



EFFECT OF SLEEPER STRETCH TECHNIQUE ON RANGE OF MOTION, PATIENT SPECIFIC FUNCTION AND GLENOHUMERAL INTERNAL ROTATION DEFICIT / GLENOHUMERAL EXTERNAL ROTATION GAIN RATIO IN ASYMPTOMATIC TENNIS PLAYERS.

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BACKGROUND & PURPOSE: Most upper limb lesion affects the shoulder at an incidence of 25% to 45.7%. The shoulder joint is a complex joint with greater mobility static and dynamic stability of shoulder depends on combined action of rotator cuff muscle and capsule-ligamentous structure. Stress on this structure will increasing while practicing sports, e.g. tennis, volleyball, baseball, swimming, bowlers. Mostly injuries in tennis players are associated with repetitive micro trauma. Glenohumeral external rotation deficit (GIRD) is commonly seen in tennis players because of overhead motion mostly in serving. A Glenohumeral joint internal rotation deficit (GIRD) is a loss of glenohumeral joint internal rotation ROM at 90° of abduction in the dominant side of shoulder. Prevalence of GIRD was found to be 29.1%. Passive sleeper stretching an advanced technique aimed at an improvement in ROM, GIRD/ GERG ratio and PSFS scale. So the purpose of this study is to see effect of passive sleeper stretch in improvement of glenohumeral internal and external rotation, GIRD/GERG ratio and three activities of PSFS scale serving, backhand and forehand in asymptomatic tennis players. **METHODOLOGY:** Total 30 asymptomatic tennis players were included in this study. Passive sleeper stretching in side lying was given by therapist for 5 days/ week for 2 weeks. Pre and post measurement of glenohumeral internal and external rotation, GIRD/GERG ratio and three activities of PSFS scale were done. **RESULT:** In asymptomatic tennis players post sleeper stretching result for Internal rotation ROM was 77.17 ± 3.395 , for external rotation ROM was 77.17 ± 3.395 , for GIRD/GERG ratio was 92.67 ± 2.537 , for PSFS scale three activities serving, forehand, backhand was 1.047 ± 0.3812 , 0.13 ± 0.346 , 0.57 ± 0.898 , 0.70 ± 0.988 , respectively. The data reveals increase in outcome measures ($p < 0.005$) after application of passive sleeper stretch. **CONCLUSION:** Based on result, the sleeper stretch produced a statistically significant improvement in internal rotation ROM and external rotation ROM, GIRD/GERG ratio and PSFS scale which includes three activities serving, forehand and backhand.

KEY WORDS: Posterior capsule tightness, tennis players, soft tissue, flexibility.

INTRODUCTION:

Tennis is a most popular game worldwide. Injury rate in Tennis players is approximately 21.5 injuries per 1000 practice hours. ^[1] The serving motion was seen as similar to throwing motion in basketball players, although there are some differences exist between them. The difference is seen in phases of motion, in which the nondominant arm tossing the tennis ball, the trajectory of forces produced and released, the tennis racket (which alters the lever arm), the technical components of the serve, and the variety of placements and goals of the motion (spin, speed, angle, direction, etc). ^[2] The percentage ratio of upper limb injuries in tennis players was little change for both the groups such as 28% for adult male players and 23% for adult female players. ^[3] Shoulder joint injuries are the most common type of upper limb injury in tennis. ^[1,4] The tennis requires continuous movement and jerky activities at shoulder joint which is more affected by mechanical injuries. ^[4] Because of the continuous mechanical overload alteration in length tension relationship of muscle around the shoulder and scapula occur which lead to deficit in shoulder rotation movement specifically internal rotation is affected more than external rotation. GIRD is believed to be one of risk factor for shoulder injury in Tennis players. ^[5] Reduction in glenohumeral internal rotation (medial rotation) range of motion in dominant shoulder compare to non-dominant shoulder is known as glenohumeral internal rotation deficit (GIRD). ^[5,6,7] Prevalence of GIRD was found to be 29.1%. ^[8] Robert Manske et al has described two types of GIRD, I) anatomical and II) pathological. In an anatomical type dominant side internal rotation loss is greater than 18-20° but total range of motion (TROM) are symmetrical bilaterally. In a pathological GIRD internal rotation loss is combined with a greater than 5° loss of dominant side TROM. ^[9] In the beginning, the glenohumeral internal rotation deficit is asymptomatic. The method of prevention and management for the deficit is easy, exciting, cost effective and less risky. ^[10,11,12,13] Multiple studies were performed to evaluate overhead shoulder movement in baseball players but there were paucity of literatures available for swimmers, volleyball and tennis players. ^[14,15,16] So the purpose of the study is to give passive sleeper stretching in side lying on dominant side and check its effect on range of motion, patient specific function and glenohumeral internal rotation deficit / glenohumeral external rotation gain ratio in asymptomatic adult tennis players.

