Original Article

Comparing the effects of two manual therapy techniques in patients with chronic shoulder impingement syndrome

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ABSTRACT

shoulder impingent syndrome is the most common disorder of shoulder joint. Manulal therapy is a crucial part of it's physical therapy.The purpose of this study was to compare the effects of mobilization and mobilization with movement on pain, disability and function of patients with chronic shoulder impingement syndrome. In this single blinded randomized controlled trial, Thirty patients were randomly divided into two groups of mobilization and mobilization with movement. All individuals were treated for 4 sessions in two weeks. The outcome measures were disability, pain and function that were assessed by DASH questionnaire, SPADI questionnaire respectively, measuring at baseline and at the end of the 4th session. In mobilization group, SPADI pain, SPADI function and DASH score significantly changed from 78.74±10.87 to 51.34±13.44,78.73±9.72 to 51.97±13.81 and 76.50±9.32 to 46.56±15.29 respectively ($p<0.05$). These outcome measures significantly changed from 81.21±8.22 to 30.31±11.68, 80.48±9.19 to 29.74±12.28 and 77.15±12.79 to 29.90±11.57 respectively in mobilization with movement group ($p<0.05$). Patients with chronic shoulder impingement syndrome who received mobilization with movement showed significantly better outcomes in pain intensity, disability, and upper limb function compared to the mobilization group.

Keywords: Shoulder impingement, Mobilization, Mobilization with movement, Manual therapy

Introduction

Primary shoulder impingenet syndrome (SIS) is caused by the impingement of the tendon of the rotator cuff muscles, the long head of the biceps muscle, the capsule of the glenohumeral joint or the subacromial bursa between the head of the humerus and acromion process. Intrinsic factors can cause it such as rotator cuff muscle weakness, chronic inflammation of the rotator cuff tendons or subacromial bursa, degenerative tendinopathy of the rotator cuff muscles, or tightness of the posterior capsule of the glenohumeral joint, which leads to the anterior displacement of the head of the humerus. Also extrinsic factors can cause it, such as curved or hooked acromion, acromion spurs, or postural disorders [1]. Common signs of SIS include pain associated with overhead activities, painful arch in the middle range of arm elevation, or positive provocative tests, which can cause pain, restricted range of motion, and functional loss.

Routine treatment of SIS is physical therapy, non-steroidal anti-inflammatory drugs, and corticosteroid injections [2]. Treatments for subacromial impingement syndrome include 4 parts: 1- Various heat, cold, and electrical modalities and pain free exercises aiming to reduce the inflammation of the subacromial space. 2- Rotator cuff muscles strengthening to compensate the weakness of the humeral depressor muscles. 3- capsular stretching exercises to reduce capsular tightness. 4- Patient education to achieve postural and biomechanical balance and scapular symmetry [3].

Patients should avoid overhead activities, until the relief of symptoms. They should avoid placing their arms above the head, behind the back, or at any point that causes the symptoms [2]. The posterior capsule of the glenohumeral joint is tight in individuals with SIS, which leads to altered arthrokinematic of the glenohumeral joint and restriction of shoulder internel

rotation range of motion. Thus, mobilization with grade III and IV aimed to restore the mobility of the posterior capsule can lead to increasing the shoulder range of motion and supressing symptoms. All grades of joint mobilization can help reduce the patient's pain [1]. Mobilization with movement (MWM) is a type of manual therapy in which the clinitian apply accessory mobilization while the patient is actively performing the physiological movement. Studies have shown better results, applying mobilization with movement compared to sham group in patients with shoulder impingement syndrome. The technique will be ceased, if the patient starts to feel pain. MWM increases pain free range of motion with biomechanical and neurological effects. Mulligan believes that MWM will assist in correcting positional fault which happen as a result of malalligning of joint surfaces and help to restore it's normal tracking [4].

Guimarães *et al.* (2016), conducted a clinical trial study regarding the effects of MWM on range of motion, strength, and fuction in patients with SIS. The patints were divided into two groups of MWM and sham technique. Each session of treatment consisted of three sets of MWM with 10 repetitions and 30 seconds of interval between sets. Mulligan's MWM group did not experience any significant changes in pain intensity, range of abduction, and external rotation of the shoulder joint and function [4].

In 2016 Neelapala *et al*. investigated the effects of posterolateral glide on pain, rotator cuff muscles strength, and scapular movement control in patients with shoulder pain. The individuals were divided into two control and experimental groups. Patients in the control group performed active shoulder flexion, abduction, and external rotation movements in a pain-free range of motion with 10 repetitions. It was done for 3 sessions. Patients in the experimental group received Mulligan's MWM treatment. Three sets of 5 repetitions were performed in each session, which lasted 15 minutes. This group also received the treatment during three sessions. The pain intensity on the VAS scale and the strength of the external rotator muscles increased significantly in the experimental group. The amount of upward rotation of the scapula and the strength of the internal rotator muscles did not change significantly [5].

