Original Research Article

Effectiveness of Mobilization with Exercise V/S Mulligan Internal Rotation MWM with Stretching in Patient with Glenohumeral Internal Rotation Deficit

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Abstract

Background: The glenohumeral joint consists of dynamic and static stabilizer, which works, in concert to allow for stability and mobility through a large arc of motion, in recent years there has been significant focus on shoulder motion, particularly in overhead throwing athletes. Glenohumeral internal rotation deficits (GIRD) are common physical impairments in evaluated both adolescent and overhead sports such as baseball, cricket, and tennis. Therefore the aim of the study firstly was to determine the effectiveness of mobilization with exercise in patients with glenohumeral internal rotation deficit and secondly to determine whether mulligan internal rotation MWM with stretching in patients with glenohumeral internal rotation deficit.

Materials and methods: 60 patients were included in the study which was divided into two groups; Group A and Group B, 30 patients in each group. All the subjects were randomly selected and assigned to each group. A pretest measurement with the help of two measures - Oxford Shoulder Instability Score (OSI) for disability, and inclinometer for an internal range of motion shoulder was

done in each group. Subjects in Group-A were given mobilizations with stabilization exercise for capsule for a total of 12 minutes a minimum of 4 times per week over a 4-week period and Group-B were given mulligan mobilization with Posterior Capsule Stretching As follows, 1st day 3 glides, 2nd day 3 sets of six glides, 3rd day 3 sets of 10 glides were given and 4th day again 3 sets of 10 was given. A patient who failed to come for 4 days with stretching performed 3–5 repetitions each repetition was held for 30 seconds, four days a week for four weeks total 16 sessions.

Results: On comparing Group A and Group B for post-treatment OSI score, results showed a significant difference (p=0.001) in improvement in terms of OSI. On comparing Group A and Group B for post-treatment inclinometer score, results showed a significant difference in improvement in terms of the inclinometer. This study showed that Mulligan MWM along with stretching exercises was more effective to that patient as compared to mobilization with strengthening exercises given to a patient with glenohumeral internal rotation deficit.

Conclusion: The study showed a significant difference between both the groups when the values obtained were analysed. It indicated that Group B in Range mulligan mobilization with Posterior Capsule Stretching of Motion in internal rotation and external rotation. Their scores in Index Oxford Shoulder Instability Score (OSI) have reduced which indicates the decreased level of disability and better functional ability.

Key words

Glenohumeral internal rotation deficit (GIRD), Oxford Shoulder Instability Score (OSI), Mulligan mobilization, Posterior capular stretching, Overhead athletes.

Introduction

The glenohumeral joint consists of dynamic and static stabilizer, which works, in concert to allow for stability and mobility through a large arc of motion, in recent years there has been significant focus on shoulder motion, particularly in overhead throwing athletes. Many articles have evaluated both adolescent and adult athletes in sports such as baseball, tennis, swimming, handball and volleyball for the prevalence of Glenohumeral Internal Rotation Deficiency (GIRD), its etiology and subsequent prevention and/or treatment [1]. Several theories have been proposed, including boney and soft tissue changes. It has been shown that appropriate recognition, training, and therapy can stop the progression of GIRD and decrease the prevalence of injuries. Failure to recognize GIRD can put the shoulder “at risk” for injury, most notably, the posterior superior labrum, the undersurface of the posterior supraspinatus tendon, and the anterior inferior capsular structures.

Glenohumeral internal rotation deficit (GIRD) is common physical impairments in evaluated both adolescent and overhead sports such as baseball, cricket, and tennis [2]. Clinically measured by passive shoulder horizontal adduction with the scapula stabilized in supine or side-lying.

GIRD is generally characterized as concurrent deficits of internal rotation (IR) and total arc of motion in the dominant side. Although the mechanisms of PST and GIRD are not clear, it is speculated that they derive from the tight posterior glenohumeral capsule and posterior muscles such as the posterior deltoid, infraspinatus, and teres minor muscles [3]. Some authors suggest that repetitive tensile stress to posterior structures in the follow-through phase in throwing movements could lead to inflammation, scar formation, and subsequent tightness in posterior tissues, resulting in PST and GIRD [2].

