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The Immediate Effect of Combination Therapy with TENS and Active Movement on Mobility and Pain Relief in a Patient with Frozen Shoulder: A Case Report

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ABSTRACT

Background and Purpose: Although the use of transcutaneous electrical nerve stimulation (TENS) for pain relief in various neuro-musculoskeletal conditions is well documented but there is hardly any study about TENS and active movement combination therapy in frozen shoulder. The purpose of this case report is to describe the use of TENS along with active movements in a patient with a frozen shoulder who had pain and mobility issues in the left shoulder for more than 6 months.

Case Description: The patient, a 52-year-old male, was referred to orthopedic physiotherapy OPD with a left frozen shoulder for the last six months with associated co-morbidity in form of type 2 diabetes for 18 years. His complaint was pain and stiffness in his left shoulder that affected his activities of daily living including sleep and his constant shoulder score was 47.

Outcomes: After intervention which included the application of LF TENS (Low-frequency Trans cutaneous Electrical nerve Stimulation) for 20 minutes with a portable TENS machine and then active movements along with TENS. Participant's pain on active movement got reduced to 1/10 on the NPRS scale and he felt comfortable in doing movements and the range of active flexion elevation increased by 15 degrees. After one week the constant shoulder score was 45.

Discussion: This case report outlines the novel use of TENS along with active movements in the treatment of the frozen shoulder.

Conclusion: Pain-free active flexion elevation demonstrates an immediate improvement in range. The results warrant further research and exploration in clinical applicability.

KEYWORDS: Frozen shoulder, TENS, Combination therapy, case report, rehabilitation

INTRODUCTION

Chronic shoulder pain has considerable health care costs and a major impact on the health of affected individuals, including absence from work and disability. Shoulder complaints may have an unfavorable outcome, with only about 50% of all new episodes of shoulder complaints presenting in health care practice showing a complete recovery within six months. [1,2] After one year, this fraction increases to sixty percent. A study that involved a self-administered questionnaire as a part of general health screening reported an estimated prevalence rate of 15.4 % in men and 24.9% in women who reported weekly episodes of pain. [3]

Non-traumatic shoulder pain is one of the disabling and episodic conditions. Large proportions of patients report symptoms that may get alleviated, only to be experienced again sometime in the near or distant future. Shoulder pain can occur due to either local or systemic causes. It has been reported that about 95% of all shoulder disorders are due to four conditions: adhesive capsulitis, simple tendinitis, tendinous perforation and rupture, and hyperalgesia calcareous tendinitis. Note that three of these four conditions are tendinous in origin, but tendon inflammation is not as common in the shoulder as it is in the elbow and wrist. [4-6] However, since all tendons are avascular, every one of them is subject to chronic trauma, microtears, slow repair, and aging degeneration.

Patients with chronic episodic shoulder pain are often seen and treated by physiotherapists. Shoulder vasculopathy and tendinopathy with or without additional inflammation mimic the

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clinical presentation with shoulder pain located at acromion, deltoid and joint capsule that may radiate up to if not below the below, mimic the clinical presentation [7-9] and key to its treatment is pain-free active movements and mostly this is tried after the application of pain-relieving modalities like TENS. In the present study, the investigator tried a simultaneous application of TENS for pain relief along with active movements to get the additional effect of negating fear of pain.

Description of case: This case report followed a science teacher with a left frozen shoulder for six months. The outcome measures included NPRS for pain, constant shoulder score, and active range of shoulder flexion elevation and abduction elevation.

History: Mr. S, a 52-year-old science teacher had considerable left shoulder pain, stiffness, and difficulty in activities of daily living especially sleeping on the affected side for six months. He visited the orthopedic department with the recent aggravation of pain, he was diagnosed by orthopedic surgeon as having frozen shoulder based on clinical presentation with normal radiography investigation.[10] Further, he was advised to take NSAIDs and for physiotherapy treatment.

Examination: Patient-reported pain in Deltoid region acromion, shoulder joint line, and arm up to the elbow and lateral epicondyle. Local tenderness at the insertion of supraspinatus tendon & joint line and spasm of deltoid and rotator cuff muscles was present. Active movements were painful at the end range, combined movements like hand behind the neck and behind the lumbar region reproduced the symptoms. Patient-reported that during working days he had less discomfort but, in the evening, at night, and till he took a bath discomfort was considerable. The left shoulder reach test was positive. Average NPRS for active shoulder movements was 8, constant shoulder score was 47 and active shoulder flexion elevation was 155 degrees, abduction elevation 120 degrees, and external rotation was 20 degrees. **Investigation:** Shoulder X-ray in anteroposterior view with glenohumeral joint in the neutral rotation was normal and supraspinatus outlet view and axillary lateral views revealed no abnormality. **Consent:** After examination, the therapist explained the findings, the procedure, and the requirement of the procedure and asked for his consent in writing.

Pre-therapy scores: Pain on active shoulder movements were 8 on NRPS (Numerical Pain Rating Scale), constant shoulder score was 47 and active shoulder flexion elevation was 155 degrees, abduction elevation 120 degrees and external rotation was 20 degrees. NPRS was used as an outcome measure since it is reported as unidimensional pain measure of pain intensity in adults including those with chronic pain [11-13] and constant shoulder pain has been reported as one of the common clinical methods of functional assessment of the shoulder. [l4] **Patient position:** Supine lying for initial twenty minutes and then long sitting for the next ten minutes to do active movements with simultaneous TENS application. Application of TENS was considered since it has been reported to significantly increase pain free range of motion more than heat combined with exercise and manipulation. [15] **Procedure:** Before the treatment, the protocol was explained, and his co-operation was requested for the active movements along with TENS. For the initial twenty minutes, the patient was supine lying and LF TENS (frequency 30 Hz, modulated TENS with high or tolerable intensity) was applied with the anteroposterior application of self-adhesive disposable electrodes over shoulder joint lines. After twenty minutes, the patient was in long sitting and instructed for active shoulder flexion, abduction, and external rotation for ten repetitions (figure1 & 2). Immediately after this, a re-assessment of outcome measures was done by the same therapist. Further, it was found that there was a significant increase in the range of active flexion and abduction elevation along with TENS due to relief of pain and a decrease in fear of pain. Participant's pain on active movement got reduced to 1/10 on the NPRS scale and he felt comfortable in doing movements and the range of active flexion elevation increased by 15 degrees. After one week the constant shoulder score was 45.

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Figure 1, 2: Application of TENS with active shoulder flexion and abduction

DISCUSSION

This case provides information on the immediate effect of simultaneous use of TENS along with active movement as an innovative treatment approach in the treatment of the frozen shoulder. There is hardly any published research that exists about the combination of active movements along with TENS application. Although, clinical practice guidelines recommend TENS and end range stretching as a part of physiotherapy management so far there is hardly any study that has reported the simultaneous application of TENS along with active movements in the treatment of frozen shoulder. Hence, interpretation of the results concerning previous evidence becomes difficult at this juncture. In the present study, an investigator could not study the exact cause and effect relationship, and considering the nature of this study design, the generalization of the results of this study has limitations.[16] Hence, evidence from a larger, placebo-controlled trial is needed with adequate follow-up to determine whether combination therapy of TENS with active movements (TWA) will reduce the pain and improve shoulder function in patients with shoulder pain and stiffness due to various pathologies.

In summary, this case showed the feasibility of TENS with active movements as a combination therapy in the treatment of the frozen shoulder. It resulted in immediate improvement in pain-free active range of motion, physical and functional well-being, body dissatisfaction, body attitude, and thereby, quality of life. TENS with active movements may be considered as an adjunct to the management of frozen shoulder.

CONCLUSION

Pain-free active flexion elevation demonstrates an immediate improvement in range. The results warrant further research and exploration in clinical applicability.

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Effect of Masako Maneuver Along with Orofacial Exercise on Swallowing Ability and Quality of Life In Subject with Post Stroke Dysphagia

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ABSTRACT

Background: Stroke is one of the most common causes of disability and the second leading cause of mortality in India. It is very usual for dysphagia to occur after an acute stroke. In physical treatment, manual therapy is essential. Many exercises are taught to patients suffering from dysphagia and they focus more on oropharyngeal region.

Objectives: The aim of the study is to find the effect of Masako maneuver along with Orofacial exercise on swallowing ability and quality of life in subject with post stroke dysphagia.

Methodology: The study was a single group pre and post experimental study design. 20 patients were selected in this study with post stroke dysphagia. Swallowing ability and Quality of Life will be measured by using MD Anderson Dysphagia Inventory and Short Form 36 questionnaire. The group received Masako maneuver along with orofacial exercise.

Result: The result showed that there is a significant improvement in MD Anderson Dysphagia Inventory (Pre-test - 36.50 and Post-test - 51.65) and in Short Form 36 (Pre-test - 44.30 and Post-test - 59) after 6 months of training.

Conclusion: The study concludes that Masako maneuver along with Orofacial exercises are effective in improving the swallowing abilities and quality of life among subjects with post stroke dysphagia.

Key words: Dysphagia, Masako Maneuver, MD Anderson Dysphagia Inventory Questionnaire, Orofacial Exercises, Short Form 36 Questionnaire, Stroke.

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Ethical Approval: The study was approved by the college ethics committee, K.G. College of Physiotherapy, Coimbatore.

