

Percutaneous Techniques for Shoulder Labral Repair

Matthew A. Kippe, MD, Duong Nguyen, MD, and Christopher S. Ahmad, MD

Arthroscopic techniques for labral repair and shoulder instability are fast becoming the standard of care. Arthroscopy has improved visualization of articular damage, allows access to multiple quadrants of the shoulder, provides the ability to create an anatomic repair, and avoids some of the complications associated with the open surgical approach. The current common technique for arthroscopic labral repair involves use of multiple working portals. Creation of these multiple portals can add to the surgical morbidity of the rotator cuff and rotator interval, which is desirable to avoid in the overhead athlete. A percutaneous technique was developed to further enhance management of all pathology with more precise anchor placement, maneuvering of suture passing instruments, and less rotator cuff and capsule morbidity.

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Arthroscopic labral repair and instability surgery has become increasingly popular as improved arthroscopic techniques have evolved. Clinical results reported in the literature now rival traditional open approaches to shoulder instability.¹⁻⁸ Initial poor results of arthroscopic instability surgery have been attributed to inadequate techniques to correct all necessary pathologic components of glenohumeral instability, including both labral tears and capsular laxity.⁹⁻¹³ Better understanding and recognition of these pathologic elements combined with improved surgical technique, including the use of multiple working portals, better anchor and suture passing instrumentation, more accurate anchor placement, and more precise capsulorrhaphy, have improved arthroscopic results.^{1-8,14-17} Additionally, arthroscopy provides increased diagnostic capacity, allowing the identification of concurrent conditions such as superior labrum anterior posterior (SLAP) tears and posterior labral lesions. Finally and perhaps most importantly in the athlete, arthroscopic repair results in significantly less morbidity to the subscapularis tendon, which requires release and repair in traditional open instability repairs and is a potential source of failed surgery.¹⁸

The current common technique for arthroscopic labral repair involves use of multiple working portals. Creation of these multiple portals can be challenging to establish and

maintain during the surgery; can add to the surgical morbidity of the rotator interval (anterior superior portal), subscapularis (anterior 5 o'clock portal), infraspinatus (accessory posterior portal), and supraspinatus (Wilmington portal); and may place limits on pathology that can be addressed. A percutaneous technique was developed to further enhance management of all pathology with more precise anchor placement, maneuvering of suture passing instruments, and less rotator cuff and capsule morbidity.

Indications

Patients with symptomatic anterior instability, posterior instability, or SLAP lesions (and patients who often have combined labral lesions) refractory to nonoperative management are considered for arthroscopic labral repair and capsulorrhaphy as necessary. Additionally, we advocate instability repair for high-risk first-time dislocators who are unable to complete their season. These patients include those younger than 19 years of age, contact and collision sports athletes, and athletes with overhead positioning such as basketball players. Surgical success rates of initial dislocators is now proven beneficial when compared with nonoperative treatment.¹⁸⁻²⁰

Surgical Technique

Positioning

Examination under anesthesia is performed after induction of either regional or general anesthesia in the supine position. The degree of anterior, posterior, and inferior instability is

Center for Shoulder, Elbow, and Sports Medicine, Department of Orthopaedic Surgery, Columbia-Presbyterian Medical Center, New York, NY.

Address reprint requests to Christopher S. Ahmad, MD, Department of Orthopaedic Surgery, Columbia-Presbyterian Hospital 622 168th St., 622 West 168 Street, PH11-Center, New York, NY 10032. E-mail: Csa4@columbia.edu

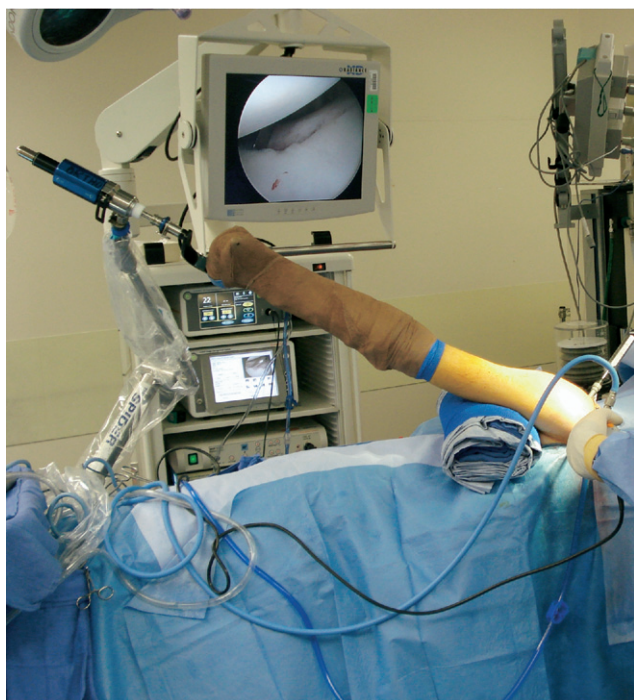


Figure 1 Patient is in the lateral decubitus position. The right upper extremity is being suspended by a hydraulic limb positioner applying approximately 10 pounds of traction. (Color version of figure is available online.)

assessed. Although labral repairs may be performed in either the beach chair or the lateral decubitus position, we prefer the lateral decubitus position with traction to improve superior visualization as well as improved access to the posterior labrum (Fig. 1). The patient is positioned in approximately 20° of reverse trendelenberg and tilted slightly posteriorly to bring the glenoid parallel to the floor. Typically, 10 lbs of traction is applied to the arm with a modular joint distractor or a hydraulic positioner, careful not to overdistract to prevent brachial plexus injury.

