Technical Note

The Peel-Back Mechanism: Its Role in Producing and Extending Posterior Type II SLAP Lesions and Its Effect on SLAP Repair Rehabilitation

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Summary: A previously undescribed mechanism of injury for posterior Type II SLAP lesions is described. The primary feature of this mechanism is a torsional peel-back of the posterosuperior labrum. Secure fixation by posterior-superior placement of suture anchors into the posterosuperior corner of the glenoid is essential. The repair must be protected against torsional peel-back forces by avoiding external rotation beyond 0° for 3 weeks. **Key Words:** SLAP lesion—Labral tear—Superior instability—Shoulder pathology—Rehabilitation.

Tendons fail by being pulled from bone (tensile load) or by being peeled from bone (torsional load). Either way, disruption of the bone-tendon interface occurs. We have observed a consistent peel-back mechanism in throwers with posterior type II SLAP lesions that has important previously unrecognized treatment and postoperative rehabilitation implications.

BACKGROUND

Andrews et al.[1] first described labral injuries in throwers and postulated tensile failure at the biceps root as the mechanism of failure. Their explanation for the mechanism of injury was that the biceps actively contracted to decelerate the extending elbow in the follow-through phase of pitching, causing a sudden tensile load at the glenoid attachment of the biceps. They further hypothesized that this load could cause avulsion of the biceps-labral complex. Snyder et al.[2] could not relate the type of SLAP lesion with the mechanism of injury.

We have previously subclassified type II SLAP lesions into three types: anterior, posterior, and combined anterior and posterior.[3] (Fig 1). This classification was based on our observations in 102 patients with type II SLAP lesions. Of these patients, 64% had a posterior component to their lesions, having either the posterior or the combined anterior and posterior subtype, with a predominant pattern of posterior extension of biceps tendon fibers into the posterosuperior labrum as previously described by Huber and Putz[4] and by Vangsness et al.[5] Huber and Putz described this periarticular fiber system as a primary restraint against subluxation.

Assuming an avulsion mechanism, the patient with a posterior-dominant biceps attachment would be expected to sustain a posterior or combined anterior and posterior labral avulsion with a tensile load, and this mechanism may indeed be operative in throwers. However, the same lesion may be extended and potentially produced by a torsional force that ''peels back'' the biceps and posterior labrum as the shoulder

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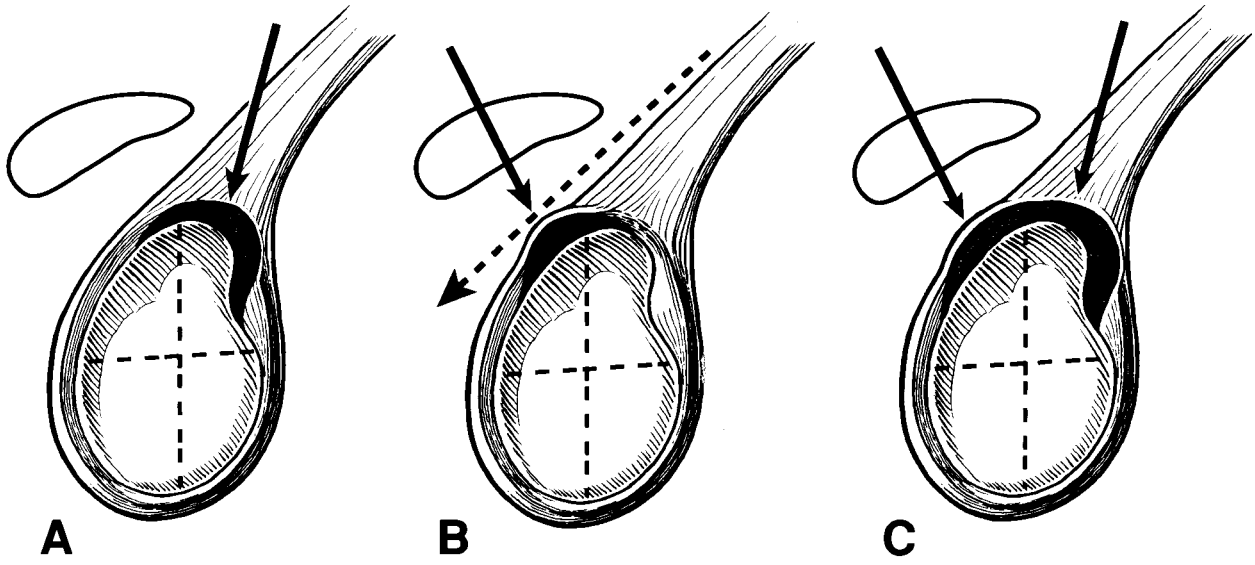

