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Effect of Sleeper Stretch with Muscle Energy Technique on Posterior Shoulder Tightness Among College Level Cricket Bowlers

Addu Dhanlaxmi, Kalidasan Varathan* and Sudhakar Subramanian

Department of Physiotherapy, Krupanidhi College of Physiotherapy, Bengaluru, Karnataka, India; physio.kric@krupanidhi.edu.in

Abstract

Introduction: Posterior shoulder tightness is the extensibility limitations of the soft tissue, due to repetitive tensile loading in overhead athletes such as cricket and other sports. Bowling is the main cause for Posterior shoulder tightness. Hence the Sleeper stretch with muscle energy technique is proposed to be effecting in improving range, flexibility and functional ability. **Purpose:** To examine the effectiveness of Sleeper stretch with Muscle energy technique on posterior shoulder tightness among college level cricket bowlers. **Materials and Methods**: The study design was a single group experimental study design. On inclusion criteria one hundred and thirty one subjects were selected through convenient sampling technique. The subjects were given sleeper stretch combined with muscle energy technique for 8 consecutive weeks for 5 times in a week, post-test assessment was taken and the data analysis was done respectively. **Results**: The result of the study post intervention of internal rotation is (72.29° ± 3.73°, P = 0.001<0.05), Horizontal adduction (38.51° ± 2.70°. P = 0.001<0.05), flexibility of posterior capsule (109.81° ± 2.65° P = 0.001<0.05), DASH score for functional ability is (4.43 ± 1.53). Through Pearson chi square test there is a significant association in internal rotation (χ^2 = 61.38, P = 0.001<0.005), Horizontal adduction (χ^2 = 16.11, P = 0.001<0.05) and no significant association in flexibility of posterior capsule (χ^2 = 0.98, P = 0.806>0.05) and DASH Score (χ^2 = 4.25, P = 0.120>0.05). **Conclusion:** Effect of sleeper stretch with MET on PST showed effective results in improving internal rotation range, horizontal adduction, flexibility, functional ability among college level cricket bowlers.

Keywords: DASH, Horizontal Adduction, Internal Rotation Range, Modified Supine Assessment, Posterior Capsular Extensibility

1. Introduction

Posterior Shoulder Tightness (PST) is the extensibility limitation of the posterior soft tissue, includes both contractile and non-contractile components as well as osseous changes as seen through training adaptations such as cricket in the form of humeral torsion[1,2]. It was first described by Papas, *et al.*, (1985) and stated mainly effects the glenohumeral joint with impaired mobility of posterior glenohumeral capsule at deceleration phase due to the eccentric forces acting on posterior shoulder capsule imposing pressure leading to the shoulder tightness[3,4]. Posterior shoulder tightness is associated with the reduced internal rotation, horizontal adduction, flexion and increased extension in the movement range of dominant arm[5]. PST is commonly seen in overhead athletes such as Cricket and other sports like Volley ball, Tennis, Baseball etc[6]. Due to repetitive tensile loading in overhead athletes such as cricket the shoulder complex regulates forces generated by the lower limb and the trunk with higher velocities accompanying the throwing motion[7]. Because of larger forces across glenohumeral joint it leads to the thickening of posterior capsule implicating with three tissue alterations they are increased

*Author for correspondence

humeral retro torsion (retroversion), reduced posterior joint capsule extensibility, Reduced posterior shoulder muscle/tendon extensibility[8]. Ticker, *et al.,* (2000), Tyler. *et al.,* (2000) demonstrated that there is a thickening of shoulder joint capsule with sub acromial impingement leading to restrictions in range which increases peak sub acromial pressure during movement leading to pathological impingement in shoulder exhibits posterior shoulder tightness[9–11]. In the studies conducted by Ranson C, *et al.,* (2008), it was concluded that 44% of bowlers reported negative impact on their performance that leads to the shoulder injuries[12]. The prevalence of shoulder injury among fast bowlers is 0.9% and spin bowlers is 1.1% according to the Australian injury surveillance data. Risk of shoulder injury in spin bowlers is more compared to fast bowlers[13].

During acceleration phase of bowling, internal rotators of shoulder undergo concentric contraction and during deceleration the eccentric contraction of external rotators occurs[14]. At the time of deceleration phase, large compressive forces are created in the shoulder which develops a contracture in the posterior shoulder[15], This is due to repetitive throwing activity which stretches the anterior joint capsule and tightens the posterior ligamentous capsule which leads to the reduction of range of motion and leads to pain in shoulder and degrades performance among cricket bowlers[16].

