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# Arthroscopic Subscapularis Repair

*Richard K. N. Ryu, MD and Asheesh Bedi, MD*

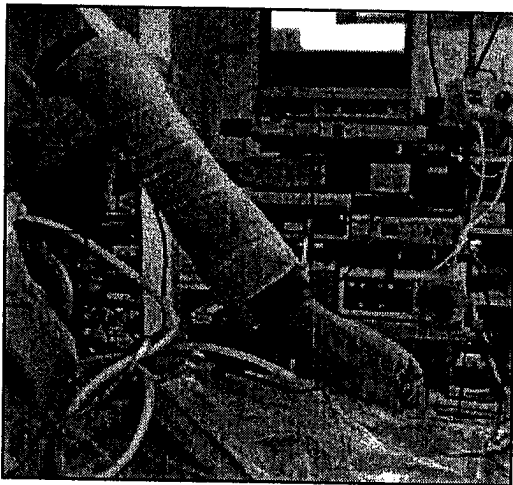
## SURGICAL GOALS

Inherent difficulty visualizing and instrumenting in the most anterior aspect of the glenohumeral articulation makes arthroscopic subscapularis repair one of the more challenging arthroscopic interventions. For this reason, appropriate preoperative planning is required, and each step must be carefully rehearsed. Recognizing the pathology can be difficult due to distortion caused by retraction. The subscapularis tear is commonly a component of an anterior-superior rotator cuff tear, which can also involve the supraspinatus tendon and the proximal biceps tendon presenting as an intra-articular subluxation or dislocation. With an isolated subscapularis tear, the possibility of subcoracoid impingement must be considered as a subcoracoid decompression may be necessitated to create adequate clearance between the coracoid tip and the anterior border of the subscapularis.

Restoring continuity of the subscapularis tendon to the lesser tuberosity requires the same methodical sequencing as with any rotator cuff repair:

- \* Tear pattern recognition determined from preoperative imaging and physical examination
- \* Proper portal placement
- \* Biceps tenotomy or tenodesis to treat intrinsic biceps pathology
- \* Mobilization of the subscapularis
- \* Subcoracoid decompression if indicated
- \* Preparation of the footprint
- \* Placement of anchors into the lesser tuberosity
- \* Suture passage
- \* Knot tying
- \* Completion of the supraspinatus rotator cuff repair
- \* Possible acromioplasty

The final result should include a tension-free subscapularis reattachment with a stable biceps construct and supraspinatus repair. On occasion, chronic retracted subscapularis tears are best treated through an arthrotomy because cuff mobilization can jeopardize the surrounding neurovascular structures. The postoperative rehabilitation must take into account the associated subscapularis repair and the delayed implementation of external rotation.

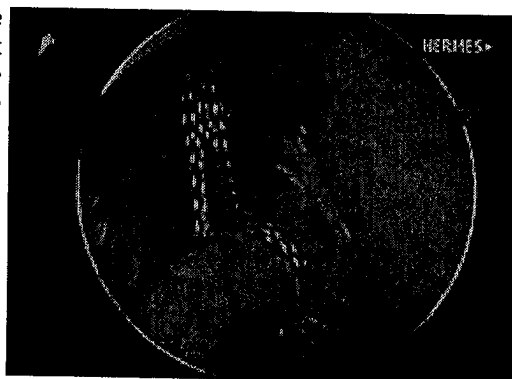


**Figure 7-1.** Standard arthroscopic positioning for arthroscopic rotator cuff repair in lateral decubitus position.



**Figure 7-2.** Axillary view of shoulder in lateral decubitus position. Access around top of the patient facilitates knot-tying, implant and instrument insertion.

**Figure 7-3.** Grasping stitch placed through the proximal biceps (B) in right shoulder. Tenotomy, soft tissue, or bony tenodesis must be performed before treating the subscapularis tear in order to visualize and instrument anteriorly (HH=humeral head).



