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GLENOHUMERAL JOINT

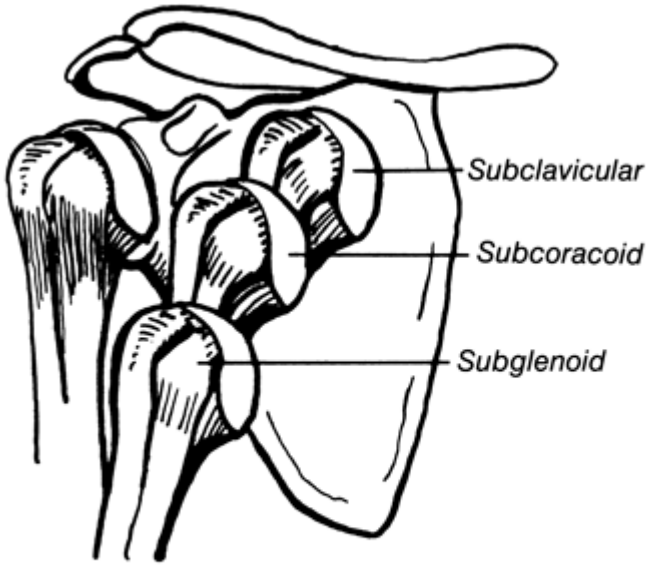
The most frequent location of a glenohumeral joint dislocation is anterior, accounting for 95% of cases. Posterior dislocations are seen in the remaining 5%, with inferior dislocations (luxatio erecta) being extremely rare.

ANTERIOR SHOULDER DISLOCATION

An anterior dislocation of the shoulder is the most common joint dislocation presenting to the ED and represents approximately 50% of all major joint dislocations seen by the emergency physician. Approximately 70% of all anterior dislocations of the shoulder occur in patients <30 years of age.

There are three types of anterior dislocation: *subclavicular*, *subcoracoid,* and *subglenoid* (Fig. 11–58). In 90% of cases, the humeral head is in a subcoracoid location. A subclavicular dislocation is rare. The humeral head can interchange from one position to the next, but it usually remains in one of the three.

Figure 11–58.



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The three types of anterior dislocations of the shoulder.

Mechanism of Injury

The mechanism by which this injury occurs is usually *abduction* accompanied by *external rotation* of the arm, which disrupts the anterior capsule and the glenohumeral ligaments.[56] Subcoracoid

dislocations are often secondary to "hyper" external rotation. Less commonly, they can be seen after convulsions or a direct blow to the posterior aspect of the proximal humerus, displacing it anteriorly. Subglenoid dislocations are usually associated with more abduction than external rotation and have a higher incidence of greater tuberosity fractures and rotator cuff tears associated with them. A small percentage (4%) of dislocations are atraumatic, occurring while raising an arm or moving during sleep.[57]

Examination

The patient presents with the arms held to the side. The acromion is prominent and there is loss of the normal rounded contour of the shoulder (Fig. 11–59). The examiner will note the absence of the humeral head in its usual location while palpating inferior to the acromion. Fullness in the anterior shoulder may be palpated, indicating the presence of the humeral head. The patient permits some abduction and external rotation of the arm, but resists any attempts at internal rotation and adduction.

Figure 11–59.

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Anterior shoulder dislocation on the right. Note the normal, rounded appearance of the left shoulder compared to a more "squared off" appearance of the right shoulder.

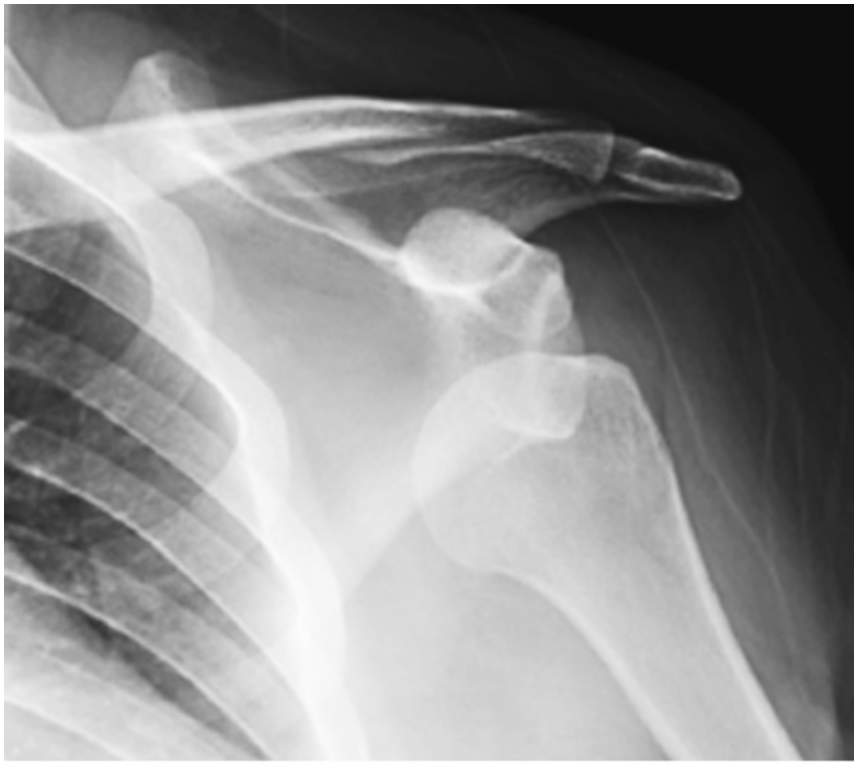
Axillary nerve injury is the most common associated neurologic injury in anterior shoulder dislocations occurring in approximately 12% of cases.[56] Injury to the axillary nerve can be assessed by testing motor strength and pinprick sensation over the lateral aspect of the arm and comparing it with the other side. Some authors have reported that sensory testing is unreliable and motor weakness (abduction) is a better indicator of nerve injury.[58] In addition, the radial, ulnar, and brachial pulses should be evaluated as well as the integrity of the median, ulnar, and radial nerves.