To overcome posterior shoulder tightness manual techniques like sleeper stretch, joint mobilization, cross body stretching, muscle energy technique helped in enhancing the performance in the overhead athletes[17]. Burkhart, *et al.,* (2003) found that there is an increase in shoulder movement and flexibility after applying sleeper stretch resulting in extensibility of tendon and muscle leading to less tensile stress on the subacromial tissue providing enough end range to extend the posterior shoulder muscles and periarticular structures[5,18,19]. Muscle Energy Techniques (MET) is a type of osteopathic treatment in which the patient initiates both the muscle contractions (isotonic, isometric) in order to improve musculoskeletal function and reduce pain[20]. Moore, *et al.,* (2011) mentioned that Muscle energy techniques on applying to the Glenohumeral (GH) joint improves shoulder Range of Motion (ROM). PST and a lack of GH Internal Rotation (IR) are the most common causes of shoulder discomfort and impairment in overhead throwers. The reduction in horizontal adduction range of motion has also been linked to an increase in injury rates among overhead athletes. Hence the stretching techniques and MET's is incorporated to reduce the risk of injury[21]. Kevin G, *et al.,* (2008) stated that in overhead athletes, the sleeper stretch was found to be responsible for improved shoulder flexibility and Range of Motion (ROM)[22]. Reed *et al.,* (2018), the ROM of asymptomatic high school and baseball players rose substantially after applying MET to the GH joint. As a result, using MET to treat PST might be beneficial[23].

Although there are studies on sleeper stretch and muscle energy technique on PST, there is dearth of literature available on adding the effects of sleeper stretch with MET in PST. Hence the goal of the study was to analyze the effect of sleeper stretch with MET among college level cricket players having posterior shoulder tightness in terms of range, flexibility and ability.

2. Materials and Methods

Study was designed as a single group pre-test and post-test experimental study where non probability sampling technique was used like convenient sampling technique. Based on the prevalence rate and the impact of the shoulder injury among cricket bowlers the estimated sample size was 131. All the participants were told about the study and informed consent was taken. After obtaining the ethical approval from the ethical committee (Ref: EC-MPT/20/PHY/001), the study was conducted at Krupanidhi Group of Institutions and the duration of the study was from March 2020 to March 2021. The inclusion criteria were Glenohumeral internal rotation deficit more than 15 degrees compared with non-dominant arm[24]. Subjects had less than 105 degrees through modified supine assessment[25] between the age of 18 to 30 years among male cricket bowlers[24].

Pain during stretching, VAS score >6 were excluded from the study. Shoulder impingement, history of shoulder surgeries, recent shoulder fractures, shoulder dislocation in less than 12 months were excluded from the study.

The treatment was done for one session per day for 5 days a week for 8 weeks. The study duration was for one year. Hence the single group was provided with sleeper stretch with muscle energy technique.

3. Procedure

3.1 Sleeper Stretch

The participant was lying in a side position adjustting his shoulder to 90º and flexing elbow to 90º. Stabilising scapula with a towel against the treatment table, the shoulder was internally rotated passively by supporting the distal forearm and the pressure was kept on hold for 30 seconds and 5 repetitions was given in each set of 3 sets and 30 seconds of rest interval between each set[26].

3.2 MET

3.2.1 MET for External Rotators

In a supine position the participant abducting his shoulder to 90º and flexing elbow to 90º the acromion process was stabilized and arm was passively internally rotated and was said to do a 5 second of isometric contraction of 25% in external rotation direction. Whereas Reciprocal inhibition was done at the distal fore-arm and the subjects was instructed to rotate internally towards the ground. 30 seconds of active assisted stretch was applied and relaxed. This was repeated for 5 times in each of total 5 sets[27]. Rest interval was given for 30 seconds in between each set[21].

3.2.2 MET for Horizontal Abductors

The participant was in a supine lying and was instructed to flex his shoulder to 90º along with elbow flexion of 90º. The scapula was stabilized and the elbow was supported. The subject was asked to adduct the shoulder horizontally. And was instructed to perform the isometric contraction of 25% in the direction of shoulder abduction and the reciprocal inhibition was provided at the elbow while performing shoulder abduction. And the subject was said to adduct his arm and 30 seconds of active assisted stretch was applied and relaxed[18]. This was performed for 5 times in each set of 5 sets and the rest interval was 30 seconds between each set[27].

4. Measurement Tools and Methods

Goniometer was used for assessing IR and horizontal adduction and flexibility of shoulder through modified supine assessment. DASH questionnaire was given to assess the ability of shoulder in daily activities. To know the significance of pre and post treatment these tools were used.

