Shoulder Arthroscopy Lab Manual

Dalhousie University Orthopaedic Program

May 5, 2017

Skills Centre

DALHOUSIE
Orthopaedics

OBJECTIVES

1. Demonstrate a competent understanding of the arthroscopic anatomy and biomechanics of the shoulder joint.

2. Describe the patho-anatomy in the shoulder joint of instability **TUBS** & **AMBRI**.

3. List the pertinent steps of arthroscopic treatment of shoulder instability.

4. Tie successful sliding and non-sliding knot using arthrocopic tools.

SHOULDER ARTHROSCOPY WORKSHOP

JUNIOR RESIDENTS

By the end of the skills session, you will be better able to:

1. Set-up the equipment needed for shoulder arthroscopy.
2. Properly cadaveric specimen for beach chair and lateral decubitus shoulder arthroscopy.
3. Tie a successful sliding and non-sliding knot using arthroscopic tools on a knot tying station with a passing proficiency score.
4. Draw the anatomical skin landmarks and portal sites on the shoulder specimen.
5. Insert portals (cannulas) into the shoulder using inside-out and/or outside-in techniques.
6. Perform a diagnostic glenohumeral arthroscopy using the Snyder 15 point examination technique successfully without needing external guidance.
7. Manipulate and triangulate shoulder anatomy arthroscopically as directed by colleague using the probe and shaver.
8. Attempt a simple labral repair.

SENIOR RESIDENTS

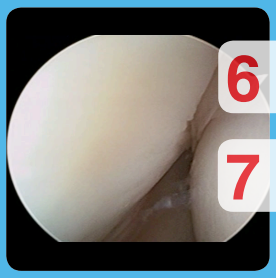
By the end of the skills session, you will be better able to:

1. Competently tie an arthroscopic sliding and non-sliding knot.
2. Position cadaveric specimen for shoulder arthroscopy (beach chair and lateral positions) without external guidance.
3. Draw the shoulder anatomical skin landmarks, portal placement, as well as glenohumeral and subacromial joint injections without requiring redrawing by attending staff.
4. Demonstrate the best view of shoulder anatomy.
5. Demonstrate competent techniques of inside out and outside in portal/cannula insertion.
6. Demonstrate competent skill of diagnostic glenohumeral arthroscopy using the Snyder 15-point examination technique (10 from posterior portal / 5 from anterior portal).
7. Perform the steps of a labral repair using the correct instruments, portals, suture passing techniques, suture management and knot tying.

CONTENT

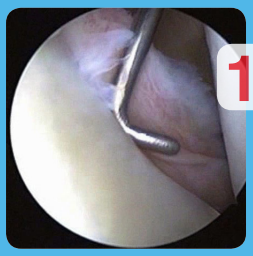
4 Shoulder Arthroscopy Setup

5 Arthroscopic Shoulder Portals



6 Snyder: 15 Point Glenohumeral Exam

7 Snyder: 8 Point Subacromial Space Exam



10 Anterior Shoulder Stabilization

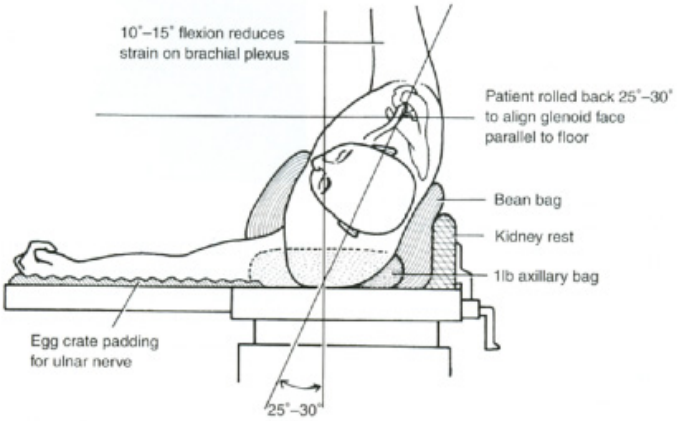
12 SMC Knot

Shoulder Setup

T-MAX SHOULDER FRAME USED FOR PATIENTS IN BEACH CHAIR POSITION

SPYDER SHOULDER POSITIONER USED FOR PATIENTS IN BEACH CHAIR & LATERAL POSITIONS

BASIC SHOULDER ARTHROSCOPY EQUIPMENT



Shoulder arthroscopy may be performed in the beach chair or lateral position"