Diagnostic Arthroscopy

A posterior viewing portal is created 2 cm inferior to the posterior lateral edge of the acromion and is slightly more lateral than the standard portal to have the portal “above” the glenoid to facilitate better access to the posterior labral pathology. Diagnostic arthroscopy is performed, and attention is paid to anterior and superior labral injuries as well as articular-sided rotator cuff tears. A spinal needle is introduced anteriorly and used to probe the superior labrum as well as the anterior labrum before committing to the location of the anterior portal. Proper portal placement is critical, especially when addressing multiple areas of detached labrum. A 6-mm cannulae is introduced over a switching stick, and a probe is then used to test the stability of the biceps anchor and labrum attachments to the superior and anterior glenoid (Fig. 2A and B). The arthroscope is then switched to the anterior portal to better assess the posterior labrum, evaluate the anterior glenoid for bony deficiency, and identify anterior labral periosteal sleeve avulsion lesions (Fig. 3). In the case of posterior labral detachment or the need for a

posterior capsulorrhaphy in cases of posterior instability and multidirectional instability, all posterior work is performed when viewing from the anterior portal. In the event of encountering a shoulder with multiple labral pathologies, all labral tissue is mobilized and all glenoid surfaces are prepared for healing by abrading the bone. The sequence of repair is then (1) placement of posterior suture anchors and suture passing; (2) placement of anterior suture anchors, anterior suture passing, anterior knot tying; (3) posterior knot tying; and (4) SLAP lesion anchor placement, suture passing, and knot tying.

Percutaneous Labral Repair

After confirming the presence of a labral tear, an elevator device is used to fully mobilize the labrum from the glenoid neck. A motorized shaver is then used from either the anterior or posterior portal to prepare the glenoid depending on the location and extent of the tear. Typically anterior labral work is performed from viewing posterior and using the anterior working portal for glenoid preparation and for posterior work viewing from anterior and using the posterior portal for posterior glenoid preparation (Fig. 4). After the soft tissues have been sufficiently mobilized and the bone

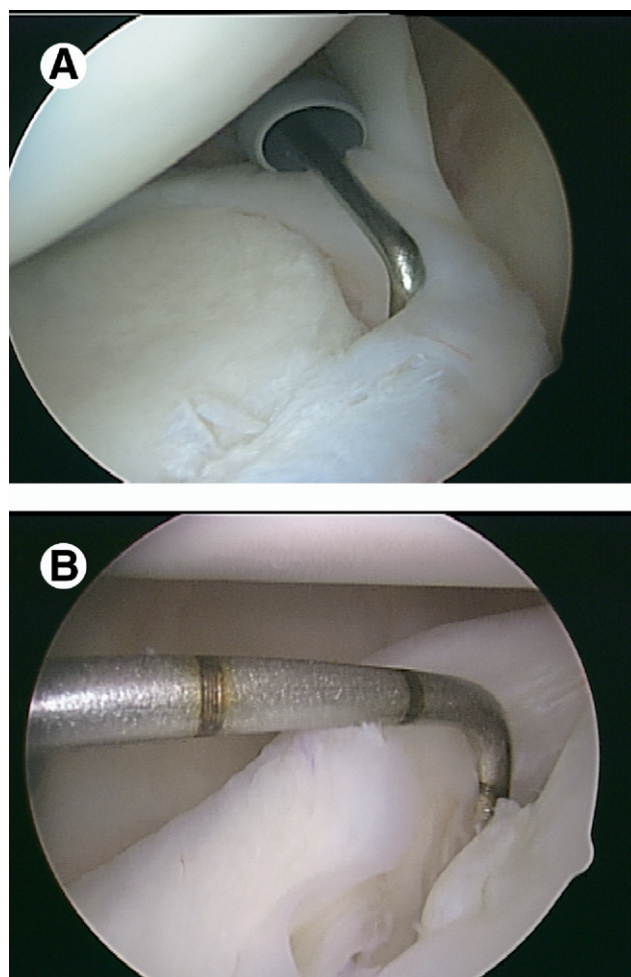


Figure 2 Arthroscopic probe is introduced through the anterior cannulae to assess the (A) superior and (B) anterior labrum. (Color version of figure is available online.)

