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Arthroscopic Bursectomy and Superomedial Angle Resection for the Treatment of Scapulothoracic Bursitis and Snapping Scapula Syndrome

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Introduction

The shoulder complex is composed of 4 complementary articulations assembled in a manner that allows maximal range of motion across the glenohumeral joint. Dynamic, coordinated contraction of surrounding musculature is necessary to adequately position the glenoid in 3-dimensional space, which maximizes the area of contact between the glenoid and the humeral head. More specifically, glenoid positioning is determined by the position of the scapular body, which is controlled by the synchronous action of the periscapular musculature. When glenohumeral motion is initiated, the scapula must tilt, rotate, protract, and/or retract to compensate for the position of the humeral head. To achieve these motions, the concave scapular body must glide smoothly over the convex posterior thorax with the aid of strategically placed muscular tissue and interposed bursae. Therefore, anatomic derangements within the scapulothoracic space can produce disordered glenohumeral kinematics, leading to painful bursitis with or without mechanical crepitus. These conditions are often collectively referred to as *snapping scapula syndrome* and/or *scapulothoracic bursitis*.

The wide range of possible symptoms associated with these conditions can be classified according to the most likely etiology. For example, scapulothoracic incongruence as a result of space-occupying skeletal or soft-tissue lesions, kyphoscoliotic posture,[1] or predisposing anatomic variation, such as hyperangulation of the superomedial scapular angle or the presence of a so-called *Luschka tubercle*,[2-4] are more likely to generate symptoms related to mechanical crepitation. In contrast, patients who complain of pain in the absence of mechanical symptoms are more likely to have symptomatic bursitis, often as a result of chronic overuse. However, although this basic classification can be helpful, it is important to recognize that symptomatic bursitis can lead to mechanical crepitation (via bursal fibrosis[5-8]), while mechanical crepitation can lead to symptomatic bursitis (via disordered scapular motion).[9]

Although the etiology is often unknown in the clinical setting, symptoms related to scapulothoracic bursitis and/or crepitus are most often associated with adventitial (pathologic) infraserratus or supraserratus bursal tissue located deep to the superomedial angle of the scapula.

Ryu RKN, Angelo RL, Abrams JS, eds. *The Shoulder: AANA Advanced Arthroscopic Surgical Techniques* (pp 275-282).

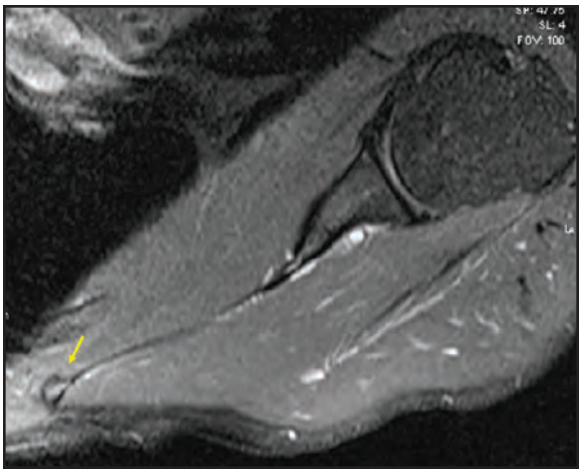

Figure 23-1. This axial magnetic resonance imaging slice demonstrates a prominent superomedial angle (yellow arrow) in a patient with recalcitrant scapulothoracic bursitis and mechanical crepitus.

Arthroscopic excision of pathologic bursal tissue and bony resection of the superomedial scapular angle have each been found to provide significant improvements in pain and function in the majority of patients.[10-13] The purpose of this chapter and corresponding video is to demonstrate a reliable technique for arthroscopic scapulothoracic bursectomy with additional bony resection of the superomedial scapular angle.

Indications

- Symptoms persist despite 3 to 6 months of appropriate nonoperative treatment.
- Diagnostic imaging reveals a clinically relevant prominence or anterior hyperangulation of the superomedial angle (Figure 23-1).
- Mechanical crepitus are persistent during intraoperative dynamic examination despite removal of pathologic bursal tissue.

