Injuries to the Shoulder Girdle and Humerus

M. Scott Linscott

Supracondylar distal humeral fractures rarely occur after the age of 15 years.

DISLOCATIONS

The most common dislocations are glenohumeral (85% being anterior), followed by acromioclavicular, sternoclavicular, and the very rare dislocation of the entire shoulder girdle from the thorax.

SOFT TISSUE INJURIES

The most common soft tissue injuries are the shoulder impingement syndromes, including subacromial tendinitis and bursitis with rotator cuff tears (95% are chronic and 5% acute), as well as tendinitis and rupture of the long head of the biceps tendon.

PATHOPHYSIOLOGY

The shoulder girdle connects the upper extremity to the thorax and axial skeleton. It consists of three bones (scapula, clavicle, and humerus), three joints (sternoclavicular, acromioclavicular, and glenohumeral), and one articulation (scapulothoracic). Injuries to the shoulder girdle include disarticulation (rare), fractures, ligament sprains, joint dislocations, musculotendinous strains, and contusions, as well as injuries to the nerves and vascular structures of the shoulder girdle and humerus.

The scapula and clavicle are attached to the axial skeleton by ligaments at the sternoclavicular joint and by muscles from the blade or body of the scapula to the thorax. The clavicle is attached to scapula by the coracoclavicular and acromioclavicular ligaments. The coracoacromial ligament serves as the roof of the coracoacromial arch, beneath which the neurovascular bundle traverses (Figs. 87.1 and 87.2).

PRESENTING SIGNS AND SYMPTOMS

STERNOCLAVICULAR JOINT SPRAINS AND DISLOCATIONS

These injuries are graded as type I, a simple sprain of the joint; type II, subluxation of the joint, either anterior or posterior; and type III, complete dislocation of the joint. Dislocation usually results from a lateral force applied to the shoulder and an indirect force applied to either a rolled-back shoulder...
(anterior dislocation) or a rolled-in shoulder (posterior dislocation). Posterior dislocations are potentially life-threatening because the dislocated medial head of the clavicle may cause pneumothorax or injuries to the great vessels, esophagus, or trachea (all structures in the superior mediastinum).

The patient complains of severe pain in the affected sternoclavicular joint. In anterior dislocations, the protruding medial end of the clavicle is visible, easily palpable, and tender. In posterior dislocations, there is often a cavity where the medial end of the clavicle would normally lie, which is especially noticeable when compared with the uninjured side. Patients with posterior dislocations may also have signs and symptoms of pneumothorax, vascular occlusion, and esophageal or tracheal injury. Routine radiographs may not be diagnostic, and computed tomography (CT) is usually required to make the diagnosis. This should always be performed with intravenous (IV) contrast media when a posterior sternoclavicular dislocation is suspected to rule out injuries to the superior mediastinal vascular structures (Fig. 87.3).

**ACROMIOCLAVICULAR JOINT DISLOCATION OR SEPARATION**

Acromioclavicular separations are generally caused by a fall onto the point of the shoulder or acromioclavicular joint with the arm adducted (thus the lay term *shoulder pointer* to describe this injury). It is caused less frequently by a fall onto the outstretched arm in extreme abduction, which drives the acromion below the clavicle. Acromioclavicular separations are classified as six types, although only the first three (I to III) are commonly seen. Types IV to VI are very uncommon and usually require surgical repair. In type I acromioclavicular separations, the acromioclavicular ligaments are partially torn and the coracoclavicular ligaments are intact, which results in less than 50% superior dislocation or separation of the clavicle from the acromion (Fig. 87.4, A to C). In type II injuries, the acromioclavicular ligaments are completely torn and the coracoclavicular ligaments are stretched or partially torn, which results in at least 50% superior dislocation or separation of the clavicle from the acromion. In type III injuries, both the acromioclavicular and coracoclavicular ligaments are completely torn, with complete superior dislocation or separation of the clavicle from the acromion.

