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Original Research Article

Correlation of scapulothoracic muscle strength and functional activity in volleyball players

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ABSTRACT

Background: Volleyball is the game in which upper extremities are mostly involved. This game needs repeated forceful high-speed upper limb activities required during training sessions and matches; which are reported to high incidence of shoulder injuries. This study is to correlate scapulothoracic muscle strength and functional activity in volleyball players.
Methods: Study is cross sectional; correlational study was done with convenient sampling. Sample size was 55. Subjects were selected from all over Pune. Scapulothoracic muscles strength was measured (using the handheld dynamometer) in volleyball players which fitted in the inclusion and exclusion criteria and filled disabilities of the arm, shoulder and hand (DASH) scale by every participant included in study. Correlated evaluated data using spearman rho method.
Results: Study shows that all muscle carry good strength. Statistical analysis shows no significance, p value for all tested muscle is ($p>0.05$). Also DASH scale shows lesser score which indicates lesser difficulty to do functional activities.
Conclusions: This study proves that there is no correlation between scapulothoracic muscle strength and functional activity in volleyball players.

Keywords: DASH scale, Handheld dynamometer, Correlation

INTRODUCTION

Volleyball is the game in which upper limb and lower limb activity gets involved. Volleyball players required well balanced scapulothoracic performance. It is one of the traditional sport needs repeated forceful high speed upper limb activities required during training sessions and matches which are reported to high incidence of injuries to upper extremities. Prevalence of shoulder pain amongst musculoskeletal problem is approximated 20-22% of the population.[1] In athletes, shoulder injuries are commonly seen. Volleyball includes movements like servicing, smashing, lifting and defending. These all are overhead activities which needs dynamic stability of scapula.[1] Weakness in scapulothoracic muscle can have an impact on dynamic stability of scapula which can slower down functional activity of players.[1]

In activities like smashing, servicing; scapula facilitates shoulder movements. Research shows, because of these repetitive movements muscles such as serratus anterior, lower trapezius and rhomboid gets weaken; causes abnormalities at glenohumeral joint.[1] Also athletes having overhead activities reported to decrease in strength of lower trapezius muscle.[2-5] Scapulothoracic muscles are stabilizing muscles of scapula as per biomechanics. Lesser the muscle strength or endurance of scapulothoracic muscles can cause scapular dyskinesia or muscular

imbalance. Injury induced by muscle imbalance affects on stability at shoulder joint. Repetitive movements will not weaken the muscle but can cause muscle discoordination which can disturb normal rhythm of scapulothoracic joint. Disturbed movement of scapula can cause tension in muscle and decreases muscle activity.

In musculoskeletal assessment, muscle strength measurement of players is one of the main component. With-out having good muscle strength; performance level of player goes down.[2] Therapist require accurate muscle strength of players to record gain or loss of strength and capacity of the muscle to do functional activities. Dynamometer is to identify parameters of strength and power development.[2] In manual muscle testing method, force given by assessor gets differ. In handheld dynamometer force given by an instrument itself.[3] It will not get differ in muscle testing.[2]

DASH scale introduced in 1996 consist of 30 domains.[3] Scale designed for age group 18-65 years old. It includes questions and activities which are related to daily functioning.[3] Scale asses some domains which affects pain and functional activities like (write, prepare meal, push heavy door) etc. There are some domains in scale concerning about ability to play sport and ability to work.[3,4] Precisely 8 questions are included to asses sport performance activity. Scale shows lesser score then there will be lesser difficulty to do work and good ability to play sports.[4]

Purpose of this study is to assess scapulothoracic muscle strength by handheld dynamometer and functional activity with Disabilities of the arm, shoulder and hand (DASH) scale. In this study particularly scapulothoracic muscles (serratus anterior, lattissimus dorsi, lower trapezius, rhomboids, pectoralis major) were of interest.

METHODS

This was a cross sectional, co relational study. Total55 volleyball players were evaluated. The sampling technique was convenient sampling.[7] It was done on the ground where players practice everyday.

Inclusion criteria

The inclusion criteria for the study was as follows: age between 16-32 years, athlete (volleyball players) and players at least playing volleyball since 1 year.

Exclusion criteria

The exclusion criteria for the study was as follows: recent trauma, any fracture related to upper limb, participant playing any another game rather than volleyball on any level and presence of shoulder deformity.

Subjects who fit the inclusion criteria and exclusion criteria were selected and their strength of muscle (serratus anterior, lattissimus dorsi, lower trapezius, rhomboids, pectoralis major) was measured by handheld dynamometer and all readings were noted.[5,6] Then asked them to fill DASH scale.[3] Reading were noted and accordingly calculated DASH scale score by formula.

Consent form (approved and reviewed by the Ethical committee) was given and their consent was taken. They were given the necessary details and were informed that they would not be affected in any way or their person-al information won't be revealed in any way. Also, the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000. This study was done under Sancheti Institute for orthopedics and rehabilitation for the period of (September 2019 to March 2019).

