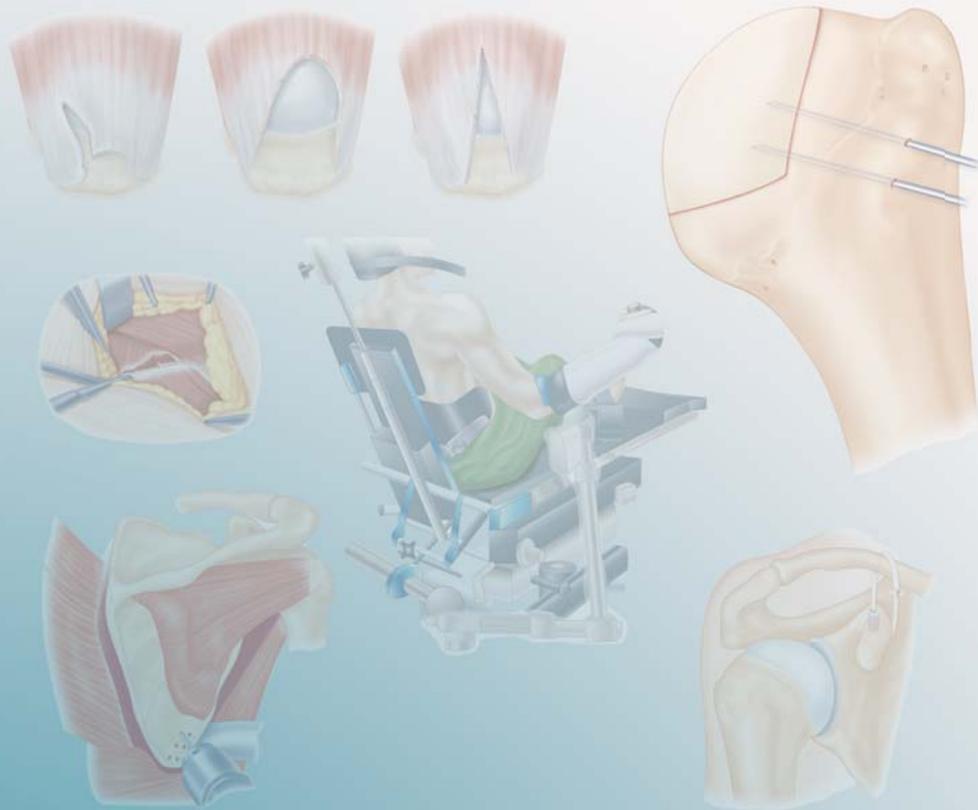


# Subacromial Decompression

*Geoffrey S. Van Thiel, Matthew T. Provencher, Shane J. Nho, and Anthony A. Romeo*



### PITFALLS

- *There are numerous possible causes of shoulder pain that can mimic impingement symptoms. All potential causes should be thoroughly evaluated prior to undertaking operative treatment of isolated impingement syndrome.*

### Controversies

- Subacromial decompression in the treatment of rotator cuff pathology has been continually debated. Prospective studies have suggested that there is no difference in outcomes with and without subacromial decompression.
- Subacromial decompression performed in association with a superior labrum anterior-posterior (SLAP) repair can potentially increase postoperative stiffness.

### PITFALLS

- *Ensure that an axillary lateral view is obtained to rule out an os acromiale. The finding of an os acromiale can potentially change management strategy.*

### Treatment Options

- Impingement syndrome can be effectively managed nonoperatively with rest, physical therapy, nonsteroidal anti-inflammatory medications, and subacromial corticosteroid injections.

## Indications

- Impingement symptoms refractory to at least 3 months of nonoperative management
- In conjunction with arthroscopic treatment of a rotator cuff tear
- Relative indication: type II or III acromion with clinical findings of impingement

## Examination/Imaging

### PHYSICAL EXAMINATION

- Assess the patient for
  - Complete shoulder examination with range of motion and strength
  - Tenderness with palpation over anterolateral acromion and supraspinatus
  - Classic Neer sign with anterolateral shoulder pain on forward elevation above 90° when the greater tuberosity impacts the anterior acromion (and made worse with internal rotation)
  - Positive Hawkins sign: pain with internal rotation, forward elevation to 90°, and adduction, which causes impingement against the coracoacromial ligament
- The impingement test is positive if the patient experiences pain relief with a subacromial injection of lidocaine.
- Be certain to evaluate for acromioclavicular (AC) joint pathology, and keep in mind that there are several causes of shoulder pain that can mimic impingement syndrome.

