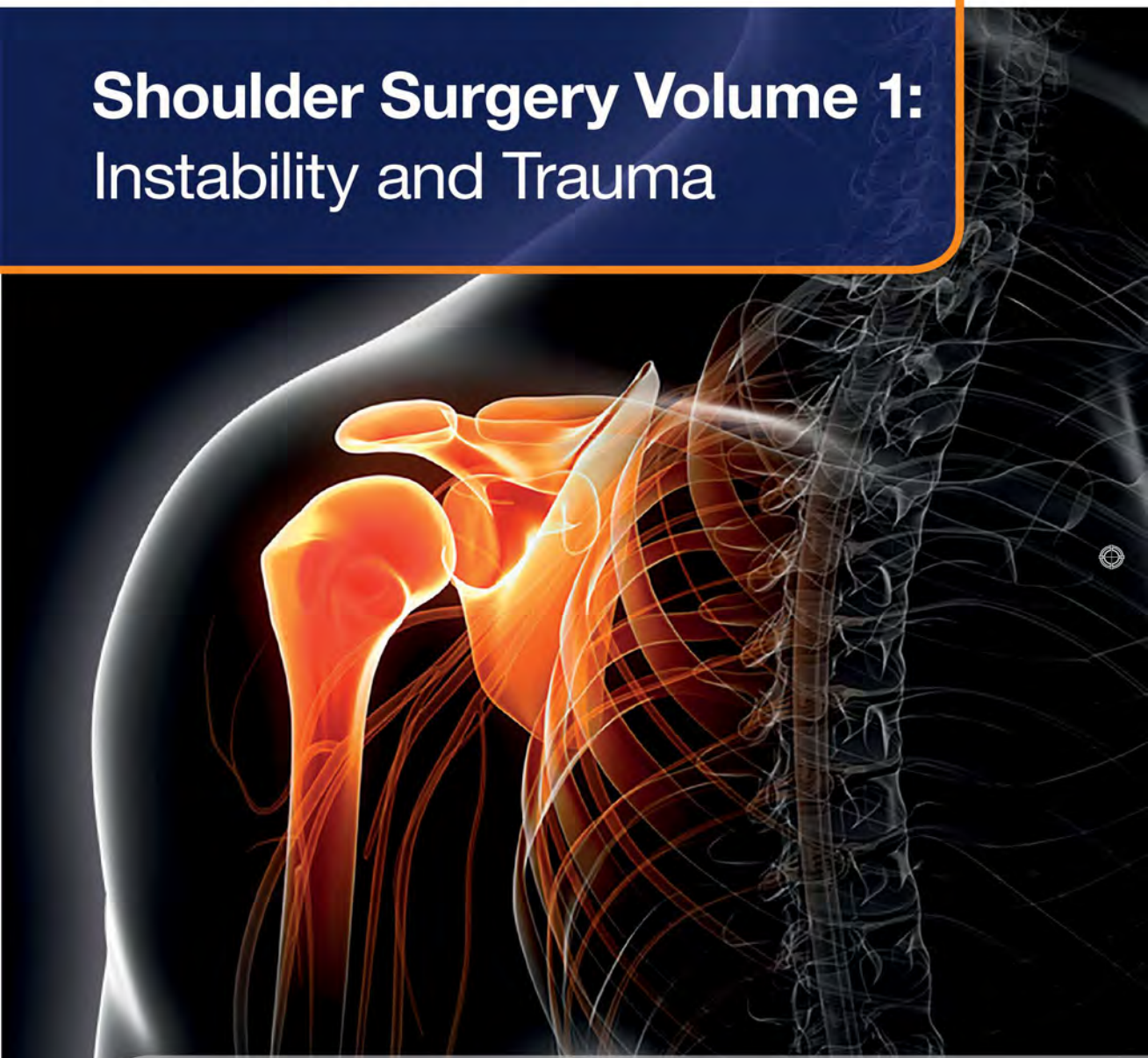
EFOST

Surgical Techniques in Sports Medicine

Shoulder Surgery Volume 1: Instability and Trauma



Francesco Oliva • Howard Cottam

Series Editors François M Kelberine • Nicola Maffulli

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2 Arthroscopic labral repair