## OPERATIVE TECHNIQUE

- \* The preferred position is lateral decubitus where access around the head of the table is unfettered by placing anesthesia at the foot of the table using extended hoses. This permits knot-tying while facing the patient and preserving the ability to instrument from the posterior portal. Muscle relaxation can be beneficial (Figures 7-1 and 7-2). A repair can also be performed in the beach chair position, with visualization and repair of the tear improved by forward flexion of the arm. A pneumatic arm holder can facilitate the ability to maintain this arm position.
- \* Once these three portals have been established, the glenohumeral joint is carefully inspected. The biceps tendon, which is often subluxated or dislocated into an intra-articular position, needs to be addressed first in order to visualize and instrument the subscapularis pathology. Older, less active patients may benefit from a simple tenotomy while more active patients require a bony or soft tissue tenodesis (Figure 7-3).

## PORTALS

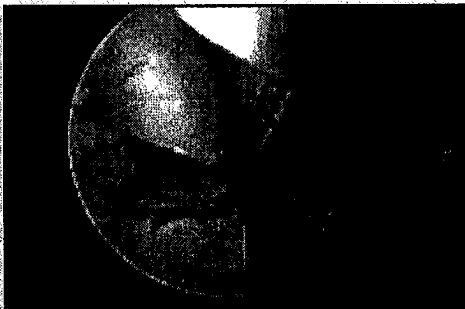
- Proper portal placement is critical to the success of the operation. A standard posterior portal is utilized for initial viewing. Use of a 70-degree arthroscope is critical when dissection is carried out medial to the glenoid rim. A working anterior-inferior portal (AIP) with a medial to lateral orientation is then established. In most cases, an associated supraspinatus tear is encountered. This allows for relatively easy placement of an anterolateral superior (ALS) portal at the anterolateral corner of the acromion (Figures 7-4 and 7-5). If placed correctly, this portal allows parallel instrumentation of the subscapularis, facilitating medial dissection (Figure 7-6) and access to the lesser tuberosity footprint as well. If an isolated tear is present, the ALS portal is placed through the superior border of the rotator interval directly behind the biceps tendon.



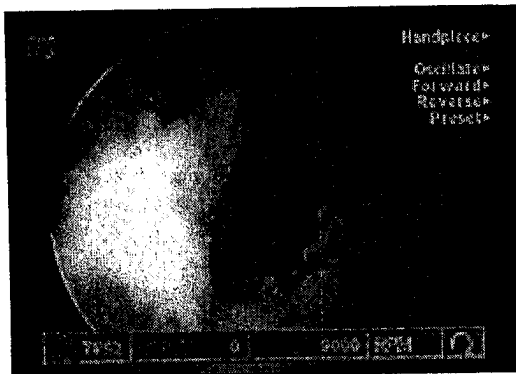
**Figure 7-4.** Anterior view of working portals (AI=anterior inferior portal [anterior working portal], ALS=anterolateral superior portal [working portal for lesser tuberosity and subscapularis tendon], AS=anterior-superior portal [viewing for incomplete subscapularis tears]).



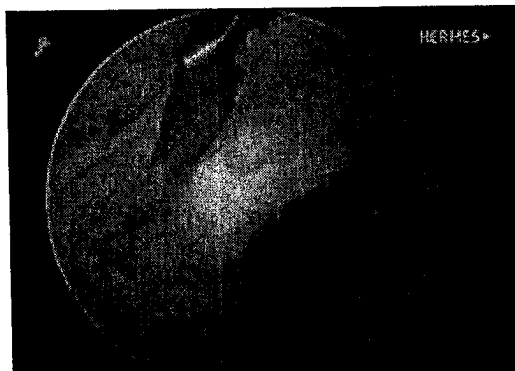
**Figure 7-5.** Axillary view of the portal (AIP=anterior inferior portal, ALS=anterolateral superior portal, AS=anterior-superior portal, LAT=mid-lateral portal).



