Combined Intra-articular and Extra-articular Visualization for Repair of a Complete Subscapularis Tear: The “Blended View” Technique

John P. Bell, M.D., and Larry D. Field, M.D.

Abstract: Repair of subscapularis tendon tears can be a challenging task, even for an experienced arthroscopist. The complexity results not only from the difficulty in identifying these tears accurately but also because establishing orientation for visualization and repair of this often distorted anatomy can be difficult. Even after a subscapularis tear is identified and mobilized, restoration of the footprint can prove demanding due to the limited view of the subscapularis tendon’s lesser tuberosity insertion site, especially from the traditional posterior portal. Such visualization limitations often necessitate switching back and forth between 30° and 70° arthroscopes. A “blended view” technique is used routinely because it offers optimal visualization and access to the subscapularis tendon and the lesser tuberosity during full-thickness subscapularis repair.

Subscapularis tendon pathology can be difficult to manage. This is of clinical significance because the subscapularis is the largest and most powerful rotator cuff muscle, and anatomic restoration of subscapularis tears is critical to restoring shoulder function.1 Recent data have suggested that magnetic resonance imaging fails to recognize smaller subscapularis tears more than 50% of the time.2,3 The gold standard for diagnosing these tears remains direct visualization using an arthroscope. Thought to be present in as many as 30% of all arthroscopic shoulder procedures, subscapularis tears must be recognized by means of subtle signs of subscapularis disruption, and the repair techniques used must address this pathology adequately because of its importance in maximizing patients’ outcomes.4 Likewise, failure to recognize subscapularis tears may increase the likelihood of suboptimal outcomes for patients.5

Once subscapularis pathology and adjacent normal anatomy are identified, it can still prove formidable for the surgeon to mobilize the tendon and reapproximate it to the native footprint on the lesser tuberosity. Visualization is paramount to obtaining an ideal anatomic repair. This task can be quite arduous if viewing from the posterior intra-articular portal. A 70° arthroscope is often used by surgeons employing this viewing perspective in an effort to achieve adequate visualization of the tear and lesser tuberosity. However, even after switching cameras, the inferior portion of the subscapularis footprint may be difficult to visualize adequately. We propose an alternative technique for achieving optimal visualization by combining the advantages of an intra-articular view with the advantages of an extra-articular subacromial viewing perspective. This “blended view” allows the surgeon to identify the subscapularis tear reliably, to mobilize the tendon thoroughly and to visualize and access the entire lesser tuberosity consistently. We believe this technique provides the surgeon superior visualization compared with intra-articular viewing for addressing this challenging pathology.

Surgical Technique

The patient is positioned in the beach-chair position (the preferred position of the senior author [LDF] for repair of rotator cuff tears), but these techniques can be
applied in the lateral decubitus position as well. The operative shoulder is prepared and draped in the usual sterile fashion. Before the anatomy and proposed portal-site locations are marked, the patient is carefully evaluated for passive range of motion and gleno-humeral joint stability. A standard posterior portal is established using manual lateral distraction of the gleno-humeral joint to create maximum space for trocar insertion and to minimize the risk of iatrogenic articular cartilage damage. Once this portal has been established, a spinal needle is used for localization of an anterior portal, which is then established through the rotator interval using a 5 mm trocar and cannula (Smith & Nephew, Andover, MA). In cases of large, retracted subscapularis tears, the anterior shoulder anatomy is commonly distorted. Identification of the comma tissue is a highly useful landmark for establishing subscapular anatomy prior to establishing an anterior working portal (Fig 1). This comma tissue usually retracts medially with the subscapularis tendon, and the rotator interval tissue retracts medially as well. Anatomically, this dictates that because the anterior working portal should be established within the rotator interval, this cannula should be directed more medially so that it penetrates the rotator interval capsule. Once the anterior portal is established within the interval, the anterior cannula can then be used to aid in reduction of these tissues by physically translating the cannula in a

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**Fig 1.** For this right shoulder of a patient in the beach-chair position, the comma tissue landmark (indicated by arrow) is shown from the standard posterior viewing portal.

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**Fig 2.** For this right shoulder of a patient in the beach-chair position, the cannula, indicated by the arrow, is used to lateralize the comma tissue and subsequently demonstrate reduction of the subscapularis tendon.

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**Fig 3.** For this right shoulder of a patient in the beach-chair position, rotator interval resection using an arthroscopic shaver is shown. This allows for visualization and mobilization of the tendon.

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**Fig 4.** For this right shoulder of a patient in the beach-chair position, the medially subluxated biceps tendon is removed from the field of view via tenotomy.
lateral direction, which will, thus, also lateralize the rotator interval, comma tissue and subscapularis tendon (Fig 2). A thorough diagnostic assessment is then performed using a 30° arthroscope, viewing through both the posterior and the anterior portals.

