

Diagnostic Shoulder Arthroscopy: Surgical Technique

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Abstract: Shoulder arthroscopy is the second most common orthopaedic procedure. Diagnostic arthroscopy of the shoulder requires an efficient and reproducible technique. In this Technical Note, we describe a step-wise approach to diagnostic arthroscopy of the shoulder. This technique is performed using a posterior viewing portal. It can be performed from the beach chair or the lateral decubitus position. This technique uses a 2-circle approach: the surgeon first evaluates the glenoid aspect of the joint space, followed by the humeral aspect of the joint space. This method ensures a complete and consistent evaluation of the glenohumeral joint.

Shoulder arthroscopy is the second most common orthopaedic procedure behind knee arthroscopy for partial meniscectomy.¹ Shoulder arthroscopy is commonly used to treat pathologic shoulder conditions including rotator cuff tears, labral tears, proximal biceps pathology, loose bodies, degenerative arthritis, adhesive capsulitis, and subacromial impingement. Arthroscopy has several advantages compared to open surgery, including a more comprehensive view of intra-articular pathology, smaller incisions with decreased morbidity, the potential for a more rapid rehabilitation, and a faster return to work.² A systematic approach to diagnostic shoulder arthroscopy is important to ensure a complete and efficient examination of the glenohumeral joint. Here we present a basic, step-wise approach to diagnostic shoulder arthroscopy. This technique is based on a 2-circle approach where the surgeon first visualizes structures in the glenoid circle followed by visualization of structures in the humeral circle.³

Surgical Technique

Patient Positioning

Patient positioning is primarily a matter of surgeon preference, as both the lateral decubitus and beach chair positions have been shown to be safe and effective. The lateral decubitus position helps prevent intraoperative cerebral hypoperfusion, and the use of balanced suspension allows for distraction across the glenohumeral joint, which may improve intra-articular visualization.² The beach chair position, on the other hand, allows the surgeon to adjust the arm position intraoperatively and to easily convert to an open procedure if needed.⁴ Additionally, it has a decreased risk of traction related injury.^{2,4} In either case, great care is taken to adequately secure the head and pad all bony prominences to prevent the development of pressure sores and neuropraxias.^{5,6}

Sterile Patient Preparation

Sterile preparation and draping are performed after appropriate positioning. Our preference is to have the patient wash the surgical site at home with a hibiclens scrub the night before and the morning of surgery. Body hair is removed with clippers in the preoperative holding area. Once the patient is intubated and positioned in the operating room, the operative extremity is isolated with plastic nonsterile drapes. The entire upper extremity, from axilla to finger tips, is wiped with alcohol, benzoyl peroxide, and Chloraprep. Benzoyl peroxide is used to decrease the bacterial load of *Propionibacter acnes*. The shoulder and upper extremity are draped with sterile drapes, and the hand and forearm are wrapped with an impervious stockinette. The edges of the drapes are sealed to the skin with 2-inch strips of

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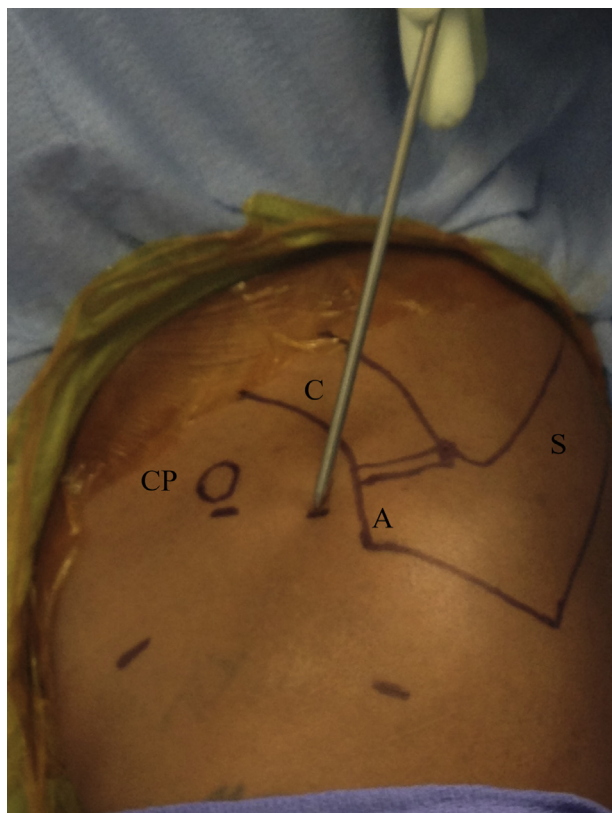


