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# Shoulder Arthroscopy

Basic to Advanced Techniques

*Authored by William B. Stetson*





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- Basic to Advanced  
Techniques

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Contributors

William B. Stetson and Akin Akinwumi

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# Meet the author



Dr. William Stetson is an award-winning orthopaedic surgeon who is double board-certified in orthopaedic surgery and sports medicine and is the Olympic Team Doctor for the USA Men's and Women's Indoor Volleyball Teams. He is a sports medicine and arthroscopy specialist with expertise in the surgical reconstruction of complex shoulder, knee, and elbow injuries. He has over 25 years of teaching experience as a volunteer professor of orthopaedic surgery at the Los Angeles County and USC Medical Centre, where he teaches residents in orthopaedic surgery and arthroscopy. He has traveled all over the world teaching other surgeons arthroscopic surgery and founded his own non-profit Operation Arthroscopy ([www.operationarthroscopy.org](http://www.operationarthroscopy.org)), whose mission is to bring orthopaedic surgery and arthroscopy to those in need.



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# Preface

Diagnostic shoulder arthroscopy is the gold standard for diagnosing intra-articular shoulder pathology. With over 30 years of experience in shoulder arthroscopy, I have learned a tremendous amount not only from my own personal experience but also from being trained and mentored by the “Godfathers of shoulder arthroscopy”: Dr. Steve Snyder, Dr. Jim Esch, and Dr. Steve Burkhart. During my fellowship with Dr. Snyder at the Southern California Orthopedic Institute (SCOI) (Van Nuys, California, USA), I learned from one of the masters of shoulder arthroscopy. Since then, it has been my passion to learn as much as I could about shoulder arthroscopy, perfect my surgical techniques, and share that knowledge with other orthopaedic surgeons through lectures, cadaver lab sessions, and courses, not only here in the United States but also throughout the world. Having served as a shoulder laboratory instructor and director for over 25 years, I have witnessed numerous participants and lab instructors navigating the basics and advanced techniques of shoulder arthroscopy. Through this experience, I have learned a tremendous amount, which I will share with you in this book entitled “Shoulder Arthroscopy – Basic to Advanced Techniques”. I believe this book will be helpful to all those who perform shoulder arthroscopy, from beginners to experienced practitioners.

**William B. Stetson, M.D.**

Stetson Lee Orthopaedics and Sports Medicine Center,  
Burbank, California, USA

Associate Clinical Professor of Orthopaedic Surgery,  
University of Southern California Keck School of Medicine,  
Los Angeles, California, USA



## Chapter

# Shoulder Arthroscopy – Basic to Advanced Techniques

*William B. Stetson and Akin Akinwumi*

## Abstract

Diagnostic shoulder arthroscopy is the gold standard for diagnosing intra-articular shoulder pathology. Having over 30 years of shoulder arthroscopy experience, I have learned a tremendous amount not only from my own personal experience but from being trained and mentored by the “Godfathers of shoulder arthroscopy,” Dr. Steve Snyder, Dr. Jim Esch, and Dr. Steve Burkhart. During my fellowship with Dr. Snyder at the Southern California Orthopedic Institute (SCOI) (Van Nuys, California, USA), I learned from one of the masters of shoulder arthroscopy. Since then, it has been my passion to learn as much as I could about shoulder arthroscopy, perfect my surgical techniques, and share that knowledge with other orthopedic surgeons through lectures, cadaver lab sessions, and courses not only here in the United States but throughout the world. Having been a shoulder laboratory instructor and director for over 25 years, I have seen many participants and lab instructors navigating the basics and advanced techniques of shoulder arthroscopy. Through this experience, I have learned a tremendous amount which I will share with you in this book chapter entitled, “Shoulder Arthroscopy: Basic to Advanced Techniques.” I feel this book chapter will help all those who do shoulder arthroscopy from the beginner to those with experience. I am always surprised how many of those who participate in shoulder laboratory cadaver sessions are always anxious and eager to learn advanced techniques but many of them have not yet mastered the basic shoulder arthroscopic techniques necessary to do these more advanced techniques. The purpose of this book chapter is to give you the fundamentals of shoulder arthroscopy which will allow you to do basic, advanced and complicated arthroscopic shoulder procedures to help your patients.

**Keywords:** shoulder, arthroscopy, glenohumeral joint, subacromial space, labrum, biceps tendon

## 1. Introduction

A complete history and physical examination are critical in evaluating any patient with shoulder pathology and before making the decision to proceed with shoulder arthroscopy. As a wise surgeon once said, “there is nothing that surgery can’t make worse,” and I would also add “many shoulder problems get better without surgery.” Taking a complete history and then performing a complete physical examination are the first steps in making a diagnosis and then a treatment plan for a patient with shoulder complaints.

Most of us would consider a concentrated and directed history of the patient's shoulder complaints the essential first step in diagnosing shoulder pathology and helping our patients, a basic first step we all learned in medical school. Unfortunately, not all of our colleagues remember this. I once had a patient come to me for a second opinion about her "shoulder fracture." After taking her history, it became apparent that she had no history of trauma to her shoulder but rather had an insidious onset of shoulder pain that had started a few months ago. After taking her history and performing an examination, I reviewed her shoulder x-rays, which showed a large calcific deposit near the greater tuberosity. I explained to her that she had calcific tendinitis of her shoulder, not a fracture, and recommended a conservative approach to her shoulder condition. She asked me why the first orthopedic surgeon told her she had "a fracture to her shoulder" and needed shoulder surgery right away! After talking to her a bit more, it became apparent that the first orthopedic surgeon never even bothered to take a history from her but rather only looked at her shoulder x-ray to make the diagnosis and recommended surgery! As I was taught many years ago, take a complete history first before making a treatment recommendation, especially surgery, and "when in doubt, examine the patient!" Indeed, a complete history and physical examination are key in diagnosing and treating any shoulder problem.

A history starts with when the symptoms started and whether there is any history of trauma, repetitive use (laborers, overhead athletes), subluxation/dislocation or instability, or an insidious onset of shoulder symptoms. The age of the patient, hand dominance (right or left-handed or ambidextrous), what is their occupation, what activities they participate in, and whether the symptoms started acutely or gradually over a period of time, are all important questions to ask. With a good history, it is easy to determine if this is an overuse injury (most common) or traumatic. The most common presenting complaint that patients come in for is their shoulder pain. Pain can come from musculoskeletal conditions of the shoulder or can be referred to as pain from the cervical spine where the pain is localized to can be the first clue as to whether it is primarily shoulder pathology (pain localized over the lateral deltoid regions) or pain over the top of the shoulder, the back of the scapula (referred from the cervical spine), or radiating to the arm and hand.

When evaluating pain, the simple "PQRST" acronym for pain will help any clinician in the evaluation of pain of any kind. "P" is for pain and where it is located in the shoulder (anterior, posterior, lateral, diffuse, periscapular, or trapezial) is the first key step in evaluating shoulder pain. "Q" is for the quality of the pain (sharp, dull, or both). "R" is for radiation (localized to the shoulder, or radiating to the arm, elbow, forearm, or hand), "S" is for severity (1–10 pain scale, one being mild and ten being the worst pain they have ever felt) and "T" for time (when did it start). I like to add "A" for associated factors, that is, what makes it worse or causes it (overhead work, heaving lifting, etc.), and what makes it better. This simple mnemonic "PQRSTA" is the first important step to evaluating shoulder pain for any clinician.

The mechanism of injury is the next important step and whether there is a history of a discrete injury (e.g., a fall), repetitive activity (overhead athletes or laborers) or did this pain start gradually or insidiously. If there is a history of trauma with a fall, did the patient land directly on their shoulder, or on an outstretched hand? Were they lifting a heavy object from the ground to the waist level, or did they lift something above their head? Did they feel a pop or snap? If they are an overhead athlete, did the pain start acutely or gradually over time?

The duration of symptoms is also important, did the symptoms start a few days ago, a few months ago, or a few years ago? None of us are surprised when patients

come to see us with a shoulder problem that has been there “for years” and expect a miracle from us in a few weeks. Indeed, when asking further questions about why they are now seeking treatment for their long-standing shoulder problems, many will say that their symptoms have worsened while other will have a life-changing event (having a child and cannot throw a ball to their daughter or play catch with their son) while others have suddenly “decided to get back into shape.” Whatever the reason, it is paramount that the shoulder surgeon knows their patient and the reason why they came in for their shoulder problem. Whether it is the dad who wants to be able to play ball with his children, the mom who is the recreational tennis player and is unable to overhand serve, or the elderly woman or man who just wants to be able to lift her or his arm above their head so they can comb their hair or get something off the top shelf of the refrigerator, every patient is different and it is our responsibility as physicians and surgeons to understand that and do the best we can to try to help them, whether it is with surgery or not.

It is also very important in the history to discuss what the patient does for a living. Are they a professional and have a desk job, or do they have a physical job like a plumber, electrician, or contractor? Besides their occupation, just as important is what they do in their spare time? Are they active in playing tennis, weightlifting, working out, yoga, or the latest craze of pickleball? Knowing our patients, their activity level, their expectations and desires for a healthy, pain-free shoulder helps guide us to the best treatment option for our patients.

After pain, the next common complaint that brings patients to a shoulder surgeon’s office is instability or the unstable shoulder. Shoulder instability is a spectrum of diseases and can range from the instability described by Matsen [1] using the acronym “TUBS” for traumatic, unidirectional with a Bankart lesion requiring surgery to “AMBRI” for atraumatic, multi-directional, bilateral, and usually respond to rehabilitation. If surgery is performed, the “I” stands for an open inferior capsular shift with closing of the rotator interval. Since this description, our understanding of shoulder instability has evolved, and we now recognize that patients can have one with the other or anything in between. Early in my career, I made the mistake (actually twice) of performing an arthroscopic Bankart repair and not recognizing the patient had underlying multi-directional instability (MDI). The patient later presented to me with recurrent posterior instability which I did not initially recognize or diagnosis. I had to take these patients back to surgery and perform an arthroscopic posterior capsulorrhaphy to stabilize the shoulder.

The degree and direction of the shoulder instability can often be determined with a careful history. Was there a significant injury causing the shoulder dislocation, requiring a manual reduction in the emergency room? How many times has this occurred? Or does the shoulder feel like it slips in and out of the socket and does not require being put back into place? Do patients avoid certain activities or certain positions of their arm, the so-called “apprehension position” (shoulder abduction and external rotation), because they feel like the shoulder will come out of socket or dislocate? The degree of instability is important and as many clinical studies have shown us, the younger the patient is with the first shoulder dislocation, the higher the risk of recurrent dislocations.

Other common complaints of shoulder symptoms include stiffness, weakness, catching, locking, crepitus, deformity, or paresthesias of the arm and hand. Each of these complaints needs to be investigated and discussed in order to determine a differential diagnosis.

## **2. Physical examination**

After a detailed history is obtained about the patient's shoulder condition, a thorough physical examination is critical in helping to diagnose shoulder pathology. A systematic approach is critical to make sure we maximize efficiency and avoid mistakes.

An initial observation or impression of the patient is important before we even examine the shoulder. Take note of general body habitus, physiologic age, and appearance, generalized well-being or in distress are all important first steps. When examining the shoulder, we typically ask men to take their shirts off and for women, we supply a gown that has Velcro that covers them from the breasts down. A sports bra if worn is also adequate, and the important thing is to be able to inspect both shoulders. I typically have the patient sit on the exam table facing me with their legs bent over the edge of the table at 90°. I inspect the shoulder and upper extremity for deformities, atrophy, hypertrophy, skin integrity, swelling, and generalized contour are the first steps. Examining the shoulder from the front, side, and back is also critical. A neurovascular exam can be done next by checking both radial pulses simultaneously for a normal rate and rhythm. I then check for sensation of the hand and work my way up by checking sensation to light touch to the first dorsal webspace (radial nerve), small finger (ulnar nerve), volar aspect of the thenar eminence (median nerve), upper lateral forearm (lateral antebrachial cutaneous nerve), and lateral deltoid (axillary nerve).

Palpation of the shoulder can start at the clavicle working medially (sternoclavicular joint) all along the clavicle laterally to the acromioclavicular (AC) joint. AC joint osteoarthritis is very common but usually asymptomatic. Tenderness at the AC joint can mean not only symptomatic osteoarthritis, but if there is a recent history of trauma (direct fall onto the shoulder), a subtle AC joint injury or separation can be easily detected when palpation elicits tenderness. Young people who are weightlifters, swimmers, or overhead athletes can develop osteoarthritis of the AC joint at an early age, and it is important to look for this in this set of patients. After palpating the clavicle, it is then easy to palpate the anterior bursa and the intertubercular groove for biceps tenderness (forearm and arm in slight internal rotation will bring the groove anterior and can be easily palpated). The lateral acromion and deltoid bursa can then be palpated, working posteriorly to the posterior bursa and infraspinatus, teres minor, and the spine of the scapula. After palpation, a gentle pull on the arm inferiorly may produce a "sulcus" sign, an indication of ligamentous laxity and underlying multidirectional instability, typically seen in a younger population.

Range of motion can be measured first in the sitting position and if there are any questions of reliability or exaggeration, it can also be done in the supine position, which stabilizes the scapula. The range of motion of the affected shoulder is always compared to the contralateral or normal shoulder, which is examined first, assuming there is no contralateral shoulder pathology.

In order to eliminate compensatory movement, I typically have the patient sitting on the exam table, knees bent at 90° and facing me. I place my one hand (if examining a right shoulder, then I place my right hand on the top of their shoulder, just lateral to their neck), on top of their shoulder, and then with my other hand will assess active assisted range of motion. By placing my hand on the patient's shoulder, it can reduce or eliminate compensatory trapezial and scapulothoracic motion. All motions are measured from 0° as a starting position, then I measure flexion, abduction, adduction, extension, external rotation, and internal rotation at 90° of abduction, and then

internal rotation to the highest posterior anatomical body part reached posterior by the thumb or hand. Passive range of motion is then measured and again if there is any question about reliability, this can be done in the supine position which stabilizes the scapula.

Any pain with range of motion is of course noted and what maneuvers precipitate the pain (abduction, adduction, external rotation at 90°, etc.) is noted as this can give important information about underlying shoulder pathology. Any crepitus or mechanical clicking and popping should also be noted.

Manual muscle testing is performed working from the hands (grip testing, wrist flexion and extension), elbows (flexion and extension/biceps and triceps), and then the shoulder in forward flexion (anterior deltoid), abduction (middle deltoid), external rotation (infraspinatus and teres minor), and internal rotation (subscapularis).

Provocative tests for rotator cuff pathology include painful range of motion with a positive Neers, and/or Hawkins's tests. Instability is measured first with the detection of a sulcus sign, the apprehension test and relocation test. Provocative tests for superior labrum anterior to posterior (SLAP) lesions are unreliable as we have seen that SLAP lesion pathology can mimic impingement syndrome and anterior instability [2, 3] as there is no single, accurate diagnostic physical exam test for SLAP lesions.

An important note is to always assess the cervical spine with range of motion, a detailed upper extremity neurological exam, and specialty tests if necessary (compression test, Spurling's test) to make sure that cervical pathology is not present.

### **3. X-ray evaluation**

Radiographic evaluation of the shoulder should consist of an anterior-posterior (A/P) of the glenohumeral joint (not the shoulder!), axillary view, and supraspinatus outlet view (not a trans-scapular Y view) which helps determine if there is any glenohumeral arthritis, calcific deposits, and also to determine what type of acromion is present (type I-III) and the thickness of the acromion which can be seen on the supraspinatus outlet view.

If there is a history of trauma, then the recommended trauma view x-rays are true A/P x-rays in internal and external rotation, an axillary view, and trans-scapular "Y" rule to rule out fractures and dislocations. If there are symptoms related to the acromioclavicular (AC) joint such as a possible AC joint separation or AC joint osteoarthritis, then an AP view in the plane of the thorax with a 10-degree cephalic tilt of the AC joint (ZANCA view) is done.

### **4. MRI with and without contrast**

Magnetic resonance imaging (MRI) of the shoulder and other body parts has become very popular and in the eyes of the public, gives all the information that is needed to make a diagnosis. Of course, as medical professionals, we know differently, and it is important that we educate our patients that it is just not about the MRI to make the diagnosis. As we have seen in our overhead Olympic athletes, asymptomatic MRI pathology or other findings are very common especially of the rotator cuff and labrum, which does not limit their ability to participate [4].

An MRI is a good test to detect full-thickness rotator cuff tears [5], inflammatory conditions such as labral tears, and glenohumeral osteoarthritis. However, it has limitations in detecting partial thickness rotator cuff tears and labral tears. An MRI with intra-articular gadolinium (MRA) increases the sensitivity of detecting partial anterior-sided rotator cuff tears [6] and labral tears [7] and is a useful test in younger patients, especially overhead athletes.

