Technical Note

Basics of Shoulder Arthroscopy Part II: Diagnostic Arthroscopy in the Beach-Chair Position

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Abstract: Shoulder arthroscopy is a popular modality for the treatment of shoulder pathology. Since its advent in the 1970s, significant advancements have been made in both technology and technique. Shoulder arthroscopy is performed in either the beach-chair or lateral decubitus positions, and each position has its unique benefits and considerations. Beach-chair positioning, initially described in the 1980s, has become the preferred method of positioning for most arthroscopic procedures. In this work, we describe the history of beach-chair positioning for shoulder arthroscopy. We outline a reproducible and teachable method for consistent and comprehensive diagnostic arthroscopy in the beach-chair position. Pearls, pitfalls, advantages, and disadvantages of diagnostic arthroscopy in this position are discussed. When properly executed, diagnostic arthroscopy in the beach-chair position can effectively identify and characterize intra-articular shoulder pathologies.

Shoulder arthroscopy is increasingly utilized to manage pathologies of the shoulder joint.[1] Since the advent of modern shoulder arthroscopy in the 1970s, significant advancements have been made in instrumentation and surgical techniques. Beach-chair positioning, initially described in the 1980s, was presented as an alternative option to the standard lateral decubitus positioning. It is often emphasized as a safer alternative to lateral decubitus positioning due to the lack of traction placed on the arm.[2] However, concerns have been raised regarding the risk of cerebral malperfusion intraoperatively.[3] In modern day, beach-chair positioning is safely utilized for arthroscopic management of various shoulder pathologies. Many believe that beach-chair positioning is superior to lateral decubitus positioning for rotator cuff repairs and subacromial decompression, citing improved access to the anterior shoulder and easier palpation of external landmarks.[4,5] The ease of arm manipulation and relative simplicity of equipment compared to the lateral decubitus traction apparatus improve ease of setup and positioning. In addition, its anatomic positioning has made the beach-chair position a favorite among novice arthroscopists. Over time, it has remained the preferred method of positioning for most arthroscopic procedures regardless of surgeon experience.

Beach-chair positioning provides satisfactory access to the shoulder for anterior stabilization procedures and allows for various anesthetic options depending on patient and anesthesiologist preference. In addition, the anterior shoulder is easily accessible in the event an arthroscopic procedure must be converted to open. It was traditionally thought that labral repair in the beach-chair position was inadequate due to difficulty with visualizing and accessing the inferior glenoid. However, many surgeons perform successful labral repairs in the beach-chair position without significant difficulty.[6] Key to performing any successful shoulder arthroscopy is skill and familiarity with a diagnostic evaluation. Although many approaches exist for diagnostic evaluation of the shoulder, a systematic approach is essential to ensure thorough evaluation of the shoulder is conducted. In this installment on the Foundations of Shoulder Arthroscopy, we demonstrate

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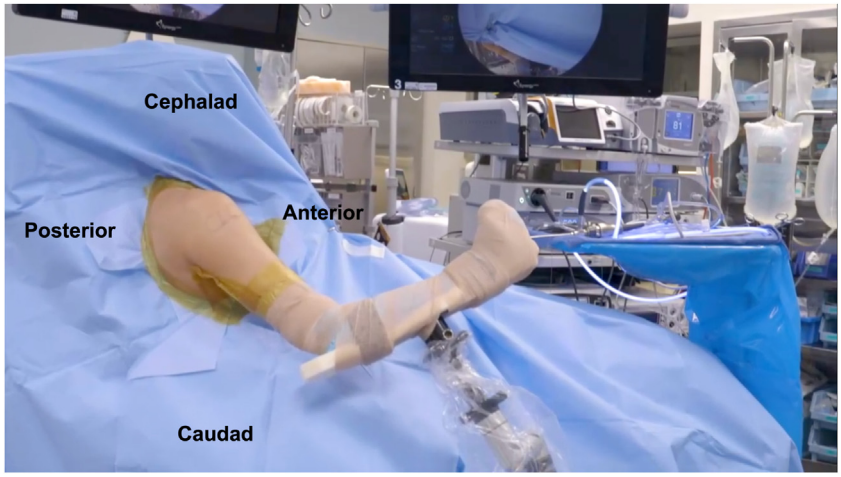

Fig 1. Patient positioning and preparation of the surgical field. This figure demonstrates appropriate beach-chair positioning for right shoulder arthroscopy.

a reproducible and teachable method for efficient and effective diagnostic shoulder arthroscopy in the beach-chair position.

