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EFFICACY OF DRY NEEDLING IN TREATMENT OF ADHESIVE CAPSULITIS OF SHOULDER

Physiotherapy

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ABSTRACT

Background And Purpose: Adhesive Capsulitis is represented as a common shoulder condition indicated by painful and limited active and passive range of motion. Dry Needling is a treatment that involves a very thin needle being pushed through the skin to stimulate a trigger point. Dry Needling release the tight bands connected with trigger points and lead to decreased pain and improved function. This study aimed to find out the efficacy of Dry Needling in treating Adhesive Capsulitis of the shoulder. **Material And Method:** Dry Needling was used on the affected muscles combined with the standardized treatment protocol, including joint mobilization, pRom, aRom, therapeutic exercise, moist heat and home exercise. The pretest, post-test one and post-test two readings on the Penn Shoulder scale for pain and functional outcome measure and the ROM by the universal goniometer were taken. The treatment protocol was of four weeks. A standardized physiotherapeutic protocol was given for four sessions per week and a maximum of two sessions of Dry Needling per week as per the requirement. The muscles treated were upper trapezius, supraspinatus, infraspinatus, teres minor, subscapularis and deltoid. **Subjects:** Twenty-two subjects aged 36 to 55 years with adhesive capsulitis were recruited from the outpatient department of the Hakeem Abdul Hameed Centenary Hospital, New Delhi according to the predefined inclusion and exclusion criteria. **Results:** Overall, subjects in both groups improved over the four weeks. In terms of percentage, statistically significant improvements in shoulder ROM, pain and functional outcome were found in the experimental group. **Conclusion:** Dry Needling to the upper trapezius, supraspinatus, infraspinatus, teres minor, subscapularis and deltoid muscles led to rapid improvement in the patients' symptoms which suggests that they may be a significant source of pain and restricted ROM in this condition.

KEYWORDS

Dry Needle, Adhesive Capsulitis, Trigger Point, Joint mobilization

INTRODUCTION

Adhesive capsulitis is a common condition of the shoulder identified by a painful and limited range of motion[1]. Usually, the most affected ranges of motion are flexion, abduction and lateral rotation[2]. Some authors say that adhesive capsulitis is a self-limiting condition lasting around six months. On the other hand, some authors suggest that it is a chronic disorder causing prolonged disability.[3] The exact pathophysiology of adhesive-capsulitis remains doubtful[2].

One gets capsular and ligamentous tightness in adhesive capsulitis, facial limitations, muscular stiffness and trigger points within the involved muscles.[2]

Cyriax suggested that joint capsule tightness would result in a pattern of proportional motion restriction (a shoulder capsular pattern in which abduction would be less limited than external rotation, which would be less limited than internal rotation).[3]

Physical therapists use various interventions in the adhesive-capsulitis patients, including mobilisation, soft tissue massage, therapeutic exercise, electrotherapy and dry needling.

In this specific research, we have to study the effect of dry needling on the overall rehabilitation process of adhesive capsulitis.

Dry needling (DN) is a technique that physiotherapists extensively use all over the world.[6] Dry needling is a treatment that involves piercing by a thin acupuncture needle to treat a trigger point (TrP). The tight bands associated with trigger points get released by the dry needling technique; this decreases the pain and improves the function.[5]There are two types of dry needling, i.e. superficial and deep dry needling. Deep DN helps treat the TrPs by eliciting a local twitch response (LTR), modified by the central nervous system. An LTR is an involuntary spinal reflex. It involves localised contraction of muscle fibres that are stretched manually or dry needled. *Ceccherelli* et al. have shown that the deep stimulation by the needle had a good analgesic effect compared with superficial stimulation. *Itoh* et al. concluded that the deepness of needle penetration is essential for muscle pain relief.[11]

Muscle tension depends upon the viscoelastic properties of a muscle and its surrounding fascia. The degree of activation of the sarcomeres also plays a role. Some researchers say that extreme muscle tension seen in spasticity can also be relieved by DN.[12]

Chen et al. and *Hsieh* et al. showed that DN to muscle Trp could effectively repress the spontaneous electrical activity (SEA) by eliciting the LTRs. Inserting the needle at the endplate region increases the discharges, quickly utilizing the available Acetylcholine stores (Ach) and decreasing the SEA.[11]

Physiotherapists around the world widely use dry needling for the treatment of musculoskeletal disorders. A 32-gauge acupuncture needle is penetrated into the palpably painful trigger points using a superficial (10-20mm) or deep (25-40mm) needling technique[8].