Imaging

Standard radiographic views of the shoulder (*AP internal and external rotation*, and *scapular Y view*)

should be obtained before reduction is attempted. On AP radiographs, the humeral head will be displaced from the glenoid fossa and fixed in external rotation. In external rotation, the greater tuberosity will be located along the lateral aspect of the humeral head. Any attempt to obtain an internal rotation AP view will be unsuccessful and should be a clue to the diagnosis (Fig. 11–60). Pseudodislocation occurs when a hemarthrosis causes widening of the joint space. This is seen most commonly in patients with proximal humerus fractures (see Fig. 11–12).

Figure 11–60.



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Anterior shoulder dislocation on the AP view.

The scapular Y view will demonstrate anterior dislocation from the glenoid (Fig. 11–61). If question still exists, an *axillary view* of the scapula should be obtained. If the patient is ambulatory, and has difficulty fully abducting the arm due to pain, a *Velpeau axillary view* is obtained (Fig. 11–62). A *true AP (Grashey) view* in which the beam is directed at a 45° angle in a medial to lateral direction may be helpful to assess subtle joint incongruity.

Figure 11–61.

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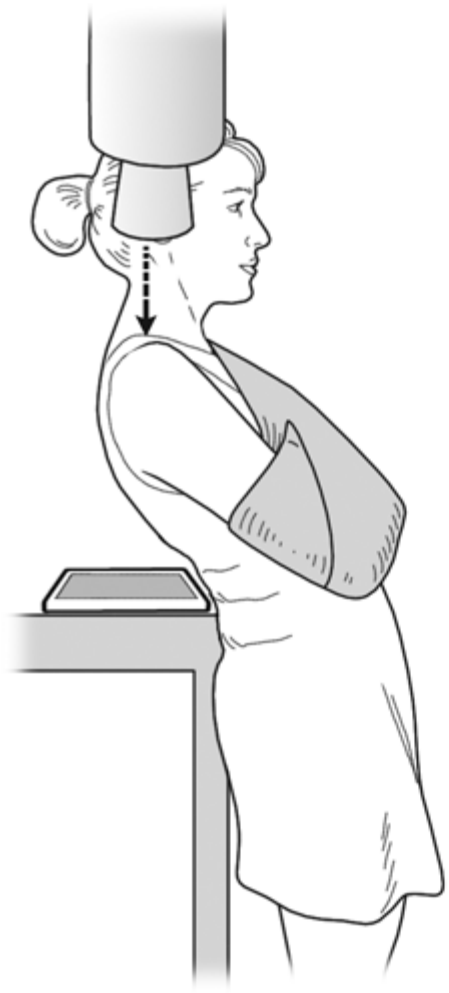
Scapular Y view demonstrating an anterior shoulder dislocation.

Figure 11–62.



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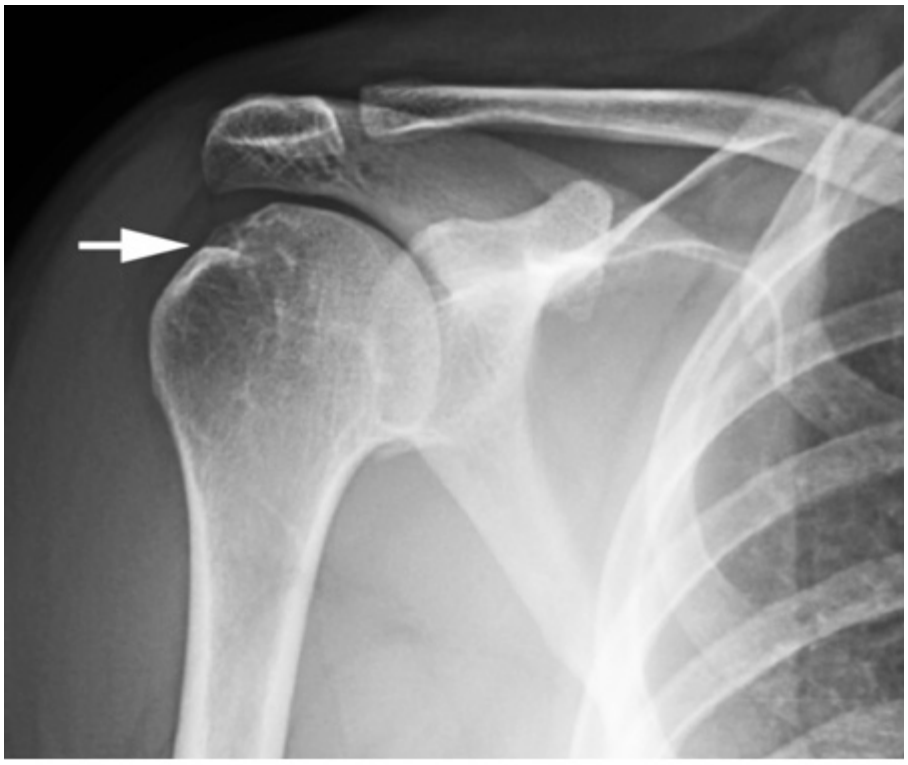
The Velpeau axillary view can be used to diagnose shoulder dislocations in patients who are unable to abduct the arm.

In evaluating the radiographs in patients with suspected anterior dislocations of the shoulder, one should look for a defect in the posterior lateral portion of the humeral head. This defect, known as a *Hill-Sachs defect*, is present in up to 50% of cases of anterior shoulder dislocation (Fig. 11–63). It occurs as a result of impaction of the soft base of the humeral head against the anterior glenoid. The longer the humeral head is out of the glenoid fossa, the larger is the defect. This defect commonly occurs with recurrent anterior dislocations. If one suspects a Hill-Sachs deformity, an internal rotation view can be obtained after the shoulder has been reduced that will delineate the defect more clearly.