Since both PST and GIRD are thought to reflect tightness of posterior structures in the shoulder, the term *PST* is occasionally used instead of

GIRD to describe decreased IR range of motion. Mobilization techniques are an important part of the intervention. Mobilization techniques can be performed as physiologic movements or accessory movements Physiologic movements at the glenohumeral joint are movements of the humerus in the cardinal planes (e.g., flexion, extension, abduction, adduction, external rotation, and internal rotation). Accessory movements are movements that are passively induced by a therapist and consist of rolling, gliding (or sliding), spinning, and distraction within the joint. The intensity of the mobilization techniques with rhythmic oscillatory movements usually is categorized according to the 5-grade classification system of Maitland [4].

Due to the increased risk of overuse injuries, it is important to incorporate exercises that stabilize the shoulder and correct muscle imbalances that can lead to decreased performance and injury [5]. Shoulder stability exercises strengthen the rotator cuff (Supraspinatus, Infraspinatus, Teres minor, Subscapularis), lower and middle part of the trapezius, rhomboids and the posterior deltoids. The shoulder complex consists of two joints: the scapulothoracic joint (joint formed by the rib cage and shoulder blade) and the glenohumeral joint (joint formed by shoulder blade and the upper arm). The role of the rotator cuff muscles is to stabilize the glenohumeral joint while the prime mover muscles generate power. The rotator cuff muscles have their origin on the scapula [10]. To effectively stabilize the glenohumeral joint they need to operate from a stable scapular base. The balance between the muscles that attach to the scapula and sufficient strength levels of these muscles provides scapular stability [7-9].

Brian Mulligan's mobilization with movement technique (MWM) is widely used to treat various musculoskeletal dysfunctions. Mobilization with movement (MWM) is a manual therapy technique based on the analysis and correction of any minor positional faults in a joint [6]. According to Mulligan, positional faults are due to various soft tissue and/or bone lesions in/around the joint. The relevance of a correct joint position was argued in a kinematic study in healthy shoulders [13, 14]. This technique aims to realign the joints positional faults by performing a manually specific oriented glide to painful joint and assessing and adjusting force intensity. Meanwhile, the patient performs an active joint movement so that patient's symptoms are immediately relieved and the manoeuvres improve pain and movement. Therefore, when a correct mobilization is sustained, the pain-free movement is restored [3].

Therefore, the aim of the study firstly was to determine the effectiveness of mobilization with exercise in patients with glenohumeral internal rotation deficit and secondly to determine whether mulligan internal rotation MWM with stretching in patients with glenohumeral internal rotation deficit.

Materials and methods

Study design: Experimental study design (comparative).
Source of data: Physiotherapy department in KIMS hospital, clinics, Hospitals and sports academy in and around Hyderabad
Population: Subjects with GlenoHumeral Internal Rotation Deficit
Aged 18-50 years
Sample selection: 60 patients
Study duration: 4 days per week for 4weeks, one session daily
Group A: 30 patients. **Group B:** 30 patients.

Inclusion criteria

- Subjects within the age group 18-50 years were taken.
- Both male and female were taken.
- Subjects with glenohumeral internal rotation deficit were taken.
- Subjects with minimum 50% reduction in the internal rotation range of motion were taken
- Compared to the unaffected side.

- Subjects with positive lift-off test and belly compression test

Outcome measure

- Inclinometer
- Oxford Shoulder Instability Score (OSI)

Method

All the subjects were informed in detail about the type and nature of the study. The subjects were divided into two groups; Group A and Group B, 30 patients in each group. All the subjects were randomly selected and assigned to each group. A pretest measurement with the help of two measures - Oxford Shoulder Instability Score (OSI) for disability, and inclinometer for an internal range of motion shoulder was done in each group [7].

