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Physiotherapeutic Interventions for Shoulder Impingement Syndrome

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Abstract: Across the globe, a large number of individuals suffer from significant pain and incapacity due to typical musculoskeletal issues including shoulder fatigue, which are frequently observed in basic healthcare. The present review of literature aimed to find the effect of different types of physiotherapeutic interventions for treatment of shoulder impingement syndrome (SIS). Various databases, such as google scholar, PubMed were searched for studies published between 2017 and 2023 using keywords such as pain, function, disability and shoulder impingement syndrome (SIS). It was found that intervention that focused on strengthening, stabilization and stretching had better results in improving flexibility, function and reducing pain.

Keywords: Disability, Function, Pain, Range of motion, Shoulder impingement.

I. Introduction

Shoulder discomfort is a prevalent issue that affects a significant number of people at some point in their lives. It is a common presenting symptom for patients of all ages in clinical practice, and it can have a severe impact on their quality of life (QOL). Shoulder pain may cause a decline in shoulder joint function, leading to a deterioration in the individual's overall activities of daily living.

Subacromial impingement syndrome (SIS) is a condition that occurs due to the irritation of rotator cuff tendons in the subacromial space, causing pain and discomfort in the shoulder. It may contribute up to 65% of cases of shoulder pain. This condition is typically characterized by a gradual onset of symptoms, including weakness, stiffness, and a limited range of motion in the affected shoulder. Over time, the pain may increase in severity and become more persistent, potentially leading to a decreased quality of life and difficulty in performing daily activities, especially overhead movements such as abduction and internal rotation [1]. Alteration in the shape of acromion process can also be one of the contributing factors for development of SIS. The shape can be flat, curved or hooked, thus impinging upon the underlying tendons of the rotator cuff muscles. Understanding the morphology of the acromion process is essential in identifying the cause of shoulder impingement and implementing an effective treatment plan [2].

When it comes to treating scapular kinematics, the ultimate objective should be to enhance the muscular forces that regulate the position and movement of the scapula. This can be achieved by focusing on increasing the movement of muscles and improving strength, flexibility, and balance. The primary objective of rehabilitation should be to increase motion awareness and strengthen the rotator cuff and scapular rotators. Recent research findings have shown that exercise therapy can significantly reduce pain and disability in patients with SIS in contrast to no exercise done. It is crucial to consider a holistic approach to rehabilitation that involves various strategies to improve scapular kinematics effectively.

The present review of literature aims to find different physiotherapeutic interventions and their efficacy in Subacromial impingement syndrome.

II. Effect of Joint Mobilization on Shoulder Impingement Syndrome

Joint mobilization is one of the most commonly used methods to improve a joint's range of motion (ROM). There are many studies that have reported the effect of this technique in SIS patients. Gutiérrez-Espinoza *et al.,* studied the efficiency of scapular mobilization combined with an exercise programme in 72 individuals suffering from SIS who were allocated to two groups. One group received exercise and the other group received exercise plus scapular mobilization. Outcome measures included the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, pain assessment using the visual analog scale (VAS), scapular upward rotation, and the Constant-Murley questionnaire, which were recorded at baseline and after 6 weeks. It was found that the inclusion of scapular mobilization did not significantly improve function, discomfort, in patients with shoulder impingement syndrome [3].

Comparisons of joint mobilization have been done with various other methods / interventions. For example, Moradi *et al.,* conducted a study to find the effects of joint mobilization versus Fascial Distortion Model (FDM) in terms of the pain severity, painfree abduction ROM, and function in individuals suffering from shoulder impingement syndrome. Twenty-six patients with a diagnosis of shoulder impingement syndrome were randomized equally into two groups that received shoulder joint mobilization and manual treatment based on FDM. Every other day, three intervention sessions were given to each patient. Before and after each session, as well as at the 2-week follow-up, pain severity, pain-free abduction ROM, and performance were evaluated. The patients' level of satisfaction with their care was also measured. After the intervention, the FDM therapy group had a statistically significant increase in ROM and a reduction in discomfort compared to the joint mobilization group; however, only the difference in ROM persisted after the intervention. For function, therewas no statistically significant difference between the groups. Patients' satisfaction with their treatment also did not differ between the groups [4].

Upon comparing the effects of conventional physiotherapy and neuromobilization (NM) on pain and functional disability, Akhtar *et al.,* concluded that NM had better effects in reducing the pain intensity and disability experienced by Subacromial impingement syndrome patient [19]. They conducted the study on 80 individuals with SIS and divided them into two groups (n=40 each) that received standard physiotherapy and neuromobilization (NM) with conventional physiotherapy [5].