Figure 11–63.



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Hill-Sachs deformity following an anterior shoulder dislocation. This injury occurs as a result of impaction of the posterolateral aspect of the humeral head against the anteroinferior aspect of the glenoid rim.

Associated Injuries

Associated fractures other than the Hill-Sachs defect include the greater tuberosity and glenoid rim (Bankart lesion). Fractures of the greater tuberosity occur in 15% of patients with anterior shoulder dislocations.[57] In approximately 40% of cases they occur in patients >45 years of age (Fig. 11–64). Glenoid rim fractures occur in approximately 5% of patients.[57]

Figure 11–64.

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Anterior shoulder dislocation with associated fracture of the greater tuberosity.

Soft-tissue injuries may also occur. In the young, the common site of capsular tear is between the superior and middle glenohumeral ligaments. In addition to capsular tears, the labrum may be torn from the glenoid by the displacing humeral head. Rotator cuff tears occur in 50% of patients <40 years old and in 80% of patients >60 years old.[59] Inability to abduct the arm following reduction of an anterior shoulder dislocation is a sensitive indicator of a rotator cuff tear. This test is not specific, however, because it may occur in patients with an axillary nerve injury. Rotator cuff tears are important to diagnose early because early surgical repair improves outcome.[58] Biceps tendon injuries may also be seen.

Brachial plexus injury or damage to the axillary nerve occurs in 5% to 14% of cases.[60,61] Axillary nerve injury is usually a neurapraxia and full recovery can be expected in most instances.[62]

Treatment

Several methods have been described for reducing anterior shoulder dislocations, five of which will be discussed. We prefer the Hennepin or the scapular manipulation techniques as the method of first choice. In elderly patients with anterior shoulder dislocations, we recommend either the Hennepin technique or the Stimson technique. These patients have a high incidence of associated injuries and thus should be carefully examined before any traction or significant manipulations are applied.

Prior to performing shoulder reduction, procedural sedation should be administered as described in Chapter 2. Without adequate analgesia and muscle relaxation, anterior shoulder dislocation reduction can be difficult. Alternatively, an intraarticular injection of 20 mL of 1% lidocaine into the joint (just inferior to the lateral edge of the acromion) is another method to obtain a successful reduction that has been shown to shorten the time to discharge.[63,64]

Five techniques for reducing anterior shoulder dislocations include:

1. **External Rotation Technique.** This technique is, in our opinion, the preferred method to reduce anterior dislocations of the shoulder. This technique was popularized at Hennepin County Emergency Medicine Center and requires little manipulation and permits the shoulder muscles to reduce the dislocation with little or no analgesia. To perform this maneuver, the patient is seated upright or at 45°. The patient's elbow is supported by one hand and the other hand is used to slowly and gently externally rotate the arm. The arm is externally rotated to 90° (Fig. 11–65). If the patient experiences any discomfort during the external rotation, the examiner should stop and wait a moment until the muscles relax. During this procedure it is important that the patient be completely relaxed and that the rotation be done gradually and slowly. After reaching 90°, the shoulder may have reduced spontaneously. If not, the arm is slowly abducted and the humeral head is lifted into the glenoid if it does not spontaneously reduce on elevation.

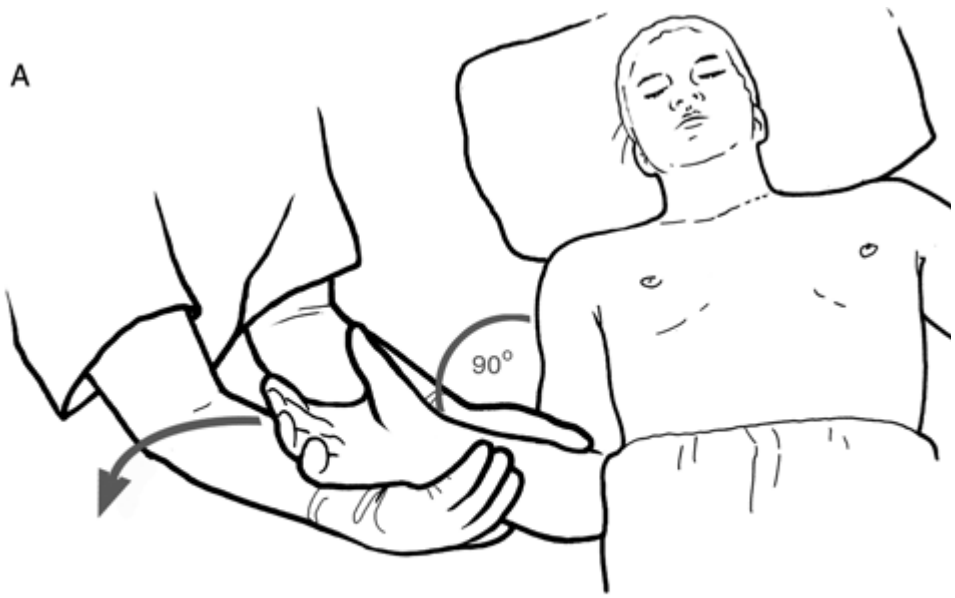
2. **Stimson Technique.** The Stimson technique is a safe procedure to reduce an anterior dislocation of the shoulder. The patient is placed in the prone position with the arms dependent over a pillow or folded sheets (Fig. 11–66). A strap is added to the wrist or distal forearm and 10 to 15 lbs of weights are applied for a period of 20 to 30 minutes. Procedural sedation is difficult to administer in the prone patient, leaving intraarticular lidocaine as a good alternative anesthetic method. Success rates range from 70% to 90%.[56] If unsuccessful, the examiner may rotate the humerus gently, externally and then internally with mild force, which usually reduces the dislocation.