**Fig. 87.1 Anatomy of the shoulder girdle.**

**Fig. 87.2 Anatomy of the glenohumeral joint.**

**Fig. 87.3**
The patient complains of severe pain in the acromioclavicular joint. Type I dislocations are characterized by tenderness and some swelling over the acromioclavicular joint, with little or no tenderness over the distal end of the clavicle and coracoid process. With type II dislocations, patients have tenderness and more swelling over the acromioclavicular joint and some tenderness over the coracoid process. In type III dislocations, the clavicle is obviously dislocated superiorly when the patient is sitting or standing, with less deformity noted when the patient is supine. Shoulder radiographs may miss an acromioclavicular separation if the radiograph is taken with the patient supine. Acromioclavicular views (a single radiograph that includes both acromioclavicular joints) should be taken with patients in the sitting or standing position and the arms unsupported. In type I injuries there is less than 50% cephalad dislocation of the clavicle on the acromion of the affected shoulder. Type II injuries are marked by greater than 50% cephalad displacement of the clavicle on the acromion on the affected side. In type III dislocations, complete dislocation is seen on sitting or standing films. Use of weight-bearing films (the patient holds weights with the affected arm) is of no benefit.4

CLAVICLE FRACTURES

The most common mechanism of injury is a medially directed blow to the shoulder, usually from a ground-level fall. Children frequently have a bowing deforming or a greenstick fracture, whereas in adults the fracture fragments are often significantly displaced. Clavicle fractures are divided into proximal third, middle third, and lateral third. Lateral third fractures are divided into types I, II, and III (Fig. 87.5). Type II lateral third fractures are relatively unstable because the coracoclavicular ligament has been disrupted.

Patients complain of severe pain at the site of the fracture. They may support the adducted arm on the injured side with the other hand. A deformity is usually obvious, and the fracture site is tender. The diagnosis is made by radiography of the injured clavicle. If a type II distal third clavicle fracture is suspected, both supine and upright films will reveal the degree of instability of the fracture.

SCAPULA FRACTURES

Scapular fractures are typically associated with high-energy force and are thus often associated with significant life-threatening injuries, especially injuries to the ipsilateral ribs, pleura, and lungs. Most scapular fractures are caused by a direct blow, although fractures of the glenoid and scapular neck may occur as a result of a fall on an outstretched arm.5

The patient complains of pain at the site of the fracture. Any movement of the ipsilateral arm will exacerbate the pain, especially with fractures of the glenoid. Fractures of the scapular spine are usually seen clearly on plain films. However, fractures of the neck and the glenoid may not be seen, and if suspected, a CT scan of the scapula should be obtained.

GLENOHUMERAL DISLOCATIONS

Dislocations of the glenohumeral joint are divided into anterior, posterior, and inferior (luxatio erecta). Most glenohumeral dislocations are anterior and are caused by an indirect
force such as abduction, extension, and external rotation; however, they are occasionally caused by a direct blow to the proximal end of the humerus.

Patients generally have severe pain in the glenohumeral joint and hold the affected arm in adduction and internal rotation. There is lack of the normal contour, with a depression where the humeral head would normally reside. Patients report extreme pain in the joint with any attempted movement of the arm. Anteroposterior (AP) and axillary or transthoracic lateral radiographic views should be obtained in all patients with suspected dislocations, even if the patient has a history of multiple dislocations, because occasionally an associated fracture of the proximal end of the humerus or a posterior dislocation will be present.\(^5,7\) If displaced fractures of the glenoid or proximal end of the humerus are suggested on plain radiographs, CT scans of the shoulder should be obtained. Although the AP film usually shows the “light bulb” appearance of the humeral head, it is not always present (Fig. 87.6). Though rare, with luxatio the patient has the classic picture of holding the arm in marked adduction and over the head (Fig. 87.7). The radiograph reveals the humeral head to lie inferior to the glenoid and the humeral shaft adducted superiorly (Fig. 87.8).

**PROXIMAL HUMERUS FRACTURES**

The two mechanisms that most commonly cause fractures of the proximal end of the humerus are (1) a direct blow to the lateral aspect of the upper part of the arm and (2) indirect forces generated by a fall on an outstretched arm. The position of the humeral shaft in relation to the proximal fragments depends on whether the fall is onto an abducted or adducted arm.

The Neer fracture classification is most commonly used and is based on the position of the articular segment, the greater and lesser tuberosities, and the humeral shaft. According to the Neer classification, a fracture is considered displaced if any major fracture fragment is displaced 1 cm or more or is angulated greater than 45 degrees.\(^8\) Fractures are classified as
Injuries to the Shoulder Girdle and Humerus

One-, two-, three-, or four-part fractures and are usually differentiated along the classic epiphyseal lines (anatomic neck, surgical neck, greater tuberosity, and lesser tuberosity) (Fig. 87.9).