### IMAGING

- Standard radiographs should be ordered, including anteroposterior (AP), lateral, and scapular Y views.
- Additional imaging that can aid in the evaluation of impingement syndrome includes supraspinatus outlet and AC joint views.
- Evaluation
  - AP view—glenohumeral anatomy and position of the humeral head
  - Scapular Y view—acromial morphology (see curved acromion in Figure 1)
  - Axillary view—os acromiale and anterior acromion
  - Supraspinatus outlet view—complete acromial morphology
  - Acromioclavicular view—AC joint pathology; osteophytes and degeneration



FIGURE 1

- MRI is used to evaluate the integrity of the rotator cuff as well as the biceps and labrum.
- Ultrasound can be considered as an alternative method to evaluate the rotator cuff.

## Surgical Anatomy

- Between the rotator cuff inferiorly and the acromion superiorly lies the subacromial space (Fig. 2).
  - The acromion is an extension of the spine of the scapula and has various shapes and slopes.

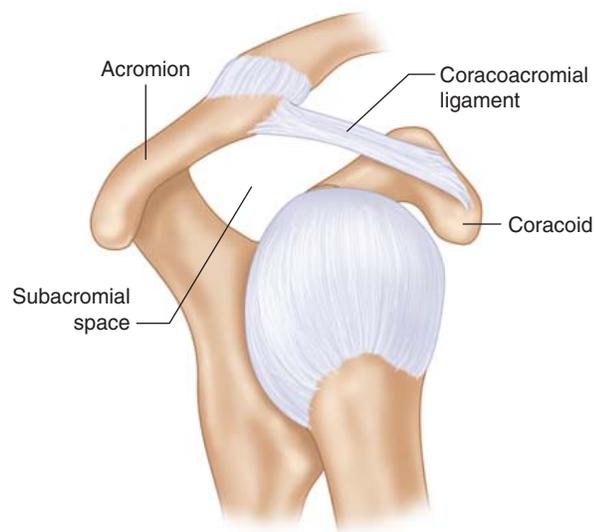
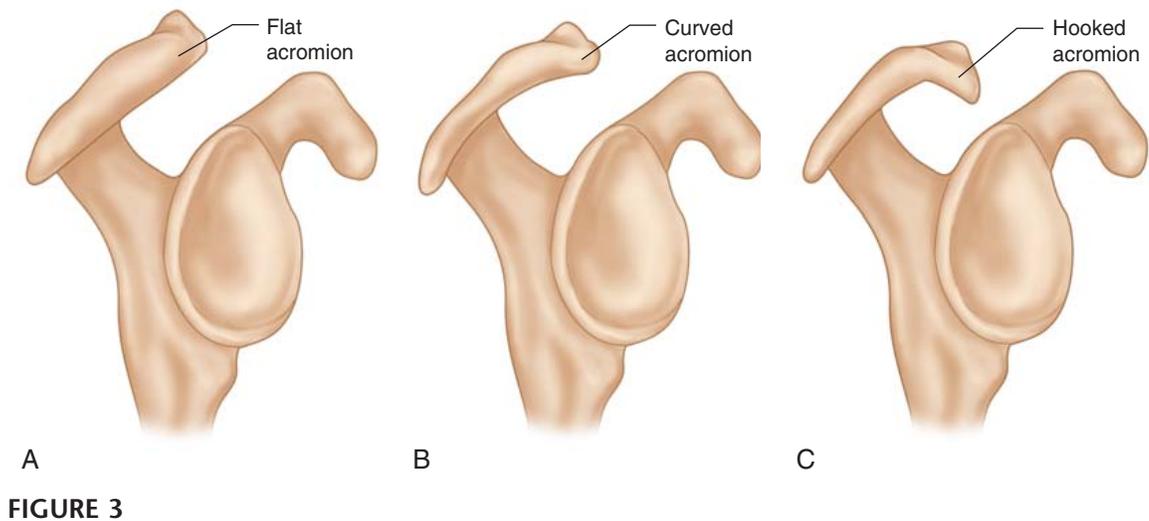
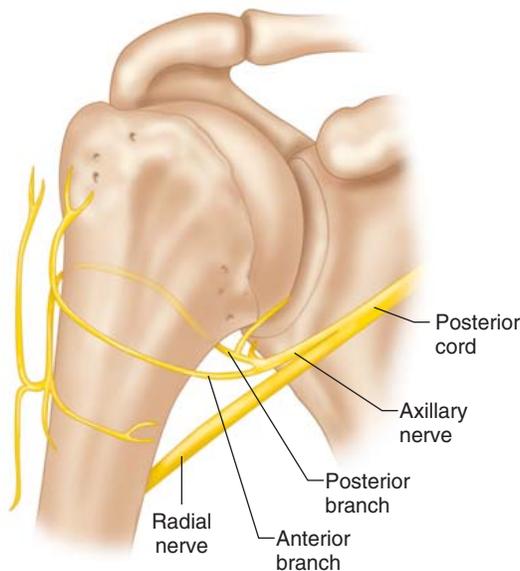


