INTRODUCTION:
Arthroscopic treatment of anterior shoulder instability has gained popularity, and with improving techniques and instrumentation has resulted in outcomes similar to open treatment. Repair of the torn, stretched or incompetent anteroinferior capsulolabral structures has been performed with both open and arthroscopic techniques and has become the standard operative treatment for anterior shoulder instability.

The inferior glenohumeral ligament complex (IGHLC) is the primary static stabilizer of the glenohumeral joint in the abducted position. It is a thickening in the capsule with discreet anterior and posterior bands. The axillary pouch lies on the inferior aspect between the two bands. Most surgical techniques address repairing only the labrum, the anterior band of the IGHLC and the anterior aspect of the axillary pouch.

The purpose of this study was to evaluate an arthroscopic balanced repair by repairing both the anteroinferior and posteroinferior aspect of the IGHLC. Our hypothesis was that this balanced repair would prevent anterior translation, but would result in an over tightening of the shoulder. The repair’s effects on glenohumeral translation, range of motion and humeral head position as well as intraarticular pressure were evaluated.

METHODS:
Six fresh frozen cadaveric shoulders with an average age of 65.6 years were dissected down to the capsule. The shoulders were tested in a position of 60° of glenohumeral abduction in the coronal plane (20° of extension from the scapular plane), close to the ‘apprehension position’ clinically seen with anterior instability. Testing was conducted for intact specimens, after anterior capsular stretching, after anterior repair, and after balanced repair conditions.

The shoulders were placed in a six-degree of freedom custom shoulder jig after the scapula was potted (Figure 1). A compressive force of 60N was used to recreate normal glenohumeral compressive forces. Range of motion was tested and measured with a goniometer on the jig. Maximum internal and external rotation was measured with 1 Nm of torque. Translation measurements were recorded using a Microscribe 3DLEX (Immersion Corp, San Jose, CA). Translation was measured in the anterior, posterior, inferior, and superior directions with both 20N and 25N of force. A Tekscan (Tekscan Inc, South Boston, MA) pressure pad was inserted through the rotator interval and was used to record data through a full range of motion for each condition.

The shoulders were taken out of the abducted position for the arthroscopic repairs. They were placed in 45° of abduction and 20° of forward flexion. Repairs were performed using arthroscopic techniques and placing suture anchors on the glenoid rim. A 10mm suture plication was used for both the anterior and posterior repair. Arthroscopic knot tying techniques were used to fix the repair. A repeated measures analysis of variance with a Tukey post hoc test was used for statistical analysis (p < 0.05).

RESULTS:
Stretching the capsulolabral structures in external rotation significantly increased external rotation (mean increase 12.2° [9.5%]; p = 0.0002) and anterior translation (mean increase 0.87mm with 25N transitional load; p < 0.03), providing an instability model.

Following anterior plication, external rotation was restored similar to the intact condition and anterior translation decreased compared to the stretched condition (mean decrease 62% with a 20N translational load; p < 0.019 and mean decrease of 53% with a 25N translational load; p=0.005). The balanced repair also resulted in a decrease in anterior translation (mean decrease 58% with a 20N translational load; p=0.029 and 47% with a 25N translational load), but there was a significant decrease in internal rotation (decrease of 31%; p=0.023) and a decrease in total range of motion from the intact condition (mean decrease of 8%; p = 0.001). Posterior translation decreased with the addition of the posterior repair but this was not statistically significant.

The humeral head apex was shifted with both repairs. The anterior repair alone shifted the center of rotation of the humeral head posterior with greater than 90° of external rotation. This shift was significant in all measurements taken past 90° of external rotation, at maximum external rotation (p = 0.002). The balanced repair condition shifted the humeral head apex anterior with internal rotation, and was significant in all measurements taken in internal rotation. Significance at maximum internal rotation (p = 0.007)

Both repairs led to a decrease in glenohumeral contact area across the entire range of motion, which was significant in the mid range of motion, from 10° of internal rotation to 45° of external rotation. There was also a trend of increased intra-articular contact pressures in maximum external rotation with the anterior repair compared to the balanced repair (p = 0.07).

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