EFFECT OF INSTRUMENT ASSISTED SOFT TISSUE MOBILIZATION ON HAND GRIP STRENGTH IN PATIENTS WITH SUBACROMIAL IMПINGEMENT SYNDROME: A RANDOMIZED CONTROLLED STUDY

Fatma Seddik Amin¹, Nabil Mahmoud Abdel-Aal², Nancy Shehta Ali³, Ashraf Nehad Moharram⁴

¹ PhD, Professor of physical therapy, Department of physical therapy for Basic Sciences, Faculty of Physical Therapy, Cairo University, Giza, Egypt.
² PhD, Assistant professor, Department of physical therapy for Basic Sciences, Faculty of Physical Therapy, Cairo University, Giza, Egypt.
³ MSc., Department of physical therapy for Basic Sciences, Faculty of Physical Therapy, Cairo University, Giza, Egypt.
⁴ PhD, Professor of Orthopedic Surgery, Department of Orthopedic Surgery, Faculty of Medicine, Cairo University, Giza, Egypt.

E-mail: nancy_shehta89@yahoo.com, nancyshehta47@gmail.com (Nancy Shehta Ali)

ABSTRACT

Objective: To investigate the additive effects of instrument assisted soft tissue mobilization to the conventional physical therapy program on handgrip strength, upper limb functions, and pain in patients with subacromial impingement syndrome.

Design: A single-blinded, randomized controlled study.

Setting: Outpatient physical therapy clinic, Cairo University Hospitals.

Subjects: Sixty patients, 25 to 40 years old, with subacromial impingement syndrome, were randomly assigned either into one of two groups: study or control.

Intervention: The study group received the conventional physical therapy for subacromial impingement syndrome plus instrument assisted soft tissue mobilization (IASTM), while the control group received only the conventional physical therapy. Interventions were conducted three times per week for four weeks.

Outcome measures: Hand grip strength, upper limb functions, and pain were evaluated at the beginning of the study and after two, and four weeks of interventions.

Results: There were statistically significant differences in hand grip strength, upper limb functions, and pain in both groups after 2 and 4 weeks from intervention in favor of the study group (p<0.05). After 4 weeks from intervention, M±SD for HG, DASH, and VAS were 31.28±5.19 kg, 7.18±3.44, and 15.0±5.72 mm in the study group, and 21.48±6.87 kg, 16.69±6.67, and 30.67±6.91 mm in the control group, respectively.

Conclusions: Instrument assisted soft tissue mobilization combined with the conventional physical therapy program was more beneficial in improving hand grip strength, upper limb functions, and pain than the conventional physical therapy alone. It could be used as a useful adjunctive therapy in management of patients with subacromial impingement syndrome.

Key Words: IASTM, Exercises, Subacromial impingement syndrome, Hand Grip strength.
I. INTRODUCTION
One of the most common causes of shoulder pain among musculoskeletal disorders is subacromial impingement syndrome, which is a narrowing of the subacromial space[1,2]. The prevalence of subacromial impingement syndrome (SIS) increases with aging for both men and women, but it is more frequent in women. The resulting shoulder pain from SIS not only causes pain and limitation of the shoulder joint functions but also significantly influence the upper limb functions and the patient's ability to work and perform his normal daily life and recreational activities that limits the quality of life of SIS patients[3,4].

Common examination findings associated with SIS include abnormalities with scapular kinematics such as lateral displacement of scapula, reduced upward rotation, and posterior scapular tilting [5]. It is hypothesized that SIS presenting with decreased upward rotation of the scapula may be due to soft tissue restrictions [6]. Inflammation or injury of fascia, as a result of inactivity or bad posture, may alter its mechanical properties due to loss of elasticity, dehydration, fibrous adhesions, pain, and limited muscle function [7].

Instrument assisted soft tissue mobilization (IASTM) is a common skilled myofascial intervention for musculoskeletal pathologies and sports medicine. It is applied using uniquely designed instruments to provide soft tissue mobilization by various direct compressive stroke techniques [8]. IASTM treatment can regenerate and remodel soft tissues by creating a localized inflammatory response releasing cellular mediators and growth factors [9,10]. The IASTM help to trigger remodeling of the connective tissue via excessive fibrosis re-absorption, as well as facilitating recruitment of fibroblast that induces repair and regeneration of collagen [11,12]. In turn, this will lead to disruption of the adhesion, scar tissue and fascial restriction[13].

