Effect of Integrated Neuromuscular Inhibition Technique on Frozen Shoulder

Amir A. Khan[1], Smita Patil[2], Khushboo Bathia[3]

[1]Intern, [2]Assistant Professor, [3]Assistant Professor, Department of musculoskeletal Sciences, Faculty of Physiotherapy, Krishna Institute of Medical Sciences Deemed To Be University, Karad, Maharashtra, India

Abstract

Background: Frozen shoulder is a painful condition of the joint capsule leading to loss of range of motion of the joint. Due to pain and inability to move the involved shoulder, patients tend to avoid any movement of the involved arm. This leads to formation of Myofascial Trigger points and tender points in the muscles. This overall makes the prognosis more challenging as the focus is mostly on the joint. Integrated Neuromuscular Inhibition Technique is a soft tissue manipulation technique that has been proven to relieve trigger and tender points. Although proven to be efficiently effective in many disorders, this technique is not as such practiced as a common and regular approach by professionals. Thus, this technique was undertaken and experimented on Frozen Shoulder.

Objectives: Objectives of the study were to determine the effect of Integrated Neuromuscular Inhibition Technique in Frozen Shoulder and compare the effect of Integrated Neuromuscular Inhibition Technique with conventional treatment in frozen shoulder.

Material and Method: In this experimental study, 40 Frozen Shoulder subjects were assessed using Visual Analogue Scale (VAS), Goniometer for Range of Motion (ROM) and Shoulder Pain and Disability Index (SPADI). The subjects were divided into 2 groups, Group A Included 20 subjects treated with Hot moist pack, Therapeutic Ultrasound, Exercises and Capsular Stretching and Sleeper stretch. Group B included 20 subjects treated with Hot moist pack, Therapeutic Ultrasound, Exercises and Capsular Stretching and Sleeper stretch and Integrated Neuromuscular Inhibition Technique.

Results: Within group statistical analysis of VAS, ROM and SPADI for both the groups were found to be extremely significant with a p value of <0.0001. On comparing between the two groups post treatment, there was extremely significant difference in Group B as compared to Group A regarding VAS (p=0.002), very significant difference for SPADI (p=0.0047), FLEXION ROM (p=0.0076) and ABDUCTION ROM (p=0.0026). But, there was no significant difference between the two groups regarding MEDIAL ROTATION ROM (p=0.1772) and LATERAL ROTATION ROM (p=0.7602).

Conclusion: The study concluded that Integrated Neuromuscular Inhibition Technique and Conventional Physiotherapy are both effective in the management of Frozen Shoulder. Also, Integrated Neuromuscular Inhibition Technique given with Conventional Treatment is significantly more effective as compared to conventional treatment alone on pain, range of motion and functional status of Shoulder and thus Alternate Hypothesis accepted.

Keyword: *Frozen Shoulder, Integrated Neuromuscular Inhibition Technique, Pain, Muscle Release Intervention, Range of Motion.*

Corresponding author:
Dr. Smita Patil,
Assistant professor, department of musculoskeletal sciences, Faculty of physiotherapy, Krishna institute of medical sciences deemed to be university, Karad, Maharashtra, India.E-mail ID: smitakanase@gmail.com

Introduction

Frozen shoulder or adhesive capsulitis is a commonly occurring condition characterized by a capsular pathology associated with pain and progressive loss of passive and active movement. The incidence of Frozen Shoulder in General population is 2-5%, while

in patients with Diabetes Mellitus rises to 20-29% and is more common in females above 40 years of age. (1)

This inflammatory condition that leads to fibrosis of the glenohumeral joint capsule is seen with gradually progressive stiffness and significant restriction of range of motion (typically external rotation). (2) The causes for Frozen Shoulder have been classified according to two types namely Primary and Secondary Frozen Shoulder. While primary is idiopathic, secondary is ought to be due to conditions like Diabetes mellitus, Stroke, Thyroid disorder, Shoulder injury, Dupuytren's disease, Parkinson disease, Cancer, Complex regional pain syndrome. (3)

Subjects suffering with Frozen Shoulder often come up with symptoms of Pain usually Radiating to the deltoid insertion, nocturnal pain that interferes with sleep and restricted movement particularly abduction and external rotation. (4) The condition is marked into four stages through its course starting from the first stage being An Acute Painful Stage, progressing to a Freezing Stage, followed by a Frozen Stage and lastly A Thawing Stage. (5,6,7)

