

Frozen Shoulder 360° Release



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Abstract: Arthroscopic capsular release has emerged as a safe and reliable method for treating severe frozen shoulder in patients with significant loss of range of motion. This article describes a reproducible technique for arthroscopic 360° release of the shoulder performed in the lateral decubitus position.

Frozen shoulder has an established course characterized by the onset of pain followed by the development of shoulder stiffness. Recovery usually occurs within 1 to 4 years from the onset of symptoms.¹ Frozen shoulder is a self-limited condition that resolves in most patients.¹ However, despite the condition resolving, 40% to 60% of patients suffer some persisting restriction of motion.²

Manipulation under anesthesia (MUA) is an accepted treatment technique for patients with frozen shoulder.³ However, iatrogenic injuries have been reported.³ Furthermore, the amount of release is variable, and the capsular tear is poorly controlled.

Arthroscopic capsular release is a surgical option for patients who have a debilitating loss of range of motion. Early techniques predominantly involved the partial release of the capsule.^{4,5} Some surgeons prefer a partial release of the capsule owing to concerns that a more

extensive capsular release would be associated with increased rates of complications such as instability. We describe a complete 360° arthroscopic release performed with the patient in the lateral decubitus position. Our indication for surgery is debilitating functional restriction due to a capsular contracture limiting external rotation to less than 30°.

Surgical Technique

The operative technique is demonstrated in the [Video](#) and summarized in [Table 1](#).

Positioning

The patient is positioned in the lateral decubitus position using a beanbag positioner (Vac-Pac Surgical Positioning System; Olympic Medical Corp., Port Angeles, WA). A cushion (Leg Tunnel; BoneFoam, Corcoran, MN) is placed between the patient's legs. Examination under anesthesia is performed to document the preoperative range of motion (ROM) and confirm the diagnosis. The arm is placed in 30° abduction and 10° forward flexion with lateral distraction of the glenohumeral joint using a 3-Point Shoulder Distraction System (AR-1600 M; Arthrex, Naples, FL). Traction is applied through the hand using an Atraumatic Hand Holder Traction Attachment (AR-1602D; Arthrex) ([Fig 1](#)).

Establishing the Posterior Portal

The 4-mm 30° arthroscope (Stryker, Kalamazoo, MI) is introduced through the posterior portal and placed 2 cm inferior and medial to the posterolateral corner of the acromion. It is usually more challenging to place the arthroscope in the glenohumeral joint (GHJ) of patients with frozen shoulder because of the contracture. Once the arthroscope is in the joint, the presence of capsulitis and fibrous capsular thickening further confirms the diagnosis.

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Table 1. Steps

1. The arthroscope is placed in the posterior portal.
2. The anterior portal is established immediately lateral to the coracoid tip using an outside-in technique.
3. The anterior capsular release is performed viewing from posterior with the straight punch introduced through the anterior portal.
4. Release of the anteroinferior capsular is completed past the 6 o'clock position using the upswept arthroscopic punch through the anterior portal.
5. The superior capsular release is performed using the straight punch and sometimes a chondrotome or electrocautery.
6. Release of the superior capsule is completed when the arthroscope in the posterior portal is reached.
7. The posterior and inferior capsular release is completed viewing from the anterior portal with the straight arthroscopic punch introduced through the posterior portal. The posteroinferior release is finished when it joins the anteroinferior capsular release.

In severe cases, the capsular contracture and consequent restriction of the joint space may preclude the joint from being fully visualized before at least a partial release is performed. Occasionally, it may not be possible to introduce the arthroscope into the GHJ from the posterior portal if the capsular contracture is severe. If this occurs, entry to the GHJ can be obtained through the rotator interval, anteriorly, with the arthroscope placed in the anterior subacromial space.

Establishing the Anterior Portal

We establish the anterior portal using an outside-in technique. A 14-gauge intravenous catheter (BD Insyte, Sandy, UT) is placed through the skin immediately lateral to the coracoid tip. Viewing the tip of the needle as it enters through the rotator interval confirms correct positioning. A soft tissue chondrotome (FMS Tornado Micro Shaver; Depuy Mitek, Raynham, MA) is used to excise the rotator interval. Bleeding may occur at this point and is controlled with the use of electrocautery (VAPR COOLPULSE 90 Electrode, Depuy Mitek).