Fig 1. The acromion (A), coracoid process (CP), clavicle (C), acromioclavicular joint, and scapular spine (S) are marked before beginning the procedure.

Ioban. The shoulder is prepped again with a second Chloraprep stick, and the entire surgical team changes their outer gloves.

Identification of Surface Landmarks

After prepping and draping, surface landmarks are identified and marked, including the acromion, coracoid, clavicle, acromioclavicular joint, and scapular spine as shown in Figure 1. The posterolateral corner of the acromion is always palpable, even in shoulders with a large soft tissue envelope.²

Standard Portal Placement

Posterior Portal

The standard posterior portal should be placed in the “soft spot” in the raphe of the infraspinatus. This is

typically 2 cm inferior and 2 cm medial to the posterolateral border of the acromion but may vary depending on patient size.^{2,7} An 18-gauge spinal needle may be inserted through this location prior to portal incision to approximate the appropriate trajectory. When entering the joint, a blunt trocar is used and aimed toward the coracoid until the posterior capsule is penetrated.²

Anterior Portals

The exact location of the anterior portal is dependent on the intended procedure. In cases of arthroscopy for rotator cuff repair or biceps tenodesis, the anterior portal is most commonly placed centrally within the rotator interval, just proximal to the subscapularis tendon. In cases of arthroscopy to address labral pathology, 2 anterior portals are commonly used. The anteroinferior portal is typically the working portal and is placed just proximal to the subscapularis tendon. The anterosuperior portal is an accessory portal that may be used for viewing or shuttling of sutures and is placed directly above or just anterior to the biceps tendon, making sure not to damage the supraspinatus tendon.² These portals are often established using an “outside-in” technique, where a spinal needle is inserted under direct arthroscopic visualization to identify the appropriate location of this portal.² Additional portals are highlighted in Table 1.^{2,8,9}

Diagnostic Arthroscopy

The authors use a 2-circle approach based on the Southern California Orthopedic Institute “15-point system” for a complete diagnostic examination of the shoulder.³ The glenoid aspect of the joint is examined using the first 9 positions. The humeral aspect of the joint space is examined with positions 10 through 13. Position 14 is an examination of the subacromial space.

Position 1

Insert the standard, 30° arthroscope (Smith & Nephew) through the posterior portal and the probe through the anterior portal as shown in Video 1. Once the rotator interval is clearly visible, examine the superior labrum and biceps anchor for tears, instability, and unstable SLAP lesions (Fig 2).³

Table 1. Additional Portals

Portal	Location	Indication
5 o'clock portal	Anteroinferior transsubscapularis	Bankart repair ⁸
7 o'clock portal	Posteroinferior	Posterior labral repair, loose body removal ⁹
Neviaser portal	Superior, posterior to acromioclavicular joint	Suture passage during SLAP repair and rotator cuff repair ²
Portal of Wilmington	Posterolateral, 1 cm lateral to posterolateral acromion	Anchor insertion during SLAP repair and rotator cuff repair ²