BEACH CHAIR POSITION

LATERAL POSITION

SHOULDER PORTALS

PRIMARY PORTALS

POSTERIOR PORTAL

FUNCTION: Primary viewing portal used for diagnostic arthroscopy

LOCATION & TECHNIQUE: Located 2 cm inferior and 1 cm medial to posterolateral corner of acromion portal may pass between infraspinatus (supraspinatus nerve) and teres minor (axillary nerve) or pass through the substance of infraspinatus this is usually the first portal placed direct anteriorly towards tip of coracoid.

ANTERIOR PORTAL

FUNCTION: Viewing and subacromial decompression

LOCATION & TECHNIQUE: Lateral to coracoid process and anterior to AC joint portal passes between pectoralis major (medial and lateral pectoral nerves) and deltoid (axillary nerve). This portal is usually placed under direct supervision from the posterior portal with aid of spinal needle

LATERAL PORTAL

FUNCTION: Subacromial decompression

LOCATION & TECHNIQUE: Located 1-2 cm distal to lateral edge of acromium portal passes through deltoid (axillary nerve)

SECONDARY PORTALS

ANTEROINFERIOR (5 O'CLOCK) PORTAL

FUNCTION: Placement of anchors in anterior labral repair

LOCATION & TECHNIQUE: Located slightly inferior to coracoid this portal is usually placed under direct supervision from the posterior portal with aid of spinal needle

POSTEROINFERIOR (7 O'CLOCK) PORTAL

FUNCTION: Placement of anchors for posterior labral repair

LOCATION & TECHNIQUE: This portal is usually placed under direct supervision from the posterior portal with aid of spinal needle

NEVASIER (SUPRASPINATUS) PORTAL

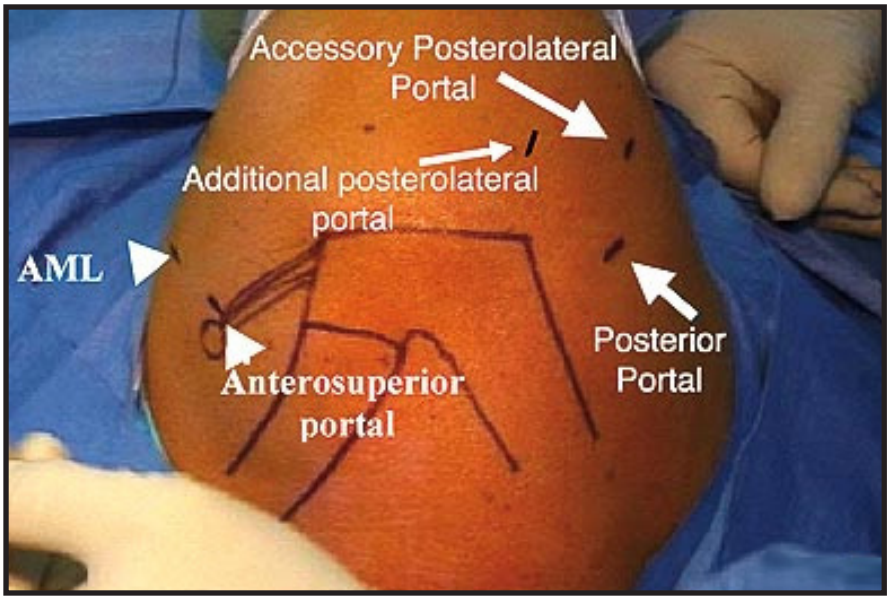
FUNCTION: anterior glenoid visualization and SLAP repairs

LOCATION & TECHNIQUE: Located just medial to lateral acromion goes through supraspinatus muscle (suprascapular nerve)

PORT OF WILMINGTON (ANTEROLATERAL) PORTAL

FUNCTION: Used to evaluate/repair posterior SLAP and RTC lesions

LOCATION & TECHNIQUE: Just anterior to posterolateral corner of acromium this portal is usually placed under direct supervision from the posterior portal with aid of spinal needle.