Inclinometer for Internal Rotation Range of Motion Prior to a range of motion testing [8], subjects were asked to warm up by performing 3 active, bilateral shoulder flexion stretches with hands clasped, holding each for 10 seconds. Our primary measure passive internal rotation of the glenohumeral joint with the arm abducted to 90° in the frontal plane (IR90) the inclinometer was placed on the dorsal surface of the forearm with the elbow flexed to 90°. We were careful to prevent scapular substitution by watching the anterior aspect of the shoulder during the measurement. Accordingly, the end point for IR90 measurement was the angle just prior to the anterior aspect of the shoulder moving anteriorly, indicating scapular motion [18, 19].

Subjects in Group-A were given mobilizations with stabilization exercise for glenohumeral internal rotation deficit. Joint mobilizations were performed Patients were treated with grade III and IV joint mobilizations [7, 8] directed toward the posterior capsule for a total of 12 minutes a minimum of 4 times per week over a 4-week period. Care was taken to ensure that the joint mobilization technique was done in a posterior lateral glide to achieve translation along the joint surface Joint mobilizations occurred separately from stretches in all participants and at all times.

In the stabilization exercise for the shoulder joints, the subjects were placed in a standing position with both hands pressed against the wall and the shoulder joints bent at 90°. At this point, the therapist applied alternative resistance to the shoulder and the trunk, and the subjects were instructed to maintain their position against such resistance. In all the exercises, the subjects maintained the position for 10 seconds, and they took a rest for 3 seconds. Ten repetitions were considered one set, and the subjects conducted three sets. A break of 3 minutes was given between each set. In stabilization of the scapula and shoulder joint, the therapist alternatively applied resistance in different directions to the subjects. The treatment was applied four times per week, for four weeks, for a total of 16 times.

Subjects in Group-B were received mulligan mobilization with Posterior Capsule Stretching Subject were in therapist stands facing the patient [7]. The therapist then places a web of his one hand around patient's axilla and thumb of another hand in the bent elbow and the glide was applied to the head of the humerus down in the glenoid fossa using thumb while stabilizing the scapula with another hand. Therapist ensures that the other hand is stabilizing up and inwards. While this distraction is taking place the patient internally rotated his shoulder with the help of another hand, at the same time his affected upper arm was abducted by therapist abdomen distracting the head of the humerus laterally. The hand in axilla acts as a fulcrum. Mulligan MWM was applied for four days continuously by following the rule of 3 i.e. 1st day 3 glides, 2nd day 3 sets of six glides, 3rd day 3 sets of 10 glides were given and 4th day again 3 sets of 10 was given. A patient who failed to come for 4 days continuously was discontinued from the study [9, 12]. The treatment was applied four times per week, for four weeks, for a total of 16 times [13, 14].

Posterior Capsule Stretching Lie in a semi-side lying position mid-way between supine and side laying the shoulder to be stretched should be down or in contact in the mat abduction arm at the shoulder 90 flexion the arm at elbow to 90 using up arm put pressure on the forearm to drive arm in to internal rotation stretching exercises stretch was performed 3–5 repetitions [3]. Each repetition was held for 30 seconds. The stretching program lasted for a period of four weeks.

- Sleeper Stretch performed in prone.
- Sleeper Stretch 4 alternate side-lying position, self-stretch with arm elevated above 90 degrees.

Sleeper Stretch 3, traditional position, self-stretch performed in side-lying with the arm at 90 degrees of abduction [3].

Results

A randomized control trial was performed on 60 subjects, with the age group of 18-50 years whose mean age in control group was 37.60 ± 4.32 and in the experimental group were 37 ± 4.30 It was seen that 60 patients were randomly allocated, out of which control group had 13 (40%) males and 18 (60 %) females and in experimental group 10 (33.3%) were males and 20 (60.7 %) were females. The study design was experimental, single-blinded. The criterion was recently diagnosed patient with glenohumeral internal rotation deficit due to the diabetic and idiopathic cause, traumatic adhesive capsulitis, adolescent and adult athletes in sports such as baseball, tennis, swimming, handball and volleyball both males and females. Any medical condition that would exclude the patient from physiotherapy treatment and patient taking prior treatment [2, 20].