Indications

- Glenoid labrum tears may occur through any part of the fibrocartilaginous labral ring. Traumatic causes are the most frequent and often affect the anterior or posterior edge of the glenoid, depending on the direction of the trauma
- Microtrauma and tears associated with repetitive sporting injuries may affect the superior labrum and are known as superior labrum anterior posterior (SLAP) lesions and involves the long head of the biceps anchor
- In 1991, Matsen divided the types of shoulder instability into traumatic and atraumatic, referring to traumatic instability by the acronym TUBS (traumatic, unilateral, Bankart lesion, surgery)
- The anatomical damage is due to anterior shoulder dislocation involving soft tissue and bone (the glenoid rim and humeral head)
- The most common defect is antero-inferior capsulolabral complex detachment from the glenoid rim and glenoid neck, which was first described by Arthur Bankart in 1939, and is known as a Bankart lesion
- The Hill–Sachs lesion (also called Hill–Sachs fracture) is the cortical depression of the superior-posterolateral region of humeral head, which occurs as a result of the impact of the head with the edge of anterior-inferior glenoid
- Recurrent instability is common following anterior shoulder dislocations, and the worsening of Bankart and Hill–Sachs lesions is unavoidable. Di Giacomo, Itoi & Burkart (2014) established the indications for arthroscopic Bankart repair as shoulder instability with less than 25% glenoid bone loss and a non-engaging Hill-Sachs lesion. They described the concept of on-track and off-track bone defects. (**Table 2.1**)
- SLAP lesions were described by by Snyder in 1991. They can be categorized into four types (**Figure 2.1**). They are responsible for painful symptoms with subtle instability that reduces the performance of athletes giving the sensation of a detached and weakened shoulder ('dead arm' syndrome)
  - *SLAP type 1 lesions.* these lesions do not need repair: the labrum is not detached but is fibrillating. Simple debridement of the upper labrum is sufficient
  - *SLAP type 2 lesions.* These are the most frequent lesions seen and are characterized by a detachment of the upper labrum from the glenoid, both anteriorly and behind the long head of the biceps. They often need repair.
  - *SLAP type 3 and type 4 lesions.* These often result from a worsening of a type 2 lesion, involving bucket handle tear (type 3); and upper labrum detachment with the tear extending into the long head of the biceps (type 4). In both cases, arthroscopic treatment is required. In type 3 the bucket handle must be removed and the residual labrum repaired; in type 4 the tear is

Table 2.1 Evolving concept of bipolar bone loss and the Hill–Sachs lesion (with permission from Di Giacomo et al. 2014)

Group	Glenoid defect	Hill-Sachs lesion	Treatment
1	<25%	On-track	Arthroscopic Bankart repair
2	<25%	Off-track	Arthroscopic Bankart repair plus remplissage
3	>25%	On-track	Latarjet procedure
4	>25%	Off-track	Latarjet procedure

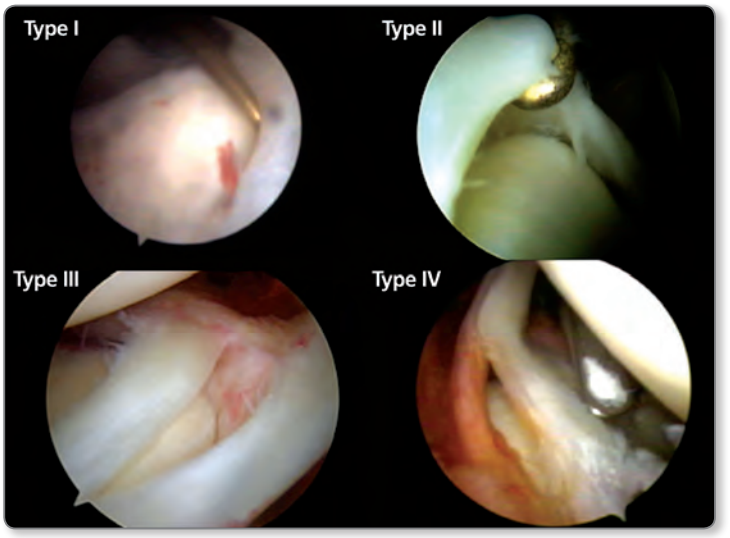


Figure 2.1 SLAP lesions.