15 POINT SNYDER

Glenohumeral Exam

Posterior Portal view

Perform viewing from the posterior portal anteriorly **(Figure 1)**

1. Biceps tendon.
2. Superior labrum and posterior capsule attachment to the posterior labrum.
3. Posterior inferior labrum and inferior recess.
4. Glenoid articular surface.
5. Supraspinatus tendon to the rotator cuff insertion into the humeral neck.
6. Posterior cuff tendons and bare area.
7. Articular surface of the humeral head looking for Hill Sach's lesion.
8. Superior subscapularis recess, including the superior glenohumeral ligament, subscapularis tendon, and the middle glenohumeral ligament crossing at a 45 degree angle.
9. Middle glenohumeral attachment to the anterior superior labrum.
10. Inferior glenohumeral ligament and inferior labrum.

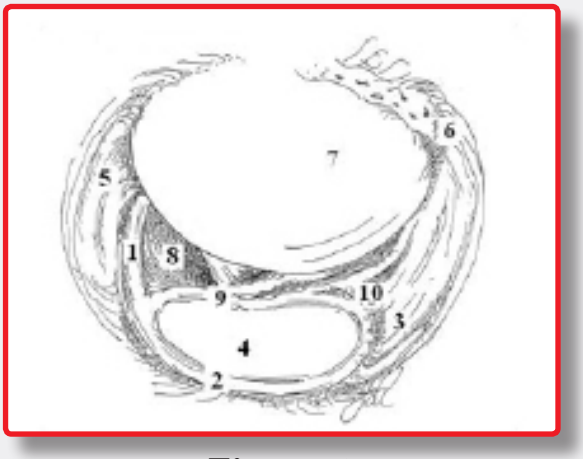


Figure 1

Anterior Portal view

Perform Snyder's 5 point anterior exam from anterior superior viewing portal **(Figure 2).**

11. Posterior capsule and posterior labrum.
12. Posterior aspect of the rotator cuff, both superior and inferior to the biceps tendon.
13. Anterior glenoid neck, labrum, middle glenohumeral ligament (MGHL), inferior glenohumeral ligament (IGHL).
14. Subscapularis tendon, subscapularis bursa, and recess.
15. Attachment of the subscapularis tendon to the humeral head and the anterior humeral articular cartilage and the anterior surface of the biceps tendon.

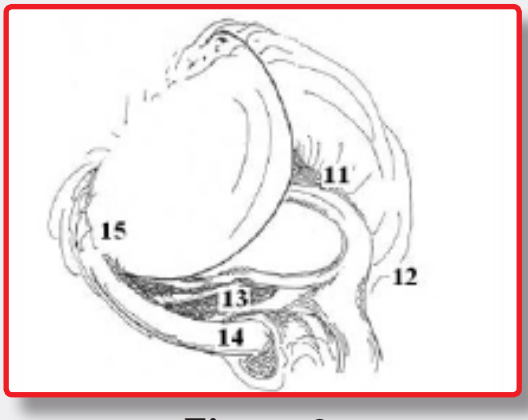


Figure 2

8 POINT SNYDER

Subacromial Space

Posterior Portal view

Perform Snyder's 5 point posterior subacromial space exam from posterior viewing portal **(Figure 3).**

1. Anterior inferior surface of the acromion and the attachment of the coracoacromial ligament.
2. Lateral subdeltoid shelf.
3. Rotator cuff tuberosity insertion.
4. Supraspinatus tendon and the musculotendinous junction.
5. The fat pad beneath the A-C joint.