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INTRODUCTION

The World Health Organization (WHO) defines a stroke as having rapidly developed clinical indications of a localized or generalized impairment of brain function that lasts for more than 24 hours or results in death and has no other apparent cause other than a vascular origin. A stroke is a sudden decline in brain function caused by a significant reduction in blood supply to a specific area of the brain, or due to haemorrhage. These are her two basic types of strokes. Both damage certain areas of the brain and also impair its function. A stroke's clinical characteristics include BEFAST (Balance, Eye, Facial droop, Arm weakness, Speech difficulty and Time) [12,27]. Stroke Association of India: Over the past few decades, the incidence of stroke in India has nearly tripled. Only prompt treatment can reduce morbidity and mortality among the 1.8 million stroke patients who suffer a stroke in India each year [2]. The burden of stroke in India is steadily increasing, with stroke now being the fourth leading cause of death and the fifth leading cause of disability in the country. Studies suggest that the rate of stroke in India falls between 105 and 152 cases per 100,000 individuals annually. Moreover, men are about 1.25 times more likely to suffer from a stroke compared to women. As such, addressing the rising prevalence of stroke in India is crucial to mitigating its impact on public health and improving overall quality of life for individuals at risk [3,26,28]. Stroke frequency doubles in the 10 years after age 65. Haemorrhagic stroke is the most common cause of death with a mortality rate of 37% to 38%, while ischemic stroke has a mortality rate of 8 to 12%. Important mortality indicators include loss of consciousness at stroke onset, lesion size, chronic severe hemiplegia, multiple neurological deficits, and history of previous stroke, three major stages are used to describe the progression of stroke [29].

- Acute (1 to 7 days)
- Sub-acute (1 weeks to 6months)
- Chronic (more than 6 months)

Stroke is a major cause of abnormal movement synergies, decreased motor performance, and long-term disability, especially in adulthood. Additionally, for each people, the risk of falls due to decreased balance and increased energy expenditure during daily activities is reduced[11,16,14].The most common clinical presentation was headache complained by 87 [75.0%] patients followed by aphasia/dysphasia 70 [60.3%], hemiparesis62 [53.4%], facial palsy 60 [51.7%], vomiting [46.6%], bladder/ urinary incontinence 44 [37.9%], decreased level of consciousness 43 [37.1%], hemiplegia 38 [32.8%],dysphagia 26 [22.4%], dysarthria 24 [20.7%], blurred vision 23 [19.8%], ataxia 21 [18.1%], loss of memory 18 [15.5%], vertigo 16 [13.8%], neck stiffness 15 [12.8%], asphyxia 14 [12.1%], chest pain 14 [12.1%], forced gaze (conjugated deviation) 12 [10.3%], coma 11 [9.5%], altered sensorium 9 [7.8%], seizure 8[6.9%], trismus (lock jaw) 5[4.3%] [5]. Oropharyngeal dysphagia, a common condition, affects three main groups: the elderly, patients with neurological or neurodegenerative diseases, and patients with head and neck diseases. This condition makes it difficult for individuals to swallow food and liquids safely and comfortably. Proper diagnosis and treatment can help individuals with oropharyngeal

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dysphagia enjoys eating and drinking without complications. Oropharyngeal dysphagia is associated with decreased laryngopharyngeal sensitivity, damage to cortical regions of the central nervous system or the swallowing centre, and impaired efferent nerve or muscle drive [1,25]. Oropharyngeal dysphagia is a Serious condition because it affects quality of life and causes nutritional and respiratory complications associated with poor prognosis and high mortality. Oesophageal dysphagia is usually caused by primary or secondary oesophageal dysmotility affecting the enteric nervous system or the muscular layer of the oesophagus [7]. A commonly used medication and drug for dysphagia is botulinum toxin type A (BONT-A), Diltiazem – May help the oesophagus contract and move, especially in a condition known as nutcracker oesophagus. Glucagon – Diazepam is used to relieve esophagitis, a condition where the lining of the oesophagus becomes inflamed and irritated. This medication helps to reduce the inflammation and discomfort caused by esophagitis, allowing the person to feel better and improve their overall quality of life. Sometimes diazepam is also used. Cystine depletion therapy with cysteamine - treatment of choice for patients with dysphagia due to cystinosis before and after transplantation [8,20]. Several interventions are being investigated to treat dysphagia. When we speak, our vocal folds come together to produce sound. Our lips, tongue, and jaw also move to help form different sounds. Additionally, our jaw helps with chewing and biting while we eat. All of these movements work together to help us communicate effectively through speech and eating. Exercises to help dysphagia like Effortful swallow, Dynamic shaker, Jaw thrust, Masako manoeuvre, Mendelsohn manoeuvre, Supraglottic manoeuvre, Hyoid lift manoeuvre is used as a treatment for dysphagia [3,10,24]. In this think about we utilized to treat dysphagia subjects by Masako manoeuvre along with Orofacial exercise. In Post stroke dysphagia (PSD), swallowing ability is measured using several outcome measures such as the Dysphagia Severity Rating Scale (DSRS), which grades how severe dysphagia is based on fluid and diet modification, Functional Diet Scale, MD Anderson Dysphagia Inventory, Penetration Aspiration Scale (PAS), Functional Oral Intake Scale (FOIS), The Mann Assessment of Swallowing Ability (MASA), Dysphagia Severity Rating Scale (DSRS), National Institutes of Health Stroke Scale (NIHSS), Modified Rankin Scale (MRS), and Quality of Life (QoL) [6]. In this study we used to measure the swallowing ability by using the MD Anderson Dysphagia Inventory. There are several outcome measures for the Quality of Life. The outcome measures used to measure Quality of Life are Swallowing Quality of Life (SWAL-QOL), Health Related Quality of Life (HRQOL), General Quality of Life, Dysphagia – Related Quality of Life were used as an outcome to measure the Quality of Life. In this study we used to measure the Quality of Life by using Short Form 36. The aim of this study is to find out the effect of Masako manoeuvre along with Orofacial exercise on gulping capacity a nd Quality of Life in subjects with post stroke dysphagia. The objective of the study is to find out the effects of Masako manoeuvre along with Orofacial exercise on swallowing ability and Quality of Life in subjects with post stroke dysphagia.

OBJECTIVES

- To find out the effects of Masako manoeuvre along with Orofacial

exercise on swallowing ability in subjects with post stroke dysphagia.
- To find out the effects of Masako manoeuvre along with Orofacial exercise on Quality of Life in subjects with post stroke dysphagia.

REVIEW OF LITERATURE

STROKE

Tasneem Hartley et al., (2022)

Globally, stroke is the third most common cause of disability and an increasing global burden. It is well-documented that 80% of strokes occur in low- to middle-income countries. With the high rate of Non-Communicable Diseases (NCDs), lack of physical activity, poor diet and rate of alcohol consumption, stroke has become the eighth most common cause of years of life lost to illness and ninth cause of disability in South Africa.

Corinne A. Jones et al., (2020)

Stroke is one of the leading causes of dysphagia, with incidence rates up to 80%. Incidence estimates depend on the definition of dysphagia, which can range from failing a dysphagia screen, to prescribed diet modifications, to measures of physiology on an instrumented swallowing study.

MASAKO MANEUVER

Jahanvi Barot et al., (2023)

The Masako manoeuvre improves the function of pharynx musculature by strengthening the base of the tongue muscles. It has been reported to improve swallowing by improving the coordination of the larynx, hyoid bone, and pharynx. This also reduces airway obstruction during pharyngeal swallowing.

OROFACIAL EXERCISE

Lockwood C et al., (2023)

Oral motor exercises support the maintenance and strengthening of the oral cavity for persons with dysphagia following a stroke. Adapt swallowing exercises to the individual's needs, abilities and preferences and the specific swallowing impairment. Regular therapy is recommended including skill and strength training in direct therapy (with food/fluids) and indirect motor therapy.

MD ANDERSON DYSPHAGIA INVENTORY

Hemail M. Alsubaie et al., (2021)

The MD Anderson Dysphagia Inventory (MDADI) is a self-administered, 20-item survey devised to assess the degree of swallowing-related QOL.The composite score ranges from 20 (extremely low functioning) to 100 (high functioning) The results of the test–retest reliability was revealed to be acceptable for the MDADI kappa coefficient for each item (ICC > 0.70), as well as the ICC for individual domains (emotional = 0.973, physical = 0.971, and functional = 0.956) and composite score (ICC = 0.984)

SHORT FORM 36

Craig Anderson et al., (1996)

Few studies have examined the utility of a new generic health status measure, the Short Form 36 health survey questionnaire (SF-36), in stroke patients. Our aim was to test the internal consistency and validity of the SF-36 in a cohort of long-term stroke survivors. The SF-36 was relatively quick and easy to use and had satisfactory internal consistency (Cronbach's α>0.7).

MATERIALS & METHODS

The study design is a Pre-test and Post-test Single group Experimental study. The study was conducted at the K.G PHYSIOTHERAPY AND REHABILITATION CENTER, Saravana Patti, K.G HOSPITAL, Coimbatore. The study was conducted for the period of 6 months, the treatment

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duration was 60 minutes / session, 5 times / week for a period of 4 weeks.20 subjects who fulfilled predetermined inclusion criteria and exclusion criteria were selected as Single group using convenient method. This group was named as group A. This group receives Masako manoeuvre along with Orofacial exercise. The selection of the patients based on the inclusion criteria are subjects with post stroke dysphagia were clinically diagnosed by neurologist, subjects with symptoms of stroke after 7 days of onset, age 50 - 70 years. Both genders were included, subjects who have sufficient, physical and mental ability to understand instruction and cooperate throughout the session, able to communicate properly. The exclusion criteria are haemorrhagic stroke, uncontrolled hypertension, hearing impairment, pain from multiple sources, behavioural disorders, patients who could not lift their head and flex the neck, those who had undergone tracheostomy, unstable medical conditions.