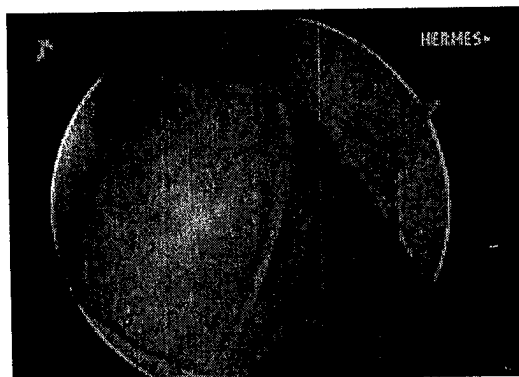
**Figure 7-6.** View of the right shoulder with a 70-degree arthroscope from the posterior portal. Angled elevator (E) through anterolateral superior (ALS) cannula parallel to subscapularis fibers, facilitating medial dissection (AIC=anterior-inferior cannula, G=medial glenoid rim, SSC=subscapularis tendon).



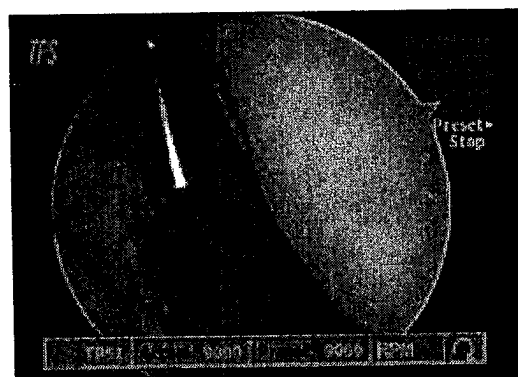
**Figure 7-7.** Traction stitch (arrows) passed through superolateral border of the subscapularis (SSc); traction stitch outside of anterolateral superior cannula (ALS) (LT=lesser tuberosity).



**Figure 7-8.** Angled elevator (E) passed through the ALS portal used to liberate the anterior surface of the subscapularis (SSc) in a right shoulder (HH=humeral head, G=medial glenoid rim).

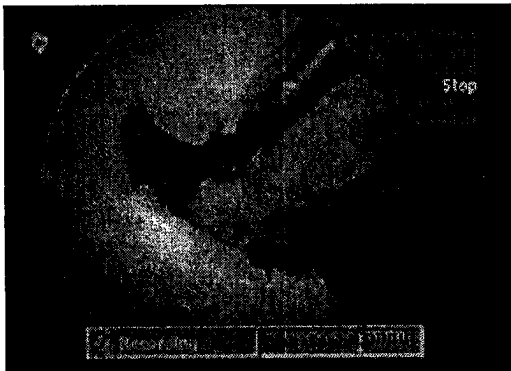


**Figure 7-9.** A 30-degree arthroscope viewing the right shoulder from the posterior portal with complete, retracted subscapularis tear with evidence of subcoracoid impingement; posterolateral aspect of the coracoid (\*); articular cartilage defect (ACD) of the humeral head secondary to chronic subcoracoid impingement (HH=humeral head).

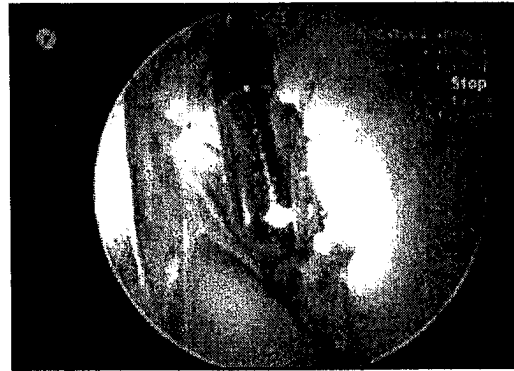


**Figure 7-10.** A 30-degree arthroscopic view from the posterior portal of the coracoidplasty (HH=humeral head). Shaver blade (S) through anterolateral superior portal. Resected coracoid surface (arrows).

