

Shoulder Instability

Hany Elrashidy, MD

Shoulder Anatomy and Pathoanatomy

The glenohumeral (GH) joint allows motion in multiple planes. Stability is conferred by both static stabilizers (glenoid concavity, labrum, capsule and ligamentous restraints) and dynamic (scapular and rotator cuff) stabilizers. Three groups of glenohumeral ligaments (superior, middle and inferior) resist GH translation at varying degrees of abduction (anterior band of IGHL most important in the at-risk position of 90° of abduction and external rotation). Middle GH ligament runs across subscap (patients can have normal variants including Buford complex)

Both scapular and rotator cuff musculature keep glenoid aligned and compress humeral head into glenoid. In the healthy shoulder, strengthening and neuromuscular training help optimize neuromuscular control of the glenohumeral joint

Glenohumeral instability encompasses a wide spectrum of injury from microinstability to dislocation. 85% of these events involve anterior instability but can also be posterior (seizures, electric shock, trauma) or inferior. It is important to distinguish laxity (increased translation but asymptomatic) vs. instability where symptoms occur in conjunction with increased laxity

Traditionally 2 Types:

- 1) **Traumatic/Unidirectional Instability: TUBS** - Traumatic, Unidirectional, Bankart lesion is common, Surgery is often required

In young athletes, traumatic anterior dislocation has been shown to result in a high incidence of avulsion of the anteroinferior glenoid labrum (i.e. Bankart lesion) as well as Hill-Sachs lesions. With this injury, the bumper effect of the labrum is eliminated as is the sling effect of IGHL with abduction

The Bankart lesion is the “essential lesion” of instability. Studies show it is present between 79%-100% after initial dislocation and 93-97% of recurrent instability. Studies suggest that recurrence depends on patient age and activity level with a much higher incidence in active patients under the age of 23. Even higher recurrence rates found in young athletes participating in contact sports (over 90%)

Recurrent instability is also associated with acute (Bony Bankart) or chronic (glenoid deficiency) bony involvement. Arthroscopically, look for a change of the normal pear-shaped glenoid to an inverted pear appearance

- 2) **Atraumatic or Multidirectional Instability (MDI):AMBRI** - Atraumatic, Multidirectional, often Bilateral, usually responds to Rehab, if surgery is needed it involves Inferior capsular shift

Associated with generalized joint laxity (flexible, adolescent male and females)

Often bilateral, often positive family history, instability with minimal trauma or mechanism

Clinical History

Patient may or may not recall a specific traumatic event. Often it can be numerous partial subluxation events or they may describe generalized laxity of both shoulders. It is important to determine mechanism of injury (traumatic vs. atraumatic) and if this was the initial occurrence vs. a repeated event. Ask about mechanical symptoms. Pt may describe anxiety with arm abducted and externally rotated.

Ask about frequency of symptoms. MDI may present with insidious onset and non-specific symptoms (activity-related pain in 2nd or 3rd decade of life). Identify specific inciting events or positions (pts may avoid certain provocative positions or activities)

Differential Diagnosis

Proximal humerus fractures and scapular fractures – deformity, swelling, eval x-rays carefully

Acromioclavicular or sternoclavicular dislocation: look for asymmetry compared with contralateral joints and evaluate imaging

Cervical radiculitis – look for neurologic symptoms (numbness, tingling, paresthesias). Thorough neurovascular exam, Spurling's maneuver
Scapulothoracic crepitus – evaluate for scapular dyskinesia and palpable posterior snapping/crepitus

Physical Exam

Acute dislocation: palpable prominence of humeral head anterior and inferior to shoulder, abnormal shoulder contour, arm held adducted and internally rotated, limited motion. Always examine cervical spine

Inspection: Asymmetry, atrophy, previous incisions. **Palpation:** AC joint, bicipital groove. **Motion:** Both active (AROM) and passive (PROM) range of motion. **Strength:** scapular muscles, deltoid, biceps, triceps and rotator cuff. Perform full neurovascular exam. Test for generalized ligamentous laxity (hypermobile patella, hyperextensible elbow and thumb MPs)

Specific **stability tests** include:

Sulcus Sign (measures inferior laxity): With arm neutral/adducted, longitudinal inferior traction is applied; measure distance from acromion to humeral head (1 cm=1+, 2 cm=2+, 3 cm=3+). Test again in 30° ER. If still positive, this suggests incompetence of superior GH ligament. Elimination in ER suggest competent rotator interval. Positive sulcus with arm at 90° of abduction = inferior capsular laxity

Apprehension: Pt supine, arm abducted to 90° and gentle ER, guarding or apprehension = positive apprehension

Relocation: From this position, posteriorly directed force improves symptoms. **Surprise:** sudden release of posterior force causes recurrence of apprehension (most accurate of the three tests)

