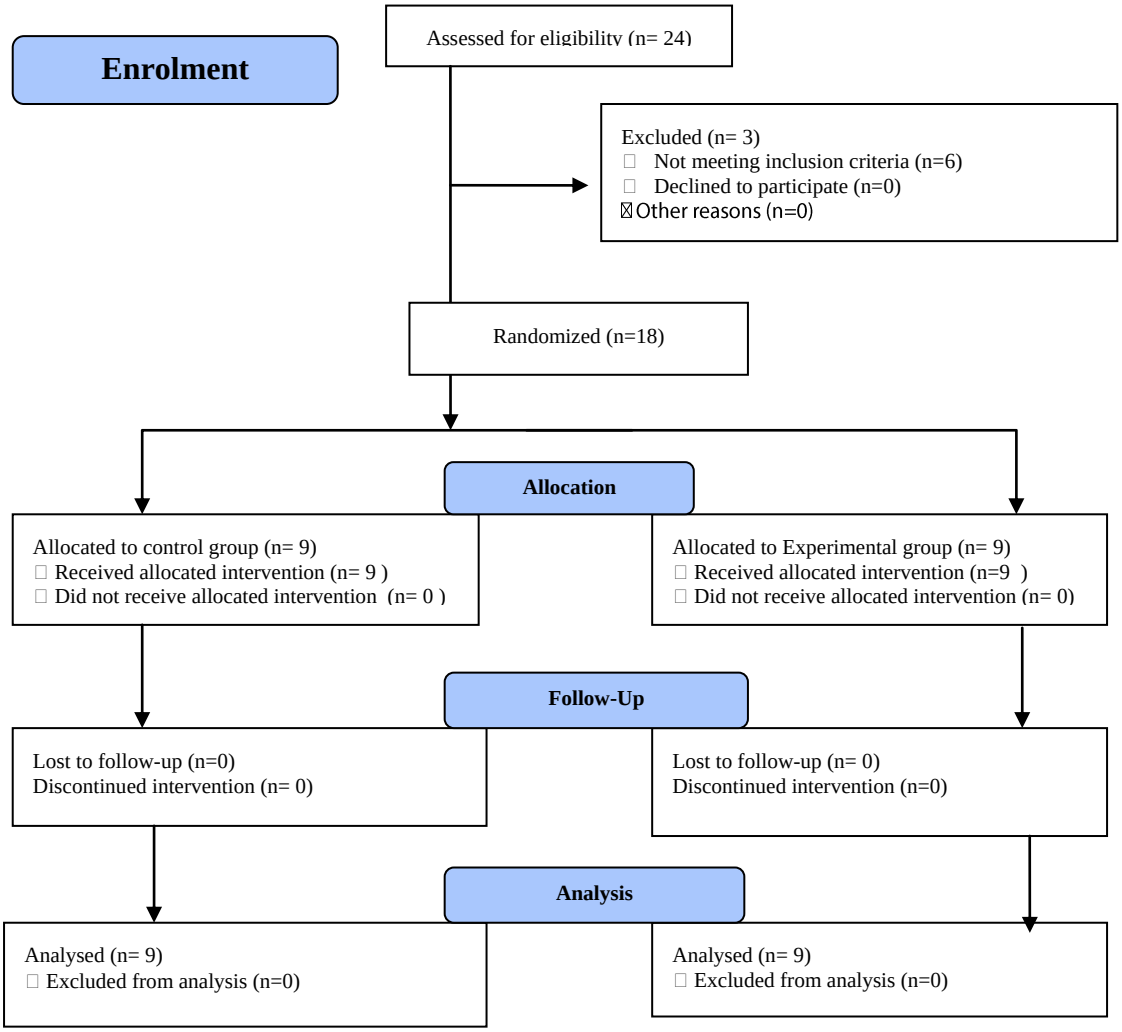
PRESSURE PAIN THRESHOLD WITH PRESSURE ALGOMETER

Fig 1 a – PPT of Deltoid muscle using pressure algometer
Fig 1 b – PPT of subscapularis muscle using pressure algometer

COMBINATION RELEASE TECHNIQUE

Fig 2a – Arm pull + Focused MFR to Deltoid muscle.
Figs 2b – Arm pull + Focused MFR to subscapularis muscle
Figs 2c – Arm pull + Focused MFR to trapezius muscle
Figs 2d- Arm pull + Focused MFR to pectoralis muscle

CONSORT CHART



DISCUSSION

The present study was conducted to see the combined effect of gross and focused myofascial release technique along with Maitland's mobilization and conventional treatment on trigger points and mobility in frozen shoulder. The findings of the present study indicate that although both the groups were effective addition of Myofascial release proved to be more beneficial.