debrided with tenotomy and tenodesis of the long head of biceps tendon

Preoperative assessment

Clinical assessment

- *Anamnesis:* presence of a traumatic event and trauma mode, number of episodes, reduction mode, description of the activities of apprehension, functional disability
- *Active and passive range of movement:* complete mobility is usually preserved the patient is often apprehensive in abduction and external rotation
- *Apprehension test:* abduction and external rotation of the arm and the head of the humerus are pushed anteriorly and inferiorly. The test results are positive if pain or apprehension is present
- *Relocation test:* following a positive apprehension test, apply anterior pressure over the glenohumeral joint. The test result is positive if pain or apprehension disappears
- *Drawer test:* the examiner stabilizes the scapula with one hand and moves the head of the humerus anteriorly and posteriorly with the other. Excessive anterior or posterior translation indicates laxity of the glenohumeral joint
- *Jerk test:* the examiner stabilizes the scapula with one hand and holding the elbow with the other hand pushes the elbow posteriorly, adducting the arm. Pain, anxiety or the sensation of a 'click' indicate posterior instability
- *Sulcus test:* the examiner holds the forearm below the level of the elbow and pulls downwards. If a depression under the acromion is created, the test is positive for more subtle instability
- *O'Brien's test:* the patient should raise the arm against resistance, with the forearm extended and pronated. The O'Brien's test is positive if the procedure causes pain in the biceps
- *Mimori test:* the arm is abducted at 90°, externally rotated upwards and with the elbow flexed to 90°. The forearm is then pronated and supinated. The test is positive for micro-instability of the shoulder if the pain is greatest during pronation
- *Palm up:* the patient should elevate the arm against resistance, with the forearm extended and supinated. If it causes pain in the biceps, the test is positive

Imaging assessment

Radiographs

- Radiographs show the correct reduction of shoulder dislocation and help to exclude any fractures associated with the dislocation (**Figure 2.2**)
- A Bernageau view should be used to assess the bone defect (**Figure 2.3**)





Figure 2.2 (a) Anterior shoulder dislocation. (b) Control after reduction.

Magnetic resonance imaging (MRI)

- MRI can identify associated pathology (e.g. Hill–Sachs and Bankart lesions) with detachment of the antero-inferior glenoid labrum and laxity of the middle glenohumeral ligament and inferior glenohumeral ligament (**Figure 2.4**)
- Detachment of the posterior labrum looks similar to an anterior labrum tear on MRI but involves the equatorial or higher glenoid rim. It is often a simple longitudinal tear (Kim lesion), but less frequently a reverse Bankart with reverse Hill–Sachs lesion can be identified on the anterior part of humeral head (also known as a McLaughlin lesion)
- The sensitivity of MRI to identify SLAP lesions is low
- *Artro-MRI:* shows capsular overflow and allows a higher definition of anatomical lesions (**Figure 2.5**). It is the gold standard procedure in cases of instability and especially when a SLAP lesion is suspected

Computed tomography (CT)

- The PICO method and 3D reconstruction of the shoulder is used to study the glenoid track and identify bone defects (**Figure 2.6**)



Figure 2.3 Bernageau view.

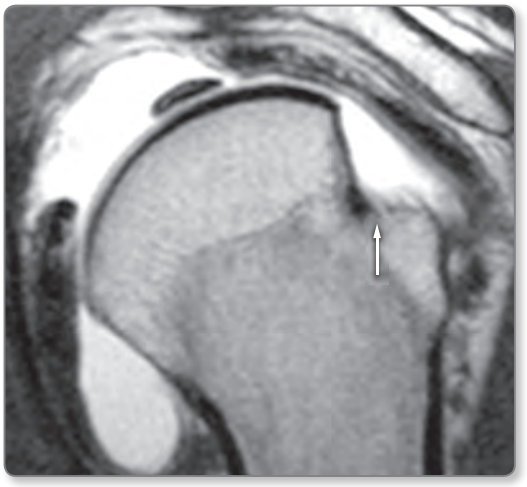


Figure 2.4 Magnetic resonance imaging (MRI) in shoulder instability.