Load and Shift: patient supine with shoulder at edge of table. With arm abducted in plane of scapula, place a small axial load to center glenoid. Then translate proximal humerus anterior-inferior and posterior. Grade 1 – translation to glenoid rim, Grade 2 – past rim but spontaneous reduction, Grade 3 – Dislocation without spontaneous reduction

Imaging

Plain films: Shoulder series includes AP, True AP (Grashey), Scapular Y and Axillary lateral (CRITICAL to get pre AND post reduction axillary views on every dislocation). Evaluate for hill-sachs or bony bankart injury

MRI(arthrogram preferred): Look for Bankart lesion (tear, avulsion of AI capsulolabral ligamentous complex) and Hill-Sachs (defect in posterolateral humeral head), evaluate for rotator cuff tear and other associated injuries. In MDI, arthrogram will show **patulous capsule** or **increased GH volume**

CT: Assess for bony bankart injury (fracture of AI glenoid) and chronic glenoid deficiency (can quantify with 3D reconstruction)

Prevention

Adequate off-season training, appropriate technique (i.e. tackling), proper equipment selection, keep dynamic stabilizers conditioned

Non-Operative Management

Initial management of traumatic instability includes emergent reduction, often under sedation or anesthesia:

a) Traction on abducted and flexed arm with countertraction on the body (sheet in axilla)

b) Other reduction techniques:

Stimson: patient prone with downward traction (weight on wrist)

Spaso: With patient supine, gentle longitudinal traction as you forward flex and ER

Post-reduction management includes: POST-OP XRAY AND NV EXAM! Then, temporary immobilization (3-10 days) in a sling and early rehab to achieve full pain-free ROM. PT focuses on early ROM with progression to strengthening (focus on dynamic stabilizers) by 3 weeks. Return to sports varies by individual and activity. Can return with motion limiting brace.

For most MDI patients, rehabilitation is treatment of choice. Treat scapular dyskinesia to improve glenoid position and dynamic stabilization. Focus on preferential strengthening of the rotator cuff. Most reports show excellent results with non-op treatment of MFI. This should be a minimum of 6 months before considering surgical interventions

Operative Indications

Absolute - Recurrent instability (or pain) despite maximum non-operative measures (immobilization, activity modification, rehab). This can be for recurrent traumatic OR atraumatic instability

Associated rotator cuff tear or glenoid defect >25%, proximal humeral fracture (i.e. displaced GT fracture)

Irreducible dislocation or nonconcentric reduction (interposed tissue)

Relative – Overhead throwing athlete or contact sport athlete, age < 20

Contraindications: Acute infection, Non-compliant individuals, Limited ROM.

* Pts with significant bone loss (i.e. >25% anterior glenoid) may require Latarjet procedure (coracoid transfer)

Surgical Technique

1) Arthroscopic Anterior Stabilization (Bankart Repair)

Preop Area : Verify history and consent in pre-op. Be aware of anesthesia plan, antibiotics. Mark operative site. Inter-scalene blocks or catheters are extremely useful for analgesia intra and post-op

Positioning

Lateral decubitus or beach-chair. For lateral decubitus, remember to place axillary roll (just distal to axilla). Stabilize body with beanbag, flex knees and place padding under down leg and in between legs. Tilt table posteriorly 20° to orient glenoid horizontally. Place arm in balanced traction (with 10-15 lbs of traction) in 30-45° of abduction and 20° of forward flexion. Use a 3-point distraction system for better GH distraction and visualization

Procedure

Prior to positioning, perform exam under anesthesia (EUA) on BOTH extremities to confirm direction of instability and motion. Then prep, drape and perform surgical time-out

After marking out bony anatomy, establish posterior viewing portal in “soft spot” (1 cm inferior and 1 cm medial to posterolateral corner of acromion).

Use outside-in technique with spinal needle localization to establish 2 further portals anteriorly: Anteroinferior portal (just above subscap, ensure appropriate angle to glenoid) and anterosuperolateral (AS) just anterior to leading edge of supraspinatus around biceps. After verifying trajectory with spinal, make small incision with 11 blade, followed by Wissinger rod, followed by cannulas (may need dilator system for larger cannulas)

Space 2 anterior cannulas as much as possible to avoid OVERCROWDING.