In a study of Shirivastava *et al*. (2011), Mulligan's mobilization was more effective than Maitland's mobilization in improving shoulder flexion, abduction, and external rotation range of motion in patients with frozen shoulders. A reason for this significant improvement in Mulligan group was explained by the therapist's corrective glides, which lead to achieve the maximum alignment of joint surfaces, and the maintanance of this effect was also attributed to the recruitment of muscles that occurs during the voluntary effort of the patients in this treatment method. Mulligan's positional fault theory can explain this case. The change in the biomechanics of the shoulder joint can be a result of the posterior capsular tightness of of glenohumeral joint in patients with shoulder pain. Tightness of the posterior capsule leads to compression of the head of humerus into the glenoid fossa, which causes displacement of the humerus. Sufficient extensibility of the joint capsule is necessary for the roll and glide of joint surfaces. Any restriction in the joint capsule or incorrect contact of the joint surfaces conflicts with the correct movement of the joint. Mobilization has a direct effect on altered biomechanics. The mechanical effects of mobilization include breaking adhesions, remodeling the collagen fibers, and increasing the sliding of fibers on each other [6]. As mentioned before, Mulligan's MWM technique is based on correcting positional faults and restoring normal arthrokinematics, which causes a pain-free range of motion. This technique is effective in creating a pain-free range of motion through the neurophysiological mechanism and the production of pain killers in the body based on the stimulation of peripheral mechanoreceptors, the inhibition of pain receptors, and changing the activity of the sympathetic nervous system [7].

Many studies have investigated the effects of mobilization and MWM in patients with shoulder impingement syndrome. However, there is little evidence about the comparison of the therapeutic effects of these two types of interventions. This study is new in this regard. Thus, it compares the effects of mobilization and MWM on pain, disability, and function in patients with chronic shoulder impingement syndrome.

Materials and Methods

Our study is a randomized controlled clinical trial. The patients were randomly divided into two groups of mobilization and MWM groups. The population under study is individuals with shoulder impingement syndrome, which is confirmed by an orthopedic surgeon.

Inclusion criteria included age between 18 and 65 years, pain in the shoulder joint that lasts for more than 6 weeks, not suffering from systemic diseases, not using anti-inflammatory and pain-killer drugs before evaluation or treatment, no history of injecting corticosteroids in the shoulder joint in the last one year, no history of fracture. trauma or surgery in neck and shoulder , no history of physiotherapy treatment in the last 3 months for the shoulder or neck, at least one positive test of subacromial impingement syndrome, Neer test, Hawkins-Kennedy test, Jobe test, and pain during arm elevation or shoulder internal rotation when the arm is in 90 degrees of abduction. Exclusion criteria included failure to complete physical therapy sessions by patients, non-participation in physical therapy sessions regularly, the occurrence of unpredictable events for each of the participants in the study, increase in pain or other symptoms of the patients.

Demographic information was recorded for all subjects. All patients were given a brief explanation of the purpose of this study. Then, written informed consent was taken from the individuals.

The shoulder pain and disability index (SPADI) questionnaire was designed in English in 1991 by Roach to measure pain and disability associated with shoulder problems and changes in posture over time. It is a self-report questionnaire that comprehensively examines shoulder pain and disability. This questionnaire is specific for shoulder joint, inexpensive, and

easily used in clinical conditions. It contains 13 questions in two subgroups of pain and disability, each of which has 5 and 8 questions, respectively, and the items are scored on a VAS scale. This questionnaire deals with the severity of pain in different states and the ability of a person to perform daily activities [8]. It was localized by Mr. Ebrahimzadeh *et al*. (2014) [9]. The disabilities of the arm, shoulder and hand (DASH) questionnaire is for measuring the level of upper limb function [10] and covers a wide range of symptoms and disabilities to measure their effects on daily activities. This questionnaire contains 30 items that measure symptoms and disorders on a five-point scale[10,11]. It has been used from the past to evaluate patients with shoulder impingement syndrome, and its validity and reliability has been proven [12]. This questionnaire was localized by Mr. Mousavi *et al*. (2008)[13].

Results and Discussion

Thirty patients met the eligibility criteria to engage in this study and were divided into group 1 (3 men, 12 wemen) that received mobilization treatment and group 2 (2 men, 13 wemen) that received MWM treatment. Demographics are figured in **Table 1**.