METHODOLOGY:

Ethical approval was given from Parul University. In this study 18-30 years age of tennis players were included. Prior consent form was taken from all players. Explanation about whole treatment program was given to the players. The players were selected on the basis of inclusion and exclusion criteria. Inclusion criteria, age group of 18-30 years, practice of tennis sports 2-4 times a week for at least 6 months, both males and females, asymptomatic tennis players, tennis players with loss of IR < 18° - 20° in dominant shoulder as compared to the non-dominant one. Exclusion criteria, affected activities of daily living due to pain and other symptoms since 3 months were excluded from the study, history of any fracture, partial dislocation of the shoulder joint or any surgical procedure in/around the shoulder, any history of total displacement of shoulder joint, pathology of cervical vertebra/ spine and shoulder joint, shoulder symptoms requiring medical treatment in the last one year, shoulder pain at the time of study, players with any neurological or cardio-respiratory conditions, continuous use of analgesic or anti-inflammatory drugs, muscle relaxant or benzodiazepines, affected gait and routine daily activities. Players were assessed hours earlier before any sports practice at rest. Internal rotation and external rotation was taken bilaterally through goniometer then GIRD/GERD ratio and Patient specific functional scale (PSFS) was taken on dominant side. The examiner was blind about dominance of players before measurement of ranges of IR and ER.

For ROM measurement player was asked to be in supine lying position on plinth with shoulder abducted 90° and elbow flexed at 90°, towel roll were placed below to the shoulder to hold the scapula in place. Goniometer was used to assess range of motion. Olecranon process of ulna was the place for the fulcrum of goniometer. Stable arm of the goniometer was towards the ground and movable arm towards the styloid process of ulna. Then rotate the shoulder medially and laterally and this is how internal rotation and external rotation was performed. ^[17] After the pre-assessment passive sleeper stretch technique was given to the asymptomatic tennis players on dominant side for 5 days a week for 2 weeks. So at the end of 2 weeks again post assessment was taken for ROM, GIRD/GERD ratio and Patients specific functional scale (PSFS).

Passive Sleeper Stretch the subject was in side lying on his/her dominant side. Participants' shoulders and elbows were positioned into 90° of flexion with the lateral border of the scapula positioned firmly against the treatment table. Next, the investigator passively internally rotated each participant's shoulder by grasping the distal forearm and moving the arm toward the treatment table. Pressure was held constant at the end of ROM for 30 seconds and then repeated thrice with 30 seconds' of rest in between stretching episodes. ^[18] Thus stretching to the posterior structure of shoulder will be given for 2 weeks, 5 times per week. ^[17,19] All the precautions of COVID-19 were taken during treatment.

Patient specific functional scale is an outcome measure that is uniquely relevant to individual patients with upper limb injuries. Reliability is moderate to good for the PSFS (ICC = 0.713), accuracy is 0.887. Posterior Shoulder Tightness

IR and ER ROM were assessed in supine lying position. Reliability and Precision is Intrasection ICC - 0.91, Intersession ICC- 0.75, Intertester ICC- 0.94. ICC values above 0.75 are indicative a good reliability, while those below 0.75 indicated a moderate to poor reliability. [20]

STATISTICAL ANALYSIS

Through SPSS version 25.0 the collected data were analyzed. Parametric t test is analyzed statistically because of normal distribution. The collected demographic values were compared within the groups with p value consider 0.005 using paired t test.

RESULT:

In this study 30 asymptomatic Tennis players were included out of which 22 were male and 8 were female. In this tennis players were included who fits into the inclusion criteria. Statistical package of social science (SPSS) version 25.0 and Microsoft Excel 2019 was used to perform statistical analysis.

Table 1: Mean age of participants according to gender.

AGE GROUP	MEAN AGE	SD
MALE	22.68	5.008
FEMALE	19.38	3.503

Table 1 displays 22 males and 8 females were included in this study. The mean age for man was 22.68 and for female were 19.38.

Table 2: Mean of dominancy in players.

HAND DOMINANCY	NUMBER	MEAN	SD
RIGHT	26	21.00	4.317
LEFT	4	27.00	5.354

Table 2 displays dominancy of players. The mean of right dominance was 21.00 and mean of left dominance is 27.00.

Comparison of outcomes within a group.

