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EFFECTIVENESS OF SPENCER MUSCLE ENERGY TECHNIQUE AND GONG'S MOBILIZATION ON PAIN, RANGE OF MOTION AND FUNCTION IN SUBJECTS WITH ADHESIVE CAPSULITIS OF SHOULDER

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ABSRACT: The purpose of the study was to find the effectiveness of spencer muscle energy technique and gong's mobilization on pain, range of motion and function in subjects with adhesive capsulitis of shoulder. A total of 64 subjects with unilateral shoulder pain were included and randomised into two groups.Group-A (N=32) received Spencer muscle energy technique and Group-B (N=32) received Gong's mobilization in addition to this both groups received conventional therapy. Intervention was given for 3 days a week for 4 weeks. Visual analogue scale, Universal goniometer, Shoulder pain and disability index were used to asses intervention's effectiveness. Paired student t-test was performed to asses the statistical difference with the group and independent student t-test to asses statistical difference in between the groups.This thesis has provided transparent overview of an RCT evaluating effectiveness of muscle energy technique and gong's mobilization for subsiding the symptoms. The current study concluded that spencer muscle energy technique and gong's mobilization has shown significant improvement in reducing pain, range of motion and function. However, spencer muscle energy technique is more effective when compared to gong's mobilization on reducing the pain, range of motion and function in subjects with adhesive capsulitis of shoulder.

INTRODUCION

Adhesive Capsulitis commonly reffered to as Frozen Shoulder, is a disabling condition due to excessive fibrosis and contracture of Glenohumeral joint capsule.This condition is associated with Pain, Stiffness, limited Range of Motion, sleep deprivation and disability that may have huge impact on every aspects of daily living and occupational activities of an individual.[1]

The Annual Incidences are 3% to 5% in general population and even upto 40% in people with diabetes. The peak incidence is between the age of 40-60 and slightly more common in women.[2] The Prevalence rate of Adhesive Capsulitis in general population is 2-5% and 10-20% in diabetes.[3].

Neviesar was the first to identify the pathology through histological and surgical examination of Frozen Shoulder. He concluded that frozen shoulder was not Periarthritis, but a "thickening and contracture of capsule that become adherent to the humeral head" and then he coined the term Adhesive Capsulitis for this condition . Codman described the common features of Adhesive Capsulitis as slow onset of pain felt near the insertion of deltoid, inability to sleep on affected side, painful restricted elevation and external rotation with normal radiological appearance.[4]

Generally it is sub-categorized into Primary (idiopathic) and Secondary Adhesive Capsulitis. Primary
Adhesive Capsulitis occurs spontaneously without specific precipitating event. Secondary Adhesive Capsulitis is associated with Systemic, Extrinsic and Intrinsic disorders. Systemic disorders includes
Diabetes, Thyroid.[5] Extrinsic disorders include Cardiopulmonary disease, Parkinson's Disease, Stroke,

Cervical Pain pathology. Intrinsic disorders include Rotatorcuff Pathology, Bicipital Tendinitis, Acromio clavicular joint arthritis.[6]

Neviesar and Hannafin identified 4 stages of Adhesive Capsulitis.

Stage 1 Painful Phase: There is gradual onset of Pain and mild decrease in Range of Motion. This stage lasts for< 3 months.

Stage 2 Freezing Phase: It is characterized by stiffness with decreased active and passive Range of Motion due to reduced capsular volume. This stage lasts for 3-9 months.

Stage 3 Frozen Phase: It is characterized by Pain with nocturnal periodicity and stiffness at the end range of motion. This stage lasts for 9-14 months.