FIGURE 2



- It is classified as I–III (I, flat; II, curved; III, hook), with progressive levels of inferior slope and the presence of a “hook” in its terminal portion (Fig. 3A–C).
- The acromion forms the posterolateral aspect of the coracoacromial arch, which is composed of the coracoid process, clavicle, AC joint, and coracoacromial ligament.
  - The coracoacromial arch stabilizes the humeral head and prevents anterior-superior instability.
  - The coracoacromial ligament comprises the anterior margin of the arch and widens as it extends from the outer edge of the coracoid to the anteromedial aspect of the acromion.
- The subacromial bursa also resides in the subacromial space. It extends from approximately the midportion of the acromion to 2 cm anterior and lateral to the acromial edge.
- The axillary nerve is the terminal branch of the posterior cord, and descends with the axillary artery to the lower border of the subscapularis (Fig. 4). It then passes through the quadrilateral space with the posterior circumflex humeral artery. Its anterior branch winds around the posterior surface of the surgical neck of the humerus.
  - In the context of posterior and lateral portals, the surgeon should be aware that the axillary nerve passes approximately 5 cm distal to the edge of the acromion.



### PEARLS

- Positioning will be dictated by the preference of the operating surgeon or other pathology that is to be addressed.

### PITFALLS

- Not placing the patient at the edge of the table or failing to stabilize the scapula can restrict working room in the posterior portal.
- It is important to position the head in neutral and to avoid hyperextension of the cervical spine.

### Equipment

- There are commercially available head and arm holders to facilitate setup. The arm holders are also able to provide some distraction across the joint.

### Controversies

- The authors prefer to perform subacromial decompressions in the beach chair position, usually in the setting of concomitant rotator cuff repair or distal clavicle resection.
- The lateral decubitus position is preferred in cases that also require simultaneous labral repair. However, some surgeons prefer to use lateral decubitus for all shoulder procedures.

## Positioning

- Patient can be positioned in either a lateral decubitus or beach chair position.
  - The beach chair position provides ease of setup, normal anatomic orientation, the ability to manipulate the arm, reduced risk of neurapraxias because traction is not used, and ease of conversion to open procedures.
  - The lateral position allows the surgeon to provide distraction across the joint.
- Beach chair position (Fig. 5)
  - Either general anesthesia, interscalene block, or a combination can be used.
  - The head is either secured in a commercially available head holder or secured with tape to the operating table.
  - A roll of towels is placed behind the medial scapula to stabilize the shoulder joint.
  - The torso is flexed to approximately 45°.
  - The legs are lowered and the knees slightly flexed.
  - The arm is positioned in about 20°–30° of abduction.
  - The operative arm is left free or placed in a commercially available holder.



FIGURE 5

## PEARLS

- Palpate the tip of the coracoid and place the spinal needle just lateral to the tip for the anterior portal. The spinal needle can be redirected to the desired position.
- Use the light of the arthroscope to illuminate the correct initial placement of the lateral portal.

## PITFALLS

- The axillary nerve runs approximately 5 cm distal to the posterior and lateral edges of the acromion. An extremely distal lateral or posterior portal has the potential to injure the nerve.