Surgical Technique

After patient positioning, prepping, and draping, portal placement is planned. Prior to incision, care must be taken to appropriately identify and mark the important external anatomic landmarks (Figs 1 and 2). Palpation and marking of the borders of the acromion, coracoid, and acromioclavicular joint are key to ensuring appropriate portal placement. Now, access to the posterior shoulder can be obtained. The posterior portal is typically positioned about 2 cm inferior and 2 cm medial to the posterolateral corner of the acromion and functions as the primary viewing portal. Sharp dissection is carried through the skin, and a blunt trocar is introduced into the posterior shoulder. Care is taken to gently probe the glenoid and humeral head with the trocar to ensure appropriate positioning for entry into the posterior capsule. The trocar is advanced with a trajectory aimed toward the coracoid. The blunt trocar is then removed, and the camera is inserted into the joint.

We begin viewing from the posterior portal with the camera angled inferiorly to visualize the glenohumeral joint (Fig 3). Care is taken to ensure the horizon of the arthroscope is maintained throughout this process. Our diagnostic arthroscopy begins by viewing the humeral head and glenoid, ensuring appropriate visualization of the typical glenoid bare area. We advance the camera into the joint and use it for distraction to access the axillary pouch (Fig 4). The arthroscopist's hand is often placed at the site of entry of the camera to prevent

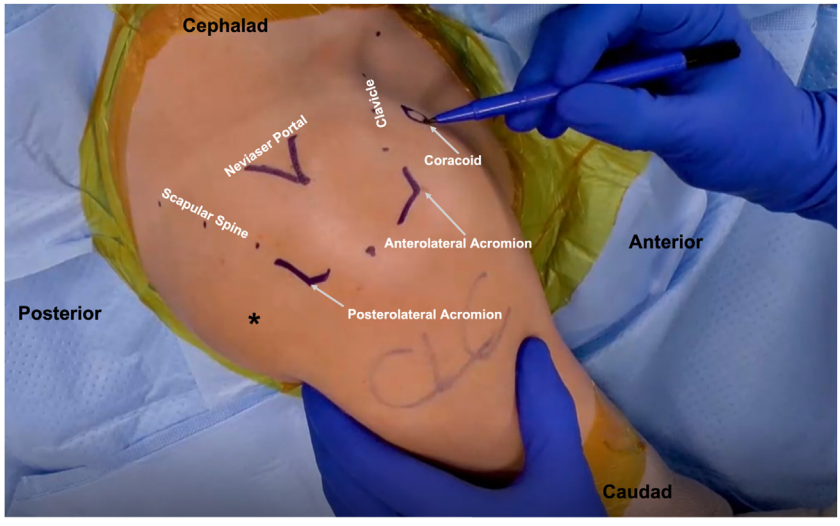

Fig 2. Anatomic landmarks. Important anatomic landmarks necessary for successful execution of diagnostic arthroscopy in the beach-chair position. It is important to outline landmarks prior to insufflation to prevent obscuring native anatomy. We enter the joint from the soft spot posteriorly (asterisk), which is normally 2 cm inferior and 2 cm medial to the posterolateral corner of the acromion.

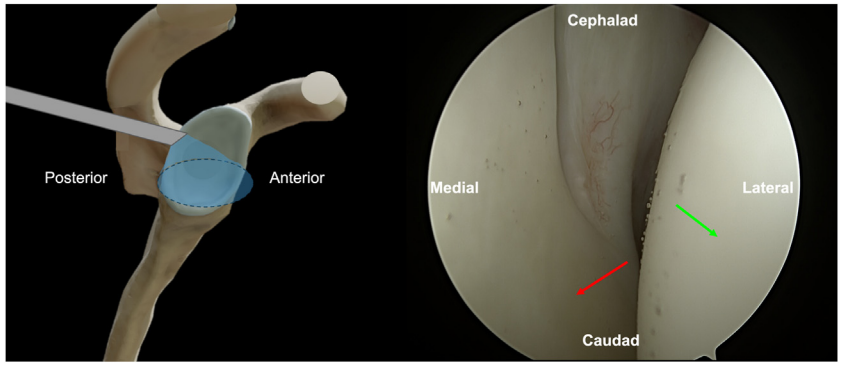

Fig 3. Initial glenohumeral joint view. A view of the glenohumeral joint from the posterior portal with the camera angled inferiorly. The humeral head (green arrow) can be visualized on the right of the screen, and the glenoid (red arrow) can be seen on the left. Here, intra-articular pathology such as arthritis or chondral defects can be seen.