The patient has severe pain in the proximal end of the humerus. An obvious deformity may be present, as well as swelling and extreme tenderness over the proximal end of the humerus. The trauma radiographic series recommended by Neer, as well as an AP internal rotation view and an axillary lateral view, provides the most complete diagnostic information. A CT scan of the shoulder may be necessary to better define the extent of injury.

Humeral Shaft Fractures
Humeral shaft fractures are almost always caused by a direct blow to the bone, and this mechanism usually results in a transverse fracture. Occasionally, a fall onto an outstretched hand or a severe twisting force brought about by supination or pronation or by twisting of the entire arm may result in spiral fractures.

Symptoms include pain and deformity at the fracture site. In addition, the fracture is usually very unstable. If the radial nerve is injured, the patient will not be able to extend the wrist or fingers and generally has decreased sensation on the dorsum of the hand. The diagnosis is based on radiographs of the humerus. As with all long-bone fractures, the joints above and below the fracture—in this case the shoulder and elbow—should also be radiographed.

Distal Humerus (Supracondylar) Fractures
Supracondylar fractures are classified as either flexion or extension fractures and occur almost exclusively in children, usually between the age of 4 and 10 years. More than 95% of these fractures are the extension type and occur when the child falls onto an outstretched arm with the elbow in full extension or hyperextension. In the flexion-type fracture, the child falls onto the arm with the elbow flexed.

The patient is generally seen holding the injured arm in extension with the unaffected hand. Swelling, as well as tenderness to palpation over the distal end of the humerus, is typical. An S-shaped deformity may be present if significant displacement of the fracture fragments has occurred. The patient resists any attempt to flex or extend the elbow. Elbow radiographs (AP and lateral views) should be obtained. The fracture will often be visible only on the lateral view unless fracture fragments are significantly displaced. Normally, the anterior humeral line should pass through the capitellum (Fig. 87.10, A and B). If the capitellum is anterior to the anterior humeral line, it is diagnostic of a flexion-type supracondylar fracture in a child. If the capitellum is posterior to the anterior humeral line, it is diagnostic of an extension-type supracondylar fracture. Based on radiographic findings, extension fractures are often classified into three types: type I has minimal or no displacement; type II is a displaced fracture with the posterior cortex intact; and type III is a completely displaced fracture, with both the anterior and posterior cortices disrupted.

Rotator Cuff Tendinitis/Subacromial Bursitis, Rotator Cuff Tears, and Impingement Syndromes
These three disorders have much in common; rotator cuff tears are the end result of rotator cuff tendinitis and subacromial bursitis. Most rotator cuff tears occur in patients older than 40 years and result from long-term degeneration and entrapment of the rotator cuff tendons as they pass between the humeral head and the acromion (impingement syndrome). The injury occurs with a sudden, powerful elevation of the arm (as when grabbing a tree limb during a fall). Occasionally, the injury occurs in weight lifters and in patients who fall onto...
the shoulder. In younger patients, these injuries frequently result in avulsion of bone because their tendons are normal.

The patient complains of pain over the proximal end of the humerus, where the rotator cuff tendons attach to the greater tuberosity. Significant pain is felt with both active and passive abduction of the shoulder. In other impingement syndromes (supraspinatus tendinitis and subacromial bursitis), the symptoms are similar, but with less tenderness over the rotator cuff and greater tenderness proximally. The drop arm test is positive if a significant rotator cuff tear has occurred. The patient extends the injured arm to 90 degrees and the operator lightly taps the wrist or forearm. In a positive test, the patient suddenly drops the arm. In addition, the patient cannot slowly lower the arm from the abducted position—rather, it drops suddenly to the side. In patients with rotator cuff tendinitis or subacromial bursitis, significant pain occurs with abduction, but the drop arm test is negative.

### TENOSYNOVITIS AND RUPTURE OF THE LONG HEAD OF THE BICEPS TENDON

The long head of the biceps tendon inserts into the glenoid rim and traverses the bicipital groove between the greater and lesser tuberosities. The tendon is irritated by multiple shoulder

---

**Fig. 87.9** Neer classification of proximal humerus fractures.

**Fig. 87.10** A, Normal anterior humeral line alignment. B, Supracondylar fractures. (From Simon R, Koenigsknecht S. Emergency orthopaedics: the extremities. 2nd ed. Norwalk, Conn.: Appleton & Lange; 1987.)
movements and becomes inflamed. Eventually, the tendon becomes weakened and may rupture completely.

