

## Effect of Muscle Energy Technique and Passive Stretching Versus Mobilization and Passive Stretching On Posterior Shoulder Tightness in Inswing and Leg Spin Bowlers- A Comparative Study.

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### **Abstract:**

**Background:** The shoulder plays a vital role in many athletic activities. Overhead motions repetitively place the shoulder in vulnerable positions possibly leading to injuries. During bowling in cricket, glenohumeral (GH) joint reaches extremes of motion, velocity and forces. Posterior shoulder stiffness results from repetitive microtrauma which leads to the development of fibrotic scar tissue of the posterior capsule. This leads to posterior shoulder tightness and alteration of GH joint ROM. Muscle energy technique has been used to increase the flexibility, and ROM of a restricted joint. The basic principle is post-isometric relaxation.

**Materials and Methods:** The study was conducted at Nashik District Cricket Association. The duration of the study was 5 months. Total sample size was 30. Subjects were divided into 2 groups of 15 each. group A- MET and passive stretching group B- mobilization and passive stretching. 4 treatment sessions in a week for 2 weeks were performed. Materials used were Goniometer, pen, paper and consent form.

**Results:** The P value was  $< 0.05$  in group A, so the result was statistically significant, i.e. MET and passive stretching is effective. The P value was  $< 0.05$  in group B, so the result was statistically significant, i.e. mobilization and passive stretching is effective. The P value was  $< 0.05$  in group A & group B, result was statistically significant, i.e. Both MET and passive stretching & mobilization and passive stretching are equally effective.

**Conclusion:** The findings of this study indicate that application of MET for GHJ horizontal abductors and passive cross body adduction stretch and mobilization for multiple sessions results in greater GHJ horizontal adduction and internal rotation ROM.

**Key Word:** Muscle energy technique, posterior shoulder tightness.

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Date of Submission: 18-03-2020

Date of Acceptance: 03-04-2020

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### **I. Introduction**

The shoulder plays a vital role in many athletic activities. Overhead motions repetitively place the shoulder in vulnerable positions possibly leading to injuries. During bowling in cricket, glenohumeral (GH) joint reaches extremes of motion, velocity and forces. It was suggested that posterior shoulder stiffness results from repetitive microtrauma which leads to the development of fibrotic scar tissue of the posterior capsule. As a result of abnormal orientation between fibers, their ability to glide is impaired, leading to joint stiffness. This leads to posterior shoulder tightness and alteration of GH joint ROM i.e. decrease in internal rotation and horizontal adduction in overhead athletes. Capsular tightness and consequent restricted joint mobility can prevent opposite direction humeral head glide, leading to an earlier onset or greater degree of subacromial compression and painful or limited function, particularly in elevated planes of movement<sup>(2)</sup>. Stretching of posterior shoulder plays an important role in restoring flexibility and was commonly used to treat internal rotation ROM loss due to muscular and capsular limitations. Muscle energy technique has been used to increase the flexibility, and ROM of a restricted joint. The basic principle is post-isometric relaxation<sup>(1)</sup>. Evidence suggests that joint mobilization procedures can lessen the associated glenohumeral rotational deficits characteristic of this condition<sup>(3)</sup>.

## **II. Material and Methods**

**Type of study-**Comparative study

**Sampling method-** convenient sampling

**Sample size-**30

group A- MET and passive stretching (15)

group B- mobilization and passive stretching. (15)

**Study setting-** Nashik District Cricket Association.

**Duration of study-** 5 months

### **Materials used:**

Pen

Paper

Goniometer

Consent form

### **Outcome measures:**

Range of motion for Internal rotation.

Range of motion for horizontal adduction.

### **Inclusion criteria:**

Asymptomatic male bowlers(Inswing and leg spiners)

Age group- 16 to 24 years

Practicing regularly from atleast 1 year.

Difference of more than 10 degrees in internal rotation compared to contralateral extremity.

### **Exclusion criteria:**

Previous History of shoulder surgery

Previous manipulation under anesthesia on Dominant side

Upper extremity injury in last six months.

### **Procedure methodology:**

Subjects were selected on the basis of inclusion and exclusion criteria. Written informed consent were taken from all the participants.

Subjects were divided into 2 groups:

group A- MET and passive stretching

group B- mobilization and passive stretching.

In initial evaluation session, the athletes were interviewed and the baseline outcomes of posterior shoulder tightness and glenohumeral joint horizontal adduction, internal rotation ROM were obtained.

### **Procedure-**

1) **Glenohumeral internal rotational ROM-** Athlete in supine, with the shoulder abducted 90° and the elbow flexed 90°. The fulcrum was placed on olecranon process, movable arm parallel to ulna, stable arm perpendicular to ground. Glenohumeral joint was passively internally rotated. When the the scapula starts to protract, the measurement was taken by the examiner<sup>(1)</sup>.