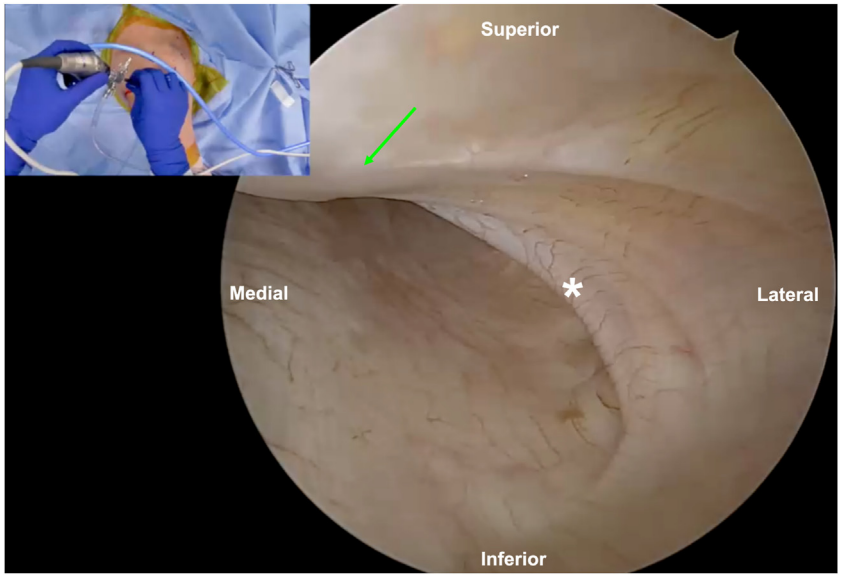

Fig 4. Inferior axillary pouch. When viewing from the posterior portal with the scope angled inferiorly (inset), the inferior axillary pouch is visualized. The inferior glenohumeral ligament (IGHL) (asterisk) can be seen inserting on the inferior humeral head (green arrow). Here, loose bodies or avulsion injuries of the IGHL can be seen.

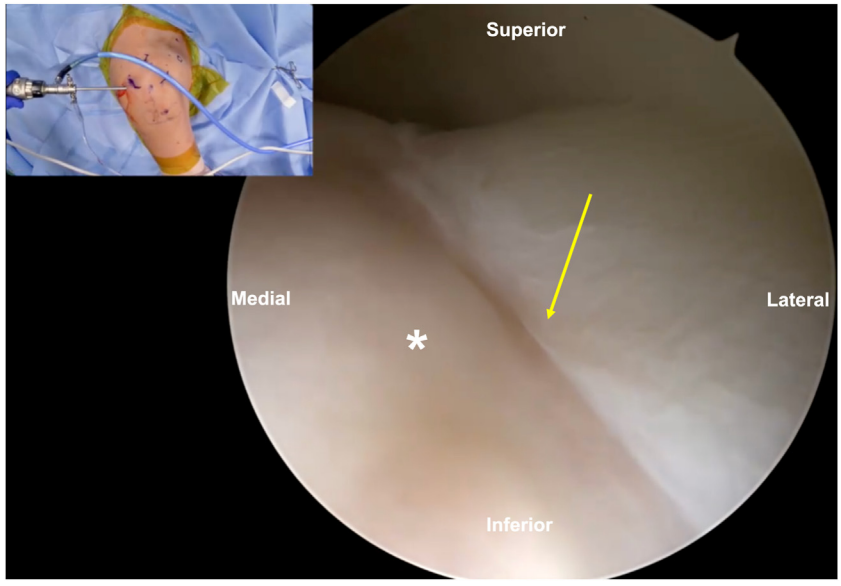

Fig 5. Infraspinatus insertion. When viewing from the posterior portal, the insertional footprint of the infraspinatus (yellow arrow) is visualized to be intact. As expected, it is recessed from the articular margin, allowing visualization of the bare area of the humeral head (asterisk).