Anterior and Inferior Release From the Anterior Portal

We perform the anterior release with a straight arthroscopic punch (Capsular Release Punch; ACUFEX; Smith & Nephew, Andover, MA) introduced through the anterior portal, above the superior margin of the subscapularis tendon. The punch is held closed and pushed between the posterior aspect of the subscapularis and the middle glenohumeral ligament (MGHL) to create a plane between the capsule and the subscapularis muscle. Once this plane is developed, the punch is withdrawn to the level of the superior margin of the subscapularis tendon. The punch is then advanced, progressively dividing the MGHL, anterior capsule, and anterior band of the inferior glenohumeral ligament (IGHL) immediately adjacent to the labrum. Staying adjacent to the labrum assists in avoiding injury

to the axillary nerve. We take care to remain peripheral to the labrum to prevent damage to the labrum (Fig 2).

The straight punch can typically reach the 6 o'clock position. Once the limit of the straight punch is reached, it is exchanged for a punch with a 30° upward angle, 3 cm back from its tip (Capsular Release Punch; Upswept; ACUFEX; Smith & Nephew). We use the angled punch to release the capsule past the 6 o'clock position. We prefer an arthroscopic punch over electrocautery for the release of the inferior capsule, as we believe that its use avoids the risk of thermal injury to the axillary nerve and the chondral surfaces. To avoid injuring the axillary nerve with the arthroscopic punch, we deploy the punch only under direct vision.

Anterior and Superior Release From the Anterior Portal

Once the limit of the anteroinferior capsular release from the anterior portal is reached, the straight arthroscopic punch is used to progressively divide the capsule immediately superior to the biceps insertion and adjacent to the glenoid margin (Fig 3). If it is difficult to use the punch for this part of the release, the chondrotome or electrocautery may be more effective. The biceps tendon is not routinely released. The straight punch is used to divide the capsule across the superior aspect of the GHJ until the arthroscope is reached in the posterior capsule. The arthroscope is now transferred to the anterior portal using a switching stick (4 mm × 12 in AR-3026; Arthrex).

Posterior and Inferior Release

The straight punch is introduced through the posterior portal, viewing with the arthroscope in the anterior



Fig 1. Right shoulder. Patient in lateral decubitus position using a bean bag positioner and cushion placed between the legs. The arm is abducted to 30° and forward flexed 20°. Glenohumeral joint distraction is applied using the lateral traction device. The standard anterior (E) and posterior (A) portals are marked.

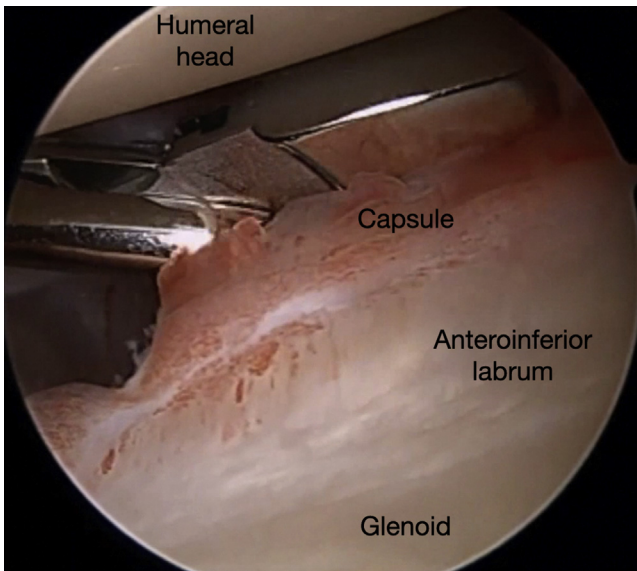


Fig 2. Viewing from the posterior portal of the right shoulder in the lateral decubitus position, the release of the anterior and inferior capsule is performed using the straight arthroscopic punch introduced through the anterior portal. Care is taken to stay immediately peripheral to the labrum to avoid damaging it and at the same time, avoid the axillary nerve.

portal. We divide any remaining intact capsule between the posterior portal and the superior capsular incision with the straight arthroscopic punch. Next, the posteroinferior capsule is released. Often the posterior capsule is more easily divided with the straight punch in a reversed orientation, with its footplate inside the joint capsule. The posterior capsule, the posterior band of the IGHL, and the remaining inferior capsule are divided until the anterior inferior capsular incision is joined. Any bleeding is controlled with electrocautery under direct vision. This completes the 360° capsular release.