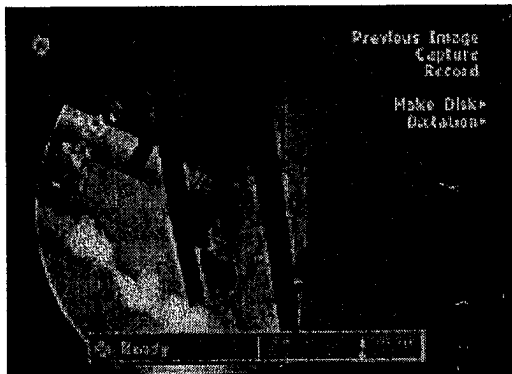
- \* A traction stitch is placed in the superolateral corner of the subscapularis (Figure 7-7). The suture is then placed outside of the ALS cannula so that suture management is enhanced. Mobilization of the subscapularis is accomplished using 15 degree angled elevators through the ALS portal (Figure 7-8). As mobilization progresses toward the base of the coracoid, the 30-degree arthroscope in the posterior portal is replaced with a 70-degree arthroscope that allows viewing down the medial neck of the glenoid.
- \* The space between the coracoid process and the anterior border of the subscapularis is evaluated carefully for subcoracoid impingement anatomy (Figure 7-9). Less than 7 mm of clearance requires a decompression during which the posterolateral aspect of the coracoid is resected until 11 to 12 mm of clearance is achieved (Figure 7-10).
- \* The subscapularis is freed from the arch of the coracoid and the medial neck of the glenoid (Figure 7-11). The coracohumeral ligament can be dissected from the anterior aspect of the subscapularis with care taken not to extend the dissection beyond the confines of the coracoid arch, especially inferior and medial to the coracoid tip.



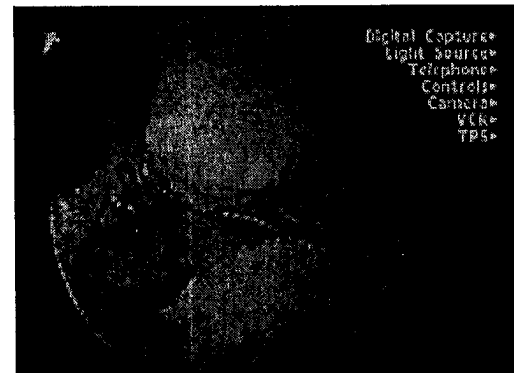
**Figure 7-11.** Liberation of the subscapularis (SSc) under retraction from the coracoid arch in a right shoulder. Angled elevator (E) from anterolateral superior portal, parallel to the subscapularis muscle fibers, coracoid base (C), medial glenoid rim (G).



**Figure 7-12.** Debriding subscapularis footprint in a right shoulder with shaver through anterolateral superior portal parallel to lesser tuberosity (LT) (AC=anterior-inferior cannula).

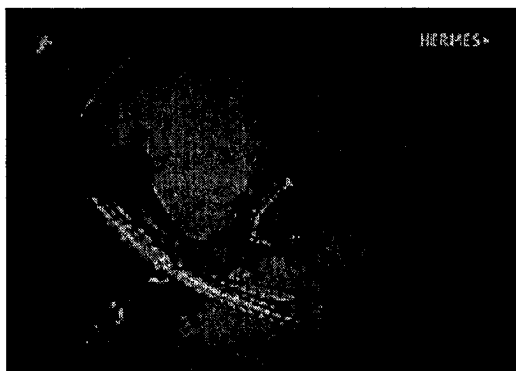


**Figure 7-13.** Inferior anchor (A) placed first in a right shoulder; traction sutures (arrows) through subscapularis (SSc); lesser tuberosity (LT).



**Figure 7-14.** Two sutures tied after first anchor inserted (SSc=upper half of the subscapularis, B=tenotomized biceps, LT=lesser tuberosity).

