Technical Note

Arthroscopic Repair of SLAP Lesions With a Bioknotless Suture Anchor

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Abstract: The diagnosis and treatment of SLAP tears have improved with the development of arthroscopic shoulder surgery techniques. With types 2 and 4 tears, the goal is to restore stability to the labrum and biceps anchor and achieve healing to the glenoid. Suture repair with anchors is currently the repair technique of choice. The purpose of this article is to report a fast and simple method for arthroscopic SLAP repair that uses knotless suture anchors and obviates complex suture management and arthroscopic knot tying. **Key Words:** SLAP—Shoulder arthroscopy—Knotless suture anchors—Superior labrum tear—Repair.

The rapid evolution of arthroscopic shoulder surgery over the past decade has given orthopaedic surgeons the ability to treat many injuries using arthroscopic techniques, with the goal of an anatomic repair. Andrews et al.[1] first described superior labrum lesions in 1985, and the acronym SLAP lesions and their classification was subsequently proposed by Snyder et al.[2] and further defined by Maffet et al.[3] Snyder et al.[2] described 4 types of lesions with increasing involvement of the biceps tendon. For types 2 and 4, the current preference is surgical repair to restore stability to the biceps anchor.

Suture repair with anchors is widely advocated.[4,5] In experienced hands, arthroscopic knots can provide secure fixation. However, a significant learning curve is associated with arthroscopic knot tying, and improper knot tying with sliding knots may be a potential cause of treatment failure and recurrent pain.

Bioabsorbable knotless suture anchors (Bioknotless Anchor; Mitek, Norwood, MA) have been reported to provide a secure, low-profile repair without the added complexities of arthroscopic knot tying.[6] Its design has been well described by Thal et al.[7] The Bioknotless suture anchor consists of a polylactic acid body with 2 prongs and with an attached, closed "anchor" loop of braided Panacryl suture (Mitek Inc, Norwood, MA).[7] A longer open "utility" suture loop (2-0 Ethibond; Ethicon, Somerville, NJ) is linked to the anchor loop and is used to pull the "anchor" loop through the injured soft tissue. One strand of the "anchor" loop is captured under the anchor and driven into the bone, pulling in soft tissue with it. Advantages of the Bioknotless anchor include a lower implant profile, increased suture strength (2 limbs) compared with simple sutures, and the potential for improved healing because the tissue is pulled into the drill hole rather than on top of the suture anchor. Benefits of the new technique also include secure, reliable fixation, no need for bulky, difficult knots, and a more efficient surgery.

A multitude of arthroscopic repair techniques have been described with associated portal placements, suture passage devices, and fixation equipment. O'Brien

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et al.[8] have recently reported good results using a lateral transrotator cuff portal for standard suture anchor repair of SLAP lesions. This article describes our preferred technique for the repair of unstable SLAP lesions with a Bioknotless suture anchor using an accessory transrotator cuff lateral portal.

SURGICAL TECHNIQUE

Anesthesia and Patient Positioning

Our preferred anesthetic is a long-acting regional interscalene nerve block. This provides intraoperative and postoperative analgesia, minimizes postoperative pain, and allows for fast-track recovery. A careful examination under anesthesia is performed to record passive range of motion and joint translation.

Although superior labrum repair can be performed in the lateral decubitus position, we prefer the standard beach-chair position. This allows easy access to the shoulder and facilitates the need for an open repair if any associated intra-articular lesions are found. We use a special surgical chair with a padded headrest to ensure adequate exposure of the posterior and lateral borders of the shoulder joint. Keeping the medial border of the scapula exposed and without interference from drapes is important. We have also had good experience using a similar set-up, as described by Randall et al.,[9] with a long beanbag on a standard surgical chair. A pneumatic arm holder is used to facilitate intraoperative positioning of the extremity.

Intraoperative Diagnostic Examination

Bony landmarks are identified and marked, including the coracoid process, clavicle, acromioclavicular joint, acromion, and scapular spine. The patient is placed with the arm in slight traction and 50° of forward flexion and neutral rotation.

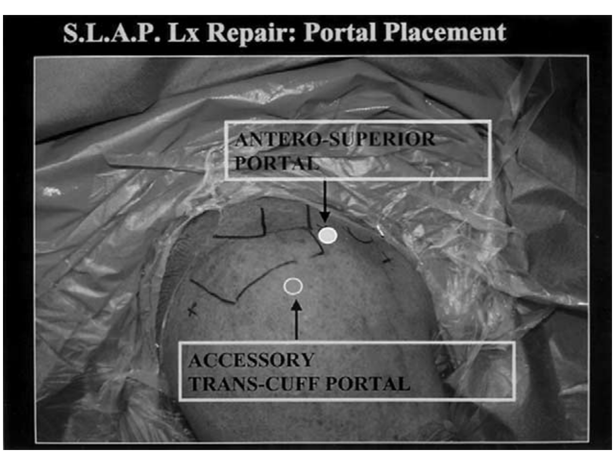

FIGURE 1. Portal locations: A posterior camera portal, anterior superior portal, and lateral transcuff working portal are established.

