Quantifying the Extent of a Type II SLAP Lesion Required to Cause Peel-Back of the Glenoid Labrum—A Cadaveric Study

Aruna Seneviratne, M.D., Kenneth Montgomery, M.D., Babette Bevilacqua, P.A.C., and Bashir Zikria, M.D.

Purpose: To quantify the extent of labral disruption required to cause it to peel back when the peel-back test is performed. **Methods:** Ten cadaveric shoulders were prepared by removal of the deltoid and rotator cuff muscles. The glenohumeral joint was concentrically reduced and brought into 90° abduction and maximal external rotation. The peel-back of the labrum was graded 0, 1, or 2. The labrum was sequentially detached from the glenoid in the following order: biceps anchor only, 1 o'clock, 2 o'clock, 11 o'clock, and 3 o'clock positions. After each labral cut, the peel-back test was performed. Labral repair was performed with a single suture anchor placed at the 12:30 o'clock position; labral peel-back was reassessed. **Results:** A progressive increase was noted in peel-back grade with sequential cutting of the labrum posteriorly. However, disruption of the anchor alone did not lead to a positive peel-back sign. Disruption to the 2 o'clock position resulted in a positive peel-back sign overall in 9 of 10 shoulders (5 were grade 1, and 4 were grade 2). No increase was seen in peel-back grade with anterior extension of the labral detachment. Labral repair with a single anchor placed at the 12:30 o'clock position eliminated labral peel-back in 100% of shoulders. **Conclusions:** Detachment of the biceps anchor alone does not cause peel-back. The labrum must be disrupted to at least the 2 o'clock position before overt (grade 2) peel-back is observed. A single suture anchor placed at 12:30 o'clock eliminated peel-back of the labrum. **Clinical Relevance:** Validation of the peel-back test as an important diagnostic tool during shoulder arthroscopy. **Key Words:** SLAP lesion—Peel-back test—Labrum—Shoulder surgery—Shoulder arthroscopy.

Superior labral anterior posterior (SLAP) lesions were first classified into 4 types by Snyder et al.[1] The type II SLAP lesion, as described by Snyder, involves detachment of the biceps anchor, along with the labrum, at an anteroposterior location and is the focus of this study.

From the Department of Orthopaedic Surgery, Lenox Hill Hospital, New York, New York, U.S.A.

Address correspondence and reprint requests to Aruna Seneviratne, M.D., Department of Orthopaedic Surgery, Lenox Hill Hospital, 130 East 77th St, Black Hall, 5th Floor, New York, NY 10021, U.S.A. E-mail: asene@nycsportsdoctor.com

0749-8063/06/2211-5296$32.00/0

doi:10.1016/j.arthro.2006.06.017

NOTE: To access the supplementary tables accompanying this report, visit the November issue of *Arthroscopy* at www.arthroscopyjournal.org

SLAP lesions, at times, can be a diagnostic dilemma. A variety of clinical signs have been described, including the active compression test, the crank test, the compression rotation test, and the pain provocation test.[2] None of these tests alone has adequate sensitivity or specificity to rule in or out a type II SLAP lesion. Magnetic resonance arthrograms are the most accurate study available, with a single study demonstrating a sensitivity of 89%, a specificity of 91%, and an accuracy of 90% in detecting labral lesions.[3] Sensitivity may be poorer in lesions that are dynamically unstable (+peel-back) but are not acute injuries in which fluid separates the labrum from the glenoid.

Arthroscopy is the most accurate method of diagnosing labral lesions. Burkhart and Morgan described use of the peel-back test to aid in the arthroscopic diagnosis of type II SLAP lesions.[4] The peel-back

phenomenon occurs when the arm is abducted and externally rotated. This causes the biceps tendon force vector to shift from a horizontal to a vertical orientation, producing a torsional force at the base of the biceps, which is transmitted to the posterior labrum. If the labrum is injured, this will result in peeling back of the labrum medially over the glenoid. This is often a subtle finding, and no grading scale has been prepared for the peel-back phenomenon. Furthermore, the extent of the lesion required to cause peel-back of the labrum is unknown.