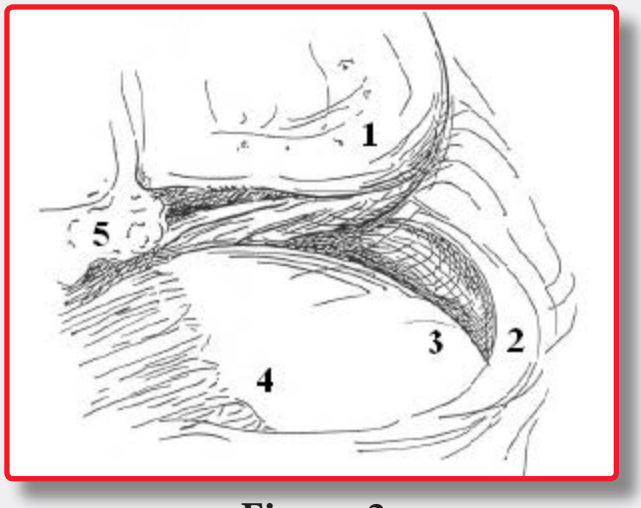


Figure 3

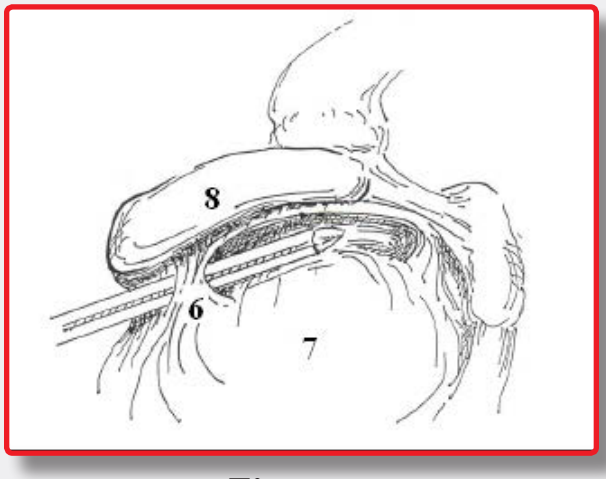
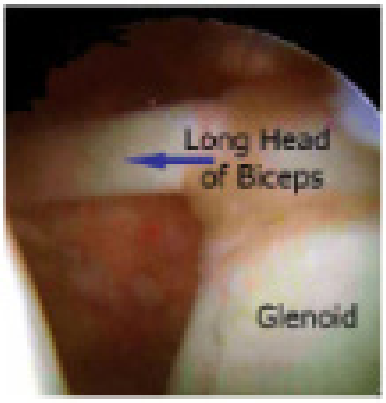


Figure 4

Lateral Portal view

Perform Snyder's 3 point lateral subacromial space exam from lateral viewing portal **(Figure 4).**

6. Posterior bursal curtain.
7. Rotator cuff, including posterior surface of the supraspinatus, infraspinatus and rotator interval.
8. Shape of the acromion