However, even if an MRA shows a partial rotator cuff or a SLAP tear, it is not an automatic indication for surgery as over half of these patients will get better with non-operative management.

MRIs, MRAs, and x-rays are all useful tests, but they do not replace a good history and physical examination in taking care of a patient and doing the right thing, whether that is with surgery or without surgery through rehabilitation.

## **5. Non-operative treatment**

When reviewing the multiple textbooks and journal articles on shoulder arthroscopy, there is very little written about the non-operative treatment of shoulder pathology for impingement, partial rotator cuff tears, full-thickness rotator cuff tears, SLAP lesions, and even instability. “Surgeons do surgery” is a maxim I have often heard from some of my colleagues and there could be nothing further from our responsibility as doctors first, not surgeons, to always do what is best for our patients, whether that is surgery or not!

“*Primum non nocere*” is the Latin phrase that is attributed to Hippocrates and the Hippocratic Oath, although the phrase does not appear in the AD 245 version of the Hippocratic Oath but rather is believed to date from the seventeenth century according to WIKIPEDIA. The salient point is that as physicians and surgeons, we have a moral obligation to do what is best for our patients, and for those patients who come to us with shoulder pain, the vast majority can get better with non-operative management.

One only has to dissect the literature to realize that the majority of patients with a non-traumatic onset of shoulder pain with impingement-like signs and symptoms, and even an MRI that shows a partial rotator cuff tear, improve and return to normal pain-free activities pain without surgery. An MRI that shows a partial rotator cuff tear is not an automatic indication for surgery as approximately 40% of the population over the age of 40 will have a partial rotator cuff tear by MRI that is asymptomatic [8]. An MRI will identify a high prevalence of partial and even complete tears of the rotator cuff that are asymptomatic.

What is the best measurement for our patients who come to us with shoulder pain? First and foremost, as we discussed before, a detailed history is the first step in diagnosing and treating our patients with shoulder pain. Differentiating those with an acute onset of shoulder pain and those with an insidious onset of shoulder pain and then determining if there was any history of any significant trauma, change in activity level, level of activity, or other significant factors in their history to rule out a significant traumatic cause of their shoulder pain. Once we have taken a detailed history and performed an examination, initial x-rays can help us to rule out any significant fractures or glenohumeral osteoarthritis as a cause of their pain. After ruling out any significant bony pathology, the next step is to reduce the patient’s shoulder pain, which is the primary reason many patients seek orthopedic evaluation and treatment for their shoulder. Immobilization in a sling is usually not recommended as the shoulder is prone to developing adhesions with loss of motion early in the acute period of

an injury. If patients are in a significant amount of pain and a fracture has been ruled out, a sling can be used for comfort, but patients are recommended to come out of their sling and start active elbow range of motion exercises of flexion and extension (10×, once per hour, while awake), hand sequencing exercises (squeezing a tennis ball or washrag 10×, once per hour while awake), and gentle pendulum exercises, (5 one direction, 5 the other direction, for a total of 10 circles, once per hour, while awake). This will prevent shoulder adhesions from developing and will aid the rehabilitation process, whether surgery is needed or not.

Non-narcotic pain medication such as non-steroidal anti-inflammatory medications are the next step in managing a patient's pain. I typically prescribe a 10-day dose of a prescription non-steroid anti-inflammatory (NSAID) medication. If the symptoms are not too severe, I then recommend an over-the-counter anti-inflammatory medication to take on an as-needed basis. With any medication, I discourage any long-term use because of the potential side effects. If, on initial presentation, the patient is in severe pain, I will sometimes recommend a one-time cortisone injection, which is welcomed by some patients who are in severe pain just seeking pain relief. In some patients with diffuse shoulder, arm, elbow, hand, and neck pain, it is difficult to determine the exact etiology and in this subset of patients, a short course of an oral steroid medication (Medrol Dose-Pack) may be the best option.

Once their level of pain and the best way to manage it is determined, the next step to consider is whether an MRI is necessary to make the diagnosis. In patients with shoulder pain and a significant history of trauma, I typically recommend an MRI to make out an acute full-thickness rotator cuff tear. If there is not a significant history of trauma, an MRI is not always necessary to begin treatment. However, many patients expect and want an MRI of their shoulder, even after I explain to them that I do not think anything is badly damaged or injured and that it probably will not change our initial management of the shoulder problem. Even with that, some patients demand an MRI of their shoulder and reasoning with them can sometimes be futile. In the United States, MRIs are much more easily obtained than in other countries, so depending on the resources where you practice, an MRI is not always possible or even needed. Explaining this to patients can be useful and the vast majority do understand that an MRI is not always necessary to help them initially with their shoulder problem.

If there is a significant history of trauma and plain x-rays do show a fracture, a CT scan can be the next step in evaluating the fracture patterns.

The role of narcotics in pain management is controversial and every physician must make the best decision possible for each patient. As a general rule, I only prescribe narcotic medication for my post-operative patients and then for only a short course after surgery. There was a feeling that NSAIDs could inhibit the healing process after rotator cuff surgery but that has been disproven; so I generally recommend my patients take an NSAID after surgery and only take narcotic pain medicine if necessary or for break-through pain. Most patients will wean off the narcotic pain medicine within 3–5 days after surgery, 7 days at the most.

As for the use of narcotic pain medication before surgery, I highly recommend against it and will only prescribe a very short course of narcotic pain medication if there is a significant history of trauma with significant pain.

Depending on their initial history, complaints, and physical examination findings, most patients will benefit from a structured physical therapy program. Most patients do not realize the benefits of physical therapy and are usually happily surprised by the benefits it can give them for improvement of their range of motion, improved strength, and often pain relief.

If I am unsure of the diagnosis on initial examination and an MRI is ordered, I will often wait on prescribing formal physical therapy but instead will give them a home stretching program, which includes pendulum exercises and other shoulder stretches to keep the shoulder mobile or moving until the MRI is completed. Most patients appreciate this and are eager to start doing something to help their shoulders. I tell the patient to do the exercises within their pain tolerance until the MRI is completed and at that point, we can determine what is the best treatment option for that patient.

In the ideal world, the patient will return within 2 weeks after the initial evaluation and after the MRI is completed. At this point, approximately 2 weeks after their initial consultation, they are seen for a follow-up, and I can ask them how their pain level is and if the NSAID helped. I also re-examine them again to determine their pain level and range of motion.

When dealing with patients over the age of 40 with an insidious onset of shoulder pain, typical MRI findings include fluid in the subacromial space, rotator cuff tendinosis or a partial tear, and possibly a SLAP lesion with bicipital tenosynovitis. These are *not* automatic indications for surgery as over half of the patients will get better with non-operative management.

Differentiating impingement syndrome from adhesive capsulitis can sometimes be difficult to determine clinically and the MRI may or may not be helpful. Depending on their pain level and how they respond to the short course of NSAIDs, some patients are candidates for a cortisone injection either in the subacromial space if I feel that they have subacromial bursitis/impingement syndrome or in the glenohumeral joint if I feel that they have adhesive capsulitis. A one-time injection of cortisone in the appropriate location can be a “game-changer” for some patients for pain relief and allows them to improve faster in physical therapy. If I do give them a cortisone injection, I instruct them to rest the shoulder for 2 weeks, do gentle stretches on their own, and then start formal physical therapy in 2 weeks. Some patients are reluctant to have a cortisone injection and would rather wait and try physical therapy to see if that will relieve their symptoms. At this juncture, I never insist on giving a cortisone injection as it is perfectly fine to see how patients first do with more conservative measures of rest, NSAIDs, and physical therapy before proceeding with a cortisone injection.

It is important for us as physicians and surgeons to educate our patients on the role of cortisone (corticosteroids) in treating shoulder pain. Corticosteroids are very effective in many inflammatory conditions including shoulder subacromial bursitis and adhesive capsulitis. Educating our patients that their shoulder pain is more than likely caused by inflammation (and *not* the patient’s partial rotator cuff tear or tendinosis!) and that cortisone if injected into the right location (subacromial bursa or glenohumeral joint), may reduce or eliminate that inflammation causing their shoulder pain. The molecular pathway of corticosteroids is important for all physicians to understand and can explain its effectiveness in treating shoulder pain [9].

With a diagnosis of impingement syndrome and rotator cuff tendinosis/partial rotator cuff tear, I typically prescribe a physical therapy program twice per week for 6 weeks with a protocol that we attach to the physical therapy prescription to give the therapist a treatment guide. This protocol consists of four phases, starting with phase one which starts with gentle passive and active assisted range of motion exercises and advancing to full active and passive range of motion with a strengthening program they can eventually do on their own. In those patients whose MRI shows a full-thickness rotator cuff tear, depending on their age and activity level, I am much more aggressive in recommending arthroscopic surgical repair.

In younger patients with anterior instability and are first-time dislocators, I am also much more aggressive in recommending arthroscopic surgical repair (Bankart reconstruction with or without remplissage). Many studies have shown that the younger the patient, the greater the risk of re-dislocation [10, 11]. Risk factors for recurrent shoulder instability include male sex, contact athletes, age < 20 years, and glenoid bone loss [12–16].

In overhead athletes, shoulder MRIs may show significant pathology which is asymptomatic. Lesniak et al. [17] found that 43% of asymptomatic pitchers had a partial rotator cuff tear in their dominant arm and 48% had a SLAP tear or fraying of the superior labrum which was also asymptomatic. In our study of MRI findings of the dominant arm of asymptomatic elite volleyball players, 89% (23/26) had rotator cuff tendinosis, 65% (17/26) had partial rotator cuff tearing, and 46% (12/26) had a SLAP tear or fraying of their superior labrum [4].

All overhead athletes and the vast majority of patients with shoulder pain have MRI findings of rotator cuff tendinosis, partial tears, and SLAP lesions, and should first be treated conservatively first with rest, restrictions of activity, a short course of NSAIDs, a structured physical therapy program, and even a one-time injection of cortisone before surgery is recommended. Studies have shown that MRI pathology does not always correlate with symptoms and the majority of patients will improve with conservative management within 2–3 months of formal treatment. For those who fail conservative management, diagnostic shoulder arthroscopy and bursoscopy is the gold standard for diagnosing and treating shoulder pathology, and can help patients of all ages and activity levels.

## **6. Operative treatment**

Once the decision has been made to proceed with surgery and patients have failed a reasonable course of conservative management, diagnostic arthroscopic shoulder surgery and bursoscopy is the gold standard by which we can diagnose and surgically treat our patients. The history, physical examination findings, x-rays, MRI findings and the response to conservative management should all be reviewed before proceeding with surgery. I always review the medical records of every patient before I proceed with surgery and make sure that my indications are appropriate and that I have all of the surgical equipments needed for the procedure. If one is going to do shoulder arthroscopy, one have to make sure that all equipment including implants, disposable devices, cannulas, and instrumentation are available for every case.

Having the right surgical facility and the right surgical team for shoulder arthroscopy will ensure that all goes well at the time of surgery. Building your surgical team does not happen overnight and doing surgery at a facility where there is never the same circulating nurse, surgical scrub technician, or anesthesiologist will make your life miserable and will compromise the care of the patient.

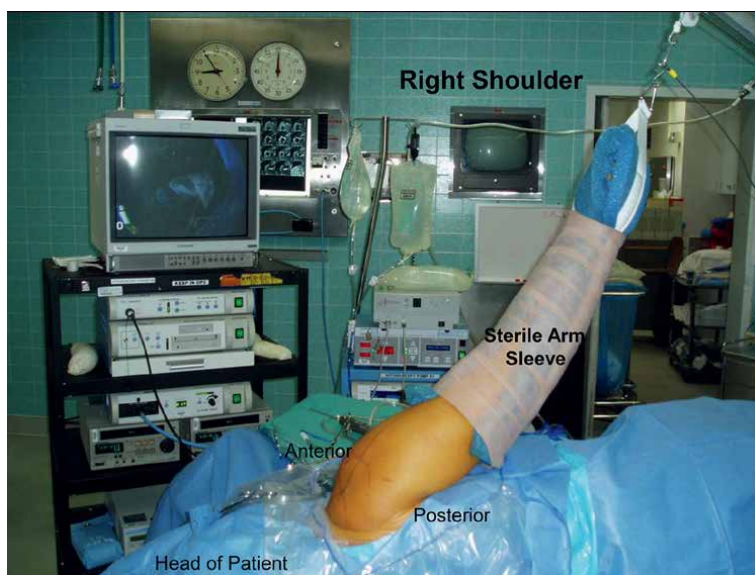
In the United States and now in many countries, shoulder arthroscopy is done in an outpatient basis. Most patients prefer this, and I have found that working in our own outpatient surgery center has greatly improved the care that I can give my patients. I work with the same circulating nurse, the same group of surgical scrub technicians, and the same anesthesiologist, all who know my routine and give great medical care to my patients. Building your surgical team is not always easy but once you do it, you will see the value in it.

Having the proper facility, right surgical team, proper equipment, a skilled and experienced anesthesiologist, a systematic approach to the operating room set-up, and to the arthroscopic surgical procedure will ensure smooth surgery for our patients.

### **6.1 Patient positioning and set-up**

Diagnostic shoulder arthroscopy and bursoscopy can be done either in the beach chair position or in the lateral decubitus position, depending on the surgeon's preference. When shoulder arthroscopy was in its infancy, some of the first shoulder arthroscopists (Jim Esch, Stephen Burkhart, Steve Snyder) experimented with both positions. It is no coincidence that each one of them converted full-time to the lateral decubitus position. I strongly recommend that shoulder arthroscopy be done in the lateral decubitus position for many different reasons including ease of position, ability to access the anterior portion of the glenohumeral joint, decrease risk of anesthetic complications, and the need for only one assistant (surgical technician/scrub tech) to perform procedures without the use of expensive, hydraulic arm holders to position the arm.

I prefer the Arthrex (Naples, CA) three-point shoulder holder which allows gentle suspension of the arm with weights and can change the position of the arm and the humeral head to allow easy access of the glenohumeral joint (arm abduction) or the subacromial space (arm adduction). The device is attached to the opposite side of the operating table, to the side rail of the table, and it is then rotated so it is angled directly at the operating shoulder. All of the remainder of the equipment is placed in front of the patient and in front of the surgeon for easy viewing (**Figure 1**).



**Figure 1.** A right shoulder positioned in the lateral decubitus position with the arm in balanced suspension with 70° of abduction and 15–20° of forward flexion. All of the remainder of the equipment is placed in front of the patient and in front of the surgeon for easy viewing. All arthroscopic cords and tubing run off of the Mayo stand positioned in front of the patient's arm which is at 90° of abduction when in the lateral decubitus position.

Endotracheal intubation is preferred as it is safer (able to directly control the airway) than an LMA (laryngeal mask airway) and easier to control the blood pressure (hypotensive anesthesia) for adequate intra-operative visualization.

Four people are needed to turn the patient to the lateral decubitus position with the anesthesiologist controlling the head, neck, and airway, the surgeon on the operative arm side, and two other nurses/assistants, one at the foot of the bed and the other on the opposite side of the surgeon. The patient is lifted up, brought close to the side of the surgeon, then turned on their side with the knees bent. An axillary roll is then placed below the dependent thorax to reduce pressure on the axillary structures and then the head is stabilized with a stack of wide towels and a circular rubber cushion. For a right shoulder, the left arm is at 90° and is on an arm board secured and padded to prevent any nerve palsies. Pillows are not used near the head used as they can interfere with surgical instruments and the anesthetic tubing is allowed to fall off the front end of the bed. Two pillows are placed between the legs and pneumatic compression devices are placed on both legs for deep nervous venous thrombosis (DVT) prophylaxis. Positioning aids for the lateral decubitus position include a pneumatic bean bag or a total hip positioning system with posts and pads in the front and in the back which we prefer.

Once the positioning is secure, non-sterile draping using a U-drape around the neck running distally anteriorly lateral to the nipple and posteriorly over the scapula, and then a short “10-10” drape across the chest just above the nipple from anterior to posterior. The operating room table is slightly angulated at about 30–40° with the foot of the bed away from the surgeon.

The next important step is the examination of the operative shoulder under anesthesia to check for adhesions and for instability. Once this is done, I then perform a suprascapular nerve block, injecting 20ccs of 0.25% bupivacaine with epinephrine for post-operative pain control. This is an effective and much safer than an interscalene block which has significantly more risks associated with it [18].

The operating room layout and equipment is key and should not be neglected or left to an assistant surgeon or nursing staff. The surgeon is ultimately responsible for everything that occurs in the operating room and having the proper set-up, equipment, and staff is the key to any successful surgery. The arthroscopic tower is mobile and is positioned opposite the surgeon, anterior to the patient. This tower includes an arthroscopic monitor, camera box, shaving power, and the computer if videography and pictures are being taken. Adjacent to this tower is a second tower with the arthroscope pump inflow, suction device, and the radiofrequency/electrocautery box. All of this is in front of the surgeon so that in a moment's notice, the surgeon can make sure that all is functioning properly and troubleshoot if things are not working properly as everything is right in front of the surgeon. The analogy of an airline pilot sitting in the cockpit with everything in view is the best analogy (**Figure 1**).