Controversial Indications

- Diagnostic or therapeutic injection results in symptomatic relief[14-16]
- Symptoms related to kyphoscoliosis

Pertinent Physical Findings

- Scapular dyskinesis
- Scapular malposition, inferomedial border prominence, anterior coracoid pain, scapular dyskinesis scapula; glenohumeral internal rotation deficit; posterosuperior glenoid impingement; and SLAP tears in overhead athletes[17,18]
- Scapular winging (neuromuscular etiology) or pseudowinging (mechanical etiology, such as the presence of a mass within the scapulothoracic space)
- Localized tenderness on superficial and/or deep palpation
- Periscapular muscle weakness or imbalance

Pertinent Imaging

- Plain radiographs
  - Anteroposterior
  - Tangential Y
  - Axillary
- Computed tomography (CT)
  - Indicated when a relevant skeletal lesion is apparent on plain radiographs
- Magnetic resonance imaging
  - Identification of soft-tissue structures within the scapulothoracic space that may contribute to symptoms
  - Evaluation of potentially predisposing anatomy
- Ultrasound
  - Mostly used to guide diagnostic or therapeutic injections
- Electromyograms
  - Used to evaluate patients with unexplained periscapular muscle weakness or winging

Equipment

- Fully equipped arthroscopic tower
- Basic arthroscopic instrumentation
  - Arthroscopic shaver
  - Radiofrequency ablator
  - Arthroscopic burr
  - Arthroscopic rasp
- 4-mm 30- and 70-degree arthroscopes
- Basic surgical set in the event of conversion to an open procedure

Positioning and Portals

After the induction of general anesthesia, the patient is placed prone on the operating table (see video). The operative extremity and posterior thorax are widely prepared and draped using a sterile technique. The humerus is then extended and internally rotated such that the dorsum of the forearm is positioned over the lumbar spine (Figure 23-2). This so-called *chicken wing position* induces a physiologic posterior scapular tilt, which enlarges the operative field and aids in arthroscopic visualization. "Bayonet apposition" of the scapular body can also increase this potential space by applying a medially directed force over the humeral head.[10]

The medial scapular border is palpated and a sterile marking pen is used to outline its most medial margin. Typically, 2 arthroscopic portals are established inferior to the level of the scapular spine and at least 3 cm medial to the medial scapular border to prevent injury to underlying neurovascular structures (Figure 23-3). In addition, medial portal positioning mitigates the risk for intrathoracic penetration, which can occur when arthroscopic instruments are inserted into the scapulothoracic space at an acute angle.[19] An accessory superior portal may also be helpful when

Figure 23-2. This preoperative photograph demonstrates the "chicken wing" position in which the dorsum of the forearm is placed over the lumbar spine. This position subjects the humerus to nearly maximal internal rotation, which forces the scapula to tilt posteriorly, thus increasing the available operating space between the anterior scapula and the posterior chest wall. When additional space is needed for visualization during the procedure, application of a medially directed pressure on the proximal humerus may help increase the volume of the scapulothoracic space via "bayonet apposition."