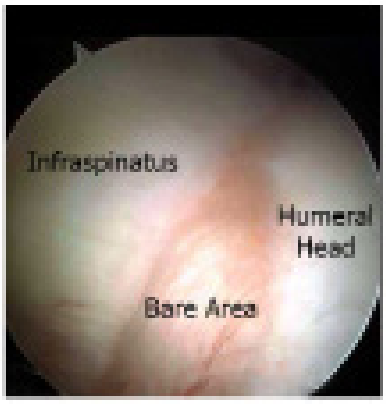
1. Biceps Tendon

2. Superior labrum

3. Posterior Inferior labrum and inferior recess

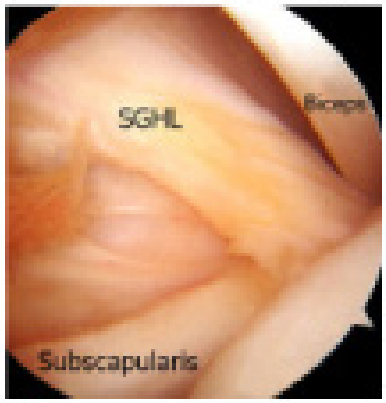
4. Glenoid

5. Supraspinatous tendon to humeral head insertion

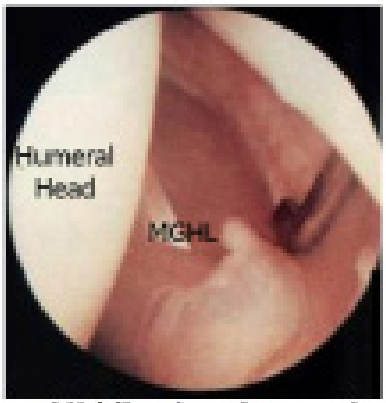


6. Posterior cuff to bare area

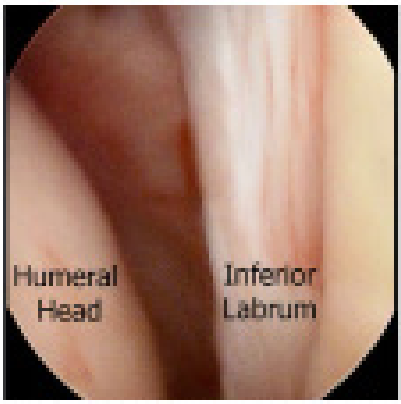
7. Articular surface of humeral head



8. Subscapularis and superior glenohumeral ligament (SGHL)



9. Middle glenohumeral ligament (MGHL)



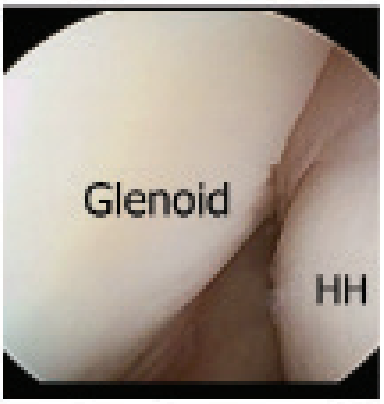
10. Anterior inferior labrum & Inferior glenohumeral ligament (IGHL)

Snyder's 15 Point Shoulder Exam

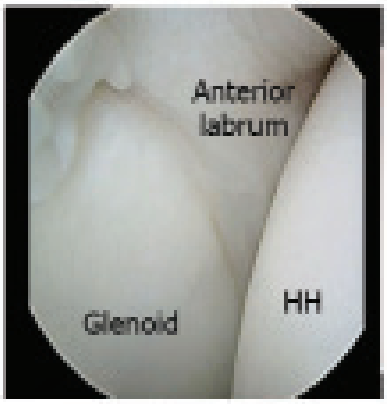
Posterior Portal
(10 points)