All of the surgical cords, suction tubing, light cords, etc. are placed on a Mayo stand positioned on the front side of the operating table at the level of the patient's chest in the “crook of the patient's arm” which is at 90° to the operating table, opposite from the surgeon. On this Mayo stand, the mechanical shaver, the arthroscope and the electrocautery device can be positioned with all tubing running off the Mayo stand to the arthroscopic tower. No tubing should be run behind or to the side of the surgeon.

A second Mayo stand or “backtable” is positioned behind the surgeon and the assistant which holds all the instruments needed to begin the arthroscopic procedure including the cannula with obturator, scalpel, 18-gauge spinal needle, and other arthroscopic equipment including a grasper, probe, crochet hook, and other arthroscopic hand

equipment needed for arthroscopic suturing and knot tying. All sharp instruments are passed in a “sharp basin” and no sharp instruments should be handed in a direct fashion to minimize the risk of injury to the scrub assistant or to the surgeon.

An arthroscopic pump and irrigation system is key for adequate distension and visualization for shoulder arthroscopy. Adequate visualization is essential to perform shoulder arthroscopy and there are key components necessary to ensure adequate visualization. A proper arthroscopic cannula system is a 5.5 mm × 8.5 cm “J-lock” cannula system. The 5.5 mm diameter cannula provides adequate inflow and flow rate through the arthroscope for adequate visualization and the 8.5 cm in length cannula is easier to maneuver within the glenohumeral joint.

Maintenance of a “bloodless field” for shoulder arthroscopy is dependent upon both the flow rate and pressure of the irrigation fluid. High flow rates keep the operative field free of blood. The goal is to obtain sufficient glenohumeral and subacromial pressure to decrease bleeding while at the same time minimizing fluid extravasation. To obtain the ideal situation, the glenohumeral joint pressure and systolic blood pressure must be controlled and the same is true for the subacromial space pressure.

Arterial and capillary pressure average 25 mm Hg less than the measured systolic blood pressure [19]. An arthroscopic pump system with a pressure set to 40 mm Hg is usually acceptable for joint distension and visual clarity as long as the patient’s systolic blood pressure is maintained at approximately 90 mm Hg.

In arthroscopy, resistance to flow is a function of the diameter of the inflow system so a large, 9 mm diameter inflow tubing from the irrigation solution to the arthroscope is recommended. In arthroscopy, joint distension is accomplished by pressuring the joint with saline or Ringer’s lactate (recommended as more physiologic). Normal saline solution is currently used in large quantities as an irrigation solution for shoulder arthroscopy, but normal saline solution is in fact not physiologic and it has been shown to inhibit normal synthesis of proteoglycans by chondrocytes [20]. The data shows that neither normal saline nor phosphate-buffered saline supports metabolic activity as well as Ringer’s lactate [20].

Adding epinephrine to the irrigation fluid has shown potential benefits by reducing intra-articular bleeding and surgeon rated visualization [21, 22]. Anecdotal observations of arthroscopic shoulder and knee surgery suggests that intra-operative bleeding is minimized when dilute epinephrine irrigation solution is used but there are very few studies in the literature that have proven this hypothesis [22]. The vasoconstrictive effects of intra-articular administered epinephrine have demonstrated in early animal studies [23] and a recent study in 2016 by Van Montortt and colleagues undergoing shoulder arthroscopy showed that visual clarity was significantly better and total operating time significantly shorter when epinephrine is used in irrigation solution [24]. However, there is no mention of the use of hypotensive anesthesia or other techniques (adequate pump pressure, diameter of inflow cannula) which we have found helpful in reducing bleeding and improving visual clarity in shoulder arthroscopy.

In 2012, the cost of a 30 ml (30 mg) vial of epinephrine was six US dollars (adrenaline/epinephrine injection, USP, Par Pharmaceuticals) and approximately 3 to 4 bottles would be used on average for a simple shoulder arthroscopic surgery. In 2019, the same vial of 30 ml of epinephrine was 237 US dollars, an almost 40-fold increase. Because of this, we stopped using epinephrine in our shoulder irrigation fluid and described the cost-effective technique of shoulder arthroscopy without the use of epinephrine in irrigation solution in 2021 [21]. By maintaining adequate inflow with proper dimensions of the arthroscopic cannula (5.5 mm), flow rate of an arthroscopic pump (40 mm Hg), hypotensive anesthesia (systolic blood pressure  $\leq$  90), and the

judicious use of electrocautery or a radiofrequency device, adequate visualization can be obtained without the use of epinephrine in the irrigation solution [21].

Portal-site injection of epinephrine [25] or the use of intravenous tranexamic acid [26] has also been proposed as adjunctive treatment to enhance shoulder arthroscopic visualization, but we have not found this necessary if the technique of hypotensive anesthesia with adequate inflow is done [21].

## **6.2 Arthroscopic equipment**

Shoulder arthroscopy, similar to knee arthroscopy, is usually performed with a 30-degree arthroscope. Adequate visualization and maintaining visualization are key to performing shoulder arthroscopy and this requires a properly functioning arthroscope lens, camera and equipment. Joint distension can be obtained with gravity inflow, but we have found this inadequate to maintain proper distension and visualization. We recommend the use of a pump system that delivers and maintains a clean picture, allowing proper distension of the joint which facilitates accurate visualization. A pump pressure of 40 mm Hg is recommended as long as the systolic blood pressure is 90 mm Hg or below which provides adequate hydrostatic pressure on the capillaries to decrease “bleeding” [21].

A radiofrequency/thermal electrocautery device (monopolar or bipolar) is also needed to control bleeding. The use of thermal electrocautery devices and pressurized irrigation systems to control bleeding have been shown to have a positive effect in visual clarity [27].

An arthroscope shaver system is used with a 4.0 or 4.5 mm diameter shaver. A large diameter system (5.0 or 5.5 mm) uses too much suction and can “suck the shoulder dry” by opening it up too much during the procedure. An arthroscopic “oval burr” 4.0 or 4.5 mm is also often used for burring the bone in an acromioplasty or a 4.0 or 4.5 mm “round burr” is used for glenoid decortication procedures.

A shoulder suspension or traction device is needed when using the lateral decubitus position. We have used the Arthrex (Naples, FL) Three-Point Traction Tower (**Figure 1**) with a sterile shoulder traction and rotation (STaR) sleeve. This allows the surgeon to position the arm in abduction for entering and viewing the glenohumeral joint, adduction for entry and visualization in the subacromial space, and three-point suspension for arthroscopic Bankart stabilization procedures. An alternative device is an intravenous (IV) pole, which can be attached to the side of the operating table and to the shoulder wrapped in non-sterile gauze or an ace wrap with a hook on the end that attaches to a thin rope that goes over the top hook of the IV pole.

A 4.5 mm × 8 cm plastic cannula (Arthrex, Naples FL) is often used as a working cannula and easily attaches to the arthroscopic shaver and can also be used for introducing arthroscopic instruments (probe, grasper, etc.) into the shoulder joint.

Anchors for arthroscopic rotator cuff repairs and labral repairs should be readily available in the operating room but not opened until needed. This also is true for any other disposable device (burrs, cannulas, radiofrequency devices, etc.); they should only be opened as needed during the surgery to reduce costs for the surgical procedure.

## **6.3 Hypotensive anesthesia**

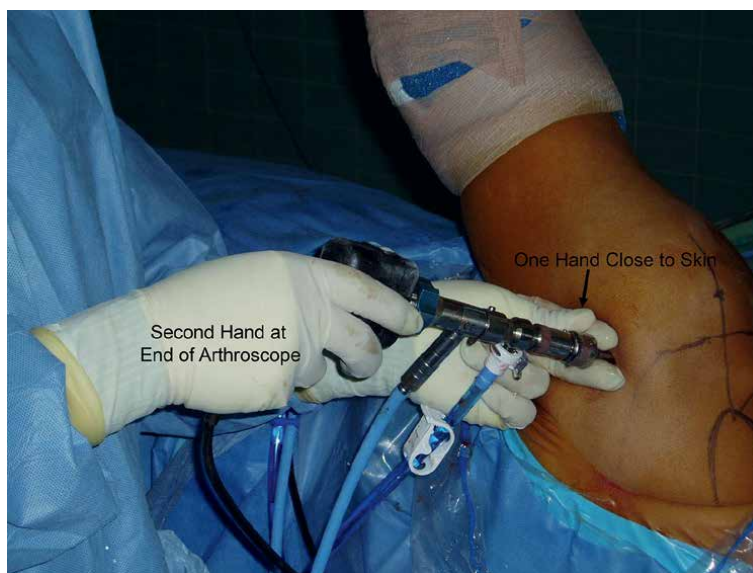
Hypotensive anesthesia is critical for adequate visualization in shoulder arthroscopy. In the lateral decubitus position, blood pressure can be easily monitored with

no risk of cerebral desaturation. A higher incidence of cerebral desaturation events during arthroscopic shoulder surgery in the beach chair position compared with the lateral decubitus position has been reported [28, 29].

An experienced anesthesiologist is also key in order to safely perform shoulder arthroscopy using hypotensive anesthesia techniques with general endotracheal intubation. Maintaining the systolic blood pressure of 90 mm Hg or lower and an arthroscopic pump pressure of 40 mm Hg is the ideal situation for visualization, especially in the subacromial space [21]. Morrison and colleagues [30] have found that the average difference between systolic blood pressure and the subacromial space pressure at which bleeding from cancellous bone and surrounding soft tissues caused was 49.2 mm Hg  $\pm$  9.0 mm Hg. Therefore, a pump pressure of 40 mm Hg and a systolic blood pressure of approximately 90 mm Hg, with a difference of 50 mm Hg, is the ideal situation for adequate visualization not only in the subacromial space but also in the glenohumeral joint [21].

#### **6.4 Operating room personnel**

It is very important to have experienced staff members working with the surgeon during shoulder arthroscopy. This includes an experienced circulating nurse and an experienced surgical technician or “scrub tech.” I typically operate with only one scrubbed assistant who is an experienced technician and knows the technique and maneuvers for complex arthroscopic shoulder procedures. The trained first assistant must be able to hold the arthroscope with two hands to maintain visualization which enables the operating surgeon to use two hands for anchor placement, suture management, and arthroscopic knot tying (**Figure 2**).



**Figure 2.** *The trained first assistant must be able to hold the arthroscope to maintain visualization, which enables the operating surgeon to use two hands for anchor placement, suture management, and arthroscopic knot tying. The first assistant uses two hands on the arthroscope to maintain the picture or “freeze the frame,” so the surgeon can visualize what is needed for the procedure.*

## 6.5 Surgical procedure set-up

The patient is brought into the operating room and placed supine on the operating room table and general endotracheal anesthesia is administered. The patient is then placed in the lateral decubitus position with an axillary roll placed (1 L IV bag wrapped in a towel works well) and all bony prominences are padded. Two pillows are placed between the legs with the knees bent and pneumatic compression devices are placed on both legs. The head is supported by folded towels and a circular gel pad to protect the ear. The shoulder is examined under anesthesia for instability and to release any adhesions. The non-operative arm is placed on an arm board at 90° to the operating table.

The operating room table is then slightly rotated to bring the head of the bed closer to the surgeon. The operating room table is then locked and lowered as low as it goes so the surgeon can operate with his or her elbows at 90° of flexion. If patient is large and or the surgeon is short, a step stool may be necessary, but we usually advise against this for safety reasons.

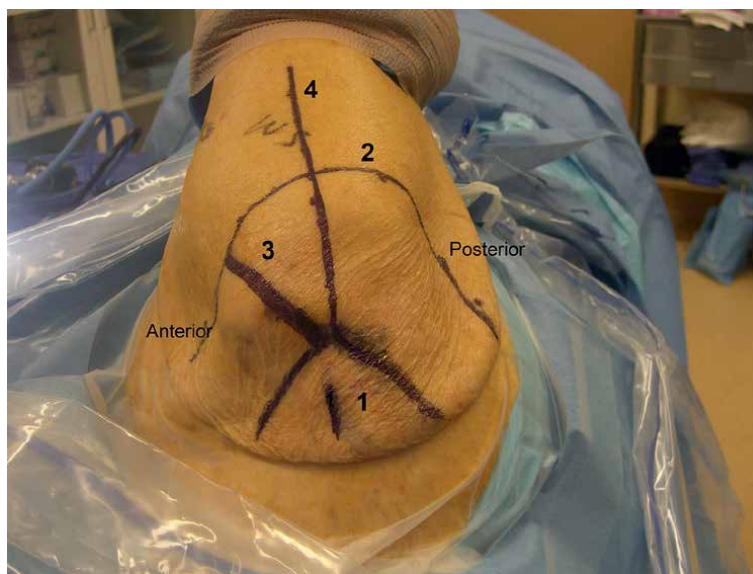
A non-sterile U-drape is placed high on the neck, over the head, and the tails go anterior (lateral to the nipple) and posteriorly (midportion of the scapula). A 10-10 drape is then used across the chest, above the nipple line. The entire extremity from the fingers to the neck is sterilized in the usual fashion, and then the surgeon and assistant apply the sterile surgical drapes. The arm is then placed in the Arthrex (Arthrex, Naples, FL) (or other devices) shoulder suspension/traction device using the sterile STaR sleeve (Arthrex, Naples, FL). The arm is secured with straps or coban and the arm is supported by attaching the loop onto the end of the sleeve “S hook” [31]. Ten pounds is typically attached to the cable, but this weight may be increased or decreased depending on the size of the patient. For entry into the glenohumeral joint, this places the arm in approximately 70° of abduction and 15° of forward flexion.

## 6.6 Surface anatomy

Once the arm is held in balanced suspension, the bony landmarks of the shoulder are outlined with a sterile marking pen. The supraclavicular fossa is palpated first and drawn, and the acromion is then outlined, followed by outlining the very lateral position of the bone (not the top part but lateral parts) including the clavicle in front, acromion laterally and the scapula posteriorly. The acromioclavicular (AC) joint is then outlined, followed by the lateral orientation line, where the posterior aspect of the AC joint intersects the supraclavicular fossa (**Figure 3**).

## 6.7 Portal placement

Portal placement is critical and comes from knowing surface anatomy. The posterior portal is established 2 cm medial and 1–2 cm inferior from the posterolateral aspect of the acromion. A 5.5 mm × 8.5 cm “J-Lock” metal cannula is used with a blunt-tipped obturator through the posterior skin incision (1–1.5 cm in size). The posterior humeral head is palpated with the tip of the obturator and with the opposite hand palpating the anterior surface of the shoulder joint, the humeral head is gently rotated back and forth to make sure the obturator is in the proper position. The opposite hand, which is placed anteriorly over the coracoid, should feel the movement of the humeral head. The cannula is then directed medially and slightly inferior (raising your hand slightly) to slide medially off the humeral head toward the coracoid process. One usually feels



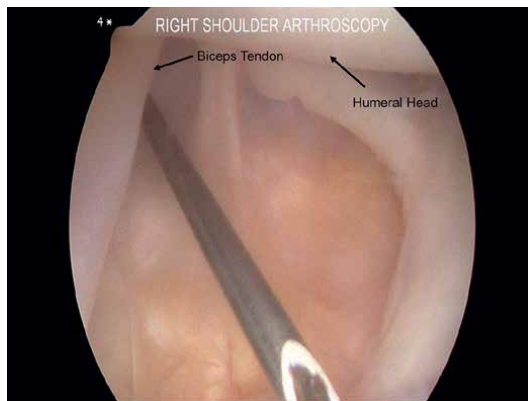
**Figure 3.** The surface landmarks of a right shoulder in the lateral decubitus position. The supraclavicular fossa is drawn first (1), then the outlining of the acromion from posterior to anterior (2), the AC joint is at a 45-degree angle from the posterior aspect of the supraclavicular fossa (3), and the lateral orientation line is drawn from the posterior aspect of the AC joint laterally, perpendicular to the lateral edge of the acromion (4).

a popping sensation as the joint is entered. The obturator is removed, and the arthroscope should then be placed into the cannula to verify entry into the glenohumeral joint and avoid multiple holes in the posterior capsule with repetitive attempts, which can lead to increased fluid extravasation [32]. If difficulties are encountered in entering the glenohumeral joint, especially in larger patients, placing five more pounds of traction provides more distraction and may make it easier to portal placement.