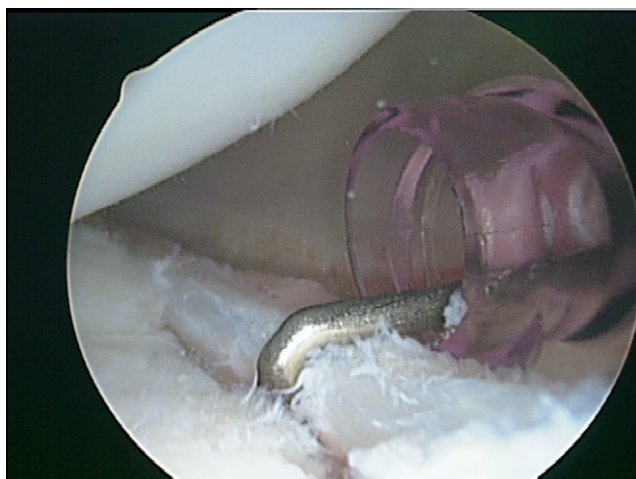


Figure 3 The posterior labrum is assessed with a probe through the posterior portal while viewing from the anterior portal. (Color version of figure is available online.)

abraded to enhance healing, a spinal needle is introduced anterior and inferiorly at approximately the 5-o'clock position for placement of the first suture anchor in the case of an anterior instability repair. The portal is typically 4 cm inferior to the superior portal (Fig. 5). The spinal needle is used to identify the exact angle for proper tissue preparation and anchor placement. Once the appropriate location and angle of the percutaneous portal has been confirmed, a small 2- to 3-mm stab incision is made at the portal location. The 3-mm guide for the anchor placement (Arthrex, Naples, FL) is then introduced with a blunt obturator percutaneously through the incision in the same orientation as the spinal needle, penetrating the subscapularis tendon and capsule at the previously identified spinal needle location (Figs. 6A and 6B). The anchor is then placed on the glenoid face and the sutures are visualized from the entrance of the capsule (Fig. 7). The suture to be passed through the labrum is retrieved out the anterior cannulae (Fig. 8). We prefer suture shuttling devices such as 90° or curved corkscrew suture lasso (Arthrex, Naples, FL), because

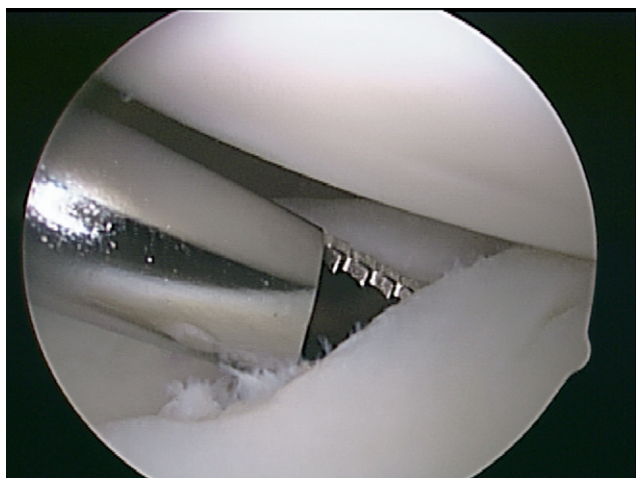


Figure 4 Debridement of the anterior glenoid neck. (Color version of figure is available online.)



Figure 5 Anterior and inferior portal localized with a spinal needle at the 5-o'clock position. (Color version of figure is available online.)

they are small in diameter and less traumatic to the injured labrum. The suture passing device is introduced through the same percutaneous incision, with the surgeon being careful to enter the joint through the same capsular rent as created prior by the anchor drill guide (Fig. 9A and B).

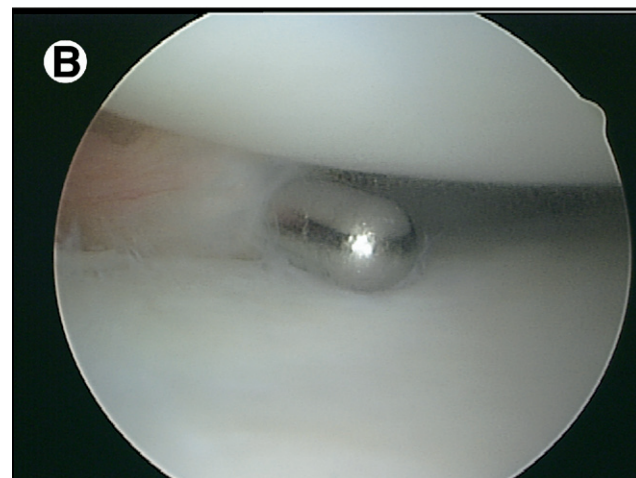


Figure 6 Percutaneous and trans-subscapularis drill guide placement. (Color version of figure is available online.)

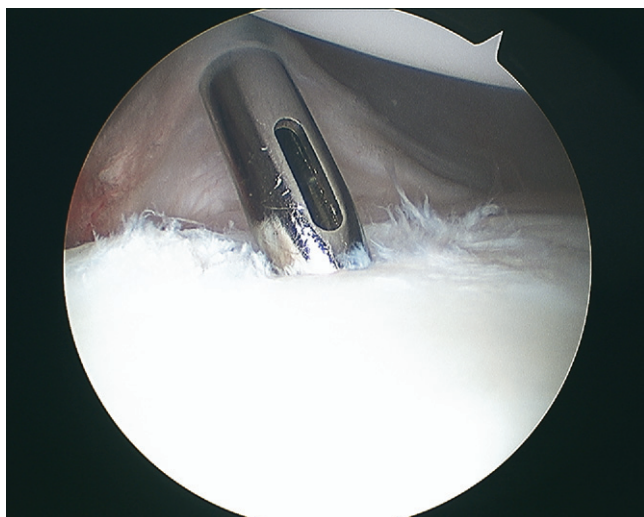


Figure 7 Anchor placed on the glenoid face at the 5-o'clock position. (Color version of figure is available online.)