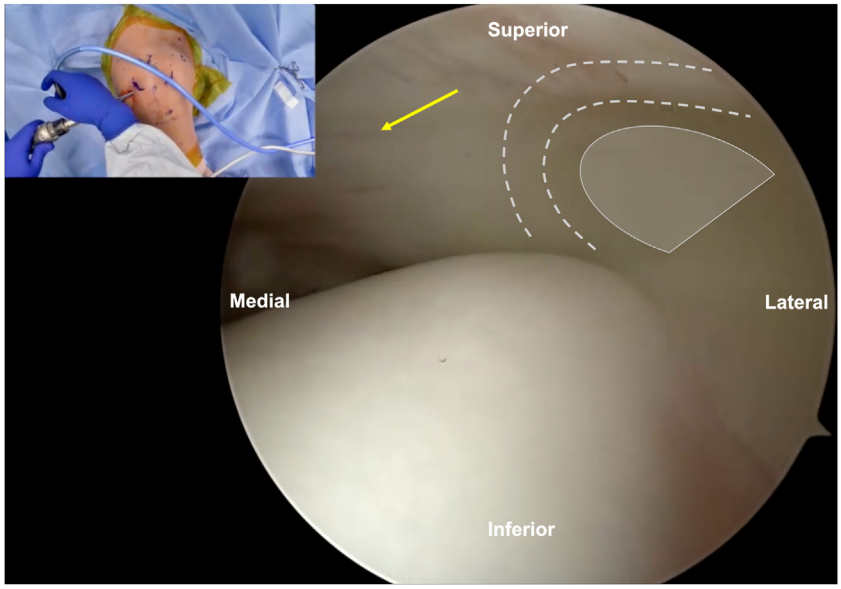

Fig 6. Rotator cable and crescent. When viewing from the posterior portal, the supraspinatus (yellow arrow) can be viewed along with the rotator cable (dashed lines) and crescent (semicircle).

falling out of the joint during these maneuvers. Here, the inferior capsule and loose bodies may be assessed. We then progress posteriorly along the humeral head to evaluate the insertion of the rotator cuff (Figs 5 and 6). The bevel of the camera is then turned medially to visualize the posterior labrum (Fig 7). The camera is then advanced through the rotator interval. To assess the subscapularis, we turn the bevel of the camera inferiorly and laterally. We then pull the humeral head posteriorly to tension the subscapularis for better visualization of its insertional footprint (Fig 8).

Once the posterior portal has been established and satisfactory visualization of structures is complete, entry into the anterior shoulder is pursued. Under direct arthroscopic visualization, a spinal needle is inserted into the anterior shoulder. There can be significant variation in placement of the anterior portal depending on the procedure being performed. For cases of shoulder instability, the anterior portal is placed low and medial within the rotator interval. A second accessory portal can be created high and lateral within the rotator interval just anterior to the supraspinatus. If only one

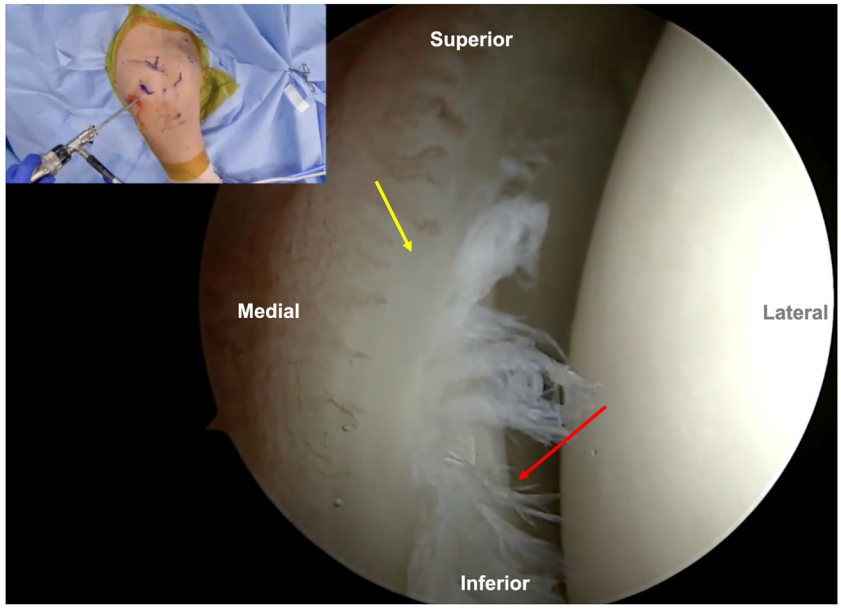

Fig 7. Posterior labrum. Viewing from the posterior portal with the camera angled medially, the posterior labrum (yellow arrow) is visualized and contains a large tear (red arrow).