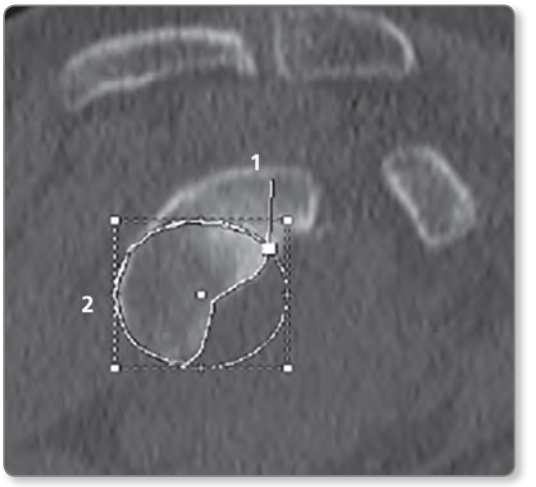


Figure 2.6 PICO method is used to study the glenoid bone defect.

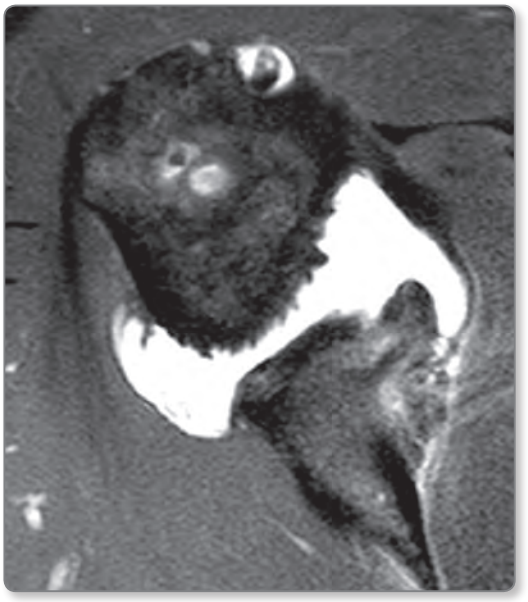


Figure 2.5 Arthro-MRI in shoulder instability.

Timing for surgery

- Anterior or posterior instability with apprehension and a reduction in functional capacity represents an indication for surgical treatment
- In a first dislocation, a Bankart repair is indicated in patients under 20 years old, who are the age group who present with the highest rate of redislocation after a first episode
- The standard indication is recurrent dislocation (2nd episode) that is not age related
- A first dislocation in high performance athletes is an absolute surgical indication for arthroscopic Bankart repair
- Pain and discomfort with a 'dead arm' syndrome are the conditions which indicate repair of an isolated SLAP lesion

Surgical preparation

Surgical equipment

- Arthroscopic devices and standard instruments for shoulder arthroscopy, and specific arthroscopic instruments for shoulder instability (spectrum hooks, direct sutures retriever graspers, shuttle sutures, anchors) (**Figure 2.7**)
- Non-metallic anchors have been shown to be comparable to metallic anchors, and are advised by the author
- Bioabsorbable anchors should not be used because they can cause serious problems, including high bone resorption and glenoid defects

Equipment positioning

- The surgeon should be positioned behind rather than lateral to the shoulder of the patient, with the arthroscopic tower opposite and the second surgeon positioned from anterior to lateral

Patient positioning

- *Lateral:* double traction (3–5 kg) arm abduction at 70° and arm anteposition at 20°. A pillow under the axilla is often necessary for improved distraction of the humeral head
- *Beach chair:* arm abduction at 70°, back, hip and knee flexed to 90° and the upper arm positioned on the shoulder distractor (**Figure 2.8**)

Surgical technique

Skin marking

- It is **good practice** to mark the anatomical landmarks prior to surgery (**Figure 2.9**)
- It is important to mark all possible arthroscopic portals

Arthroscopic portals

- *Posterior portal:* classic soft spot is 2 cm medially and 2–3 cm inferiorly
- *Matthews antero-inferior portal* in the safe triangle (superior edge of subscapularis tendon, inferior edge of long-head of biceps and supero-anterior glenoid rim)
- *Antero-superior portal:* 2 cm medial from the anterior angle of the acromion
- *Wilminghton portal:* 3 cm distal and 2 cm anterior from posterior angle of acromion
- *Nevaiser portal:* 1 cm medial border in the acromion – soft top spot
- The three most useful standard portals for simple labrum repair are:
  1. Soft spot
  2. Antero-inferior portal (AI)
  3. Anterosuperior portal (AS)
- Screwed cannulas are important as disposable devices to maintain an open, secure and effective portal during the repair
- Three cannulas should be used: one 8 mm cannula in the AI portal, one 5 mm in the AS portal and one 8 mm cannula in the soft spot
- In the case of SLAP lesions, the Wilmington portal should be used for a better angulation of the anchors with respect to the upper glenoid,

