

# Arthroscopic Outside-in Shoulder Release for Patients With an Inaccessible Glenohumeral Joint



Jin Tang, B.M., and Jinzhong Zhao, M.D.

**Abstract:** Severe shoulder contracture, which usually results from severe frozen shoulder or traumatic arthrofibrosis, is clinically quite common. This condition requires surgical release resulting from severe functional impediment. However, most surgeons are reluctant to operate on such patients because the glenohumeral joint is always inaccessible because of contracture severity. Thus, we introduced an outside-in shoulder release technique starting from the posterior side of the glenohumeral joint. This procedure includes the fabrication of posterior and inferior posterior portals, locating the glenohumeral space out of the capsule, creating working space just posterior to the posterior capsule, releasing the posterior capsule, and thereafter releasing the inferior and superior capsules. Our clinical experience indicates that this procedure can be performed safely and effectively when certain guidelines are followed and can allow for subsequent access to the glenohumeral joint in most cases. We think the introduction of this technique will provide a special surgical option for patients with severe joint contracture.

Severe shoulder contracture is a common clinical condition. It often results from frozen shoulder in the frozen or early thawing stages, traumatic arthrofibrosis resulting from severe shoulder injury or operation, rheumatoid arthritis of the shoulder, osteoarthritis, and sometimes from joint infection and immobilization.<sup>1-6</sup> Severe shoulder contracture greatly affects shoulder functionality. The majority of patients are urged to have a surgical intervention due to the severe impediment of daily activities. However, surgeons are reluctant to perform shoulder release in severe joint contracture because of the inaccessibility of the glenohumeral joint. Some surgeons perform manipulation under anesthesia

(MUA) first to increase joint accessibility. However, although MUA may be effective in cases of slight contracture, it is usually ineffective and may endanger the humerus in cases of severe joint contracture. Thus, we would like to introduce an outside-in release technique starting from the posterior side of the shoulder to obtain access to the glenohumeral joint. This procedure includes the fabrication of posterior and posteroinferior portals, locating the glenohumeral space out of the posterior joint capsule, creating working space just posterior to the capsule, releasing the posterior capsule, and thereafter releasing the inferior and superior capsules.

## Indications

In our clinical practice in a referral institution in which more than 200 cases of shoulder release are

**Table 1.** Step-by-Step Surgical Technique of Posterior Outside-in Release of Shoulder

1. Create a routine posterior portal, as well as an inferior posterior portal, which is located 5 to 6 cm directly below the routine posterior portal.
2. Create working space just posterior to the posterior capsule at the site of the glenohumeral space.
3. Make a hole in the posterior capsule with the radiofrequency probe to view the humeral head or glenohumeral space.
4. Perform outside-in posterior capsule release along the posterior labrum.
5. Perform outside-in inferior capsule-ligament release along the inferior labrum.
6. Perform superior capsule release to restore the superior capsule recess.
7. Gain access to the glenohumeral joint.

From the Operating Theater (J.T.) and Department of Sports Medicine (J.Z.), Shanghai Sixth People's Hospital, Shanghai Jiao Tong University, Shanghai, China.

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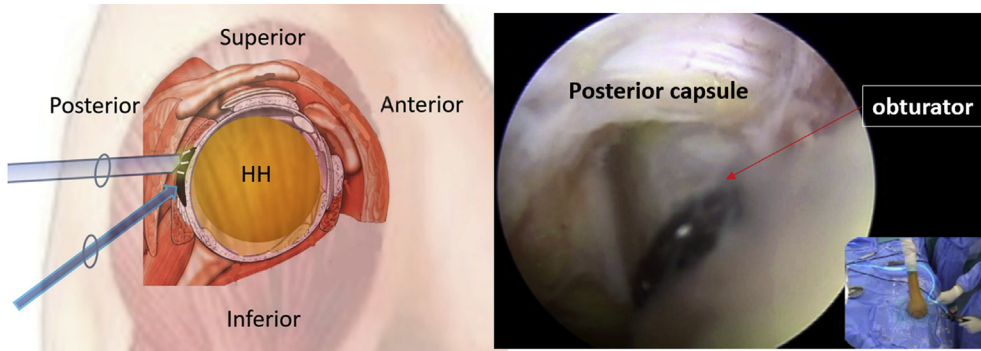
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Address correspondence to Jinzhong Zhao, M.D. Department of Sports Medicine, Shanghai Sixth People's Hospital, Shanghai Jiao Tong University, 600 Yishan Road, Shanghai 200233, China. E-mail: [zhaojinzhong@vip.163.com](mailto:zhaojinzhong@vip.163.com) or [jz Zhao@sjtu.edu.cn](mailto:jz Zhao@sjtu.edu.cn)