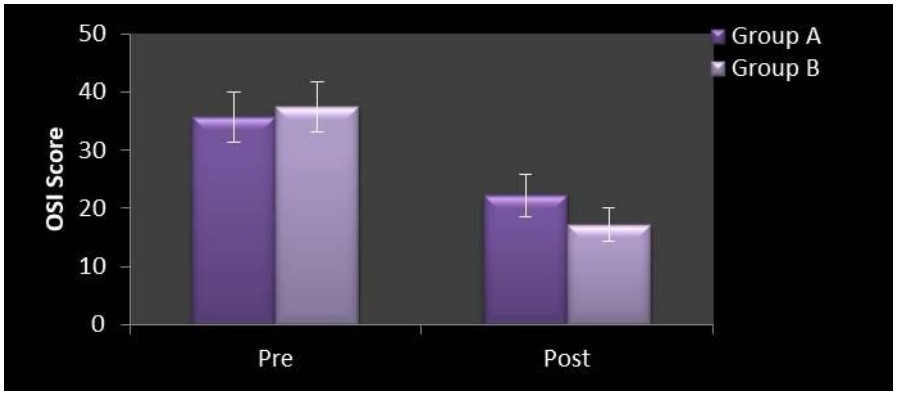
Wilcoxon Signed Rank Test was applied to Group A and in Group B for with-in group analysis and it is as follows: In Group A, results showed significant improvement in OSI score (T =16.77±5.52 P< 0. 001).

In Group A, results showed significant improvement on OSI score (T = 13.37±4.16 P< 0. 001). In Group B, results showed significant improvement in OSI score (20.17±4.56 P< 0. 001) In Group B, results showed significant improvement in OSI score (T=16.77±5.52 P<0. 001) as per **Table - 1**.

Table – 1: OSI Score.

OSI Score	Group A	Group B	Total	P value
Pre	35.60±4.32	37.40±4.30	36.50±4.37	0.111
Post	22.23±3.71	17.23±2.87	19.73±4.15	<0.001**
Pre- post difference	13.37±4.16	20.17±4.56	16.77±5.52	<0.001**

Graph – 1: OSI Score.



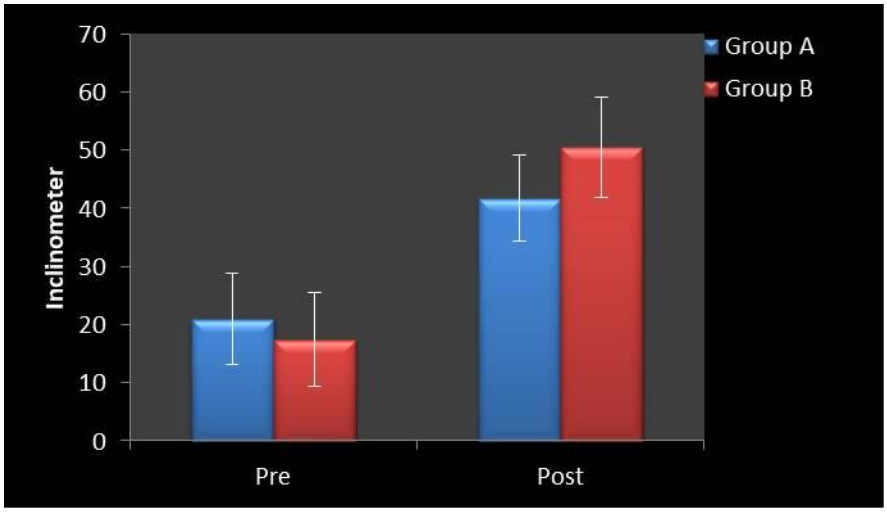
Group – A: In internal rotation pre-treatment mean score was 21.00±7.92 degrees and post-treatment it was degrees. There 41.83±7.37 was a significant increase in the range of internal rotation by 20.83±8.10 degrees.

