Biomechanical Effect of Anterior Band of the Inferior Glenohumeral Ligament Reconstruction for Bankart Lesion in Thrower's Shoulder: A Novel Surgical Treatment to Maintain Maximum Shoulder External Rotation Angle after Surgery

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INTRODUCTION:

For anterior shoulder instability, Bankart repair is a reliable surgery to prevent shoulder dislocation. However, in biomechanical and clinical studies, maximum shoulder external rotation angle is reported to be decreased by about 10 degrees due to shortening of the anterior band of the inferior glenohumeral ligament (AIGHL) length after Bankart repair. For overhead throwing athletes, the reduction in shoulder external rotation makes it difficult to return to the previous performance level. To prevent shortening of the AIGHL length, an AIGHL reconstruction was developed using fascia lata graft. Preliminary clinical results in overhead throwing athletes showed that a throwing program could start with complete restoration of maximum shoulder external rotation angle 3 months after AIGHL reconstruction. In this study, the effects of AIGHL reconstruction on shoulder external rotation and anterior stability for simulated Bankart lesion in a cadaveric model of a thrower's shoulder was evaluated.

METHODS:

Eight cadaveric shoulders were tested at 60° of glenohumeral abduction to simulate throwing motion using a validated cadaveric model for throwers and a custom shoulder testing system. Glenohumeral translations at 60° and 90° of external rotation, maximum humeral rotational range of motion, and humeral head shift were measured. Each specimen was tested in 1) intact condition; 2) simulation of thrower's shoulder by anterior capsular stretching based on previously reported method; 3) creation of Bankart lesion (AIGHL and the labrum were detached at glenoid side); 4) Bankart repair; and 5) AIGHL reconstruction using allograft of fascia lata. To restore the original AIGHL length, allograft was patched between the detached AIGHL and glenoid at maximum shoulder external rotation position. A linear mixed-effects repeated measures ANOVA model with Tukey's post-hoc analysis was used for statistical analysis.

RESULTS:

After 20% capsular stretching to create a thrower's shoulder, the external rotation and anterior translation were significantly increased (intact: 128.3° and 2.8mm, thrower's shoulder: 141.9° and 7.3mm). Creation of Bankart lesion also significantly increased anterior translation (8.3mm) compared with intact condition. Bankart repair completely restored anterior translation (3.0mm) to intact level; however, maximum shoulder external rotation angle after Bankart repair (134.8°) was significantly less than that in thrower's shoulder. AIGHL reconstruction completely restored anterior translation (6.5mm) to thrower's shoulder without decreasing maximum shoulder external rotation angle (144.4°) compared with thrower's shoulder.

At maximum humeral external rotation, the humeral head was significantly shifted superiorly after creation of Bankart lesion compared with intact condition. After Bankart repair, the humeral head was significantly shifted inferiorly relative to the Bankart lesion and the position after AIGHL reconstruction.

DISCUSSION AND CONCLUSION:

While Bankart repair completely restored anterior translation to the intact level (tighter than thrower's shoulder) and significantly decreased maximum shoulder external rotation, AIGHL reconstruction maintained both at the thrower's level. Therefore, AIGHL reconstruction can be a useful surgical option for Bankart lesion in overhead throwing athletes to restore anterior stability while maintaining maximum shoulder external rotation angle after surgery.

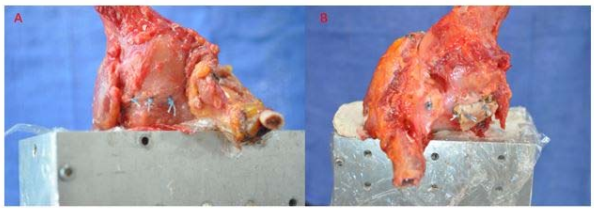

Figure 1. Photographs showing experimental conditions of (A) Bankart Repair and (B) AIGHL Reconstruction.

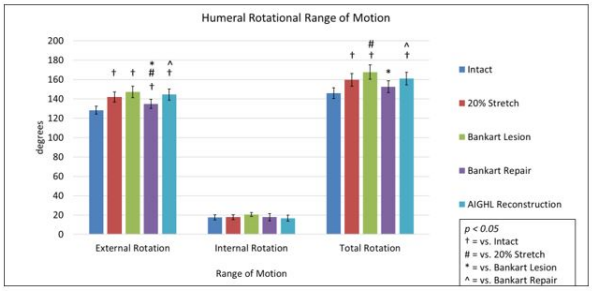

Figure 2. Glenohumeral rotational range of motion with maximum external rotation and maximum internal rotation calculated from 0° of rotation.