Glenohumeral Instability

13

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Definition

The glenohumeral (GH) joint is the most mobile joint in our body allowing us 180° flexion, 60° extension, 180° abduction, 60° adduction, 90° external rotation, and 90° internal rotation. Consequently, the shoulder endures a lack of stability to allow such a wide range of motion [1]. While at rest the shoulder is stabilized by the architecture of the humeral head resting in the glenoid fossa, glenoid labrum, and the joint capsule. The shoulder is most unstable during motion and is stabilized dynamically by rotator cuff muscles, long head of biceps tendon, and scapular stabilizing muscles [2].

GH instability is classified by a spectrum of instability including dislocation, subluxation, and microinstability. Dislocation is complete disassociation of the humeral head from the glenoid fossa which is often unilateral and requires manual reduction. Subluxation occurs when the humeral head translates beyond its physiologic limits to the edge of the glenoid, often able to be self-reduced. Microinstability is excessive capsular laxity which leads to multidirectional instability [3].

Anterior dislocation from traumatic origin is the most common type of unidirectional instability resulting from a traumatic event with the arm in abduction and external rotation. This accounts for 95–97% of dislocations [1]. Less common are posterior dislocations which account for 2–4% and inferior dislocations about 0.5%. Posterior dislocations occur with a posterior directed force with the arm in internal rotation and adduction and also seen in electrical shocks or violent seizures. Inferior dislocations can occur with severe trauma pushing the humerus inferiorly [4, 5].

Anterior dislocations are associated with tears to the anterior portion of the inferior GH ligament, avulsion to the anterior-inferior glenoid labrum referred to as Bankart lesion, and compression fracture of the posterolateral aspect of the humeral head referred to as a Hill-Sachs lesion [2, 6, 7]. Predisposition toward anterior dislocation includes the associations noted above, prior traumatic dislocation, glenohumeral ligament avulsion, superior labral anterior to posterior lesions, subscapularis or other rotator cuff tears, and injury to the rotator interval [2]. Multidirectional instability is sometimes seen in those with Marfan or Ehlers-Danlos syndrome who have congenital joint laxity. More commonly, multidirectional instability can occur in those who experience sustained repetitive microtrauma such as athletes and those with an occupational history of repetitive shoulder motions [8, 9].

Diagnosis

It is very important to ask a good history by taking in account patient age, activity level, mechanism of injury, and prior history of trauma to cue in diagnosis. Equally important are family history for congenital joint laxity and review of systems for associated neuromusculoskeletal conditions. Patients with GH instability usually complain of pain, burning, swelling, popping and snapping with movement, and the sensation of imminent dislocation [10].

On physical examination you may notice a patient with loss of the normal rounded contour of the shoulder, due to displacement of the humerus. With anterior dislocations the patient may present with their affected shoulder in abduction and external rotation. Patients with posterior dislocation may present with their shoulder in adduction and internal rotation. In addition, make sure to check other shoulder stabilizing joints such as the acromioclavicular and scapulothoracic joints for instability. Furthermore, rule out associated complications by analyzing both active and passive range of motion; perform manual muscle testing for strength deficits, reflexes, and sensation for nerve injury. It is especially important to assess axillary and radial nerve injury due to its close proximity to the humeral head. Assess for any weakness with shoulder abduction and elbow, wrist, and finger

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extension as well as altered sensation patterns over the deltoid and the dorsolateral hand. Also assess distal pulses to evaluate for any possible vascular injuries.