Group – B: In internal rotation pre-treatment means the score was 17.50±8.07 degrees and post-treatment it was degrees. There 50.50±8.65 was a significant increase in the range of internal rotation by 33.00±7.83degrees (**Graph - 1**).

Table – 2: Inclinometer.

Inclinometer	Group A	Group B	Total	P value
Pre	21.00±7.92	17.50±8.07	19.25±8.12	0.095+
Post	41.83±7.37	50.50±8.65	46.17±9.08	<0.001**
pre- post difference	20.83±8.10	33.00±7.83	26.92±10.00	<0.001**

Graph – 2: Inclinometer.



Wilcoxon Sum Rank Test (Mann Whitney U Test) was applied for between-group comparison of Group A and Group B, and it was as per **Table – 2**.

On comparing Group A and Group B for post-treatment OSI score, results showed a significant difference in improvement in terms of OSI.

On comparing Group A and Group B for post-treatment inclinometer score, results showed a significant difference in improvement in terms of the inclinometer (**Graph – 2**).

Discussion

This study was designed to know the efficacy of mobilization with exercise technique in the treatment of glenohumeral internal rotation deficit for internal rotation ROM by comparing with mulligan internal rotation movement with mobilization with stretching technique. This study included 2 groups: (a) control group and (b) experimental group. The results of this study indicate that the Experimental group shows a significant difference in the internal rotation range of motion when compared with control group (p = 0.00). This study compared the effects of two treatment strategies; Mobilization with exercises and Mulligan's MWM technique and stretching exercises. Stretching exercise was taken in this study because Griggs, et al. have previously demonstrated that the patient with idiopathic adhesive capsulitis can be treated successfully with shoulder stretching programme.

That is why in control group we have given patients mobilization and strengthening exercise. The reason experimental group was given both

Mulligan along with stretching exercise, because mobilization with intense capsular stretching causes tissue remodeling refers to a physical rearrangement of the connective tissue extracellular matrix (fibers, crosslinks, and ground substance) and collagenous tissues respond to increased tensile loading by increasing the synthesis of collagen and other extracellular components Studies have shown that mechanical force during mobilization may include breaking up of adhesions, realigning collagen, or increasing fiber glide when specific movements stress the specific parts of the capsule [15, 16].

Furthermore, mobilization techniques are supposed to increase or maintain joint mobility by inducing biological changes in synovial fluid, enhanced exchange Studies have also shown that mulligan MWM technique stretches the tightened soft tissues and also improve the normal extensibility of the shoulder capsule and normalizes the abnormal scapulohumeral rhythm to induce beneficial effect Mulligan technique was selected because it not only improves ROM it also has analgesic effect. In another study done by Doner et al says that Mulligan technique was compared with the stretching technique because stretching exercises are the mainstay of exercises in joint limitations; however, in contrast to Mulligan's technique they lack an analgesic effect., were he successfully demonstrated that mulligan technique with stretching exercises was better than conventional mobilization with strengthening exercises [17].

This study shows that Mulligan MWM along with stretching exercises is more effective to that patient as compared to mobilization with strengthening exercises given to a patient with glenohumeral internal rotation deficit

Conclusion

From the above study results, it is concluded that there is a difference between the Group A and Group B when the values obtained were analyzed. It indicated that Group A mobilization with shoulder stabilization exercise had a significant improvement in Range of Motion in internal rotation and external rotation. Their scores in Index Oxford Shoulder Instability Score (OSI) have reduced which indicates the decreased level of disability and better functional ability. So, it indicates that mulligan mobilization with posterior capsule stretching is more effective in improving range of motion and function when compared to mobilization with shoulder stabilization exercises alone.

Future scope

- The beneficial treatment effect can be followed for the persistence of recovery.
- This should be done for a larger population.
- Objective parameters can be included.
- Other parameters should also consider (e.g., emotional if needed)

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