Perform thorough diagnostic arthroscopy, evaluate rotator cuff, ligaments, capsule, articular cartilage, biceps, all labral lesions and the size of any bone defect (glenoid and hill-sachs)

Viewing from posterior and/or AS portal, prepare the capsule and labrum. Begin with arthroscopic elevators (especially necessary if labrum is healed medially as in ALPSA lesion) and work from lateral to medial. Prep capsule with rasp or shaver on forward. Prep glenoid to bleeding, cancellous bone with burr or high-speed shaver

Begin placing anchors, starting with most inferior (thru AI portal or percutaneous) and place 3-4 total, advancing superior by approximately 5 mm with each anchor. Place anchor at 45 degrees to glenoid and on edge or 1-2 mm onto face (not medial)

Separate sutures by retrieving one out of one cannula. Then use one of several commercially available suture-passing devices with a sharp twist to pierce capsule and torn labrum and exit on face of glenoid. With the first, most inferior anchor, it is critical that this capsular bite is inferior to anchor to achieve an “Inferior to Superior” shift. Retrieve out of same cannula suture was retrieved from and relay suture back thru passed tissue and out AI cannula. Tie down with surgeon’s choice of arthroscopic knot. Repeat 2-3 times for remaining anchors to complete repair

Final Steps

The joint is thoroughly irrigated and the portal sites are routinely closed. A soft dressing is applied followed by a cooling unit and ultra-sling (with abduction pillow)

2) Open Anterior Stabilization

Positioning

Beach chair – captain’s chair or beanbag. Head elevated 30-45 degrees, knees flexed, head secured. Bump (two folded towels) under scapula to stabilize and deliver glenoid. Drape arm free (can rest on padded mayo or use commercially available pneumatic arm holder)

Procedure

Standard deltopectoral approach is used with incision from coracoid (or just lateral) towards axillary fold. Develop full-thickness flaps and ID fat stripe and DP interval. ID cephalic vein and take lateral with deltoid, develop interval bluntly. Id coracoid and conjoined tendon, incise clavipectoral fascia, and place deep self-retaining retractors

Define subscap, ligate anterior humeral circumflex vessels and take down upper 2/3rds of subscap, leaving cuff of tissue to repair to. Place retractor on medial neck of glenoid to facilitate exposure

Mark and incise medial capsule from superior to inferior and mobilize. Prep AI glenoid to bleeding bone and place 3-4 anchors from inferior to superior

Sutures are then passed to effect a superior capsular shift and tied from inferior to superior with arm in 30 degrees of forward flexion and external rotation. Then reexamine for stability

Final Steps

Secure subscap repair is critical. Anatomic reapproximation and repair with #2 nonabsorbable suture followed by running closure of DP interval with 2-0 vicryl, subcutaneous buried 2-0 vicryls and either staples or running subcuticular stitch.

3) Arthroscopic Treatment of Multidirectional Instability (Arthroscopic Capsular Plication)

Positioning and Prep

Lateral decubitus or beach chair (as for anterior instability). Perform pre-op exam and EUA

Procedure

Establish posterior portal, two anterior portals, and perform diagnostic arthroscopy as for anterior instability. Notice ease with which arthroscope can be advanced between glenoid and humeral head (commonly called “drive-thru sign”). Now switch to viewing from AS portal

Abrade anterior capsule with rasp or shaver and begin placing plication stitches. The first is placed at 5:30 (right shoulder) and if intact, the labrum is used as an anchor. Use suture shuttle device to pierce capsule, first inside-out, and then outside-in to grab 1-2 mm of capsule. Then pass underneath labrum, deploy wire relay, grasp from free posterior portal, relay high tensile strength suture thru posterior portal, labrum, capsule and out AI portal. Retrieve other limb from posterior limb and tie arthroscopic knot. Place 2 additional plication sutures moving superior. Use limb exiting from capsule as post

While still viewing from AS portal, abrade posterior capsule and repeat these steps to place plication stitches posteriorly for a balance plication. Again, if labrum is torn or not robust, suture anchors can be used in glenoid

Final Steps

The joint is thoroughly irrigated and the portal sites are routinely closed. A soft dressing is applied followed by a cooling unit and ultra-sling (with abduction pillow)

Postoperative Rehab and Expectations

Patients are maintained in a sling for 4-6 weeks. Begin pendulums in the first 1-2 days and PT begins by 7-10 days. Motion is limited to PROM (passive supine forward elevation). Begin AROM by week 5-6 and strengthening between week 8-12 (varies with each surgeon). Begin interval, sports-specific drills at 4 months and overhead lifting at 6 months

Most important: Explain to the patient that the rehabilitation process is long and difficult. Stress the importance of compliance with restrictions to achieve successful results.

Further Reading

- ElAttrache NS et al. *Surgical techniques in sports medicine*. Lippincott 2007
- Gerber C, et al. Classification of Glenohumeral joint instability. *Clin Orthop Relat Res*. 2002; 400:65-76
- Lee DH, et al. *Operative techniques. Shoulder and elbow surgery*. Elsevier 2011
- Matsen FA, et al. Principles for the evaluation and management of shoulder instability. *J Bone Joint Surg*. 2006; 88: 647-659
- Millett PJ, et al. Management of multidirectional instability of the shoulder. *J Am Acad Orthop Surg*. 2011; 19: 758-767
- Provencher MT, et al. The Hill-Sachs Lesion: Diagnosis, classification and management. *J Am Acad Orthop Surg* 2012;20:242-252
- Reider B, et al. *Operative techniques. Sports medicine surgery*. Elsevier 2010