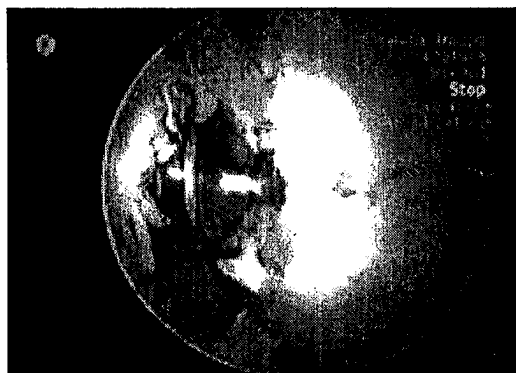
- \* The lesser tuberosity is prepared with a shaver as a burr is rarely needed (Figure 7-12). For the chronic, retracted tear, medializing the lesser tuberosity attachment by 5 to 10 mm may occasionally be necessary to establish a low-tension repair. The footprint normally measures 2 x 2.5 cm, and for a complete tear, 2 anchors placed 1 cm apart are sufficient (Figures 7-13 through 7-16).
- \* Anchor insertion is accomplished through the AIP (Figure 7-17). The anchor inserter must be tilted such that the handle points to the jaw of the patient. This angle accounts for the retroverted humeral head alignment. Insertion with the anchor perpendicular to the patient runs the risk of articular penetration.
- \* Suture passage and configuration are decisions based on surgeon preference. The simplest technique involves separating the suture ends through the AIP and ALS cannulas and then using a retrograde grasping device to capture the suture tail from the ALS cannula (Figure 7-18). A simple looped suture can be tied (Figure 7-19) or the step can be repeated and both limbs brought through the substance of the subscapularis and tied as a vertical mattress stitch (Figure 7-20).



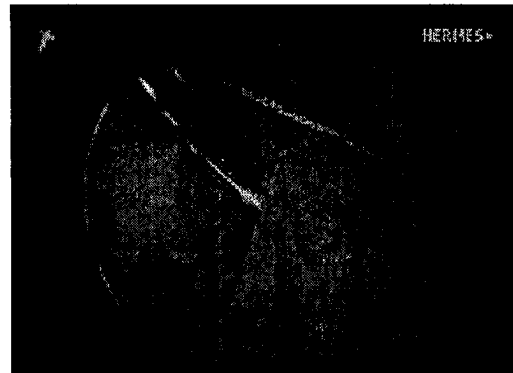
**Figure 7-15.** Sutures from second double-loaded anchor (arrows) placed into upper subscapularis footprint (SSc=subscapularis, B=tenotomized biceps).



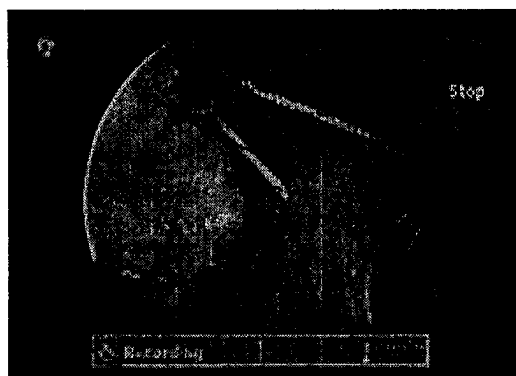
**Figure 7-16.** First suture of second anchor tied with last suture to be passed (arrows) (SSc=subscapularis, B=tenotomized biceps, LT=lesser tuberosity).



**Figure 7-17.** Angle of insertion into a right shoulder is optimized if the handle of the inserter points towards the patient's jaw (A=anchor, LT=lesser tuberosity, HH = humeral head).



**Figure 7-18.** One suture tail is placed in the AIP cannula (AIC) and the second tail in the ALS cannula to prevent tangling when retrograding the suture and subsequent knot tying (SSc=subscapularis; arrows=suture hook/retriever, HH=humeral head).