Stage 4 Thawing Phase: There is minimal Pain with gradual improvement in Range of Motion due to capsular remodeling. This stage lasts for 15-24 months.[7]

Adhesive Capsulitis can be diagnosed by clinical symptoms and Magnectic Resonance Imaging. The clinical features of Adhesive Capsulitis include Pain around shoulder, limited passive and active ROM for >3 months.It is difficult to diagnose Adhesive Capsulitis as clinical features of several shoulder joint conditions overlaps with it. Thus Magnetic Resonance Imaging (MRI) and Magnetic Resonance Arthrography (MRA) are widely used to Diagnose Adhesive Capsulitis.[8]

Most of the Symptoms subsides with conservative treatment. Conservative treatment includes Physiotherapy, Non Steroidal Anti Inflammatory Drug's [NSAID'S], Intra Articular Corticosteroid Injection, Hydrodylation. Various Physiotherapy interventions includes Cryotherapy, Transcutaneous Electrical Nerve Stimulation, Ultrasound, Codman's Exercises, Stretching and Mobilization Techniques. Surgical interventions are opted for subjects with minimal improvement of symptoms and who cannot tolerate pain even after 6 to 12 weeks of Conservative treatment. Surgical treatment options include Arthroscopic Capsular Release and Repair, Manipulation under Anaesthesia.[8] Literature cites Adhesive Capsulitis is best managed by Physiotherapy techniques, such as Joint Mobilization Glides, and Active and Passive stretching exercises.[9] Passive Stretching produces mechanical effects by re-aligning collagen, improves joint functional range.[10]

Spencer Technique is an Osteopathic Manipulative Treatment to Diagnose, Treat and establish Prognosis for subjects with Adhesive Capsulitis. It is a multi-step technique that combines Spencer's Positioning, Sequencing, Slow Stretching of Shoulder complex within pain free limit done by Physiotherapist while incorporating Muscle Energy with Post Isometric Contraction and Relaxation. Spencer Technique attempts to re-establish fuctional relationship between soft tissue and articular surfaces of the Shoulder, minimizes inflammation and restores arterial, venous and lymphatic flow. It is sequenced to improve Shoulder mobility by first treating most pain free followed by most restricted motions.[11-13] Muscle Energy Technique is unique in its application as the patient provides initial effort while Physiotherapist facilitates the process. This technique can be used on any joint having restricted range of motion identified during passive range of motion.[14-16]

Gong's Mobilization is an End Range Mobilization technique in which a corrective Antero-Posterior Glide is applied with Shoulder in dynamic positioning followed by distraction and performing the restricted movements. Then Oscillations at Maitland's grade 3 and 4 is given with sustained Stretching at grade 4 for about 7 seconds. It is repeated for 10-15 times. Gong's Mobilization aims to reduce Pain and improve Range of Motion by stretching the contracted articular capsule.[17,18]

Both Spencer MET and Gong's Mobilization have been proved effective in reducing Pain, improving ROM and Function in subjects with Adhesive Capsulitis of Shoulder. However, the available literature for comparision is limited. Hence, the need of the study arises.

NEED OF THE STUDY

Adhesive Capsulitis of Shoulder is a disabling condition and it is the utmost cause of morbidity and functional limitations especially in subjects with mean age. Pain subsides by administration of Non
Steroidal Anti-Inflammatory Drugs but regaining normal Range of Motion and Function can be achieved by Physiotherapy. In most of the available literature, Physiotherapy management for Adhesive Capsulitis includes Conventional therapy such as Codman'sPendular Exercise , Shoulder Wheel Exercise, Stretching and MobilizationTechniques to maintain the range, along with them TENS is used to reduce Pain by blocking the ascending Pain pathway. Spencer's MET is unique in its application as the subjects active participation in addition to Physiotherapist's effort and there by contributes to some degree of Range of Motion. Gong's Mobilization is an end range mobilization technique that includes corrective AnteroPosterior Glide with shoulder in dynamic position. It has immediate effect by aiding the stretch of contracted soft tissue and transitional movement help to gain normal functional range and there by inducing beneficial effects. Both Spencer MET and Gong's Mobilization have been proved effective on reducing Pain, improving Range of Motion and Function in Adhesive Capsulitis. However, the available Literature for comparision is limited. Hence the need of the study arises.

RESEARCH METHODOLOGY

STUDY DESIGN: Prospective Study Design.

ETHICAL CLEARANCE: The Study protocol was approved by the Ethical Committee of GSL Medical College& General Hospital (Annexure-I), the investigator explained the purpose of the study and given the patient information sheet. The participants were requested to provide their consent to participate in the study (Annexure-II). All the participants signed the informed consent and the rights of the included participants have been secured.