## Instrumentation

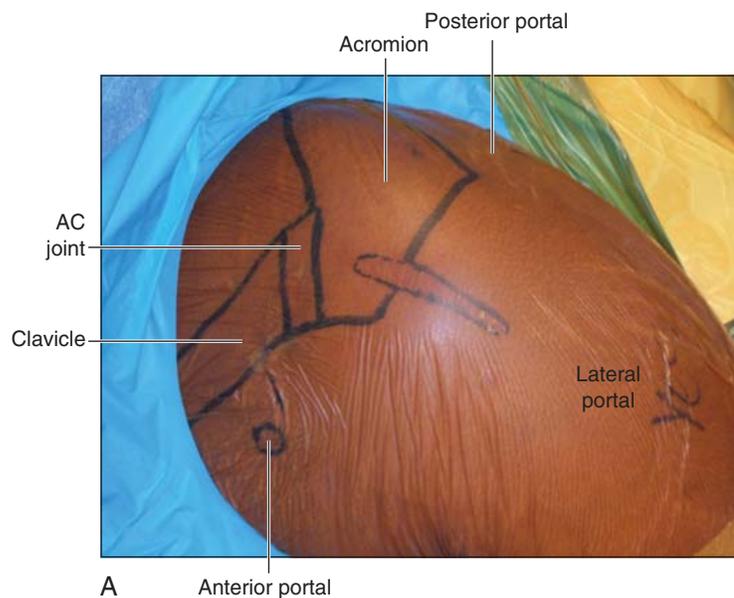
- 5.0- to 7.0-mm cannula with a blunt trocar
- 4.0-mm 30° arthroscope

## Controversies

- When the blunt trocar is redirected from the glenohumeral joint to the subacromial space, the surgeon can “shotgun” the blunt trocar through the same incision as the anterior portal and place the cannula over the blunt trocar to bring the cannula into the subacromial space.

## Portals/Exposures

- Basic arthroscopic portals and anatomic landmarks are marked out prior to the procedure (Fig. 6A and 6B).
- Anatomic landmarks include the acromion, clavicle, AC joint, and coracoid process.
- Portals used
  - Anterior portal
    - ◆ Using the inside-out technique, place a spinal needle in the rotator interval within the boundaries of the anterior triangle formed by the long head of the biceps, glenoid, and humeral head.