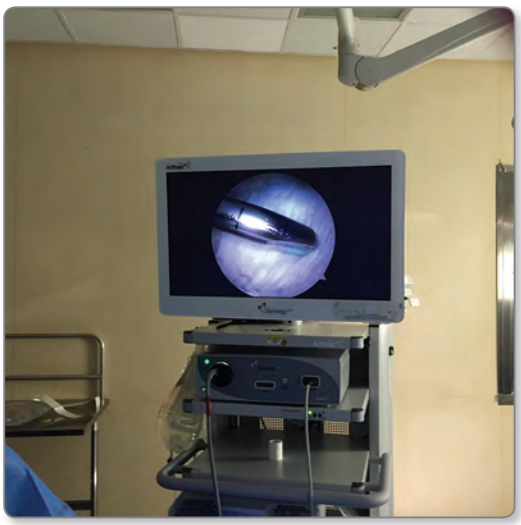


Figure 2.7 Arthroscopic tower.



Figure 2.8 (a) Beach chair positioning. (b) Shoulder distractor.

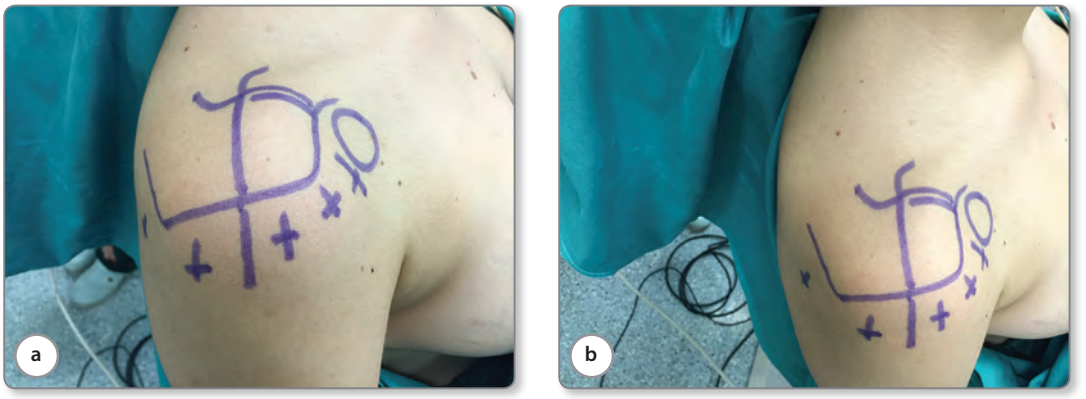


Figure 2.9 Skin marking and portals.

and the Neviser portal is ideal for the direct passage of the sutures in the labrum with a grasper for direct suture passage. In the repair of the posterior labrum, the Wilmington portal is required to plant anchors at the correct angle

Recognition of the lesion and planning the repair

- The extent of the lesion on the glenoid rim should be defined to gauge the number of anchors and sutures required. The defect should be described as if looking at a clock face (**Figure 2.10**)
- Associated lesions should also be identified. A SLAP tear is often present, but cuff tears are not common and are usually only present after many redislocation episodes. There is a strong correlation between a rising number of dislocations and associated lesions of the supraspinatus and infraspinatus. This correlation becomes stronger after seven episodes of dislocation
- The number of anchors, sutures and the repair time should be planned, to achieve a methodical and effective repair (**Figure 2.11**). The SLAP lesion will be repaired at the end of the labral suture to prevent excessive tension of the labrum and restricted workspace (**Figure 2.12**)

Detachment of the labrum

- In anterior lesions the tissue from the glenoid is separated until , the subscapularis muscle can be seen (**Figure 2.13a,b**). Glenoid reaming

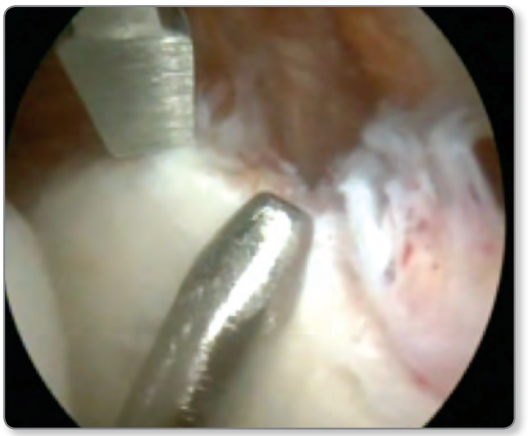


Figure 2.10 The lesion extension identification from antero-superior portal with a scissor in the antero-inferior portal and a Wissinger rod from the posterior portal.