STUDY POPULATION: Subjects clinically diagnosed with Adhesive Capsulitis of Shoulder by an Orthopaedician.

STUDY SETTING: Study was conducted at Outpatient department of Physiotherapy, GSL Medical College and General Hospital, Rajahmundry, Andhra Pradesh, India.

STUDY DURATION: The Study was conducted for the period of 1 year.

INTERVENTION DURATION : 4 weeks.

TREATMENT DURATION : 30 mins per session,3 sessions per week, for 4 weeks.

SAMPLING METHOD: Systematic Random Sampling.

SAMPLE SIZE: A total of 82 subjects based on the prevalence were screened in that 64 subjects were recruited who are willing to participate in the study. Recruited participants were explained the purpose and relevance of the study.Those willing to participate voluntarily had included in the study after obtaining informed consent. All the eligible participants were randomized into Spencer MET group an Gong's Mobilization group with 32 in each Group.

GROUPS	NO.OF.SUBJECTS	TREATMENT
GROUP-A	32 SUBJECTS	Spencer's MET +Conventional Therapy
GROUP-B	32 SUBJECTS	Gong's Mobilization +Conventional Therapy

MATERIALS USED

- Examination Couch.
- SPADI Questionnaire.
- VAS Score Sheet.
- Universal Goniometer.
- Shoulder Wheel.
- Over Head Pulley.

INTERVENTION

The Study consists of 4 weeks of intervention.The subjects was recruited based on the Inclusion Criteria. Subjects who fulfilled the inclusion criteria was asked to sign the consent form. Then the subjects was allocated into two groups. Before the Commencement of the treatment a brief demonstration about the intervention was given. Pre-test was done to measure Pain, Range of Motion and Function by using Visual Analogue Scale[VAS], Universal Goniometer[UG], Shoulder Pain and Disability Index[SPADI]. Intervention duration was for a period of 4 weeks, 3sessions per week. After 4 weeks post treatment Outcome data was analysed for Results.

GROUP-A SPENCER MUSCLE ENERGY TECHNIQUE:[11]

Subjects in this group received Spencer Muscle Energy Technique with Pateint in side-lying position. It is a Multi step technique that contains Spencer's Positioning, Sequencing, Slow Stretching of shoulder complex with in Pain free limit while incorporating the muscle energy.

PROCEDURE: The Subjects was positioned in side-lying with the affected shoulder above.The Therapist stands beside the patient and stabilizes the shoulder girdle with on hand while the other hand provides force into restrictive barrier of shoulder in 7 different movements. This Multi-step technique includes Glenohumeral Extension, Flexion, Circumductionwith Compression, Circumduction with Distraction, Abduction, Adduction with Internal Rotation, Glenohumeral Pump or Lymphatic Pump. During these movements subject's were asked to exert their Muscle Energy against the resistance offered by the therapist for 3-5 seconds.The Maneuver was repeated for3-5 times in each session, with 3 sessions a week for 4 weeks. Spencer's Technique attempts to re-establish functional relation between soft tissue and articular surfaces of the shoulder joint and also improves arterial, venous and lymphatic flow.

GLENOHUMERAL EXTENSION: The Therapist holds the subjects elbow by flexing it with one hand and shoulder with other hand.Then therapist extend the subject's shoulder in horizontal plane until end ROM is felt.Then return to neutral position. Repeat it for 6 to 8 times.

FIG 1:Spencer MET-Shoulder Extension

GLENOHUMERAL FLEXION: The Therapist holds the subject's wrist with one hand and stabilizes the scapula with other hand.Then available shoulder Flexion is encouraged until End Range is felt. Then return to neutral position. Repeat it for 6 to 8 times.

FIG 2 :Spencer MET-Shoulder Flexion

CIRCUMDUCTION WITH COMPRESSION: Therapist holds the subject's elbow by Flexing it and shoulder was Abducted to 90^0.Mild compression was given to glenohumeral joint by using elbow as pivot to rotate humerus in clockwise and counter clockwise direction. Gradually increase the circle size.