The full-thickness capsular release is confirmed by visualizing muscle fibers in the base of the incision

throughout the full extent of the circumferential incision (Fig 4). If the underlying muscle cannot be seen, the incision is deepened until muscle fibers are readily apparent. Satisfactory excision of the rotator interval is confirmed by visualizing the posterior aspect of the conjoined tendon. It is not our practice to use manipulation after completing the release.

The incisions are closed with adhesive skin closure (Steri-strip; 3M, St. Paul, MN) and covered with a large suction dressing (PICO; Smith & Nephew).

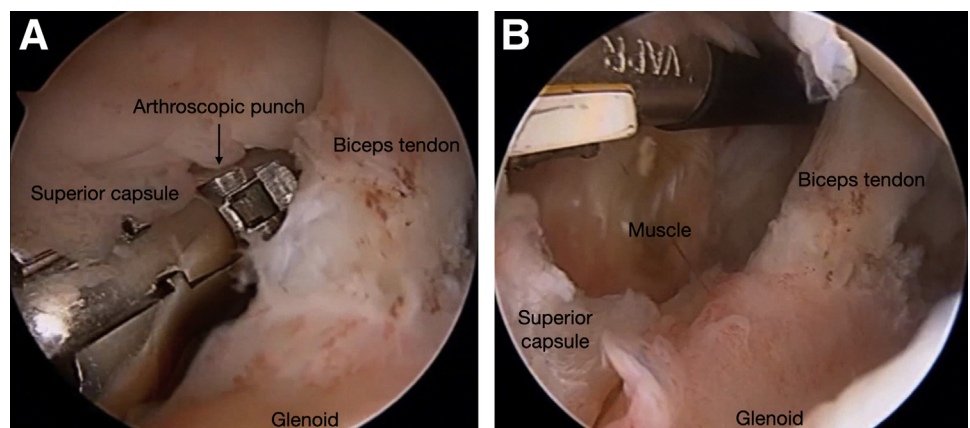
We prefer to perform the procedure early in the day so that the physiotherapist may see the patient that afternoon. The physiotherapist will see the patient again the following morning, before discharge. While the patient is not doing physiotherapy, the nursing staff place the patient's arm in a sling (UltraSling III ERTM; DJO Global, Vista, CA) suspended from a drip pole to avoid the arm resting in internal rotation. The morning after surgery, nursing staff remove the bulky PICO dressing and pain pump and reapply the Steri-strips if any have come adrift. The nurses redress the incisions with waterproof dressings (Cutifilm plus; Smith & Nephew). Patients are typically discharged from hospital the day after surgery with simple analgesics.

Discussion

We advocate the arthroscopic 360° capsular release to achieve a controlled complete capsular release. Surgery is offered to those patients with frozen shoulder causing a significant functional problem due to a capsular contracture with $<30^\circ$ of external rotation.

Some authors advocate partial release of the capsule.^{4,5} Kanbe⁵ recommended leaving the inferior-posterior capsule intact to maintain shoulder stability and to avoid axillary nerve injury. Injury to the axillary nerve during inferior capsular release is indeed a possible complication. However, leaving the inferior capsule intact may not completely address the restriction in range of motion.² The authors believe that

Fig 3. Viewing from the posterior portal of the right shoulder in the lateral decubitus position, the superior capsule is released using the straight arthroscopic punch passing through the anterior portal superior to the biceps tendon (A). The full-thickness capsular release is confirmed by visualizing muscle fibers in the base of the capsular incision (B).



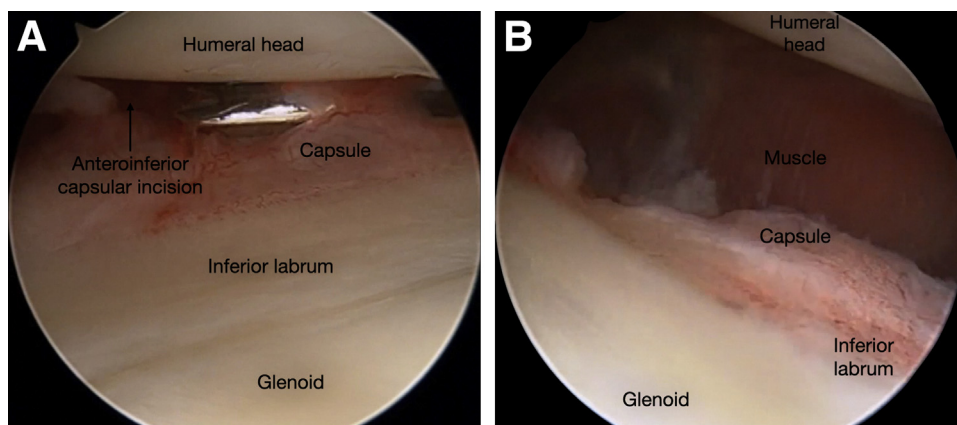


Fig 4. Viewing from the anterior portal of the right shoulder in the lateral decubitus position, the circumferential capsular release is completed by releasing the posterior and inferior capsule until the anterior inferior capsular incision is joined (A). The full-thickness capsular release is confirmed by visualizing muscle fibers in the base of the capsular incision (B).

