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Comparison of the performance and upper limb strength of semi-professional female volleyball players with and without shoulder injury

Zeinab Mahbobi¹, Seyed Hossein Mir Karimpour², Seyed Majid Tabatabaei Nejad³

1. M.Sc., Sport Injury and Corrective Exercise, Department of Sport Sciences, University of Raja, Qazvin, Iran.

2. Assistant Professor, Sport Injury and Corrective Exercise, Department of Sport Sciences, University of Raja, Qazvin, Iran. (Corresponding Author), Email: shmirkarimpour@ut.ac.ir

3. Assistant Professor, Sport Injury and Corrective Exercise, Department of Sport Sciences, University of Raja, Qazvin, Iran.

Extended Abstract

Introduction

The shoulder joint is one of the most important joints involved in some sports such as volleyball, handball and swimming. The decrease or increase in the strength of various muscle groups is also one of the important factors in the occurrence of injury in this joint. It is a Synovial joint in the body that requires a balance between stability and movement to perform normal movements to provide a lot of freedom of movement for the upper limb. This requires the joint's various muscles to work in a coordinated and balanced manner. On the other hand, this joint is subject to repetitive trauma and small impacts in overhead sports and activities, and is at risk of strength imbalance and injury.

Volleyball is a complex sport with high technical and tactical movements, frequent speed and power movements, and a lot of pressure is placed on players during training and competition. These pressures can be a factor in causing injury, pain, and subsequent dysfunction in these athletes, and lead to changes in muscle strength ratios. The present study seeks to answer the question of whether upper limb performance and strength differ between semi-professional female volleyball players with and without shoulder injuries. The answer to this question can provide important information about joint injuries and can be used in diagnosis, prognosis, and design of care programs.

Method

The aim of this descriptive and cross-sectional study was to compare the performance and strength of upper extremity female semi-professional volleyball players with and without shoulder injury. For this purpose, 40 volleyball players participated in this study in two groups of injured (N=20, age: 25.60 ± 2.89 years, height: 1.63 ± 0.07 m, weight: 59.55 ± 4.71 kg, BMI: 22.46 ± 2.50 kg/m²), and without shoulder injury (N= 20, age: 24.50 ± 2.76 years, height: 1.61 ± 0.04 m, weight: 58.20 ± 5.17 kg, BMI: 22.36 ± 2.60 kg/m²). Demographic data and information on injury history and sports history were collected using a questionnaire. the strength of flexion, extension, abduction, adduction, internal rotation and external rotation by MMT, was evaluated. Athletes with shoulder injury were also found to have impairment in performance, which was assessed using the DASH questionnaire. A manual dynamometer [MMT, North Coast, made in the USA, measuring unit kg, validity 95% to 98%] was used to measure the isometric strength of the shoulder muscles. All muscle tests were performed using the method presented by Kendall (2005). For each strength test, the subject was asked to stand in an appropriate position and was instructed to maintain this position. The researcher applied an appropriate pressure to the dynamometer against the subject's produced force. The maximum produced force was recorded. Each test consisted of 3 5-second contractions with 30 seconds of rest between each contraction, and the mean

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of the repetitions was used for statistical analyses. Independent t-test ($P < 0.05$) and Mann-Whitney U test were used to compare the ratio of muscle strength and superiority between groups.

Results

There was a significant difference between the ratio of flexor to extensor muscles of the dominant hand in the two groups with and without injury, and healthy volleyball players had relatively better strength compared to athletes with shoulder injury of the dominant hand ($p = 0.03$). Also, there was no significant difference between the ratio of flexor to extensor muscles of the non-dominant hand in the two groups with and without injury ($p = 0.66$). There was a significant difference between the ratio of abductor to adductor muscles of the dominant hand in the two groups with and without injury, and healthy volleyball players had relatively better strength compared to athletes with shoulder injury of the dominant hand ($p = 0.03$). It was also observed that there was no significant difference between the ratio of abductor to adductor muscles of the non-dominant hand in the two groups with and without injury ($p = 0.61$). However, a significant difference was observed between the ratio of the strength of the internal rotator to the external rotator muscles of the dominant arm in the two groups with and without injury, and healthy volleyball players had a better strength ratio (closer to 1) compared to athletes with shoulder injury in the dominant arm ($p = 0.001$). In contrast, there was no significant difference between the ratio of the strength of the internal rotator to the external rotator muscles of the non-dominant arm in the two groups with and without injury ($p = 0.82$).

Discussion and Conclusion

The results showed that there was a statistically significant difference between the functional strength of the two groups of volleyball players with and without injury, and healthy athletes performed better on the questionnaire than injured individuals. The results of the present study on the relationship between injury and functional disability are consistent with the results of previous studies that examined the extent of shoulder injury and functional disability in professional volleyball players and pointed out the high percentage of functional disability and injury in this group. The results indicate the presence of injury and functional impairment in semi-professional volleyball players with injuries. Given the high volume of training and the repetitive and heavy movements that each player must perform continuously during training sessions, we can expect a high prevalence of shoulder injuries and impaired performance in injured athletes. The injury is accompanied by a protective state in the joint that leads to less force being applied during the activity to prevent further damage, which is probably why the difference in the ratio of strength in the injured hand could be due to this, and considering that the injury does not affect all the muscles around the injured part equally, a change in the ratio of muscle strength may occur as a result of this factor. Therefore, the necessary exercises to increase the strength of the muscles on the non-dominant side, rehabilitation exercises to prevent muscle weakness and muscle imbalance and, as a result, injury are necessary.

The overall results of the present study showed the effect of injury on functional impairment and muscle strength ratio in the injured hand. In this way, the ratio of flexion to extension, abduction to adduction, and internal rotation to external rotation strength in the injured dominant hand was changed compared to the dominant hand in the healthy group. It seems that prolonged presence and repetitive movements caused changes in the muscle strength imbalance of the shoulder, which are related to the occurrence of injury and changes in the movement pattern in the injured joint.

Keywords: Strength, Functional Disability, Volleyball, Injury, Shoulder.

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