to bleed the bone of the neck increases the healing process (**Figure 2.13c**)
- The glenoid labrum is mobilized anteriorly or posteriorly to ease repair, especially if it is cicatrized medially as in an anterior labroligamentous periosteal sleeve avulsion (ALPSA) lesion
- In SLAP lesions, the superior labrum should be mobilized and the glenoid neck debrided with synovial aggressive blades or with a gentle burr. The arc of the SLAP lesion and its extension, especially posteriorly, should be defined

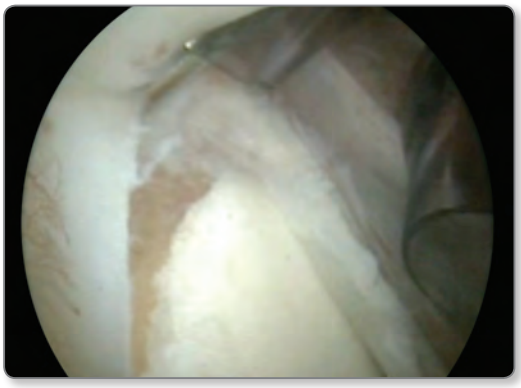


Figure 2.11 Left shoulder: view from the posterior soft spot. Using the radiofrequency instrument inserted through the anterior portal, mark the proposed anchor positions.



Figure 2.12 Right shoulder-associated SLAP lesion visualized from soft spot, probe in the AS portal.

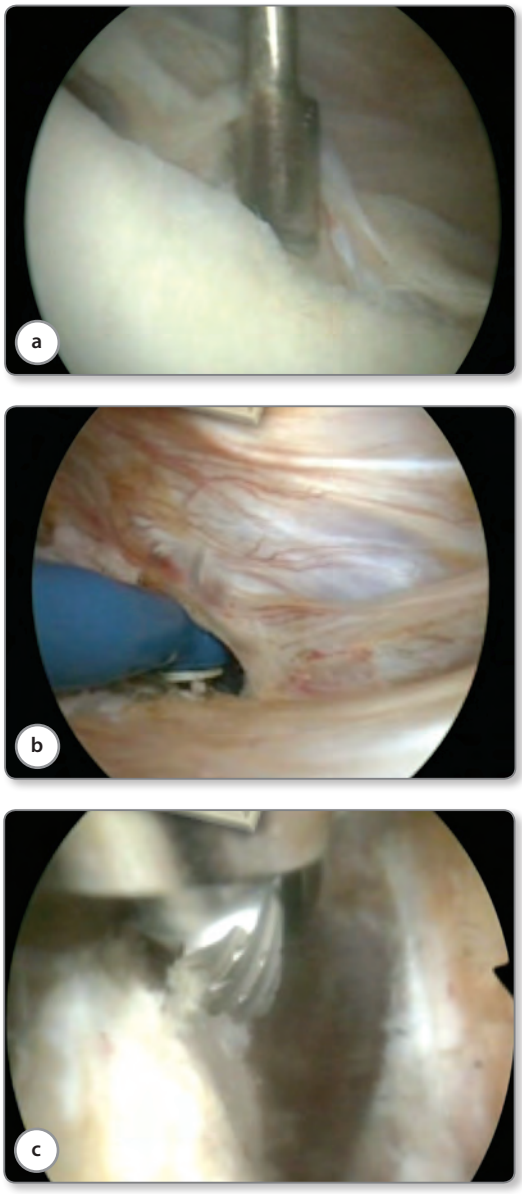


Figure 2.13 (a, b) Left shoulder: view from the posterior soft spot. Separation of tissue from the glenoid, using scissors and radiofrequency instrument inserted from the anterosuperior portal. (c) Glenoid reaming with Burr inserted from the anterior portal.