Table 1. Comparison of demographic characteristics between two groups

varible	Mobilization group	MWM group	P Value
age	52.13±10.45	52.26±9.22	0.97
BMI	27.10±2.99	27.26±3.77	0.89
Pain Duration	6.06±2.76	5.33±3.28	0.51

SPADI pain and SPADI function scores before and after mobilization and MWM groups are presented in **Table 2**.

Table 2. Comparing average pain and disability of shoulder before and after intervention in two groups

Variable	Group	Before mean±Standard deviation	After mean±Standard deviation	p
SPADI pain	Mobilization group	78.74±10.87	51.34±13.44	۰.۰۱>۰
	MWM group	81.21±8.22	30.31±11.68	۰.۰۱>۰
	P-value	۰.٤٨٨	۰.۰۱>۰	
SPADI function	Mobilization group	78.73±9/72	51/97±13.81	۰.۰۱>۰
	MWM group	80.48±9.19	29.74±12.28	۰.۰۱>۰
	p-value	0.616	۰.۰۱>۰	

The results of the paired t-test of both mobilization and MWM groups showed that SPADI pain and SPADI function scores significantly decreased after the treatment sessions (P<0.05).
Comparing SPADI pain and SPADI function scores between the two groups before treatment didn't show statistically significant difference between the two groups (P>0.05). Comparing SPADI pain and SPADI function scores of the two groups after treatment using the independent t-test showed that the SPADI pain and SPADI function scores showed statistically significant difference in favor of MWM group (P<0.05).
DASH scores of both two groups are presented in **Table 3** before and after treatments.

Table 3. Comparing the average of DASH index before and after the intervention in two groups

Group	Before mean±Standard deviation	After mean±Standard deviation	p
Mobilization group	76.50±9.32	46.56±15.29	۰.۰۱>۰
MWM group	77.15±12.79	29.90±11.57	۰.۰۱>۰
P-value	٦٧٦.۰	۰.۰۱>۰	

The results of the paired t-test of the mobilization and MWM groups before and after interventions showed statically significant decrease of DASH scores (P<0.05).
Comparing the averages of DASH scores between the two groups before treatment showed that the two groups had no statistically significant difference (P>0.05). Comparing the averages of two groups after treatment using independent t-test showed that the DASH score had a statistically significant difference infavor of MWM group (P<0.05).
SPADI pain and SPADI function in the present research were significantly improved in both groups. The MWM group had a significant decrease in this index. These results are consistent with those of Abhay Kumar *et al*. (2012), The function of patients with frozen shoulder who were treated with mobilization significantly improvemed [14]. In a study conducted by Samiksha Sathe *et al*. (2020), patients with frozen shoulder who received mobilization showed significant improvement of pain intensity and SPADI score compared to the group that received routine physical therapy [15]. In the study of Amie F *et al*. (2008), three groups of patients who received mobilization, MWM, and exercise therapy, showed greater improvements than the control group, although these improvements was not significant. A reason for the lack of significant difference in the treatment results of the two groups of mobilization and MWM is, as stated in this study, the application of mobilization in the middle of the range of motion or loose pack position of the shoulder joint. This is while applying mobilization in the middle of the range of motion does not cause sufficient capsular stretch, neither lengthen the joint capsule nor activate the mechanoreceptors [16]. Because the SPADI questionnaire is designed based on the patient's pain during functional activities, obviously the interventions that lead to the patient's pain relief will also improve this index. Likewise, the group that received MWM, experienced greater pain reduction and functional improvement in comparison to the other two groups. It is attributed to the design of Mulligan's MWM, which is based on pain reduction during active movements and force regulation based on the reduction of patient's pain during the application of the technique. The superiority of Mulligan's treatment over

mobilization can be attributed to the implementation of Mulligan's techniques during active range of motion, which stretchies muscle tendons, and will activate other proprioceptive tissues like Golgi's tendons.

The DASH score in the present study was significantly reduced in both groups after therapeutic interventions. The MWM group showed significant decrease in DASH index. The results of the present study are consistent with that of Sumaira Nawaz *et al.* (2023), in which Frozen shoulder patients who recieved 3 sessions of MWM, showed significant decrease in DASH index [17]. Burak Menek *et al.* (2019) observed also significant decrease in the DASH index in patients with rotator cuff syndrome after 3 sessions of MWM [18].

Conclusion

Based on the results of this study, both techniques enhance function and reduce pain and disability of patients with chronic shoulder impingemrnt syndrome. It was found that mobilization with movement is significantly more efficient in relieving pain, reducing disability and improving the function of these patients.

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