3. **Scapular Manipulation Technique.** The patient lies prone on the table with the affected arm hanging off of the table suspended with approximately 5 to 10 lbs of weight in a similar fashion to the Stimson technique. The physician then pushes the tip of the scapula medially and the superior aspect of the scapula laterally (Fig. 11–67). This technique is reported to have a high rate of success for reducing anterior shoulder dislocations with little associated complications.[56]

4. **Traction and Countertraction.** This method has been advocated for those anterior dislocations that are difficult to reduce by other techniques (Fig. 11–68). In this method, an assistant applies countertraction with a folded sheet wrapped around the upper chest, and the examiner applies traction to the arm in an inferolateral direction. This maneuver usually dislodges the humeral head and slight lateral traction of the proximal humerus will usually reduce the dislocation.

5. **Traction and Countertraction with Lateral Traction.** This maneuver is similar to the preceding one. In addition to traction and countertraction as indicated in the previous section, a perpendicular force to the longitudinal axis of the humerus is applied to the proximal humerus in the axilla by a second assistant (Fig. 11–69). The patient must have good muscle relaxation when using this maneuver. Lateral traction before the humeral head is safely below the glenoid rim may result in fracture to the rim during reduction.

Figure 11–65.



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The Hennepin technique to reduce an anterior shoulder dislocation. (Reprinted with permission from Reichman EF, Simon RR. *Emergency Medicine Procedures*. New York: McGraw-Hill, 2004.)

Figure 11–66.

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Stimson technique for reduction of anterior dislocations.

Figure 11–67.

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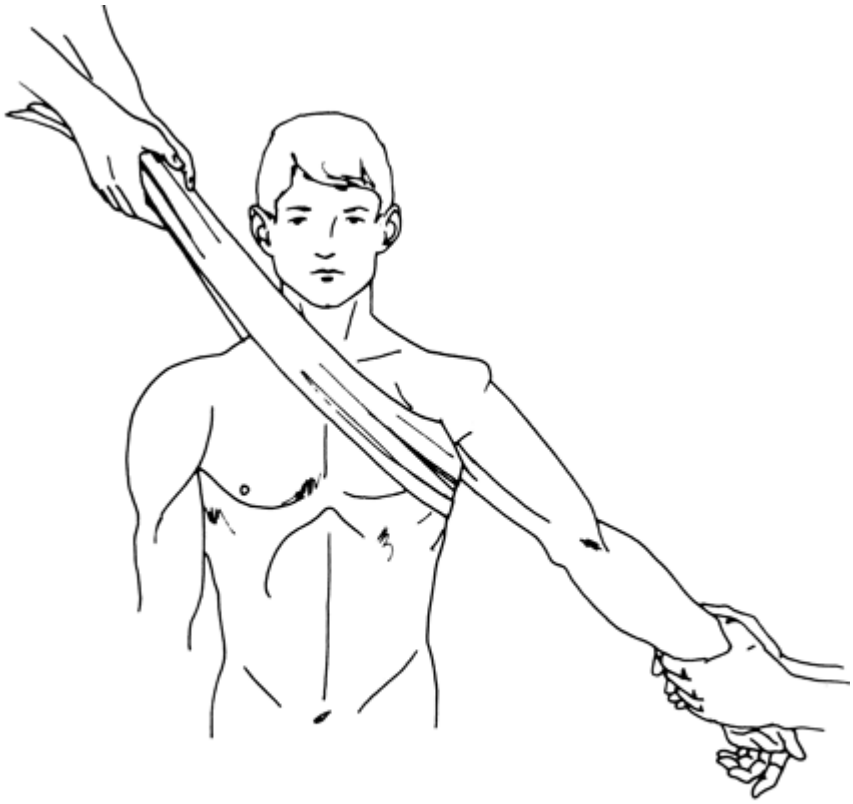
Scapular manipulation. The inferior border of the scapula is rotated medially, while the superior border is rotated laterally.

Figure 11–68.



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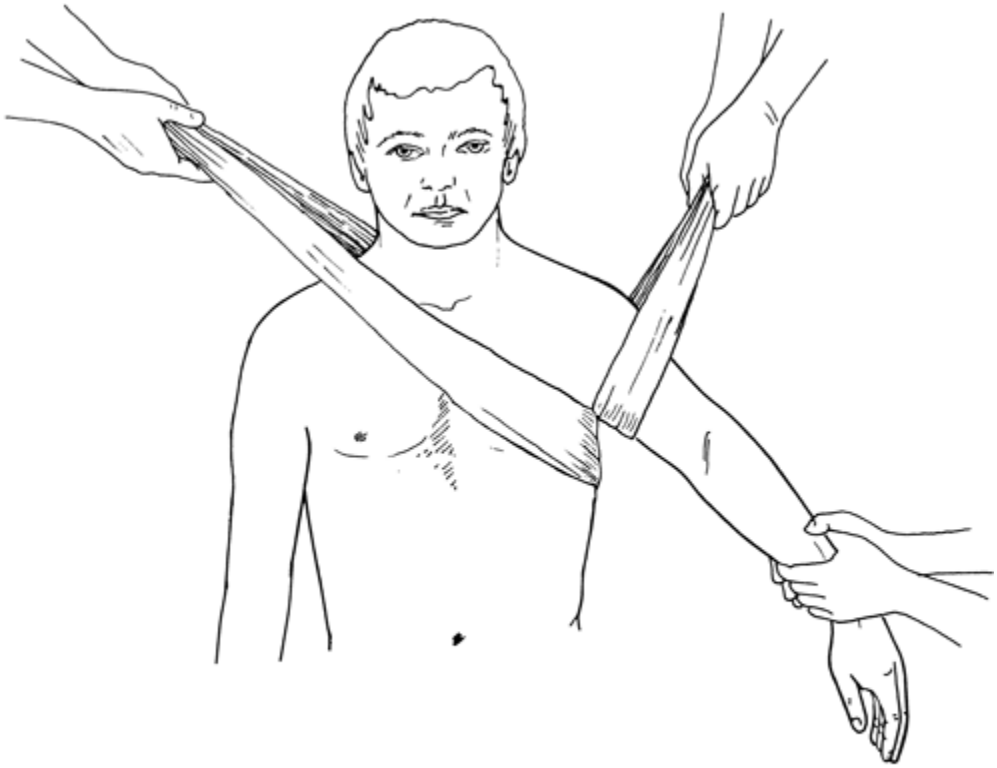
Traction-countertraction technique for reducing anterior shoulder dislocations.