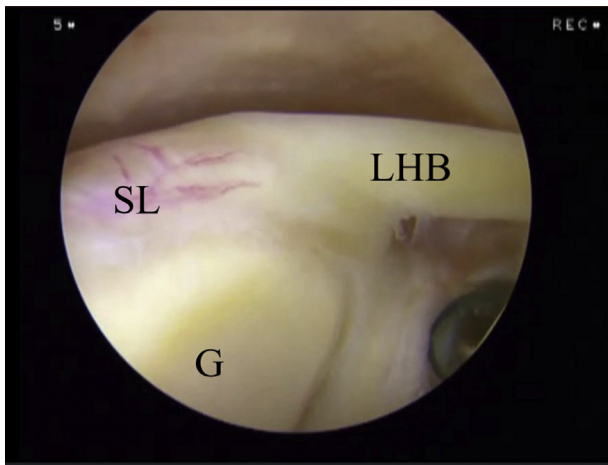


Fig 2. The rotator interval, superior labrum and biceps anchor are visible after entering the joint space (right shoulder in the beach chair position, as viewed from the posterior portal). (SL, superior labrum; G, glenoid; LHB, long head of the biceps tendon.)

Position 2

Rotate the arthroscope superiorly to examine the long head of the biceps tendon (LHBT). A probe can be used to manipulate the LHBT into the joint to evaluate for pathology and biceps subluxation (Fig 3).³

Position 3

Examine the superior glenohumeral ligament (SGHL), which often runs with the LHBT.

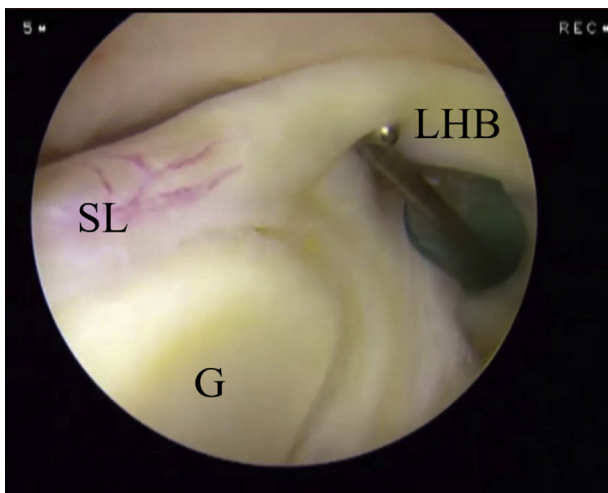


Fig 3. The probe is used to manipulate the long head of the biceps tendon to assess for pathology (right shoulder in the beach chair position, as viewed from the posterior portal). (SL, superior labrum; G, glenoid; LHB, long head of the biceps tendon.)

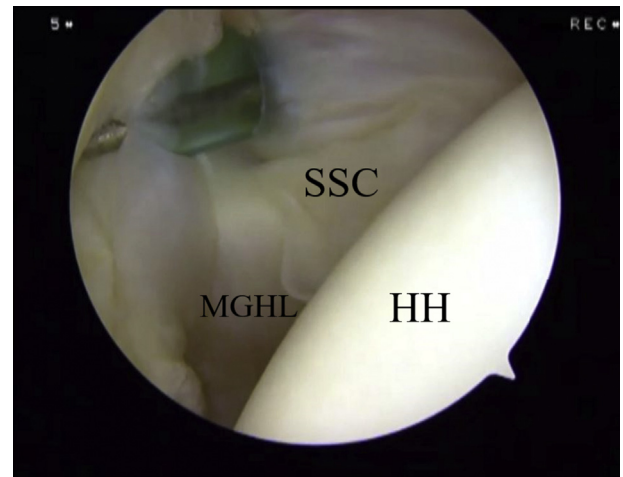


Fig 4. The middle glenohumeral ligament and the subscapularis tendon are visible in this position. The subscapularis is anterior to the middle glenohumeral ligament (right shoulder in the beach chair position, as viewed from the posterior portal). (MGHL, middle glenohumeral ligament; SSC, subscapularis tendon; HH, humeral head.)