MASAKO MANEUVER:

The Masako manoeuvre fortifies the muscles at the base of the tongue and progresses the muscles of the throat. The Masako manoeuvre has been observed that the Masako manoeuvre enhances the synchronisation of the pharynx, hyoid bone, and larynx, hence enhancing swallowing. This reduces airway obstruction during swallowing [7,8].

Instructions:

- Adhere out your tongue and hold it between your lips/teeth.
- Swallow your saliva while holding in this position.
- If this is as well troublesome to start with, you can keep your tongue against the interior of your teeth.
- Practice this technique 3 times per day 3-5 repetitions per set.
- Stop if you are getting tired or finding it difficult.

Tip: If you don't have enough saliva, moisten your mouth in between repetitions.

MASAKO MANEUVER:

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OROFACIAL EXERCISE

Orofacial Exercises & Oral Exercises-the oral muscles can help you improve your ability to swallow, speak, and function. The following treatment procedure was used during the orofacial exercise session.[12].

- Warm up session- 5 minutes
- Stretching- 5 minutes
- Active range of motion exercise- 10 minutes
- Passive range of motion exercise- 5 minutes
- Strengthening exercise- 10 minutes
- Cool down session- 5 minutes

Each session has some special types of exercise and rest is provided during the session. The therapist guided throughout the sessions. Totally the treatment duration are 40 minutes per session, one session per day, 3days per week for a duration of 4 weeks.

Warm up session:

- Finger tapping over the face.
- Brushing over the facial muscle.

Stretching:

- Orbicularis oris
- Mentalis muscle
- Frontalis muscle
- Masseter muscle
- Temporalis muscle
- Circular stretching over the buccinators muscle, zygomatic major and minor, and depressor angular orris.

Relaxation:

- Brushing with three- point position (jaw, lower lip, upper lip)

Active range of motion exercise:

- Air blowing exercise.
- Back and forth
- Pointing tongue
- Jaw aerobics
- Say ‘ahh’ mouth opening exercise
- Straw sucking exercise

Passive range of motion exercise:

- Eye brows rising exercise with assistance and passively.
- Eye closing exercise with assistance and passively.
- Make the nasolabial fold passively.
- Mouth opening exercise with passively therapist by assistive.

Strengthening exercise:

- Tongue in cheek
- Wide mouth Grog pulls
- Jaw curls
- Tongue pops
- Sucking
- Water hold

Cool down:

- Tapping
- Brushing

OROFACIAL EXERCISE WARM UP

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Figure Tapping

Frontalis

Brushing

Buccinator

STRETCHING OF FACIAL MUSCLES:

Orbicularis orris

Mentalis

Masseter

Zygomaticus

ACTIVE RANGE OF MOTION EXERCISES

Air Blowing Exercise

Back and forth

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Pointing tongue exercise

Jaw Aerobic Exercise

Say ‘ahh’ mouth

Straw sucking exercise

STRENGTHENING EXERCISE:

Wide mouth grog pulls

Jaw Curls

Water Hold

STATISTICAL ANALYSIS

The statistical tool used to this study was paired ‘t’ test.

The paired ‘t’ test was used to find out the statistical significance in pre and post-test of the subject treated with Masako maneuver along with Orofacial exercises.

TABLE – I

COMPARISON OF PRE-TEST AND POST-TEST VALUES OF MD ANDERSON DYSPHAGIA INVENTORY FOR SWALLOWING ABILITY IN GROUP A.

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S.NO	MD ANDERSON DYSPHAGIA INVENTORY	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 't' VALUE
1.	Pre test	36.50	15.15	7.19	26.898
2.	Post test	51.65		7.34	

It shows the analysis of MD Anderson Dysphagia Inventory. The paired 't' test with 19 degrees of freedom with Pre versus Post session value of **26.898** at 0.05 level of significance which was greater than the tabulated value of **2.093.** This showed that there was a statistical significance difference in between Pre versus Post-test values.

GRAPH – I

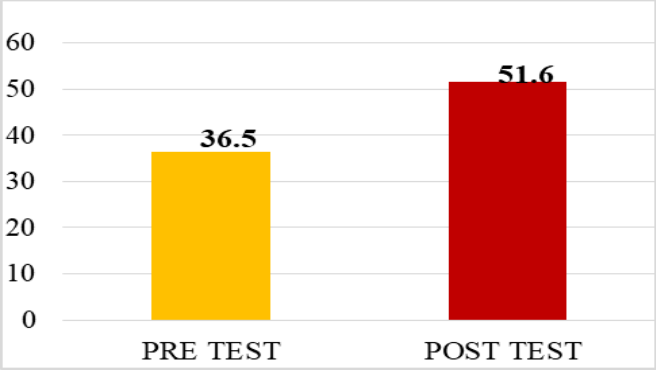
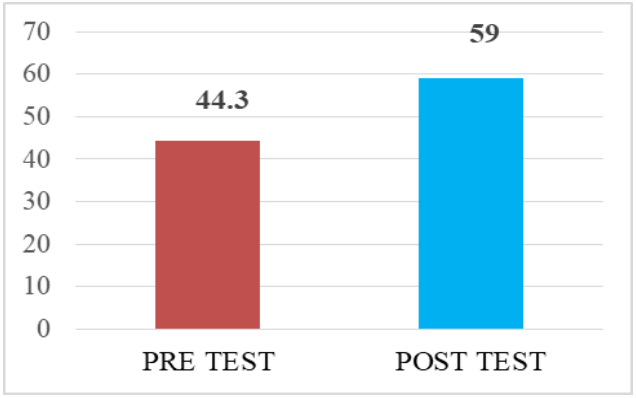


TABLE - II

S.NO	SHORT FORM 36	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 't' VALUE
1.	Pretest	44.30	14.7	2.54	18.412
2.	Post test	59		3.68	

GRAPH – II



It shows the analysis of short form 36. The paired "t" test with 19 degrees of freedom with pre versus post session value of **18.412**at 0.05 level of significance which was greater than the tabulated value of **2.093**. This showed that there was a statistical significance difference in between pre versus post-test values.

The paired 't' test analysis for the pre- test and post-test variables of MD Anderson Dysphagia Inventory group A with post stroke dysphagia which was shown in table III. The group shows significant difference in pre-test and post-test values. The 't' value of group A is **26. 898.**The paired 't' test analysis for the pre-test and post-test variables of short form 36 group A with post stroke dysphagia which was shown in table IV. The group shows significant difference in pre-test and post-test values. The 't' value of group A is 18. 412.Even though statistical analysis revealed that there is statistically significant improvement in pre and post of group in MD Anderson

Dysphagia Inventory questionnaire and short form 36 questionnaire.

Totally 20 subjects were conveniently selected into group A. Age group of subjects are between 50-70 years. The paired "t" test analysis for the pre-test and post-test variables of MD Anderson Dysphagia Inventory group A with post stroke dysphagia which was shown in table III. The group shows significant difference in pre-test and post-test values. The "t" value of group A is 26.898.

The paired "t" test analysis for the pre-test and post-test variables of short form 36 group A with post stroke dysphagia which was shown in table IV. The group shows significant difference in pre-test and post-test values. The "t" value of group A is 18.412.

Even though statistical analysis revealed that there is statistically significant improvement in pre and post of group in MD Anderson Dysphagia Inventory questionnaire and short form 36 questionnaire.

CONCLUSION

The MD Anderson Dysphagia Inventory questionnaire and short form 36 questionnaire was given to each subject individually and marked the score. The study concludes that Masako maneuver along with Orofacial exercises are effective in improving the swallowing abilities and Quality of Life in subjects with post stroke dysphagia.

LIMITATIONS AND RECOMMENDATIONS

- The study was not followed in the age of below 50 years
- The study was done with two outcome measures
- This was a lack of long term follow up study.
- Only stroke dysphagia patients were included
- This study was including the age group of 50 to 70 years
- This study was focused on swallowing ability and Quality of Life
- Large sample size can be used to demonstrate the effects of intervention.
- Long term follow up should be done
- Future study can focus on improving other skills such as breathing control and speech

CONFLICT OF INTEREST

There was no personal or institutional conflict of interest for this study.

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Exercise Therapy Protocols in Treatment of Non-Specific Low Back Pain-A Literature Review

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ABSTRACT

Background: Non- specific low back pain can be defined as pain or discomfort which arises via unknown cause or pathology, which may/ may not be radiating to legs. There is a need to assess the efficacy of currentlyused treatment protocols to find the best out of them.
Materials and Methods: Search was done on three sources i.e., google scholar, PubMed and springer nature and related literature was obtained. A thorough appraisal of twenty research papers was done to draw an accurate result.
Result: Observation was drawn that instead of using a single technique, a combination of two or more techniques [like combination of dynamic stabilization exercises and muscle energy technique]. Apart from that, app-based physiotherapy regimens were found to be more effective than conventional physiotherapy.
Discussion: The results were derived that use of technologies has been found to be effective in treating CNSLBP and it can also help in yielding better results when combined with physiotherapy techniques.
Conclusion: From the above study it was concluded that combining the treatment protocol can help achieve treatment goals earlier and can also help reduce disability.
Keywords: Non-Specific low back pain, Myofascial Release Therapy, Muscle Energy Technique, Latest Physiotherapy Protocols.