Pain in the anterior aspect of the shoulder may radiate to the elbow. The pain is made worse with abduction and external rotation. There is tenderness over the biceps tendon in the bicipital groove. The Yergason test is a reliable method for confirming the diagnosis of tenosynovitis of the long head of the biceps tendon. The patient’s elbow is flexed to 90 degrees and the patient tries to supinate the forearm against resistance. If this action causes increased pain in the bicipital groove, the test is positive (Fig. 87.11).

ADHESIVE CAPSULITIS

Adhesive capsulitis is caused by inflammation within the glenohumeral joint capsule, which leads to the formation of adhesions within the joint capsule and marked limitation of range of motion of the shoulder. The exact mechanism is unclear; however, this disease usually results from prolonged immobilization of the shoulder joint, particularly when associated with inflammation, such as in subacromial bursitis.

In most cases the nondominant arm is affected and the patient experiences pain with minimal activity. The pain is generally worse at night. There is tenderness in the subacromial area and marked limitation of glenohumeral motion in all ranges, especially abduction and rotation. The diagnosis is made primarily on the basis of the symptoms and signs described previously. Radiographs are typically normal. Arthroscopy or arthrogram may be diagnostic, but these modalities are invasive and should be avoided if possible. Adhesive capsulitis is usually due to prolonged immobilization of the shoulder in patients with subacromial bursitis or rotator cuff tendinitis.

TREATMENT

STERNOCLAVICULAR DISLOCATION

Closed reduction of an anterior dislocation is accomplished with the patient in the supine position and rolled blankets placed between the shoulder blades. Significant downward pressure on the distal and proximal ends of the clavicle with elevation of the proximal end usually reduces the dislocation (Fig. 87.12). If reduction is accomplished, the patient should be placed immediately in a clavicle or figure-of-eight splint to maintain the reduction (Fig. 87.13), as well as an arm sling and swath (Figs. 87.14 and 87.15). Patients with posterior sternoclavicular dislocations require immediate orthopedic consultation; open reduction is usually necessary. Most reductions should be performed in the operating room with thoracic surgery backup in the event of injury to the superior mediastinal structures. Complications include pneumothorax and vascular, esophageal, and tracheal injuries. Although nonoperative attempts at reduction are occasionally successful, most patients with posterior sternoclavicular dislocations require
slung or a sling and swath for the ipsilateral arm). Even markedly displaced fractures generally heal without surgical intervention. Some attempts at closed reduction may be appropriate if these fractures are markedly displaced or if significant skin tenting is noted. Many orthopedic surgeons believe that surgical intervention is indicated only if the fracture is open, if there is marked diastasis between the two fracture fragments that cannot be corrected with closed reduction, or in some cases of a type II distal clavicle fracture. Recently, one study showed that surgical repair of middle third clavicle fractures may be cost-effective after 9 years when compared with nonsurgical therapy. However, even type II distal third clavicle fractures may do well with nonoperative therapy, although nonunion occurs frequently and surgical therapy is probably preferred.

For patients with middle and proximal third fractures, a figure-of-eight clavicle splint may decrease the pain and, in occasional patients, help keep the fracture reduced. However, such splints are primarily for the patient’s comfort and should not be used if their application increases pain from the fracture, which it often does, especially with lateral third clavicle fractures. No evidence has shown any difference in healing time, severity, duration of pain, or any other parameter with an arm sling versus a figure-of-eight clavicle splint or both.

SCAPULA FRACTURES
Most scapular fractures are treated nonsurgically with a sling, ice, analgesics, and range-of-motion exercises. Displaced fractures of the glenoid, neck, and coracoid and some acromial fractures may need ORIF; patients with such fractures should be referred for consultation with an orthopedic surgeon.