Dry needling of trigger points is recommended to reduce the MTrP shoulder pain in the short term, i.e. less than 9 days. Latent TrP DN may avert the growth of active MTrPs in the upper limb, decrease the nociceptive input, normalize synaptic efficacy, and decrease the central and peripheral sensitization in shoulder pain.[9]

Although Clewely showed the clinical significance of giving DN to the upper trapezius, levator scapulae, deltoid and infraspinatus muscles in adhesive capsulitis patients, however, there is not much evidence describing dry needling as an effective intervention for restricted ROM, reducing pain and function in them.[4,15]

This research aims to study the effect of deep dry Needling on the affected muscles in Adhesive capsulitis. In most musculoskeletal conditions, specifically chronic, there is a development of TrPs in the affected muscles; [19] therefore, the addition of Dry Needling to the standardized physiotherapeutic treatment protocol of Adhesive capsulitis will decrease the associated pain and stiffness. It will also augment the limited ROM due to the capsular tightness and will positively affect the overall functional performance of the individuals.

METHODS

A convenient sample of twenty-two subjects, middle-aged and older adults from 36-55 years, male and female, was recruited in the study. The source of the subject was Hakeem Abdul Hameed Centenary Hospital (HAHC). The subjects signed the informed consent and participated according to the inclusion and exclusion criteria. The chit system randomly allocated the selected subjects to the control and experimental groups, with 11 subjects in each group. Before data

collection, the study was approved by the Institutional Ethics Committee of Jamia Hamdard (Deemed to be University).

Inclusion Criteria

1. Painful and stiff shoulder for at least three months
2. Limited ROM of the shoulder joint (flexion, abduction, or medial and lateral rotation)
3.Diagnosed Adhesive Capsulitis patients by an orthopaedic surgeon.

Exclusion Criteria

1. A history of surgery on the particular shoulder
2. H/o Rheumatoid arthritis
3. Painful and stiff shoulder after a severe trauma
4. Fracture of the shoulder complex
5. Previous h/o Rotator cuff ruptures

Pre Test

The subjects were assessed by the Penn shoulder scale14 for self-report levels of pain, satisfaction, and function. Apart from this, their Range of Motion for the involved shoulder joint was also assessed. Range of motion measurement is necessary for the evaluation and diagnosis of Adhesive Capsulitis of the shoulder. The measurements were taken with a universal goniometer.

INTERVENTION

Control Group:

The control group patients were treated with the standardized treatment protocol, including appropriate joint mobilization, pRom, aRom, Therapeutic exercise, Patient education, and moist heat.

Experimental Group:

The Experimental group patients were treated by a course of DDN to the affected muscles in combination with the standardized treatment protocol. Dry needling was applied on the upper trapezius, levator scapulae, deltoid, infraspinatus, supraspinatus, teres minor and subscapularis muscles.

The treatment protocol was given for 16 sessions in a month. For the control group, the standardized protocol was given for four sessions per week, and the Experimental group Standardized protocol was given for four sessions per week, and a maximum of 2 sessions per week of DN were given to different muscles on a rotation basis. All the muscles were not treated in a single session. A maximum of four muscles were treated during a single session of DN depending upon the presenting complaints of the patient and the palpatory assessment by the therapist. The maximum number of DN sessions for a single subject ranged from five to eight during the whole study period. The average numbers of DN sessions per patient were six on a rotation basis.

Post Test

The Post-test readings of ROM and Penn Shoulder scale were taken after two weeks of treatment (Post Test1) and after four weeks (Post Test 2). After four weeks of treatment, the ROM and Penn Shoulder scale readings were compared: Pre-test to Post-test1, Pos-test1 to Post-Test2 and final Pre-Test to Post-Test2.