A Anterior portal



B Posterior portal

FIGURE 6

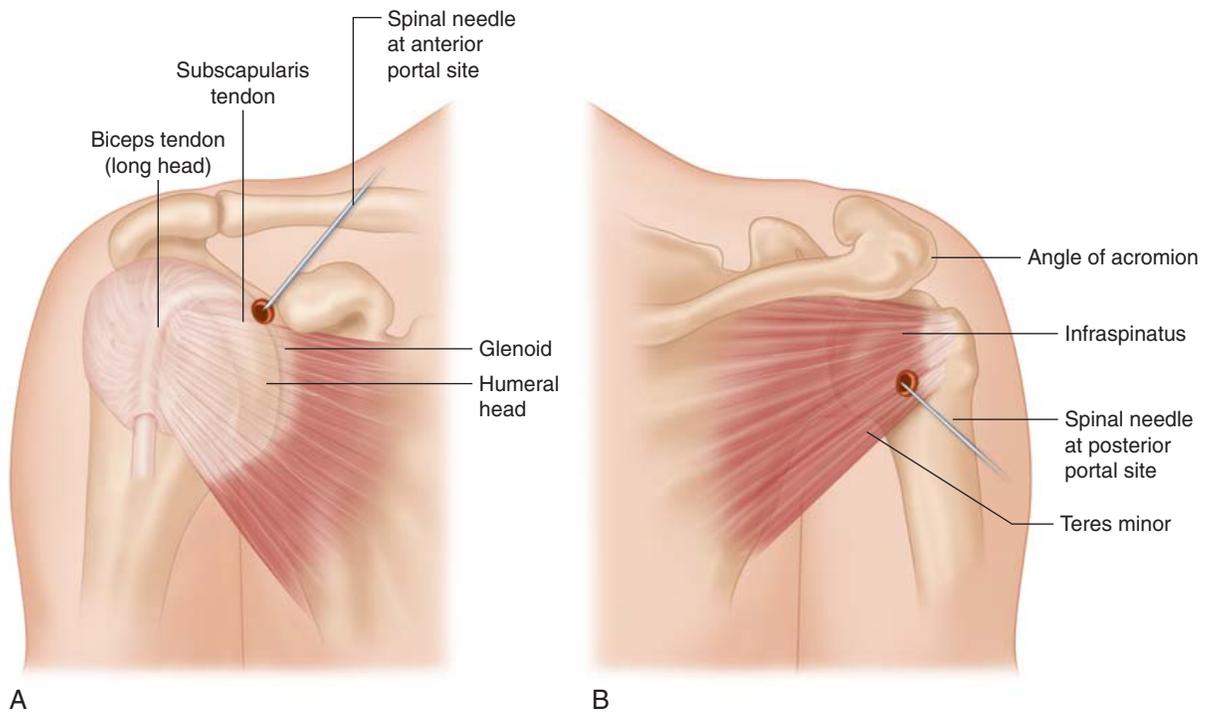


FIGURE 7

- ◆ The authors prefer to insert the cannula just above the subscapularis tendon (Fig. 7A).
- Lateral portal—2–3 cm distal and at the midpoint of the acromion.
  - ◆ The lateral portal is the primary operative portal for the subacromial space.
- Posterior portal—2 cm inferior and 1 cm medial to the posterolateral corner of the acromion.
  - ◆ Enter between the infraspinatus and teres minor muscles (Fig. 7B).
  - ◆ One hand is placed on top of the shoulder with the thumb in the “soft spot” posteriorly and the index finger on the coracoid anteriorly. This provides the correct orientation for entry.

### PEARLS

- Location of a rotator cuff tear can be a key to diagnosis of impingement. Bursal-sided “impingement” lesions have been suggested to be caused by acromial impingement, and there may be cases of “kissing lesions” in which the undersurface of the acromion as well as the bursal surface of the rotator cuff tendon are frayed (Fig. 8).
- The subacromial space can be increased, and the approach can be made easier by placing the arm in approximately 45° of abduction.
- Upon entry through the posterior portal, be sure to pass the “posterior curtain” that can obstruct the view of the subacromial space (Fig. 10).

### PITFALLS

- The cannula should not be aimed toward the AC joint.

### Instrumentation/ Implantation

- 5.0- to 7.0-mm cannula
- 4.0-mm scope
- Arthroscopic shaver/burr
- Spinal needle
- #11 blade

### Controversies

- Depending on the arthroscopy system, the outflow can either be located on the camera itself or connected to the cannula in the anterior portal.

## Procedure

### STEP 1

- A full diagnostic glenohumeral joint inspection is performed.
- The rotator cuff is inspected from the glenohumeral joint and any tears are noted.
- The subacromial space is then entered by placing the blunt trocar through the cannula (5.0 to 7.0 mm) in the posterior portal. It is slowly withdrawn and redirected so that the blunt edge of the trocar abuts the posterior edge of the acromion just medial to the posterolateral edge. The trocar is then slid just inferior to the acromion into the subacromial space.
- The surgeon can then advance (“shotgun”) the blunt trocar through the same incision that was used for the anterior portal and place the cannula over the blunt trocar to bring the cannula into the subacromial space.
- The trocar is then withdrawn from the cannula placed in the anterior portal and advanced anterior and inferior in order to locate the subacromial bursa. The coracoacromial ligament, which indicates the appropriate location, can be palpated with the tip of the trocar.
- The arthroscope is then inserted through the posterior portal and the space is distended with the inflow and outflow connected to the scope.
  - When the arthroscope is properly inserted in the anterior portion of the subacromial bursa, there should be a “room with a view” with excellent visualization of the undersurface of the acromion and the rotator cuff tendon.
  - Figure 8 shows the subacromial space from the posterior portal with a “kissing impingement lesion” on the undersurface of the acromion (bottom) and the bursal side of the rotator cuff tendon.
  - Orient the camera and direct the lens laterally to the location of the lateral portal.
- A spinal needle is inserted into the anticipated location of the lateral portal in order to confirm correct placement and freedom of movement within the subacromial space.
- A #11 blade is used to make a small incision and the blunt trocar is inserted into the subacromial space through the lateral portal (Fig. 9).