Testing

- Special testing for anterior instability includes anterior apprehension (sensitivity 98.3, specificity 71.6), relocation (sensitivity 96.7, specificity 78.0), and release tests (sensitivity 91.7, specificity 83.5).
- To perform the apprehension test, have the patient supine with the shoulder abducted to 90° and elbow to 90° and slowly externally rotate the shoulder while applying anteriorly directed pressure to the humeral head with your other hand. A positive sign is when patient feels an impending dislocation.
- In relocation testing, a posteriorly directed pressure is applied to the humeral head. A positive sign is when the patient feels apprehension relief while being able to tolerate external rotation.
- Finally, the release test is performed by suddenly releasing the posterior applied pressure. A positive sign is the feeling of impending dislocation [11].
- The jerk test is performed to check for posterior instability with the patient positioned supine and shoulder in 90° of flexion, elbow in 90° flexion, and shoulder in 90° of internal rotation. Adduct the arm across the body in the horizontal plane while applying a posteriorly directed pressure. A positive sign is when the patient jerks the shoulder back to the original position to prevent posterior dislocation [12–14].
- The sulcus sign is performed with the patient seated with the shoulder adducted, while a caudal force is applied to the humerus. A positive sign for inferior instability is when a sulcus develops between the acromion and humeral head [12, 15].

Differential Diagnosis

- Rotator cuff tendonitis or tear
- Subacromial bursitis
- Glenoid labrum tears
- Bicipital tendonitis

Imaging

- Imaging is not only useful in visualizing a dislocated shoulder, it is also useful in assessing for two associated findings with shoulder dislocations: Hill-Sachs lesions and Bankart lesions.
  - A Hill-Sachs lesion is a cortical depression of the humeral head resulting from it sitting against the rim of the glenoid and labrum of the shoulder in its dislocated position. With anterior shoulder dislocations, this is typically found in the posterior part of the humeral head. This could be seen in 35–40% of anterior shoulder dislocations [16].
  - Bankart lesions are defects found on the glenoid and/or labrum from the traumatic shear force applied on it as the humeral head dislocates. They are described as either "soft," if there is only labrum involvement, or "bony," if there is an avulsion of the glenoid present as well. Bony Bankart lesions occur in about 5% of anterior dislocations [17].
- Radiology exams should be performed in two planes to confirm direction of dislocation and to rule out humeral head fractures. The basic radiological exams are x-rays with anteroposterior (AP) shoulder view, axillary lateral view, and scapular Y-view [3].
- The AP view allows bony visualization of the scapular, humeral head, clavicle, and glenoid rim. With anterior dislocation you would expect to visualize the humeral head inferior to the coracoid process. See Fig. 13.1.
- An AP view with internal rotation can also allow visualization of a Hill-Sachs defect.
- With both axillary lateral and scapular Y-views, you can detect alignment of the humeral head in anterior and posterior subluxations or dislocations relative to the glenoid to assess for the direction of the dislocation/subluxation.
- Further specialty views include Garth and West Point, which help in visualizing bony Bankart fractures, and Stryker notch view, which can also help visualize a Hill-Sachs lesion [7].
- Magnetic resonance imaging is useful for patients with suspected associated ligamentous, labral, or rotator cuff injuries as well as those with multidirectional instability who have recurrent episodes of dislocation [18].

Treatment

- In acute shoulder dislocation, the first step is to relocate the shoulder. Closed reduction is a procedure and informed consent must be obtained.
  - There are many techniques of shoulder reduction including scapular manipulation, external rotation, traction/countertraction, Stimson, Milch, and FARES (fast, reliable, and safe) technique. These techniques vary with one to two operators and some may require or not require anesthesia. With all these factors and similar reduction success rates, it is best to be familiar with a few techniques in case of unsuccessful reduction. A few are discussed below.

Fig. 13.1 Anterior shoulder dislocation (Reprinted from bone and joint injuries: trauma surgery III, posttraumatic shoulder instability, 2014, pp. 13–23, Martin Jaeger, Kaywan Izadpanah**,** Norbert P. Südkamp, Fig. 2.2a. With permission of Springer)