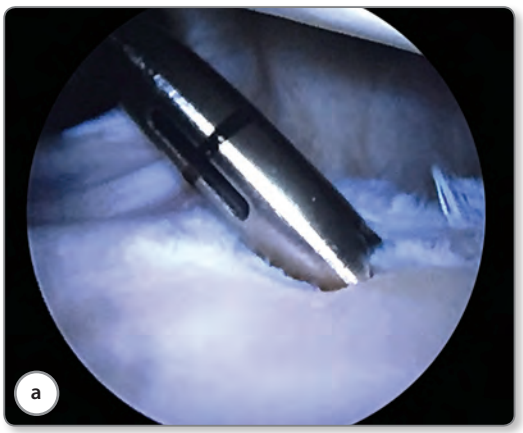
Positioning of the anchors

- An insertion angle of 45° is maintained to ensure secure anchor position in the glenoid, or avoid damage to the glenoid (**Figure 2.14a**). Double loaded anchors should be used (**Figure 2.14b**)
- An effective position (5 o'clock and 3 o'clock on right anterior glenoid rim) should be chosen. In a SLAP lesion repair through the Wilmington portal, the optimal position of the anchors needs to be chosen: one anchor with two sutures should be placed at 12 o'clock under the long head o the beceps tendon (LHBT) to facilitate the passage of the suture, one posteriorly and the second anteriorly to the LHBT (**Figure 2.15**). In the case of a SLAP lesion with posterior extension, two anchors will be useful: the first at 11 o'clock and the

second at 12 o'clock to cover the whole lesion, being careful to avoid overtensioning the biceps anchor
- A pull-out test should be performed to ensure anchor security

Suture of the labrum

- *Bleeding soft tissues:* a full radius dissector is used to gently abrade the capsule (**Figure 2.16**)
- The capsule is plicated proximally towards the glenoid, reducing the inferior capsule enlargement by transferring the arthroscope to the anterosuperior portal and using the hook from the posterior portal. Plicate the inferior glenohumeral ligaments (IGHL) at 6 o'clock to the first anchor (**Figure 2.17**)
- In the case of a SLAP lesion, particularly if isolated, the superior glenohumeral ligaments (SGHL) should be gently plicated with the anterior wire of a two-suture loaded soft anchor and the Nevaiser portal used to directly pass the sutures through the posterior superior labrum. If the extension of the tear is more than 10 mm, the soft spot should be used for direct suture management through the labrum to allow better positioning of the instruments



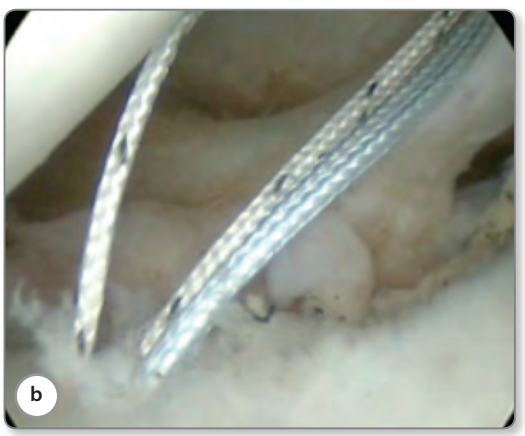


Figure 2.14 (a) Left shoulder: view from the soft spot. Cannula for the insertion of the soft anchor inserted at an angle of 45°. (b) Left shoulder: view from the soft spot. Double suture anchor.



Figure 2.15 Right shoulder: view from the soft spot. One anchor at 12 o'clock with two sutures, the first posterior and the second anterior to the LHBT.



Figure 2.16 Left shoulder: view from the soft spot. Radius dissector inserted from the AS portal that gently abrades the capsule.

- The suture is shuttled through the soft tissue with a strong non-absorbable wire. It is important to keep the sutures in sight so as not to confuse the wires, tangle them and lose the anchor (**Figure 2.18**). Direct retrievers or graspers, such as BirdBeak (Arthrex), can be useful if the direction of repair allows
- The IGHL and middle glenohumeral ligaments (MGHL) are retensioned from the posterior, with a 'crossing stitch' (**Figure 2.19**)

Completion of knots

- Knot security: seven half stitches and sliding knots (**Figure 2.20**)
- 'Bumper effect' (**Figure 2.21**)