Diagnosis can be made on the basis of history and investigations. Other conditions causing a painful and stiff shoulder are ruled out, the affected shoulder is assessed to identify the stage of the disorder, Any History of previous trauma or surgery around shoulder is enquired. About 50% reduced range of motion may be seen. History of Cardiac or Neurosurgery, impaired consciousness and hemiparesis and other neurological conditions like Parkinson's disease and brachial neuritis. Cervical spondylitis, Diabetes and thyroid disorders and a normal joint appearance in radiograph. (4)

Integrated Neuromuscular Inhibition Technique is a combination of a few techniques in a stepwise application. It involves using the position of ease as part of a sequence which commences with location of a tender/ trigger point, application of ischemic compression and introduction of positional release. After an appropriate length of time, during which the tissues are held in ease, the patient introduces an isometric contraction into the affected tissues for 5-7 seconds. After this, the local tissues housing the trigger point is stretched. (8)

The rationale behind the technique is quiet similar to those of any other muscle release intervention. When a trigger point is being palpated by direct finger or thumb pressure, and when the very tissues in which the trigger point lies are positioned in such a way as to take away the pain (entirely or at least to a great extent), then the most stressed fibres in which the trigger point is housed are in a position of relative ease. At this time the trigger point would be under direct inhibitory pressure (mild or perhaps intermittent) and would have been positioned so that the tissues housing it are relaxed (relatively or completely). Following a period in this position of ease and inhibitory pressure, the patient is asked to introduce an isometric contraction into the tissues and to hold this for 5-7 seconds – involving the precise fibres that had been repositioned to obtain the positional release. The effect of this would be to produce (following the contraction) a reduction in tone in these tissues. The hypertonic or fibrotic tissues could then be gently stretched as in any muscle energy procedure so that the specifically targeted fibres would be stretched following an isometric contraction. The technique is proven to be effective in Non- Specific Myofascial Pains, Trigger Point Pain, Muscle Spasms, Fibromyalgia Syndrome and some other myofascial conditions. (8)

As this technique is found to be effective in these conditions, this made a scope for this technique to be experimented in Frozen Shoulder. In order to find out the effectiveness of the current technique in Frozen Shoulder and enable faster and smoother prognosis of subjects with Frozen Shoulder towards normal functioning, the current study was undertaken.

Materials and Methodology

Study Type: Experimental study.

Study Design: Comparative study (Pre treatment and Post Treatment)

Place of Study: Karad.

Sampling Method:

Simple Random Sampling.

Sample Size:

$n = 4\ pq / L^2$

Total number of subjects in study n = 40

Inclusion Criteria

1. Both male and female participants willing to

participate in the study.

2. Age: 40-65 Years

3. Subjects clinically diagnosed with frozen shoulder by certified physiotherapist/Orthopaedician

4. Subjects in second stage of frozen shoulder.

Exclusion Criteria

1. Recent Trauma around Shoulder.

2. Recent fracture around the shoulder.

3. Open wound or skin disease.

4. Bone tumors.

5. Previous shoulder surgeries.

6. Other shoulder pathologies such as Rotator cuff tear or Chronic Regional Pain Syndrome.

Outcome Measures

1. Visual Analogue Scale (VAS). [9]

2. Universal Goniometer. [10]

3. Shoulder Pain And Disability Index (SPADI). [11]

Procedure :

The study was carried out and the result was drawn by using VAS, SPADI and Joint ROM scores as the outcome measures. 40 patients (23 Males and 17 Females) were undertaken for the study. The age Group was between 40-65 years. Study place was Krishna College of Physiotherapy, OPD. Patients were evaluated and were divided into 2 Groups by convenient sampling with random allocation. Group A Included 20 subjects treated with hot moist pack, Ultrasound, Exercises and Stretching (capsular and sleeper). Group B included 20 subjects treated with hot moist pack, Ultrasound, Exercises and Stretching (capsular and sleeper) and Integrated Neuromuscular Inhibition Technique. An informed Consent was taken from the subjects once they were filtered by the inclusion and exclusion criteria. Subjects were asked to fill the data collection sheets and were treated for 7 days after which. The scores of the outcome measures were measured post-procedures.

Findings

Statistical analysis was done manually and by using the statistics software INSTAT so as to verify the results derived. The statistical analysis within group value of VAS, ROM and SPADI was done by Paired 't' test. Unpaired 't' test was used for interpretation of post interventional values between Group A and Group B. Fisher's Exact test was used for calculating the difference in the age groups and occupation.

Table 1: Gender Distribution.

A total of 40 subjects were taken for the study. Out of 40 subjects 23 were males and 17 were females.