FIG 3:Spencer MET- Shoulder Circumduction with Compression

CIRCUMDUCTION WITH TRACTION: Therapist holds the subjects hand and shoulder was Abducted to 90^0 with one hand and shoulder with the other hand.Traction was applied to glenohumeral joint while rotating humerus in clockwise and Counter clockwise direction. Gradually increase the circle size.

FIG 4 :Spencer MET-Shoulder Circumduction with Traction

ABDUCTION: The subject's elbow was flexed and the shoulder was abducted to 90^0.The Therapist held the subject's elbow with one hand and shoulder with the other hand and exerted upward pressure at the elbow to increase Abduction range. Then return to starting position. Repeat it for 6 to 8 times.

FIG 5 :Spencer MET-Shoulder Abduction

INTERNAL ROTATION: The Therapist instructs the subject to reach their back and therapist holds subjects elbow with one hand and shoulder with the other hand. Therapist exerts forward pressure at the elbow to Internally Rotate until end range is felt. Repeat it for 6 to 8 times.

FIG 6 :Spencer MET- Shoulder Internal Rotation GLENOHUMERAL PUMP: Extend subject's elbow by resting it on therapist's shoulder. Then the therapist clasps her hand around the subject's shoulder and provide gentle traction by pulling humeral head towards therapist.Then Return to neutral position and apply compression force into glenoid fossa. Repeat it for 6 to 8 times.

FIG 7: Spencer MET -Shoulder Glenohumeral Pump

GROUP-B

GONG'S MOBILIZATION:[29]Subjects in this group received Gong's Mobilization. It is an End Range Mobilization Technique in which a corrective Antero-Posterior Glide is applied, with the shoulder in the dynamic position followed by Distraction and performing the restricted movement. Then oscillation at Maitland's Grade 3 and 4 is given with sustained Stretching.

PROCEDURE:

For Abduction: The Subjects sat on chair with Spine in neutral position. The Therapist stood on the affected side and pushes the Scapula of the affected side from posterior to anterior with one hand, and the humeral head from anterior to posterior direction parallel to the joint plane with the other hand.This restored the humeral head to its normal position. Simultaneously, the subject was asked to quickly and powerfully perform Shoulder Abduction with no External Rotation with Elbow Flexion. During this, the Therapist hands kept pressing the humeral head with the long axis of the palm aligned with the long axis of the humerus. The Therapist followed the subjects movement during Shoulder Abduction, at the same speed while maintaining a little distraction, and adding acceleration in the end range, otherwise no increase in Range of Motion would occur.

FIG 8 :Gong's Mobilization for Abduction

For Medial Rotation: Subjects were positioned in side-lying with the involved shoulder upward and abducted at 90 degrees so that the humerus vertical position was maintained and the flexed elbow joint was maintained at 90 degrees. The therapist maintained the subject's elbow at 90degrees by placing his elbow below the subjects elbow, and pressed the humerus head from anterior to posterior direction with the other hand. Then the Therapist held the vertical axis of the humerus steady by maintaining the Shoulder Abduction and the elbow at 90degrees Flexion and raised therapist own body while slightly pulling on the articular capsule of the shoulder joint. This slight pulling of the articular capsule was maintained for 10-15 seconds then relaxed for 5 seconds . This Maneuver was performed for about 2 to 3 minutes. After extending the articular capsule by slightly pulling it, the therapist used one hand to press the shoulder joint from anterior to posterior in order to prevent vertical pulling of the slightly extended articular capsule and the humerus.The therapist supported the elbow with the other hand and performed Shoulder Medial Rotation. Then, in order to increase ROM, Oscillation at Maitland's Grades 3 and 4 was performed followed by sustained Stretching at Grade 4 for about 7 seconds.

FIG 9 :Gong,s Mobilization for Medial Rotation

CONVENTIONAL PHYSIOTHERAPY[22]

Conventional Physiotherapy includes the Shoulder Wheel, Over Head Pulley, Codman's Exercises, Finger Ladder and Home Programme. Both the groups received Conventional Physiotherapy.

