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Lower Shoulder Abduction During Throwing Motion May Cause Forceful Internal Impingement and Decreased Anterior Stability

Masaki Akeda, MD, UNITED STATES
Teruhisa Mihata, MD, PhD, JAPAN
Woong Kyo Jeong, MD, KOREA, REPUBLIC OF
Michelle H. McGarry, MS, UNITED STATES
Tetsuya Yamazaki, MD, JAPAN
Thay Q. Lee, PhD, UNITED STATES

Orthopaedic Biomechanics Laboratory, VA Healthcare System, Long Beach, CA
Long Beach, California, UNITED STATES

Summary:
Decreasing the shoulder abduction significantly increased the contact pressure during internal impingement in the simulated late-cocking phase of the throwing motion. During the simulated acceleration phase of the throwing motion, anterior glenohumeral translation significantly increased as shoulder abduction decreased.

Abstract:
INTRODUCTION
Internal impingement and decreased anterior stability, which result from shoulder capsular loosening, are common shoulder pathologies in throwing athletes. Decreased glenohumeral abduction loosens the anterior band of the inferior glenohumeral ligament, which is the primary static restraint to anterior force in the glenohumeral joint during the throwing motion. The purpose of this study was to assess the effect of the shoulder abduction angle on shoulder internal impingement and anterior shoulder stability during the simulated throwing motion.

METHODS
Eight cadaveric shoulders were tested at the simulated late-cocking and acceleration phases of the throwing motion for intact and thrower's shoulder conditions. The maximal glenohumeral external rotation angle, anterior translation, location of the rotator cuff insertion with respect to the glenoid, length and site of internal impingement, and glenohumeral contact pressure were measured. All data were compared between shoulder abduction of 80°, 90°, and 100° (the sum of 50°, 60°, and 70° glenohumeral abduction and 30° upward rotation of the scapula).

RESULTS
Decreasing shoulder abduction at the simulated late-cocking phase shifted the humeral head significantly posteriorly ($P < .05$) and superiorly ($P < .05$), thus decreasing the total internal impingement area between the greater tuberosity and glenoid ($P = .04$)—particularly in regard to impingement of the supraspinatus tendon ($P < .01$)—and increasing the glenohumeral contact pressure during internal impingement ($P = .02$). In the simulated acceleration phase, anterior glenohumeral translation significantly increased as the shoulder abduction angle decreased ($P < .001$).

CONCLUSION
Decreasing the shoulder abduction significantly increased the contact pressure during internal impingement in the simulated late-cocking phase of the throwing motion. During the simulated acceleration phase of the throwing motion, anterior glenohumeral translation significantly increased as shoulder abduction decreased. Current results suggest that lower shoulder abduction during throwing motion may increase the risk of forceful internal impingement and decrease anterior stability.