2) **Glenohumeral horizontal adduction ROM-** Athlete in supine, with both shoulders flat against the plinth. The test shoulder was placed in 90° of abduction, and elbow in 90°. The fulcrum was placed on the tip of acromion process. Movable arm & stable arm, both parallel to humerus. Athlete's distal arm was grasped and then the humerus was passively horizontally adducted. When the first tissue resistance reached, goniometer was aligned along the midline of the humerus for measurement<sup>(1)</sup>.

**group A- MET and stretching-** In MET(postisometric relaxation) for GH joint horizontal abductors the intervention was given as follows - athlete in supine position on the plinth. The lateral border of the scapula stabilized, and with the elbow flexed, athlete's shoulder horizontally adducted to the first barrier of motion. The athlete was instructed to perform a 7-second isometric contraction at approximately 25% of maximal effort in the direction of horizontal abduction, against an opposing force provided by the examiner at the distal humerus<sup>(1)</sup>.

The athlete was instructed to relax, and a new movement barrier was then engaged. This was performed for a total of 3 repetitions and 4 such sessions were done in a week for 2 weeks.

**Passive stretching-** athlete in supine on the plinth, the humerus brought into 90 degrees of abduction and elbow in 90 degrees of flexion with neutral rotation at the GH joint. The scapula manually stabilized at the acromion and humerus passively brought into adduction till the level of discomfort. Stretch maintained for 30 seconds, repeated 3 times in each session and 4 such sessions were undertaken in a week for 2 weeks<sup>(2)</sup>.

**group B-mobilization and passive stretching-**

**Mobilization-**Subject was made to lie supine. Shoulder flexed to 90 ° and elbow flexed to 90 °. arm supported with therapist trunk; with one hand distal humerus was grasped. By placing another hand on the top of elbow, mobilizing force was given. Humeral head was glided posteriorly. The hold time was for 1 minute. 10 repetitions were done in 1 session and 4 sessions were done in a week for 2 weeks<sup>(2)</sup>.

**Passive stretching-** athlete in supine on the plinth, the humerus brought into 90 degrees of flexion and elbow in 90 degrees of flexion with neutral rotation at the GH joint. The scapula manually stabilized at the acromion and humerus passively brought into adduction till the level of discomfort. Stretch maintained for 30 seconds, repeated 3 times in each session and 4 such sessions were undertaken in a week for 2 weeks<sup>(2)</sup>.

**Statistical analysis:**

- Repeated Measure ANOVA- within the group
- Unpaired t test- Between the groups

**III. Result**

**Repeated Measure ANOVA test**

**Group A:**

Comparison of means of shoulder Internal Rotation range of motion at different intervals(pre, 1<sup>st</sup> week & 2<sup>nd</sup> week) in MET & passive stretching group:

Table 1-

Internal Rotation	Mean	S. D	P value	F value	Result
Pre	49	38.7	0.0001	615.41	Significant
1 <sup>st</sup> week	58.2	2.39			
2 <sup>nd</sup> week	68.33	2.43			

- As p is 0.0001 the result is significant.

Comparison of means of shoulder Horizontal adduction range of motion at different intervals(pre, 1<sup>st</sup> week & 2<sup>nd</sup> week) in MET & passive stretching group:

Table 2-

Horizontal adduction	Mean	S. D	P value	F value	Result
Pre	82.66	5.93	0.0001	555.93	Significant
1 <sup>st</sup> week	92.46	5.96			
2 <sup>nd</sup> week	101.13	4.70			

As p is 0.0001 the result is significant.

**Group B:**

Comparison of means of shoulder Internal Rotation range of motion at different intervals(pre, 1<sup>st</sup> week & 2<sup>nd</sup> week) in mobilization & passive stretching group:

Table 3:

Internal Rotation	Mean	S. D	P value	F value	Result
Pre	43.66	3.99	0.0001	589.66	Significant
1 <sup>st</sup> week	53.8	3.78			
2 <sup>nd</sup> week	63.46	4.42			

- As p is 0.0001 the result is significant.

Comparison of means of shoulder Horizontal adduction range of motion at different intervals(pre, 1<sup>st</sup> week & 2<sup>nd</sup> week) in mobilization & passive stretching group:

**Table 4-**

Horizontal Adduction	Mean	S. D	P value	F value	Result
Pre	88	4.55	0.0001	207.12	Significant
1 <sup>st</sup> week	96	3.56			
2 <sup>nd</sup> week	104.66	3.99			

- As p is 0.0001 the result is significant.

**Unpaired t test**

Comparison of means of shoulder Internal Rotation range of motion between group A and group B:

**Table 5-**

Internal Rotation	Group A	Group B	P value	t value	Result
Pre	49	43.66	0.0009	3.72	significant
1 <sup>st</sup> week	58.2	53.8	0.0007	3.81	
2 <sup>nd</sup> week	68.33	63.46	0.0008	3.73	

- As p<0.05 the result is significant.

Comparison of means of shoulder Horizontal Adduction range of motion between group A and group B:

**Table 6-**

Horizontal adduction	Group A	Group B	P value	t value	Result
Pre	82.66	88	0.0099	2.76	significant
1 <sup>st</sup> week	92.46	96	0.0396	2.15	
2 <sup>nd</sup> week	101.13	104.66	0.0349	2.21	

- As p<0.05 the result is significant.