Checking the repair

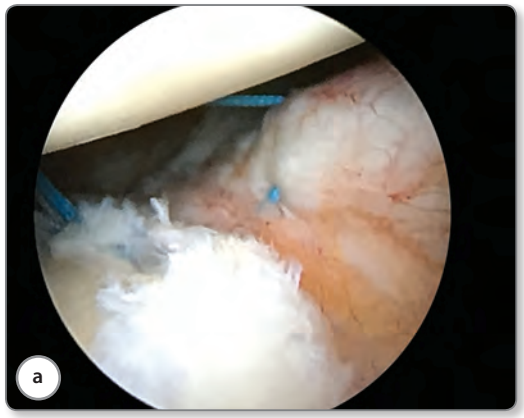
- The stability of the sutures is evaluated with a probe, and the effectiveness of the surgery is evaluated through the restoration of the centering of the head in the glenoid fossa (**Figure 2.22**)

Possible perioperative complications

- These are often due to errors in surgical technique. The suprascapular nerve, which is located approximately 2 cm from the back edge of the glenoid, can be damaged by



Figure 2.18 Left shoulder: view from the soft spot. Non-absorbable wire used to pass suture through the soft tissues from posterior portal.



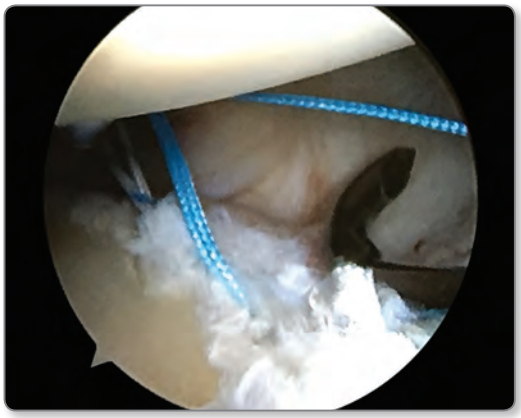


Figure 2.17 Left shoulder: view from the soft spot. Plication of IGHL at 6 o'clock to the first anchor with the hook arthroscopically inserted from the AI portal.

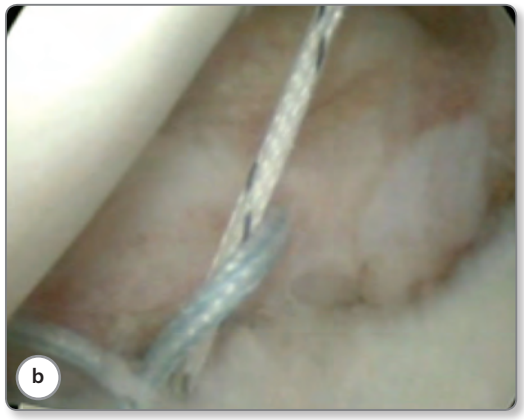


Figure 2.19 Left shoulder: view from the soft spot. (a) Retensioning of the MGHL. (b) 'Crossing stitch' from posterior portal.



Figure 2.20 Left shoulder: view from the soft spot. Sliding knots from the posterior portal.



Figure 2.21 Left shoulder: view from the soft spot. Capsule and labrum that create the "Bumper effect".

misguided handling of the rear portal. 'Wiper movements' should be avoided during the execution of the soft spot
- Errors in the insertion of the anchors may cause glenoid edge fractures, chondral injury or mobilization of the anchors

Closure

- No drainage is needed
- Arthroscopic portals should be sutured



Figure 2.22 Left shoulder. Restoration of the centering of the head in the glenoid fossa viewed from the lateral portal.

Postoperative management

Postoperative regimen

- The doses of painkillers, non-steroidal anti-inflammatories, and other drugs should be adjusted accordingly
- Antibiotics should be used until the third postoperative day

Rehabilitation

- A brace should be used for 4 weeks (3 weeks for SLAP lesions) to prevent stiffness
- The brace should occasionally be removed to mobilize the elbow and wrist
- 4–8 weeks postoperatively, re-education should begin to achieve a gradual recovery of the full range of passive and active motion, alongside physical therapy to control muscle contracture and pain, proprioceptive exercises, kinetic and isometric exercises
- 8–12 weeks postoperatively, muscle strengthening exercises with progressive resistance and pain-free pleiomorphic exercises should begin
- 12–16 weeks postoperatively, a gradual return to full activity and sport reconditioning can begin
- 20 weeks postoperatively, a return to contact sport can be made

Outpatient follow-up

- Surgical wound medication should take place every 4 days
- Sutures can be on the 14th day postoperatively
- Clinical monitoring should be undertaken every 2 weeks to assess the progressive recovery of functionality

Further reading

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