Figure 11–69.



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Traction and countertraction is applied using a sheet around the chest. After a few minutes the head is disimpacted from under the glenoid and is reduced with lateral traction on the arm.

Many other methods have been described to reduce anterior shoulder dislocations that are not recommended. The Kocher maneuver is quite dangerous and fraught with many complications and should not be used by the emergency physician in reducing anterior dislocations of the shoulder.[65] In our opinion, the Hippocratic technique should never be used under any circumstances in reducing these dislocations. *Should the dislocation be irreducible by any of the five methods listed above, then general anesthesia should be considered and reduction attempted in the operating room.* Irreducible dislocations are usually due to soft-tissue interposition. In addition, reduction is more difficult the longer the shoulder has been dislocated.

Following reduction, the shoulder should remain adducted and internally rotated and the patient sent for post-reduction radiographs. A sling and swathe or shoulder immobilizer is used for immobilization (Appendix A–13). The duration of immobilization is controversial, but is generally longer in younger patients. The older the patient, the sooner mobilization should be instituted to avoid stiffness.

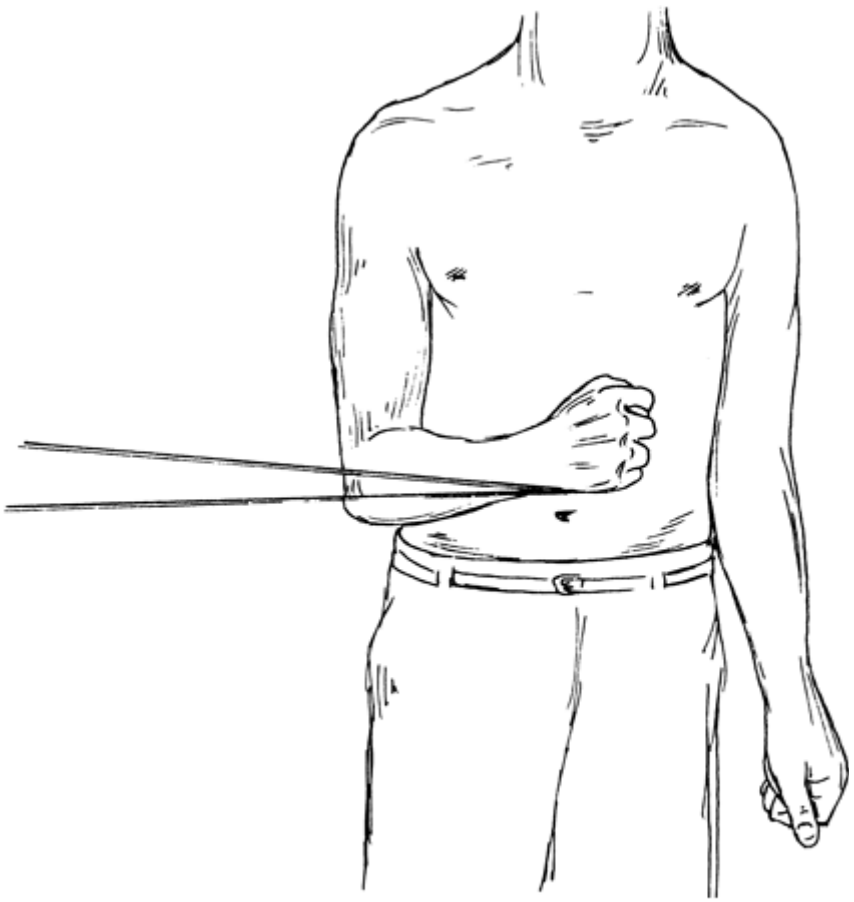
In patients <30 years of age, 3 weeks of immobilization is advocated. After this, gentle active range of motion exercises can be instituted; however, the patient should be cautioned against abduction and external rotation. External rotation and abduction should be prohibited for an additional 3 weeks after immobilization has been discontinued. During the time the patient is immobilized, exercises of the wrist, hand, and elbow should be instituted.

In patients >30 years of age, we advocate immobilization for 7 to 10 days with circumduction (Codman) exercises, to begin within 4 to 5 days of injury[66] (see Fig. 11–13). The patient should avoid abduction and external rotation of the shoulder. Exercise should be performed with a pain-free range of motion following the period of immobilization. Too little movement following a dislocation may result

in tightening of the structures around the shoulder and a prolonged time to regain full range of motion.[66]

In patients who have had an anterior shoulder dislocation, strengthening of the subscapularis muscle is advocated to prevent further dislocation. This can be initiated 2 months after injury by a strengthening exercise as shown in Figure 11–70. The external rotators can be strengthened by the opposite maneuver. Thus, the capsule, which is a static stabilizer of the joint, is further enhanced by the dynamic muscular stabilizers.

Figure 11–70.



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A rotator cuff strengthening exercise using rubber tubing. This strengthens the subscapularis muscle and helps prevent recurrent dislocations of the shoulder.

Indications for Surgery

There are several indications for surgery in an acute anterior dislocation of the shoulder besides soft-tissue interposition (rotator cuff, capsule, biceps tendon). In a subglenoid or subclavicular dislocation there is often complete disruption of the cuff. In the young athlete, repair is indicated and reduction may be attempted in the operating room at that time.[67] Another indication for surgery after reduction of an anterior dislocation is a fracture of the greater tuberosity that is displaced >1 cm post-reduction. Glenoid rim fractures (Bankart lesions) that are displaced >5 mm may require operative intervention.