Groups	Group A	Group B	Total
Males	12	11	23
Females	8	9	17
Total	20	20	40

v **Table 2: Age Distribution**.

Age group of all patients ranged between 40-65 years with the mean age of Group A was 49 and Group B was 49.85 years.

Groups	Mean Age (Yrs) ± SD
Group A	49 ± 6.456
Group B	49.85 ± 6.515

Intra group analysis of all pre and post interventional values was done by Paired 't' test. Inter group analysis of all values was done by using Unpaired 't' test. Post intervention analysis of VAS showed extremely significant difference between both groups (p=0.002). Post intervention analysis showed very significant difference between both groups for SPADI (p=0.0047), FLEXION ROM (p=0.0076) and ABDUCTION ROM (p=0.0026).There was no significant difference between the two groups regarding MEDIAL ROTATION ROM (p=0.1772) and LATERAL ROTATION ROM (p=0.7602).

v Table 3: Comparison of baseline parameters

Parameters	Group A	Group B	p value	Inference
VAS	3.75 ± 0.9665	2.4 ± 1.095	0.002	Extremely significant
SPADI	68.1 ± 14.878	52.75 ± 17.363	0.0047	Very significant
FLEXION ROM	125 ± 15.570	137.45 ± 12.150	0.0076	Very significant
ABDUCTION ROM	123.55 ± 14.947	136.35 ± 9.522	0.0026	Very significant
MEDIAL ROTATION ROM	44.25 ± 7.684	47.45 ± 7.022	0.1772	Not significant
LATERAL ROTATION ROM	41.1 ± 7.622	41.8 ± 6.756	0.7602	Not significant

Discussion

A total of 23 males and 17 females were divided in two groups randomly. Group A consisted of 12 males and 8 females, whereas Group B consisted of 11 males and 9 females. The difference between the two groups regarding Gender was found to be not significant

Although Frozen Shoulder is found to be more common in females, the current study had more number of males than females. The possible reasons behind this might be a small sample size and the characteristic flow of patients in the locality.

The mean age of subjects in Group A was 49 ± 6.456 and in Group B was 49.85 ± 6.515. With a p value of 0.5010 the difference in mean age of the two groups was found to be statistically not significant.

In Group A, which is the controlled group, extremely significant difference was obtained by the use of Hot moist pack, Therapeutic Ultrasound, Codman's Pendular Exercises, Capsular Stretching and Sleeper Stretch. The rationale behind each of the treatment and their reasonable effect can be stated as follows. Hot moist packs that transfer heat from the packs to the patient's body increase the temperature of the respective body part. [11] With increase in temperature, the stress-relaxation ability of the collagen fibres is enhanced, which enable larger deformation in these fibres when subjected to stretch. [12]

Therapeutic Ultrasound on the other hand has been proven in previous studies also for elevating collagen tissue extensibility, pain threshold and enzymatic reactions. Also, it causes alteration in nerve conduction velocity, and the contractility of skeletal muscles. [13]

Codman's Pendular exercises are a form of exercises that utilize the effects of gravity to provide a distraction of the humeral head from the glenoid fossa. [14] These exercises help reduce pain via gentle traction and revolving movement and enhance early motion of the articulating parts and the joint synovial fluid. [15]

Capsular Stretching and Sleeper Stretch follow the effects of general stretching with added benefit of going through the capsular pattern of the joint and increasing soft tissue mobility and further increasing joint Range of Motion by elongating the shortened and hypo mobile structures. [14]

In Group B, which is the experimental group, extremely significant difference was obtained by

combining the above-mentioned conventional treatment with a new technique called Integrated Neuromuscular Inhibition Technique. This group showed significant difference when compared with the control group post-interventionally.

The added benefit obtained in this group goes to explain the rationale of use of a Manual Muscle releasing technique which was not used in the control group.

Muscle release interventions have been proven to improve blood circulation, reduce pain, alter the excitability of the alpha and delta motoneurons and thus enhance joint range of motion. (16)

Studies prove that the Ischemic Compression component in the INIT decreases the threshold sensitivity of the pain nodules in the muscles. It is proposed that local pressure tends to equalize the length of sarcomeres in the involved TrP and thus reduces pain. (17) Additionally, a mechanism called 'unopposed arterial filling' has also been put forward which enables improvement in tone of the muscles. (18)

The P value for MEDIAL ROTATION ROM (0.1772) and LATERAL ROTATION ROM (0.7602) showed that the rotational movements ROM in the two groups did not differ significantly. This may have happened because these two movements being performed on a different axis and with shorter moment arms did not require much of muscle point pain corrections.

