A New Manual Assessment Method for Elbow Valgus Laxity

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Introduction: Overhead-throwing athletes risk elbow ulnar collateral ligament (UCL) injury due to tremendous elbow valgus stress during the throwing motion. Repetitive stress may cause tearing of the UCL [1], and UCL insufficiency results in pain and secondary changes [2]. Therefore, physical examination of UCL insufficiency is necessary for overhead-throwing athletes. However, an asymptomatic elbow valgus laxity cannot be assessed manually by any of the current physical examination.

We developed a new manual assessment method for elbow valgus laxity. This method compares the shoulder external rotation angle with the elbow in 90° flexion (ER-flex) and the shoulder external rotation angle with the elbow in the extended position (ER-ext). Because valgus stress is imparted to the elbow while measuring the ER-flex, this angle includes glenohumeral external rotation, scapulothoracic movement, and the elbow valgus laxity angle [3]. Whereas ER-ext includes glenohumeral external rotation and scapulothoracic movement, but this angle does not include the elbow valgus laxity angle because osseous contact occurs in the elbow extended position. Therefore, we defined elbow valgus laxity as the difference between ER-flex and ER-ext.

Presently, elbow valgus laxity can be accurately assessed by ultrasonography [4]. We hypothesized that elbow valgus laxity assessed by our manual method correlates with that assessed by ultrasonography. Our study aimed to investigate the intra- and interobserver reliabilities of our method to determine whether our method is reliable and to evaluate its correlation with the ultrasonographic assessment.

Materials and Methods: The subjects were placed in the supine position with the shoulder abducted to 90° while measuring the ER-flex and ER-ext. To measure the ER-ext, we used an originally customized arm holder that can maintain the elbow extended position, forearm and wrist in a fixed position (Figure 1). The end range of external rotation was defined as the cessation of rotation or when scapula movement was appreciated; it was measured using a digital goniometer (accuracy: 0.1°).

Intra- and interobserver reliabilities of our manual elbow valgus laxity assessment: To investigate whether our method is reliable, intra- and interobserver reliabilities were investigated. The elbow valgus laxity of 5 volunteers was measured by 3 examiners. Measurements were carried out bilaterally for 3 trials with 1-week intervals. Intra- and interobserver reliabilities were evaluated using the intraclass correlation coefficient.

Correlation with the ultrasonographic assessment: Ultrasonography can accurately assess elbow valgus laxity by measuring the width of the medial joint space under gravity stress [4]. To confirm whether the difference between ER-flex and ER-ext represents elbow valgus laxity, the correlation between elbow valgus laxity assessed by our manual method and that of assessed ultrasonography was evaluated. Nineteen high-school baseball players (mean age: 16.4 years) with no complaints of shoulder or elbow pain participated in this study. Ultrasonography of the elbow was performed using a 10-MHz linear transducer. The subjects were placed supine on the table with the shoulder abducted to 90° and the elbow in 90° flexion.

The width of the medial joint space was measured under gravity stress (Figure 2). The differences in the width of the medial joint space between the throwing side and the contralateral side were calculated. Pearson’s correlation coefficient was used to determine the relationship between the elbow valgus laxity assessed by our manual method and the width of the medial joint space measured by ultrasonography.

Discussion: As expected, we could assess elbow valgus laxity by comparing ER-flex and ER-ext measured using an arm holder that can maintain the elbow in the extended position, forearm and wrist in a fixed position. Thus, elbow valgus laxity could be assessed both manually and quantitatively. Therefore, we believe that our newly developed manual assessment method for elbow valgus laxity is useful for physical examination of UCL insufficiency, particularly in asymptomatic cases.