Complications

The most common complication of anterior dislocation is recurrence, which is seen in 60% of patients <30 years of age and drops off to an incidence of approximately 10% in patients >40 years of age. Operative repair is indicated in patients who have sustained more than three dislocations. Most of the literature demonstrates that patients with recurrent dislocations have extensive capsular tears and at least partial labral detachment resulting in some instability.[68] True Bankart lesions have been found at the time of repair in 84% and 90% of these cases, respectively.[68]

ANTERIOR SHOULDER SUBLUXATION

Anterior subluxation of the shoulder is an uncommonly diagnosed but often missed problem in the ED. This situation is characterized by sudden sharp pain when the shoulder is forcibly moved into external rotation during abduction. It can occur during forceful serving in a tennis match. The shoulder apprehension test is usually positive. To perform this test, the arm is rotated externally and abducted. Anterior pressure is then applied to the posterior aspect of the humeral head (Fig. 11–71). This causes sudden pain and may cause anterior displacement of the humeral head. When this is a recurrent problem the patient should be referred for further evaluation as many of these cases require surgical intervention to stabilize the shoulder.[69,70]

Figure 11–71.

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Technique for performing shoulder apprehension test.

POSTERIOR SHOULDER DISLOCATION

Posterior dislocations are far less common than anterior dislocations, but are the most commonly missed major dislocations of the body.[71] Posterior dislocations are missed partially because they are less common, but also because they present with less pain than anterior dislocations and the radiographic findings are subtle. Diagnosis requires a thorough history and examination, and should always be suspected in patients whose shoulders are blocked to external rotation.

There are three types of posterior dislocations: subacromial, subglenoid, and subspinous. Ninety-eight

percent of all posterior dislocations are of the subacromial type.[72]

Mechanism of Injury

There are several mechanisms by which this injury occurs, among them being a violent internal rotational force such as would occur during a fall on the forward flexed internally rotated arm. This type of dislocation may be seen after a seizure or an electric shock.[71,73]

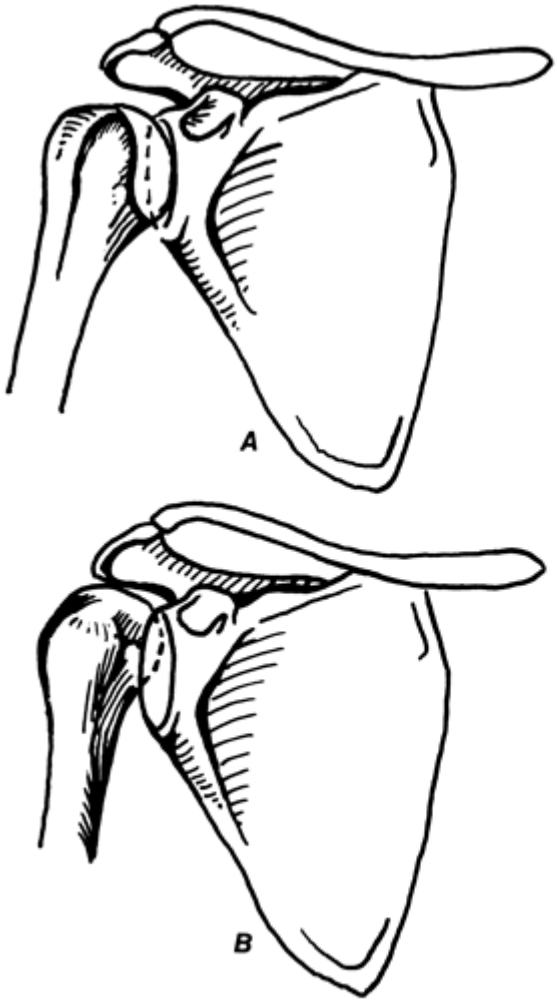
Examination

The cardinal sign of a posterior dislocation of the shoulder is that the arm is held in adduction and internal rotation. Abduction is severely limited and external rotation of the shoulder is blocked. On palpation of the shoulder girdle, the examiner will note a prominence in the posterior aspect of the shoulder accompanied by an anterior flattening of the normal shoulder contour. The coracoid process is usually more obvious than its counterpart on the normal side. *Blocking of external rotation and limitation of abduction occur in all cases of posterior dislocations.* In the subglenoid and subspinous type, the arm is held in 30° of abduction and is internally rotated.

Imaging

Two features appear on the routine views of the shoulder that will aid the emergency physician in making this diagnosis. The first is the loss of the normal elliptical pattern produced by overlap of the humeral head and the posterior glenoid rim (Fig. 11–72). The second is internal rotation of the greater tuberosity. Internal rotation of the humeral head results in rotation of the greater tuberosity so that it is no longer in its normal lateral position (Fig. 11–73). This is referred to as the "lightbulb" or "ice cream cone" sign because the humeral head appears rounded, as though it sits on top of a cone—the humeral shaft. If there remains a question about dislocation, a scapular Y or axillary view can be obtained (Fig. 11–74). A CT scan will also be diagnostic, but is not routinely performed.[71]

Figure 11–72.