There is a gap in the area of IASTM and no studies, up to the authors' knowledge, evaluated its effects on hand grip strength in patients with SIS. Therefore, the ongoing study was designed to determine the effect of adding the instrument assisted soft tissue mobilization (IASTM) to the conventional physical therapy program on hand grip strength, upper limb functions and pain in patients with subacromial impingement syndrome. The authors hypothesized that the instrument assisted soft tissue mobilization combined with the conventional physical therapy program improves hand grip strength, upper limb functions and pain more than the conventional physical therapy program alone in patients with subacromial impingement syndrome.

II. SUBJECTS AND METHODS

Study Design
This study was a single-blinded, parallel groups, randomized controlled trial. The present study was accepted by ethical committee board of the Faculty of Physical Therapy, Cairo University (P.T.REC/012/002343). This study was registered at Pan African Clinical Trial with the reference number: PACTR202005827347437. Subjects were recruited from the orthopedic outpatient clinic of the Cairo University Hospitals, after being diagnosed and referred by a physician. The study was performed at the physiotherapy outpatient clinic of the Cairo University Hospitals, Giza, Egypt from June 2019 to April 2020. The participants had been informed about the purpose of the study, objectives, ability to discontinue at any time, and information confidentiality. Before participating in the study, all individuals were required to complete a written consent form. The reporting of this study was according to CONSORT guidelines.

PARTICIPANTS
An eligibility screening was performed to all patients with subacromial impingement syndrome referred to the physical therapy clinic to participate in this study. Sixty patients were diagnosed with subacromial impingement syndrome based on the physician diagnosis and referral. All participants had been recruited according to the inclusion criteria: age ranged from 20 to 45 years, from both gender, BMI from 18.5-24.9 kg/m², with subacromial impingement syndrome lasting at least 6 weeks, as confirmed with positive Hawkins-Kennedy test, Neer's sign, and empty can test as a physical examination [4] before starting the study. Exclusion criteria included patients who have any of the following: hand trauma, present pain or other kinds of complaints in the hand area, history of deformities, fractures, or surgery of the tested upper extremity joints affecting grip strength within the last 6 months, history of degenerative disease of the cervical spine and cervical radiculopathy, abrasion or direct trauma to the shoulder, scapular and pectoral area, hypersensitive skin, presence of cardiopulmonary problems, hormonal disorder, central or peripheral neurological deficits or any
condition that can influence the results. Every patient was asked to stop using NSAID at least one week before intervention.

Sample size:
Before the beginning of the study, the sample size calculation was conducted to avoid type II error. The prior sample size was calculated by G*Power (version 3.1.9.2; Germany), according to a pilot study (5 patients in each group) with effect size equals 0.46 for hand grip strength. That effect size helps to detect a true difference in means between groups with a power of 80% and a level of significance of 5%. So, a total sample size of 49 patients was needed. To account for the drop-off, the calculated sample size was increased by 20%, resulting in a study sample size of sixty patients (30 for each group).

Randomization
Sixty subjects with subacromial impingement syndrome were randomly allocated to the study or the control group with computer-generated block randomization program at http://www.randomization.com/. Patients were randomized in block sizes of 4 and 6 with a 1:1 allocation ratio to eliminate the bias and variability between the two groups. The randomization was carried out by a statistician who was not involved in recruiting, data collection, or treatment. To ensure concealed allocation, randomization codes were kept confidential in sealed opaque envelopes and consecutively numbered.

Intervention
After the baseline measurements, the third author (N.Sh.A) unfolded the envelopes and continued with treatment according to group allocation. Both groups received the intervention three days a week for four weeks. Group (A) received IASTM and the conventional physical therapy program of SIS. Group (B) received the conventional physical therapy program of SIS alone. The conventional physical therapy program included TENS stimulation, ultrasound and therapeutic exercises. These exercises included range of motion exercises, stretching exercises for pectoralis minor and posterior capsule of the shoulder, and strengthening exercises for the scapular stabilizing muscles and rotator cuff musculatures [14]. Each exercise was done with 3 sets of 10 repetitions. The detailed description of the conventional physical therapy program is presented in Table 1.