The device is then passed through the capsulolabral complex inferior to the anchor to create a superior shift, and the suture shuttle is retrieved out the anterior portal (Fig. 10). Outside the cannulae, the suture is then passed through the shuttle loop, and the suture passer with shuttle is withdrawn through the labrum out the percutaneous portal, creating a simple suture through the labrum (Fig. 11A and B). The anterior cannulae is then placed over the anchor, and the sutures are retrieved (Fig. 12A). Arthroscopic knot tying is performed, and a probe is then used to assess the repair (Fig. 12B). The process is repeated for additional anchors using the same percutaneous incision; however, a more superior capsular penetration may be required to optimize anchor placement and suture passage (Fig. 13). When the labral repair continues superiorly and comes in close proximity to the anterior cannulae, a suture penetrator such as the angled bird beak (Arthrex, Naples, FL) can be used directly through the anterior portal in a one-step fashion for anterior–superior labral

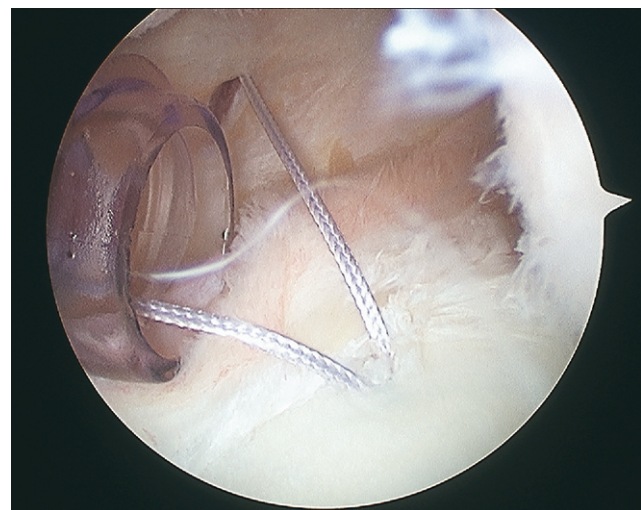


Figure 8 Anchor placed with suture exiting small rent in capsule. (Color version of figure is available online.)

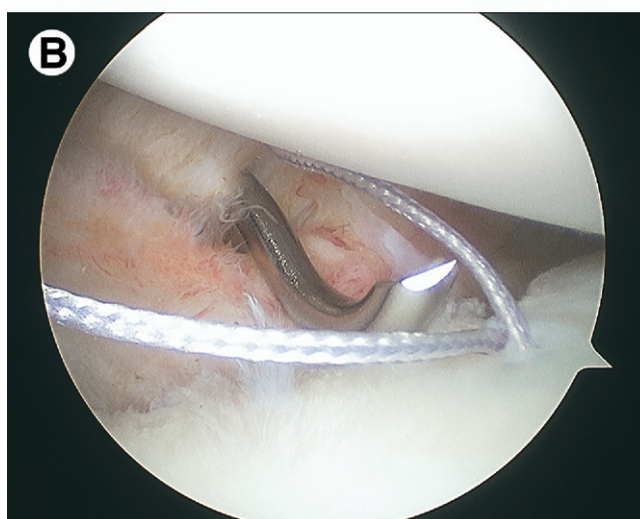


Figure 9 Percutaneous introduction of suture passer through prior incision. (Color version of figure is available online.)

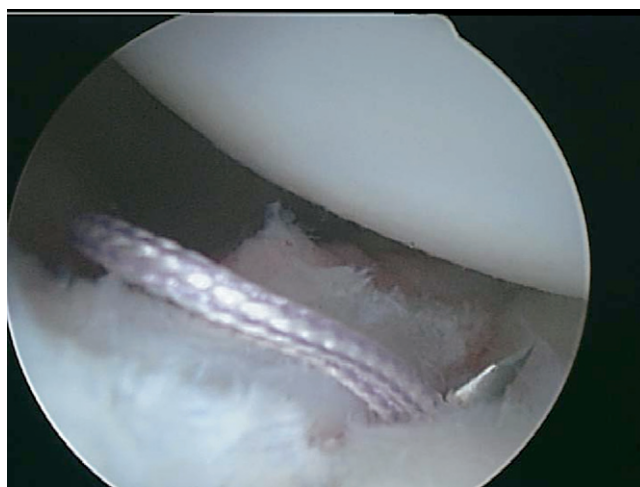


Figure 10 Suture passer placed through the labrum inferior to the anchor. (Color version of figure is available online.)