The hypothesis of this study was that disruption of the biceps anchor alone is sufficient to cause peel-back of the labrum.

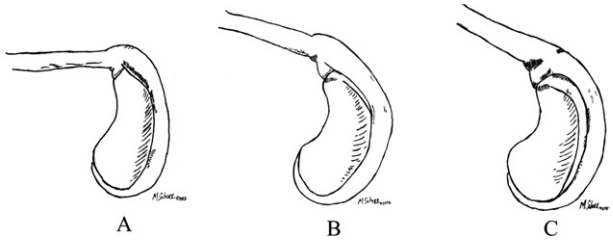

FIGURE 1. Peel-back grading scale viewed from the posterior portal. (A) Grade 0 peel-back. Note the horizontal biceps orientation and complete coverage of the supraglenoid tubercle by the labrum. (B) Grade 1 peel-back. Note the buckling of the biceps root and medialization of the superior labrum, exposing the supraglenoid tubercle. (C) Grade 2 peel-back. The labrum has peeled back medially, fully exposing the supraglenoid tubercle.

METHODS

A total of 14 human cadaveric shoulders were used in this study, of which 10 met the inclusion criteria (intact biceps tendon, no preexisting SLAP lesion, and absence of severe degenerative joint disease [DJD]). Three specimens were excluded because the biceps tendon was not intact. An additional specimen was excluded because it had a preexisting type II SLAP lesion that extended to the 3 o'clock position. None was excluded because of severe DJD. Demographic data were available for 6 of the 10 specimens. Average age was 48.3 years. Four were female and two were male. Grade 3 DJD was noted in 2 specimens.

Fresh frozen shoulder specimens were thawed at room temperature over 24 hours. These shoulders were individually mounted on a standard specimen holder, and the overlying skin was removed. The deltoid, supraspinatus, infraspinatus, and teres minor portions of the rotator cuff were removed, with care taken to avoid damaging the long head of the biceps. The cuff of tissue overlying the bicipital groove was left in place to preserve normal motion and mechanics of the long head of the biceps tendon. The capsule was left intact anteriorly and posteroinferiorly. The subscapularis tendon was left intact. The coracoacromial and coracohumeral ligaments were transected, and the lateral acromion was removed with a saw at the level of the acromioclavicular joint to allow visualization of the biceps anchor complex. In specimens with a short humerus, a Schantz pin was placed distally to mimic the forearm and to improve the mechanical advantage to facilitate movement of the glenohumeral joint.

TABLE 1. *Grading Scale of the Peel-Back Phenomenon*

Grade	Description
0	No peel-back of the labrum
1	Medialization of the biceps anchor and initiation of medial labral peel-back without rolling over of the glenoid margin
2	Overt peel-back of the labrum over the posterior superior glenoid

The glenohumeral joint was concentrically reduced manually and was brought into 90° of abduction in neutral rotation. Concentrically reducing the shoulder involved centering the humeral head on the central portion of the glenoid. This position was maintained with application of an axial manual load to the humerus. The long head of the biceps was manually loaded for application of approximately 4 lb of force.[5] The humerus was then maximally externally rotated, and the labrum was observed. The peel-back phenomenon was graded as described in Table 1 and Fig 1. The preceding motion was reproduced after each intervention as described here. The labrum was detached from the glenoid with the use of a No. 11 scalpel in the following sequence: biceps anchor only, posteriorly to the 1 o'clock position, posteriorly to the 2 o'clock position, anteriorly to the 11 o'clock position, and posteriorly to the 3 o'clock position (all glenoids were normalized to the left side). The labrum was repaired to the supraglenoid tubercle with placement of a single suture anchor (3.0 mm Bio-Suture-Tak; Arthrex, Naples, FL) at the 12:30 o'clock position. Data were recorded on an Excel worksheet (Microsoft, Redmond, WA). Statistical analysis was performed with a standard statistical package (Statistical Package for the Social Sciences; SPSS Software, Chicago, IL). The Friedman test was used to discern whether a progressive change in peel-back grade occurred with sequential disruption of the labral attach-