Position 4

Rotate the arthroscope inferiorly to visualize the middle glenohumeral ligament (MGHL). Note that there is significant anatomical variation seen in the MGHL. The ligament may not be present, it may exist as a cord-like structure (Buford complex), or it may be a well-defined structure.³ The Buford complex is a specific anatomic variant consisting of a cord-like MGHL that inserts directly onto the LHBT resulting in an absent anterosuperior labrum (Fig 4).¹⁰

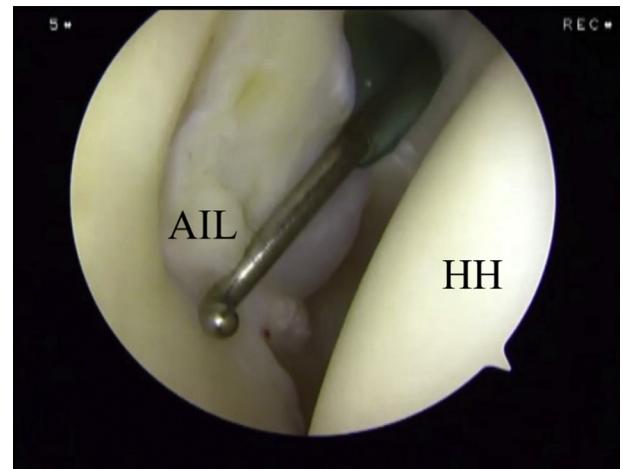


Fig 5. The probe is used to examine the anterior inferior labrum and glenoid cartilage (right shoulder in the beach chair position, as viewed from the posterior portal). (AIL, anterior inferior labrum; HH, humeral head.)

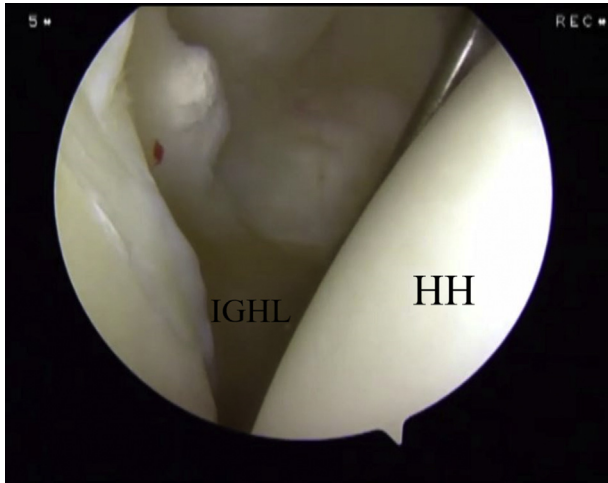


Fig 6. The probe is used to assess the inferior glenohumeral ligament (right shoulder in the beach chair position, as viewed from the posterior portal). (IGHL, inferior glenohumeral ligament; HH, humeral head.)

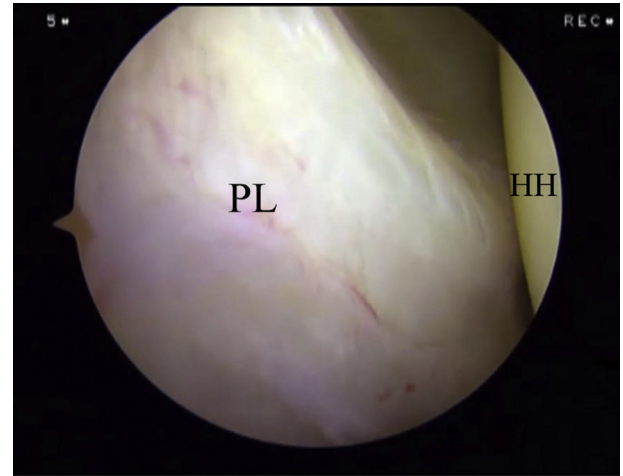


Fig 8. In this position, the posterior aspect of the joint space can be assessed, including the posterior labrum (right shoulder in the beach chair position, as viewed from the posterior portal). (PL, posterior labrum; HH, humeral head.)