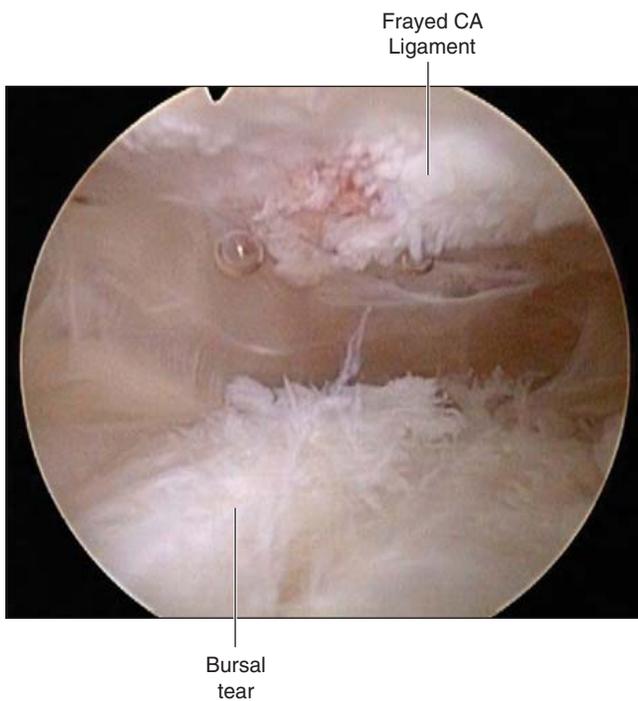


FIGURE 8



FIGURE 9

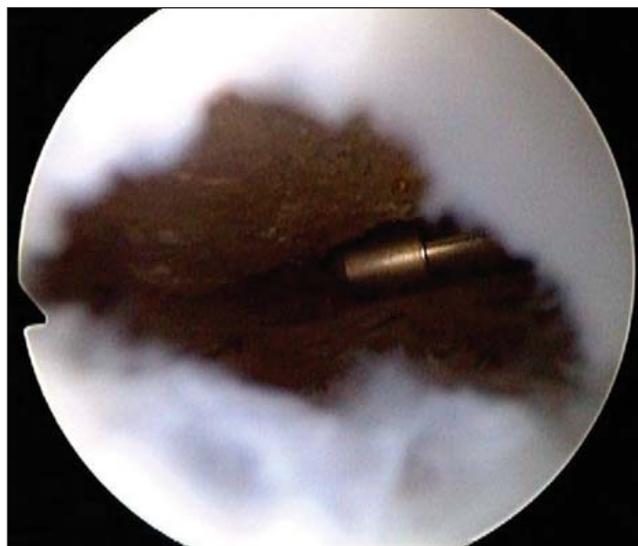


FIGURE 10

### PEARLS

- *If postoperative stiffness is a concern, the coracoacromial ligament can be resected for improved mobility.*

### PITFALLS

- *Failure to use a gentle sweeping motion with the burr will result in a rough acromial surface and can lead to over-resection.*
- *Be sure not to violate the AC joint when starting the anteromedial acromial resection.*
- *Inadequate anesthesia and hypertension will significantly increase the amount of bleeding during débridement.*
- *There is a vessel that bleeds with the débridement at the anterolateral aspect of the acromion (a branch of the thoracoacromial).*
- *The thickness and size of the acromial hook should be determined preoperatively to ensure that excessive bone is not resected.*

### Instrumentation/ Implantation

- End-cutting shaver
- Radiofrequency device
- High-speed burr

### STEP 2

- Once the portals have been established, an end-cutting motorized shaver is inserted into the lateral portal and the subacromial space is cleared of adhesions and bursa for better visibility of the acromion and rotator cuff.
- The arthroscope is then turned medially to view the area of the AC joint and the coracoacromial ligament as it traverses under the acromion (Fig. 11). When appropriate visualization is attained, a radiofrequency device is inserted through the lateral portal and the soft tissue ablated to define the anterior and lateral borders of the undersurface of the acromion (Fig. 12A and 12B).
- The coracoacromial ligament should be released subperiosteally off of the anterior edge of the acromion, but a resection of the ligament is not necessary in all cases.
- If necessary, the coracoacromial ligament can be débrided of adhesions.
- Any pathology is noted, including acromial morphology, osteophytes, and AC joint abnormalities.
- A motorized burr is inserted through the lateral portal and between 4 and 7 mm of bone is resected from the anterior and inferior prominence of the acromion. Beginning with the anterior and lateral edge, a gentle anterior-to-posterior sweeping motion of the burr is used to taper the resection posteriorly (Fig. 13A and 13B).
  - The level of resection should make the acromion approximately flush with the posterior slope of the acromion, which can be used as a cutting guide.
  - The amount of resection should be based upon preoperative radiographs delineating the size of the acromial hook and any associated spurs as well as the thickness of the acromion.
- If bony spurs are noted at the AC joint, they are resected using the high-speed burr just medial to the AC joint. The clavicle is made flush with the acromion.

### Controversies

- Many surgeons advocate complete resection of the coracoacromial ligament in every case; we do not believe this is necessary.
- Some advocate release of the coracoacromial ligament from the lateral deltoid attachment; others peel the ligament subperiosteally off the acromion to define the acromial edges.

