Restoration of Labral Anatomy and Biomechanics after SLAP Repair: Comparison of Mattress versus Simple Technique
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INTRODUCTION:
Both simple and mattress repair techniques with suture anchors have been utilized with success for Type II superior labral anterior-posterior (SLAP) lesions. However, direct comparison of these techniques with regard to restoration of normal glenohumeral anatomy and strength of repair have yet to be clearly demonstrated. The restoration of superior labral anatomy is important in maintaining proper glenohumeral stability and function to ensure successful clinical outcomes. The purpose of this study was to show which technique, mattress or simple, better restores functional anatomy and structural integrity following Type II SLAP tears. We hypothesize that, 1) mattress technique more closely restores labral height and labrum position on the glenoid face compared to simple technique, and 2) mattress technique provides improved biomechanical properties including load to failure.

METHODS:
Six-matched pair cadaveric shoulders were dissected and a clock face was created from 9 o’clock (posterior) to 3 o’clock (anterior). For the intact specimen, labral height and labral distance from the glenoid edge was measured using a Microscribe 3DLX. A SLAP lesion was then created by sharp incision of the biceps anchor at the supraglenoid tubercle and fully detaching the superior labrum from 10 o’clock to 2 o’clock. SLAP lesions were repaired with two 3.0-mm Bio-SutureTak anchors (Arthrex Inc, Naples, FL) placed at 11 o’clock and 1 o’clock, with a single #2 Fiberwire suture. For each pair, a horizontal mattress technique was used for one shoulder and a simple technique was used for the contralateral shoulder. Following repair, labral height and labral distance from glenoid edge were again measured using the Microscribe.

Biomechanical testing in tension was then performed on all specimens using an Instron machine at a rate of 20 mm/min. The biceps was loaded towards the anterolateral acromion. Clinical failure was defined as 2mm of labral displacement. Strain data were measured from a video recording of the load to failure testing using WinAnalyze software. Statistical analysis was performed with paired t-test.

RESULTS:
Labral height was significantly increased following mattress repairs compared to simple repairs at 11 o’clock (mean difference, 2.0 mm, p = 0.008) and 12:30 (mean difference, 1.3 mm, p = 0.044). Labral distance from the glenoid edge was not significantly different between mattress and simple repair techniques. However, both repair constructs effectively pulled the labrum towards the glenoid face at all clock face positions.

No difference was observed between the mattress and simple repair techniques for most biomechanical parameters. However, simple technique had higher load to clinical failure (47.7 N vs 42.5 N, p = 0.007) and energy absorbed at 2mm (50.9 Nm vs 46.6 Nm, p = 0.037). For both mattress and simple repairs, the highest labral strain was at the posterior anchor between 10:30 and 11:30. The mattress repair held the labrum more securely than the simple at the 11:30 – 12 o’clock position (+3.0 vs -2.6, p = 0.011) at 2mm displacement. Modes of failure were similar between repair techniques. For the mattress repairs, there were 3 suture and 3 tissue failures, while the simple repairs had 4 suture and 2 tissue failures.

DISCUSSION:
The mattress technique created a greater labral height while maintaining biomechanical characteristics following repair compared to simple repair. However, at 2 mm of labral displacement, the simple technique appears to provide improved biomechanics. The mattress repair technique did seem to hold the labrum more securely in the posterior area of the labrum where most of the tensile forces are seen when patients are in the abducted, externally rotated shoulder position.

Mattress repair for Type II SLAP lesions is better suited to restore the labral bumper compared to simple repairs and is comparable in regards to biomechanical characteristics. Improved labral height with mattress repair may result in improved stability to the shoulder. Further biomechanical studies are needed to determine if the improved labral height also improves glenohumeral translation. In the future, clinical studies may be performed to evaluate which technique, mattress or simple, restores maximum function in patients with Type II SLAP tears.