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**Fig 1.** Creating working space behind the posterior capsule. The obturator is placed in through the inferior posterior portal. Right shoulder viewed from the posterior portal. (HH, humeral head.)

performed a year, shoulder joint contractures are classified as follows: (1) slight, if during surgery the arthroscope can be inserted into the glenohumeral joint and swung superior-inferiorly within the joint, even if there is some difficulty; (2) moderate, if during surgery although the arthroscope can be inserted into the superior section of the glenohumeral joint, it cannot be swung to the inferior section because of the reduced glenohumeral space; (3) severe, if during surgery although the arthroscope can be inserted within the joint capsule, it can only stay above the humeral head, instead of being placed directly into the glenohumeral space; and (4) extremely severe, if during the surgery the arthroscope cannot be inserted into the capsule in any way because there is no space between the capsule and the humeral head.

The indication for shoulder joint release is refractory joint contracture that seriously affects shoulder function, whereas the indication for this posterior outside-in shoulder release technique is severe or extremely severe shoulder joint contracture.

## Surgical Procedures

### Patient Position and Portals

The patient is placed in lateral decubitus position. Procedures for severe joint contractures are performed

at first through routine posterior and inferior posterior portals. The routine posterior portal is located at the same level as the glenoid surface and faces towards the equator of the glenoid. The inferior posterior is located 5 to 6 cm directly below the routine posterior portal and faces the axillary pouch (Table 1).

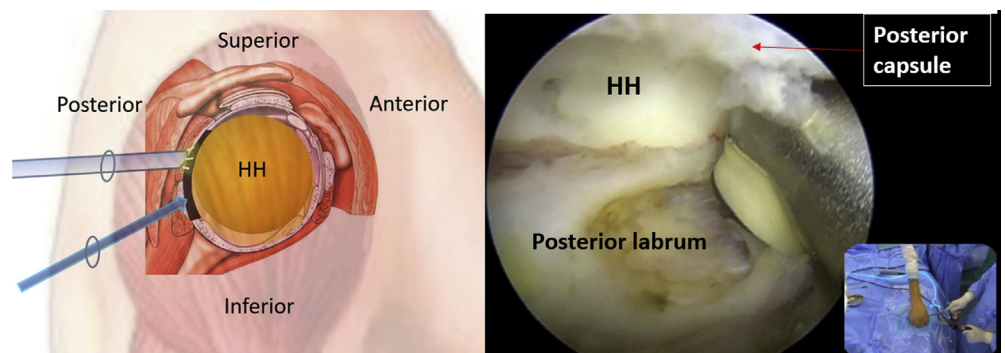
### Creating Working Space Just Posterior to the Posterior Capsule

From the posterior portal, the trocar with the obturator is placed against the posterior capsule and the hard structure in front of it, which is either the humeral head or scapular. With medial to lateral sliding of the trocar on the capsule, the step formed by the posterior glenoid edge and the glenohumeral space line can be defined. With the trocar staying in place, the obturator is replaced with the arthroscope (Video 1). The obturator is placed through the inferior posterior portal to the field of view of the arthroscope. A working space was created with the obturator just outside of the posterior joint capsule, underneath the posterior rotator cuff, at the site of the glenohumeral space (Fig 1).