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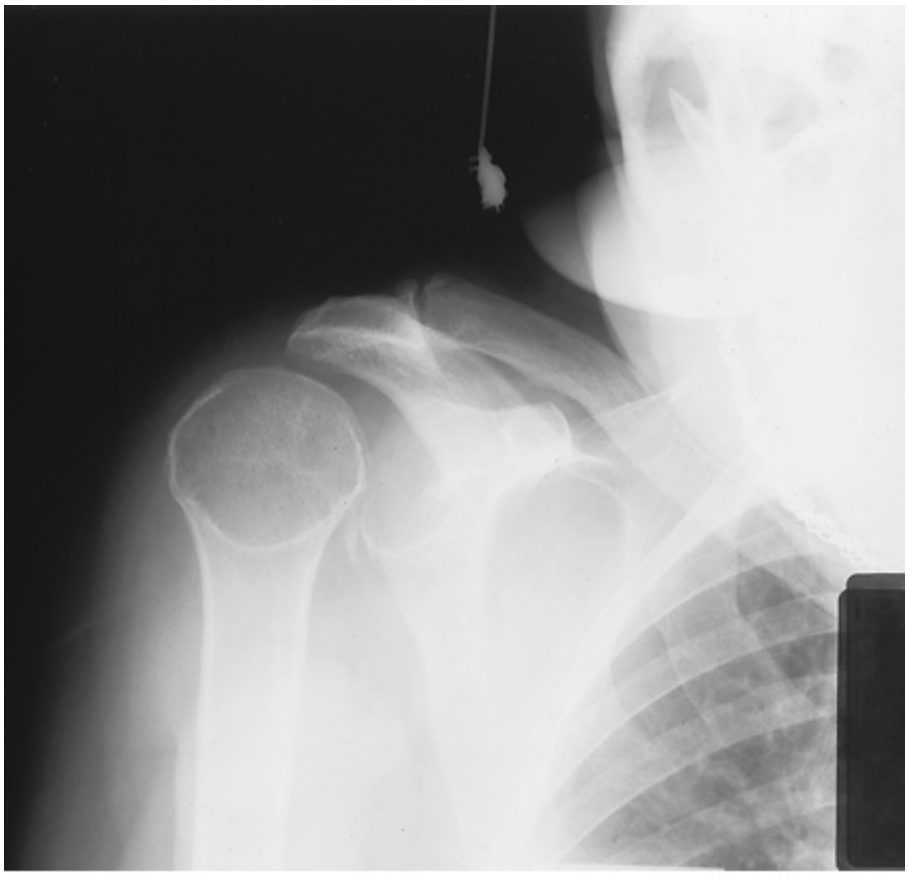
A. Note the normal elliptical pattern of overlap produced by the head of the humerus and the glenoid fossa. ***B.*** In the patient with a posterior dislocation, this pattern is lost, and there is also internal rotation of the greater tuberosity.

Figure 11–73.



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A posterior shoulder dislocation with glenoid rim fracture. Notice the "ice cream cone" sign.

Figure 11–74.

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Posterior dislocation of the shoulder. ***A***. AP view. ***B***. Axillary view.

Associated Injuries

This dislocation is commonly associated with fractures of the humerus and the posterior aspect of the glenoid rim. An isolated fracture of the lesser tuberosity should lead one to suspect a posterior dislocation until proven otherwise. A reverse Hill-Sachs lesion is an impression defect on the

anteromedial part of the humeral head due to compression by the glenoid. Neurovascular complications with this injury are uncommon.

Axiom: *An isolated fracture of the lesser tuberosity should lead one to suspect posterior dislocation of the shoulder until proven otherwise*.

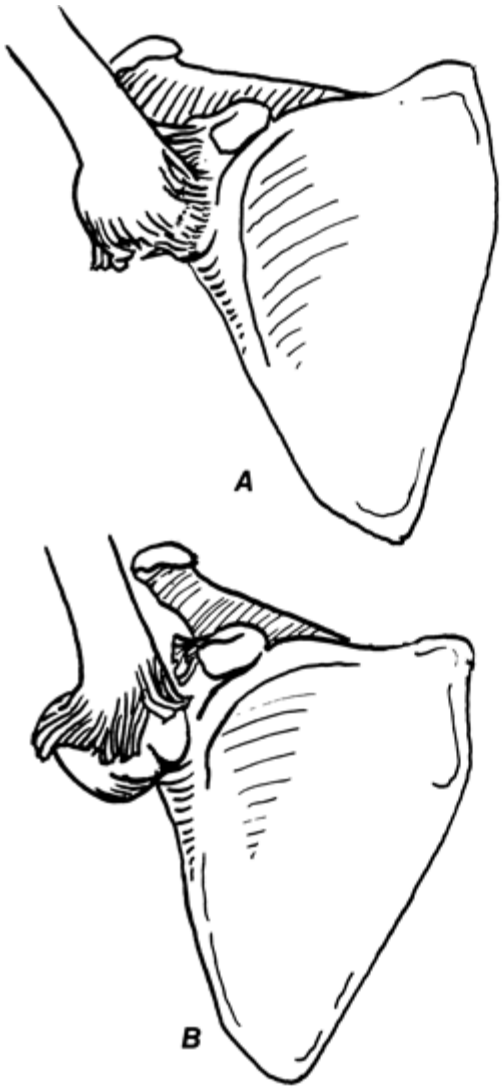
Treatment

Posterior dislocations should be referred, as these injuries are uncommon. In cases that are accompanied by acute pain and spasms, one may need a general anesthetic to reduce the dislocation. Closed reduction using flexion and adduction with axial traction on the arm is usually successful and can be performed in acute dislocations (<3 weeks) when there is a <25% articular surface defect.[71] Direct anterior pressure on the posterior displaced humeral head may facilitate the reduction. Indications for surgical intervention include significant displacement of the lesser tuberosity that is irreducible on reduction of the dislocation, an articular defect >25%, or a chronic dislocation (>3 weeks).

INFERIOR SHOULDER DISLOCATION (LUXATIO ERECTA)

Inferior dislocations of the shoulder (luxatio erecta) are uncommon but can be quite serious injuries (Fig. 11–75). These injuries are more common in men than women.[74]

Figure 11–75.



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Luxatio erecta. The mechanism by which this injury occurs is hyperabduction. This dislocation is always accompanied by both disruption of the rotator cuff and tear through the inferior capsule.