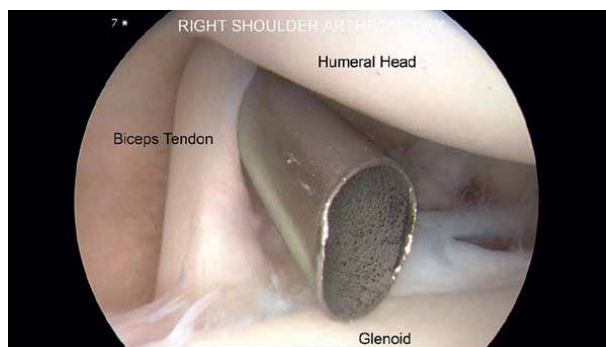
With the arthroscope in the posterior cannula, the joint is distended, and successful entry into the glenohumeral joint is verified. The biceps tendon is visualized and the glenoid positioned inferiorly in a flat position parallel to the floor.

The anterior-superior portal is then created before performing the diagnostic shoulder arthroscopy. The anterior-superior portal is used not only for fluid outflow but also for viewing anteriorly for a complete diagnostic glenohumeral shoulder arthroscopy. The anterior-superior portal can be created using an “outside-in” technique using a spinal needle placed through the skin, just below the AC joint, into the rotator interval between the subscapularis and supraspinatus tendons (**Figure 4**), or an “inside-out” technique.

I prefer an “inside-out” technique, driving the arthroscope anteriorly, just below the biceps tendon, up into the rotator interval, removing the arthroscope, placing a blunt, smooth switching stick through the posterior cannula, tenting the skin anteriorly near the AC joint, lateral to the coracoid process. A small stab incision is made at the tip of the rod in the direction of Langer’s lines and the rod is placed through the skin incision. A second 5.5 mm × 8.5 cm metal “J-Lock” cannula is inserted over the guide rod and gently twisted in until the anterior capsule of the joint is penetrated. Using the metal cannula makes it easier to penetrate the anterior capsule, and it is interchangeable so that the arthroscope can be easily switched from posterior to



**Figure 4.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the anterior-superior portal can be created using an “outside-in” technique using a spinal needle placed through the skin, just below the AC joint, into the rotator interval between the subscapularis and supraspinatus tendons for proper placement and direction. A small skin incision is made anteriorly and the metal cannula with the blunt obturator follows the direction of the needle into the glenohumeral joint.



**Figure 5.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the anterior-superior portal has been established with the interchangeable cannula system. The cannula is attached to gravity outflow controlled with a clamp which is opened to clear the picture of blood or debris during the diagnostic arthroscopy. The tip of it can also be used as a probe for palpating the biceps tendon and the labrum. This portal is later used for viewing from anterior to posterior to complete the diagnostic exam of the glenohumeral joint.

anterior during the diagnostic arthroscopy (**Figure 5**) [33]. Tubing outflow to gravity (bucket onto the floor at the head of the operating room table) is attached to the anterior-superior portal and a clamp is placed on the tubing to prevent a constant outflow of fluid from the shoulder joint. It is periodically opened up to “clear the picture” of any blood or debris which may inhibit visualization.

The anterior-superior portal is created in an anterior-superior position in the rotator interval between the anterior edge supraspinatus and subscapularis tendons. By placing the portal high anteriorly in the rotator interval, superior labrum anterior to posterior (SLAP) pathology can be addressed as the angle for inserting a superior glenoid anchor is facilitated. It also ensures an adequate anterior viewing portal for evaluating anterior lateral pathology and that there is adequate space for a second anterior mid-glenoid working portal for arthroscopic Bankart repairs [32].

## 7. Diagnostic glenohumeral shoulder arthroscopy

Once the patient is positioned and the posterior and anterior -superior portals have been established, a 15-point glenohumeral exam as described by Synder [31] is performed. The importance of this cannot be overstated in every diagnostic shoulder arthroscopy as it teaches the new and experienced arthroscopist a systematic evaluation of the glenohumeral joint. This is effective in detecting not only shoulder pathology but also recognizing normal anatomic variants, especially of the anterior-superior and anterior labral structures. Proper handling of the arthroscope with not only pivoting the arthroscope but also learning how to rotate the bevel of the 30-degree arthroscopic lens will improve visualization and gain a greater arthroscopic visual field with very little movement of the arthroscope. This allows the arthroscopist to “look around the corner” for visualizing hard-to-see structures. Although some experienced shoulder arthroscopists sometimes recommend a 70° arthroscope, we have never felt it necessary. We will describe the 15-point glenohumeral exam described by Snyder [31] with only a few minor changes. For this, the descriptions will be for a right shoulder in the later decubitus position. The glenoid is flat and parallel to the floor.

*Position #1:* The first structure to be visualized in the glenohumeral joint is the biceps tendon. With the 30° arthroscope looking up at approximately 12 or 1 o'clock position with the anterior-superior portal cannula just inferior to the biceps tendon, the cannula can be used to pull the biceps into the joint from the intertrabecular groove to check for inflammation or partial tears of biceps tendon (**Figure 6**). Treatment of partial biceps tendon tears is beyond the scope of this chapter, but in general, in the shoulder world, there are “biceps killers” and “biceps savers.” I am a biceps saver, and I typically debride and leave *in situ* a partial biceps tendon tear of less than 40–50% and will perform either a tenodesis or tenotomy for tears greater than 50%, depending on their age and activity level or for unstable biceps.

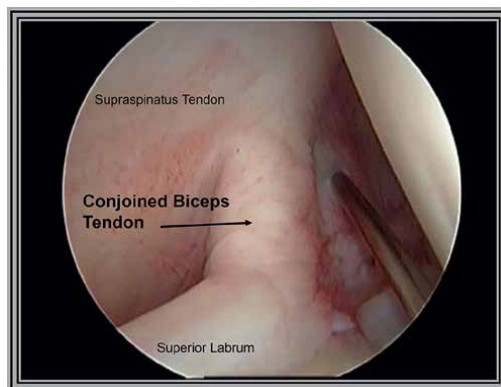
There are rare variants of the biceps tendon including a partial or conjoined tendon (**Figure 7**), complete intra-capsular position, absence of the tendon (**Figure 8**) [33] and a double structure (bifid) of the long head of the biceps tendon (**Figure 9**) [34].

*Position #2:* After visualizing the biceps tendon, the arthroscope is rotated in a counterclockwise position to approximately the 8 o'clock position to visualize the



**Figure 6.**

*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, is the first structure to be visualized in the glenohumeral joint, which is the biceps tendon. With the 30° arthroscope looking up at approximately 12 or 1 o'clock position with the anterior-superior portal cannula just inferior to the biceps tendon, the cannula can be used to pull the biceps into the joint from the intertrabecular groove to check for inflammation or partial tears of the biceps tendon.*



**Figure 7.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, a rare variant of the biceps tendon is a conjoined biceps tendon which is enveloped by the supraspinatus tendon.*



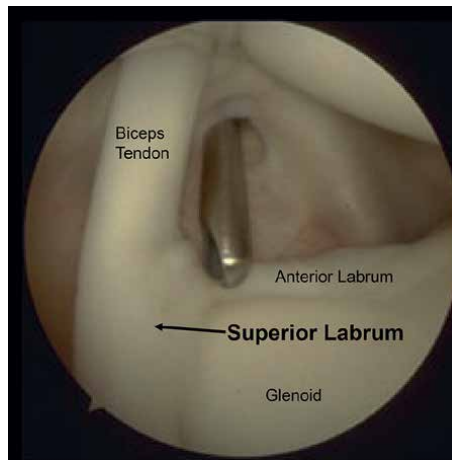
**Figure 8.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, and a complete intracapsular position or absence of the biceps tendon.*



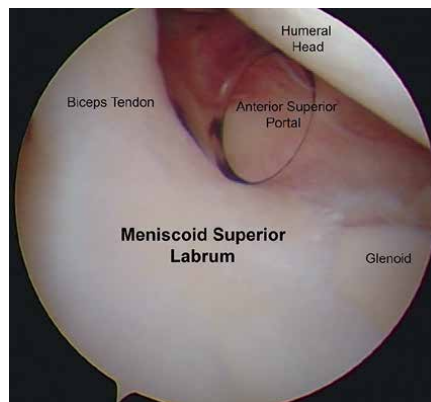
**Figure 9.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, and a double long head of the biceps tendon also known as a bifid tendon.*

superior labrum and the biceps anchor. Using the cannula or tip of a shaver as a probe, the superior labrum can be palpated to see if it is well attached to the superior glenoid (**Figure 10**). Three different types of attachment of the biceps tendon labral complex to the superior glenoid have been described [35]. These variants include a normal meniscoid type of labrum (**Figure 11**), and a normal, small cleft between the glenoid and labrum, which should not be confused with a type II SLAP lesion (**Figure 12**). Traction on the biceps should not produce any detachment of the labrum.

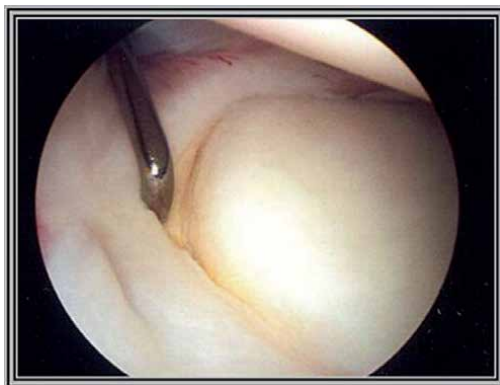
Snyder et al. described four types of SLAP lesions [36]. Type I is a degenerative type of labrum and after debridement, it still has a firm attachment to the superior glenoid (**Figure 13**). Type II SLAP lesion is the most common type and can be pulled away from the superior labrum and there is granulation tissue present on the glenoid side (**Figure 14**). Type III SLAP lesion has a split between the superior labrum, similar to a bucket handle tear of the meniscus (**Figure 15**). Type IV SLAP lesion is similar to type III



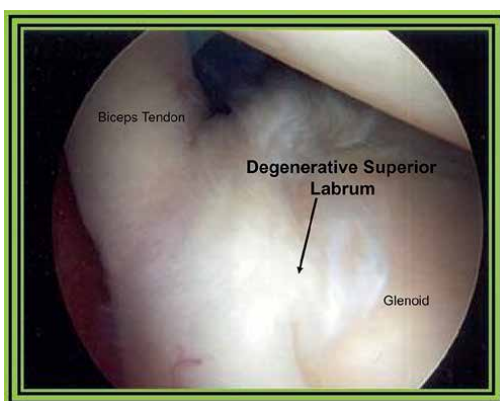
**Figure 10.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the arthroscope is rotated in a counterclockwise position to approximately the 8 o'clock position to visualize the superior labrum and the biceps anchor. Using the cannula or tip of a shaver as a probe, the superior labrum can be palpated to see if it is well attached to the superior glenoid.



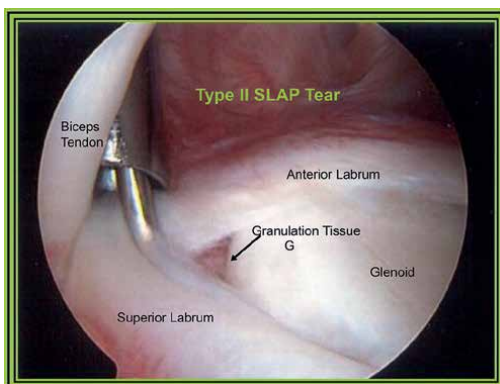
**Figure 11.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, a meniscoid type of labrum, is a normal variant of the superior labrum.



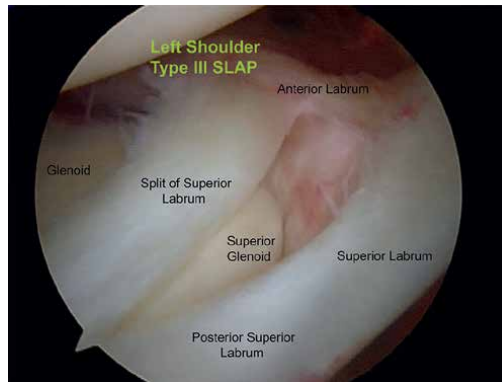
**Figure 12.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, with a small cleft between the glenoid and labrum, is a normal variant and should not be confused with a type II SLAP lesion.*



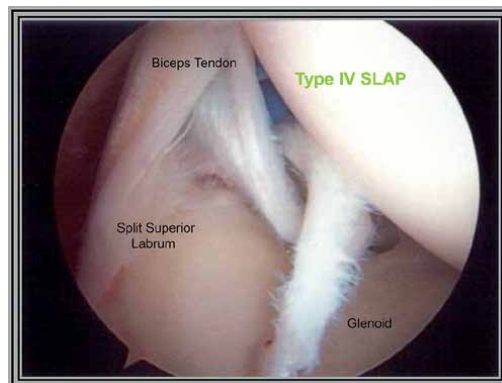
**Figure 13.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, a degenerative type I SLAP lesion.*



**Figure 14.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, a type II SLAP lesion is the most common type and can be pulled away from the superior labrum and there is granulation tissue present on the glenoid side.*



**Figure 15.** A left shoulder in the lateral decubitus position, viewing from posterior to anterior, a type III SLAP lesion has a split between the superior labrum similar to a bucket handle tear of the meniscus.

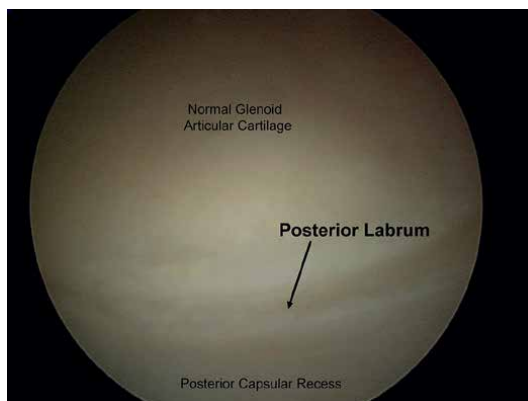


**Figure 16.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, a type IV SLAP lesion is similar to a type III but also has a split extending into the biceps tendon.

but also has a split extending into the biceps tendon (**Figure 16**). It is important to note that even experienced shoulder surgeons have difficulty agreeing on the intra-operative diagnosis of a SLAP lesion. Gobezie et al. [37] studied inter and intra-observer reliability in the diagnosis and treatment of SLAP tears with 73 “expert surgeons.” Regarding type II SLAP tears, only 52% of surgeons made the correct diagnosis of distinguishing normal shoulders from type I and type II SLAP lesions and making the appropriate treatment recommendations. The techniques of the arthroscopic repair of type II SLAP lesions are beyond the scope of this chapter, but the reader is encouraged to look at our surgical techniques with videos that have been previously published [38].

The arthroscope is then slightly rotated to the 6 o’clock position to visualize the posterior superior labrum and then the posterior labrum. To visualize the posterior labrum adequately, the arthroscope is slightly retracted and gently lifted upward, with the scope bevel looking downward.

*Position #3:* From the posterior labrum being visualized with the arthroscope bevel of the 6 o’clock position (**Figure 17**), the arthroscope is then rotated in a counterclockwise fashion to the 4 o’clock position to visualize the posterior-inferior

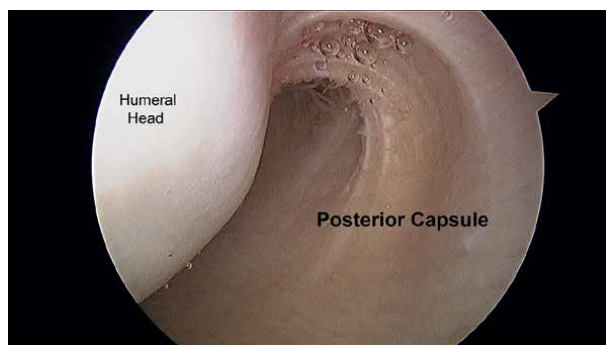


**Figure 17.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the posterior labrum being visualized with the arthroscope bevel of the 6 o'clock position.*

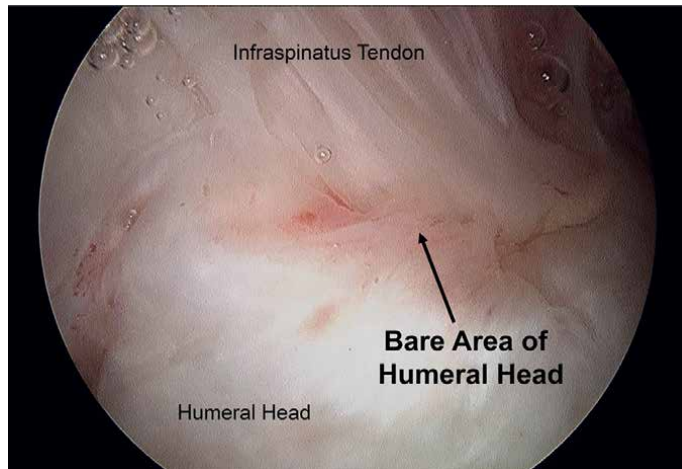
labrum and then to the 3 o'clock position to visualize the posterior-inferior axillary recess. Here, the posterior capsular attachment can be seen with the posterior-inferior glenohumeral ligament, which is just a thickening of the posterior capsule and often indistinguishable from the posterior capsular structure (**Figure 18**).