STATISTICAL ANALYSIS

All Statistical Analysis was done by using SPSS software version 20.0 and Microsoft excel 2007. Descriptive data was presented in the form of mean +or- standard deviation and mean difference percentages was calculated and presented.

Within the groups: Paired student "t" test" was performed to asses the statistical difference within the group for Pain, Shoulder Range of Motion and function from Pre-test and Post-test values.

Between the groups: Independent student "t" test was performed to asses the statistically significant difference in mean value between the groups for Visual Analogue Scale for pain, Universal Goniometer for Shoulder Range of Motion and Shouder Pain and Disability Index for Function.

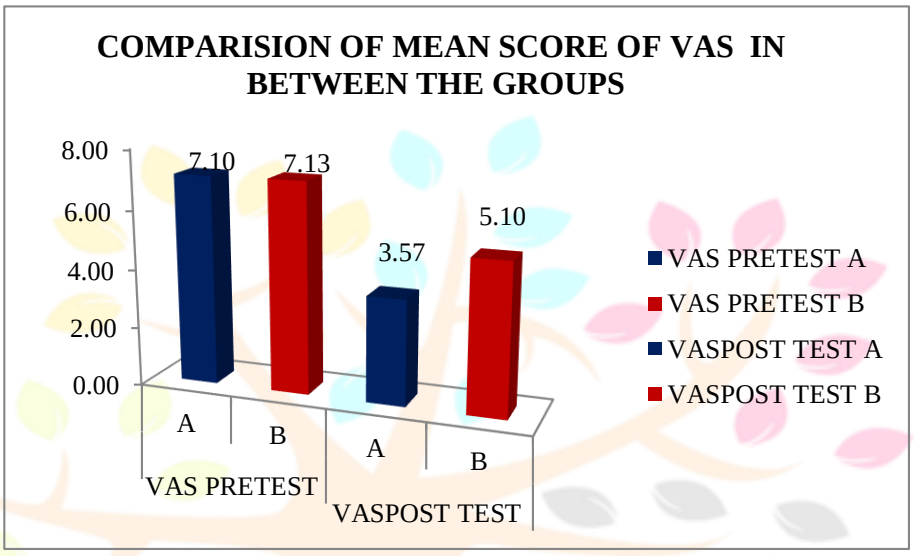
For all Statistical Analysis, P<0.05 was considered as statistically Significant.