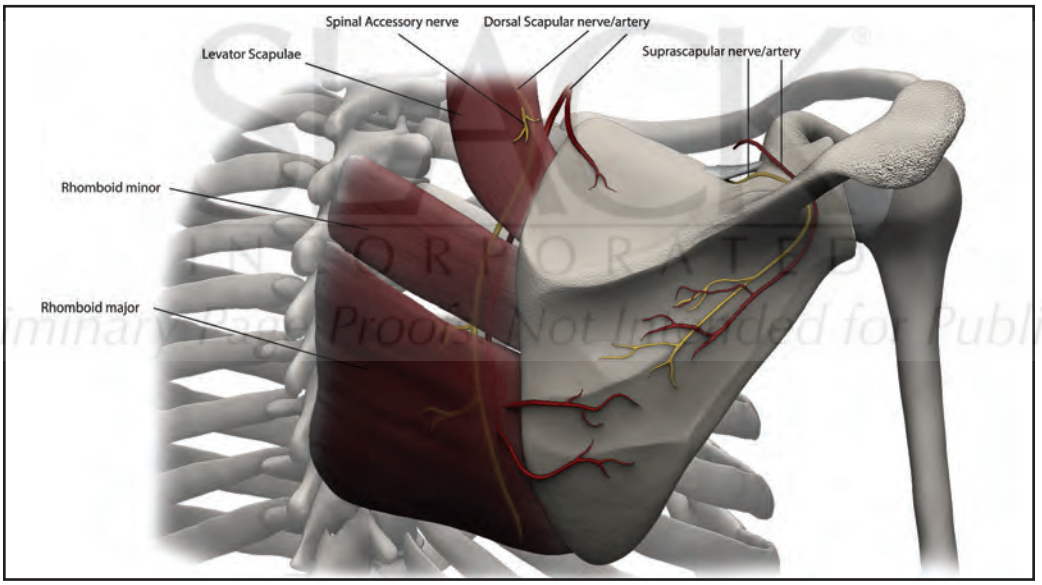

Figure 23-3. Illustration depicting the important neurovascular anatomy relevant to scapulothoracic bursectomy and superomedial angle resection. Arthroscopic portals should be established at least 3 cm medial to the medial scapular border to avoid iatrogenic injury to the dorsal scapular nerve and artery, which run together beneath the rhomboid major, rhomboid minor, and levator scapulae muscles. In addition, risk of injury to the spinal accessory nerve can be minimized by establishing portals inferior to the level of the scapular spine. The suprascapular nerve and artery are rarely at risk unless an accessory superior portal is needed to complete the procedure or excessive lateral dissection is undertaken.

bony resection of the superomedial angle is indicated[20,21]; however, there is an increased risk for iatrogenic injury using this portal site and it is not used on a routine basis.

Prior to the insertion of arthroscopic instruments, approximately 100 mL of saline mixed with local anesthetic and epinephrine is injected deep to the superomedial angle to both expand the infraserratus bursa for adequate visualization and to provide hemostasis during the procedure.