INTRODUCTION

The most typical cause for dysfunction and absenteeism is low back pain (LBP), a serious health issue [1] Research on non-invasive therapies for treating the persistent LBP has been conducted over the past few decades and physiotherapy is one of them to be found effective in managing LBP [2]
Mechanical, non-mechanical, and psychogenic forms of LBP, all of them can take place. Further mechanical LBP distinct into specific and non-specific mechanical pain. Non-specific LBP is personified by pain without any specific cause or underlying disease. Back pain that is not specific to any one causative agent or underlying condition is referred as non-specific LBP [3]
Predictions of the broader population's occurrence of LBP varies from 30 to 80% throughout the world, and is among the most prevalent musculoskeletal disorder in both developed and underdeveloped nations. Lower socioeconomic position and educational attainment in those countries have been linked to LBP. After a single episode of LBP, the persistence rate was found to be 60–80% [4] Additionally, it was found that the chronic type of LBP was

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connected to the highest level of disability and that the frequency rose with increasing age.[5]

Physically, patients with chronic LBP may have limitations like weak and insufficient muscles for trunk stabilization, poor static postural control, and altered gait performance[5] Numerous neuromuscular factors, such as weakness of muscles, postural instability, altered equilibrium, and debilitated sacroiliac joint, can be a contributory factor of chronic LBP[6] Patients suffering from CLBP face trouble controlling their movements, and they become more disabled and limit their activities out of fear of their pain returning at different time.[6,7]

Non- specific low back pain consists of all possible medical conditions causing pain and discomfort in lower back region (below 12th ribs and above inferior gluteal fold), which may/may not be radiating towards legs. Hip muscles are crucial in conveying stresses from the lower extremities to the spine, especially in activities involving upright posture and hence could be the reason of LBP [8]

An internationally acceptable **categorization of LBP** divided it into 3 types:

- Particular pathophysiology of spine
- Pain throughout the nerve root
- Non specified LBP it was named as "diagnostic triage"(waddle 1987) [8]

Janda classified muscles into two types i.e., flexors in other words known as tonic muscles which were majorly prone for tightness or shortness and the second one was extensors or phasic muscles which were majorly prone for weakness or inhibition. Janda's approach resulted in lessened discomfort & reduced dysfunction in LBP's patients [8]

Treating the hip joint is the goal for NSLBP patients, particularly for those who also experience hip joint pain. For NSLBP, exercises that help in strengthen & stabilize the muscles is recommended as a rehabilitation approach. Exercises that induce the stabilization of core muscles helps stabilize the spine by training the specific fashion in which muscle works without any undue pressure over the underlying tissue.[9]

Consequently, subjects with LBP are expected to benefit from a number of advantages associated with blended care—the integration of online applications into healthcare.[10]

One of the primary treatment modalities, manual acupuncture (MA), is primarily used for a variety of painful and other conditions. To enhance the benefits of it, electroacupuncture (EA) combines the ancient practiceswith electric current.[11]

Strong evidence points to nons pecific LBP to be a multidimensional disease wherein muscle guarding takes place in response to the pain and when it is combined with psychological (such as low will power, fear from pain, and emotional instability), social (like stressful living conditions), and lifestyle factors (such as sedentary lifestyle, disturbed sleep cycle) can lead to a very harmful triage of distress, pain & dysfunction.[12]

To identify and study the effect of currently used exercise therapy protocols in patients with Non-specific Low Back Pain.

REVIEW OF LITERATURE

1. Cui D et al. (2023) The goal of this randomized controlled trial (RCT) is to analyse the clinical results of patients with CLBP who receive evidence-based in-person physiotherapy against those who receive digital intervention. As a possible approach to lessen the burden of CLBP, this RCT shows that a remote digital intervention can support recovery at the same levels as evidence-based in-person physiotherapy [1]
2. Aubin-Porras V et al. (2021) aims to assess how physiotherapy affects patient's subjective pain perception and autonomic nervous system activation in patients suffering from LBP. Only males participating in a strength of 30 suffering from NSLBP were divided into 3 groups: (A) manual therapy cantered on soft tissue techniques and joint mobilization in the lumbar region; (B) stretching exercises; and (C)

core muscle motor control exercises. In NSLBP patients, physiotherapy treatment was found to be able to reduce the subjective pain perception and increase the parasympathetic nervous system activation.[2]

3. Bhosale SV et al. (2021) aims to ascertain the short-term combined effects of quadratus lumborum muscle stretching, muscular energy technique (MET), and myofascial release (MFR) therapy on NSLBP. Thirty-five patients in all were distributed in a group of 2 for this study: first group was referred as the control group and the other one was named as experimental group. This study lasted for two weeks. The study concluded that treating individuals suffering from NSLBP with a combinationof MFR, MET, and quadratus lumborum stretching has proven to be more effective for the experimental group.[3]
4. Ahmad UA et al. (2021) 125 patients were enrolled in a double-blind randomized control trial and splatted it in a group of 3: Only dynamic stabilization exercise (DSE) with total number of participants to be 39, one with only traditional physiotherapy with a total number of 45 patients and the last onewith a combination of DSE with that of MET in total of 41 patients. Two weekly interventions were given during the course of the 12-week study. With the exception of functional disability, the results showed that group consisting of 41 subjects that were treated with a combination of DSE with met performed way better than the other two groups and that too in each and every measure of effects.[4]
5. Schema L et al. (2021) conducted a RCT to examine the precise psychological, intellectual, and physical impact of multimode in individuals with CLBP. Over a 12-week period, the specific number of subjects were given multimode 2 times in a week for 1 hour and that group was named as intervention group. The study concluded that multimode can be helpful in enhancing the range of motion and functional capacity in the lower limb. Apart from this, physical and physiological functions will also be improved.[5]
6. Alvani E et al. (2021) performed an interventional study to look into how neuromuscular exercises affect military personnel with LBP's proprioception, balance, functional impairment, and level of pain. Random assignments were made to place subjects with LBP into two groups: intervention (15 people) and control (15 people). For eight weeks, regular daily life activities were performed via controlled group but on the other hand 3 sessions of 1 hour each of the neuromuscular exercises was performed via the other group. The findings show that among subjects with CLBP, eight weeks of neuromuscular exercise reduced pain intensity and enhanced functional ability, static and dynamic balance, and proprioception.[6]
7. Murtagh S et al. (2021) conducted a cross-sectional observational survey to provide an overview of the range of interventions that private United Kingdom based physiotherapists imply for patients with LBP & the degree till which these interventions are in line with clinical guidelines. This research sheds light on the self-reported practices of the involved physiotherapists and emphasizes how they typically used a multimodal treatment approach for LBP patients.[7]
8. Mirmoezzi et al. (2021) performed a semi-experimental study to analyse the effect of hydrotherapy-based McKenzie and Williams in patients with NSLBP. Hydrotherapy based McKenzie and Williams therapy for 3 days per week till 20 sessions was performed on total 28 patients with NSLBP. Outcomes measures were numeric pain rating scale, Roland-Morri's disability questionnaire, and straight leg raise test. Author concluded that after 10 sessions of hydrotherapy program

which was designed based on McKenzie and Williams therapy got relieved from NSLBP.[8]

9. Bhat V et al. (2021) performed a parallel group study among 65 subjects with NSLBP. 33 Subjects were given strengthening exercises along with MFR and 32 subjects were given strengthening exercises with sustained natural apophyseal glides (SNAGs) for 6 sessions over a week. Outcome variables were pain, functional independence, disability, ROM, immediate and short-term effects. Results showed that both the group showed similar improvement in pain and restricted function. However, mulligans SNAGs performed better for limited flexion ROM of lumbar spine. So, the conclusion was drawn that both the manual therapies can help achieve better results along with exercises for patients with NSLBP.[9]
10. Tank SN et al. (2020) performed an intervention study consisting of 34 subjects 25 to 45 years of age (including both females and male) which were categorized in a group of 2. One of the groups was an intervention group that performed normal exercises plus stretching and strengthening exercises and another was a control group. Both the group performed the exercises for two weeks and at least 6 days in a week. Outcome was drawn via numeric pain rating scale and modified Oswestry index (MODI) and both the measures were found to be improved in the interventional group. When used in conjunction with traditional therapy, Janda's method assists patients with NSLBP to achieve greaterimprovements in pain and function.[10]
11. Kim B et al. (2020) carried out an RCT, on subjects with NSLBP to see if activity level & physical function could be enhanced or not with the help of hip muscle strengthening exercise and core stability exercise (CSE). Three groups were assigned to patients. Among which there was a strengthening group that specifically performed the strengthening of hip muscles consisting of total 22 subjects and while attempting to strengthen the muscles of hip also preserving the maximal isometric contraction, another group performed the exercises for hip muscles focusing on stretching the muscles to an extent to achieve maximal motion and it was referred as stretch group with a total number of 22 subjects and the last group was the sham group had their skin gently palpated in total of 22 subjects. This trial ran for six weeks, during which time three therapy interventions were given each week. According to the study's findings, it was concluded that CSE while performed along with stretching of hip muscles can help in patients with NSLBP.[11]
12. Koppenaal T et al. (2020) also performed a RCT to compare the cost-efficiency of internet-based home exercise program to that of traditional physiotherapy care in LBP patients, as well as the short-and the long-term impact of the program on physical functioning. Two hundred eight subjects suffering from LBP received treatment using either standard care physiotherapy or e-exercise for LBP. The results have not been concluded yet but aims at how well blended treatment works for LBP patients and will contribute to better blended physiotherapy in the future.[12]
13. Camacho J et al. (2020) intended to determine the impact of manual acupuncture (MA) and electro- acupuncture (EA) on discomfort and dysfunction in subjects suffering from NSLBP. Overall subjects were 66. Outcome measures were Roland Morris disability questionnaire (RMDQ) and numeric pain rating scale (NPRS). It was concluded that no significant difference was found in both EA group and MA group, both were same in decreasing depth of pain and dysfunction in patients with NSLBP.[13]
14. Loss JF et al. (2020) conducted a RCT to identify the immediate effect of lumbar manipulation over pain and postural control in patients with NSLBP. Only single

session was given to 24 subjects that were divided into two groups: group 1 was given simulated manipulation and group 2 were given high velocity low amplitude (HVLA) manipulation. Results revealed reduction in pain intensity in both groups however no significance was seen in postural control in both groups.[14]