Position 5

Examine the subscapularis tendon for signs of injury. External and internal rotation of the arm can be used to better visualize the tendon. A posterior force can be applied to the humerus to translate the humeral head posteriorly, as described by Denard and Burkhart,¹¹ to tension the subscapularis and better visualize the attachment to the lesser tuberosity (Fig 4).

Position 6

Advance the scope anteriorly and inferiorly to examine the anteroinferior labrum. Anterior

instability can stem from anterior labral tears (i.e., Bankart lesions). In a Bankart lesion the anterior labrum and the anterior inferior glenohumeral ligament (AIGHL) are detached from the anterior glenoid rim.^{12,13} An anterior labral periosteal sleeve avulsion (ALPSA) can cause the anterior labrum to appear absent on examination. In an ALPSA lesion, the anterior labrum, AIGHL, and anterior scapular periosteum are separated from the anterior glenoid rim and shifted medially on the glenoid neck.¹² The anterior scapular periosteum remains intact in an ALPSA lesion (Fig 5).

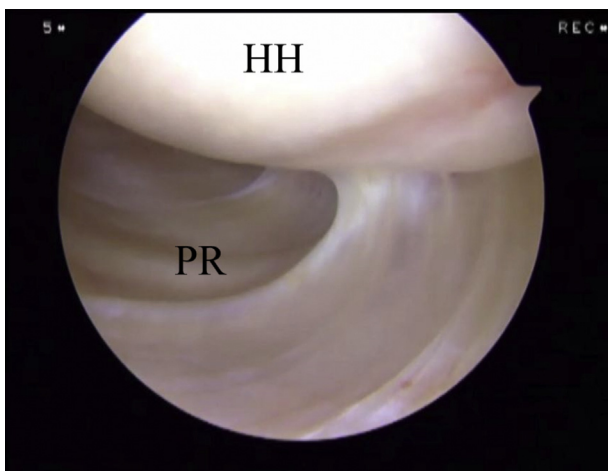


Fig 7. The posterior recess is a possible location for loose bodies (right shoulder in the beach chair position, as viewed from the posterior portal). (PR, posterior recess; HH, humeral head.)



Fig 9. Returning to the starting position, the posterior superior labrum can be visualized. (right shoulder in the beach chair position, as viewed from the posterior portal). (PSL, posterior superior labrum; G, glenoid.)

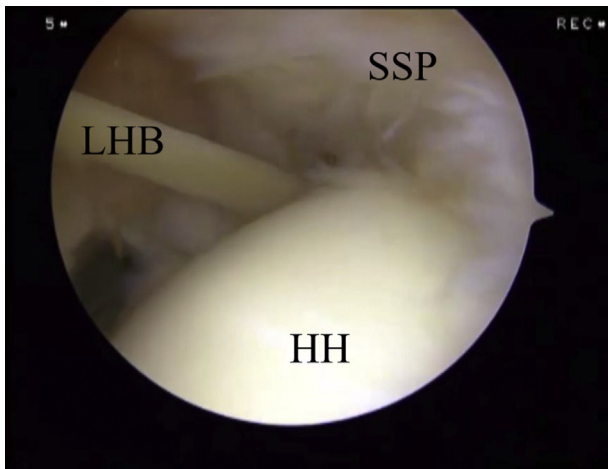


Fig 10. The attachment of the supraspinatus to the greater tuberosity of the humerus is examined, partial undersurface tearing of the supraspinatus is visible (right shoulder in the beach chair position, as viewed from the posterior portal). (SSP, supraspinatus; LHB, long head of the biceps tendon; HH, humeral head.)