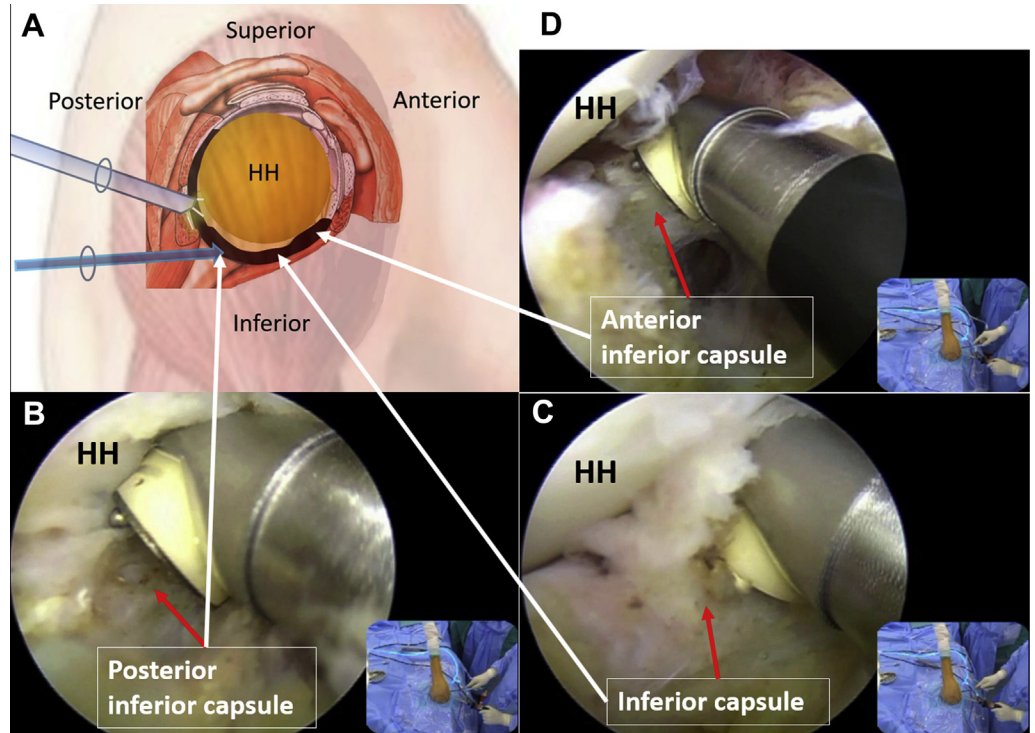
### Outside-in Release of the Posterior Capsule

The arthroscope is placed through the posterior portal into the working space. A radiofrequency probe is placed through the posteroinferior portal also into the

**Fig 2.** Release the posterior capsule from outside in through double posterior portals. Right shoulder viewed from the posterior portal. (HH, humeral head.)



**Fig 3.** Release the posterior inferior, inferior, and anterior inferior capsule through double posterior portals. Right shoulder viewed from the posterior portal. (A) Overview of posterior and inferior capsule release. (B) Posterior inferior capsule release. (C) Direct inferior capsule release. (D) Anterior inferior capsule release. (HH, humeral head.)



working space. A hole in the posterior capsule is created with the radiofrequency probe to view the humeral head or glenohumeral space; this hole is enlarged to identify the labrum. The posterior capsule is then released along the posterior labrum (Fig 2).

**Inferior Capsule Release**

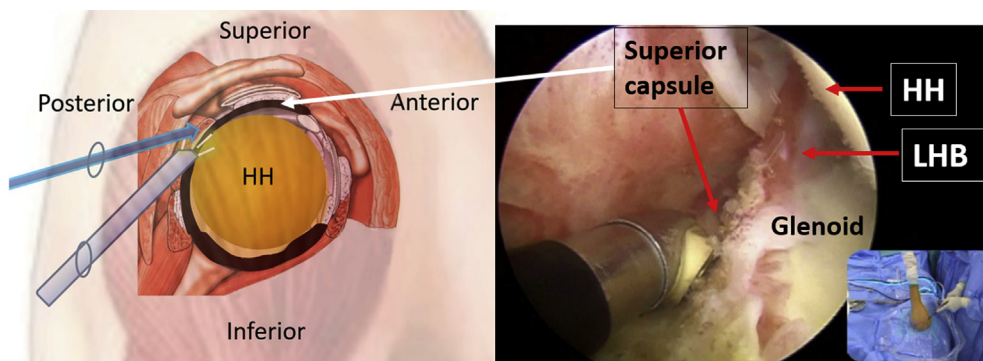
With the scope placed through the posterior portal, the instruments are placed in through the posteroinferior portal, to the inferior side of the glenoid. The inferior capsule ligament, which includes the posterior band of the inferior glenohumeral ligament, the inferior capsule, and the anterior band of the inferior glenohumeral ligament, is released from the posterior to anterior side in sequence (Fig 3).