IASTM was delivered by using M2T blade, which was applied to the pectoral muscles, shoulder rotator cuff musculature, and periscapular musculature (upper, middle, and lower fibers of Trapezius; rhomboids major and minor; teres major; and latissimus dorsi). The IASTM technique was performed for 20 seconds parallel to the muscle fibers followed by 20 seconds perpendicular to the muscle fibers with the instrument held at a 45° angle to the skin. Stroke pressure and speed were modified according to the subject's tolerance to avoid causing pain, and according to the depth of the treated muscle. Pressure was applied lightly at first with a gradual increase due to the subject's initial sensitivity to the treatment, then pressure was increased within the subject's tolerance to maximal force. After each treatment, the instrument was cleansed with alcohol. The IASTM program is presented in detail in Table 1.

Outcome measures
The second author (N. M. A), who was blinded to the allocation, evaluated all of the measurable outcomes at baseline, after 2 weeks, and after 4 weeks of the intervention. The primary outcome measure was hand grip strength. The secondary outcomes were upper limb functions and pain.

1. Hand grip strength assessment: JAMAR SMART dynamometer (Patterson Medical, UK) was used for hand grip strength assessment. This instrument is the most widely used and has excellent concurrent validity with known weights (r > 0.96) and moderate to excellent test-retest reliability (r > 0.80). It has been validated as a gold standard tool for hand grip strength measurement by the American Society of Hand Therapists (ASHT) [15].

2. Upper limb functions assessment: Disabilities of arm, shoulder, and hand (DASH) questionnaire was used for upper limb functions assessment. It is a self-administered region-specific outcome instrument developed as a measure of self-rated upper extremity disability and symptoms [16]. The Arabic form of DASH was administered, and all subjects completed it. DASH questionnaire includes 30 items with a score from 0 to 100. A score of 0 represents no disability, while a score of 100 represents the most severe disability.
disability. The items ask about the degree of difficulty in performing different physical activities as a result of the arm, shoulder, or hand problem (21 items), the severity of each of the symptoms of pain, activity-related pain, tingling, weakness, and stiffness (5 items), as well as the impact of the problem on social activities, work, sleep, and self-image (4 items).

3. Pain assessment: For assessment of pain, the visual analogue scale was used. It is usually a horizontal line, 100mm in length, with the left extremity indicating "no pain" and the right extremity indicating "intolerable or worst pain. The patients marked on the line the point that they feel represents their perception of their current state. Higher values suggest more intense pain [17]. Visual analogue scale is a valid, reliable and interval scale with high test retest reliability and repeatability [18].
III. DATA ANALYSES

The obtained data were analyzed and compared statistically using SPSS for windows version 25 (SPSS, Inc., Chicago, IL). The data was collected before and after 2 and 4 weeks for each patient in the two groups. Prior to analysis, the Shapiro-Wilk test for normality and Levene’s test for homogeneity were used to assess for

<table>
<thead>
<tr>
<th>Intervention program</th>
<th>Description</th>
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<tr>
<td>1. Transcutaneous electrical nerve stimulation (TENS)</td>
<td>TENS therapy stimulation was provided as conventional mode, current with high frequency (1000Hz) with a pulse duration of 120µs and low intensity (30-40mA) for 20 minutes. It was used around the affected shoulder to manage pain before beginning the exercises using Uniphy Physiotherapy.</td>
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<td>2. Ultrasound (US)</td>
<td>Ultrasound 1 MHz was used to provide ultrasound at an intensity of 1.5 W/cm² for 5 min, followed the application of TENS, using Zimmer MedizinSysteme, Ultrasound diathermy unit Soleosono, Germany.</td>
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<td>3. Therapeutic exercises</td>
<td>a- Range of motion exercises: Patients performed warm up exercises which included range of motion exercises of the upper extremity. The program was initiated with passive range of motion (PROM), active-assisted range of motion (AAROM), and active range of motion (AROM) with respect to the level of pain to maintain range of motion (ROM). b- Stretching exercises: After the warm up, patients performed stretching exercises focusing on the pectoralis minor, and the posterior shoulder capsule (Hold time 30 seconds/3 repetitions). c- Scapular stabilization exercises: - Dynamic Hugs: Arms at 60 abduction, elbow at 45 flexion and shoulder internally rotated 45, this exercise targeted the serratus anterior muscle. - Chevronner Exercise: These exercises include horizontal abduction for rhomboids major, rhomboids minor and middle trapezius and PNF D2 flexion/extension pattern, which targeted upper and lower trapezius muscles. d- Rotator cuff strengthening exercises: Isotonic strengthening exercises to strengthen the rotator cuff musculature. The arm was rested in an abduction position and the elbow adjacent to the trunk then initiate external rotation exercises for infraspinatus and teres minor, followed by internal rotation exercises for subscapularis muscle.</td>
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<td>4. IASTM program</td>
<td>Patients were positioned according to the treated muscles. For pectoral region: patients were put in a supine position while the GH joint placed in 120° abduction and 90° flexion and internal rotation draped over the side of the patient.</td>
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<tr>
<td>Position of the patient</td>
<td>1- Before IASTM intervention, an ultrasound gel was applied to the treatment region to prevent skin irritation. 2- IASTM was used over the respective muscle groups to detect soft tissue adhesions by a change in the fluidity of the stroke of the instrument. Areas with a higher concentration of adhesions were identified by the sensation of traversing a roughened surface with the instrument, whereas tissue with fewer soft tissue restrictions allowed for a smoother glide of the tool against the subject's skin. 3- Stroke pressure and speed were modified according to the subject's tolerability to avoid causing pain and according to the depth of the treated muscle. Pressure was applied lightly at first with a gradual increase due to the subject's initial sensitivity to the treatment.</td>
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normality, homogeneity, and the incidence of extreme scores. Descriptive statistics in the form of mean and standard deviation for subject characteristics were used. The differences between the groups on the combined mean change scores of hand grip strength, DASH, and pain intensity were determined using Two-way mixed design MANOVA. When the MANOVA yielded a significant effect (P < 0.05), the F values used rely on Wilks' lambda and follow-up univariate ANOVA were conducted. To avoid type 1 error, multiple comparisons were made with Bonferroni correction. For all statistical tests, the significance level was set to (p 0.05).