15. Spivakian S et al. (2020) conducted a study including 70 females with sedentary lifestyle and complains of low back pain often. They were randomly allocated either lumbar stabilization exercises (LSE) or to lumbar muscle strengthening exercises for 20 weeks. Results revealed that both groups showed positive response in reducing LBP and functional disability. However, LSE was more effective comparatively.[15]
16. Vibe Fersum K et al. (2019) executed RCT to look into the effectiveness of exercises performed in combination with manual therapy (MT-EX) and the cognitive functional therapy (CFT) for individuals with NSLBP with a follow-up of 3 years. A total of one hundred and twenty-one subjects were allocated into two groups: a group treated with only CFT containing sixty-two subjects and another group treated with combination of MT-EX with total fifty-nine subjects. Outcomes were derived via MODI and NPRS primarily. At a three-year follow-up, CFT is superior to MT-EX in certain extents such as decreasing dysfunction, overcoming fear of pain, & depression.[16]
17. Toelle TR et al. (2019) through a randomized controlled trial, they examined the effects of an app specifically designed to analyse back pain (Kaia App). 101 subjects assigned into control and experimental group (used Kaia app for 3 months). The Kaia App, is better than physiotherapy plus online education when it comes to treating LBP patients, according to the results.[17]
18. Oz soy G et al. (2019) conducted a single-blinded RCT to check the combined effect of core stabilization exercise (CSE) along with MFR (with roller massager) in elderly patients with NSLBP. Atotal number of 45 subjects were randomly allocated into two groups, in first group only CSE was performed while in another group CSE along with the MFR with roller massager was given. Both groups performed these exercises 3 day per week for 6 weeks. Outcome measures were flexibility in lower back, pain, mobility of spine, disability in lower back, characteristics of gait, endurance of core stability, Kinesio phobia, and quality of life (QOL) that too both before starting the treatment and after the treatment. Results revealed that second group that was treated with both CSE and MFR performed better in terms of mobility of spine and endurance of core stability. However, no such difference was found in other aspects. So, this study suggested that CSE along with MFR is a better choice of treatment than core stabilization alone.[18]
19. Eshowe AM et al. (2018) performed RCT to analyse the effectiveness of traditional non-invasive treatment modalities with pulsed electromagnetic field therapy at a low intensity of 20 Gauss and 50 Hz frequency for subjects suffering from recurrent NSLBP. Total of 50 participants divided into 2 groups: control & experiment group. When combined with conventional physical therapy, pulsed electromagnetic field therapy produces better clinical outcomes than only using conventional physical therapy in subjects suffering from NSLBP in terms of discomfort, inability to perform functional tasks, and ROM in lumbar region.[19]
20. McCaskey MA et al. (2018) performed a cross-sectional study which not only looked after the linear parameters of posture control but also assessed the non-linear parameter of posture control to analyze individuals with chronic nonspecific LBP, both of them were combined in a group and total of 24subjects were assessed for the same and these 24 subjects were compared to another group consisting 34 subjects that does not reflected any symptoms. In the end, the author concluded that this research validates the idea that multi-segmental analysis should be used in conjunction with summary results to detect postural abnormalities in CNLBP patients.[20]

METHODOLOGY

Search was done through three search engines: google scholar, PubMed, and springer nature and literature was derived from them. A thorough investigation of 20 research papers was done.

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Inclusion Criteria

- Studies between year 2018-2023
- Randomized controlled trial
- Interventional studies
- cross-sectional studiessurveys

Exclusion Criteria

- Systemic review and meta-analysis
- Case-studies
- Studies before year 2018

RESULT

From the above review of literature, the results were derived that instead of using a single technique combining two or more techniques could help in extracting better therapeutic effects. As described by Bhosale SV et al, combined effect of MFR, MET and quadratus lumborum stretching exercises has been proven to be an effective treatment for the individuals with NSLBP.

Even digital sessions and app-based exercise program also enhanced the outcomes as compared to conventional physiotherapy.

CONCLUSION

From the above study it was concluded that combining the exercise therapy protocol can be found helpful in reducing impairment and helping treatment goals be met sooner. Also, usage of app-based exercises along with cognitive functional therapies and exercise therapy protocols can even perform better to yield best results.

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Unravelling The Complexity of Posterior Internal Impingement: AComprehensive Case Study Investigation

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ABSTRACT

The individual in question is a 25-year-old male enrolled as a student at Delhi University. There is no history of falls. He visited our clinic seeking physiotherapy assistance. Upon assessment, the patient complained of pain and restricted range of motion in his right shoulder joint, particularly during movements involving reaching overhead and behind the back (cross-body movements). He experiences dull, discomfortand deep pain within the shoulder joint or at the back of the shoulder, along with tenderness along the jointline and pain during the throwing. Physical examination further revealed limitations in shoulder flexion, abduction, and predominantly internal rotation, with slightly reduced external rotation. Additionally, weakness was noted in the external rotators (infraspinatus, teres minor) and rotator cuff muscles (supraspinatus), along with tightness in the posterior capsule and internal rotators (subscapularis, pectoralis major, and latissimus dorsi). We offered a six -week rehabilitation program at our clinic. Our physiotherapy treatment adopted a comprehensive strategy to address the condition, incorporating physical activity treatment, hands-on therapy, electrical therapy, advice on ergonomic practices, and strategies for patients to manage their own care.

KEYWORDS: Internal impingement, Posterior impingement, Rotator cuff, Sleeper stretch

INTRODUCTION

The shoulder complex comprises four joints that operate with precise coordination and synchronization. Alterations in arm position entail movements of the clavicle, scapula, and humerus. These movements arise from thecollective action of the sternoclavicular, acromioclavicular, and glenohumeral joints, as well as the scapulothoracic gliding mechanism. (Bechtol, 1980); (Inman, Saunders, & Abbott, 1944); (Warwick & Williams, 1973)

The acromioclavicular joint

This articulation constitutes a synovial plane joint, connecting a small, convex oval facet located at the lateral end of the clavicle with a concave area situated on the anterior aspect of the medial border of the acromion process of the scapula (Moore, 1980); (Warwick & Williams, 1973).

Joint capsule

The acromioclavicular (AC) joint possessesa slender capsule coated with synovial tissue. This capsule is fragile and gains reinforcement from capsular ligaments both below and above, which are further strengthened by connectionsfrom

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the deltoid and trapezius muscles (Neumann, 2009).

Ligaments

- Coracoclavicular Ligament (Levangie & Norkin, 2011) –
- The conoid ligament the trapezoid ligament
- The acromioclavicular ligament

Muscles

- Pectoralis Major (Clavicular Head) Sternocleidomastoid
- Deltoid Trapezius

The sternoclavicular joint

This joint functions as a synovial articulation. While its structure resembles that of a plane joint, its functionality is more akin to a ball-and-socket joint. Approximately half of the prominent, rounded medial (internal) end of the clavicle extends beyond the shallow sternal socket (DePalma, 1973). The innermost portion of the clavicle is connected to the sternum andthe first rib, including its costal cartilage. Ligaments provide reinforcement to the fibrous capsule in front, behind, above, and below (Beam, 1967); (Warwick & Williams, 1973).

Joint capsule

The SC Joint capsule is strong enough however, it relies heavily on the ligaments for structural support.

Ligaments

a. Anterior Sternoclavicular Ligament
b. Posterior Sternoclavicular Ligament
c. Costoclavicular Ligament
d. Interclavicular Ligament (Dutton, 2008); (Levangie & Norkin, 2005).
e. Coracohumeral ligament
f. Transverse humeral ligament (Dutton, 2012); (Levangie & Norkin, 2011).

Muscles

a. Deltoid
b. Pectoralis Major (Clavicular Head) Trapezius
c. SternocleidomastoidSubclavius muscle
d. Scalene muscles

The glenohumeral joint

This joint is characterized by a synovial structure featuring a multiaxial ball-and-socketdesign. While the meeting points of the humeral head and the glenoid fossa of the scapula exhibit complementary curvature, they are oval in shape and do not constitute complete spheres (Warwick & Williams, 1973).

The surfaces do not align perfectly, and the joint is in a state of loose packing. Complete congruence and the tightest fit occur when thehumerus is abducted and rotated outward(Warwick & Williams, 1973).

The glenoid labrum is a fibrocartilaginous rim that encircles the periphery of the glenoid fossa. Various theories suggest that the labrum serves to deepen the joint cavity, shield the bone edges, and aid in joint lubrication (Bateman, 1971); (Moore, 1980); (Warwick & Williams, 1973). The labrum adjusts itself to rotate the humeral head thereby providing flexibility to the borders of the glenoid fossa.

