Immediate effect of Pulsed electromagnetic field therapy and Spencer's Technique on pain and stiffness in Frozen shoulder: A Case Report

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Abstract:

Background: Prevalence rate in the general population is 2-5% and 10–20% in diabetics. It is characterized by a painful, gradual loss of both active and passive glenohumeral motion resulting from progressive fibrosis and ultimate contracture of the glenohumeral joint capsule and the marked reduction in forward elevation and external rotation i.e. Capsular pattern of involvement. An increased incidence of frozen shoulder has been noticed in patients with hyperthyroidism and hypertriglyceridemia. The use of electromagnetic fields (EMFs), particularly magneto-therapy, has increased significantly in rehabilitation treatment over the last decade and provides a non-invasive, safe, and simple method of directly treating the site of injury, the source of pain and inflammation, and other types of disease. Magnetic field therapy has been used to stimulate bone repair, cure arthritis and inflammatory illnesses of the musculoskeletal system, relieve pain, improve healing, and decrease stiffness. Scientists have reported analgesic and anti-nociceptive efficacy of pulsed electromagnetic field (PEMF), similar to the opioid analgesic effect.

The Spencer technique is a standardized series of shoulder treatments with broad application in diagnosis, treatment and prognosis in reducing pain and stiffness.

Case description: A 43-year-old female, housewife, presented with a chief complaint of shoulder pain since last 6 months, which had aggravated since past 1 month. Patient reported chronic shoulder pain which was continuous in nature with an intensity of 8 on NPRS on activity and 6 on NPRS at rest. The pain aggravated during the shoulder movements like shoulder flexion & abduction was more painful. She received analgesics as well as physical therapy for the same and had a poor response to previous interventions. She had a history of diabetes since 2 years along with thyroid.

Conclusion: This study determined the effect of Pulsed electromagnetic field therapy and Spencers mobilization technique in a case of patient with frozen shoulder and showed that it provides immediate effect to the patient by facilitating pain relief and increase in shoulder ROM which aids in improving activities of daily living and improved quality of life. Thus, this case study concludes that in patients suffering with frozen shoulder, PEMF and spencers technique have the potential to speed up positive physical therapy outcomes.

Keywords: Frozen Shoulder, Capsular pattern, PEMF, Spencers mobilization technique

INTRODUCTION

Duplay originally characterised "frozen shoulder" in the French literature in 1872 as "Periarthritis of the Shoulder"(1). The interchangeable, contemporary terms “frozen shoulder “and “adhesive capsulitis” were coined by Cod-man in 1934 and Neviaser in 1945, respectively(2)(3). Drs. Neviaser aptly described the diagnosis of “frozen shoulder” as a “waste can” diagnosis. They considered the diagnosis to be overused and misinterpreted. They stated, "The diagnosis must be established because the treatment of each is different," and "Every patient with a painful shoulder and obvious limitation of motion does not have adhesive capsulitis" while mentioning both frozen shoulder and stiff and painful shoulder(4).

Estimated range of frozen shoulder is between 2% and 5% of the population over the age of 40. It is a disease of middle age(3). with females and those with diabetes having a predilection for development of this problem. (5-7)Clinical association has been made with low back pain, cervical radiculitis, clinical depression, anxiety disorder, Parkinson’s disease(8), mastectomy, hyperthyroidism(9), hypertension, and migraine headaches(10), as well as histological similarities to Duypuytren’s disease(11). The painful and stiff shoulder caused by osteoarthritis, chronic subacromial bursitis, or rotator cuff tendinopathy tear should not be confused with the frozen shoulder. Trauma may or may not be associated with its onset(12). Frozen shoulder is a painful shoulder condition of insidious onset that was associated with stiffness and difficulty in sleeping on the affected side. It is characterized by a painful, gradual loss of both active and passive glenohumeral motion resulting from progressive fibrosis and ultimate contracture of the glenohumeral joint capsule and the marked reduction in forward elevation and external rotation i.e., Capsular pattern of involvement(13)(14). The incidence of FS is slightly higher in women than in men (70% of patients are women). This condition most frequently affects persons aged 40 to 60 years and rarely occurs in persons younger than 40 years of age. Frozen shoulder might affect both shoulders in up to 16% of patients; however, a relapse is uncommon. Prevalence rate in the general population is 2-5% and 10–20% in diabetics(15). An increased incidence of frozen shoulder has been noticed in patients with hyperthyroidism and hypertriglyceridemia(16).