IV. RESULTS

The flow diagram of research subjects is shown in Figure 1. In the current study, seventy-eight patients with subacromial impingement syndrome were enrolled. Twelve participants did not meet the inclusion criteria, while six subjects declined to take part in the study. So, sixty participants were qualified to take part in the study, and they were randomly allocated into two groups. There were no variations in adherence to the intervention between the two groups at the end of the study. The level of attendance was used to assess adherence.

Table 2 shows the demographic information for both groups of participants. Repeated measures multivariate analysis of variance (MANOVA) was used to assess differences between the groups on the combined mean change scores of hand grip strength, DASH, and pain intensity. Statistically significant multivariate effects were found for the main effects of groups, Wilk's A = 0.67, F (3,56) = 9.26, P < 0.0001, η² = 0.33, for time, Wilk's A = 0.014, F (6,53) = 640.12, p < 0.0001, η² = 0.98, and for the interaction between groups and time, Wilk's A = 0.84, F (6,53) = 45.5, p < 0.0001, η² = 0.83. Follow-up univariate ANOVAs reveal that significant change for handgrip strength outcome variable, F (2,116) = 57.44, p < 0.0001, η² = 0.5, for DASH outcome variable, F (2,116) = 23.65, p < 0.0001, η² = 0.29 and for VAS outcome variable, F (2,116) = 76.23, p < 0.0001, η² = 0.57.

Between-group comparison: After 2 and 4 weeks of intervention, statistically significant differences were found between the study and control groups in all outcome measures, (p < 0.05) in favor of the study group as in table 3.

Within-group comparison: In all outcome measures, there were statistically significant differences after 2 weeks and 4 weeks (p < 0.05) of treatment in the study and the control groups when compared with the baseline measurements as in table 4.

| Table 2. Baseline Demographic and Clinical Characteristics of Subjects (N=60)* |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Characteristics | Study Group (n=30) | Control Group (n=30) | MD | 95% CI | P Value |
| Age (years)     | 33.3±4.44        | 34.47±3.94       | -1.17 | -3.34, 1.00 | 0.29 |
| Height (cm)     | 167.37±5.49      | 168.27±7.75      | 0.9 | -4.37, 2.57 | 0.61 |
| Weight (Kg)     | 65.83±6.59       | 66.7±7.51        | -0.87 | -4.52, 2.78 | 0.64 |
| BMI (Kg/m²)     | 23.43±1.39       | 23.45±1.13       | -0.02 | -0.68, 0.63 | 0.94 |
| Gender (%)      | 12(40%)          | 8(26.7%)         | χ² = 1.2 | - | 0.27 |
|                 | 18(60%)          | 22(73.3%)        |               |               |               |
| Affected Side (%) | 25(60%)      | 27(90%)         | χ² = 0.66 | - | 0.42 |
|                 | 5(40%)           | 3(10%)          |               |               |               |
| Dominance (%)   | 18(83.3%)        | 21(70%)         | χ² = 0.66 | - | 0.42 |
|                 | 12(16.7%)        | 9(30%)          |               |               |               |
| Hand Grip (Kg)  | 15.16±8.16       | 13.79±6.05       | 1.37 | -2.34, 5.09 | 0.46 |
| DASH            | 70.11±15.33      | 69.79±11.73      | 0.33 | -6.73, 7.38 | 0.93 |
| VAS (mm)        | 82.0±7.61        | 78.0±8.87        | 4.00 | -0.27, 8.27 | 0.07 |
Figure 1: flow chart of the study
DISCUSSION