Variable	Pre-Post	Intervention (Mean ± SD)	t value	p value	
IR	Pre	63.67 ± 3.925	18.616	<0.001	
	Post	77.17 ± 3.395			
ER	Pre	102.33 ± 6.661	8.242		
	Post	92.67 ± 2.537			
GIRG/ GERG	Pre	1.5613 ± 0.68585	3.581		
	Post	1.047 ± 0.3812			
PSFS: Serving	Pre	3.43 ± 1.851	10.243		0.001
	Post	0.13 ± 0.346			
Forehand	Pre	2.40 ± 1.923	8.328	<0.001	
	Post	0.57 ± 0.898			
Backhand	Pre	2.43 ± 1.755	8.308		
	Post	0.70 ± 0.988			

Within group comparison for different outcomes, before and after intervention was carried out by paired t-test with 95% of confidence interval and there was statistical significant difference within group analysis of all outcomes.

DISCUSSION:

This study was designed to see the effect of passive sleeper stretch in both IR and ER ROM, GIRD/GERG ratio and three motions asked by tennis players serving, forehand and backhand in PSFS scale in dominant upper extremity. These three activities were included because they were most commonly asked by tennis players. The result of this study is showing statistical significance and improvement in all outcomes was seen. The p value is < 0.005 . Short term clinical effect has been seen. Improvement has been observed as stretching lengthens the soft tissue restraints because of that they can improve throwing velocity and control so it will limit the incidence of injury and muscle soreness.^[21] Stretching will also help in reduction of matches lost due to any injuries because stretching prevents and reduces risk of soft tissue injuries, reduce post exercise muscle soreness and enhances physical performance.^[19, 22]

GIRD leads retroversion of humerus, hyperplasia of joint capsules, muscular stiffness and imbalance in soft tissue. Continuous contraction of posterior element of shoulder joint lead to alteration in shoulder joint kinematics. Therefore, for the correction of internal rotation range deficit stretching of posterior element is necessary.^[17] The stretch produce increase in ROM including biomechanical and neural changes in the non-contractile and contractile elements of the muscle tendon unit. Changes in these are thought to be the result of increased muscle extensibility and length or decreased stiffness of muscle.^[22]

Stretching reduces passive tension in the muscles at a given length and this reduction in the passive tension in the muscle at a specific joint angle is because of reduction of stress. Stress relaxation is the reduction in stress in a material elongated and held at a constant length. Holding stretching for 20-30 seconds is good standard because most of stress relaxation in passive stretches occurs in first 20 seconds.^[23] So, in the stretched shoulder, humeral retroversion still occurs, but posterior capsule tightness can be corrected and due to that there will be improvement occur in internal and external range of motion of the shoulder joint.^[24]

Intervention of passive sleeper stretch given to participants in this study is supported by Roy Aldridge et al (2012) and author concluded that implementation of sleeper stretching may be helpful in facilitation of increased passive internal rotation ROM and total arc in throwing shoulder of collegiate baseball players. Such a stretching program can increase in passive IR ROM and may also promote the posterior glenohumeral capsule and length of posterior rotator cuff which could reduce lost performance time due to shoulder injury. As stretching may be useful in reducing innings lost due to injury in collegiate baseball players.^[19]

Another study done by Kevin G. Launder et al. concluded that sleeper stretches produced a statistical significant acute increase in internal shoulder rotation and in posterior shoulder ROM in dominant arm of baseball players but has produced insignificant clinical changes. As author have checked ROM immediately after pre and post sleeper stretching their result is not confirm that sleeper stretch produces large, acute increase in shoulder ROM. Author studied that stretches attempt to lengthen soft tissue restraint so that it can increase throwing velocity, control and limit the incidence of injury and muscle soreness. Thus, this study is not supported.^[21]

So finally this study illustrates that the glenohumeral IR ROM is increased in asymptomatic tennis players. As passive sleeper stretching is performed in against gravity motion so it will help in improving ROM. As increase in glenohumeral IR ROM reduces, external rotation gain is also reduces. Because of improvement in both of this ROM there is significant improvement is seen in GIRD/GERG ratio. And ultimately because of improvement in all of this patients issue while serving, backhand and forehand is also reduce so PSFS is also significantly improved. And even at the end of this 2-week stretching program athletes were also feeling that their capacity of playing was increased and while serving, backhand and forehand motion they were observed that they have getting less fatigued and able to play for longer than they used to be in past.

CONCLUSION:

So, this study concluded that implementation of passive sleeper stretching program is helpful to facilitate an increase in active internal rotation range, external rotation range and improvement in GIRD/GERG ratio and three activities of PSFS scale serving, forehand and backhand seen in the dominant shoulder of asymptomatic tennis players.

LIMITATIONS AND FUTURE RECOMMENDATIONS

LIMITATIONS:

The long term follow up was not taken. Control group was not taken. Only asymptomatic tennis players were included.

FUTURE RECOMMENDATIONS:

This study can be done for longer duration to check long term effect. Further studies can be done with control group. This study can be done with symptomatic tennis players.

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