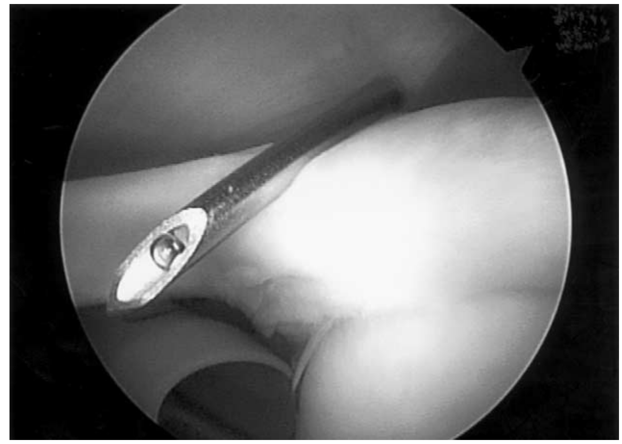

FIGURE 2. Outside-in technique to establish optimal angle for transcuff portal.

The skin is infiltrated with 0.25% marcaine with epinephrine solution at the portal sites. The posterior portal is located 2 cm inferior and 1 cm medial to the posterolateral tip of the acromion (Fig 1). Saline solution is injected through the soft spot into the glenohumeral joint with careful attention to evaluate for back flow to prevent inadvertent infiltration of the capsular tissues. A 30° arthroscope is placed into the glenohumeral joint through the posterior portal to view the glenohumeral joint. An anterior portal is made via the "outside-in" approach with a spinal needle directed anterolateral to the acromioclavicular joint through the rotator interval and inferior to the biceps tendon. A smooth, 5.5 × 70 mm cannula (Linvatec, Largo, FL) is inserted through this portal.

A complete, systematic arthroscopic examination of the glenohumeral joint is performed. Shoulder laxity is assessed with the arthroscopic anterior drawer test and drive-through sign. The quality of the capsular tissue and the degree of synovitis are also assessed. A probe is used to evaluate the stability of the labrum and biceps anchor. Recognition of the normal anatomic variants of the anterior labrum (sublabral foramen, Buford complex, or sulcus) is critical to prevent stiffness after unnecessary repair. Examining the undersurface of the labral attachment is crucial. Signs of injury included excessive laxity, fraying, partial detachment, tearing of insertional fibers, or elevation greater than 5 mm. The "normal" amount of laxity in the superior labrum is unknown and probably is extremely variable. Identification of labrum stability

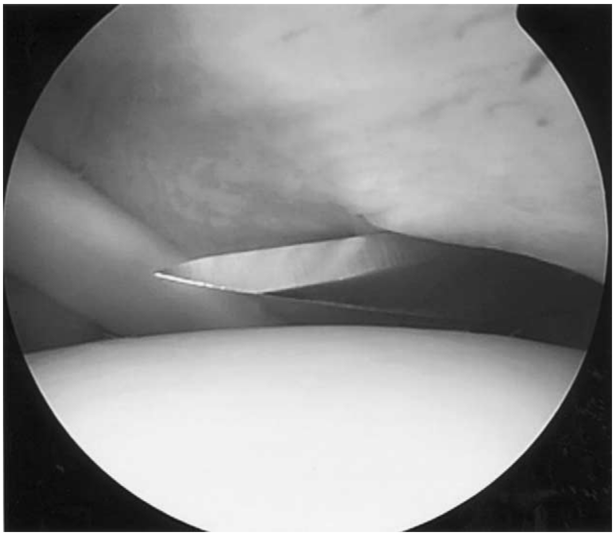

FIGURE 3. A No. 11 scalpel blade is placed longitudinally in line with rotator cuff fibers.

both anterior and posterior to the biceps anchor is important for proper accessory portal placement.

Lesion Preparation

After identification and classification of the lesion, a shaver is introduced through the anterior portal. Types 1 and 3 are debrided. Types 2 and 4 are repaired. Frayed labral tissue is removed in all cases, and for those that are repairable, the superior rim of the glenoid is debrided free of soft tissue exposing a bony surface. At this point, an accessory lateral transrotator cuff portal is created 1 to 2 cm lateral to the acromion.