GLENOHUMERAL DISLOCATIONS
Anterior Dislocations
Multiple techniques for closed reduction of anterior glenohumeral dislocations have been recommended. The three main categories are scapular manipulation, traction, and leverage. The hippocratic method (foot in the axilla with traction on the extended arm) and the Kocher maneuver (traction, adduction, internal rotation) should not be used because of the increased incidence of brachial plexus injuries with the hippocratic method and the increased incidence of proximal humerus fractures with the Kocher maneuver. For almost all reduction techniques to be successful, adequate sedation/analgesia or anesthesia must be obtained. Conscious sedation with IV fentanyl (50 to 100 mcg) and IV midazolam (1 to 3 mg) is adequate for most reductions. However, some patients require deep sedation with propofol or etomidate, and occasionally a patient may require general anesthesia to accomplish the reduction. Frequently, injecting 10 to 20 mL of 1% lidocaine or 0.25% bupivacaine into the vacated glenohumeral joint will significantly facilitate reduction of the dislocation.

Several methods commonly used to reduce anterior glenohumeral dislocations are described in the following sections.

SCAPULAR MANIPULATION
Ideally, the patient is in the prone position with the dislocated arm hanging over the edge of the stretcher. Traction is applied to the arm, and the operator pushes the tip of the scapula medially while stabilizing the
upper part of the scapula (Fig. 87.16). If the patient insists on sitting up, this same technique can be combined with a modified Hippocratic method in which one operator applies countertraction superiorly with a sheet sling in the axilla, another operator places traction on the arm, and a third operator manipulates the scapula. This is the technique of choice for the author. It requires relatively little sedation or analgesia and is successful in more than 90% of cases.\(^\text{19}\)

**EXTERNAL ROTATION**  With the patient supine, the affected arm is adducted close to the thorax. The elbow is flexed to 90 degrees and the operator very slowly externally rotates the arm without applying longitudinal traction. This method is safe, easily learned, and relatively atraumatic for the patient\(^\text{20}\) (Fig. 87.17).

**MODIFIED HIPPOCRATIC (TRACTION-COUNTERTRACTION) METHOD**  With the patient supine, the elbow is slightly abducted and flexed to 90 degrees. The operator ties a sheet around his or her waist and to the proximal end of the patient’s forearm. An assistant slings another sheet around the thorax and under the affected armpit and ties it around his or her own waist. The operator and the assistant pull in opposite directions with their arms and bodies (Fig. 87.18).

**STIMSON METHOD**  With the patient prone, the affected arm is dangling over the edge of the stretcher and a 10- to 20-lb weight is attached to the wrist to produce constant, gentle traction. This method is one of the oldest and has the advantage of not requiring the physician to be present for the reduction and probably being the least traumatic for the patient. The disadvantage is that it often takes 20 or more minutes to complete the reduction and ties up a nurse for this period if the patient has been consciously sedated (Fig. 87.19). Several other techniques have also been proposed for reduction of anterior glenohumeral dislocations.\(^\text{21-25}\)
TRIUMATIC DISORDERS

772

SECTION VIII

PROXIMAL HUMERUS FRACTURES
With a glenohumeral dislocation, the patient will usually need ORIF to reduce the dislocation and repair the proximal humeral fracture. If the fractures are not displaced (<1 cm of displacement), wearing a sling or a sling and swath may be all the treatment that is required. If significant displacement remains after closed reduction, ORIF will be necessary. Orthopedic consultation should be obtained in almost all cases.

Successful treatment is most dependent on early mobility. Prolonged immobilization without range-of-motion exercises often results in adhesive capsulitis or a marked reduction in mobility of the glenohumeral joint. Patients should be encouraged to perform circumduction range-of-motion exercises after a few days of immobilization, especially elderly patients (Fig. 87.21).

HUMERAL SHAFT FRACTURES
Most humeral shaft fractures can be treated conservatively. If the fracture fragments are minimally displaced, no reduction is necessary. If the fragments are widely separated, reduction may be carried out before splinting. If the fracture fragments are in reasonable apposition (within 1 to 2 inches) following the reduction, the most commonly used splinting technique is the coaptation or sugar-tong splint, whereby a 5-inch plaster or Orthoglass splint is applied over the shoulder, down the lateral side of the upper part of the arm, around the elbow, and up the medial side of the upper part of the arm near the axilla. The arm is then placed in a sling with the sling around the wrist so that the weight of the splint will bring the fracture fragments together (Fig. 87.22). If the fracture fragments are separated more than 2 inches after reduction or if a spiral fracture is present, the hanging cast technique may be used. A lightweight cast is applied 1 to 2 inches proximal to the fracture site up to the palmar crease of the hand. The elbow is flexed to 90 degrees and a loop is placed at the wrist either on the dorsal side to reduce lateral angulation or on the volar side to reduce medial angulation (Fig. 87.23). The hanging cast has the disadvantage of needing gravity for traction; therefore, patients must remain upright at all times, even during sleep. Many patients cannot tolerate this.