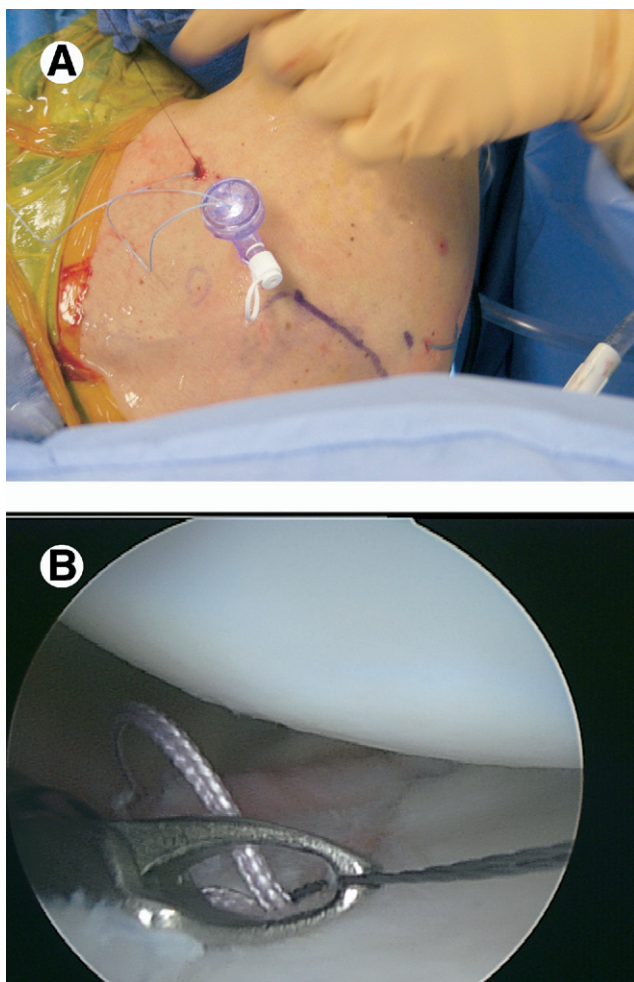


Figure 11 Suture shuttled through the labrum for simple suture configuration. (Color version of figure is available online.)

repair. The anchor is placed through the anterior portal, and one limb of the suture is retrieved after penetrating the labrum with the bird beak. Knot tying can be completed through the same anterior portal. Anchors should be placed 3 to 4 mm apart until the labrum is secured. The typical anterior instability repair requires a minimum of 3 anterior anchors (Fig. 14).

Posterior Labral Repair

Often patients with anterior–inferior traumatic instability have posterior and inferior capsular laxity or frank labral detachment that needs to be addressed in addition to the anterior labral injury. The labral tissue is mobilized and the glenoid is prepared as previously described. If a capsulorrhaphy tissue imbrication is being performed, a rasp is used to abrade the capsule to enhance healing. A percutaneous posterior and inferior portal is created, typically 4 cm inferior to the posterolateral corner of the acromion (Fig. 15). Penetration of the posterior inferior capsule is performed similarly to the percutaneous anterior labral repair (Fig. 16A and B). The anterior portal is used as the viewing portal, and the standard posterior portal is used for suture shuttling and arthroscopic knot tying. If tissue imbrication is being performed, the suture passing device is passed through the tissue 1 cm away from the labrum and then

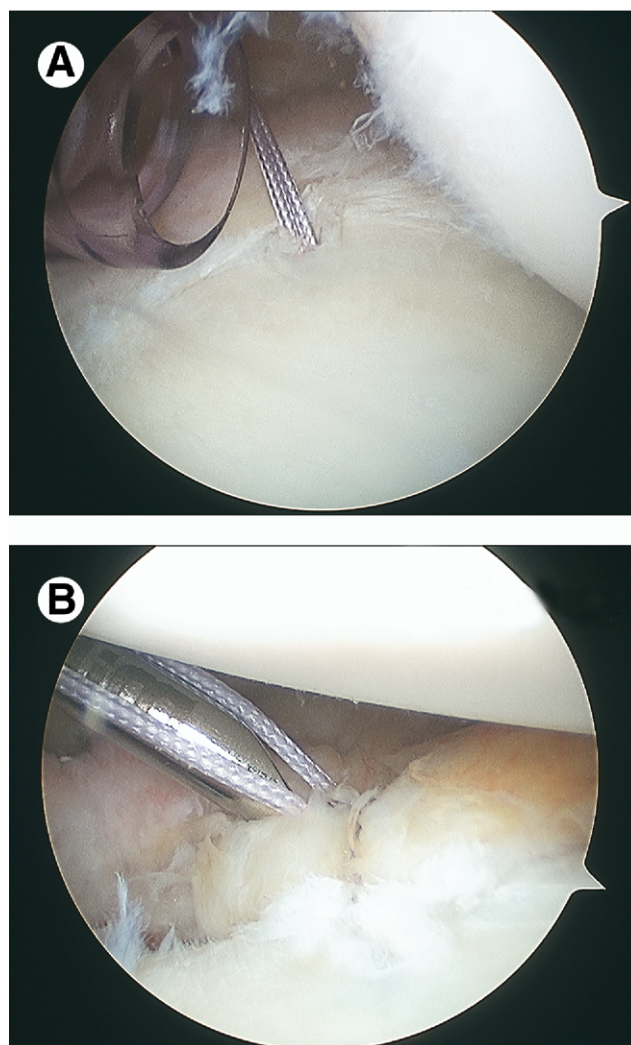


Figure 12 (A) Anterior cannulae positioned for suture retrieval. (B) Arthroscopic knot tying. (Color version of figure is available online.)