RESULTS

Serratus anterior strength versus DASH score

This is a graph of serratus anterior muscle. On x-axis strength is measured and on y-axis DASH score is measured. In this mean value is 30.10 and p=0.852 and r=0.026.

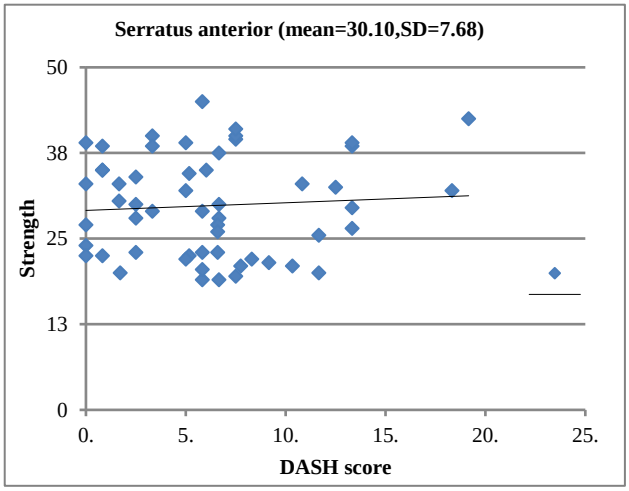

Figure 1: Serratus anterior strength versus DASH score.

Lower traperius strength versus DASH score

This is a graph lower trapezius muscle. On x-axis strength is measured and on y-axis DASH score is measured. In this mean value is 28.94 and p=0.653 and r=0.06.

Pectoralis major strength versus DASH score

This is a graph of pectoralis major muscle. On x-axis strength is measured and on y-axis DASH score is measured. In this mean value is 29.25and p=0.45 and r=0.10.

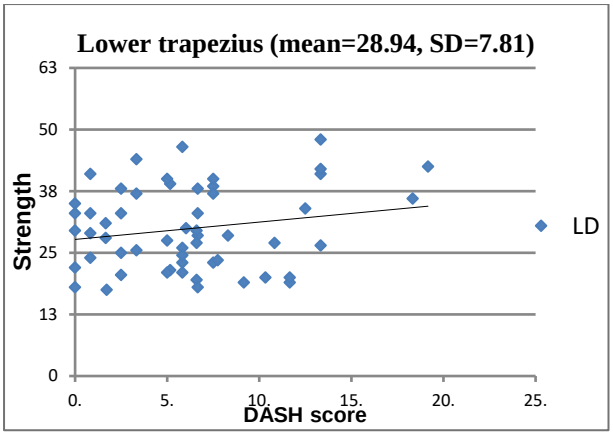

Figure 2: Lower traperius strength versus DASH score.

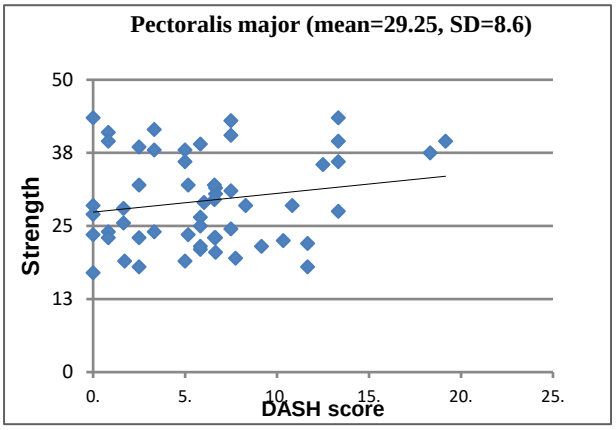

Figure 3: Pectoralis major strength versus DASH score.

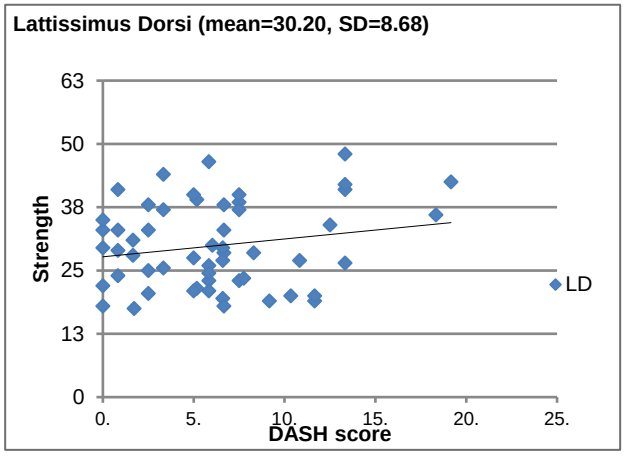

Figure 4: Lattissimus dorsi strength versus DASH score.