Reduction in pain due to myofascial release technique can be attributed by the following factors. According to one of the concept of MFR is that of tight loose which states tightness leads to weakness. To this tight loose concept there is both biomechanical and neural reflexive element. So in this concept it is fundamental to the therapeutic use of MFR. The second concept of MFR deals with the neuro-reflexive change that occurs with application of manual force on musculoskeletal system. The hands on approach in this concept offers afferent stimulation through receptors, which requires central processing at the spinal cord and cortical levels for a response. Afferent stimulation frequently results in efferent inhibition. The same principle is used in MFR technique when the afferent stimulation of a stretch is applied and the operator waits for efferent inhibition to occur so that relaxation results in tight tissue. [25] According to one of the study pain reduction after giving MFR technique may be due to neurophysiological pain reduction phenomenon associated with

graded movements of the technique. Neuromodulation of pain is reportedly achieved when stimulation of type I and type II afferent mechanoreceptors in a reflex reduces the tone or awareness of pain. [6]

Reviews have stated that increase in the range of motion after the MFR technique may be due to factors such as neurophysiological reduction in pain and muscle guarding or improvement in muscle extensibility. Other contributing factors can be the mechanical change that has occurred in the tissue due to breaking up of the adhesions which leads to realigning the collagen or maybe there was increase in fiber glide when specific movements stressed the specific parts of the capsular tissue. MFR is believed to lengthen the fascia that may free the blood vessels and nerves which will eventually improve the circulation and nervous system transmission. The load sustained stretch gradually allows the tissue to elongate and relax which eventually increase the range of motion and flexibility. [25]

In the present study, combinations of gross and focused MFR technique were applied. In indirect or gross MFR, a gentle stretch which allows the fascia to unwind itself where less pressure is applied. This gentle form of traction causes increase in blood flow and heat to the area which eventually will allow natural healing mechanism to take over. In direct or focused MFR working directly on the restricted fascia, where the tissue is loaded with constant force until release occurs. The moves are slowly reaching the layers of fascia until deep tissues are reached. Both the above mechanisms will have led to increase in range of motion and reduce the pain. [25]

A study conducted by Susan Jackson et al on frozen shoulder subjects where MFR and trigger point therapy was given along with conventional physiotherapy treatment which concluded that following a soft tissue massage there was improvement in range of motion, reduction in pain and improvement in function in subjects with second stage frozen shoulder. [19] This showed similar results to the present study where treatment to the trigger points with MFR technique showed increase in pain pressure threshold of the trigger points and increase ROM. The findings of the present study are in accordance to the above study indicating positive increase in flexibility or ROM, where Apley's scratch test was used to check the flexibility instead of goniometry for ROM which proves that increase in flexibility will improve the ROM. Since frozen shoulder has capsular restriction with multiplanar restriction and apleys scratch test will give us these multiplanar ranges of the shoulder.

Another study supports the finding of the present study where the authors have stated that soft tissue treatment (MFR) when given to a specific muscle improved the range of horizontal adduction. [26] These findings can be compared to our study where we focused on specific muscles to be treated with focused MFR and showed improvement in flexibility of muscles due to lengthening of the muscle and increasing the range of motion.

Further a study conducted by Shalaka Deshmukh, Shivani Chaudhari et al wherein they used gross MFR technique (arm pull) was applied along with conventional physiotherapy treatment in frozen shoulder population which showed its better effects in outcome measures like visual analogue scale (VAS), shoulder pain and disability index (SPADI) score, and ROM. [6] The results of this study are in accordance with findings of the present study where combination of focused MFR and gross MFR showed improvements in all the outcomes like pain pressure threshold, SPADI scale and Apley's scratch test.

A similar study where gross MFR arm pull technique was also used in subjects having mechanical neck pain with upper limb radiculopathy with age group of 20-50 years which showed improvements in VAS, Northwick Park Questionnaire (NPQ) and reduction in disability of upper limb and neck region. [17]

In present study the functional activity level was measured as functional limitation is common in frozen shoulder. Literature suggests strong correlation between pain and function and ROM and function. As per the author the pain is said to have a correlation with the functional activity level in frozen shoulder where decrease in pain will lead to increase in functional activity. [27] Einar Kristian Tveita et al has proved that reduction in ROM has an impact on the function in subjects with frozen shoulder. [22] On the basis of above findings the present study also demonstrates significant improvement in functional activity level using SPADI Scale.

Limitations of the present study are that the long term follow ups of the patients were not performed which if done would help to understand long term benefits and carryover effect of Myofascial release technique. The study did not include a separate group with either sham MFR or only MFR. Inclusion of such groups will give more clarity and stronger evidence on the efficacy of combination release technique

Future scope for the present study can be MFR technique can be compared with the instrument assisted soft tissue mobilization (IASTM) or dry needling. Strength of the muscle can also be assessed.

CONCLUSION

Based on this study it can be concluded that addition of MFR treatment along with conventional treatment will have more benefits and faster recovery in patients with frozen shoulder. From this study it can be said that combination of gross and focused MFR along with Maitland mobilization and conventional physiotherapy treatment can be used as treatment on trigger points, mobility and function in subjects with frozen shoulder.

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