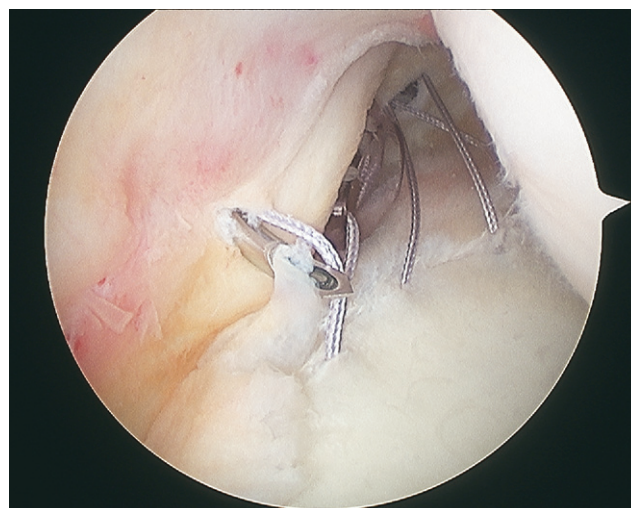


Figure 13 Suture passer placed through same percutaneous incision with more superior capsular penetration for labral repair. (Color version of figure is available online.)

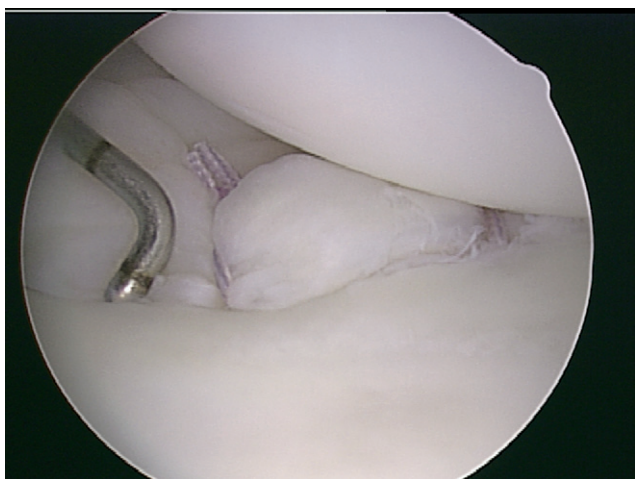


Figure 14 Completed anterior labral repair.

through the labrum. A Fiberstick (Arthrex, Naples, FL) is a stiff braided suture designed to pass through the suture passing device and avoids an extra step when a suture shuttle is used. Care is taken to avoid deep penetration of the capsule to avoid injury to the axillary nerve. Anchors and sutures are passed as necessary and

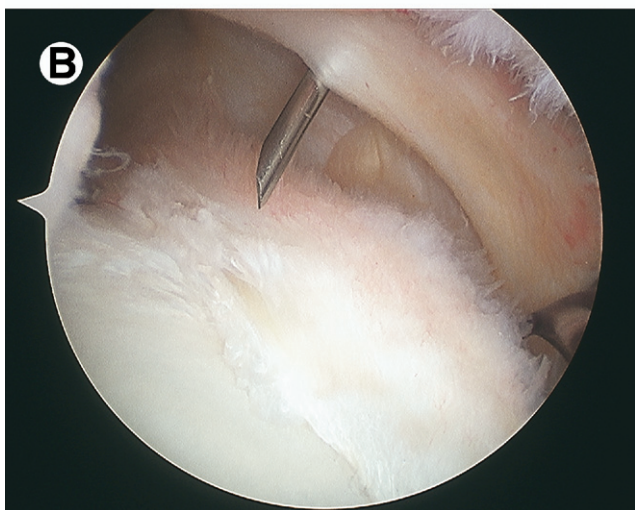


Figure 15 Posterior and inferior portal localized with spinal needle at the "7" o'clock position.

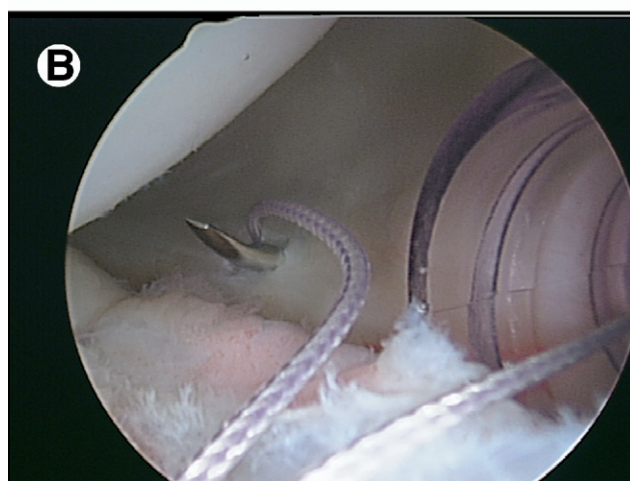


Figure 16 Percutaneous and transtendinous introduction of suture passer through the posterior inferior labrum while viewing from the anterior portal.

knot tying is avoided at this point to avoid closing down the jump until after the anterior labral repair is completed.