The results of the present study supported the authors’ hypothesis that adding the instrument assisted soft tissue mobilization to the conventional physical therapy program was more efficient in improving hand grip strength, upper limb functions, and pain than the conventional physical therapy program alone in adults with subacromial impingement syndrome.

The findings of this study revealed improvements in hand grip strength, as measured by JAMAR hand grip dynamometer after the application of instrument assisted soft tissue mobilization in patients with subacromial impingement syndrome. Hand grip strength improvement can be attributed to the efficacy of IASTM in resolving the myofascial restriction and normalizing of the soft tissue functions around the shoulder complex, involving the scapula and the glenohumeral joint. It also helps in maximizing the effect of the strengthening exercises of the
The results of this study were parallel with previous studies [31-33]. Lee et al. [31] who assessed the effect of IASTM helps to increase the local temperature, improve the circulation by producing vasodilatation of the capillaries, improve tissue nutrition/oxygenation and improve removal of local metabolites from the muscles [23]. This is thought to help in maximizing the therapeutic effects of the exercises, and normalize the scapular kinematics, by repositioning the scapula in its normal position of upward rotation, posterior tilting and adduction, which help in improving the functions of the rotator cuff musculature. The improvement in the length tension relationship of the rotator cuff increases the proximal stability, which in turn improves the distal mobility and hence increases the hand grip strength. Hand grip strength is considered as a monitor for the strength of the shoulder stabilizer muscles. A strong correlation was reported between hand grip strength and rotator cuff strength of the glenohumeral joint, in all the positions of the left and right hands [24].

Up to the authors knowledge, no published research that studied the effect of IASTM on hand grip strength in patient with subacromial impingement syndrome. The findings of this study were consistent with previous studies [25,26]. Sevier and Stegink-Jansen [25] conducted a randomized controlled study to compare the effect of instrument assisted soft tissue mobilization to an evidence-based eccentric exercises in the management of Lateral elbow tendinopathy in 107 subjects. The results revealed that subjects who received instrument assisted soft tissue mobilization therapy reported greater improvement in maximum grip strength than subjects in the eccentric exercises, with Long-term preserved gains for 6 and 12 months follow-up after the treatment intervention.

Furthermore, Gandhi et al. [26] studied the short-term effect of instrument assisted soft tissue mobilization versus Kinesiotaping on maximal grip strength in 150 healthy adults. Their results revealed statistically significant improvement in the maximal hand grip strength in IASTM and kinesiotaping group when compared to the control group. On the contrary, the current study results contrasted with MacDonald et al. [27] who showed no effects of IASTM on lower extremity muscle performance. However, these results were inferred from a single application of IASTM on healthy subjects without obvious myofascial restrictions, and only for the immediate effect, without enough period or longer treatment times, to produce meaningful change in muscle performance.

In this study, instrument assisted soft tissue mobilization improved pain in patients with subacromial impingement syndrome. The improvement in pain might be attributed to several factors. First, removal of local metabolites secondary to the increased temperature and enhanced blood flow, which contributes to releasing of the involuntary contraction of the muscles and eliminating the excitation of the nociceptors [28]. Second, IASTM may reduce the pain threshold by mechanoreceptor stimulation and interruption of nociception to inhibit the pain cycle [8]. IASTM may have activated the A-beta sensory fibers to block the A-delta and C-fibers. According to the "gate control theory" of inhibition, the transmission of pain is closed, as long as the sensory fibers are stimulated. This blocks the substance P from the pain receptors thorough presynaptic inhibition at the dorsal horn [29]. Third, the effect of IASTM in releasing the myofascial restriction and maximizing the effect of the therapeutic exercises aids in the proper restoration of normal scapular and glenohumeral kinematics and to prevent any possible impingement of structures in the subacromial space by stabilizing the humeral head in the glenoid fossa and maintaining the subacromial space [30].