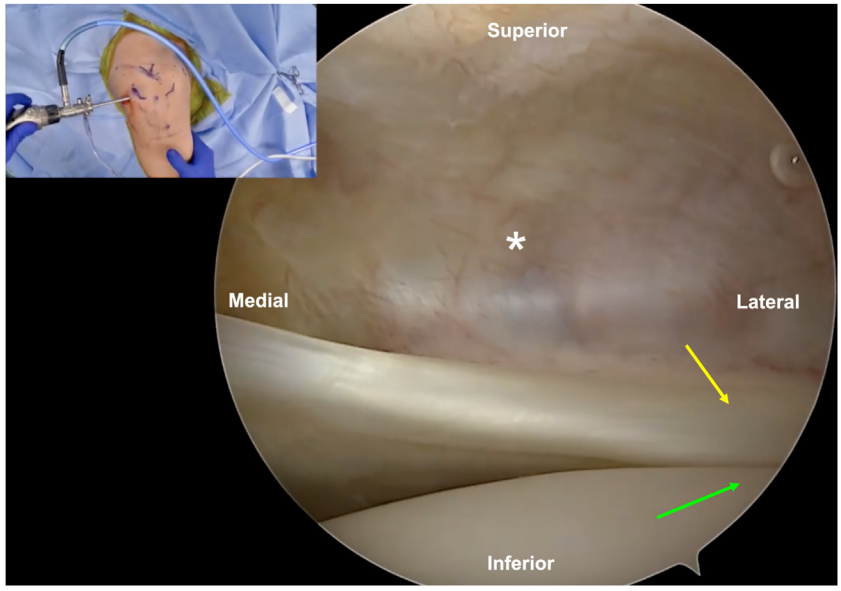

Fig 8. Subscapularis. When viewing through the posterior portal, the scope is advanced through the glenohumeral joint. The scope is angled inferiorly to view the subscapularis tendon (yellow arrow) inserting on the humeral head (green arrow). The rotator interval (asterisk) is typically utilized to establish an anterior portal.

portal is needed, it can typically be placed in the middle of the rotator interval. A detailed demonstration of portal placement can be assessed in Video 1.

After the anterior portals are established, a probe can be used to assess the integrity of the biceps tendon anchor (Fig 9). The shoulder can also be viewed through the anterior portals for better visualization of the posterior labrum, rotator cuff, and capsule (Fig 10). A switching stick can be used when alternating viewing portals to minimize trauma to surrounding tissues. Cannulas can then be inserted into the posterior and/or anterior portals for instrumentation. While Arthrex cannulas are used in this case, there are many proprietary options that are equally effective. Surgeon familiarity should be carefully considered when selecting cannula manufacturer. Pearls and pitfalls regarding diagnostic shoulder arthroscopy are further detailed in Table 1.

Discussion

Shoulder arthroscopy is increasingly utilized for management of multiple intra-articular pathologies. Magnetic resonance imaging and other advanced imaging have significantly improved preoperative

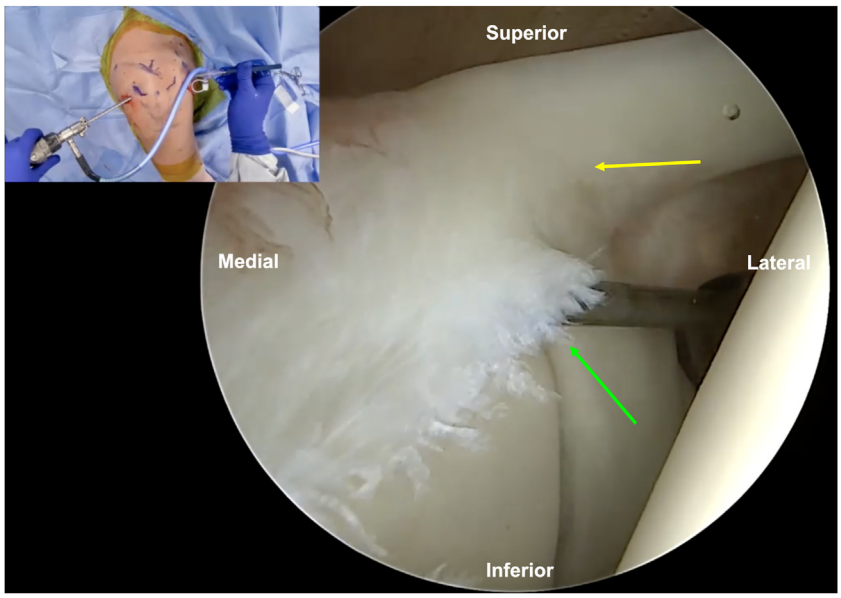

Fig 9. Biceps tendon. After establishment of the anterior portal, we insert a cannula and probe to assess the integrity of the biceps tendon anchor (yellow arrow). We can see that the posterior labral tear extends to involve the biceps anchor (green arrow).