In this study an attempt was made to analyze the effect of Conventional Treatment and Integrated Neuromuscular Inhibition Technique in relieving pain and improving Joint Range of Motion as well as functional status and strength in Frozen Shoulder patients. This study was done to investigate the reduction of symptoms after application of Integrated Neuromuscular Inhibition Technique in conjunction with Conventional Treatment in Frozen Shoulder patients and its post treatment evaluation in a standardized manner using VAS, SPADI and ROM scores. The result shows that there is significant difference in improvement of pain, functional performance, Flexion and Abduction Range of Motions between the two groups. The group treated with Integrated Neuromuscular Inhibition Technique showed significantly better results for these outcome measures. Although, there was no significant difference regarding Medial and Lateral Rotation Range of Motions between the two groups.

Conclusion

The current study concluded that Integrated Neuromuscular Inhibition Technique and Conventional Physiotherapy are both effective in the management of Frozen Shoulder. Also, Integrated Neuromuscular Inhibition Technique given with Conventional Treatment is significantly more effective as compared to conventional treatment alone on pain, range of motion and functional status of Shoulder and thus Alternate Hypothesis accepted.

Conflict of Interest: There is no conflict of interest concerning the content of the study.

Source of Funding: This study was funded by Krishna institute of medical sciences deemed university, karad

Ethical Clearance: The study was approved by the institutional ethics committee of KIMSDU.

References

1. Binder A, Bulgen D, Hazelman B, Roberts S. Frozen Shoulder: A long-term prospective study. Ann Rheum Dis 1984;43:361-364.
2. Lloyd- Roberts G, French P. Periarthritis of the shoulder. A study of the disease and its treatment. Br Med J 1959;1:1569-1574.
3. Murnaghan J. Frozen Shoulder. In: Rockwood C, Matsen F. The Shoulder. Philadelphia: WB Saunders, 1990:837-862.
4. Codman E. The Shoulder. Boston: Todd,1934.
5. Hannafin J, DiCarlo E, Wickiewiz T, Warren R. Adhesive capsulitis: Capsular fibroplasia of the glenohumeral joint. J Shoulder Elbow Surg 1994; 3(S):5.
6. Hannafin JA,Chiaia TA. Adhesive capsulitis. A treatment approach. *Clinical Orthop Relat Res*. 2000:95-109.
7. Neviaser AS, Hannafin JA. Adhesive capsulitis: a review of current treatment. Am J Sports Med. 2010;38:2346-2356.
8. Leon Chaitow; Fibromyalgia Syndrome: Third Edition:396-396.
9. Polly E. Bijur , Wendy Silver, E. John Gallagher MD. Reliability of the Visual Analog Scale for Measurement of Acute Pain ;December 2001:1553-2712.

10. Prem P. Gogia James H. Braatz Steven J. Rose Barbara J. Norton. Reliability and Validity of Goniometric Measurements at the Knee. *Physical Therapy*, Volume 67, Issue 2, 1 February 1987, Pages 192–195.
11. Artaban Johnson Jeldi, Antony Leo Aseer, Appaswami Gurunatha Dhandapani, Kathryn Elizabeth Roach. Cross-cutural adaptation, reliability and validity of an Indian version for the Shoulder Pain and Disability Index; December 2012;30:99-104.
12. Rigby BJ, Hirai N, Spikes JD, Erying H. The mechanical properties of rat tail tendon. J Gen Phsyiol 1959; 43: 265-283.
13. Robert A Donatelli, Michael J and Wooden, Orthopaedic Physical Therapy. 3rd ed Churchill Living Stone publication; 153-158.
14. Kisner, Colby: Therapeutic Exercise, ed 4th, F A Davis 2002; 325.
15. Yesim Kurtai, et al, Adding Ultrasound in the Management of Soft Tissue Disorders of the Shoulder. A Randomized Placebo-Controller Trial; Manual Therapy, Vol.84 No.4, April 2004;336-343.
16. Gordon CM, Andrasik F, Schleip R, Birbaumer N, Rea M. Myofascial triggerpoint release (MTR) for treating chronic shoulder pain; a novel approach. J Bodyw Mov Ther; 2016: 614-22.
17. Travell J, Simons DG. Myofascial pain and dysfunction. The trigger point manual. The lower extremities. 1st ed. Vol. II Baltimore, MD: Lippincott Williams & Wilkins; 1999.
18. Simons DG. Understanding effective treatments of myofascial trigger points. J Bodyw Mov Ther 2002;6: 81–8.