Beach Chair View

11. Posterior labrum and capsule

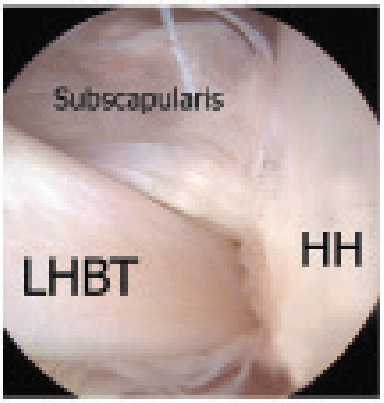


12. Posterior aspect of the rotator cuff



13. Anterior glenoid labrum, MGHL and IGHL

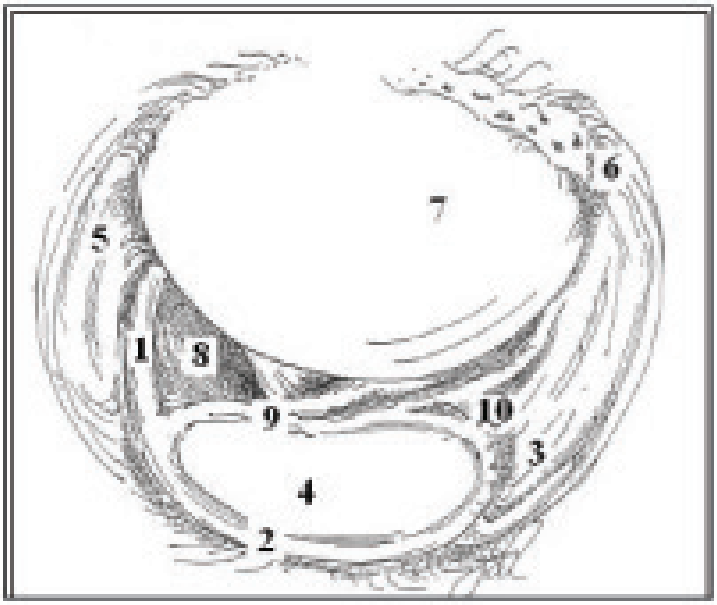
14. Subscapularis tendon and bursa



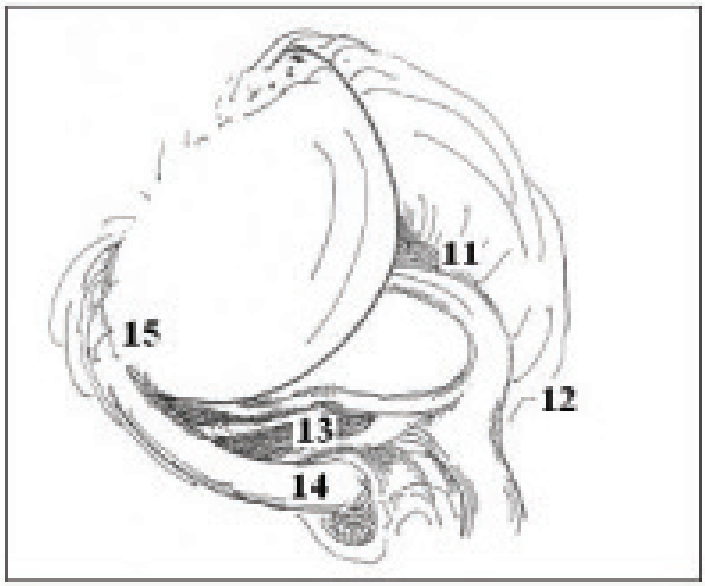
15. Suscapularis attachment to humeral head, anterior humeral articular cartilage & anterior biceps

Anterior Portal (6 points)

Lateral Patient Position

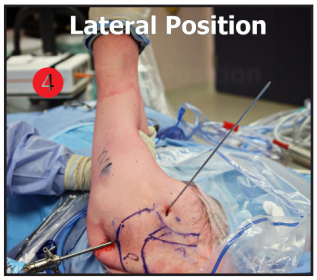


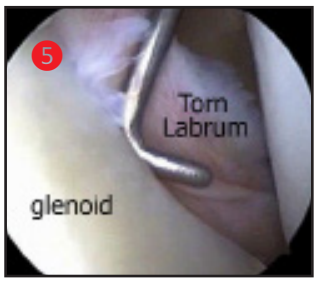
Anatomic landmarks from the posterior portal



Anatomic landmarks from the anterior portal

Shoulder Stabilization





1. Examination under anesthesia.: Assess for anterior, posterior and inferior shoulder instability. If there is 2 cm of inferior translation that does not reduce with external rotation this is an indication that there is severe rotator interval deficiency and is an indication for rotator interval closure. As the arm is brought into moderate degrees of abduction & external rotation, engagement of Hill-Sachs lesions can be further appreciated as a crepitus or click. In the OR, you should compare both shoulders.

2. Patient Positioning: Position the patient either in the lateral decubitus or beach chair position. You will become familiar with both positions during your residency. Make sure the head and neck are well-supported, axillary area and legs are padded. Some surgeons use the Spyder attachment to support the operative extremity during the shoulder arthroscopy.

3. Landmarks: Anatomical landmarks should be done before the arthroscope is introduced. For shoulder instability there is one posterior portal and 1 or 2 anterior portals. Palpate the posterior-lateral corner of the acromion and find the soft spot, which is located about 1 - 2 cm inferior to this landmark.
Some surgeons distend the glenohumeral joint before the posterior portal is established. Place the needle in the soft spot and aim toward the coracoid. Inject approximately 60 mls of saline. The posterior portal is then established with a blade in the skin only. Insert the blunt scope trocar into the glenohumeral joint being very careful not to injure the articular cartilage of the gleno-humeral joint.

4. Anterior Portals: The anterior portal(s) may be established from inside-out or outside-in (or both). There are **2 main anterior portals**. They are the anterior-inferior portal and the anterior-superior portal.

(I) ANTERIOR-INFERIOR PORTAL:
For the ***inside-out technique***, advance the scope trocar anteriorly just above the subscapularis tendon and lateral to the coracoid. Use a Wissinger rod (switching stick) through the scope trocar and then make an anterior incision over the tip of the rod. Insert the appropriate cannula.
For the ***outside-in technique***, use a Jelco or spinal needle and palpate externally to visualize where you want to place the portal (ideally just above the subscapularis and lateral to the coracoid). Once you are happy with the needle position, make an incision in the skin only and then insert a Wissinger rod (switching stick) and then the appropriate cannula (usually an 8 mm cannula).