**Figure 7-19.** Suture limb (arrows) from ALS cannula retrograded through AIP cannula as simple stitch in a right shoulder; can tie with a single pass through the subscapularis (SSc).



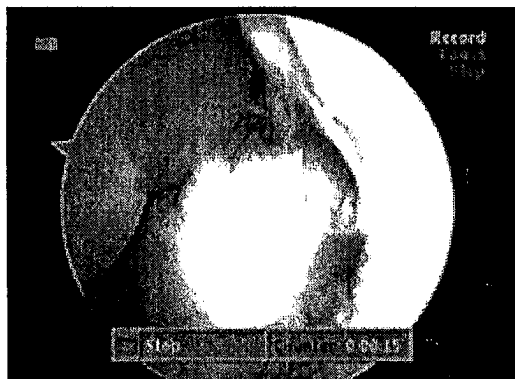
**Figure 7-20.** Both limbs retrograded through the subscapularis (SSc) to form a vertical mattress configuration in a right shoulder; lesser tuberosity (LT).



**Figure 7-21.** Axial MR image of preoperative subscapularis tear (arrows) with retraction and biceps subluxation (B).



**Figure 7-22.** Postoperative appearance after successful subscapularis repair (small arrows); anchor (large arrow) with metallic artifact.

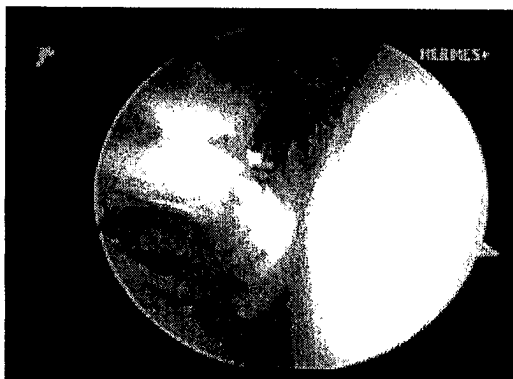


**Figure 7-23.** A 30-degree arthroscopic view from posterior portal of the left shoulder. Minimally retracted partial tear of the upper fibers of the subscapularis (SSc) in which the rotator interval (RI) is not distorted (HH=humeral head, LT=lesser tuberosity).

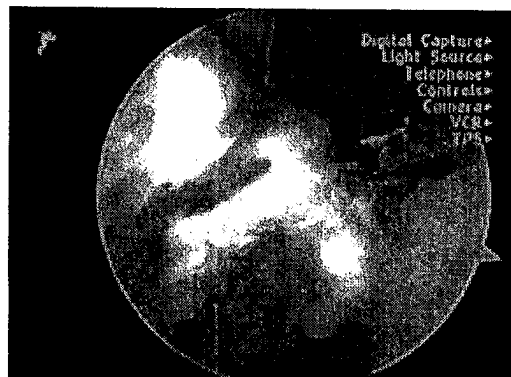
- \* Postoperative management should limit external rotation to neutral rotation for the initial 6 weeks followed by a progressive increase in external rotation. If the subscapularis tear is methodically repaired and protected, re-establishing continuity with the lesser tuberosity should follow (Figures 7-21 and 7-22).

## TIPS AND PEARLS

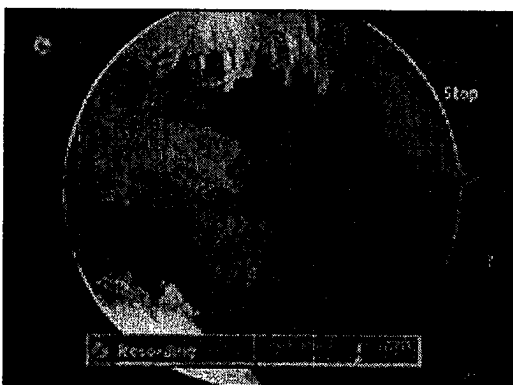
- ✓ **Sequence:** For a 2 to 3 tendon tear that includes the subscapularis, as well as the biceps, the following repair sequence should be followed: biceps tenotomy versus tenodesis, (possible coracoidplasty), subscapularis repair, supra-infraspinatus repair, acromioplasty (if indicated), and distal clavicle excision last (if needed). This repair sequence permits optimal visualization in a step wise manner and accounts for fluid extravasation and its effect on operative space.
- ✓ **Portal placement and the “comma” sign:** If the subscapularis is only partially torn, which usually involves the superior fibers (Figure 7-23), the AIP can be made directly through the rotator interval. In retracted tears, the anterior interval can be distorted as the medial