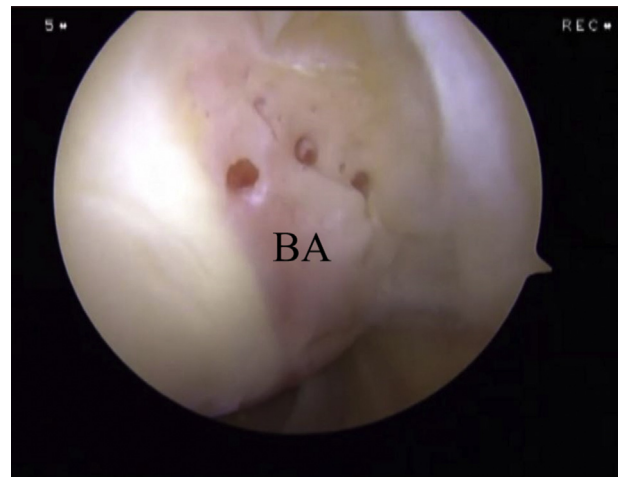


Fig 12. The articular surface of the humeral head is visualized, including the bare area (right shoulder in the beach chair position, as viewed from the posterior portal). (BA, bare area of humeral head.)

Position 7

Rotate the arthroscope inferiorly to assess the inferior glenohumeral ligament (IGHL) complex and the axillary recess. The IGHL consists of the AIGHL and posterior inferior glenohumeral ligament (PIGHL; Fig 6). As the shoulder abducts, these ligaments tighten. The posterior recess is a common location for loose bodies (Fig 7).³

Position 8

Rotate the arthroscope posteriorly to visualize the posterior labrum (Fig 8). Bennett lesions (posteroinferior glenoid rim ossifications),¹⁴ reverse

Bankart lesions, and reverse HAGL lesions can be appreciated when viewing the posterior aspect of the joint.

Position 9

Rotate the arthroscope superiorly to view the posterior superior labrum, which can be manipulated with a probe to evaluate for tears and instability, as some SLAP tears can extend down the posterior labrum (Fig 9). The arm can be taken out of traction and placed into a position of abduction and external rotation while visualizing the posterior superior labrum to evaluate for a “peel back” lesion.¹⁵ This

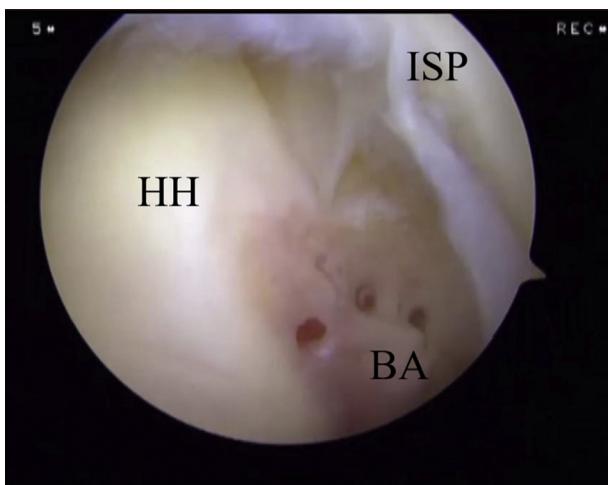


Fig 11. The attachment of the infraspinatus to the greater tuberosity of the humerus is visualized (right shoulder in the beach chair position, as viewed from the posterior portal). (ISP, infraspinatus; HH, humeral head; BA, bare area of humeral head.)