Following the diagnostic arthroscopy, resection of the central rotator interval capsule is performed with an arthroscopic shaver (Dyonics Powermax; Smith & Nephew) to allow for visualization and exposure of the anterior, extra-articular surface of the subscapularis and to facilitate tendon mobilization (Fig 3). In addition, resection of the rotator interval capsule greatly aids in subsequently identifying the superior border of the subscapularis once the arthroscope has been transferred to the subacromial space (because the rotator interval capsule otherwise obscures the superior border of the subscapularis tendon). At this point, if the biceps tendon is medially subluxated, a tenotomy is performed, and it is removed from the field of view (Fig 4). If biceps tenodesis is to be carried out after subscapularis repair is completed, the surgeon may consider tagging the biceps tendon with a suture prior to tenotomy. A supplementary anterolateral portal is then established, and continued arthroscopic debridement and mobilization of the subscapularis is performed through this accessory portal. Adjunctive coracoplasty can be carried out as well by using this accessory portal if the coracoid process is deemed too prominent (Fig 5).

The arthroscope is then transferred to this accessory anterolateral portal for visualization during the repair stage of the procedure. Sometimes, depending on the view of the subscapularis tendon and lesser tuberosity obtained via this accessory anterolateral portal, an additional accessory anterolateral portal may be created to optimize visualization. This additional accessory portal site, if deemed to be desirable, is created after localization by using a spinal needle. This subacromial viewing perspective allows the surgeon not only to see the subscapularis along the length of its tendon, it also improves visualization if additional mobilization of the subscapularis is necessary. The lesser tuberosity is also easily and completely visualized with slight external rotation of the humerus via this subacromial viewing perspective (Fig 6) and provides the surgeon with an excellent perspective for facilitating reattachment of the tendon to its native footprint. In the case highlighted, a double-row repair technique is used (Fig 7) (Video 1). Occasionally, small upper-border subscapularis tears may not be as easily visualized through a subacromial portal compared to an intra-articular viewing perspective; this is a minor limitation of this technique.

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**Fig 5.** For this right shoulder of a patient in the beach-chair position, a coracoplasty is performed through an accessory anterolateral portal. This accessory portal provides optimal trajectory for coracoid prominence resection.

**Fig 6.** For this right shoulder of a patient in the beach-chair position, the subscapularis and its native footprint are seen through a subacromial viewing portal. This viewing perspective provides a superior bird’s-eye view for the surgeon to perform an accurate reduction and repair of the subscapularis.

**Fig 7.** For this right shoulder of a patient in the beach-chair position, the completed subscapularis repair, via double row fixation, is shown through a subacromial portal.
Discussion

Subscapularis tendon tears can be difficult for the arthroscopic surgeon to repair. As minimally invasive surgeons, we should continually contemplate how to treat our patients more effectively and expeditiously. Often, we are beholden to the traditional working and viewing portals that have become the clinical norm. It can, however, often prove beneficial to consider the feasibility and potential advantages of alternative approaches when faced with nonideal, arthroscopically constrained situations. Difficulties encountered during arthroscopic visualization of anatomic structures are, ironically, common, and arthroscopic access to the subscapularis tendon is no exception. The subscapularis tendon insertion is difficult for the surgeon to visualize through a traditional posterior viewing portal, especially with a standard 30° arthroscope. Switching to a 70° arthroscope adds time and cost to the surgical case. Additionally, due to lack of familiarity, it can be difficult for the surgeon to adjust his or her spatial awareness when viewing through such a steep, angled lens. Alternatively, the surgeon may view from the accessory anterolateral portal while using the standard anterior rotator interval portal for suture passage and tying. This accessory portal is distant from and perpendicular to the standard anterior portal, maximizing the separation of these portals and, thus, minimizing challenges that competing portals in close proximity can create from the perspective of hand and instrument traffic. We propose that a subacromial portal with a 30° arthroscope affords the surgeon superior visualization of the subscapularis footprint on the lesser tuberosity. Also, this technique obviates the need for a 70° arthroscope. Table 1 outlines the advantages and disadvantages we have experienced when using the described blended view technique.

References

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Table 1. Advantages and Disadvantages of the Blended View Technique of Visualization During Subscapularis Repair

| Advantages of the Blended View Technique | Disadvantages of the Blended View Technique |
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| Elimination of the need to use an additional 70° arthroscope reduces the time and cost of a surgical case. When using the 70° arthroscope, it can be difficult for the surgeon to adjust his or her spatial awareness when viewing through such a steep, angled lens due to lack of familiarity. The proposed technique eliminates this potential issue. A subacromial portal with a 30° arthroscope affords the surgeon superior visualization of the subscapularis footprint on the lesser tuberosity. | An additional portal site may be required. Small upper-border subscapularis tears may not be as easily visualized through a subacromial portal compared to an intra-articular viewing perspective. |