Dash *et al.,* compared the immediate effectiveness of mobilization and myofascial release (MFR) on pain and range of motion in twenty SIS patients. They received myofascial release at active trigger points of thoracic spine and acromioclavicular joint mobilization respectively. Range of motion and shoulder pain were measured at beginning, after first session and after one week. The findings indicated that while all groups' members significantly improved on all measures, the myofascial group outperformed the others in terms of pain intensity reduction. The study's findings suggest that MFR can be used as an initial treatment option for SIS patients in order to alleviate discomfort [6].

Land *et al.,* evaluated the impact of intervention targeting the posterior shoulder and upper thoracic spine on external Subacromial impingement syndrome. Participants with SIS were randomly allocated to 2 groups. The first group received massage, passive mobilization and stretching. The second group served as an active control group. The treatment duration was twelve weeks. Outcome measures included active thoracic flexion / extension ROM, passive shoulder internal rotation and posterior shoulder range, VAS, and SPADI. Results indicated a substantial reduction in pain, an increase in function scores, and an increase in posterior shoulder range at twelve weeks and six months after the intervention in first group [7].

Srivastava *et al.,* evaluated the similarities and differences between cryotherapy and mobilization with movement (MWM) in 22 patients of SIS who were randomly assigned to mobilization with movement (MWM) group or cryotherapy group, combined with impairment-based exercises, for six sessions. After six therapy sessions, there was a substantial improvement in ROM and a decrease in pain and impairment levels in both groups. The MWM group had an instant improvement in discomfort and range of motion. However, after six sessions, no significant difference was found between the effectiveness of MWM and cryotherapy in improving ROM and discomfort [8].

III. Effect of Electrotherapy in Shoulder Impingement Syndrome

Electrotherapy has emerged as a multifaceted treatment approach for addressing shoulder impingement syndrome, using its diverse mechanisms of actions. By modulating pain perception, enhancing blood flow, promoting tissue healing, and facilitating muscle activation, electrotherapy offers a comprehensive therapeutic strategy. Among the array of electrotherapy modalities used, shock wave therapy is well renowned for its efficacy in delivering high-energy shock waves to stimulate tissue repair and alleviate pain. Pulsed electromagnetic field therapy on contrary, stands out for its ability to apply electromagnetic fields, fostering tissue regeneration and reducing inflammation. Electric stimulation using modalities such as transcutaneous electrical nerve stimulation (TENS) and neuromuscular electrical stimulation (NMES), contribute to pain management and muscle strength improvement around the shoulder joint. Ultrasound therapy, utilizing high-frequency sound waves to generate heat and enhance tissue healing, provides the relief by reducing pain and enhancing tissue flexibility. Also, high-power laser therapy emerges as a cutting-edge tool, delivering focused laser energy to target tissues, accelerating healing processes, and mitigating inflammation. Electrotherapy modalities provide a holistic approach towards managing shoulder impingement syndrome, offering patients a diversified toolkit to address their symptoms and enhance their overall quality of life.

There are several researches that report the efficacy of electrotherapy in SIS. Kandemire *et al.,* conducted a randomised controlled trial to assess the effectiveness of pulsed electromagnetic field therapy (PEMF) in subacromial impingement syndrome. 250 subjects with SIS were randomly allocated to intervention or control group that received pulsed electromagnetic field therapy plus exercise and sham pulsed electromagnetic field therapy plus exercise respectively for 20 sessions five days / week. SPADI, VAS, the Constant Murley Score (CMS), quality of lifeand the shoulder muscle strength were measured at the beginning of therapy (T0), the end of treatment (T1), and the twelve-week mark (T2). When

compared to the baseline, most metrics in both groups improved at T1 and T2, according to evaluations. When the two groups were compared at T1 and T2, the PEMF group showed greater improvement across the majority of measures. During the first and third months, PEMF was found to be more effective [9].

Karaaslan *et al.,* evaluated the impact of exercise training plus neuromuscular electrical stimulation with exercise training alone in 24 patients with SIS. The subjects were allocated to exercise training and exercise training plus neuromuscular electrical stimulation group respectively. DASH, VAS and range of motion were measured at baseline and after completing 8 weeks of the treatment. Both groups exhibited improvements in all variables (except for flexion in the exercise training group), and pain reduction [10].

Shanker *et al.,* compared the effects of exercise therapy and ultrasound therapy (UST) in 30 SIS patients who were randomly allocated to ultrasound therapy and exercise therapy treatment groups respectively. The VAS score, the SPADI score, and shoulder range of motion were assessed in the subjects, before and after therapy. According to the findings, exercise therapy significantly outperformed ultrasound therapy (UST) in every measure. It was concluded that exercise therapy had better results than ultrasound [11].