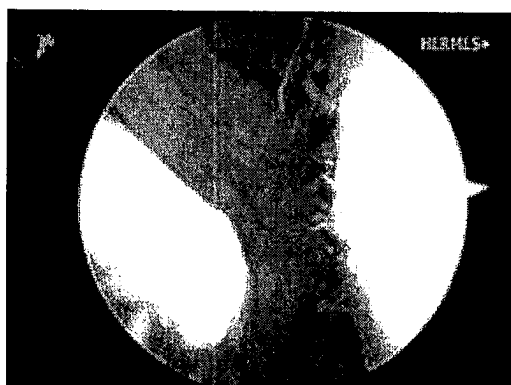
**Figure 7-24.** Right shoulder retracted subscapularis tear with grasper (GR) gripping the "comma" (C) (SSc=subscapularis, HH=humeral head).



**Figure 7-25.** With traction, "comma" (C) (consisting of coracohumeral and superior glenohumeral ligaments) defines the superolateral border of the subscapularis (arrows) in a right shoulder (HH=humeral head, CAL=coracoacromial ligament).



**Figure 7-26.** Example of the "comma" sign (C) in right shoulder viewed from posterior portal (B=frayed and subluxated biceps tendon; HH=humeral head, SSc=detached subscapularis).

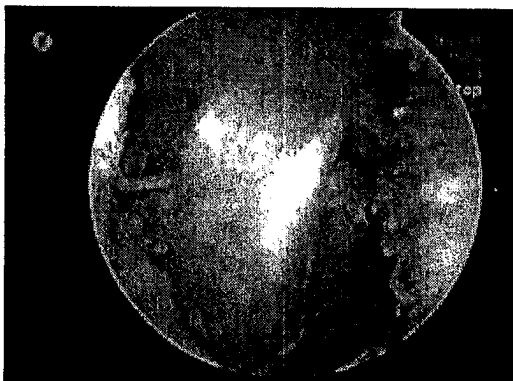


**Figure 7-27.** Magnified appearance of the "comma" sign (C) in right shoulder viewed from the posterior portal (HH=humeral head, superolateral border of SSc=arrows).

biceps pulley is detached as part of the subscapularis tear (Figures 7-24 and 7-25). This structure has been termed the *comma sign* (Figures 7-26 and 7-27) and is composed of the coracohumeral and superior glenohumeral ligaments. Its significance resides in its attachment to the superior lateral border of the subscapularis and aids in identifying the retracted torn tendon. In chronically retracted tears, often the coracoacromial ligament may be the only identifiable structure in the anterior triangle bordered by the biceps, glenoid, and subscapularis (Figures 7-28 and 7-29).

- ✓ **Partial, unretracted tears:** If the subscapularis tear is a partial one without retraction, dual anterior portals, similar to those utilized in a Bankart repair (Figure 7-30), can also be used. Visualization through the anterior superior portal (ASP) and instrumentation through the anterior inferior portal (AIP) is recommended. The posterior portal is converted to an accessory working portal. A 30-degree arthroscope is preferred with this approach.