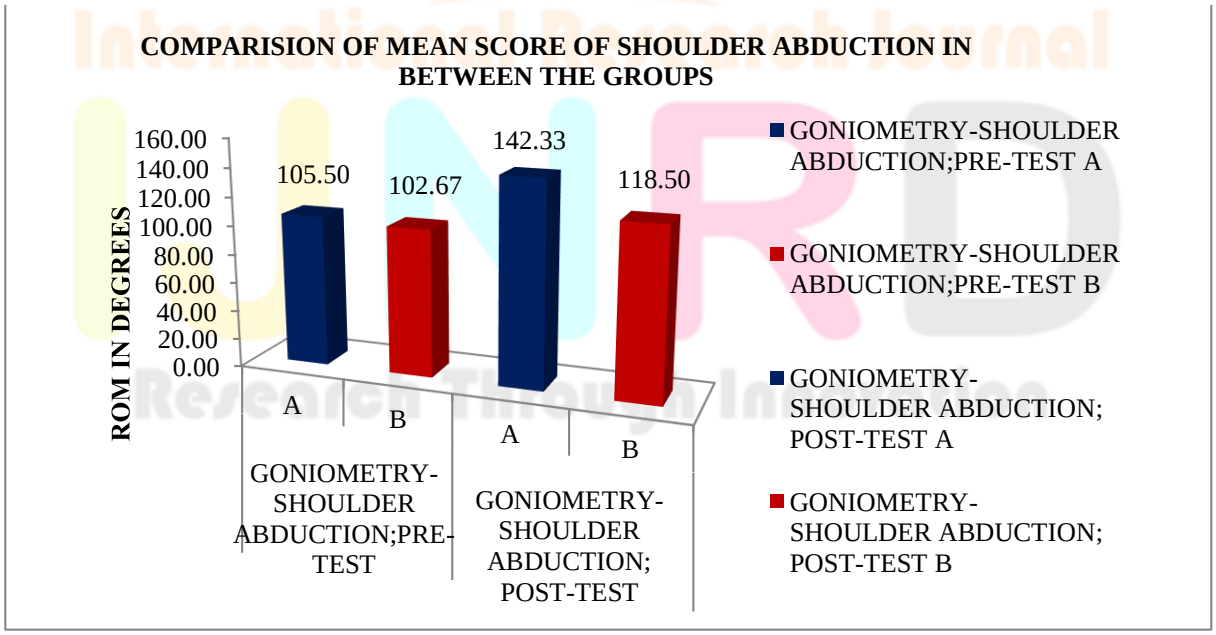
RESULTS AND DISCUSSION

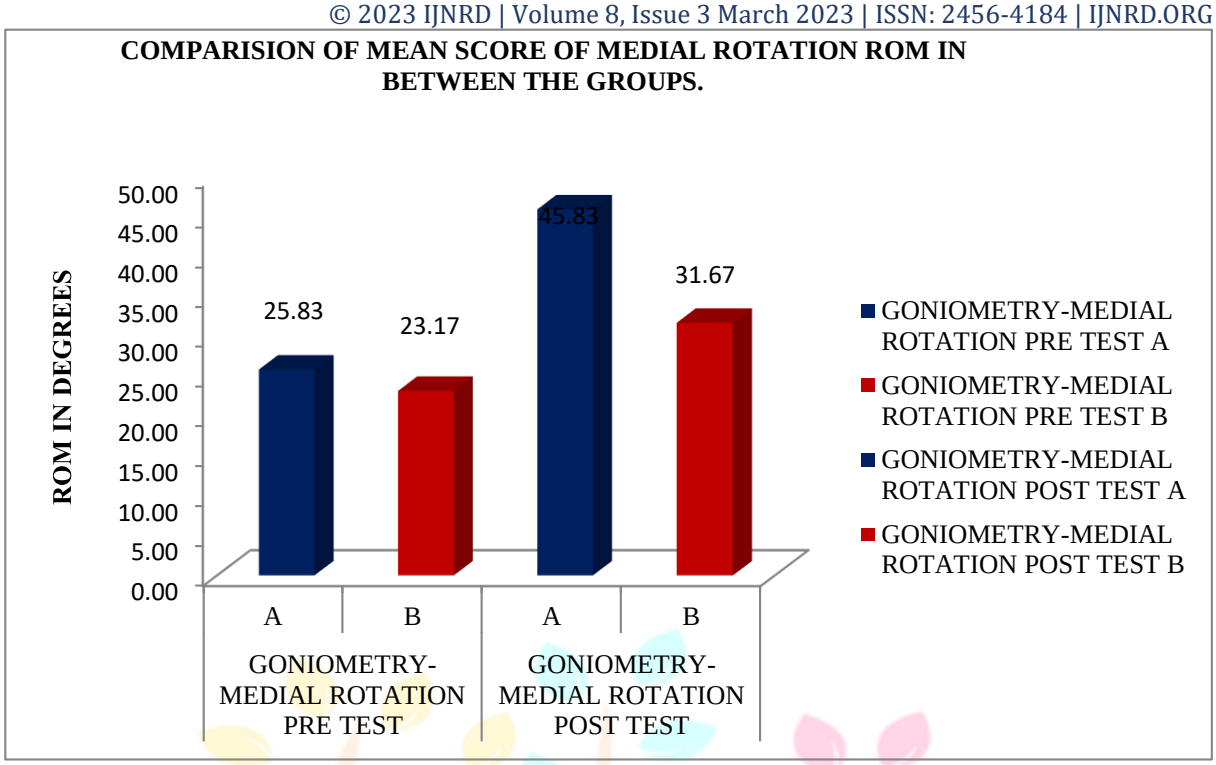
The Results of this Study were analysed in terms of reduction of Pain on VAS, Shoulder Abduction and Medial Rotation ROM on Universal Goniometer and Functional Range on SPADI. The Consort flow chart of the study showed the study organization in terms of subjects screening, random allocation and analysis following the intervention.