Kamal *et al.,* conducted a randomised controlled trial to find the impact of high-power laser therapy on the mobility of the shoulder in patients with SIS. Forty patients with a diagnosis of stage one and two SIS discomfort were allocated to 2 groups. Group A received high intensity pulsed laser for 15 minutes per session. Two sessions per week were given for 6 weeks, in addition to exercise. Group B received Pendulum exercise for 5 minutes, strengthening exercise for the anterior fibres of the deltoid followed by stretching of shoulder capsule and subscapularis muscle. Shoulder flexion, abduction, and supraspinatus tendon thickness using ultrasound, and VAS were measured. After the therapy program, group A had better results for all outcome measures than group A [12].

Ucurum *et al.,* evaluated the differences between the effects of electrotherapy and exercise therapy on pain, function and quality of life in 79 patients of shoulder impingement who were randomly allocated into four groups. Group one received hot pack and exercise, group two received hot pack, exercise and IFT; group 3 received hot pack, exercise, and TENS; and group 4 received hot pack, exercise, and ultrasound three times a week for four weeks. VAS and DASH scores were noted before and after therapy, and three months later. Improvements were observed in all variables of four groups after 4 weeks and 3 months. However, no discernible difference was seen between the groups [13].

Kibar *et al.*, determined the efficiency of laser acupuncture in 73 shoulder impingement syndrome patients who were randomly allocated to 2 groups that received laser acupuncture and sham laser acupuncture respectively. Laser acupuncture was given at 11 acupuncture points. Additionally, hot pack was applied to each patient.VAS, ROM and SPADI were measured at baseline and after completing 15 sessions of treatment. All treatment groups had statistically significant improvement in the variables studied. By week 3, the treatment group's pain and functional status were all significantly better than the control group [14].

IV. Role of Manual Therapy and Exercise in Shoulder Impingement Syndrome

Azin *et al.,* conducted an experimental longitudinal study to find the effects of manual therapy and therapeutic exercise on shoulder pain, function, and ROM in 60 patients with SIS. VAS, SPADI, and active ROM were measured at baseline, after treatment and one month later. Both groups had significant improvement in all variables. Pain was more reduced in manual therapy group. However, for ROM and disability, both groups had similar effects [15].

Gomes *et al.,* studied the effects of adding interferential current with exercise and manual therapy in 45 individuals with unilateral SIS. The subjects were randomly allocated to three groups. Group one received exercise and manual therapy, group two received exercise, manual therapy and interferential current, and group three received exercise, manual therapy and placebo ultrasound. Patients engaged in sixteen therapy sessions, held two times a week for a duration of 8 weeks. Outcomes measures included SPADI and pain. It was concluded that adding interferential current does not lead to improved clinical outcomes in patients with unilateral shoulder impingement syndrome [16].

Elnour *et al.,* investigated the impact of neuromuscular trainingon the power of internal rotator muscles and shoulder proprioception in 34 patients with SIS, aged 25 to 45 years. The selected patients were divided into two groups. Group I received strength training, while Group II received exercises for upper extremity neuromuscular training. Shoulder proprioception and isometric muscle strength were measured with an inclinometer and a hand-held dynamometer at baseline and after six weeks. Both groups improved proprioception and muscle strength. On the other hand, the strength of shoulder internal rotators did not show a significant difference among individuals [17].

Akguller *et al.,* compared the scapular proprioceptive neuromuscular facilitation (PNF) with exercise in patients with SIS. In this study, 36 individuals underwent a 6-week training program twice a week. The first group received proprioceptive neuromuscular facilitation (PNF) with stretching, while the second group only underwent the exercise program. The primary outcomes were pain and function. The secondary measures included active ROM, pain pressure threshold, scapular dyskinesis, anxiety, and depression status. The study found that the PNF group had significantly greater improvement in all variables compared to the exercise group [18].

Letafatkar *et al.,* determined if therapeutic exercise plus Kinesio tape (KT) is a more useful way to enhance clinical

outcomes for individuals with shoulder impingement syndrome than therapeutic exercise alone or not. 20 individuals with SIS were randomised to 3 groups i.e. therapeutic exercise alone; therapeutic exercise with KT and a control group. Pain, disability and scapular kinematics were measured at beginning and after eight weeks. The KT group showed a substantial difference in pain management as opposed to the control group and the therapeutic exercise alone. When as opposed to control group, therapeutic exercise alone produced better results [19].