PEMF therapy is a type of electrotherapy that employs pulsed electromagnetic fields to treat an injured area of tissue. The key to the mechanism of action of PEMF, as well as all of its biological effects on cells and tissues, is precisely the modification of the electromagnetic pulse in a pulsed,

rather than continuous, way, as in classic magnetotherapy, from which it differs completely. PEMF has been used and studied as a non-invasive technology for the promotion and speed of tissue healing for over twenty years and is effective as an adjuvant treatment in a variety of pathologies including bone fractures, acute inflammation, chronic inflammation, edema, pain, chronic pains, wounds, and chronic wounds(17).

Pulsed electromagnetic Magnetic field therapy has been used to stimulate illnesses of the musculoskeletal system, relieve pain, improve tissue healing, and decrease stiffness. and very low frequency (ELF) magnetic fields in the pico tesla and milli tesla ranges, respectively, are aimed at enhancing neurotransmission and addressing local conditions. Scientists have reported analgesic and anti-nociceptive efficacy of pulsed electromagnetic field (PEMF), similar to the opioid analgesic effect(18).

The Spencer approach is a standardised sequence of shoulder therapies that can be used for diagnosis, treatment, and prognosis. It is developed by Spencer, D.O. in 1916. The evolution of this technique is traced form 1916 to date to try to identify factors in the development of manipulative methods(19). This is a well-known osteopathic manipulative treatment that focuses on glenohumeral and scapulothoracic joint mobilisation. It improves the function of limited joints while also having a good impact on other emotional, social, and cognitive domains(20). Spencer technique is an articulatory approach comprising seven separate treatments used to treat shoulder limitation caused by adhesive capsulitis. Passive, smooth, rhythmic motion is used in this technique to stretch tight muscles, ligaments, and capsules. The majority of the force is applied at the end of the range of motion. This treatment improves pain-free range of motion by stretching the tissues, increasing lymphatic flow, and promoting joint circulation(21). Spencer technique is an articulatory technique with seven different procedures used to treat shoulder restriction caused by adhesive capsulitis. In this technique passive, smooth, rhythmic motion is designed to stretch contracted muscles, ligaments and capsules. Most of the force is applied at the end range of motion. Studies have shown the effect of PEMF and Spencer technique on improving mobility and functional ability in subjects with frozen shoulder(21-24).

However no studies till now had been investigated the immediate effect of combination of pulsed electromagnetic field therapy with spencers mobilization technique in frozen shoulder. So the aim of this study is to see the immediate effect of both the techniques in reducing pain, increasing mobility and to see the improvement of function.

CLINICAL DESCRIPTION:

A 43-year-old female, housewife, presented with a chief complaint of right shoulder pain since last 6 months, which had aggravated since past 1 month. Patient reported chronic shoulder pain which was continuous in nature with an intensity of 8 on NPRS on activity and 6 on NPRS at rest. The pain aggravated during the shoulder movements like shoulder flexion & abduction was more painful. She received analgesics as well as physical therapy for the same and had a poor response to previous interventions. She had a history of diabetes since 2 years along with thyroid.

CLINICAL FINDINGS:

Physical examination was done and all of her vital parameters including temperature, pulse rate, SPO2, blood pressure were within the normal limits. Patient reported of pain which was 8 on NPRS. Patient showed marked postural deviations which involved increased lumbar lordosis & right shoulder was depressed. On palpation, grade 2 tenderness was present. Range of motion was incomplete and painful for shoulder flexion, abduction & internal rotation. Resisted isometrics for shoulder flexion & abduction were weak & painful.