FIGURE 1. (A) Anterior type II SLAP lesion has labral avulsion in anterosuperior quadrant of glenoid. (B) Posterior type II SLAP lesion has labral avulsion in posterosuperior quadrant of glenoid. (C) Combined anterior and posterior type II SLAP lesion has labral avulsion in anterosuperior and posterosuperior quadrants of glenoid.

goes into extreme abduction and external rotation during the cocking phase of throwing. We have observed such a mechanism of injury for a posterior SLAP lesion in the baseball baserunner who slides head-first into base, sustaining a sudden forced abduction and external rotation of the shoulder. In this position, the biceps tendon force vector shifts from an anterior-horizontal direction (resting position) to a more vertical and posterior direction (abducted-externally rotated position) (Fig 2). This causes a torsional force at the base of the biceps that is transmitted to the posterior labrum. Such a torsional force tends to ''peel back'' the labrum, and can potentially cause tendon-fiber failure from bone as an acute traumatic avulsion. If such a lesion becomes initiated in a thrower, the torsional peel-back is repeated every time the arm is brought into the cocked position, causing progressive failure over time, with enlargement of the lesion.

ARTHROSCOPIC FINDINGS AND IMPLICATIONS

We have observed the peel-back phenomenon arthroscopically in throwers with posterior and combined anterior and posterior SLAP lesions. When the arm is removed from traction and brought into abduction and external rotation, the biceps tendon assumes a more vertical and posterior angle. This angle change produces a twist at the base of the biceps, which then transmits a torsional force to the posterior superior labrum, causing it to rotate medially over the corner of the glenoid. This is a consistent finding in patients with posterior SLAP lesions (Fig 3), and it is absent in normal shoulders.

There are two clinical implications of this peel-back mechanism, the first regarding surgical repair and the second regarding post-SLAP repair rehabilitation. In order to surgically repair the posterior SLAP lesion, this torsional peel-back must be neutralized. This requires at least one suture anchor stabilizing the labrum posterior to the biceps to effectively counter the torsion. Suture anchors should be placed at the corner of the glenoid at a 45° angle of insertion to most effectively restore the anatomy in a mechanically effective way (Fig 4). A separate posterolateral portal should be used for the posterior anchor, and an anterolateral portal can be used for an anterior anchor (Fig 5).

The second clinical implication applies to postoperative rehabilitation. An important part of the postoperative program in many of our shoulder arthroscopy patients, particularly those with rotator cuff repairs, is to emphasize early passive external rotation. However, in posterior SLAP lesion repair patients, we now avoid external rotation past 0° since that is where we have observed the peel-back phenomenon, even with no abduction (that is, peel-back occurs with external rotation only). Because external rotation stresses the