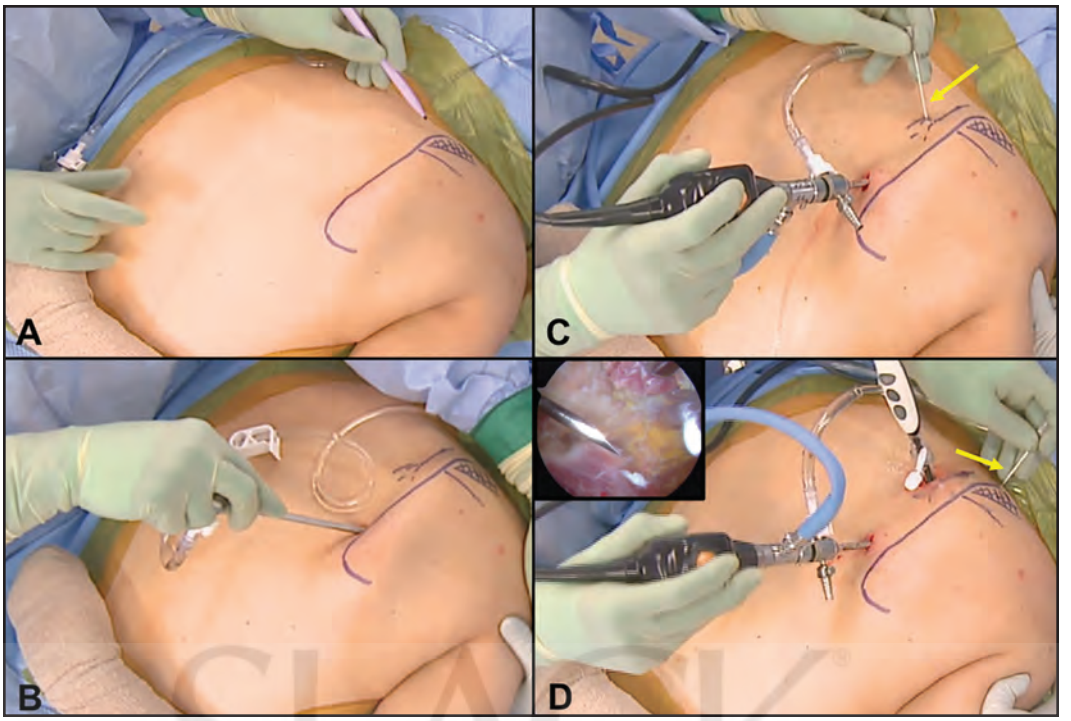

Figure 23-4. (A) A sterile marking pen is used to outline the margins of the medial scapula and the area of possible bony resection. (B) A small stab incision is made approximately 3 cm medial to the inferomedial scapular angle and a 30-degree arthroscope is inserted, thus establishing the inferior viewing portal. (C) A spinal needle is inserted at the site of the medial working portal and, under direct visualization, arthroscopic instruments are introduced into the scapulothoracic space (yellow arrow). (D) Following diagnostic arthroscopy, a second spinal needle is inserted at the most superior aspect of the superomedial angle to guide bony resection and to provide orientation during the procedure (yellow arrow). The image inset is an arthroscopic view of the spinal needle placed at the superomedial angle.

Step-by-Step Description of the Procedure

A small stab incision is made approximately 3 cm medial to the inferomedial angle and a 30-degree arthroscope is inserted, taking care to remain as parallel to the chest wall as possible. Care should be taken to maintain a fluid pump pressure of less than 50 mm Hg throughout the procedure to avoid excessive fluid extravasation into surrounding tissues. A spinal needle is inserted approximately 3 cm medial to the medial scapular border at a point just inferior to the level of the scapular spine, marking the location of the medial working portal. Once this portal is established, diagnostic arthroscopy is performed using both the 30- and 70-degree arthroscopes to accurately localize the superomedial scapular angle. Another spinal needle is inserted at the location of the superomedial angle for orientation during arthroscopy and to confirm adequate bony resection at the conclusion of the procedure (Figure 23-4).

Debridement and resection of the infraserratus bursa is then performed using an arthroscopic radiofrequency ablator or shaver (Figure 23-5). Using the previously placed spinal needle for orientation, debridement is continued until the superomedial scapular angle is completely exposed. When necessary, access to the supraserratus bursa can be achieved by bluntly penetrating the laterally positioned serratus anterior muscle.[10] At this point, dynamic examination is performed to identify the location and extent of osseous impingement between the superomedial scapular angle and the posterior thorax. If mechanical crepitus is still present and skeletal impingement is still visible following complete bursectomy, superomedial angle resection is then performed.

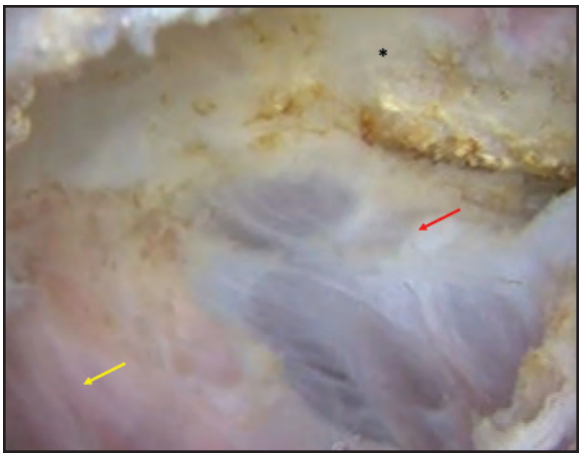

Figure 23-5. Arthroscopic view of the anterior scapula from the scapulothoracic space. The asterisk (*) represents the bony margin of the superomedial angle. The red arrow points to the area of the infraserratus bursa. The yellow arrow points to the tendinous insertion of the subscapularis muscle.