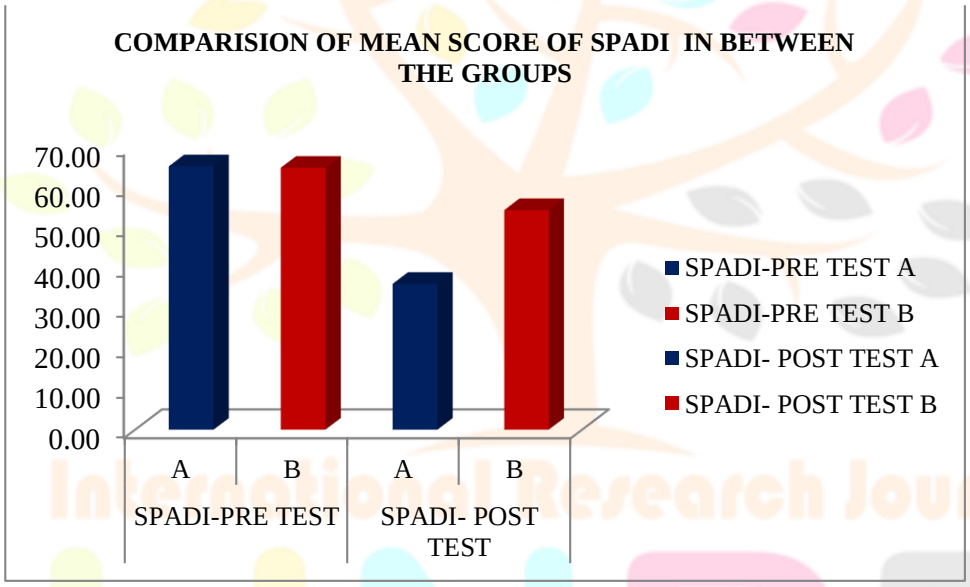
A total of 82 subjects were screened for eligibility, amongst 64 subjects were included in the study trail. All the 64 subjects who met the inclusion criteria had undergone baseline assesment and included subjects were randomized into two equal groups consisting of 32 in each group.In this study 30 participants completed training in Group A and 30 participants completed training in Group B with dropouts of 2 in each Group.

Comparision was done within the group as well as in between the groups. So as to evaluate the intra group and inter group effectiveness of Spencer Muscle Energy Technique and Gong's Mobilization which are considerations in the present study.









DISCUSSION

The Aim of the current study was to evaluate the effectiveness of Spencer Musle Energy Technique and Gong's Mobilization on Pain, Range of Motion and Function in subjects with Adhesive capsulitis of shoulder. In this study, subjects were assessed for pain, range of motion and function. The following outcome measures Visual Analogue Scale [VAS], Universal Goniometer, Shoulder Pain and Disability Index[SPADI] were used to measure the intensity of Pain, ROM and Function.

The results showed significant improvement in all three outcome measures VAS, Universal Goniometer, Shoulder pain and disability index, in Spencer MET group.

Both the Spencer Muscle energy Technique and the Gong's mobilization showed differences, but the Spencer MET group showed statistically significant difference when compared to the Gong's Mobilization group.

This study supports the previous study of Mushyyaidaiqbal, Humariaz et.al; "Comparision of Spencer Muscle Energy Technique and Passive Stretching in Adhesive Capsulitis: A single blind randomized control trail" to demonstrate the benificial effects of SMET. Findings of the study suggests Spencer MET is more effective compared to Passive Stretching for reducing Pain, improving ROM and Functional ability[11].Literature supports the observation that SMET improves pain($p<0.001$) by altering circulatory biomarkers of pain and restores pain-free joint motion by stretching the shoulder capsule and soft tissues[32]

Incorporation of Isometric muscle contraction along with Mobilization of shoulder complex stimulates muscle and joint Mechano receptors that closes pain gate at the level of dorsal horn of the spinal cord, and stimulates descending modulation of pain by Peri aqueductal gray matter in midbrain.[33,34]