*Position #4:* The arthroscope then follows the posterior aspect of the humeral head superiorly to the bare area of the humeral head. The arthroscope is rotated in a continual counterclockwise fashion up to 12 o'clock and the infraspinatus tendon which attaches to the bare area of the glenohumeral head (**Figure 19**), where the vascular channels to the humeral head can be seen (**Figure 20**). The posterolateral aspect of the humeral head is the area where Hill-Sachs lesions are seen as the scope (**Figure 21**) is continually rotated counterclockwise to approximately the 5 o'clock position.

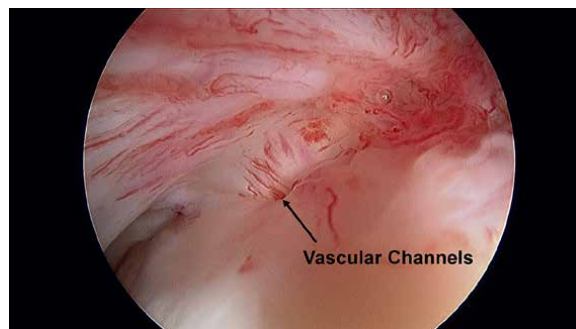
*Position #5:* The arthroscope is then slightly withdrawn and then rotated in a counterclockwise fashion to the 3 o'clock position to visualize the undersurface of the supraspinatus tendon (**Figure 22**). By rotating the arthroscope to the 12 and then 11 o'clock position in a counterclockwise fashion, the supraspinatus tendon



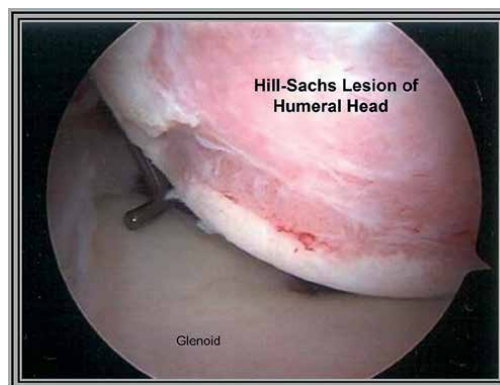
**Figure 18.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, arthroscope is then rotated in a counterclockwise fashion to the 4 o'clock position to visualize the posterior-inferior labrum and then to the 3 o'clock position to visualize the posterior-inferior axillary recess. Here, the posterior capsular attachment can be seen with the posterior-inferior glenohumeral ligament which is just a thickening of the posterior capsule and often indistinguishable from the posterior capsular structure.*



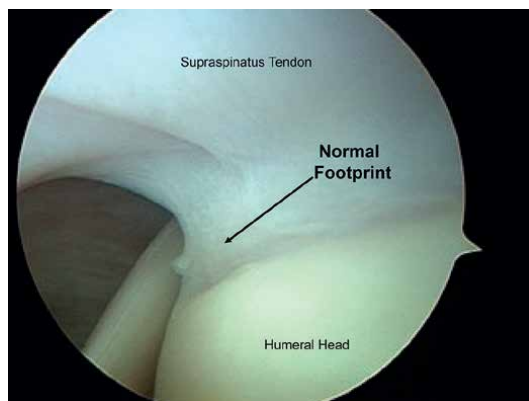
**Figure 19.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the arthroscope is rotated in a continual counterclockwise fashion up to 12 o'clock and the infraspinatus tendon which attaches and outlines the bare area of the glenohumeral head can be seen.*



**Figure 20.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the vascular channels supplying blood supply to the humeral head can be seen.*



**Figure 21.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, a Hill-Sachs lesion is seen at the posterolateral aspect of the humeral head.*

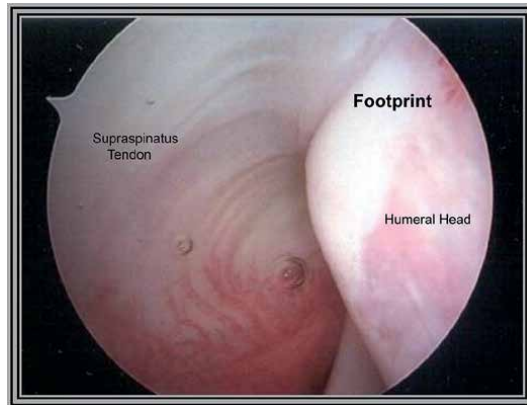


**Figure 22.**

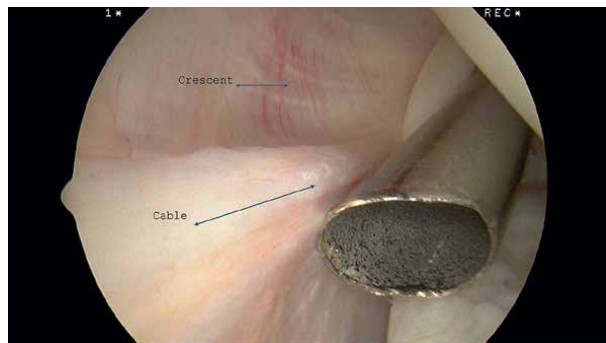
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the arthroscope is then slightly withdrawn and then rotated in a counterclockwise fashion to the 3 o'clock position to visualize the undersurface of the supraspinatus tendon.*

and its attachment to the greater tuberosity and the footprint of the supraspinatus tendon can be seen (**Figure 23**). This portion of the supraspinatus tendon has a firm attachment to the bone. The thickening of the capsular tissue is the rotator cuff cable, which is an extension of the coracohumeral ligament, and the crescent is the lateral border of the rotator cuff between the cable and the humeral head attachment (**Figure 24**). Burkhart et al. described this as a “suspension bridge,” anteriorly is the biceps tendon and posteriorly is the inferior border of the infraspinatus tendon [39], and it is thought that tears that maintain the cable can maintain function and strength. This area of the supraspinatus tendon crescent has a poor blood supply and poor healing potential compared to the bursal side of the cuff which is hypervascular (**Figure 25**). The collagen fibers on the articular side of the supraspinatus tendon and rotator cuff are also thinner and less uniform compared with the bursal-sided fibers which are thicker and more parallel (**Figure 26**). Partial articular sided or full-thickness rotator cuff tears can be seen here. If there is a partial articular sided cuff tear, a marker suture can be placed *via* an 18-gauge spinal needle introduced percutaneously off the lateral edge of the acromion, into the partial cuff tear, and the PDS (polydioxanone) suture is introduced *via* the spinal needle into the glenohumeral joint to mark the location of the partial cuff tear. The spinal needle is then removed, the PDS suture is cut leaving a tail outside of the skin (**Figure 27**), and this can be later visualized in the subacromial space to determine if there is any tearing of the bursal side of the rotator cuff (**Figure 28**). Curtis et al. [40] the supraspinatus footprint averaging 12–14 mm (range 9–22 mm). The amount of exposed footprint from the edge of the anterior surface to the tendon can help estimate the amount of footprint exposed which helps to estimate the amount of partial tears of the tendon (**Figure 29**). If there is a significant amount of partial tearing (>50%) then most surgeons would agree that the rotator cuff should be repaired using a PASTA repair technique described by Snyder [31] or the tendon should be debrided, converted to a full-thickness tear, and repaired.

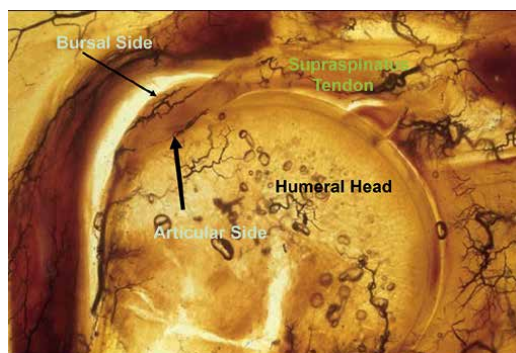
*Position #6:* The arthroscope is then rotated down from approximately the 1 o'clock position clockwise to the 3 o'clock position to examine the articular cartilage of the humeral head. The arm can be internally and externally rotated to visualize the entire humeral head and check for any anterior cartilage defects or osteoarthritic changes.



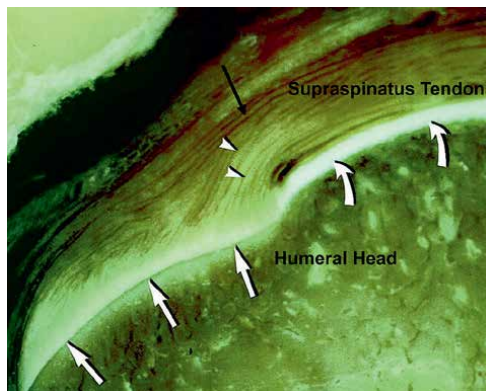
**Figure 23.**  
A right shoulder in the lateral decubitus position, viewing from posterior to anterior, by rotating the arthroscope to the 12, 11, and 10 o'clock position in a counterclockwise fashion, the supraspinatus tendon and its attachment to the greater tuberosity and the footprint of the supraspinatus tendon can be seen.



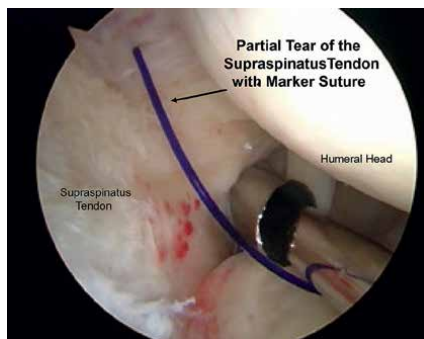
**Figure 24.**  
A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the thickening of the capsular tissue is the rotator cuff cable which is an extension of the coracohumeral ligament, and the crescent is the lateral border of the rotator cuff between the cable and the humeral head attachment.



**Figure 25.**  
A histological specimen of the blood supply to the supraspinatus tendon. The area of the supraspinatus tendon on the articular side or crescent area has a poor blood supply and poor healing potential compared to the bursal of the cuff which is hypervascular.



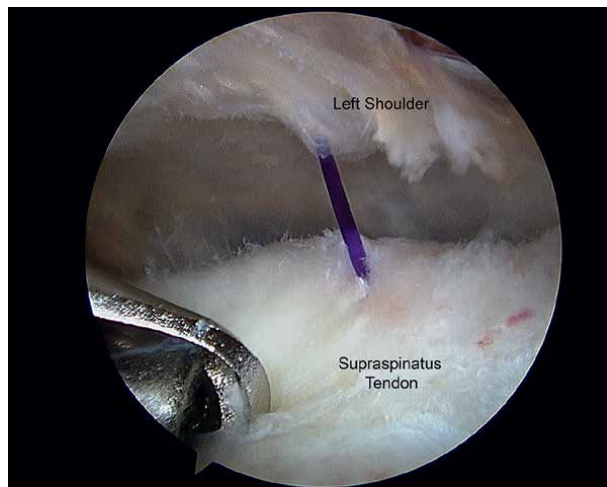
**Figure 26.**  
*The collagen fibers on the articular side of the supraspinatus tendon and rotator cuff (arrowheads) are thinner and less uniform compared with the bursal-sided fibers which are thicker and more parallel (arrow).*



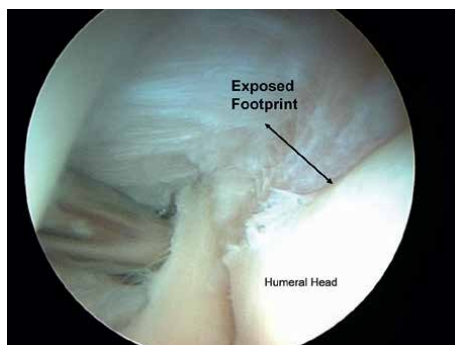
**Figure 27.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, partial articular-sided or full-thickness rotator cuff tears can be seen here. If there is a partial articular-sided cuff tear, a marker suture can be placed via an 18-gauge spinal needle introduced percutaneously off the lateral edge of the acromion, into the partial cuff tear, and the PDS (polydioxanone) suture is introduced via the spinal needle into the glenohumeral joint to mark the location of the partial cuff tear. The spinal needle is then removed, and the PDS suture is cut, leaving a tail outside of the skin.*

*Position #7:* After examining the articular cartilage of the humeral head, the arthroscope is rotated clockwise from 3 o'clock to 6 o'clock and the anterior surface of the glenoid is examined and the portion labrum can also be seen again (**Figure 17**). The center of the glenoid has a very thin appearance which is very common, and it is not to be confused with osteoarthritic changes.

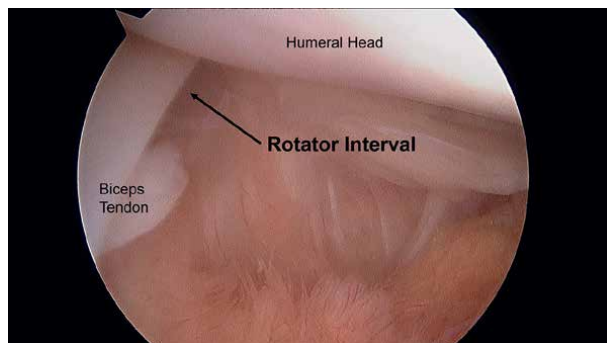
*Position #8:* The arthroscope is then introduced slightly anterior and pivoted up, then rotated upwards in a counterclockwise fashion to approximately to the 11 o'clock position to visualize the anterior-superior triangle of the shoulder joint which includes the anterior-superior labrum and the superior glenohumeral ligament which is not always seen (**Figure 30**). The superior glenohumeral ligament extends from the superior labrum at the glenoid tubercle to the upper portion of the lesser tuberosity, crossing the subscapularis superiorly and often having a common insertion with it at the lesser tuberosity. It is a discrete ligament approximately 40% of the time (**Figure 31**) [41]. This common insertion of the subscapularis and superior glenohumeral ligament is shared with the coracohumeral ligament and forms the reflection



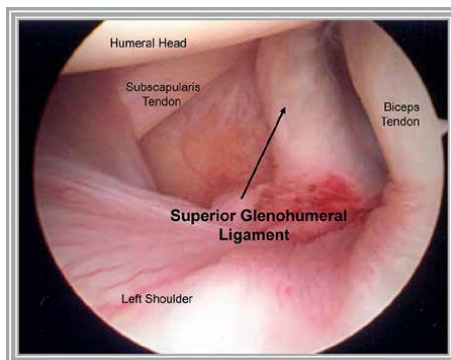
**Figure 28.** A left shoulder in the lateral decubitus position, viewing from posterior to anterior, the marker suture can be later visualized in the subacromial space to determine if there is any tearing of the bursal side of the rotator cuff.



**Figure 29.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the amount of exposed footprint from the edge of the anterior surface to the tendon can help estimate the amount of footprint exposed, which helps to estimate the amount of partial tears of the tendon.



**Figure 30.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the arthroscope is rotated up to approximately the 11 o'clock position to visualize the anterior-superior triangle of the shoulder joint which includes the anterior-superior labrum and the superior glenohumeral ligament.



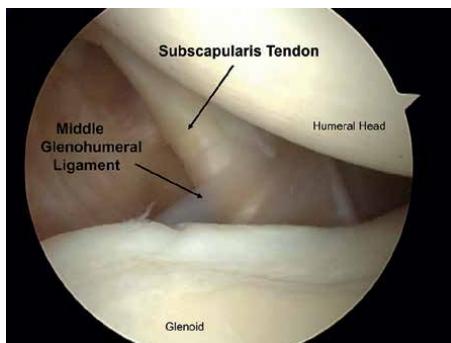
**Figure 31.**

*A left shoulder in the lateral decubitus position, viewing from posterior to anterior, the superior glenohumeral ligament extends from the superior labrum at the glenoid tubercle to the upper portion of the lesser tuberosity, crosses the subscapularis superiorly and often has a common insertion with it at the lesser tuberosity. It is a discrete ligament approximately 40% of the time.*

pulley, which is a ligamentous sling that stabilizes the long head of the biceps as it enters the intertubercular groove [42].

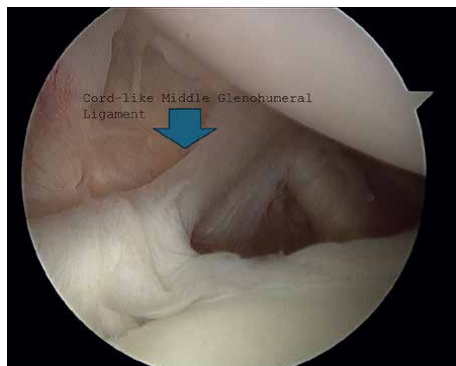
The arthroscope is then rotated clockwise to 2 o'clock to the superior edge of the subscapularis tendon, and the middle glenohumeral ligament as it crosses the subscapularis tendon at an angle of approximately 45° (**Figure 32**). The subscapularis tendon passes vertically from the humeral head attachment at the lesser tuberosity to disappear below the glenoid rim. The middle glenohumeral inserts on the anterior glenoid neck or just medial to the labrum. Over 70% of the time, the middle glenohumeral ligament appears as a thin sheet of tissue but can be a thicker structure and cordlike (21%) (**Figure 33**), bifid (1%), and absent (7%), sometimes just appearing as a thickening of the capsule [36].