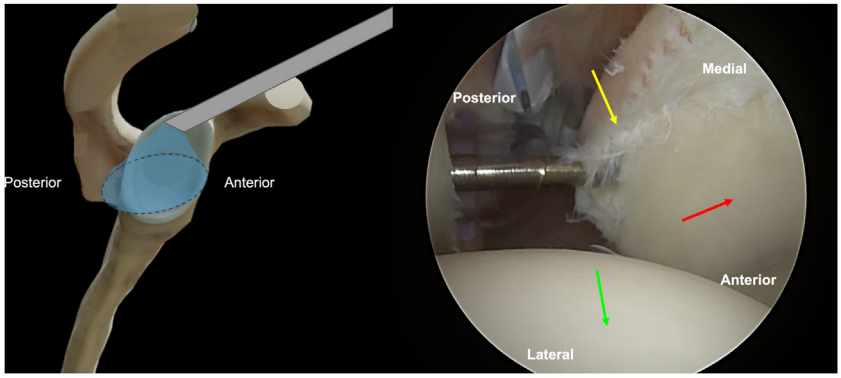

Fig 10. A view of the glenohumeral joint from the anterior portal with the camera angled inferiorly. Here we can view the glenoid on the right of the screen (red arrow) and the humeral head at the bottom of the screen (green arrow). The labrum (yellow arrow) can be visualized as it is being repaired from the posterior portal.

detection of intra-articular pathologies. However, performing a thorough and consistent diagnostic arthroscopy remains the gold standard for detecting subtle shoulder pathology. Beach-chair positioning allows for evaluation of structures in anatomic alignment and provides ease of access to the anterior shoulder for portal placement or open procedures. Even with advances in lateral decubitus positioning, beach-chair positioning remains popular among arthroscopists to manage a myriad of shoulder pathologies. However, disadvantages of this position have been described. There can be difficulty with adequate visualization of the anterior and inferior glenoid, mechanical blockage of adequate instrumentation due to patient head position, and concerns regarding cerebral perfusion.[7] The advantages and disadvantages of diagnostic arthroscopy in the beach-chair position should be weighed in light of the patient's unique needs prior to proceeding (Table 2). Regardless, no significant differences have been demonstrated regarding patient safety, satisfaction, and complications between these 2 positions.[8] Since its description in the 1980s, beach-chair positioning has been widely and safely used for arthroscopic management of shoulder pathologies. Our described technique for a diagnostic arthroscopy in the beach-chair position allows for efficient, consistent, and effective evaluation of the shoulder joint for the novice and expert alike.

Disclosures

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: C.L.C. is a paid consultant for Arthrex, receives research support from Major League Baseball, and receives publishing royalties or financial or material support from Springer. All other authors (M.N.U., F.M., A.J.T.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Table 1. Pearls and Pitfalls of Diagnostic Shoulder Arthroscopy in the Beach-Chair Position

Pearls	Pitfalls
Use the arm holder to facilitate visualization instrumentation. For example, abduct the arm to facilitate supraspinatus assessment.	Inattention to articular cartilage can result in iatrogenic injury.
Use a switching stick through both anterior and posterior portals when changing viewing/instrumentation to avoid soft tissue injury.	If landmarks are not marked prior to insufflation, palpation and subsequent portal placement may be difficult or incorrect.
The diagnostic arthroscopy can be efficiently completed through the posterior portal alone.	Failing to use the arm holder to change humeral head position may obscure key elements of the joint and surrounding tissues.
Ensure appropriate head positioning to avoid iatrogenic cervical injury.	Excessive external rotation can cause plexus strain.

Table 2. Advantages and Disadvantages of Diagnostic Shoulder Arthroscopy in the Beach-Chair Position

Advantages	Disadvantages
Anatomic alignment of shoulder facilitates visualization of structures and teaching	Head of the patient may obstruct optimal camera positioning
Ease of access to the anterior shoulder for instrumentation and visualization	Difficult visualization of the inferior glenoid for stabilization procedures
Easier access to airway for anesthesia	Increased risk of cerebral ischemia
Arm is freely mobile to facilitate visualization and instrumentation	Air/cautery bubbles in the joint may obscure view
Ease of conversion to an open procedure	

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