

SHOULDER KINEMATICS DURING CLINICAL GLENOHUMERAL TESTS. DIFFERENCES BETWEEN NO-PLAYERS AND WATER POLO PLAYERS

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INTRODUCTION

Water polo combines the skills of swimming and throwing. On both the shoulder movement is according a pattern that combines adduction and internal arm rotation, in an elevated arm position. This pattern cause retraction on the anterior glenohumeral structures (capsule-ligamentous and/or muscular) and is assumed to be one of the most important aetiology factor involve in water polo players shoulder injuries, as glenohumeral instability and shoulder impingement [1,2]. The identification of this anterior glenohumeral retraction is made by clinical tests that put the arm (passively or actively) on a maximal available external arm rotation or arm abduction position. The advantage of the active tests is that mostly the passive structures are stretching given that the anterior shoulder muscles are inhibit. The active test is a global arm movement that involves the glenohumeral joint and the shoulder girdle. However, diagnose is over a predisposed factor for shoulder injury on the glenohumeral joint, assuming the shoulder girdle as a stable platform. Thus, the purpose of this study was to identify the anterior glenohumeral retraction in water polo players and additionally to describe the shoulder girdle involvement during two glenohumeral active clinical tests: external rotation test and horizontal abduction test.

METHODS

The dominant shoulders of a group of five female elite water polo players (age = 20 ± 2.1) and a group of five no-players female subjects (age = 21 ± 2.3) were tested during two glenohumeral active clinical tests: external rotation test and horizontal abduction test. The subjects were asking to move slowly the arm to a maximal position (external rotation or horizontal abduction), while the arm was artificially supported in an elevated position. Each subject performs three repetitions of each test. Shoulder rotations were recorded by mean of a six-degree-of-freedom electromagnetic tracking device (Flock of Bird System) and described as Euler angles with respect to the thorax local coordinate system, according to a standardization protocol [3]. A “scapulalocator” device, similar to Pascoal et al. [4], was used for recording scapular 3D position.

Differences between both group in humeral (arm elevation, axial rotation and horizontal abduction) and scapular rotations (protraction, latero-rotation and spinal tilt) were analyzed by mean of a *t*-test approach.

All statistical analysis was performed with SPSS (version 10) and the alpha-level set as 0.05.

RESULTS AND DISCUSSION

The non-player group showed greater values of external rotation and horizontal abduction than the water polo players group. However, scapular rotations are greater in the water polo players group on both tests. All these differences are statistically significant with exception for scapular latero-rotation's angles. These results are in contradiction with those reported by other studies that showed larges active ranges of humeral lateral rotation in overhead sports players [5]. A possible explanation is that on the water polo the arm movement must be done without leg ground fixation. Thorax and scapula are not used as fixed points but as essential elements inside a kinetics chain that connects the hand to the trunk. On these conditions, humeral rotations are reduced and scapular rotations augmented. According with Ludewig & Cook [6] the excessive contribution of scapula during arm movement is a sign of shoulder impingement pathology, caused by the decreases in serratus anterior muscle activity and increases in upper trapezius muscle activity or to an imbalance of forces between the upper and lower parts of the trapezius muscle.

CONCLUSIONS

During clinical active shoulder tests, water polo players showed reduced values of external and horizontal abduction rotations, when compared with no-players subjects. Inversely, scapular protraction and spinal tilt rotations are greater in water polo players. These results seem to be related with specific shoulder demand in water polo where the throwing arm is moving again a less fixed trunk. The increased scapular rotations during maximal active arm external and horizontal abduction rotations, observed in water polo players, could be a predispose factor for some shoulder pathologies as shoulder impingement.

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