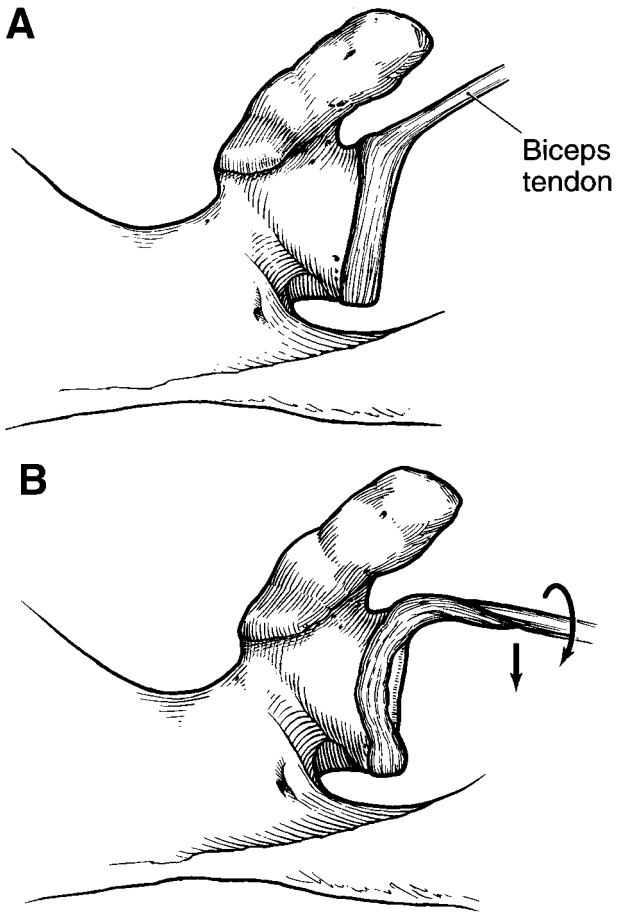

FIGURE 2. (A) Superior view of resting position of biceps-labral complex. (B) Superior view of biceps-labral complex in abducted-externally rotated position, showing peel-back mechanism as the biceps vector rotates posteriorly.

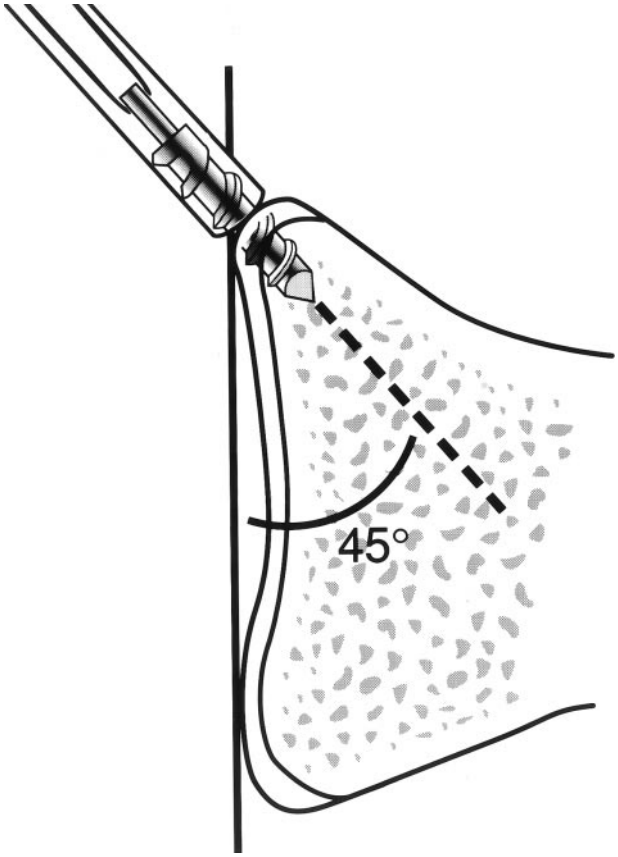

FIGURE 4. Suture anchors must be placed at the corner of the glenoid to restore the anatomy.