DIAGNOSTIC ASSESSMENT:

There was no specific radio logical testing done. The diagnosis was made on the basis of subjective and objective examination of the patient.

OUTCOME MEASURE:

The outcome measure used in this study were Numerical pain rating scale (NPRS) for assessing pain and Goniometer for assessing Range of Motion (ROM) and upper extremity functional index(UEFI).

Table 1 shows Range of motion

Table 2 shows Pain Intensity

Table 3 shows functional outcome

Range of Motion:

Table 1:

Movement	Pre-treatment	Post-treatment
Flexion	100 degrees	150 degrees
Extension	40 degrees	75 degrees
Abduction	55 degrees	110 degrees

Internal Rotation	65 degrees	90 degrees
External Rotation	18 degrees	35 degrees

Pain Intensity:

Table 2:

Pre treatment	Post treatment
9 on NPRS on Movement 5 on NPRS at Rest	4 on NPRS on Movement 3 on NPRS at Rest

Function:

Table 3:

Pre treatment	Post treatment
10/80	22/80

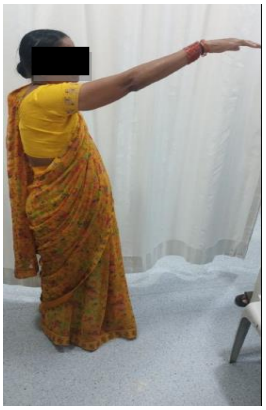

Fig: Pre and post Flexion

Fig: Pre and post Extension

Fig: Pre and Post Abduction

Fig:Pre and Post Internal Rotation

Figure: Pre and Post External Rotation

THERAPUTIC INTERVENTION:

PULSED ELECTROMAGNETIC FIELD THERAPY:

The patient was in supine lying position with the machine placed at the posterior aspect of the shoulder set on the following given parameters referred from the AMWAVES WELLNESS application given in the following figure for 30 minutes.

INDICATION	PARAMETERS
Program	9
Duty	20%
Duration	30
Micro current	ON
Heat	49

SPENCERS TECHNIQUE

The therapist stood in front of the patient, stabilising the superior aspect of the shoulder girdle, providing a resistive structure against which to stretch the soft tissues around the glenohumeral articulation as the arm was utilised as a long lever. The therapist then supports the patient's wrist and forearm and performs a passive, smooth, rhythmic back and forth motion of the arm, carrying it to the limit permitted by the tensed muscles, ligaments, and shoulder capsule.

Step 1 - Shoulder extension with elbow flexion: the patient's elbow was kept bent while the arm was extended until it reached the limited barrier.

Step 2 - Shoulder flexion with elbow extension: The flexed elbow of the patient was extended and moved anteriorly into shoulder flexion until the limited barrier was reached.

Step 3 - Circumduction with compression: with the patient's elbow grasped and his shoulder in 90° abduction, move the elbow in small clockwise and counterclockwise circles with compressive force.

Step 4 - Circumduction with distraction: The therapist held the patient's shoulder joint in 90° abduction and generated tiny clockwise and counterclockwise circles while holding either the elbow or the wrist.

Step 5 - Shoulder abduction and internal rotation with elbow flexion: The patient was instructed to place his hand on the therapist's forearm for support before the therapist performed abduction and internal rotation of the patient's arm. Internal rotation (90°) — the therapist shifted the patient's elbow anteriorly while placing the dorsum of his or her palm behind his or her hip.

Step 6 - Shoulder adduction and external rotation with elbow flexion: patient was requested to lay his hand on therapists forearm for the support and then the therapist takes patients arm into adduction and external rotation.

Step 7 - Stretching tissue and pumping fluids with the arm extended: the therapist interlocks his fingertips over the deltoid muscle, the patient's hand is placed over the therapist's shoulder, and the therapist slowly moves the arm away from the shoulder and releases it, repeating this 5-10 times if necessary.