**Superior Capsule Release**

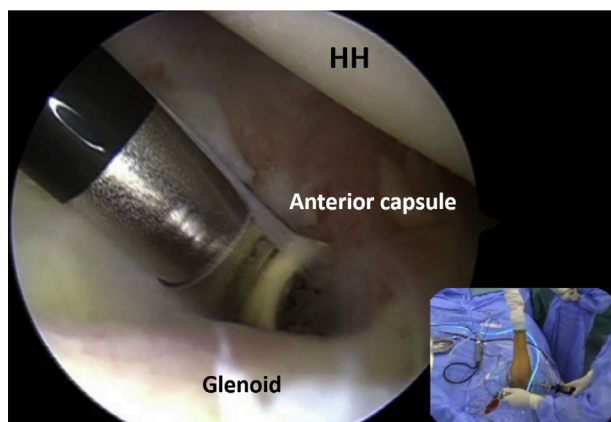
The indication for superior capsule release was a superior capsular recess less than 5 mm deep. In cases of severe or extremely severe joint contracture, the superior capsule recess always disappears or exists with a depth less than 5 mm. With the scope placed through the inferior posterior portal to the posterior superior side of the joint and the instruments placed through the posterior portal, the superior capsule is released (Fig 4).

**Access to the Glenohumeral Joint**

Following the superior capsule release, the arthroscope and instruments can be placed into the glenohumeral space. The anterior portal is fabricated,



**Fig 4.** Release the superior capsule through double posterior portals. Right shoulder viewed from the inferior posterior portal. (HH, humeral head; LHB, longhead of the biceps.)



**Fig 5.** Release the anterior capsule through the anterior portal. Right shoulder viewed from the posterior portal. (HH, humeral head.)

and the anterior release can be finished subsequently using only these 2 posterior portals or through the additional anterior portal (Fig 5).

## Discussion

The effectiveness of shoulder release has been proven in many previous studies<sup>7-9</sup>; however, in most of these studies, shoulder contracture would be classified as slight or moderate according to our clinical classifications. Shoulder release in cases of severe or extremely severe joint contracture is challenging for surgeons because of the difficulty in gaining intraarticular access. A forced entry has the risk of causing osteochondral injuries. To mitigate this problem, Lafosse et al.<sup>10</sup> developed a special outside-in release technique to first remove the rotator

**Table 2.** Pearls and Pitfalls in Posterior Outside-in Release of Shoulder

1. Both the posterior and the inferior-posterior portals should be at the same level as the glenoid surface.
2. The safest way to insert the trocar with the obturator into the joint capsule is to locate the site of the glenohumeral space and then put them proximally, instead of directly to the coracoid tip. Otherwise, they may be inserted into the humeral head.
3. The working space should be created at the same level as the glenoid surface. The trick to define the glenoid step is pushing the instrument against the posterior capsule and moving it medial and laterally.
4. When making the hole through the capsule with the radio-frequency probe, try to minimize damage to the humeral cartilage underneath by starting the release close to the labrum.
5. In releasing the inferior capsule, care should be taken to stay close to the inferior labrum. In this way, we can avoid axillary nerve injury.
6. Release the superior capsule and restore the superior capsule recess with a depth limit of 10 mm to avoid superior scapular nerve injury.
7. Fluid circulation is needed during release to prevent thermal damage to the cartilage.

interval tissue from the anterolateral side outside the capsule to gain access into the joint. This is a very useful anterior release technique in cases of severe joint contracture, but it is less useful for inferior capsular release. Xu et al.<sup>11</sup> proposed a trans-cuff portal to initialize visualization of the glenohumeral joint; however, it is still difficult to gain access to the glenohumeral joint using this initial step. From our point of view, the current technique is special because we start shoulder release from the posterior side with an outside-in manner. We believe that our release protocols are more practical. By using double posterior portals and outside-in release techniques, we overcame the challenge of the inaccessibility to the glenohumeral joint in our clinical practice in more than 120 patients.

For patients with severe shoulder contractures, many surgeons prefer to perform MUA before glenohumeral joint arthroscopy to secure an intra-articular access. However, in our clinical practice, we never perform a MUA before surgery because of the risk of fractures, dislocations, or inadvertent soft-tissue injuries. Additionally, with the current release technique, we can secure an intraarticular access and accomplish a complete release in all cases, regardless of the severity of joint contractures. Because of the risk of axillary nerve injury by instrumental capsular release, some surgeons perform an incomplete release first and thereafter rely on a MUA to relax the remaining capsule, especially the inferior capsule.<sup>10</sup> Based on our experience, for patients with severe or extremely severe joint contractures, the key to a safe shoulder release is the use of 2 posterior portals and releasing the inferior capsule close to the glenoid (Table 2).

The main risk of this technique is thermal injury of the cartilage of the humeral head during outside-in posterior capsule release because the posterior capsule is stick to the humeral head. Though it is almost inevitable, we can reduce this kind damage to the least by performing release close to the glenoid rim.

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