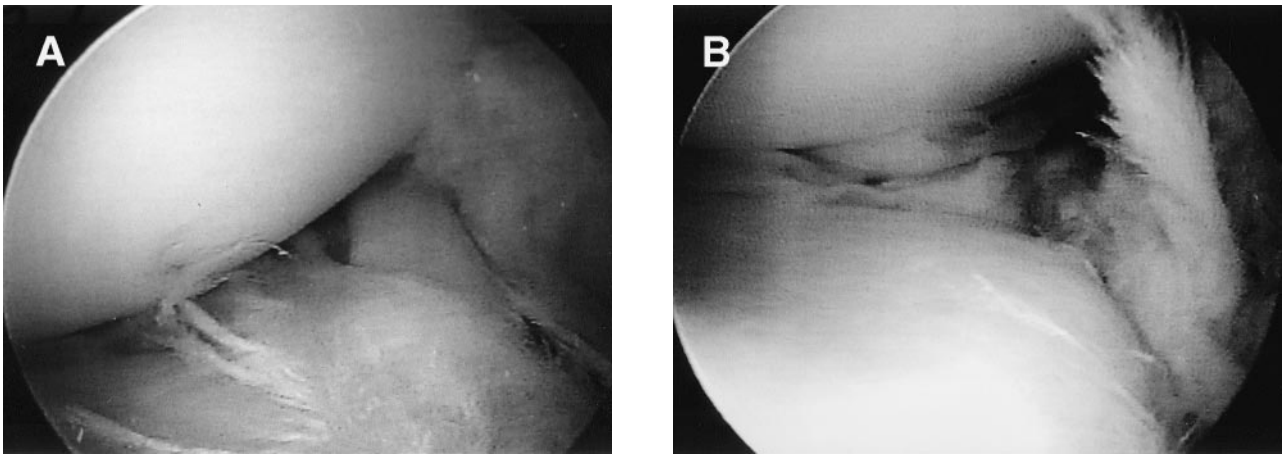

FIGURE 3. (A) In the resting position, the posterosuperior labrum covers the corner of the glenoid in this left shoulder. (B) Arthroscopic view of posterosuperior glenoid labrum, which has been peeled-back in the abducted and externally rotated position.

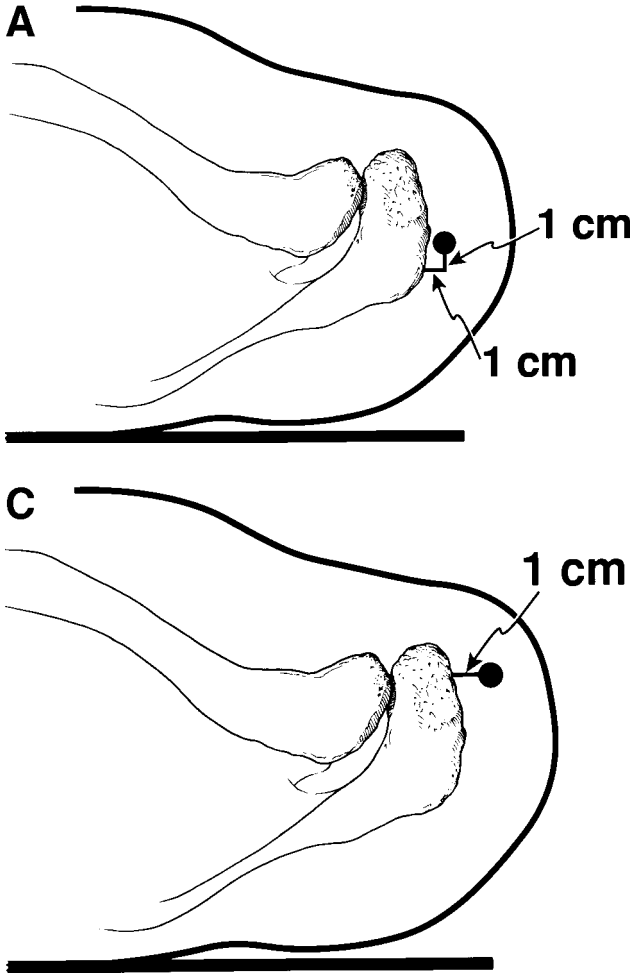

FIGURE 5. (A) Posterolateral portal (Port of Wilmington) gives proper angle of approach for posterior anchor. (B) Anchor insertion through posterolateral portal, as viewed through anterior portal. (C) Anterolateral portal for insertion of anterior anchor.

repaired posterosuperior labrum, we now wait 3 weeks before allowing external rotation beyond 0°.

CONCLUSIONS

1. The peel-back mechanism may be a cause of posterior Type II SLAP lesions.
2. To securely repair the posterior-superior labrum to resist torsional peel-back, suture anchors must be placed posterior to the biceps at the corner of the glenoid.
3. The repair must be protected against external rotation past 0° for 3 weeks to avoid undue premature torsional stresses on the repair from the peel-back mechanism.

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