Portal Placement

The arm is placed in maximal adduction to permit the postal to be established through the muscular portion of the rotator cuff. The optimum angle for the portal is determined with a spinal needle. This is of critical importance. For posterior tears, passage of the spinal needle through the supraspinatus or infraspinatus is needed (Fig 2). The drill for the anchor should be directed approximately 45° to the glenoid rim. A No. 11 scalpel blade is passed in line with the muscular fibers of the rotator cuff, while visualized through the arthroscope from the posterior (Fig 3). An entry portal measuring 5 mm is established. The arm may be abducted for easier visualization of the rotator cuff tendon. Staying as medial as possible, near the musculotendinous junction, is important. A switching

FIGURE 4. The straight spectrum is passed through the transcuff portal under the torn labrum.

stick is used to enlarge the entry and a 5.5 $\times$ 70 mm smooth cannula (Linvatec) is inserted over the rod.

Repair

A single 2.9-mm drill hole is made at the articular margin of the superior glenoid rim. Marking the location of the drill hole with radiofrequency cautery can

FIGURE 5. The knotless suture anchor is impacted over one strand of the suture loop into the hole.

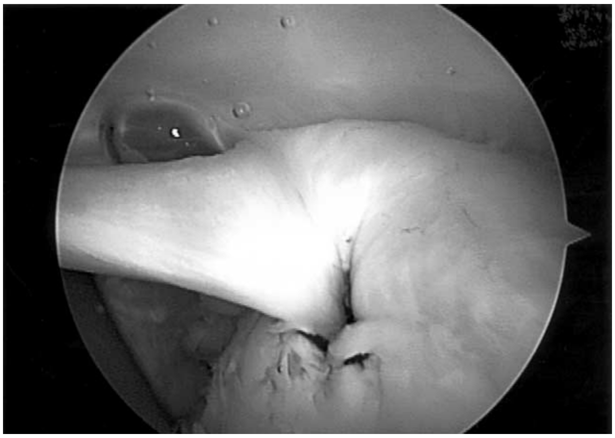

FIGURE 6. Repaired superior labrum with knotless suture anchor in place.

make it easier to find the drill hole when it comes time to place the anchor. A Spectrum suture passer device (Linvatec) is passed through the lateral portal to deliver a shuttle relay around the superior labrum (Fig 4). The device is passed from superior to inferior and towards the glenoid. The shuttle relay is retrieved through the anterior portal. The Spectrum device is removed, and the utility loop suture ends of the Bioknotless anchor are loaded into the shuttle relay (outside of the lateral portal) and pulled from the lateral portal through labral tissue and out through the anterior portal.

FIGURE 7. A pitfall is suture passer breakage. This fluroscan image shows a broken tip in the shoulder joint.

FIGURE 8. Suture passer breakage: recovery of the broken tip from the glenohumeral joint.

Alternatively, a larger threaded 8.0-mm cannula can be placed anteriorly through the rotator interval and a curved suture passer (Sutre Lasso; Arthrex, Naples, FL) can be introduced through the anterior portal from under to over the labrum adjacent to the predrilled hole. The labrum is elevated off of the superior glenoid, and the attached wire loop is passed over the glenoid rim and around the labrum. The suture loop is fed into the glenohumeral joint and the loop is retrieved through the lateral portal with a suture retriever or crochet hook. The suture ends from the knotless suture anchor are placed through the wire loop and pulled out the anterior portal.

Anchor Passage

Tension is maintained across the suture ends as the anchor is passed through the joint from the lateral portal. After the utility loop is pulled through the labral tissue, one strand of the loop is captured under the anchor prongs, and the anchor is driven into the previously marked drill hole until the loop is completely buried in bone (Fig 5). The repair is probed to assess stability and the need for additional anchors (Fig 6).

DISCUSSION

Although the use of knotless suture anchors can simplify the technique for arthroscopic SLAP repair and lead to shorter surgical times, the risk for failure still exists. The potential pitfalls are primarily technique related. They include:

1. Damage or transection of the labrum or biceps as the tear is debrided or the suture passer is used
2. Slippage of the drill tip off the glenoid rim or incorrect angle placement leading to inadvertent drilling of the articular surface (this can be prevented by using a spinal needle to assess optimal approach angle before portal placement as well as using a drill guide or tapping on the drill handle before drilling the anchor hole)
3. Injury to the rotator cuff if the scalpel blade is not in line with its fibers or too laterally placed
4. Incorrect angle for shuttle relay passage, leading to bending or breakage of the shuttle passer tip (Figs 7 and 8)
5. Twisting of the suture loop during anchor insertion, leading to suture abrasion and improper fixation
6. Impacting both limbs (instead of one suture limb) of the suture loop into the drilled hole, leading to improper fixation
7. Overimpacting the knotless anchor into bone, which will cause failure of the tissue through the suture loop

A description of a technique for performing an arthroscopic superior labrum repair using an absorbable knotless suture anchor is presented. This procedure minimizes the need for complex suture management and arthroscopic knot tying. It is easily reproducible and appears to allow for a safe and stable repair. Further investigation regarding patient outcomes and efficacy of the procedure is currently being performed.

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