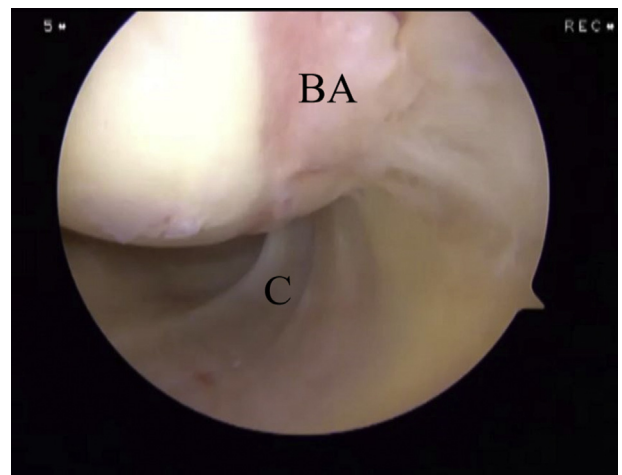


Fig 13. The capsular attachments to the humeral head are visualized (right shoulder in the beach chair position, as viewed from the posterior portal). (C, joint capsule; BA, bare area of humeral head.)

Table 2. Pearls and Pitfalls

Pearls	Pitfalls
<ul style="list-style-type: none"> • Can examine the entire glenohumeral joint space using the posterior viewing portal • Multiple portals can safely be established to view different aspects of the joint • Manipulate the arm intraoperatively to improve visualization • Visualize the subacromial space 	<ul style="list-style-type: none"> • Mark surface landmarks and portal sites before joint insufflation • Avoid damage to articular cartilage • Must recognize anatomical variants • Be aware of 3-dimensional anatomy and proximity to neurovascular structures

lesion is common in overhead athletes and may be a pathologic finding.

Position 10

Advance the arthroscope superiorly and anteriorly to assess the attachment of the supraspinatus tendon to the greater tuberosity (Fig 10).

Position 11

Examine the attachment of the infraspinatus to the humeral head to the greater tuberosity (Fig 11).

1. Infraspinatus tendon
2. Tendonitis, tears, fraying

Position 12

Rotate the scope posteriorly and inferiorly to assess the articular surface, especially the bare area (Fig 12). It is important to appreciate the anatomical humeral head bare area without mistaking it for a Hill-Sachs lesion.³

Position 13

Examine the capsule for signs of adhesive capsulitis including contracture and fibrinous synovitis (Fig 13).¹⁶ The capsular attachment to the humerus should also be visualized both anteriorly and posteriorly to rule out HAGL lesions.¹⁷

Position 14

Enter the subacromial space by advancing the trocar under the acromion, aiming it toward the anterolateral edge of acromion and coracoid. If the

subacromial space has been successfully entered, there should be space medially and laterally to move the trocar. Insert the arthroscope into the subacromial space and examine the relevant structures. Turn the scope superiorly to examine the inferior acromion and the undersurface of the coracoacromial ligament. Rotate the scope inferiorly to examine the subacromial bursa and the rotator cuff.

Discussion

Diagnostic shoulder arthroscopy is frequently used to evaluate and treat several shoulder conditions including rotator cuff tears, labral tears, adhesive capsulitis, and subacromial impingement. The systematic approach detailed here will help facilitate complete and consistent evaluation of the glenohumeral joint during these procedures. The risks associated with this technique are iatrogenic injuries stemming either from patient positioning or from the arthroscopy itself. This technique is reproducible and allows for consistent visualization of all pertinent structures. In addition, it can be performed using both the beach chair and lateral decubitus positions depending on surgeon preference. Arthroscopy is the gold standard for diagnosis of shoulder pathology, and therefore a reliable approach to diagnostic arthroscopy is key to consistent and complete evaluation of the glenohumeral joint. The pearls and pitfalls of this technique are summarized in Table 2. The advantages and disadvantages of this technique are highlighted in Table 3.

Table 3. Advantages and Disadvantages

Advantages	Disadvantages
<ul style="list-style-type: none"> • Reproducible technique • Visualization of all pertinent structures • Technique can be performed in beach chair or lateral decubitus positions • Thorough 360° glenohumeral evaluation • Gold standard to diagnose shoulder pathology 	<ul style="list-style-type: none"> • Requires general anesthesia • Risk of infection • Risk of iatrogenic injury to anatomic structures • Risk of traction neuropathy in lateral decubitus position • Risk of cerebral hypoperfusion in beach chair position

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