The superior glenohumeral ligament is a secondary restraint to external rotation of the shoulder but should not be included in repairing SLAP lesions. When repairing type II SLAP lesions, the mistake many surgeons make is placing an anchor anterior to the biceps tendon and incorporating the superior glenohumeral ligament and the middle glenohumeral ligament into the repair (**Figure 34**). This can cause an inadvertent loss of external rotation [43] and poor results in overhead athletes [38, 44, 45].

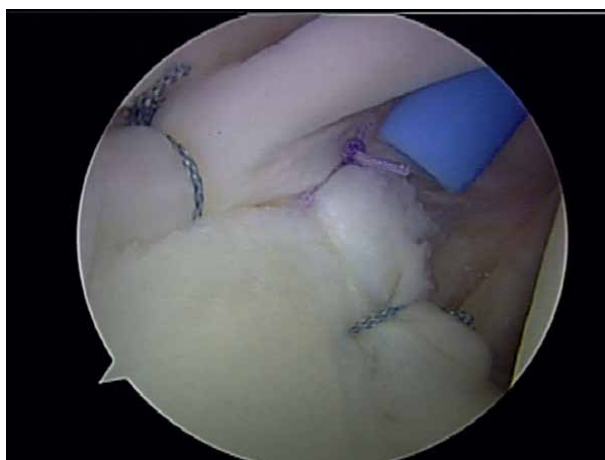


**Figure 32.**

*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, rotating the arthroscope clockwise to 2 o'clock to see the superior edge of the subscapularis tendon, and the middle glenohumeral ligament as it crosses the subscapularis tendon and 45°.*



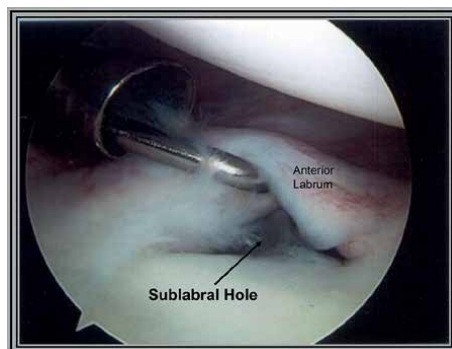
**Figure 33.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the middle glenohumeral ligament can appear as a thin sheet of tissue but can be a thicker structure and cordlike 21% of the time.



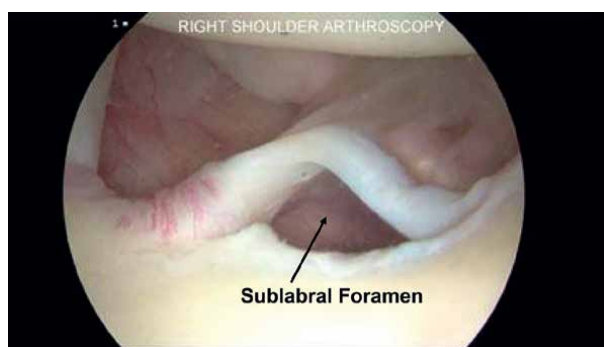
**Figure 34.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the mistake many surgeons make is placing an anchor and sutures anterior to the biceps tendon and incorporating the superior glenohumeral ligament and the middle glenohumeral ligament into the SLAP repair which will limit external rotation, especially in the overhead athlete.

Normal variants of the anatomy of the anterior-superior labrum are important to recognize. The anterior-superior labrum typically is firmly attached to the glenoid rim [31] but the presence of an anterior sublbral hole is only visible when the labrum is retracted with a probe (**Figure 35**) or a distinct sublbral foramen is seen without probing (**Figure 36**) and occurs in approximately 14–18% of shoulders [31, 32, 41]. It is important to differentiate an anterosuperior sublbral foramen from a SLAP lesion or a Bankart lesion and recognize it as a normal variant. Inadvertent repair of a sublbral foramen will restrict external rotation in a normal shoulder.

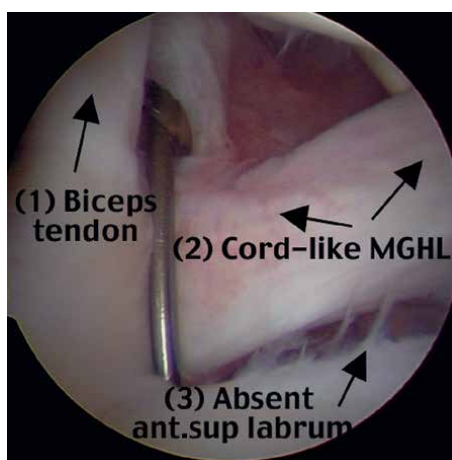
A Buford complex described by my colleagues Dr. Don Buford and Dr. Steve Snyder is a variant of a sublbral foramen and consists of a cordlike middle glenohumeral ligament that attaches to the superior labrum just anterior to the base of the biceps anchor and crosses the subscapularis tendon at a 45° angle, with an absent anterosuperior labrum (**Figure 37**). It is seen in approximately 6% of all shoulders [31, 41, 46].



**Figure 35.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, an anterior sublabral hole can vary in size to a few millimeters which is only visible when the labrum is retracted with a probe.



**Figure 36.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, a distinct sublabral foramen can be seen without any probing.



**Figure 37.** A right shoulder in the lateral decubitus position, viewing from posterior to anterior, a Buford complex is a variant of a sublabral foramen and consists of a cordlike middle glenohumeral ligament that attaches to the superior labrum just anterior to the base of the biceps anchor and crosses the subscapularis tendon at a 45° angle, with an absent anterosuperior labrum.

There are also variations of the subscapularis tendon that have been less described including a split or bifid tendon, or even an absent subscapularis tendon, which is extra-articular and not visible within the glenohumeral joint (**Figure 38**) [32].

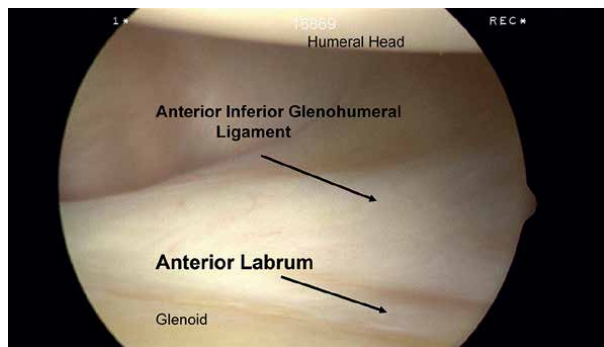
*Position #9:* The arthroscope is rotated clockwise from 2 o'clock to 3 o'clock to visualize the anterior-inferior labrum and its glenoid attachment. Over 90% of the time, the labrum has a smooth attachment to the edge of the anterior surface of the neck of the edge of the anterior surface of the neck of the glenoid (**Figure 39**). In approximately 5% of cases, there is a meniscoid type of labral attachment in which the articular edge of the labrum is separated from the glenoid, but this is a normal variant and should not be confused with a Bankart lesion.

*Position #10:* With the arthroscopic bevel still at 3 o'clock, the arthroscope is pushed forward slightly with care not to damage the articular surface of the humeral head to visualize the anterior-inferior labral structures. This is known as the “drive through” sign and is an indicator of multi-directional instability. If there is difficulty



**Figure 38.**

*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, variations of the subscapularis tendon which have been less described including a split or bifid tendon, or even an absent subscapularis tendon which is extra-articular and not visible within the glenohumeral joint as seen here.*



**Figure 39.**

*A right shoulder in the lateral decubitus position, viewing from posterior to anterior, the arthroscope is rotated to 3 o'clock to visualize the anterior-inferior labrum and its glenoid attachment. Over 90% of the time, the labrum has a smooth attachment to the edge of the anterior surface of the neck of the edge of the anterior surface of the neck of the glenoid.*

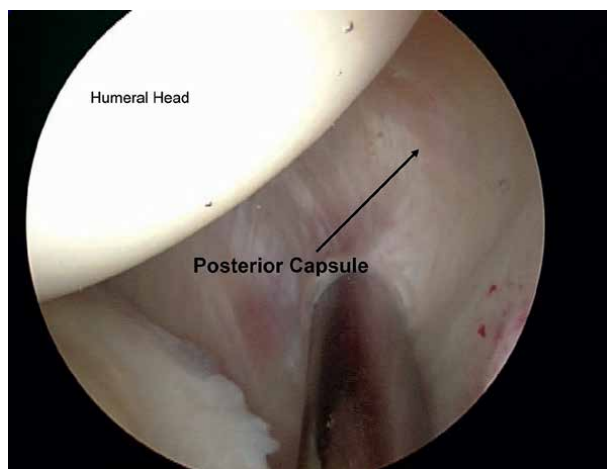
in passing the arthroscope under the humeral head, the assistant can gently lift up the arm near the axilla to view the anterior structures.

The anterior capsular structures typically insert on the glenoid labrum and there is a thickening of the capsule representing the anterior-inferior glenohumeral ligament. This is the primary restraint to anterior humeral head translation in the abducted and externally rotated (apprehension) position. It can be better visualized when viewing from the anterior-superior portal and so the arthroscope is then changed from the posterior portal to the anterior-superior portal to complete the 15-point diagnostic examination.

*Changing Viewing Portals:* The last five positions of the 15-point glenohumeral exam [31] are done with the scope in the anterior-superior portal and the outflow posteriorly. The anterior-superior cannula remains below or inferior to the biceps tendon. With the interchangeable “J-lock” cannula system, the arthroscope is easily removed from the posterior portal and placed anteriorly, and the anterior tubing system for overflow is placed in the posterior portal. If an interchangeable cannula system is not used, then the use of a switching stick technique is used to “preserve your portal” to prevent iatrogenic damage to surrounding muscle and capsular tissues.

*Position # 11:* With the arthroscope in the anterior-superior portal and the bevel at 12 o'clock, viewing posteriorly, the posterior capsule structures and posterior labrum are seen (**Figure 40**). Rotating the arthroscope counterclockwise to the 10 o'clock position, one can view the posterior capsular ligaments and check for a reverse humeral avulsion of the glenohumeral ligament, a so-called reverse humeral avulsion of the glenohumeral ligament (HAGL) lesion [31]. Rotating counterclockwise to the 9 o'clock position, one can see the inferior labrum and check for a reverse Bankart lesion. The arthroscope is then rotated in a clockwise fashion from 9 o'clock to the 3 o'clock and 4 o'clock position to visualize the entire posterior and posterior superior labrum, which is typically firmly attached to the glenoid rim but occasionally may be meniscoid in nature.

*Position #12:* From approximately the 4 o'clock position, rotating the arthroscope clockwise to 5 o'clock, the superior labrum just posterior to the biceps anchor can be visualized. Rotating upward in a counterclockwise position to one o'clock, the posterior rotator cuff is seen. In order to get a better view of the supraspinatus tendon, the arthroscope,

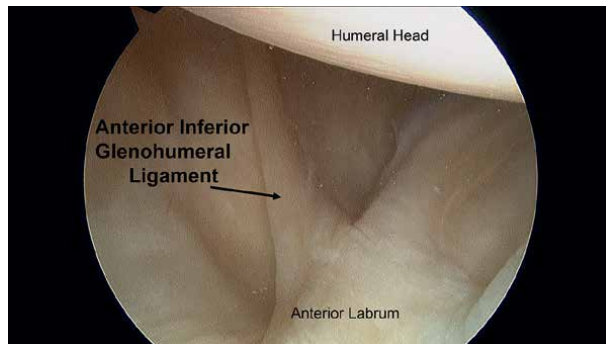


**Figure 40.**  
*A right shoulder in the lateral decubitus position, viewing from anterior to posterior, with the arthroscope in the anterior-superior portal and the bevel at 12 o'clock viewing posteriorly, the posterior capsule structures are seen.*

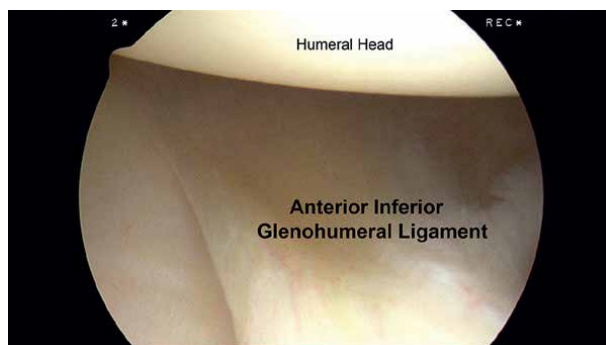
which is just below the biceps tendon, is slightly retracted and the tip of the arthroscope flips over the biceps and now the arthroscope is on the superior side of the biceps tendon, the undersurface of the supraspinatus tendon is more easily seen. Rotating from one o'clock to 12 and 11 o'clock, the supraspinatus footprint can be seen.

*Position #13:* The arthroscope is then again slightly drawn back, and the tip of the arthroscope flips back inferior to the biceps tendon and the arthroscope is rotated counterclockwise to 9 o'clock to visualize the anterior labral structures. The superior band of the anterior-inferior glenohumeral ligament (AIGHL) is seen and well developed approximately 80% of the time, can be cordlike (**Figure 41**), thicker (**Figure 42**) or poorly developed and not visualized 20% of the time [42]. This is also the best viewing portal to see an acute Bankart lesion (**Figure 43**) or a chronic Bankart lesion (**Figure 44**) and any bone involvement of the glenoid. By rotating the arthroscope from the 9 o'clock upward to the 11 o'clock positions, the humeral attachment of the AIGHL can be followed up to its attachment on the humeral head. This is the only way to see a humeral avulsion of the glenohumeral ligament (HAGL) lesion which although uncommon, can be a source of recurrent shoulder instability (**Figure 45**).

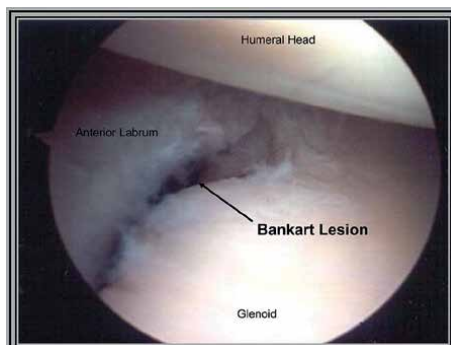
This view from the anterior-superior portal to the anterior labrum and neck of the anterior glenoid is important as this is the ideal view for arthroscopic Bankart



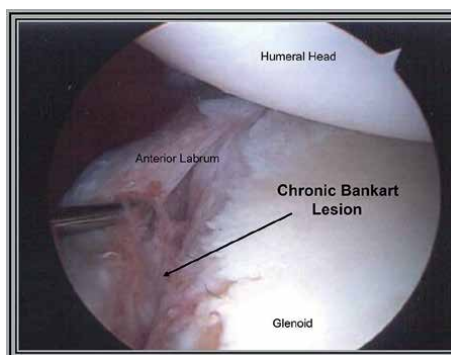
**Figure 41.** A right shoulder in the lateral decubitus position, viewing from anterior to posterior, the superior band of the anterior-inferior glenohumeral ligament (AIGHL) is seen and well developed approximately 80% of the time and poorly developed and visualized 20% of the time. Here it is a cordlike ligament.



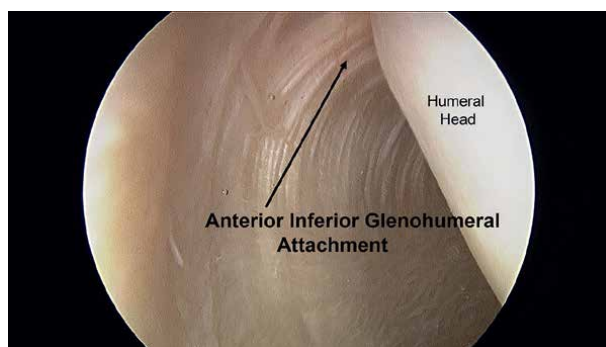
**Figure 42.** A right shoulder in the lateral decubitus position, viewing from anterior to posterior, the anterior-inferior glenohumeral ligament can be thicker.