RESULTS

A total of 22 subjects were included in the study. Eleven subjects each were included in both the control group and the experimental group. There were seven males and four females in the control group and six males and five females in the experimental group. The mean values in the control group for age was 50.27±6.53, and the mean value for age in the experimental group was 49.18±7.15.

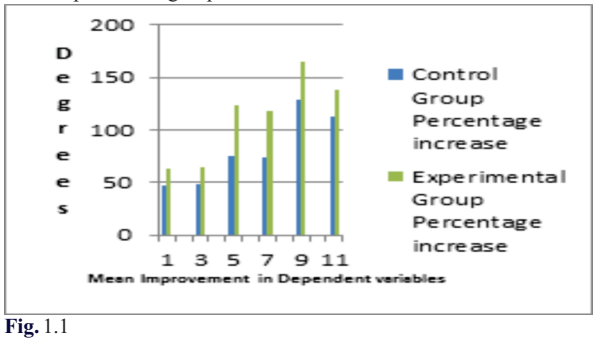

Fig. 1.1

The mean improvement in the dependent variables during the course of the study was represented as percentage improvement between pretest and post-test 2. Fig.1.1 and Table 1.1.

Table 1.1

Dependent Variable	Control Group% ageinc.	S D	Experimental Group % ageinc.	S D
Shoulder Flexion (Active)	47.57352	11.98	63.71367	27.76
Shoulder Flexion (Passive)	48.60147	10.76	64.04911	27.15
Shoulder Abduction (Active)	75.64398	34.97	123.5883	49.16
Shoulder Abduction (Passive)	73.79692	33.12	118.6261	44.25
Shoulder Int. Rotation at 45^0abd (Active)	128.4762	92.12	164.5563	150.36
Shoulder Int. Rotation at 45^0abd (Passive)	112.3909	71.66	138.7493	105.36
Shoulder Ext. Rotation at 45^0abd (Active)	180.855	90.37	357.4675	335.62
Shoulder Ext. Rotation at 45^0abdb (Passive)	160.0003	73.83	274.3201	23.12
Penn Shoulder Scale Score	101.342	31.93	118.2225	42.76

DISCUSSION

The objective of this study was to see *the Efficacy of Dry Needling in the treatment of Adhesive Capsulitis of the Shoulder*. The present study included eleven subjects in the control group and eleven subjects in the experimental group. The range of motions (Active and Passive) and Penn shoulder scale score of each group were measured, and differences of values between each group were calculated. Results revealed that a statistically significant improvement occurred in both the groups but in terms of percentage improvement, the experimental group improved more than the control group for the dependent variables. This study showed a significant difference in the ROM (Active and Passive), Pain and Functional outcome of the control and experimental group with the p-value of *0.00.*

In the present study, both our groups showed significant improvement in the dependent variables, including ROM (Active and Passive), Pain and Functional outcome. In the control group, the standardized treatment protocol included appropriate joint mobilization, pRom, aRom, Therapeutic exercise, Patient education, and moist heat. As we all know, the pathophysiology of Adhesive Capsulitis includes inflammation, contracture formation, and fibrosis of the capsuloligamentous tissue.[1] Therefore; joint mobilization is an effective intervention for adhesive capsulitis. The anterior glide was lesser effective than the posterior glide for improving external rotation in patients with adhesive capsulitis.[2]Vermulen presented a case series of 7 patients with frozen shoulder treated using only extreme end-range mobilization techniques (no exercise or modalities) over a 3-month duration. They reported significant improvement in active and passive motion and pain.[16]Vermullen also performed a randomized prospective study comparing high-grade mobilization techniques to low-grade mobilization techniques (grades I and II). Patients were treated for over 12 weeks and followed for 12 months. They found significant differences in motion and disability for both groups, and the most significant improvement occurred in the initial three months. The high-grade mobilization group did satisfactorily, but only a few comparisons gained statistical importance, and the overall differences between the two interventions were minor.[17] Mobilization technique improves the normal extensibility and mobility of the shoulder capsule and stretches the hardened soft tissues to induce beneficial effects.[3] Hot packs wrapped in a towel were placed on the target shoulder for 20 minutes for superficial heating, which helped in reducing pain.[18]

Griggs et al. disclosed in a study that showed a remarkably satisfactory result from participating in a "4-direction shoulder muscles stretching program". In the study, 75 subjects identified with Stage II idiopathic adhesive capsulitis participated, and 85% of the subjects were self-satisfied with the outcome of the four-direction shoulder muscles stretching program. As a long-term study, 85% of the subjects obtained a significant increase in ROM of lateral rotation, internal rotation, flexion and abduction in the first initial months and maintained the ROM.10.

