

Abstract

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Title: Longitudinal screening of functional and structural changes of the shoulder joint in elite female volleyball players

Objectives: The aim of this research is to analyze the short-term development of clinical examinations of the shoulder joints and their functional performance in elite female volleyball players and to compare them with the results of the sonographic examination.

Methods: Fifteen elite volleyball players were assessed at two time points – mid-season and at the end of the season. The range of motion in the shoulder joint for internal and external rotation was measured in all players. Additionally, two functional tests were conducted: the Upper Quarter Y-Balance Test and a one-handed throw with a 1kg medicine ball. The clinical examination included objective shoulder joint testing using functional assessments and ultrasound imaging. The results from mid-season were subsequently compared to the values measured at the end of the previous season.

Results: The results of the study showed that, during the observed period, elite female volleyball players experienced several functional and structural changes in the upper limb. No changes were observed in the median values of internal rotation range of motion, either in the dominant or the non-dominant upper limb. In terms of external rotation, values remained stable in the dominant arm, with only a slight increase noted in the third quartile. In the non-dominant arm, a partial decrease in the median of external rotation was observed, which may indicate a limitation in part of the studied group. Functional assessment using the Upper Quarter Y-Balance Test revealed a statistically significant difference in the composite score for the dominant upper limb ($p = 0.024$),

while the difference in the non-dominant limb was close to the threshold of statistical significance ($p = 0.054$). The average composite score was higher during the peak of the season than at its end. The dominant arm showed higher values in both periods compared to the non-dominant arm, which may reflect differences in stabilizing function and limb involvement during testing. In the medicine ball throw test, no statistically significant difference was observed between mid-season and the end of the season ($p = 0.08$), although some athletes showed individual improvement. Therefore, the results do not indicate a clear trend of performance improvement in this test over the monitored period. However, the test helped to identify a specific factor potentially related to structural damage during short-distance throwing. Ultrasound examination revealed minor structural changes in some players, which were not accompanied by subjective complaints. Clinical examination made it possible to analyze the extent to which the functional and imaging methods correlated. Higher correlations were found in frequently injured structures typical for overhead athletes. This finding supports the importance of combining functional testing and imaging techniques in the screening of elite athletes—even in cases where the athletes do not report subjective symptoms in the examined area.

Keywords: Assessment, Overhead athlete, Performance, Shoulder joint, Sport, Volleyball