**IV. Discussion**

The P value for repeated measure ANOVA Test in group A is 0.0001. So result is statistically significant, i.e. MET and passive stretching is effective.

Outcome variables were ROM of internal rotation and horizontal adduction taken pre intervention, at the end of 1st week ( post 4 sessions) and at the end of 2nd week (post 8 sessions) . Internal rotation and horizontal adduction improved after MET for horizontal abductors.

Khushboo and Charu (2013) suggested that the mechanism underlying the improvement in the ROM in MET group could be because of reflex muscle relaxation and tissue texture changes following MET.

Muscle relaxation following isometric contraction is claimed to be mediated by the golgi tendon organ with its inhibitory influence on the  $\alpha$ -motor neuron pool and by reciprocal inhibition from contraction of a muscle antagonists<sup>(1)</sup>.

Physiologic changes occur following MET which include Golgi tendon organ activation which results in direct inhibition of agonist muscles, a reflexive reciprocal inhibition occurs at the antagonistic muscles, and as the patient relaxes, agonist and antagonist muscles remain inhibited allowing the joint to be moved further into the restricted range of motion<sup>(1)</sup>.

Adel Rashad Ahmed (2011) determined that MET may produce an increase in muscle length by a combination of creep and plastic change in the connective tissue. The probably mechanism of increasing muscle extensibility involves both neurophysiological (including changes to stretch tolerance) and mechanical factors (such as viscoelastic and plastic changes in the connective tissue elements of the muscle). Also, the effectiveness MET was attributed to the inhibitory Golgi tendonreflex. This reflex is believed to be activated during isometric contraction of muscle, which is claimed to produce stretch on the golgi tendon organs and a

reflex relaxation of the muscle. Lenehan and Fryer (2003) suggested that segmental muscle contraction restricts joint motion, and attribute the efficacy of MET to relaxation of the affected muscles due to inhibition of motor activity through the Golgi tendon organs<sup>(4)</sup>.

The P value for repeated measure ANOVA Test in group B is 0.0001. So result is statistically significant, i.e. Mobilization and passive stretching is effective.

Carolyn Kisner. Mobilization stimulates biological activity by moving synovial fluid which brings nutrients to avascular articular cartilage of joint surfaces and intra-articular fibrocartilage. Myofascial adhesions are released due to mobilization<sup>(5)</sup>.

Mobilization may be applied to normalize nutrition and lubricative properties of the joint, or to improve mobility. It can lead to a generation of fibrofatty connective tissue within the joint space, adhesions between synovial folds.

Mobilization techniques improve the normal extensibility of the shoulder capsule and stretch the tightened soft tissues to induce beneficial effects<sup>(5)</sup>.

The goal of the mobilization is to reverse the negative changes in the joint, and normalize arthrokinematic gliding and rolling movement.

Tracy and Brudvig (2011) suggested that Mobilization is intended to produce a multitude of beneficial effects through stimulation of peripheral mechanoreceptors, inhibition of nociceptors, and an increase in synovial nutrition.

Mobilization also has mechanical effects, such as the realignment of collagen, increase in fiber glide, and the break-up of adhesions, which help to restore normal glenohumeralarthrokinematics<sup>(6)</sup>.

Khushboo and Charu (2013) suggested that the mechanism behind the change could be that stretching may adjust the positional sensitivity of the golgi tendon organs by affecting the series elastic component of the muscle which leads to a recoil of the stretched elastic components of the tissue to a new equilibrium state<sup>(1)</sup>.

Aldridge and Guffey (2012) demonstrated that stretching protocol has the ability to increase shoulder internal rotation and total motion arc in the throwing shoulder of collegiate baseball players. Such a program can facilitate increases in internal rotation passive range of motion, and may promote posterior glenohumeral capsular and posterior rotator cuff length which could reduce lost performance time due to shoulder injury<sup>(7)</sup>.

The main physiological basis underline increase in ROM associated with modified cross-body stretch found that ROM increase could be attributed to acutely reducing the viscosity increase could be attributed to acutely reducing the viscosity and/ or stiffness of the muscle-tendon unit, which would be a factor to increase the joint ROM<sup>(8)</sup>.

The P value for Unpaired t test in both group A and group B is <0.05, result is statistically significant, i.e. Both MET and passive stretching & mobilization and passive stretching are equally effective.

Viscoelastic and plastic changes in myofascial connective tissue elements following isometric contraction is a likely explanation for increased muscle length<sup>(4)</sup>.

Joint mobilization may be preferred because it provides precise stretch to a specific part of the capsule and can be performed with less pain, reduced load on other periarticular structures, and less compressive force on articular structures<sup>(8)</sup>.

## V. Conclusion

Findings of this study indicate that application of MET for GHJ horizontal abductors and passive cross body adduction stretch and mobilization for multiple sessions results in greater GHJ horizontal adduction and internal rotation ROM .

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