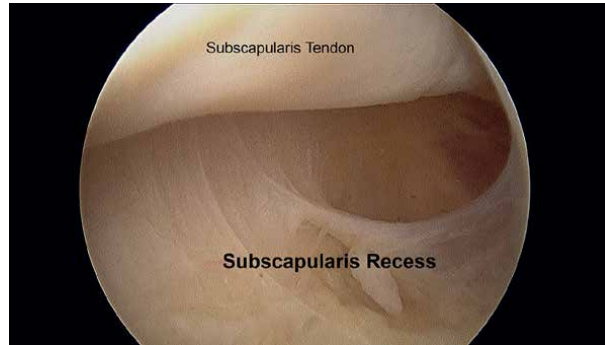
**Figure 43.**  
*A right shoulder in the lateral decubitus position, viewing from anterior to posterior, the best viewing portal to see an acute Bankart lesion and any bone involvement of the glenoid.*



**Figure 44.**  
*A right shoulder in the lateral decubitus position, viewing from anterior to posterior, the best viewing portal to see a chronic Bankart lesion and any bone involvement of the glenoid.*



**Figure 45.**  
*A right shoulder in the lateral decubitus position, viewing from anterior to posterior, by rotating the arthroscope from the 9 o'clock upward to the 11 o'clock positions, the humeral attachment of the AIGHL can be followed up to its attachment on the humeral head. This is the only way to see a humeral avulsion of the glenohumeral ligament (HAGL) lesion, which although uncommon, can be a source of recurrent shoulder instability.*



**Figure 46.**

*A right shoulder in the lateral decubitus position, viewing from anterior to posterior, by rotating the arthroscope counterclockwise from 6 o'clock to 4 o'clock, the entire subscapularis recess can be visualized to check for loose bodies.*

procedures. Viewing anteriorly, it is much easier to see the Bankart lesion, mobilizing it *via* a second anterior mid-glenoid portal, and for accurate anchor placement on the edge of the articular surface. Attempting to place anterior glenoid anchors viewing from the posterior portal is much more difficult and is not advised.

*Position #14:* The arthroscope is retracted slightly and rotated counterclockwise from 11 o'clock to approximately 7 o'clock to visualize the middle glenohumeral ligament and its insertion into the labrum of the glenoid neck as it crosses the subscapularis recess to check for loose bodies. By rotating the arthroscope counterclockwise to 6 o'clock to 4 o'clock, the entire subscapularis recess can be visualized (**Figure 46**) [31].

*Position # 15:* The tip of the arthroscope is then slightly withdrawn, and the superior edge of the subscapularis tendon is followed out, past the middle glenohumeral ligament and up to the humeral head. By rotating the arthroscope clockwise to approximately the 12 o'clock position, the attachment of the subscapularis tendon can be followed to its attachment on the humeral head of the lesser tuberosity. The anterior aspect of the humeral head is also visualized at the same time. Retracting the arthroscope slightly, and placing it directly on the biceps tendon, the arthroscope can be maneuvered along the biceps tendon just inside the biceps groove. By rotating the arm, the stability of the biceps tendon and the quality of the investing synovium can be evaluated [31].

## 8. Diagnostic bursoscopy of subacromial space

Once the 15-point glenohumeral exam is completed, the arthroscope and the cannula are removed from the shoulder joint and the arm is repositioned for entry into the subacromial space. In the lateral decubitus position, the arm is changed from abduction to adduction to allow easier passage into the subacromial space by bringing the humeral head away from the undersurface of the acromion. The weights on the shoulder suspension device are changed so that the arm is changed from 70° of abduction to 20° of abduction and 5° of forward flexion (**Figure 47**). Decreasing the abduction angle allows easier passage of the arthroscope and the cannula into the subacromial space [32].

Examining the subacromial space by performing a diagnostic bursoscopy is an important part of any arthroscopic shoulder evaluation, even if the pathology is thought to be only within the shoulder joint [32].



**Figure 47.**

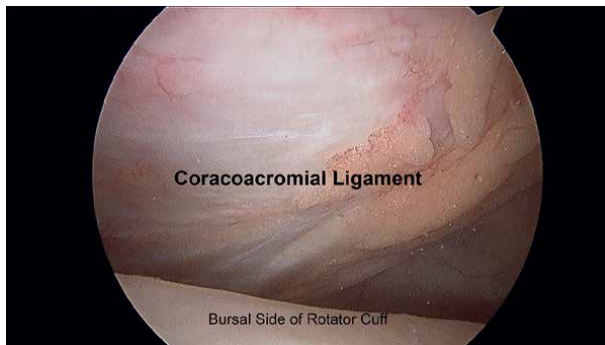
*In the lateral decubitus position, the arm is changed from abduction to adduction to allow easier passage into the subacromial space by bringing the humeral head away from the undersurface of the acromion. The weights on the shoulder suspension device are changed so that the arm is changed from 70° of abduction to 20° of abduction and 5° of forward flexion. By decreasing the abduction angle, this allows easier passage of the arthroscope and the cannula into the subacromial space.*

With the shoulder at 20° of abduction, the arthroscopic cannula with the blunt trocar is inserted into the same posterior skin incision and the posterior aspect of the acromion is palpated with the tip of the trocar. The cannula with the trocar is slightly withdrawn and redirected under the acromion toward the anterior portal, piercing the posterior bursal curtain and inserting the cannula at least two-thirds of the way into the subacromial space under the acromion. The blunt trocar is then removed, and a smooth switching stick is placed through the cannula and out the anterior skin incision. The other metal arthroscopic cannula is inserted over the switching stick and with the assistant stabilizing the shoulder, the cannula is inserted into the subacromial space with the two ends of the cannula touching each other in an end-to-end fashion. It is important that the posterior cannula is approximately two-thirds of the way into the subacromial space so viewing will not be hindered by the posterior bursal curtain.

The assistant now holds the two cannulas together in an end-to-end fashion and then the switching stick is removed. This is important as there is often a significant amount of bursal tissue, which can make initial visualization difficult. The arthroscope is placed through the posterior cannula and an arthroscopic shaver is carefully introduced through the anterior cannula (**Figure 48**), so the tip of the shaver is in view of the tip of the arthroscope. Once the tip of the shaver is in view, careful debridement of any bursal tissue is done to create a “room with a view.” The bursal tissue is very vascular so debridement with the arthroscope shaver at this point is kept to a minimum. Sometimes the subacromial space is pristine (**Figure 49**) but the vast majority of the time, it is not, so careful arthroscopic debridement of the subacromial bursal tissue will allow adequate visualization. Fraying of the undersurface of the acromion and the coracoacromial ligament is known as an impingement lesion (**Figure 50**). For the subacromial



**Figure 48.**  
*The assistant holds the two cannulas together in an end-to-end fashion with the arthroscope posterior and the shaver anterior. It is important that the posterior cannula is approximately two-thirds of the way into the subacromial space so viewing will not be hindered by the posterior bursal curtain.*



**Figure 49.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior in the subacromial space, a normal bursal space with a normal coracoacromial ligament.*



**Figure 50.**  
*A left shoulder in the lateral decubitus position, viewing from posterior to anterior in the subacromial space, fraying of the undersurface of the acromion and the coracoacromial ligament is known as an impingement lesion.*

space, an 8-point bursal exam is performed as described by Snyder [31]. By viewing from both the posterior portal and anterior portal, the surgeon became more comfortable and familiar with visualization and orientation.

*Position #1:* The arthroscope is in the posterior portal with the rotator cuff below and the acromion above, with the bevel of the arthroscope looking up at the 1 o'clock position. The undersurface of the acromion is visualized with the coracoacromial (CA) ligament (**Figure 49**). An impingement lesion is fraying of the undersurface of the CA ligament, but in a normal shoulder, it is smooth with no evidence of fraying. In a normal shoulder, this is no reactive bursitis or signs of inflammation in the subacromial space. Looking up at the CA ligament, there may be “crab-like fraying” [31] of the undersurface of the acromion, which is a hallmark of mechanical impingement and is known as an impingement lesion (**Figure 50**).

*Position #2:* From the 1 o'clock position, the arthroscope is rotated clockwise to the 2 and 3 o'clock positions to the lateral edge of the acromion, where there is typically a thin, lateral subacromial shelf of bursal tissues which extends from anterior to posterior. This can be thick and adhered to the top of the rotator cuff but should not be confused with the underlying rotator cuff tissue (**Figure 51**) [31].

*Position #3:* From 3 o'clock, the arthroscope is rotated clockwise downward to 4 o'clock and then to 5 o'clock to inspect the bursal side of the rotator cuff and rotator cuff footprint which is the attachment of the supraspinatus and infraspinatus tendons to the greater tuberosity. In a normal shoulder this is a smooth surface with no tearing or fraying. If a marker suture had been placed for a partial articular sided cuff tear, it is often seen on the bursal side of the rotator cuff in this area (**Figure 28**).

*Position #4:* In a further clockwise fashion, the arthroscope is rotated to the 6 o'clock position to visualize medially to the tendon-bone insertion and having the assistant internally and externally rotate the arm, the entire side of the bursal cuff and its footprint attachment to the greater tuberosity can be inspected [31]. These footprint areas are where most partial and complete rotator cuff tears can be found.



**Figure 51.** A left shoulder in the lateral decubitus position, viewing from posterior to anterior in the subacromial space, a marker suture had been placed for a partial articular sided cuff tear, it is seen on the bursal side of the rotator cuff in this area.

With partial anterior-sided tears where a marker suture has been placed, this is where the marker suture on the bursal side is typically found.

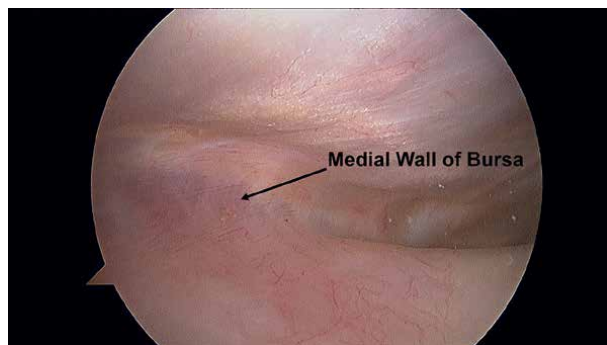
This is also a very important maneuver to always examine the bursal side of the rotator cuff even if, during the diagnostic glenohumeral examination, there was no cuff damage on the articular side of the rotator cuff. Significant partial bursal-sided tears with a normal articular side are uncommon but must be recognized. Snyder referred to these significant partial bursal-sided cuff tears with a normal articular side as a “Monk’s Hood” [31].

The bursal side of the rotator cuff tendon is more vascular than the anterior side [47] which is why articular-sided partial rotator cuff tears are two to three times more common than bursal-sided tears [48].

*Position #5:* From the 6 o’clock position, the arthroscope is rotated clockwise to 8 and then 9 o’clock to view the medial wall of the bursal space which separates the subacromial space from the subclavicular region (**Figure 52**). In a normal shoulder, this is a smooth wall of tissue typically filled with fatty tissue. With careful debridement with the arthroscopic shaver of the fatty and bursal tissue, the spine of the scapula can be seen. The spine of the scapula separates the supraspinatus anteriorly and the infraspinatus posteriorly. Anterior to the spine of the scapula is the distal end of the clavicle and the acromioclavicular (AC) joint. This area can be very vascular, and we prefer using a radiofrequency device instead of a shaver to minimize bleeding. The normal end of the clavicle has a smooth articular surface, whereas a degenerative AC joint has loss of anterior cartilage at the end of the clavicle and little if any space between the end of the clavicle and the acromion (**Figure 53**).

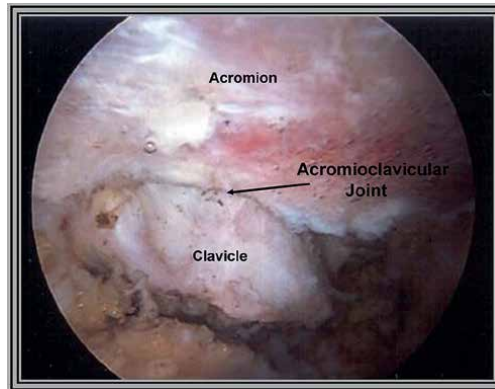
For the last three positions of the subacromial space, the arthroscope is switched from the posterior portal to the anterior portal, and the tubing with gravity outflow, which is clamped, is switched to the posterior portal. This is made easier with a set of arthroscopic cannulas, as we discussed.

*Position #6:* With the arthroscope in the anterior portal, viewing posteriorly, the posterior bursal curtain can be seen, which extends from the posterior margin of the AC joint to the lateral border of the acromion (**Figure 54**). The posterior bursal curtain can block the view of the arthroscope when it is in the posterior portal, and the arthroscopic tip is behind it. By keeping the arthroscope inserted two-thirds of the way in the subacromial space, the tip of the arthroscope will stay out of the posterior bursal curtain. We refer to this as the “2/3 to 1/3” rule of the subacromial space. The

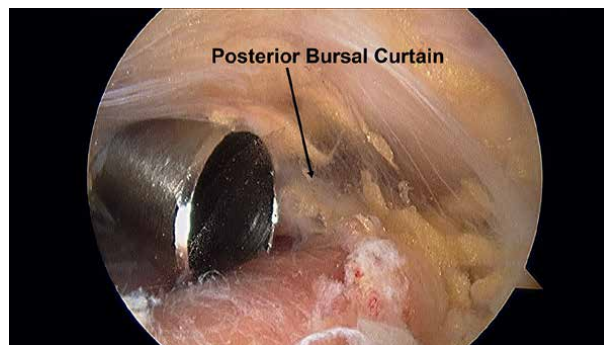


**Figure 52.**

*A right shoulder in the lateral decubitus position, viewing from posterior to anterior in the subacromial space, the arthroscope is rotated clockwise to 8, and then 9 o’clock to view the medial wall of the bursal space, which separates the subacromial space from the subclavicular region.*



**Figure 53.**  
*A right shoulder in the lateral decubitus position, viewing from posterior to anterior in the subacromial space, the normal end of the clavicle has a smooth articular surface, whereas a degenerative AC joint has loss of anterior cartilage at the end of the clavicle and little if any space between the end of the clavicle and the acromion.*



**Figure 54.**  
*A right shoulder in the lateral decubitus position, viewing from anterior to posterior in the subacromial space, the posterior bursal curtain can be seen, which extends from the posterior margin of the AC joint to the lateral border of the acromion.*

posterior bursal curtain tissue can be very thick and careful debridement with the arthroscopic shaver posteriorly can help visualization of the rotator cuff tendons.

*Position #7:* The arthroscopic bevel is then rotated in a counterclockwise fashion laterally to 9 o'clock to view the posterior attachment of the rotator cuff. With the internal and external rotation of the arm by the assistant, the entire supraspinatus and infraspinatus tendons can be visualized for tears [31].

*Position # 8:* With gentle retraction of the arthroscope and rotating it counterclockwise from 9 o'clock to 7 o'clock, the anterior aspect of the rotator cuff and the area of the biceps groove can be seen. Raising the camera head and pivoting the arthroscope tip allows visualization of the front of the shoulder into the rotator internal space and the subscapularis tendon.

## 9. Accessory portal placement

A thorough understanding of surface anatomy is critical for proper portal placement for shoulder arthroscopy. We have described the standard posterior portal and

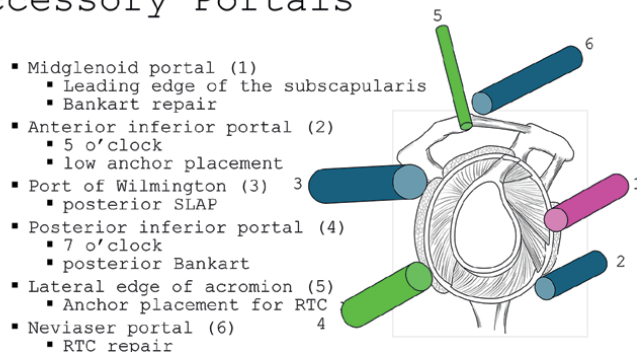
anterior-superior portal which are used for standard diagnostic arthroscopy and bursoscopy. However, additional accessory portals are necessary in order to perform more advanced procedures in the shoulder joint and subacromial space.

For arthroscopic procedures in the glenohumeral joint, there are accessory portals that are necessary to perform arthroscopic Bankart repairs, SLAP repairs, and arthroscopic capsulorrhaphies. These accessory portals include the mid-glenoid portal, the anterior-inferior (5 o'clock) portal, the "Port of Wilmington," and the posterior-inferior (7 o'clock) portal. For arthroscopic rotator cuff repairs, an accessory portal off the lateral edge of the acromion can facilitate anchor placement, a posterolateral accessory portal can be used for better viewing of anterior cuff tears, and a Neviaser portal for repairing retracted cuff tears can all be helpful for more complex arthroscopic procedures (**Figure 55**).