Active-assisted ROM exercises are frequently prescribed for adhesive capsulitis. The patients use equipment such as rope, pulley, T-bar or exercise ball. These exercises are done for flexion, abduction and external rotation, which are frequently restricted. According to Griggs and colleagues2, four self-stretches (passive flexion, horizontal adduction, internal rotation using non-affected arm, and lateral rotation at 0° with a cane) performed twice a day created a satisfactory outcome in stage two adhesive capsulitis subjects. These subjects remarkably improved in pain, range of motion, and shoulder function.
When we compared the percentage increase for our dependent variables, we found that improvement in both groups was statistically significant but more in the experimental group than the control group. The experimental group was also subjected to the standardized treatment protocol, so the explanation given above will hold good in this case. More improvement in the dependent variables in the experimental group can be attributed to the addition of dry needling in the experimental group. Myofascial trigger point pain is characterized as "pain emerging from one or more myofascial trigger points (MTrPs), which are hyperirritable spots in skeletal muscle that are related with overly sensitive tangible knots in tight bands".6 TrPs are physiological contractures, recognized by local ischemia and hypoxia, a remarkably lowered pH (active TRPs only), a chemically altered milieu (active TRPs only), local and referred pain, and altered muscle activation patterns. MTrPs are caused by an extreme arrival of acetylcholine (Ach) from motor endplates. The lengthy arrivals of acetylcholine bring about chronic contracture of sarcomeres, combined with diminished flow prompting neighbourhood ischemia and hypoxia. Subsequently, prostaglandins, bradykinins, cytokines, and histamine are delivered, sensitizing the muscles' sensory afferent nerve fibers, likely representing the particular point delicacy usually seen with MTrPs. In Travel and Simmons classic textbook, the author expressed about subscapularis muscles in cases of adhesive capsulitis because trigger points in the subscapularis cause restriction in shoulder elevation and lateral rotation.2

Dry needling intervention was centred on treating myofascial trigger focuses in the nearby tissue.[4] The benefits of DN are progressively reported in effect, including a rapid decrease in local, alluded, and broad pain and restoration of range of motion and muscle enactment. According to Hong et al. [11,19], deep DN has been shown to release TrPs by obtaining Local twitch responses adjusted by the central nervous system. A *local twitch response* is an involuntary spinal reflex, a constrained contraction of affected muscle fibers that are manually stretched or dry needled. *Ceccherelli* et al. [11,20] showed that deep stimulation has a preferable analgesic outcome as differentiated with superficial stimulation. *Itoh et al.* [11,21] conclude that the depth of needle penetration is vital for relieving muscle pain.[11]

Various studies have been done in Adhesive Capsulitis and Dry Needling, but there is a lack of literature focusing on the effect of dry needling in treating adhesive capsulitis of the shoulder. In this study, the subjects had significant pain reproduced from palpation of the associated MTrP. After trigger point dry needling was introduced, rapid improvement was seen in ROM (active and passive), pain and functional outcome. The muscles treated with DN were upper trapezius, subscapularis, supraspinatus, infraspinatus, teres minor and deltoid. The improvement suggests that these muscles were a significant source of restriction in pain, function and ROM.

In this study, we could collect data on a handful of patients because of time paucity. In the future, the research can be done with larger sample size and comparatively for a longer time.

CONCLUSION

The study included a comparison of two groups, control and experimental. In the control group, we gave a standardized treatment protocol of adhesive capsulitis, and in the experimental group, we added dry needling along with a standardized treatment protocol. The study revealed that the addition of dry needling to standardized treatment protocol led to more improvement in ROM (active and passive), pain and functional outcome. On other angles, when we compared the results within the control and the experimental groups, there was significant improvement found in each group.

Conflict Of Interest- NONE

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