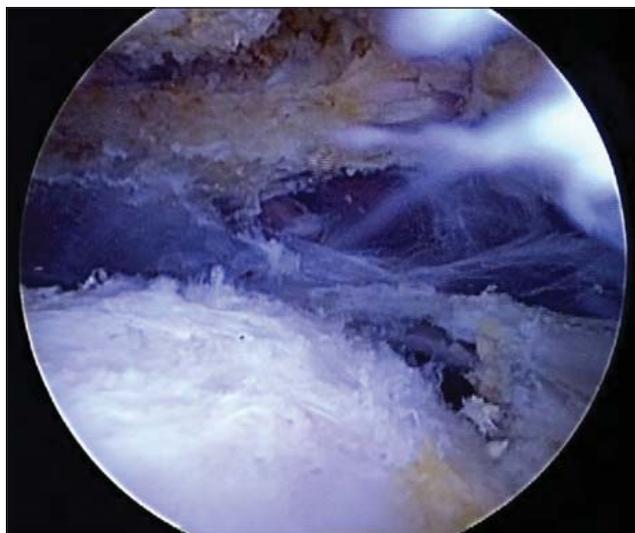
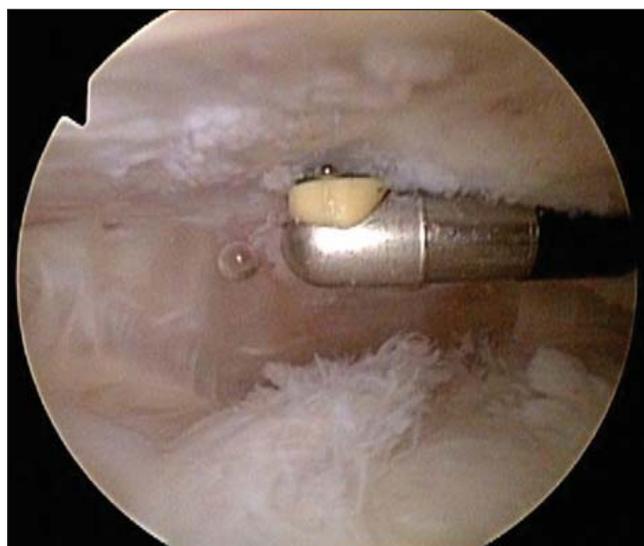


FIGURE 11



A

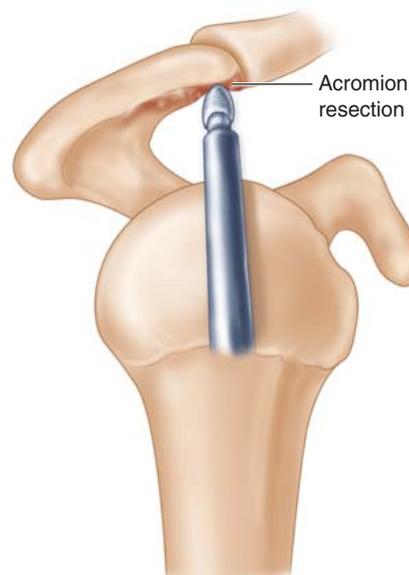


B

FIGURE 12



FIGURE 13 A



B

### PEARLS

- *Ensure that the acromial resection is smooth in all planes.*
- *The rotator cuff can be débrided with the end-cutting shaver by turning the shaver at a 90° angle to the cuff and moving across the surface (Fig. 16).*

### PITFALLS

- *Not using uniform sweeping motions will result in an acromial undersurface with ridges and prominences.*

### Instrumentation/ Implantation

- High-speed burr
- End-cutting shaver
- Switching stick

### STEP 3

- After the subacromial space is thoroughly decompressed through the lateral portal, a switching stick is placed in the lateral portal and the scope is moved from the posterior portal to the lateral portal.
- Visualization is re-established, and a shaver is inserted in the posterior portal for further decompression of any remaining adhesions (Fig. 14).
- A high-speed burr is then inserted in the posterior portal, and the undersurface of the acromion is decompressed (Fig. 15A).
  - The motorized burr is placed in the posterior portal and the posterior slope of the acromion is followed to determine the amount of anterior-inferior acromion that needs to be resected.
  - Once the depth of resection has been established, resection is done in a gentle sweeping motion from medial to lateral, using the posterior edge of the acromion as a “cutting block” for stability, until the anterior border has been reached (Fig. 15B). Typically, 5–8 mm is removed; however, this is dependent on individual patient factors and preoperative imaging (e.g., supraspinatus outlet view).

### Controversies

- Ellman described the first subacromial decompression, and Johnson described a decompression through the lateral portal in 1986. Sampson then proposed a technique through the posterior portal with the posterior acromion used as a “cutting block” for a controlled resection in the 1991.