4.1 Outcome Measures

Range of motion[28].
DASH questionnaire: functional ability[29].
Modified supine assessment: flexibility[25].

4.2 Statistical Analysis

Paired 't' test was used within the group and Pearson chi square test was used to know the significant association within the group.

Statistical analysis was done using SPSS software 29.0.

5. Results

Table 1. Age of study subjects-descriptive statistics

AGE	MEAN	SD
Age-years	23.32	3.23

Based on inclusion criteria male cricket bowlers between the age group of 18-30 were taken into consideration through descriptive statistics. It is inferred that the mean age group among the subjects were Mean ± SD (23.32 ± 3.23).

It is inferred from Table 2 that the mean internal rotation ROM was 61.87˚ ± 3.99˚ before treatment and it was improved significantly to 72.29˚ ± 3.73˚ after the therapy, Z = 9.96, P = 0.001<0.05. The magnitude of the improvement was 10.42˚ ± 2.50˚.

There was a significant improvement in the horizontal abduction from 26.42˚ ± 1.90˚ to 38.51˚ ± 2.70˚ following the treatment, Z = 9.95, P = 0.001. The magnitude of the gain was 10.79˚ ± 4.02˚.

There was a significant improvement in the modified supine flexibility from 99.02˚ ± 3.32˚ at the baseline to 109.81˚ ± 2.65˚ following the treatment, Z = 9.94, P = 0.001<0.05. The magnitude of the improvement was 12.09˚ ± 2.45˚.

It was inferred from Table 3 that there was a significant association in IR before and after training χ^2 = 61.38, p = 0.001<0.05, horizontal adduction χ^2 = 16.11, p = 0.001<0.05, modified supine assessment χ^2 = 0.98, p = 0.806>0.05, DASH score χ^2 = 4.25, p = 0.12>0.05.

At the college level the mean age of the Cricket Bowlers was 23.32 ± 3.23 (Table 1) in the single pretest-

Table 2. Comparison of mean values within the group and its significance

Variables	Mean values	Mean	SD	t value	p value	significance
Internal rotation	Pre-test	61.87	3.99	9.96	0.001	Highly Significant
	Post-test	72.29	3.73			
Hor. Add	Pre-test	26.42	1.9	9.95	0.001	Highly Significant
	Post-test	38.54	2.8			
Modified supine assessment	Pre-test	99.02	3.32	9.94	0.001	Highly Significant
	Pos-t test	109.81	2.65			
DASH	Pre- test	25.47	2.73	85.9	0.001	Highly Significant
	Post- test	4.43	1.53			

Table 3. Association of outcome scores within the groups

Variables	Value (x^2)	p value	Association
Internal rotation	61.38	0.001	Significant association
Horizontal adduction	16.11	0.001	Significant association
Modified supine assessment	0.98	0.806	No Significant association
DASH	4.25	0.12	No Significant association

post test study design. It is evident that subjects were homogenous while comparing pre and post test outcome measures among the subject within the group. Hence the magnitude of improvement for internal rotation Mean ± SD (10.42° ± 2.50°), Horizontal adduction Mean ± SD (10.79° ± 4.02°), Flexibility Mean ± SD (12.09° ± 2.45°) Functional ability Mean ± SD (21.05 ± 2.80) (Table 2). Comparing the magnitude of means of all the outcome measures it was shown that there was more significant difference in functional ability compared to the ROM and Flexibility. Association of IR through Pearson chi-square test pre and post treatment was (x^2 = 61.38, p = 0.001 <0.05), Horizontal adduction was (x^2 = 16.11, p = 0.001 <0.05), Flexibility (x^2 = 0.98, p = 0.806), Functional ability (x^2 = 4.25, p = 0.120) within the groups (Table 3). Comparing the pre and post test outcome measures within group, there was a significant association among the IR and horizontal adduction. Whereas in the flexibility and functional ability there was no significant association as the scores were independent of each other but showed significant difference in pre and post intervention. The intervention had showed effective in improving outcome measures among college level cricket bowlers.

6. Discussion

Posterior shoulder tightness mainly affects the glenohumeral joint with impaired mobility of posterior glenohumeral capsule. PST is associated with reduced IR, horizontal adduction, reduced functional ability of the arm[5]. Players participating in overhead activity play a specific role on the upper extremity. Eccentric forces during deceleration phase have an impact on posterior capsule which leads to posterior shoulder tightness. The subject having osseous changes and soft tissue adaptations results in decreasing ROM, flexibility, functional ability and increase PST. In order to enhance the risk of injury, sleeper stretch with MET was incorporated in this study[4,7].