Stage1: shoulder extension with elbow flexion

Stage2: Shoulder flexion with elbow extension

Stage 3: circumduction with compression

Step 4 - Circumduction with distraction

Stage 5 & 6: Shoulder abduction and internal rotation with elbow flexion/ shoulder adduction and external rotation with elbow flexion

Step 7 - Stretching tissue and pumping fluids with the arm extended

DISCUSSION

The current study was conducted to find out the effect of PEMF and spencers mobilization in patients with frozen shoulder on pain, mobility & functional disability.

Both PEMF and Spencer technique showed improvement in pain, improved shoulder mobility and improved functional disability.

A study conducted by Bridges, Michael et al., in 2018 stated that pulsed electromagnetic frequency show clinical effects to other modalities for relieving pain, function, and quality of life(28).

Another study conducted by S Ravid et al., in 2019 states that PEMF (Pulsed Electromagnetic Field) is a holistic modality used to treat a variety of diseases and the exploratory descriptive research study focused on individuals' experiences with the Micro-Pulse, PEMF, for pain alleviation. Finding pain relief was a common experience for all the participants by using PEMF. All participants were amazed, comforted, and relieved when they finally experienced a reduction or complete loss of pain(29).

It could be because Spencer technique is aimed to improve pain, stiffness and shoulder disability by altering the circulatory pain biomarkers. A study conducted in 2021 stated that Both Spencer's MET and the traditional treatment regimen had significant effects in terms of pain reduction, ROM improvement, and shoulder disability reduction, however when comparing groups, Spencer's MET was more successful in terms of shoulder pain reduction(25).

Some of the Functional ability from the upper extremity function index has been found to be increased immediately after the application of the treatment techniques. According to the findings of this mentioned pilot study by JA Knebl et al., in 2002 mentioned that the Spencer technique is an effective therapy method for enhancing the functional ability of the shoulder in the elderly(26). Improvement in the Shoulder mobility had also been found after the application of the treatment. A study conducted by Dr. B. Haveela et al., in 2018 states that Spencer's approach restores specific joint motion by extending the shoulder capsule and tight soft tissues and increasing pain-free ROM. When used, this procedure it enhances lymphatic flow from the treated location. With this method the joint regains its original ROM and restores neural reflexes. Passive repeated translation movements, traction, or gliding promote nutrition, circulation, and joint lubrication. It corrects the joint's unfavourable alterations and restores arthokinematic gliding and rolling action. Increased gliding will correct the osteokinematic rotation and allow shoulder mobility to be restored(27).

Changes in these biomarkers' baseline values occurred immediately after the treatment as well as 24 hours afterwards.

So from the above result of the study We got immediate effect from pemf and spencers technique in the treatment of frozen shoulder in reducing pain, increasing range of motion and improving function of the shoulder join. The immediate improvement in pain is due to Pulsed electromagnetic field because it works primarily in reducing pain and improvement in stiffness might be due to application of spencers mobilisation technique because the mobilization works to improve mobility of joint.

So both the treatment showed effective and immediate results in the treatment of chronic frozen shoulder and can be applied in clinical practice.

The limitation of the study was short term follow up so Future recommendation can be given on long term follow up which can give more better results in improving pain, disability, range of motion, and shoulder function of the patient in frozen shoulder.

CONCLUSION

This study determined the effect of pulsed electromagnetic field therapy and Spencers mobilization technique in a case of patient with frozen shoulder and showed that it provides immediate effect to the patient by facilitating pain relief and increase in shoulder ROM and function, which aids in improving activities of daily living and improved quality of life. Thus, this case study concludes that in patients suffering with frozen shoulder, PEMF and Spencers technique have the potential to speed up positive physical therapy outcomes.

INFORMED CONSENT

Informed consent was taken from the patient.

CONFLICT OF INTEREST: The authors has no conflict of interest regarding the publication of this article.

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