(II) ANTERIOR-SUPERIOR PORTAL:
If a second anterior portal is made, it is typically made using an outside-in technique. A Jelco or spinal needle is placed anterior-lateral to the acromioclavicular joint, entering the interval just below the biceps tendon. Make a skin incision only. Do not pierce the biceps tendon. The switching stick is then inserted. Some surgeons prefer to visualize using this anterior-superior portal and if so, insert the scope through this portal to perform a thorough assessment of the glenohumeral joint (Snyder's steps 10 – 15). Other surgeons use this as a suture management portal and if so, insert a cannula into this portal over a switching stick.

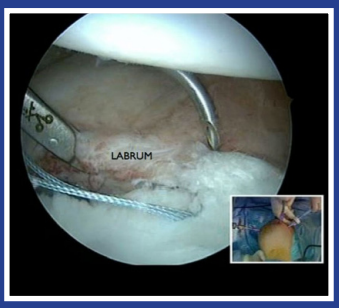
5. Diagnostic Arthroscopy:
Complete diagnostic exam of the glenohumeral joint

15 Point Snyder Glenohumeral Exam:
Evaluate biceps tendon and anchor, followed by anterior labrum. Anterior capsular ligaments: the superior, middle, and inferior glenohumeral ligaments. Evaluate the rotator interval (the triangular portion of capsule, which lies between the supraspinatus and the subscapularis tendons). Visualize the inferior pouch followed by posterior humeral head to identify chondral or impression defects on the humeral head (Hill Sachs lesion). Evaluate the rotator cuff tendons.

6. Mobilize Capsule & Labrum: Capsular labrum mobilization. This is a very important step, otherwise the capsule cannot be tensioned appropriately. Elevator instrument placed between the labrum and the glenoid to elevate the soft tissues off of the glenoid neck anteriorly and inferiorly. An RF probe can also be used here effectively with less bleeding.

7. Prepare glenoid neck: Use a shaver blade to debride devitalized tissue. Leave the suction off the shaver while you are debriding so that you do not "chew up" the labrum. You can use a shaver or a rasp to debride the glenoid bone to promote a bleeding bed for the repair.

8. Drill holes for suture anchors & Insert Anchor: Drill along glenoid using a drill guide through the anterior inferior cannula. Position a drill bit onto the anterior inferior surface of the glenoid, approximately 2mm into the joint from the articular edge. The drill holes may be marked using a radiofrequency device before drilling for future identification when anchor is inserted. Insert anchor below articular surface.

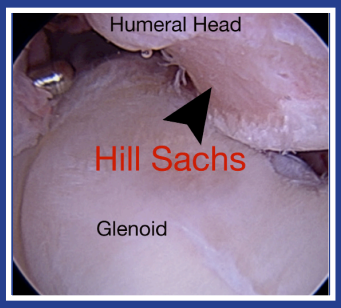


9. Suture Passage: There are many ways to pass the suture through the labrum. The most important thing to remember is that the capsule must be shifted superiorly in order to compensate for its plastic deformation prior to avulsion. Usually about 1.5cm of shift is appropriate. The suture for the first anchor must therefore be retrograded through the labrum about 1.5 cm inferior to the anchor so that the capsule will shift up to the anchor when the knot is tied.

10. Passing and shuttling sutures: Various devices are available to pass sutures such as a "suture lassos", "spectrum" & suture hooks with either a commercial relay device or P¬DS suture loop. Shuttle a braided suture from the superior cannula under the labrum and through the capsular ligament exiting out the inferior cannula. This can also be performed with the scope anteriorly superiorly and utilizing the posterior cannula for shuttling sutures.

11. Knot Tying: Tie a sliding knot through the inferior cannula with the post on the suture that has passed under the labrum and through the capsule. Push the knot towards the suture anchor, advancing the soft tissue to the glenoid. Reduce any traction on the shoulder prior to locking the knot. Follow any sliding knot with three-five alternating half hitches.

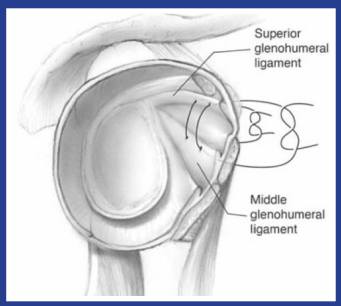
12. Additional Anchors: Create drill hole(s) if necessary to further stabilize the labral tear (typically 1 cm spacing). Two or 3 anchors are usually necessary for a labral repair.