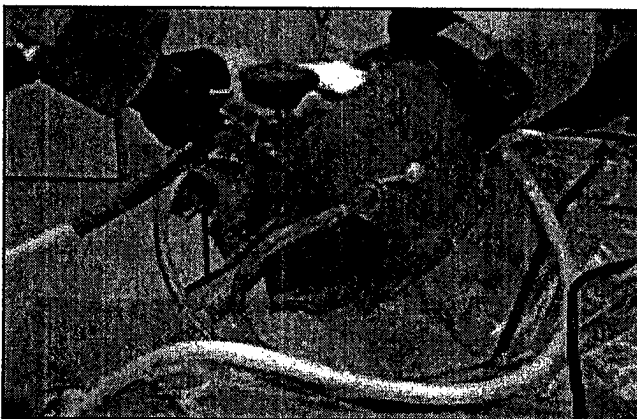




**Figure 7-28.** With retraction of the subscapularis and medial sling (C), the coracoacromial ligament (CAL) is visible from the posterior portal without dissection in a right shoulder (HH=humeral head).



**Figure 7-29.** With traction on "comma" sign (C), the coracoacromial ligament (CAL) is obscured by the rotator interval component of the medial sling (HH=humeral head).

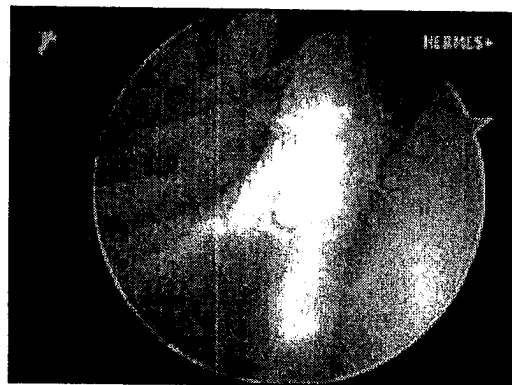


**Figure 7-30.** A 30-degree arthroscope in the anterior-superior portal (ASP) with clear cannula in the working anterior-inferior portal (AIP). Smaller cannula positioned as posterior accessory portal.

- ✓ **Locating the coracoid process:** Access to the coracoid tip while viewing from the posterior portal can be easily determined by creating a window in the rotator interval directly above the superior edge of the subscapularis. In those cases in which the medial sling and subscapularis have retracted, the CA ligament can be identified and followed to the coracoid base (see Figure 7-28).
- ✓ **Coracoidplasty:** The ALS portal allows a parallel approach to the coracoid tip. The posterolateral aspect of the coracoid can be removed without risk of detaching the conjoint tendon or injuring neurovascular structures. An instrument tip of known diameter can be used to quantify adequacy of the resection.
- ✓ **Mobilization of retracted tears:** Although the "comma" can be preserved, it can also limit mobilization of the subscapularis. Once the "comma" has been identified, a traction suture can be placed at the junction of the medial pulley and the superolateral corner of the subscapularis. The "comma" can then be divided (Figures 7-31 and 7-32) and the subscapularis tear mobilized. Reconstitution of the medial pulley is not critical once the biceps is treated, and although the "comma" tissue can reinforce the superior repair sutures, the ease of the subscapularis repair once the comma has been divided can make the sacrifice worthwhile without jeopardizing the outcome.



**Figure 7-31.** A 30-degree arthroscopic view in the right shoulder from posterior portal; basket forceps (BF) dividing medial sling or "comma" (C); superolateral corner of subscapularis (arrows). (HH=humeral head, G=medial glenoid rim).



**Figure 7-32.** Mobilized subscapularis (arrows) in right shoulder after medial sling divided (HH=humeral head, CAL=coracoacromial ligament, C=remnant of "comma").

- ✓ **Anchor and suture management:** Given the tight confines of the lesser tuberosity, anchor placement, suturing, and knot tying should be performed in sequence for each anchor. Placing 2 double-loaded anchors prior to suture passage and knot tying can complicate subsequent steps.
- ✓ **Creating space:** Occasionally, if the lesser tuberosity is difficult to access and visualize, a posteriorly directed force on the proximal humeral shaft can create extra space for instrumentation and visualization.

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