### 9.1 Mid-glenohumeral portal

The anterior mid-glenohumeral portal is key for performing arthroscopic Bankart repairs. Viewing from the posterior portal and often creating the anterior-superior (rotator interval) portal and performing a complete 15-point glenohumeral examination, an 18-gauge spinal needle is placed anteriorly at the leading edge of the subscapularis tendon. By using the spinal needle before making the skin incision, the exact placement of this portal is done. It is also important that this mid-glenoid portal is high enough above the glenoid, as the portal is usually used for anchor placement in the anterior glenoid. If the portal is too low, then the trajectory of the angle for anchor placement will not allow for anchor placement in the proper position. Once the proper location for this portal is verified by the spinal needle, a small skin incision is made along Langer's lines on the anterior aspect of the shoulder. The spinal needle is left in place and the metal arthroscopic cannula with the blunt obturator is brought onto the operative field and the direction of needle is lined up with the direction of the cannula. As the needle is removed, the cannula follows the exact same direction or trajectory where the needle was, and the blunt-tipped obturator can be seen tenting the anterior capsular structures just above the leading edge of the subscapularis. The

## Accessory Portals



**Figure 55.**

*For arthroscopic procedures in the glenohumeral joint, there are accessory portals which are necessary to perform arthroscopic Bankart repairs, SLAP repairs, and arthroscopic capsulorrhaphies. These accessory portals include the mid-glenoid portal (1), the anterior-inferior (5 o'clock) portal (2), the Port of Wilmington (3), and the posterior-inferior (7 o'clock) portal (4). For arthroscopic rotator cuff repairs, an accessory portal off the lateral edge of the acromion can facilitate anchor placement (5), a posterolateral accessory portal can be used for better viewing of anterior cuff tears, and a Neviaser portal for repairing retracted cuff tears can all be helpful for more complex arthroscopic procedures.*

obturator and cannula are introduced with care not to damage the anterior surface of the humeral head or glenoid. The obturator is then removed, and a smooth switching stick is placed through the cannula in order not to lose the portal, the metal cannula is removed, and the 8.25 mm × 7 or 9 cm large, ribbed cannula is introduced *via* a cannulated handle that fits into the cannula and acts as an introducer of the cannula over the switching stick. Once the cannula is introduced into the shoulder joint, the switching stick is removed and then the handle is removed.

For arthroscopic Bankart repairs, the arthroscope is then placed into the anterior-superior portal for best viewing purposes of the anterior aspect of the glenoid and glenoid neck for Bankart repairs. For arthroscopic SLAP repairs, the same mid-glenoid portal is used but once it is established, we continue to view from the posterior portal. We use “twin anterior portals” for SLAP repairs (**Figure 56**).

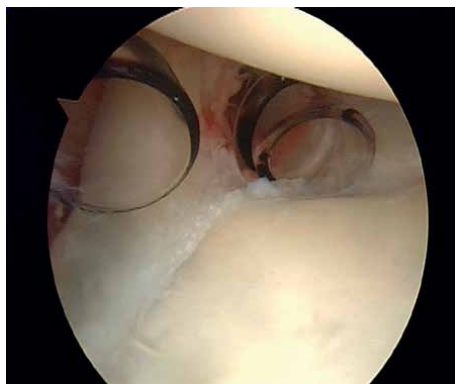
### 9.2.5 o'clock portal

The 5 o'clock portal was described in 1995 by Davidson and Tibone [49] for low anchor placement in arthroscopic anterior Bankart repairs. Using an inside-out technique, the arthroscope is driven from the posterior portal to the 5 o'clock position of the glenoid at the leading edge of the inferior-glenohumeral ligament. The arthroscope is removed, and a switching stick is placed in the cannula through the anterior capsule, which tents the skin anteriorly. A small skin incision is made, and the switching stick is pushed out anteriorly through the subscapularis. A cannula with an obturator handle is used to place a cannula over the switching stick and into the joint.

We have never found any use for this portal as we have found the mid-glenoid portal, if established properly, is all that is necessary for proper anchor placement in the anterior glenoid. Personal communication with the senior author (J. Tibone) says that he no longer uses this portal and it is not recommended.

### 9.3 Accessory posterior-inferior portal

An accessory posterior-inferior (7 o'clock) portal is sometimes necessary for posterior stabilization procedures such as posterior Bankart repairs or remplissage procedures. When this portal is necessary, the same technique of using an 18-gauge spinal



**Figure 56.**

*A right shoulder in the lateral decubitus position, viewing from posterior to anterior in the shoulder joint, twin anterior portals are used for SLAP repairs, one in the rotator interval (anterior-superior) and the second in the mid-glenoid just above the subscapularis tendon.*

needle for proper placement can be used with similar steps as used for an anterior mid-glenoid portal.

#### 9.4 Port of Wilmington/transrotator cuff

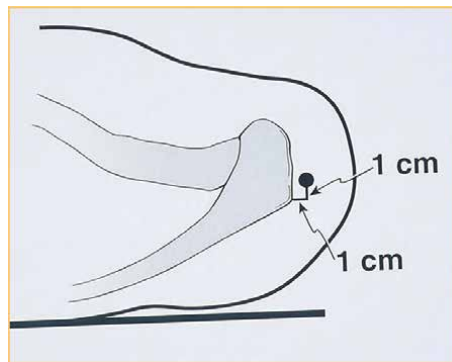
A trans-rotator cuff portal by definition, goes through the rotator cuff and can be used as an accessory portal to place anchors into the superior glenoid for SLAP repairs or also can be used for instrumentation within the glenohumeral joint. Morgan et al. [50] described the most notable trans-rotator cuff portal which he described as the “Port of Wilmington” for SLAP repair. The portal is made 1 cm anterior and 1 cm lateral to the posterolateral corner of the acromion (**Figure 57**). When establishing this portal, it is important not to violate the rotator cuff tendon but rather place the portal medial to the musculotendinous junction. We do not recommend the use of a cannula if this portal is used as there is risk of iatrogenic damage to the rotator cuff tendon if the portal or cannula is misplaced through the rotator cuff tendon. Stephenson et al. [51] published a case series of six patients who had iatrogenic rotator cuff tears following SLAP repairs using a trans-rotator cuff portal. Other authors have reported poor results using a similar technique of the Port of Wilmington/trans-rotator cuff portal in overhead athletes ranging from only 13–44% who were able to return to their pre-injury level of throwing [52–54].

#### 9.5 Neviasser portal

The Neviasser portal was first described in 1987 [55] and has been described as a convenient portal for SLAP repair suture fixations. This portal is created superiorly in the soft spot between the clavicle, acromion, and scapula spine. A spinal needle can be used for placement from this location laterally and anteriorly through the capsule just under the biceps tendon for SLAP repairs. This portal can also be used in the subacromial space for retracted supraspinatus tendon tears and the passage of a curved suturing device through the cuff medially [56].

#### 9.6 Lateral portal

The lateral portal is usually used for the subacromial space and is the third portal that is typically created when performing an initial diagnostic bursoscopy of the subacromial



**Figure 57.** The “Port of Wilmington” for SLAP repair was described by Morgan. The portal is made once centimeter anterior and 1 cm lateral to the posterolateral corner of the acromion.

space. With the shoulder in the lateral decubitus position and the arm placed in adduction to bring the humeral head away from the acromion and to open up the subacromial space, a small 1–1.5 cm incision is made approximately 3–4 cm (2 finger breadths) from the lateral edge of the acromion in line with the lateral orientation line which was drawn when we outlined the surface anatomy at the beginning of the procedure. This lateral orientation line extends from the posterior aspect of the AC joint where it intersects the supraclavicular fossa and is drawn out laterally. Once the small skin incision is made, a Crystal smooth cannula (Arthrex, Naples, FL) with the blunt obturator is introduced straight down or perpendicular through the skin and through the deltoid muscle to bone (proximal humerus). Once this is done, the cannula with the obturator tip is angled just slightly upward, and the cannula with the obturator is introduced into the subacromial space. Once this is done, take the shaver from the anterior portal and insert it laterally after the obturator has been removed and clear out more of the subacromial tissue or bursitis to facilitate viewing. This shaving is kept to a minimum as the bursal tissue is very vascular and shaving will cause excessive bleeding.

### **9.7 Posterolateral portal**

The posterolateral portal can be helpful in large, obese patients and can help facilitate viewing in the subacromial space when the posterior portal does not adequately visualize the anterolateral portion of the subacromial space. The posterolateral portal was described by Ellman in 1987 [57] as a viewing portal for arthroscopic subacromial decompression. I have found it useful as a viewing portal for rotator cuff repairs when the shoulder is very large, and the posterior portal does not give adequate visualization of the anterior aspect of the subacromial space and rotator cuff.

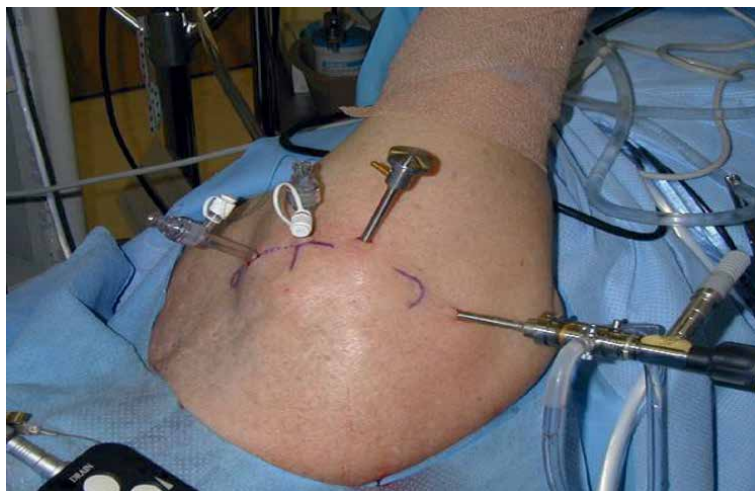
This portal is created approximately halfway between the posterior portal and the lateral portal, 2–3 cm lateral to the posterolateral aspect of the acromion. It is created in a similar fashion as the lateral portal is created with a cannula with a blunt obturator and angled into the subacromial space.

### **9.8 Accessory lateral portals**

When performing arthroscopic rotator cuff repairs in the subacromial space, I will typically use only three portals including the posterior portal for viewing, the lateral portal for instrumentation and knot tying, and the anterior portal for grasping sutures and for suture management. Besides the posterolateral portal just described for viewing, additional accessory lateral portals can be created all along the lateral aspect of the acromion to help facilitate arthroscopic rotator cuff repair. As one of the Godfathers of arthroscopic surgery, Dr. James Esch, once said, “It is still arthroscopic surgery as long as you don’t connect the portals ...” Yes indeed, multiples portals can be made laterally in a similar fashion as described for the lateral portal (**Figure 58**).

### **9.9 Accessory portals for anchor placement**

When performing arthroscopic rotator cuff repair in the lateral decubitus position, anchor placement into the area of the greater tuberosity or “footprint” of the proximal humerus can be challenging. The typical lateral portal which is created 3–4 cm off the lateral edge of the acromion, is at a poor angle for anchor insertion as it is too oblique, and the anchor cannot be placed at the proper angle. The angle of



**Figure 58.**

*A right shoulder in the lateral decubitus position, the arthroscope is in the posterior portal and multiple lateral portals can be made along the edge of the acromion with or without cannulas. Besides the posterolateral portal just described for viewing, additional accessory lateral portals can be created all along the lateral aspect of the acromion to help facilitate arthroscopic rotator cuff repair.*

insertion is best created just off the lateral aspect of the acromion at an approximately 45-degree angle to the humerus, the so-called “Dead man’s Angle,” as described by Burkhart in 1995 [58]. An 18-gauge spinal needle is used as a guide for proper orientation. Once this is established, a small skin “stab” incision is created with the needle still in place and the scalpel (“11 blade”) follows the direction of the needle, just piercing the deltoid into the subacromial space. The needle is left in place and the anchor (I prefer 5.5 mm metal corkscrew anchor triple loaded) (Arthrex, Naples, FL) follows the direction of the spinal needle parallel to it, until the tip of the anchor becomes visible in the subacromial space. Once the anchor becomes visible, the spinal needle is removed, and the anchor continues to be turned in a clockwise fashion until the entire anchor is visible and clear of any tissue. It is then placed just lateral to the articular surface at the medial margin of the rotator cuff footprint. If the angle is not perfect, the arm can be slightly adducted or even abducted slightly to insure proper anchor placement. Although this skin incision is technically a portal, no cannula is used or is necessary. This same technique can be used anteriorly or even more posteriorly for large rotator cuff tears where more than one anchor is necessary. The use of the 18-gauge spinal needle is key for proper angle placement and orientation before any skin incision or portal is created.

### **9.10 Portal placement/summary**

Proper portal placement is paramount when performing shoulder arthroscopy. A portal can be “your best friend or worst enemy” if not made in the proper position [59]. Shoulder arthroscopy with proper portal placement allows one to reproduce open surgery arthroscopically. This first starts with proper patient positioning (again, I prefer the lateral decubitus position) and the drawing and outlining all of the surface anatomy as previously described. The posterior portal, anterior-superior portal (rotator interval portal), and the lateral portal are used the vast majority of the time for almost every shoulder arthroscopy case. When addressing more complex

pathology such as Bankart lesions, posterior labral tears, remplissage procedures, and rotator cuff repairs including subscapularis tendon repairs, accessory portals are very important, usually with the use of cannulas.

With the techniques of portal placement described, shoulder arthroscopists can address almost all shoulder pathologies, which helps our patients recover faster and better than with open surgery.

## 10. Summary

Whether you are new to shoulder arthroscopy or have experience, developing a systematic stepwise approach to doing shoulder arthroscopy is critical. As we discussed earlier in this chapter, a careful history, physical examination, and imaging studies are necessary for a proper diagnosis and treatment plan. I need to remind the reader that the majority of patients will respond to non-operative management of their shoulder problem with a structured non-operative program of physical therapy and the judicious use of non-steroidal anti-inflammatory medications and corticosteroid injections.

The shoulder surgeon who performs arthroscopy should work hard on establishing a team of dedicated health professionals to assist in surgery including an experienced anesthesiologist comfortable with hypotensive anesthesia, skilled and experienced nursing staff, and a trained first assistant who is comfortable holding the arthroscope and assisting in arthroscopy. The shoulder surgeon also needs to make sure that all equipment that may be needed for arthroscopic surgery is available including anchors, suturing devices, cannulas, and other accessory equipment that may be needed during arthroscopic shoulder surgery.

Becoming a proficient and skilled shoulder arthroscopist does not come easily and takes hours of practice and experience. Those who are new to the field are encouraged to take cadaver courses (if available in your country) or other laboratory sessions and seminars to practice. Once the surgeon starts to perform shoulder arthroscopy, just like with any surgery, the surgeon should know his or her limitations and if doing more complex procedures beyond their surgical capabilities, having a more experienced shoulder surgeon present in the operating room can accelerate the learning process. This is not always possible or practical, but we do have a responsibility to our patients to do the right thing for them.

The 15-point diagnostic arthroscopic evaluation of the glenohumeral joint and the 8-point bursal examination ensure that all significant anatomy and pathology are recognized and treated. Just as important, it allows the arthroscopic surgeon to become comfortable from viewing not only from the posterior portal anteriorly but also viewing from the anterior portal posteriorly and anteriorly at the anterior glenoid, especially when performing arthroscopic anterior labral repairs. The more diagnostic shoulder arthroscopy and bursoscopy are performed, the more the surgeon will be comfortable recognizing normal anatomy and anatomic variants, expanding the surgeon's knowledge and understanding of this complex joint [32]. Once the basics of shoulder arthroscopy are learned, advanced techniques can then be employed using accessory portals, which we just described. As new technologies emerge, new instrumentation will become available, but this will not replace the skill of the surgeon. Shoulder arthroscopy is a learned skill, but with patience and hard work, it is a great skill to learn to help our patients.

## **Author details**

William B. Stetson<sup>1,2\*</sup> and Akin Akinwumi<sup>1</sup>


1 Stetson Lee Orthopaedics and Sports Medicine, Burbank, CA, USA

2 Orthopaedic Surgery, University of Southern California Keck School of Medicine, USA

\*Address all correspondence to: [wbstetsonmd@gmail.com](mailto:wbstetsonmd@gmail.com)

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*Authored by William B. Stetson*

The purpose of this book is to provide both new and experienced orthopedic surgeons with the fundamentals of shoulder arthroscopy, enabling them to perform basic, advanced, and complex arthroscopic shoulder procedures to benefit their patients. Starting with a complete history, physical examination, and proper imaging studies, most patients will respond to non-operative management of their shoulder problem. For those who require surgery, having a systematic approach to treating patients with shoulder arthroscopy, as detailed in this book, will enable both the beginner and the advanced surgeon to acquire the skills necessary for not only basic shoulder arthroscopy but also more advanced techniques. This includes operating room setup and personnel, proper anesthesia techniques, performing a 15-point diagnostic arthroscopy and an 8-point bursoscopy, recognizing normal anatomy and anatomical variants, and accessory portal placement for more advanced techniques.

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