Joint capsule

The front part of the capsule gain reinforcement from the superior, middle, and inferior glenohumeral ligaments, which create a Z-shaped pattern on the capsule. Additionally, the rotator cuff muscles reinforce the joint capsule from above, behind, and in front. Ligaments

A. Superior glenohumeral ligament
B. Middle glenohumeral ligament
C. Inferior glenohumeral ligament

Muscles

a. Deltoid (Anterior Portion)
b. Triceps Brachii
c. Teres Major
d. Deltoid (Posterior Portion)
e. Latissimus Dorsi

The scapulothoracic joint

Scapulothoracic gliding mechanism is not an actual joint; rather, it involves the movement of the concave front surface of the scapula along the convex posterolateral surface of the thoracic cage (Warwick & Williams, 1973); Kelley, D. L. (1971). The capsule envelops the joint and is connected medially to the rim of the

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glenoid fossa, extending past the labrum. The capsule is relatively thin and alone does not offer significant stability to the joint. The long head tendon of the biceps brachii muscle travels from the supraglenoid tubercle, passing over the head of the humerus and residing within the capsule. The intertubercular groove is where it exits the joint. Encased by a synovial sheath, this setup aids the tendon's movement within the joint. Vulnerability to injury occurs where the tendon arches over the humeral head, transitioning from the bony cortex to the articular cartilagesurface (Bateman, 1971).

The Rotator Cuff

This complex consists of the musculotendinous attachment of the supraspinatus muscle above, the subscapularis muscle in front, and the teres minor and infraspinatus muscles behind. Their tendonsblend intricately with the fibrous capsule, offering active support to the joint and functioning as dynamic ligaments. Rotator cuff lesions can develop due to repetitive activitiesover time or sudden overload, resulting in spontaneous injury (Frankel & Nordin, 1980).

Muscles

Supraspinatus
Infraspinatus
Teres Minor
Subscapularis

Internal impingement of the shoulder occurs when the greater tuberosity of the humeral head excessively contacts the posterosuperior aspect of the glenoid during arm abduction and external rotation. This leads to compression of the rotator cuff and labrum. The painful throwing shoulder doesn't have a single underlying pathophysiological process. Internal impingement syndrome is believed to be more complex and multifaceted. Alongside the posterosuperior labrum and rotator cuff, injury to various other shoulder structures has been linked to pathological internal impingement (Jobe, 1995). It has been proposed that up to five anatomical structures are susceptible: the posterior superior labrum, the rotator cuff tendon (articular surface), the greater tuberosity, the inferior glenohumeral ligament (IGHL) complex, and the posterior superior glenoid. Internal impingement manifests as posterior shoulder pain when the athlete places the humerus in extreme external rotation and abduction, such as during the cocking phase of pitching or throwing. Posterior internal impingement (PII) of the glenohumeral joint is a prevalent cause of pain in the shoulder complex among overhead athletes. Impingement in this context occurs between the supraspinatus and/or infraspinatus and the glenoid rim. The pathological contact between the posterior glenoid and the posterior tendons of the rotator cuff, which face the articular surface ofthe glenohumeral joint, is referred to as posterior internal impingement (Manske et al., 2013).

TYPES OF INTERNAL IMPINGEMENT

There are two types of internal impingement

- Anterosuperior
- Posterosuperior

ETIOLOGY

Impingement has been characterized as a cluster of symptoms rather than a precise diagnosis (Cools et al., 2008). Glenohumeral instability (Meister, 2000), rotator cuff or biceps pathology (Heyworth & Williams, 2009), scapular dyskinesis (Burkhart et al., 2003); (Kibler, McMullen, & Sciascia, 1998); (Kamkar et al., 1993). SLAP lesions and glenohumeral internal rotation deficit (GIRD) have been associated with impingement symptoms Two pathological mechanisms in the possible aetiology of internal impingement have beendescribed

1. Excessive humeral translations, compromising glenohumeral congruence,
2. Scapular dyskinesis, decreasing the quality of functional scapular stability (Heyworth & Williams, 2009); (Myers et al., 2007); (Myers et al., 2006).

Anterior GH instability - Jobe et al. proposed that repetitive stretching of the anterior glenohumeral (GH) capsule resulting

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in anterior instability or laxity of the shoulder complex may lead to this form of impingement among throwing athletes. This laxity permits greater anterior translation of the humeral head (Heyworth & Williams, 2009).

Tight posterior GH capsule - It is suggested that tightness in the posterior capsule and the muscle-tendon unit of the posterior rotator cuff restricts internal rotation of the joint (Burkhart et al., 2003). Tightness in the posterior capsule results in Glenohumeral Internal Rotation Deficit (GIRD) (Myers et al., 2007); (Myers et al., 2006). Burkhart et al. (2003) defined GIRD as a loss of internal rotation of >20° compared with the contralateral side.

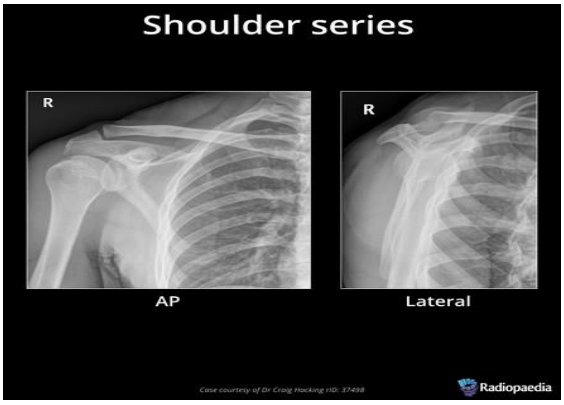
Muscle imbalance and/or improper neuromuscular control of the shoulder complex- Jobe et al. also found that improper positioning of the arm in relation to the glenoid bone during throwing actions can contribute to the impingement of rotator cuff tendons between the glenolabral complex and the humeral head (Heyworth & Williams, 2009). Research indicates that fatigue or weakness in the muscles responsible for retracting the scapula can result in reduced force generation in all four rotator cuff muscles. This, in turn, can cause abnormal positioning of the glenohumeral joint (Tyler et al., 2009); (Mihata et al., 2009).

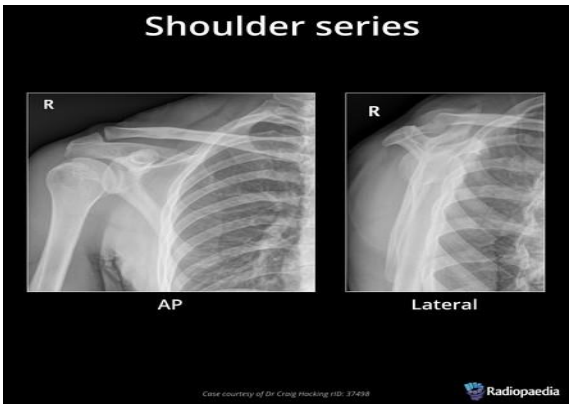
HISTORY

The individual under review is a 25-year-old male student at Delhi University. He has no history of falls or traumatic incidents. However, during assessment, he reported experiencing pain in his right shoulder when reaching overhead and behind his back, along with activity limitations. Additionally, he mentioned experiencing pain during the late cocking phase of the throwing. Physical examination revealed restricted shoulder movement in flexion, abduction, and predominantly internal rotation, with slightly decreased external rotation. Furthermore, weakness was observed in the external rotators (infraspinatus, teres minor) and the rotator cuff muscles (supraspinatus), coupled with tightness in the posterior capsule and internal rotators (subscapularis, pectoralis major, and latissimus dorsi).

INVESTIGATIONS

An X-ray imaging was conducted encompassing both the antero-posterior and lateral perspectives of the right shoulder joint. It shows narrowing of joint space. There were no subsequent fractures, dislocations, or degenerative changes in the bones and joints.





OUTCOME MEASURE

The intensity of the pain was assessed utilizing the Visual Analog Scale, while the range of motion of the elbow was determined employing a universal goniometer. Certain special tests which were performed and came out to be positive to rule out the diagnosis were as follows –

- Jobe's relocation sign (Jobe et al., 1989)

The patient is placed in a supine position, with the elbow flexed at 90 degrees and abducted to 90 degrees. An external rotation force is applied to the shoulder by the therapist. If the patient reports any feelings of apprehension, the Apprehension Test is deemed positive. Subsequently, the therapist may administer a posteriorly

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directed force to the shoulder. If the patient experiences reduced apprehension orpain in

this position, the Jobe Relocation Test is regarded as positive (Dutton, 2008).

Jobe's relocation test

- Kim's impingement test

  The patient will sit with his arm abducted to 90 degrees. The examiner supports the elbow and lateral aspect of the upper arm, applying a significant axial loading force. while the arm is raised diagonally upward at a 45-degree angle, downward and backward pressure is exerted on the upper arm. A sudden onset of posterior shoulder pain, irrespective of any accompanying posterior clunk of the humeral head, indicates a positive test result.

Kim's impingement test

Acute recovery phase – (0-2 weeks)

- Cryotherapy over posterior structures of the shoulder for 10 – 12 mins
- Ultrasound therapy with intensity of 0.8 watt/cm², frequency – 1MHz and time duration of 6 minutes over the posterior structures of the shoulder
- Soft tissue mobilizations/techniques as tolerated (Brotzman & Wilk, 2003).
- Range of motion restoration exercises to restore normal range of motion in the shoulder joint while avoiding exacerbating impingement.