SLAP Repair

SLAP lesions that occur as part of internal impingement often coexist with partial articular-sided supraspinatus tears. In these patients especially, percutaneous techniques that minimize morbidity to the supraspinatus is desired. The same steps for percutaneous anchor placement are used as previously describe for the anterior labrum. The standard Wilmington portal located adjacent to the lateral acromion at its posterior one third is assessed with a spinal needle (Fig. 17 A and B). When an angle to the glenoid posterior to the biceps is achieved, an anchor is placed percutaneously (Fig. 18). The suture to be passed through the labrum is retrieved out the anterior cannulae. A 90° lasso is passed through the labrum percutaneously and transtendinously (Fig. 19A and B). Both sutures are then retrieved out the anterior cannulae with the cannulae placed posterior to the biceps to facilitate knot tying (Fig. 20A–C). In meniscoid type labrums, a suture may be placed in a horizontal fashion to achieve a more anatomic repair.

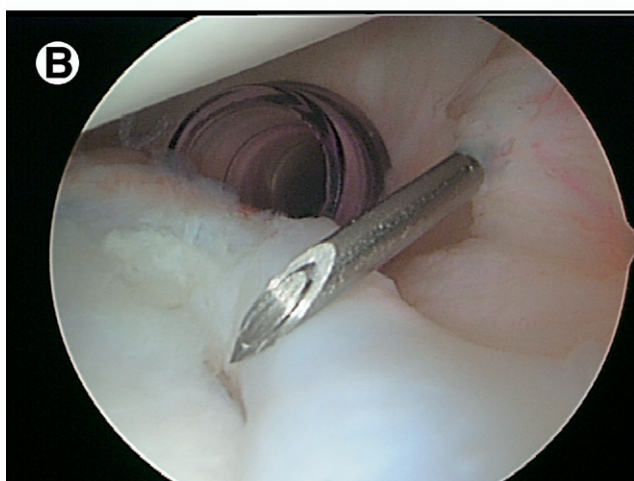
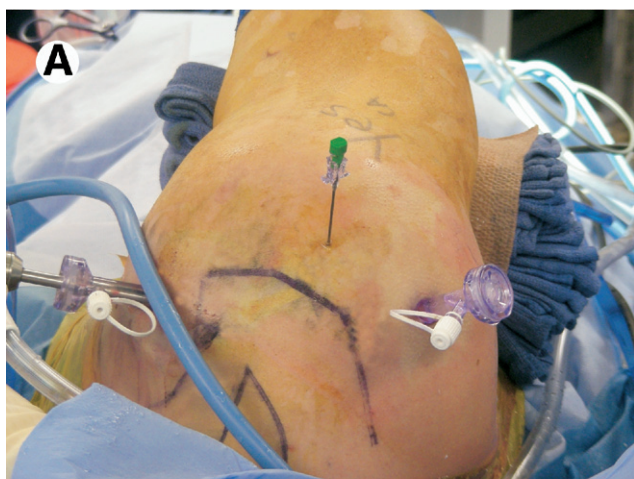


Figure 17 Standard Wilmington portal located adjacent to the lateral acromion at its posterior one third assessed with a spinal needle. (Color version of figure is available online.)

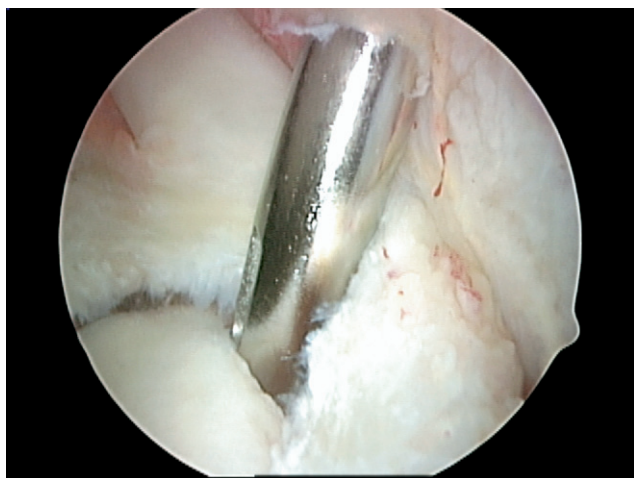


Figure 18 Percutaneous and trans-supraspinatus drill guide placement. (Color version of figure is available online.)

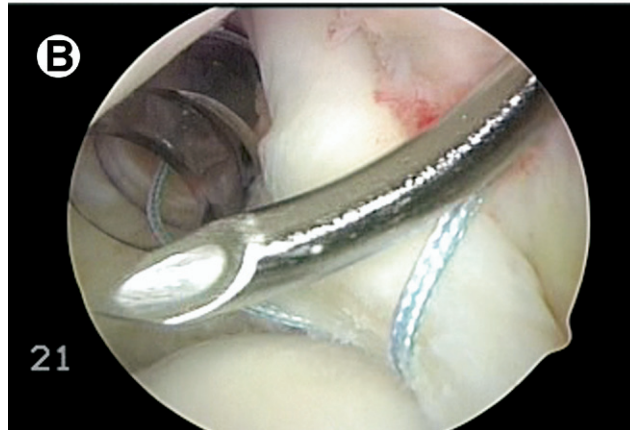


Figure 19 Percutaneous and transtendinous introduction of suture passer through the superior and posterior labrum. (Color version of figure is available online.)