Mechanism of Injury

The mechanism by which this injury occurs is forceful hyperabduction.[75]

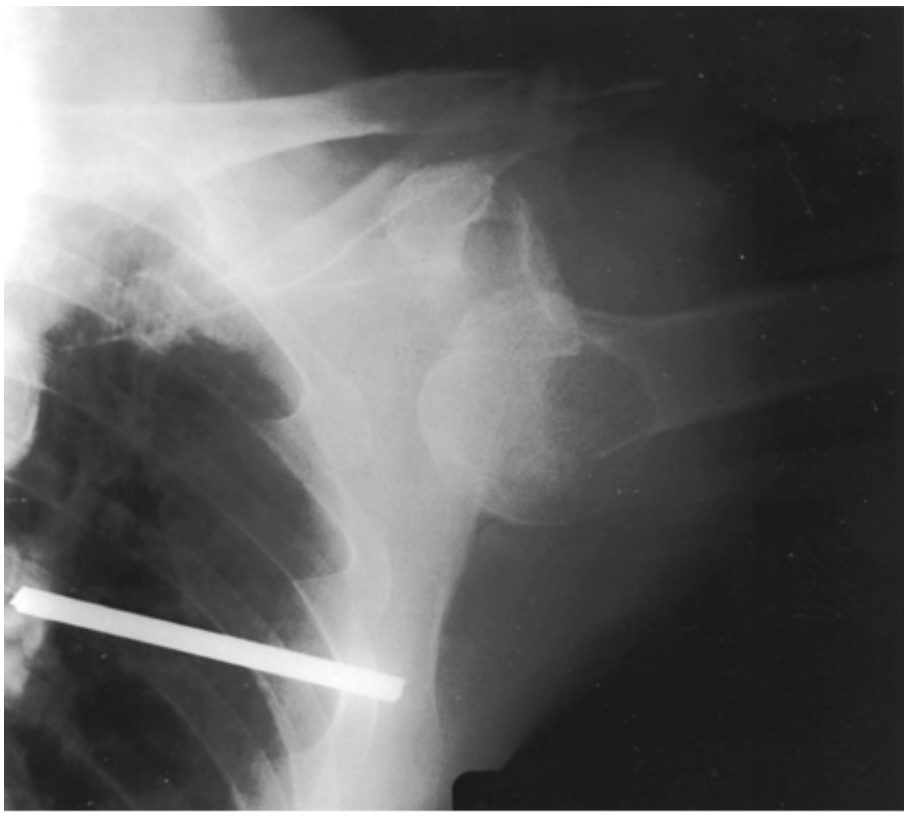
Examination

This injury is unlikely to be missed because the patient holds the arm elevated 180° and cannot adduct it, as if they are "asking a question." These patients usually present in significant pain. The arm appears to be shortened when compared with the normal side. On palpation, the humeral head is felt along the lateral chest wall.

Imaging

Radiologic evaluation with two views at right angles of each other, a lateral view and anterior posterior view, are useful (Fig. 11–76).[76]

Figure 11–76.



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A luxatio erecta dislocation of the shoulder.

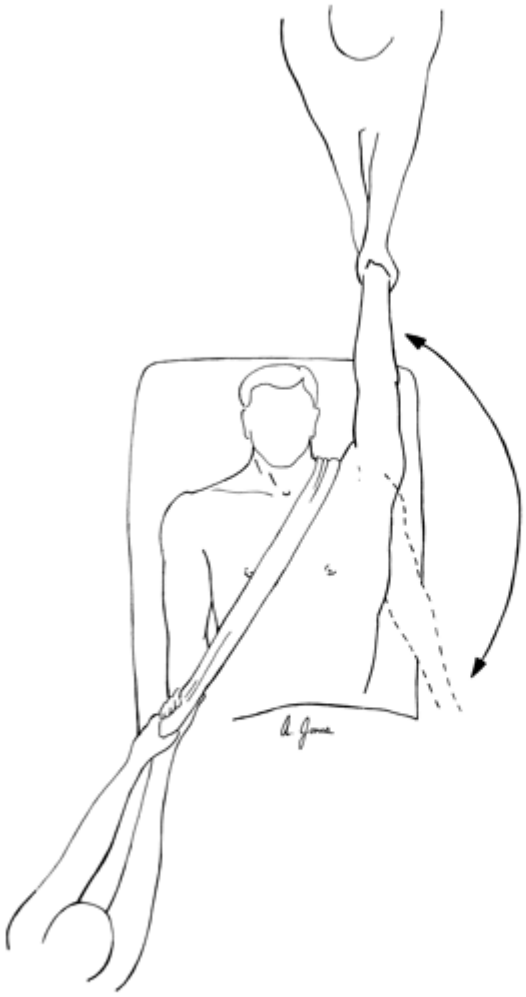
Associated Injuries

Luxatio erecta is always accompanied by detachment of the rotator cuff. The patients usually have neurovascular compression; however, they practically always recover following reduction.[74] The axillary artery and brachial plexus are commonly injured because the humeral head tears through the inferior capsule rather than the anterior capsule as with the anterior dislocation of the shoulder. Vascular injury is not common, but is more common in luxatio erecta than in any of the other types of shoulder dislocation.[74] Fractures of the acromion, inferior glenoid rim, and greater tuberosity of the humerus can occur.[76]

Treatment

Reduction may be difficult if the humeral head has torn a small defect in the inferior glenohumeral capsule.[74] The physician applies traction in the longitudinal axis of the humerus while an assistant applies countertraction with a folded sheet wrapped around the supraclavicular region (Fig. 11–77). While traction is maintained, the arm is rotated inferiorly in an arch as shown. If a button-hole deformity occurs in the inferior capsule, then an open reduction is indicated.[76] Postinjury, the patient must be followed closely for evidence of rotator cuff tears.[74] After reduction, immobilize the shoulder for 2 to 4 weeks. Occasionally, patients may require general anesthesia to reduce the dislocation and surgical repair of the cuff may be indicated.

Figure 11–77.



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Reduction of a luxatio erecta dislocation. Traction is applied by the physician in the longitudinal axis of the humerus while an assistant applies countertraction with a folded sheet. While traction is maintained the arm is rotated inferiorly in an arc as shown.

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