The purpose was to evaluate the combined effect of sleeper stretch with MET on posterior shoulder tightness among college level cricket bowlers. The intervention had been performed for 8 weeks. The efficacy of this study showed significance improvement in IR, horizontal adduction, flexibility of posterior capsule and functional ability of the shoulder. The mean age group of the study was 23.32 ± 3.23.

The result of the study post intervention of internal rotation was (72.29° ± 3.73°, P = 0.001<0.05), Horizontal adduction (38.51° ± 2.70°. P = 0.001<0.05), flexibility of posterior capsule (109.81° ± 2.65° P = 0.001<0.05), DASH score for functional ability was (4.43 ± 1.53 p = 0.01<0.05). Through Pearson chi square test there was a significant association in IR (χ^2 = 61.38, P = 0.001<0.005), Horizontal adduction (χ^2 = 16.11, P = 0.001<0.05) and no significant association in flexibility of posterior capsule (χ^2 = 0.98, P = 0.806>0.05) and DASH Score (χ^2 = 4.25, P = 0.120>0.05).

Sheshagiri, *et al.,* (2016) compared three stretching techniques for posterior shoulder tightness among throwers concluded that the cross body stretching has proved more effective in improving range of motion (73° ± 3.634, P<0.0001) compared to sleeper stretch (68.33° ± 1.759, P<0.001), horizontal adduction stretch (68° ± 3.047, P<0.0001)[30]. He also explained that many subjects felt pain and inconvenient while performing sleeper stretch although Clure, *et al.,* (2007) explained that sleeper stretch is modified from supine to side lying to reduce pain[31] whereas in this study it was proved that the combined effects of sleeper stretch in side lying with MET showed significant results with Mean ± SD (38.51° ± 2.70°. P = 0.001<0.05) and the DASH score with high significance difference of Mean ± SD (4.43 ± 1.53 p = 0.01<0.05) and the subjects didn't feel any pain while performing the stretching technique. Hence the sleeper stretch should be performed in the side lying which gives the stability to the accessory muscles and provides the proper stretch to the affected muscle whereas in the supine lying it leads to shoulder pain.

Mishra, *et al.,* (2016) on comparing the capsular stretch with sleeper stretch on pain, movement and ability in patients concluded that sleeper stretch proved more effective with pain (2.933 ± 2.0197, P<0.0001), ROM (39.95 ± 16.642), SPADI score P<0.0001). In this study the ROM showed highly significant difference of Mean ± SD (72.29° ± 3.73°, P = 0.001<5)[32].

Reed, *et al.,* (2018) comparing MET with Joint mobilization on PST in young throwing participants concluded that application of MET showed significant effect in increasing horizontal adduction (P = 0.04<0.05) but showed no significance effect on IR (p = 0.28>0.05). He explained that immediate effects of MET was transient lasting less than 15 minutes. These transient changes reduce the prevalence of injury over a time. So, this study was to provide the long term intervention of the sleeper stretch with MET to improve range, flexibility and functional ability to prevent from shoulder injuries and reduce PST and it was shown that there was an improvement but no significant association among flexibility and functional ability[23].

The mechanism behind sleeper stretch is that the intrinsic components consisting of several non-contractile tissues have a large amount of collagen which exhibits elasticity and viscosity properties when stretched passively. Constant stretch is held and the force of the length gradually decreases and effect is known as stress relaxation[33].

When a muscle contracts, the golgi tendon organ between the muscle belly and its tendon experiences increased tension, which is the mechanism underlying the muscle energy technique. When GTO is engaged, it inhibits constriction (reflex inhibition) and contracts opposing muscle groups (agonists). When GTO stops the agonist muscle from contracting, the antagonist muscle relaxes more easily, allowing the muscles to stretch wider[34].

7. Limitations and Suggestions

Only single group study was conducted where the subjects were healthy and pain free. The results of this study were among the asymptomatic college level cricket bowlers.

The study can be performed on symptomatic individuals to know the effectiveness which can be done to compare with other techniques to know the efficacy of the intervention. The study can be considered also for both male and female cricket players.

8. Conclusion

Through this study it was hypothesized that there was significant improvement in range of motion, flexibility and functional ability among college level cricket bowlers. Hence it was concluded that effect of sleeper stretch with MET showed effective results which helps in improving ROM, flexibility and functional ability.

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