Rehabilitation

Postoperatively, the shoulder is protected in a sling in slight external rotation for 6 weeks. The patient is encouraged to perform elbow, wrist, and hand exercises immediately after surgery. At 4 to 6 weeks, gentle passive and active assisted range of motion exercises are started and, in most cases, advanced to full active range of motion by 8 to 10 weeks. Progressive strengthening exercises are typically started at 10 to 12 weeks and continued until normal strength and full range of motion is achieved. A sports specific training program can be instituted at 12 to 16 weeks and return to sports possible at 6 months.

Summary

Use of a percutaneous technique for labral repair allows for exact instrument placement, which enhances the ease of tissue preparation and anchor placement. The curved shape of the glenoid can make anchor placement challenging, especially along the inferior aspect of the glenoid. Suture anchors can be placed errantly if soft tissue adjacent to bone, resulting in migration and joint damage. Additionally, percutaneous transtendinous portals mini-

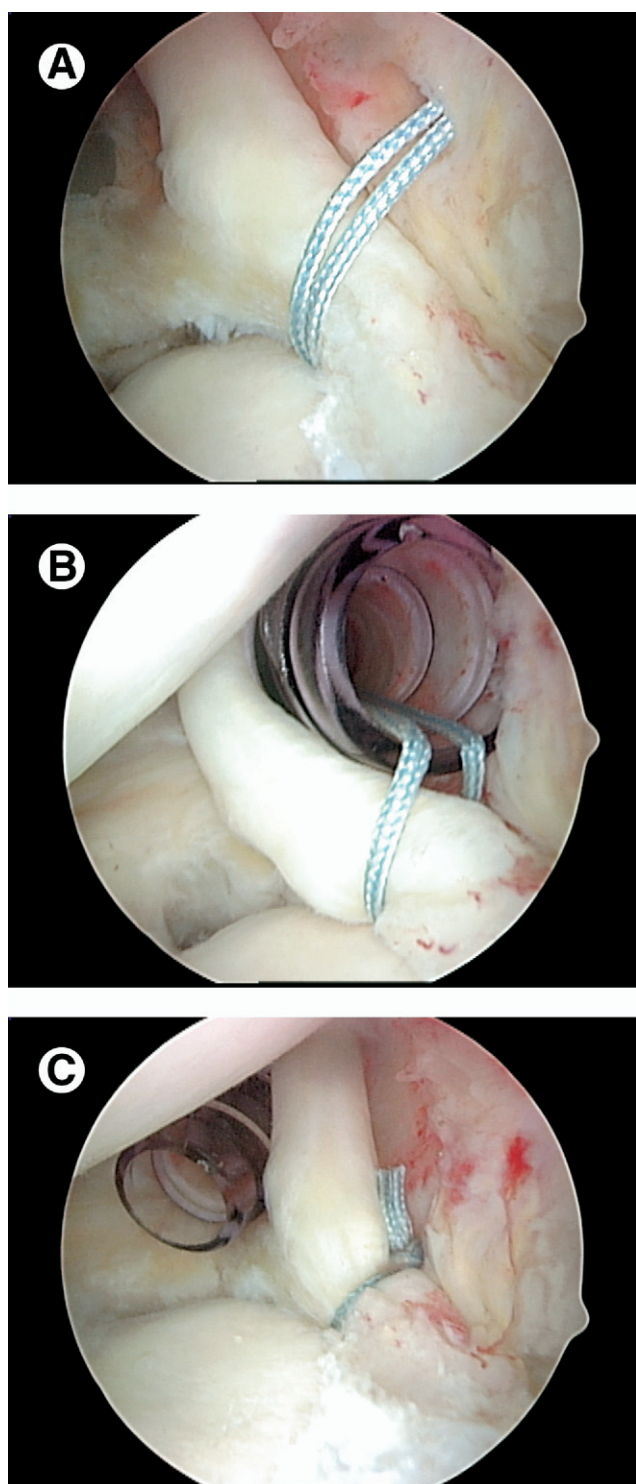


Figure 20 (A) Sutures exiting the percutaneous portal to be retrieved from the anterior cannulae. (B) Anterior cannulae positioned posterior to the biceps tendon to facilitate arthroscopic knot tying. (C) Completed posterior-superior labral repair. (Color version of figure is available online.)

minimize the morbidity to the rotator cuff in labral repairs. This is desirable for those athletes with anterior instability to decrease morbidity to the subscapularis and overhead athletes with SLAP lesions to decrease morbidity of the supraspinatus tendon. Finally, when performing capsulor-

raphy, it is also desirable to limit the capsular injury that occurs from utilizing cannulae for multiple portals.

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