Hotta *et al.,* determined the effect of periscapular strengthening or scapular stabilization on pain, ROM, muscular strength and disability in 60 participants suffering from Subacromial pain syndrome (SAPS). They were randomly allocated to 2 groups that received these techniques respectively. These interventions were given 3 times a week over a span of 8 weeks. The primary and secondary outcomes were measured at baseline, 4 and 8 weeks and also 16 weeks after the baseline assessment. There were no discernible variations between the groups' primary and secondary results at any point during the study period. SAPS retraction and depression focused scapular stability exercises did not improve self reported shoulder pain, disability, muscular strength, or range of motion when combined with a gradual general periscapular strengthening strategy [20].

ElGendy *et al.,* investigated the impact of adding local corticosteroid injection or extracorporeal shock wave therapy to a conventional physical therapy (CPT) in patients with Subacromial impingement syndrome. 60 patients of unilateral subacromial impingement syndrome were allocated to three groups. Measurements of subacromial space, shoulder discomfort, disability score, and ROM were done at baseline, four weeks, and twelve weeks. At four weeks, no differences existed between the groups. Local corticosteroid injection and extracorporeal shock wave therapy did not differ significantly at the 12-week follow-up. In terms of subacromial space and shoulder internal rotation, there was a substantial difference favouring conventional physical therapy (CPT) over local corticosteroid injection. With the exception of subacromial space, CPT outperformed extracorporeal shock wave therapy in every outcome. When added to CPT, extracorporeal shock wave therapy produced more pronounced intermediate-term benefits than either CPT alone or CPT + local corticosteroid injection [21].

Juárez-Albuixech *et al.,* conducted a comparison between Vojta therapy (VT) and standard therapy (ST) in 60 individuals with SIS who were randomly allocated to 2 groups: standard therapy (ST) and standard therapy plus vojta therapy (SVT). Fifteen sessions were given for 4 weeks. Outcome measures included quality of life, strength, joint ROM functioning, and pain severity. All groups showed statistically significant improvement. Follow up at 3 months indicated that standard therapy plus vojta therapy is more effectivein lowering discomfort, enhancing performance, strengthening, enhancing joint ROM, and providing a better quality of life in individuals with SIS [22].

Imani *et al.,* determined efficiency of dry needling in shoulder impingement syndrome. 66 patients of SIS were randomly allocated to 3 groups that received deep dry needling, routine physiotherapy with only dry needling and routine physical treatment without dry needling. Pain, disability and pressure pain threshold prior to, during and after four weeks were measured. Group receiving dry needling treatment showed considerable reduction in pain and disability. The other two groups showed no significant differences in pressure pain threshold in comparison to deep dry needling group [23].

V. Overall Impact of Physiotherapy Methods in Shoulder Impingement Syndrome

The review of literature has indicated that shoulder impingement syndrome can be effectively treated with physiotherapy to reduce pain, increase range of motion, and improve shoulder function. In addition to manual therapy techniques, exercises aimed at posture correction, strengthening, and flexibility are effective. In addition to helping with long-term management and recurrence prevention, patient education about correct mechanics and ergonomic modifications is also beneficial. When treating shoulder impingement syndrome, physiotherapy usually takes a multimodal approach with the goals of minimizing pain, increasing range of motion, and regaining function. In order to relieve tension and enhance joint mechanics, manual therapy methods, including joint mobilization and soft tissue mobilization, may be used as part of the treatment. To increase muscular balance and shoulder stability, strengthening exercises that focus on the rotator cuff and scapular stabilizers are frequently recommended Stretching exercises also aid in reducing muscular imbalances that cause impingement and improving flexibility. Pain and inflammation can be controlled with modalities like electrical stimulation, ultrasound, and ice or heat therapy.

Apart from electrotherapy, interventions such as kinesio taping, proprioceptive neuromuscular facilitation (PNF) techniques and dry needling have also shown positive benefits in the management of shoulder impingement syndrome. Kinesio taping offers support to muscles and joints while maintaining full mobility. On other hand, PNF techniques enhance neuromuscular control and coordination to improve the functionality of the shoulder complex. Dry needling can be used as a method to relieve pain and muscle tension in the affected shoulder. Use of laser energy to target tissue hastens healing processes while alleviating pain and inflammation. Thus, physiotherapy can be a safe and effective treatment method for shoulder impingement syndrome. However, the selection of appropriate interventions should be tailored to each individual's specific needs and preferences, considering factors such as the severity

of symptoms, underlying causes, and functional limitations. Additionally, a comprehensive rehabilitation program that includes a combination of modalities and exercises is often recommended to achieve optimal outcomes in the management of shoulder impingement syndrome.

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