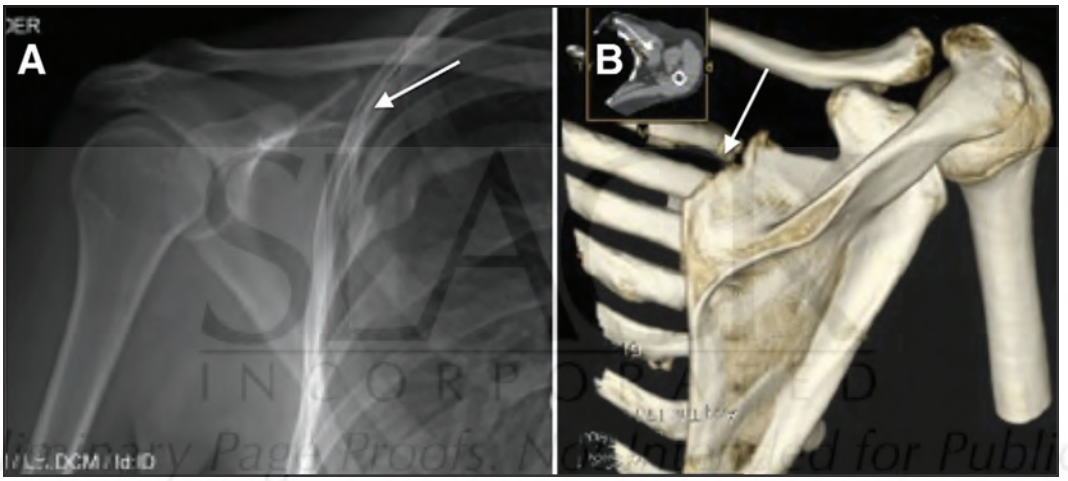

Figure 23-6. (A) An anteroposterior radiograph of a right shoulder demonstrating previous resection of the superomedial scapular angle (arrow) in a patient who initially presented with scapulothoracic pain and crepitus. (B) CT scan with 3-dimensional reconstruction of the right shoulder in the same patient. Note that a triangular section of the superomedial scapular angle has previously been resected (arrow).

Although a triangular section of bone is typically removed approximately 2 cm superoinferiorly and 3 cm mediolaterally, it is important to mark the extent of the planned resection in every case using several spinal needles, depending on the degree and location of scapulothoracic impingement. This method facilitates complete, accurate bony resection of the superomedial angle without increasing the risk to nearby vascular structures.[20] Resection is typically performed using a high-speed arthroscopic burr until the deep surface of the supraspinatus muscle is identified. A rasp is typically used to smooth the edges of the resection. The operative extremity is again placed through a range of motion while directly visualizing the scapulothoracic space through both portals to confirm both adequate resection and the presence of a smooth articulating surface. The portal sites are closed using a standard technique, a simple sling is applied, and the patient is transferred to the post-anesthesia care unit. Because the scapulothoracic articulation is not surrounded by a joint capsule, some patients may experience significant swelling that can extend down the arm or around the torso within the immediate postoperative period; however, this side effect typically resolves over a period of days. Postoperative radiographs or CT scans may be obtained in some cases to evaluate the adequacy of superomedial angle resection (Figure 23-6).

Postoperative Protocol

Active and passive range of motion exercises, such as scapular protraction, retraction, and rotation, are begun immediately postoperatively with a progression toward glenohumeral strengthening at approximately 4 weeks followed by periscapular strengthening at approximately 8 weeks. Most patients return to sports after 3 months of structured and supervised rehabilitation. In all cases, physical therapy protocols should be individualized according to patient tolerance and progress.

Potential Complications

Although uncommon, there are several important surgical complications unique to this procedure that can be prevented by using appropriate arthroscopic techniques. Injury to the dorsal scapular artery and/or nerve can occur when arthroscopic portals are placed < 3 cm medial to the medial scapular border. The spinal accessory nerve is also in danger when an arthroscopic portal is placed superior to the level of the scapular spine. Puncture of pleural tissue can be avoided by maintaining the arthroscopic instruments at an angle that is approximately parallel with the thoracic cage.[19] Other complications include incomplete bursectomy and/or scapulectomy that may result in recurrent symptomatology and inferior outcomes.

Top Technical Pearls for the Procedure

1. Placing the operative limb in the "chicken wing" position increases the potential space between the scapula and the posterior chest wall, which improves arthroscopic visualization.
2. Always establish arthroscopic portals at least 3 cm medial to the medial scapular border and inferior to the level of the scapular spine to prevent injury to important neurovascular structures, such as the dorsal scapular nerve and artery and the spinal accessory nerve.
3. Always use spinal needles to facilitate arthroscopic orientation to avoid excessive bony resection and to prevent neurovascular injuries as a result of excessive superior or lateral dissection.
4. To avoid becoming "lost" in the subscapularis and serratus anterior muscle bellies, it is important to ensure that the arthroscope is advanced down to the posterior thorax.
5. Avoid resection of red muscle fibers, such as those of the subscapularis, as this may produce increased postoperative pain and lengthen rehabilitation.

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