surgical release of the inferior capsule improves the postoperative outcome in terms of the range of motion achieved. We prefer the use of an arthroscopic punch under direct vision and believe this to be a safe technique that avoids injury to the axillary nerve (Table 2).

Circumferential release of the capsule has been described in the literature.^{2,3,6-8} Some previously reported techniques of complete capsular release involve additional manipulation to achieve full release.^{6,8} This has been more commonly observed in surgeries performed in the beach-chair position owing to the difficulty accessing the inferior capsule and close proximity of the axillary nerve.⁸ Division of the intra-articular portion of the subscapularis tendon in an effort to offer a more significant improvement in ROM has also been described.^{2,6}

The technique we describe does not require such additional steps to complete the release. Instead, the circumferential full-thickness capsular release is more easily achieved by performing the surgery in the lateral decubitus position. The lateral traction that we use provides glenohumeral distraction, allowing improved visualization of the inferior capsule and labrum. It also tends to produce some lateral displacement of the axillary nerve.⁹ Thus, the lateral decubitus position with lateral distraction assists with easier access to, and a safer release of, the inferior capsule. Complete release is then ensured by visualizing muscle fibers in the base of the incision throughout the full extent of the capsular incision. In addition, it is believed that the lateral position poses less risk of cerebral hypoperfusion, and hence the development of neurologic injury, compared with the beach chair position.¹⁰

Apart from the risk of axillary nerve injury, there is a possible risk of destabilizing the shoulder after a circumferential release of the capsule. This complication has not been widely reported in the literature except for 1 case of frank dislocation and another case of mild

subjective symptom of instability.^{11,12} Other possible risks are described in Table 3.

Arthroscopic 360° release of the glenohumeral joint capsule is a reproducible treatment for patients with severe frozen shoulder suffering from a debilitating loss of range of motion. We believe that the controlled circumferential release of the glenohumeral capsule using arthroscopic punches with the patient in the lateral decubitus position offers several advantages over other described techniques.

Table 2. Pearls and pitfalls

Pearls

The lateral position with traction and abduction aids in visualization of the inferior capsule and helps improve the position of the axillary nerve.

Full-thickness release of the capsule is confirmed by visualizing muscle fibers in the base of the incision, ensuring the adequacy of the release.

In excessively tight shoulders, it may be necessary to incrementally release the anterior and posterior capsule by swapping the arthroscope and straight punch from anterior to posterior portals with the aid of a switching stick until adequate release of the glenohumeral joint (GHJ) is achieved to allow sufficient visualization of the inferior capsule that it can be safely released as described.

Pitfalls

It is usually more challenging to place the arthroscope in the GHJ of patients with frozen shoulder. In severe cases, it may not be possible to introduce the arthroscope from posterior owing to the capsular contracture. In this case, access to the GHJ can be obtained by opening the rotator interval with a chondrotome while viewing with the arthroscope in the anterior subacromial space. Once the rotator interval is opened, a switching stick can be used to place the arthroscope in the GHJ.

The axillary nerve is at risk during the inferior release. Lateral distraction of the GHJ together with incision of the inferior capsule just lateral to the labrum and use of the arthroscopic punch only under direct vision are key.

Using the arthroscopic punch rather than electrocautery avoids the risk of thermal injury.

Table 3. Advantages and risks

Advantages
Controlled capsular release
Easier access to the inferior capsule, facilitating complete capsular release
Does not require additional manipulation
Lower risk of axillary nerve injury because of the lateral decubitus position with lateral distraction and abduction
Lower risk of cerebral hypoperfusion that is usually associated with the beach-chair position
Risks
Axillary nerve injury
Less commonly, suprascapular nerve injury
Cartilage scuffing in very tight joint spaces
Injury to the labrum and rotator cuff, especially when the intraarticular structures are distorted
Instability

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