

〈자유연제Ⅲ 09:30~10:10〉

## 어깨관절이 불안정한 야구선수에서 회전근개의 선택적 강화운동의 필요성

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### INTRODUCTION

During the late cocking phase of throwing, the humerus maintains its level of abduction and moves into the scapular plane while externally rotating from 46 to 170. In this position the humeral head is angled so that it can stretch the anterior structures. This creates the potential for anterior instability. Baseball pitchers with unstable shoulders demonstrated several significant differences from pitchers with normal shoulders during the late cocking phase. Jobe et al. (1983) reported that the player with unstable shoulder might begin with some compensatory mechanics, such as moving the humerus into the coronal plane. When the humerus moves into the coronal plane, the head of humerus angles even further anteriorly.

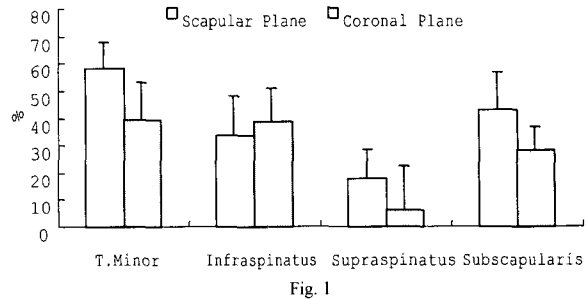
The purpose of this study was to estimate quantitatively the dynamic glenohumeral stability provided by the rotator cuff muscles, and thus to evaluate the biomechanical effect of moving the humerus into the coronal plane in the late cocking phase of throwing by a baseball pitcher with unstable shoulder.

### METHOD

Using ten fresh-frozen human cadavers, force components in the medial/lateral (compression), anterior/posterior (shear), and superior/ inferior (shear) directions generated by four rotator cuff muscles were investigated. To simulate the late cocking phase of throwing, testing was performed with the humerus (1) in the scapular plane and (2) in the 45 of extension (coronal plane), while glenohumeral joint was in 60 of abduction, 90 of external rotation. A new biomechanical parameter, the dynamic stability index (DSI), was defined to represent the combined stabilizing effects of the rotator cuff muscle force vectors and glenoid concavity. The unit of DSI is a percent magnitude of the minimal external anterior shear force that can dislocate the joint to the magnitude of contraction force of each cuff muscle. Thus the higher the DSI of a rotator cuff muscle, the greater the dynamic glenohumeral stability.

## RESULTS

DSI of the teres minor, infraspinatus, supra-spinatus, and subscapularis in the late cocking phase with the arm in the scapular plane was 58.9, 34.14, 18.10, and 43.14, respectively. DSI with the arm in the coronal plane was 40.13, 39.13, 6.16 and 28.9, respectively for each muscle (Fig.1).



The supraspinatus was the least effective stabilizer in both positions ( $p < .05$ ). Dynamic anterior stability provided by the teres minor and subscapularis decreased significantly when the arm moves from the scapular plane to the coronal plane in terms of DSI ( $p < .05$ ).

## 결론 및 제언

(1) 야구선수의 투구중 어깨관절이 가장 불안정한 위치인 Late cocking phase에서 동적어깨관절 안정성에 가장 중요한 회전근개는 어깨의 내회전, 외회전을 주도하는 견갑하 건, 극하 건, 소원형 건이었다. 또한, 어깨관절이 불안정한 야구선수에서는 투구중 팔꿈치가 과도하게 뒤로 젖혀지는 보상기전이 생기게 되는데, 본 연구에서는 이런 경우에 회전근개에 의한 동적안정성이 감소되어 더욱 어깨의 불안정이 심해지면서 어깨관절 인대의 이차적인 손상을 초래할 수 있다는 것을 알 수 있었다.

(2) 야구선수의 반복적인 투구로 인한 어깨관절의 손상을 막기 위해서는 내회전 및 외회전 근개의 선택적 강화운동이 필요하며, 어깨의 불안정성이 이미 발생한 경우는 투구중 어깨의 과도한 신전을 막기 위하여 반드시 견갑골-흉벽 운동에 작용하는 큰 근육의 강화운동을 추가해야 할 것이다.

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