13. Assess Stability:

(I) With the scope posteriorly, visualize the relationship of the Hill-Sachs lesion to the glenoid, making sure that it is posterior and does not articulate with the glenoid.

(II) Place the scope anteriorly and further visualize the Hill-Sachs lesion posterior to the glenoid with the arm out of traction and attempt rotation to visualize the concentric reduction of the humeral head.

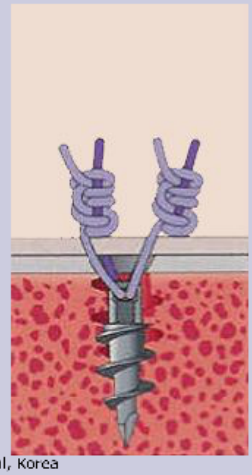


14. Rotator interval closure: In selected cases, a rotator interval closure may be performed. The tightness of the closure depends on how superior you pass the suture through the interval capsule and the number of sutures placed. With the scope posteriorly, use a right suture hook on a right shoulder to grasp the superior border of the middle glenohumeral ligament. The hook can be passed through the superior capsular ligament posterior to the biceps. Introduce a suture and tie. A reverse suture hook can then be introduced through the large cannula behind the biceps, grasping full-thickness superior glenohumeral ligament and followed by middle capsule ligament. The sutures can be placed sequentially from the glenoid edge to the lateral-placed cannula.

SMC KNOT

The SMC Knot

The SMC Knot* is a unique sliding knot that utilizes a self-locking loop to achieve good initial knot security. The SMC knot is low profile and there is minimal or no slack once the knot is secured. The SMC Knot cannot be used if the sutures do not easily slide through the soft tissues. If there is any doubt about the freedom of suture passage, then the Revo knot should be used.



*Developed by Seung-Ho Kim, M.D., Samsung Medical Center, Seoul, Korea

STEP 1

Thread the knot pusher on the post strand (held in the left hand) and place a clamp on the post. Pass the knot pusher into the joint to ensure that there are no twists or obstructing soft tissue. Arrange the suture so that the original post suture is short, with only 10cm of the suture outside of the cannula.

STEP 2

Pinch the two strands together between the thumb and index finger, crossing the loop strand over the post.

STEP 3

Pass the loop suture under and then over both strands.

STEP 4

Pass the loop strand under the post strand between the two sutures and over the top of the post strand in a direction away from the pinching fingers. There will be a triangular interval formed between the two previous loops over the post strand (red arrow).

STEP 5

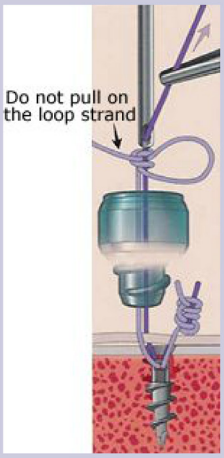
Feed the free end of the loop strand from bottom to top through this interval under the post strand. As the suture is pulled through, a "locking loop" is created (blue arrow).

STEP 6

Release the thumb and index finger and place the left index finger into the "locking loop" from bottom to top to keep it open. Remove all slack (dress the knot) from the sutures with the index finger in place to avoid tightening the "locking loop" prematurely.

STEP 7

Pull on the post strand and use the knot pusher to guide the knot down to the soft tissue. **Do not pull on the loop strand until the knot is seated.** Maintain tension on the post strand and back off the knot pusher to assess the knot.



STEP 8

Once satisfied that the knot is well seated, tighten the "locking loop" by pulling on the loop strand while maintaining pressure on the knot with the knot pusher.

Step 9

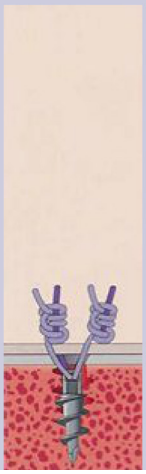
The "locking loop" will slide over the knot pusher and secure the knot. For further security, an **underhand** half-hitch is worked down the post suture.

Step 10

An **overhand** half-hitch is next placed on the post and worked down into position onto the knot stack.

Step 11

Suture tails are cut with microscissors.



Images from Linvatec