Posterior Dislocations
The most common technique for reduction of a posterior dislocation is to apply axial traction in line with the humerus while an assistant applies countertraction with a sheet slung under the axilla of the affected arm. Gentle pressure is applied by the operator, who also applies slow external rotation to the affected humerus (Fig. 87.20).

Luxatio Erecta (Inferior Dislocations)
If possible, orthopedic consultation should be obtained before reduction. The traction-countertraction method is most effective in reducing this dislocation, although deep sedation or general anesthesia may be required. Recently, a technique by which the luxatio erecta is converted to an anterior-inferior dislocation and then relocated in a separate step has been shown to be more successful and requires less analgesia and sedation.26
Injuries to the Shoulder Girdle and Humerus

The most common and most feared complication of humeral shaft fractures is radial nerve injury. If nerve function is lost before reduction, most authorities treat it expectantly. Most of the time nerve function returns because the nerve has been either contused or stretched. After reduction, function of the radial nerve should again be tested. If radial nerve function is compromised but was normal before reduction, most authorities recommend ORIF because the probability is high that the radial nerve is entrapped within the fracture.

**Supracondylar Fractures**

Type I supracondylar fractures are treated with a long arm splint and the elbow flexed to 90 degrees. The arm is placed in a sling. Protected active range-of-motion exercises are begun in 3 to 4 weeks.

Type II fractures require reduction even though they are minimally displaced. Following reduction, a long arm splint is applied with the elbow flexed to 100 to 120 degrees. Flexion greater than 90 degrees places tension on the intact posterior periosteum to maintain the reduction. Because this degree of hyperextension may compromise neurovascular structures volar to the elbow, careful attention should be paid to ensure that this complication does not arise, especially in the first 2 to 3 days after the fracture. Orthopedic consultation should be obtained in all cases.

Type III injuries are problematic because they may increase the chance for a varus deformity and are more likely to cause injury to the neurovascular structures passing through the elbow. Rarely should an attempt be made to reduce these fractures in the ED. The only exception might be the unavailability of immediate orthopedic consultation for a patient who has an obviously occluded brachial artery. The vast majority of these patients should be taken to the operating room immediately and undergo either closed or open reduction. Orthopedic consultation is mandatory in all cases.

The most common complication is loss of the normal carrying angle, which results in a cubitus varus deformity. This complication has decreased in incidence as the practice of percutaneous pinning of the fracture has evolved. More serious complications of supracondylar fractures include brachial artery injury and injuries to the radial, median, and ulnar nerves. Most often these injuries are due to contusion or stretching of the nerves, and full recovery is the rule.

**Rotator Cuff Tendinitis/Subacromial Bursitis, Rotator Cuff Tears, and Impingement Syndromes**

Treatment depends on the degree of disability (incomplete versus complete tear), the patient’s age, and the patient’s activity level. In patients with tendinitis or subacromial bursitis, an injection into the subacromial bursa usually results in relief of pain. In young, active patients with significant rotator cuff tears, arthroscopic repair is indicated. In older patients with a sedentary lifestyle, repair should rarely be attempted because the outcome is often worse than that with conservative therapy. For evaluation, patients should be referred for consultation with an orthopedist who specializes in shoulder injuries.

**Tenosynovitis and Rupture of the Long Head of the Biceps Tendon**

Conservative treatment consists of a sling and nonsteroidal antiinflammatory drugs (NSAIDs). If after a week of immobilization the patient continues to have pain, the bicipital canal can be injected with a combined local anesthetic and steroid. Range-of-motion exercises should be performed daily to prevent adhesive tenosynovitis.