In Group A, pain was reduced after intervention, the possible mechanism include neurological and tissue factors, such as stimulation of low threshold Mechanoreceptors on centrally mediated pain inhibitory mechanism and on neuronal population in the dorsal horn with possible gating effect. Low threshold Mechanoreceptors from the joint and muscles project to the Peri aqueductal gray matter in the midbrain region. During Isometric contraction and activation of muscle and joint mechanoreceptors occur. This leads to sympatho-excitation evoked by somatic efferent's and localized activation of peri aqueductal gray that plays a role in descending modulation of Pain. Nociceptive inhibition then occurs at the dorsal horn of the spinal cord, as simultaneous gating of nociceptive impulses takes place in the dorsal horn, due to mechanoreceptor stimulation.[35]

The Mechanism for increase in ROM by MET is that muscle contaction against resistance triggers the golgi tendon organ. The afferent nerve impulse from the golgi tendon enters the dorsal root of the spinal cord and meets an inhibitory motor neurons. This inhibits the discharge of the efferent motor neurons impulse and prevents further contraction, the muscle tone decreases, which results in agonist relaxation and lengthening, so there is increase in ROM. The finding of the present study is similar to the work done by guptas, jaiswalp[36]

Subjects were told to discontinue the Pain medications, which may have helped in reducing Pain. However 90% of the subjects stopped their medication during treatment period. Function is considered as one of the essential outcome measure of any treatment approach. A study found significant difference in VAS, Universal Goniometer, SPADI scores between the groups. When compared between groups Spencer MET group showed more effectiveness in reducing Pain, Disability and increasing External Rotation, Abduction and Flexion ROM than Maitland"s Mobilization group[14]

In previous studies on the Gong's Mobilization, the analysis of Pain and shoulder mobility within the group shows the statistically significant change in means of VAS and ROM, when analysed prior to the treatment and post intervention. The mechanism behind pain reduction by joint mobilization includes both Neurophysiologic, Mechanical effects and Rhythemic oscillatory movements stimulates the type 2 dynamic mechano receptors and inhibit the type 4 nociceptive receptors. Hence effectively used to treat reversible painful joint with low mobility.[25-27]

The improved shoulder Medial Rotation range in Group B was due to the fact that shoulder medial rotation is limited by humeral head anterior disposition and when humeral head was compressed posteriorly it maintains the normal postion. Better ouctcomes were seen while mobilization in performed in the end range by maintaining shoulder in neutral position during the antero-posterior gliding.[25] Gong's et.al conducted a study on the effects of Gong's Mobilization applied to the shoulder on Abduction. In that study total 57 male and female subjects suffering with limited shoulder Abduction ROM i.e; less than 120 degrees were included and allocated into Gong's group and Antero-posterior glide group and concluded that both groups were effective in improving shoulder abduction ROM but effect of Gong's mobilization was superior to the Antero-Posterior Glide group.[27]

The ROM increased more by Gong's Mobilization than by Anterior to Posterior Gliding alone because mobilization occurs in the end range in anterior to posterior glide but tension of the posterior joint capsule is reduced in the static position. In Gong's Mobilization on the other hand, Abduction of the shoulder joint occurs when the humerus head is in the normal position; thus normal muscular contraction occurs with the rolling and sliding at the articular surfaces when the tension of posterior joint capsule is reduced.[28]

Dilip JR and Akalwadi A et al; had conducted a study comparing the Gong's Mobilization versus Mulligan's Mobilization. The study results concluded that both Gong's mobilization with Conventional therapy and Mulligan's Mobilization with conventional therapy were effective in reducing Pain and improving shoulder Medial Rotation range in frozen shoulder. However, Gong's Mobilization showed a significant percent of improvement in ROM.[29]

Gong's Mobilization was not typical the AP glide, because in the later technique, humeral head is pushed back to their normal position. The normal position of the humeral head can be held only during static position and fail during dynamic position. However, Gong's technique revives and maintains the neutral position of humeral head in dynamic position. Hence, Gong's technique was considered to be more effective than Antero-Posterior glide.[30-31]

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