The results of this study were parallel with previous studies [31-33]. Lee et al. [31] who assessed the effect of instrument assisted soft tissue mobilization on the pain in 30 patients with chronic low back pain. The results showed that the IASTM significantly decreased pain after 4 weeks from the intervention. Naik et al. [32] conducted a study to measure the effect of IASTM in treating shoulder pain and they concluded that IASTM was more effective in reducing pain than kinesiotaping application. They claimed that using IASTM leads to stretch of the tight fascia, alleviating nerve fiber compression and enhancing joint mobility. Furthermore, another agreement with the systematic review provided by Lambert et al. [33] about the efficacy of instrument-assisted soft tissue mobilization in comparison with other interventions on pain level over a treatment span of several different conditions of the spine, upper extremity, and lower extremity. They suggested that IASTM is an efficient treatment modality for reducing pain. On the contrary, the current study results contrasted with Vardiman et al. [34] who showed a decrease in the perception of function and a significant increase in pain immediately following IASTM. However, these findings were concluded from a study on a small sample (11 participants),
only one application of IASTM, healthy subjects; all of them were males, and only for the acute effects of IASTM.

The current study revealed that instrument assisted soft tissue mobilization improved upper limb functions as measured by disabilities of arm, shoulder, and hand questionnaire (DASH) in patients with subacromial impingement syndrome. The upper limb functions were improved because of pain improvement, hand grip strength improvement and enhancement of the therapeutic exercises' response due to the reduction of the myofascial restriction which is an important precursor to the restoration of motion and normal kinematics. So, proper scapular and glenohumeral kinematics and increased proximal stability help to reduce the upper limb disabilities and improve the quality of daily living activities.

The current study results were reinforced by previous studies [35,36]. Coviello et al. [35] who assessed the effect of adding instrument assisted soft tissue mobilization to scapulothoracic mobilizations and stretching exercises on pain free AROM and upper limb functions in subacromial impingement syndrome. Their results revealed significant increase in shoulder pain-free range of motion, upper limb functions (DASH score), and patient satisfaction after three treatment sessions. Also, this study was in parallel with Aggarwal et al. [36] who studied the effect of adding IASTM to the conventional physical therapy program on upper limb functions, in thirty patients with shoulder adhesive capsulitis. The patients were randomly allocated into IASTM plus conventional treatment or treatment only. Outcome measures were shoulder pain and disability index. Their results revealed significant improvement in functions and pain after 4 weeks of intervention.

The results of this study contradicted with Crothers et al. [37] who compared the effect of spinal manipulation, IASTM or sham therapy for non-specific thoracic spine pain. No differences were found among the groups at any time point for pain, disability, however all groups improved with time. This can be attributed to the use of modified Oswestry Disability Index (ODI) for the thoracic spine, which is a modification from the original ODI by replacing the words "low back pain" with "mid back pain". However, because this disability index was designed to assess disability caused by low back pain, it may not be appropriate or accurate for measuring disability caused by mid back pain. In addition to spinal manipulative therapy and IASTM therapy were delivered with final year chiropractic interns.

Hazards of using IASTM

In the current study, instrument assisted soft tissue mobilization is a safe myofascial release method. The side effects of IASTM were bruising and soreness, which occurs after treatment in soft tissues. They can be reduced by cryotherapy following IASTM application [38].

Clinical implications

IASTM is an acceptable treatment where no drop-out in the participants due to the intervention. Furthermore, in patients with subacromial impingement syndrome, it is an effective adjunctive therapy for improving handgrip strength, upper limb functions, and pain. So, it helps to reduce the disabilities and to improve pain in patients with subacromial impingement syndrome. In addition, the viability and low cost of the instrument recommended that it can be used in the outpatient clinics to enhance the effect of the therapeutic exercises and improving the scapular dyskinesia, to enhance handgrip strength, upper limb functions, and pain in patients with subacromial impingement syndrome.

Limitations

The current study was limited by the small sample size, so the study results need to be examined widely in a larger population. Also, the duration of treatment was only four weeks, which is relatively short, and there was no follow-up assessment. Therefore, long duration treatment and long term follow-up should be examined in future studies. Moreover, both of therapist and patients could not be blinded due to the nature of the experiment.

VI. CONCLUSIONS

Adding the instrument assisted soft tissue mobilization to the conventional physical therapy program improved hand grip strength, pain, and upper limb functions in patients with subacromial impingement syndrome more than the conventional physical therapy program alone. The instrument assisted soft tissue mobilization might be used as a useful adjunctive therapy in treating patients with subacromial impingement syndrome.

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