  - The scapula manipulation method is a good first choice for reduction as it is quick and can be performed seated or prone, and local anesthesia is optional. Success rates range from 80 to 100%. To perform while the patient is seated, rotate the scapula by pushing the apex medially and acromion inferiorly using your thumbs. Meanwhile, an assistant grabs the patient's wrist with one hand and elbow with the other and provides forward or downward traction on the arm.
  - This also can be performed prone with one operator manipulating the scapula the same way, while the patient holds 10–15 pounds of weight with the arm hanging off the table for traction [19–24]. When the arm is allowed to hang with the weight and no scapular manipulation is performed, this is the Stimson technique. The shoulder should relocate spontaneously within 10–15 min.
  - Milch technique is performed with the patient lying supine, arm on the side with the elbow flexed to 90°, and shoulder externally rotated 90°. The practitioner stabilized the shoulder at the humeral head with one hand while applying gentle traction and slowly placing in abduction with the other hand toward an overhead position [31].
  - Signs of a successful shoulder reduction include audible pop, reduced pain, and a return of the rounded shoulder contour.

- Rehabilitation for shoulder instability varies in the literature in regard to mechanism of injury, patient age, activity level, and direction of dislocation. There are currently ongoing clinical trials investigating rehabilitation options as some areas of research are not clear.
  - For young patients involved in their first-time traumatic anterior dislocation, surgery is recommended as the rate of reoccurrence is high.
  - The rate of dislocation reoccurrence for those undergoing surgery was 3% at 2 years and 9% at 10 years compared to 54% at 2 years and 62% at 10 years for those treated conservatively in a randomized control trial with 76 patients from ages 15 to 39 [25]. Surgery for first-time traumatic anterior shoulder dislocation is further supported with systemic reviews [26].
  - Nonoperative therapy with rehabilitation is preferred in the elderly or less active population [27].
- Following relocation, it is recommended to immobilize the shoulder in a traditional sling for 1 week. Systemic reviews have shown that there is no benefit of 1 week versus 3 weeks of immobilization on re-dislocation rates [28].
  - Extensive periods of immobilization run risk of developing adhesive capsulitis especially in the elderly.
  - There have been multiple studies investigating immobilization in internal rotation versus external rotation. Systemic reviews of these trials have insufficient evidence showing more benefit with immobilizing in external rotation as opposed to internal rotation [29].
- Rehabilitation after a shoulder relocation and any surgical intervention occurs in a stepwise fashion to ensure optimal healing with the goal of returning to full activity.
  - After or during immobilization if tolerated, patients can perform pendulum exercises. These are performed with the patient bent over while allowing their shoulder joint to gently swing with the body's momentum.
  - Next, isometric contractions can be performed to activate shoulder muscles to prevent them from deconditioning and undergoing atrophy.
  - Following general rehabilitation principles, patients will advance from passive range of motion, active range of motion, and strengthening exercises, respectively, once pain-free between each stage.
  - Patient's rehabilitation program should incorporate neuromuscular and proprioceptive training before returning to prior level of activity.
  - Adjunctive therapies can be performed during these stages to reduce muscle spasms and restrictions. These interventions include transcutaneous electric nerve stimulation, acupuncture, and soft tissue manipulations.
  - Multidirectional instability patients need to focus on strengthening the scapular stabilizers and rotator cuff muscles.

- If the patient has pain secondary to rotator cuff impingement, shoulder injections can be used to advance therapy.
- Other advances in medicine such as prolotherapy and platelet-rich plasma are being explored for musculoskeletal rehabilitation and look to have a promising role in the future [30].
- Patients with multidirectional instability should be educated to not self-sublux their shoulder.
- When accidental dislocations or subluxations occur, patients should be educated on how to self-reduce their own shoulder. Instruct patients to be seated and with hands together grab their knees. Then, lean backward slowly while extending the hip until reduction occurs [31].

Return to Play

- Patient can return to sport-specific activities once full active range of motion, strength, and proprioception is achieved without pain or feeling of instability.

Referral

- Young patients with first-time traumatic anterior shoulder dislocations should be referred to orthopedic surgery.
- Elderly patients with dislocations or others with multidirectional instability should be referred to physiatry or sports medicine specialists.

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