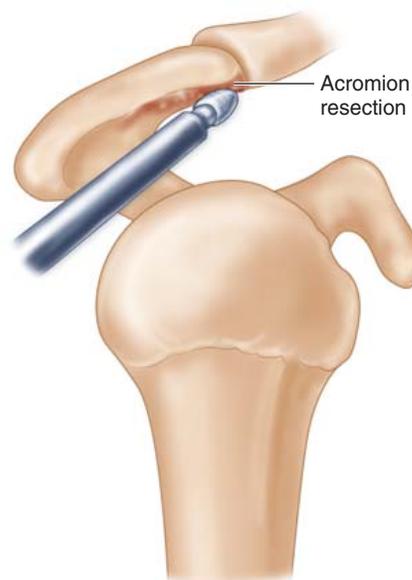


FIGURE 14



A

FIGURE 15



B



FIGURE 16

## Postoperative Care and Expected Outcomes

- Postoperative care is usually dictated by other concomitant pathology that is treated.
- For an isolated subacromial decompression, the patient is sent home in a sling and active range of motion is encouraged with no restrictions.
- Full activities are allowed once muscle control of the glenohumeral joint is restored, usually in 4–6 weeks.

## Evidence

Gartsman GM, O'Connor DP. Arthroscopic rotator cuff repair with and without arthroscopic subacromial decompression: a prospective, randomized study of one-year outcomes. *J Shoulder Elbow Surg.* 2004;13:424-6.

*In this prospective randomized study of full-thickness supraspinatus tears with type II acromion with and without subacromial decompression, no difference in outcomes was noted at 1 year.*

Kempf JF, Gleyze P, Bonnomet F, et al. A multicenter study of 210 rotator cuff tears treated by arthroscopic acromioplasty. *Arthroscopy.* 1999;15:56-66.

*In a retrospective multicenter study that looked at rotator cuff tears treated with acromioplasty, good results were obtained in 79% of patients with average follow-up of 26 months. The authors suggested that isolated acromioplasty is a good option for the low-demand patient.*

Lim JT, Acornley A, Dodenhoff RM. Recovery after arthroscopic subacromial decompression: prognostic value of the subacromial injection test. *Arthroscopy.* 2005;21:680-3.

*This diagnostic study of nonconsecutive patients found that patients who have pain relief with the subacromial injection test have significantly better postoperative outcomes.*

Milano G, Grasso A, Salvatore M, Zarelli D, Deriu L, Fabbriani C. Arthroscopic rotator cuff repair with and without subacromial decompression: a prospective randomized study. *Arthroscopy.* 2007;23:81-8.

*In a prospective randomized study of 80 patients with full-thickness rotator cuff tears with repair performed with and without subacromial decompression, no statistical difference was found at 2 years' follow-up.*

Mohtadi NG, Hollinshead RM, Sasyniuk TM, Fletcher JA, Chan DS, Li FX. A randomized clinical trial comparing open to arthroscopic acromioplasty with mini-open rotator cuff repair for full-thickness rotator cuff tears: disease-specific quality of life outcome at an average 2-year follow-up. *Am J Sports Med.* 2008;36:1043-51.

*A randomized prospective study compared open with arthroscopic acromioplasty in the context of a mini-open rotator cuff repair. Outcomes at 2 years were identical, but outcomes at 3 months were significantly better in the arthroscopic group.*

Morrison DS, Frogameni AD, Woodworth P. Non-operative treatment of subacromial impingement syndrome. *J Bone Joint Surg [Am].* 1997;79:732-7.

*In this retrospective study of 616 patients that looked at the results of nonoperative management for impingement syndrome, 67% had a satisfactory result, 28% had no improvement and went on to have an arthroscopic subacromial decompression, and 5% had an unsatisfactory result but declined additional treatment.*

Nicholson GP. Arthroscopic acromioplasty: a comparison between workers' compensation and non-workers' compensation populations. *J Bone Joint Surg [Am].* 2003;85:682-9.

*A prognostic study showed that worker's compensation patients experience the same level of relief from subacromial decompression in impingement syndrome as non-worker's compensation patients.*

Norlin R, Adolfsson L. Small full-thickness tears do well ten to thirteen years after arthroscopic subacromial decompression. *J Shoulder Elbow Surg.* 2008;17:125-165.

*A retrospective study looked at 181 small rotator cuff tears with subacromial decompression. The study suggested that subacromial decompression may slow the rate of cuff deterioration after a single-tendon full-thickness tear.*