Lattissimus dorsi strength versus DASH score

This is a graph of lattissimus dorsi muscle. On x-axis strength is measured and on y-axis DASH score is measured. In this mean value is 30.20 and p=0.449 and r=0.104.

Rhomboids strength versus DASH score

This is a graph of rhomboids muscle. On x-axis strength is measured and on y-axis DASH score is measured. In this mean value is 29.98 and p=0.732 and r=0.47.

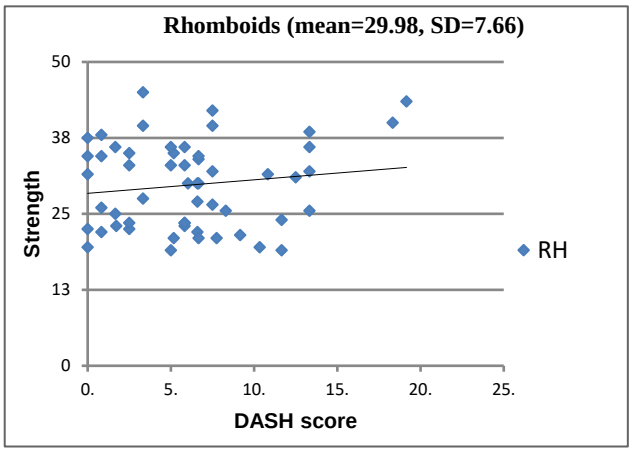

Figure 5: Rhomboids strength versus DASH score.

DISCUSSION

Our purpose is to correlate scapulothoracic muscle strength and functional activity in volleyball players. We wanted to asses strength of scapulothoracic muscles (serratus anterior, lower trapezius, lattissimus dorsi, rhomboids, and pectoralis major) of players. Also to assess functional activity in players.[8] According to principles of kinetic chain during daily activities, adaptations at scapulothoracic muscles may influence quality of function-al movements.[9] Some researches shows adaptation is necessary and should get corrected in athletes career to prevent overuse of injuries.[9] In bilateral use of upper extremities, we did not found difference on arm dominance in players. No significant side difference found in isokinetic scapulothoracic muscle strength in healthy populations of volleyball players.[9]

As seen, strength is more in both dominant and non-dominant side.[8] In several study shows that in activities like baseball, volleyball which includes overhead activities scapular muscle adaptation is more that involves use of dominant arm. Researches shows using of both arms as scapular muscle performance during volleyball activities.[9] One of the aspects of this study is to correlate lower trapezius muscle with functional activity. Lower trapezius is one of the important muscles for scapular stability.[8] But as lower trapezius is not source of propulsive force and players have strength training for the same. So strength of muscle increases.[8] As we found higher value of strength of lower trapezius. Lower trapezius and rhomboids muscles both are responsible for retraction of scapula. If there will be weakness in this muscle players will not be able to do activities like smashing and lifting and al so they will find difficulty in daily overhead activities like hair dressing. Better muscle strength at these muscles prevent impingement to glenohumeral muscles and other muscles on acromion during movement in an external rotation.[10]

As we got good muscle strength of lower trapezius and rhomboids players do not have any difficulty while performing functional activities which includes an external rotation. Action of serratus anterior is protraction of scapula, this pushing movement is needed being lifter in this game .It is main muscle functioning in activity for pulling body over arm.[8] When players try to push something like pushing the door in his functional activities protraction movement occur at scapula.[9] Also muscle maintains congruency at glenohumeral joint. Stronger muscle strength of serratus anterior muscle maintains length tension relationship at glenohumeral region; which does not hamper activities or movements at shoulder.[10] We got good muscle strength this may be because of some sport specific adaptations. Because of this may be players are not facing any problems while performing daily activities includes DASH scale.

Repetitive nature of activity in volleyball involved some adaptations at shoulder joint in rior muscle strength was more which could also due to players height which had position them differently sitting in chair as resulting force given by player it was different. Some researches shows strength of lattissimus dorsi at dominant side more than non-dominant side. This higher value strength of lattissimus dorsi muscle may be related to higher level of contribution of arm to generate velocity acceleration phase. As lattissimus dorsi muscle strength is good then player will be able to do service action while playing volleyball. This can be related to its concentric action to place scapula in rotation during backward movements occurred in daily activities.

In previous study researchers found significant side difference in serratus anterior strength but no difference found in lower trapezius strength. According to authors stronger the strength of serratus anterior on dominant side might possibly cause muscle imbalance and increases risk of an injury but as we found good strength there is no negative impact on players functional activities.

As players perform regular stretching and strengthening exercises, do not lose muscle strength throughout.[11] As we got greater upper limb strength and lower DASH scale score which shows lesser difficulty to play volley-ball or to do work.[12]

CONCLUSION

In conclusion, we found there is no correlation between scapulothoracic muscle strength and functional activities in volleyball players.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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