Intermediate recovery phase – (2-4 weeks)

- Grade IV posterior glides of the glenohumeral joint in the scapular plane as described by Maitland (Maitland, 1991) and in maximum glenohumeral internal rotation in 90° shoulder abduction (Hsu et al., 2000).
- Active-assisted cross-chest adduction with manual stabilization of the scapula (Bang & Deyle, 2000). Cross- arm stretching exercises the cross-arm stretch can be performed in either a seated or supine position by the patient or by force imparted by a therapist (Manske et al., 2013).
- "Sleeper stretch" which allows posterior capsular stretching (Corpus et al., 2024) - 3 sets of 30 seconds

  "Sleeper stretch" exercises in patients were found to have significant increases in both internal rotation and total rotation, as well as a 38% decrease in the prevalence of shoulder problems (Burkhart et al., 2003).

Rotator cuff and scapular strengthening exercises-

i. Rhythmic stabilization exercises are performed for the rotator cuff muscles in a supine position with the shoulder in approximately 20-30 degrees of scapular plane abduction and progressed to 90 degrees of elevation or more (still in the scapular plane) as the patient tolerates (Manske et al., 2013).

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Jobe's clinical classification of internal impingement (Jobe, 1997).

Stage	Presentation/symptoms
1. Early	Shoulder stiffness and need for prolonged warm-up, no pain with ADL's
2. Intermediate	Pain localized to posterior shoulder in the late cocking phase, no pain with ADL's
3. Advanced	Similar symptoms stage II, but refractory to a period for adequate rest and rehabilitation
ADL's – Activity of daily living	

ii. Rhythmic stabilization exercises are performed for the rotator cuff muscles in a supine position with the shoulder in approximately 20-30 degrees of scapular plane abduction and progressed to 90 degrees of elevation or more (still in the scapular plane) as the patient tolerates (Manske et al., 2013).

iii. Progressive exercises were performed with isometrics in greater ranges of either flexion or abduction or doing them in an upright position with the extremity in a closed chain position via hand placement on a wall (Davies & Dick off-Hoffman, 1993).

iv. The prone full can, or horizontal abduction (100 degrees of elevation) with external rotation exercise facilitates high supraspinatus electromyographic activity (Blackburn et al., 1990).

v. Push up plus done with feet elevated to enhance cuff and scapular muscle recruitment (Uhl et al.,2003).

vi. Prone on elbows strengthening exercise for early scapular strengthening.

vii. Prone Blackburn exercises performed in 100 degrees of abduction and external rotation (thumb up) (Blackburn et al., 1990).

viii. Core strengthening exercises (Corpus et al., 2024).

Advanced strengthening phase –

(4-6 weeks)

- Scapular strengthening exercises using dumbbell and therabands
- Rotator cuff strengthening exercises using dumbbell and therabands
- LE & core- progress strengthening
- UE- push up progression
- Progress closed chain UE activities, balance, PNF (Brotzman & Wilk, 2003).

Return to activity

(6-12 weeks)

- Proper throwing mechanics (Corpus et al., 2024).
- The home exercise program included the sleeper stretch, cross-chest adduction, external rotation, and scapular strengthening exercises (Tyler et al., 2010).
- Flexibility exercises
- Flexion
- External rotation
- Self – scapular stretches
- Isotonic exercises
- Supraspinatus
- Prone extension
- Prone horizontal abduction
- Internal and external rotation
- Neutral or 90/90 position
- D2 proprioceptive neuromuscular facilitation (PNF) pattern (Brotzman & Wilk, 2003).

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Fig.1 and 2Ultrasound therapy with intensity of 0.8 watt/cm², frequency – 1MHz and Cross arm stretch done by therapist

“Sleeper stretch” which allows posterior capsular stretching (Corpus et al., 2024)- 3 sets of 30 seconds

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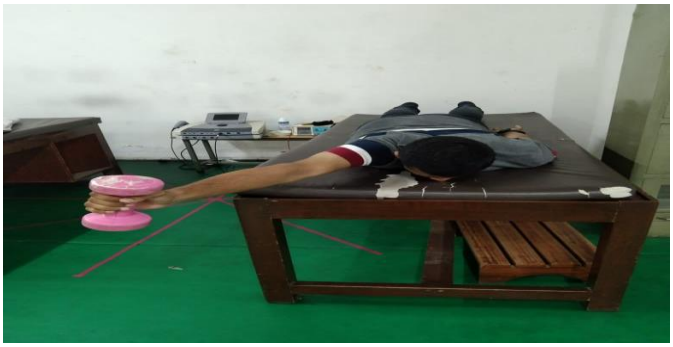

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Fig.1.Cross- arm stretching exercises for posterior capsules stretching, 2. Wall push-ups to strengthen scapular muscles, 3. Push up progression: Push up plus done with feet elevated to enhance cuff and scapular muscle recruitment[47] 4.Ecentric strengthening of External rotators using TheraBand, 5. Shoulder external rotators strengthening exercise with dumbbell, 6. Scapular retractors strengthening exercises with dumbbell

Following the treatment, a clear decrease in discomfort and enhancement in mobility were evident.

OUTCOME MEASURES	PRE-INTERVENTION		POST INTERVENTION	
1. VAS	8 (During overhead activity and reaching behind the back)		0	
2. ROM(SHOULDER)	AROM	PROM	AROM	PROM
FLEXION	160º	165º	180º	180º
ABDUCTION	160º	165 º	175º	180º
INTERNAL ROTATION	45º	50º	65º	90º
EXTERNAL ROTATION	75º (with pain)	80º (with pain)	85º	90º

OUTCOME MEASURES	PRE-INTERVENTION	POST INTERVENTION
1. MMT (SHOULDER)	GRADES	GRADES
FLEXORS	4	5
EXTENSORS	4	4+
ABDUCTORS	4-	4+
ADDUCTORS	4	5
INTERNAL ROTATORS	3+	4+
EXTERNAL ROTATORS	3+	4+

DISCUSSION

In this case study, we encountered a 25-year-old male student presenting with symptoms indicative of internal impingement syndrome in his right shoulder. His history and clinical examination revealed pain and restricted range of motion, predominantly affecting movements such as overhead reaching and behind-the- back activities,

The assessment highlighted limitations in shoulder flexion, abduction, and internal rotation, along with weakness in the external rotators and rotator cuff muscles, and tightness in the posterior capsule and internal rotators. Positive findings from special tests such as Jobe's relocation test and Kim's impingement test corroborated the diagnosis of internal impingement.

Radiographic imaging ruled out fractures or degenerative changes but indicated joint space narrowing, consistent with impingement-related changes. The treatment plan involved a comprehensive six-week rehabilitation program focusing on cryotherapy, ultrasound therapy, soft tissue mobilization, and a structured exercise regimen aimed at restoring range of motion, improving strength, and enhancing scapular stability.

Throughout the rehabilitation phases—acute recovery, intermediate recovery, advanced strengthening, and return to activity—the patient showed significant improvement. Outcome measures demonstrated a marked reduction in pain intensity, improved range of motion, and enhanced muscle strength, as assessed by the Visual Analog Scale, goniometric measurements and manual muscle testing.

The SPADI score improved from 27.69% to 1.5% over the course of six-week physical therapy sessions. The patient reported full return to usual activity, with only mild or occasional symptoms associated with lifting and reaching overhead.

The Maitland (Maitland, 1991) mobilization techniques - Grade IV posterior glides of the glenohumeral joint in the scapular plane and in maximum glenohumeral internal rotation in 90° shoulder abduction (Hsu etal., 2000); active-assisted exercises of cross-chest adduction with manual stabilization of the scapula scapula (Bang & Deyle, 2000) supports our treatment.

Sleeper stretches which allows posterior capsular stretching (Corpus et al., 2024) - 3 sets of 30 seconds, these exercises in patients were found to have significant increases in both internal rotation and external rotation; Cross- arm stretching exercises that are performed in either a seated or supine position by the patient or by force imparted by a therapist (Manske et al., 2013) also supports our treatment.

CONCLUSION

In conclusion, the successful outcome of this case underscores the efficacy of a tailored physiotherapy approach in managing internal impingement syndrome. By addressing underlying biomechanical deficits, improving muscular balance, and restoring functional mobility, the rehabilitation program facilitated a return to pain-free activities. Long-term management will involve continued adherence to strengthening exercises, maintenance of proper throwing mechanics and ongoing monitoring to prevent recurrence and promote optimal shoulder health. We can use this therapeutic regime including cryotherapy for 10-12 mins, ultrasound therapy for 6 mins, soft tissue mobilization and Maitland mobilization (grade-4) techniques as tolerated as wellas therapeutic exercises mentioned above in clinical practice.

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Effect Of Muscle Energy Technique in Frozen Shoulder- A Literature Review

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ABSTRACT

Background and need of research: Frozen Shoulder also known as Adhesive Capsulitis is a common shoulder condition marked by pain and a gradual loss of shoulder movement. Frozen shoulder patients see three overlapping stages: Stage I is inflammation, Stage II is frozen, and Stage III is thawing. According to estimates, 2–5% of the general population has frozen shoulder, which affects 8% of males and 10% of women. The present review of literature has been undertaken to discover the effect of muscle energy technique in frozen shoulders.
Methods: Various research articles were searched using the database such as PubMed, Research gate, Google Scholar, and Scopus were searched. Randomized controlled trials that studied both short- and long-term effects of muscle energy technique were selected.
Result: Majority of the reviewed studies indicated that muscle energy technique improves the range of motion, increases the flexibility, muscle activation and reduce the pain. This technique has been proven to be effective in comparison with various other techniques.
Conclusion: Muscle Energy Technique when given is individually and in combination has proven to be effective in reducing pain, enhancing functionality, and improving the range of motion.
Keywords; Frozen Shoulder, Muscle Energy Technique, Range of Motion, Pain, Function.

INTRODUCTION

Frozen Shoulder, also known as Adhesive Capsulitis, is a common shoulder condition marked by pain and a gradual loss of shoulder movement. Frozen shoulder patients see three overlapping stages: Stage I is inflammation, Stage II is frozen, and Stage III is thawing. [1]

According to estimates, 2–5% of the general population has frozen shoulder, which affects 8% of males and 10% of women. [2]

Under a microscope, the impacted capsule has more T cells, mast cells, fibroblasts, and macrophages. Increases in fibrotic growth factors, inflammatory cytokines, and interleukins are linked to this synovitis. [3-5]

The patient with frozen shoulder has a sudden onset of discomfort and restriction of both active and passive range of motion of the shoulder. [6]

In Stage I there is pain without negligible limitation of motion and there is also hyper vascular synovitis. In Stage II there is continuation of pain with progressive limitation in motion, there is hyper vascular synovitis and loss of axillary folding. In Stage III there is ongoing stiffness. [1] Pain Rating Scale through numbers measure the individuals rate their discomfort in

0 means no discomfort at all to 10 which means more discomfort that is an outcome measure. [7]

The Muscle Energy Technique is credited to Dr. Fred Mitchell. It is a non-invasive treatment for stretching or extending fascia and stiff muscles. MET mostly targets soft tissue, but it also aids with joint mobility, which improves muscular extensibility and range of motion. Voluntary isometric shrinkage of the targeted muscle occurs when the patient resists the therapist&#39, s resistance. [7]

Muscle Energy Technique strength the muscle, which causes increase in the blood flow in that area which in turn lower the muscle tension.[8]

Muscle Energy Technique is based upon two principles i.e., post isometric relaxation reduces the muscle tone because of isometric contraction and reciprocal inhibition which through the inhibition of alpha motor neurons, reduce the antagonist muscle tone after the contraction of agonist muscle. [9-11]

In physiotherapy treatment there are diverse types of exercises and modalities which help in relieving pain and maintain the range of motion and also causes function restoration [12]

REVIEW OF LITERATURE

To identify and study the effect of Muscle Energy Technique in Frozen Shoulder.

1.Deepak et al, (2023) [12] who conducted a study on Efficacy of isometric muscle contraction (MET on movement and discomfort in individuals with Periarthritis Shoulder with 30 subjects out of which 18 are males and 12 are female. This study shows that isometric muscle contraction (MET) improves the movements of shoulder and its ability to do the movements effectively, reducing discomforts in individuals in the early stage of protocol.

2.iraj etal, (2023) [13] who conducted a study i.e., Efficacy of Muscle Energy Technique on improving the pain, range of motion, Muscle strength and quality of life in Diabetic Adhesive Capsulitis Conditions with 31 patients. This study concluded that MET, Exercise for stabilization and Moist Heat Therapy in individual with Periarthritis Shoulder in diabetic condition showed betterment in discomfort, Movements of shoulder muscular power and sense of joint position in 4 th weeks & 8 th weeks of programmed.

3.Sandeep Pattnak et al [14] (2023) who conducted a comparative study on Kaltenborn mobilization technique versus muscle energy technique on Frozen Shoulder with 60 subjects which shows that, Both Kaltenborn mobilization technique versus muscle energy technique is effective in improving shoulder movements, discomfort and performance but Muscle Energy Technique showed a significant reduction in discomfort and enhancing the performance in the individual with frozen shoulder.

4.Tamjeet Ghaffar et. al (2023) [15] who conducted comparative study Efficacy of Proprioceptive Neuromuscular Facilitation Stretch with Spencer Muscle Energy Technique on Frozen Shoulder with a sample size of 30, aged between 30 and 60 years and the outcome measure was NPRS and SPADI. The study concluded that Spencer Mets has been more effective in reducing the pain of the patients as compared to PNF treatment.

5.Ayesha Razzaq et al (2022) [16] who conducted a study i.e. effect of MET and mulligan mobilization with movements on pain, range of motion, and disability in frozen shoulder patients with a sample size of 70 between the age group of 30-70 years, these subjects were divided into 2 groups of patients i.e. group A and group B. Group A with mulligan mobilization with movement and group B with MET. Result was that group A

treatment was more effective when compared with group B.

6.Sadia Nazir etal (2022) [17] who conducted a study in which they compare the effect of isometric muscle contraction technique and training of flexors deep to neck in patients with postural Neck stress with a sample size of 30 and these were divided into 2 groups. Group A was treated with isometric muscle contraction technique while Group B was given with training of flexors deep to neck. When Group A and Group B were compared it seemed Group A showed more meaningful results than Group B.

7.Prajakta Bhosalea and Sona Kolke (2022) [18] who conducted a comparative study of soft tissue mobilization through an instrument and isometric muscle contraction technique on after surgery elbow stiffness, with 26 subject. Result showed that were both the protocol is effective but soft tissue mobilization through an instrument was more effective in the improvement of distress and function of patient.

8.Pratik Phansapkar and Mohd Irshad Qureshi (2022) [19] who done research on Effect of MET (spencer), effect of Kaltenborn, effect of Mulligan, and Maitland mobilization in Patients with Periarthritis Shoulder, and the sample size was 80. The outcome measure was VAS, ROM and SPADI. This research stated that MET was better, when compared.

9.Raksha R. Jivani etal (2021) [20] who conducted a comparative study i.e., Importance of Isometric contraction of Muscle (spencer) and Mobilization Technique by mail land on distress, movements of shoulder in individual with Periarthritis Shoulder: Research with 58 subject between the age group of 40-60 years. Patient was divided into 2 groups with 29 patients in each group. By using VAS, SPADI and ROM study shows that both the techniques are best for minimizing the discomfort and increasing the movements of shoulder. but isometric contraction of Muscle was better.

10. Kamya Somaiya etal (2021) [21] who done research on Quick effect of isometric contraction of muscle (MET) and Kalternborn Mobilization Technique in Diabetic individual with Periarthritis Shoulder with a sample size of 40. Group A received Kalternborn Mobilization and Group B received Muscle Energy Technique. The result was that there was improvement in pain and ROM as compared to Group A.

11.Mushyyaida Iqbal etal (2020) [22] who conducted research on isometric muscle contraction (MET) and stretching passively in frozen shoulder with 60 subjects in which they concluded that isometric muscle contraction (MET) is better that passive stretching.

12.Anmol Thomas et al (2020) [23] who conducted a comparative study on "Isometric muscle contraction (MET) and Exercises of shoulder by individual on Function of shoulder" after surgery of radial neck in individual with Cancer of head and neck with 48 subjects and were randomly assigned into 2 groups. Group A received active range of motion and Group B received Muscle Energy Technique. This study concluded that both techniques were effective, but MET was more effective when compared to active range of motion exercises.

13.Himanshu Sharma et al (2020) [24] who conducted a comparative study on Muscle Energy Technique with Capsular Stretching on Frozen Shoulder Patients with a sample size of 30 between the age of 40-60 and these subjects were divided into 2 groups with 15 subject each. Group a with capsular stretching and group b with MET. The result was that group b is more effective in treatment than group a.

14.Nithya Jaiswal et al (2019) [25] who conducted a study on Effect of Isometric muscle contraction (MET) and Mulligan Mobilization in Periarthritis Shoulder and the sample size of 30 including both the sex group aged between 40-60 years.

The participants were divided into 2 groups. groups with 15 patients in each group. Group A received Mulligan Mobilization alone and Group B received Mulligan Mobilization along with MET. This study concluded that Group B treatment was more effective as compared to Group A.

15.Anool I Faqib et al (2019) [26] who conducted a study in which they examine the impact of isometric muscle contraction technique on distress, movements of shoulder in individual with stiffness of elbow after surgery with 30 subject and divided into 2 groups. Group A was given an isometric muscle contraction technique after immobilization and Group B was given isometric muscle contraction technique after 1 week with the home programmed. This study concluded that group A showed significant improvement compared to group B.

METHODOLOGY

Search was done through three search engines: google scholar, PubMed, and research gate and literature was derived from them. A thorough investigation of 20 research papers was done.

Inclusion Criteria

- Studies between year 2018-2023
- Randomized controlled trial
- Interventional studies
- cross-sectional studies
- Surveys

Exclusion Criteria

- Systemic review and meta-analysis
- Case-studies
- Studies before year 2018

From the above review of literature, the results were derived that numerous studies have been conducted individually on effects of MET for treatment of frozen shoulder. MET improves the range of motion, increase flexibility, muscle activation and reduce pain. This technique has been proven to be effective in comparison with various other techniques. Continued exploration and research in this area will contribute to refining treatment protocols and advancing our understanding for better interventions.

CONCLUSION

In conclusion, the evidence suggests that MET is a highly effective treatment for frozen shoulder, offering improvements in range of motion, pain reduction, and functional ability. Its incorporation into physical therapy protocols has the potential to significantly improve outcomes for individuals with this condition. &quote.

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