**Adhesive Capsulitis**

The most important form of therapy should be directed at prevention of this problem. All patients with shoulder injuries or inflammation should be encouraged to perform circumduction range-of-motion exercises daily to prevent adhesive capsulitis. Conservative treatment consists of a gentle exercise program, NSAIDs, and corticosteroid injections. Such treatment results in significant improvement in many patients;
**Injection of the long head of the biceps tendon in the bicipital groove.**

however, many others require the adhesions to be broken up by putting the shoulder through full range of motion under general anesthesia.

---

**FOLLOW-UP, NEXT STEPS IN CARE, AND PATIENT EDUCATION**

**STERNOCLAVICULAR STRAINS, SUBLUXATIONS, AND DISLOCATIONS**

Anterior dislocations can be reduced in the ED. The patient should be placed in a sling and swath and be told to wear it for 2 to 3 weeks and follow up with an orthopedic surgeon. If an anterior dislocation cannot be reduced in the ED, the patient should be placed in a sling and figure-of-eight clavicle splint and be referred to an orthopedic surgeon. A patient with a posterior dislocation should undergo CT of the sternoclavicular joint and be seen urgently by an orthopedic surgeon. The patient must also be seen by a cardiothoracic surgeon if injury to a superior mediastinal structure is suspected.

**ACROMIOCLAVICULAR SEPARATION OR DISLOCATION**

Patients with a type I or II separation should be put in a sling or a sling and swath for their comfort. They should be treated with ice and analgesics and be told to follow up with their primary care physician. Patients with type III separations should be put into a sling, be told to apply ice to the injury, and be referred for follow-up consultation with an orthopedic surgeon within 1 to 2 weeks. Most type III fractures should be treated conservatively. Although some orthopedic surgeons may elect to perform open reduction of these injuries in an athlete who uses the injured arm in overhead activities (e.g., baseball pitcher, football quarterback), no good evidence has shown a difference in outcome with surgical versus nonsurgical therapy, even in these patients. Type IV, V, and VI injuries are usually severe, and these patients should be referred to an orthopedic surgeon for consultation because most will require ORIF.

---

**CLAVICLE FRACTURES**

The only indication for immediate surgery is an open fracture or fractures with neurovascular compromise. Some orthopedic surgeons would consider a significantly displaced type II distal third clavicle fracture, any fracture with skin tenting, or any widely displaced middle or proximal third clavicle fracture as an orthopedic urgency. All such patients should be referred immediately to an orthopedic surgeon. If patients are to be discharged, they should be put in a sling, be told to put ice on their injured clavicle, and be prescribed potent opioid analgesics. Patients should leave their arm in a sling (with a figure-of-eight bandage if it provides additional comfort). Patients should be told to perform circumduction range-of-motion exercises at least once daily to prevent adhesive capsulitis. The sling should be left on for 2 to 4 weeks in children younger than 14 years and for 4 to 8 weeks in adolescents and adults. Referral to an orthopedic surgeon is necessary only for patients with severely displaced fractures (>20 mm of shortening), open fractures, fractures associated with neurovascular injury or skin tenting, and type II distal third clavicle fractures. Complications are uncommon and consist of osteoarthritis of the acromioclavicular joint (in type II and III distal third clavicle fractures) and nonunion in type II distal third clavicle fractures (primarily a cosmetic issue).

**SCAPULA FRACTURES**

Most scapular fractures heal without surgery, and patients should be discharged with a sling, instructions to apply ice, and analgesics, as well as arrangements for follow-up with an orthopedic surgeon. Patients with fractures of the scapular neck and glenoid that are widely displaced or angulated may need ORIF and should be referred immediately to an orthopedic surgeon. These fractures are associated with internal injuries, which should be ruled out before discharge.

**GLENOHUMERAL DISLOCATIONS**

Most dislocations can be reduced with some type of conscious sedation in the ED. In some cases the relocation will be unsuccessful and the patient must be taken to the operating room for relocation. Following relocation, the patient may be discharged with a sling or a sling and swath. The sling should be kept on for 3 to 5 weeks, and the patient should perform circumduction range-of-motion exercises until the sling is removed. Complications include fracturing of the humerus during reduction and injury to the axillary nerve, which should be checked before and after reduction. Prereduction radiographs are recommended. However, routinely obtaining postreduction radiographs is controversial, especially if the patient is asymptomatic. The sling should be left on for approximately 4 weeks.

**PROXIMAL HUMERAL FRACTURES**

Most patients with these fractures do not require admission unless it is needed for pain control. Successful treatment is most dependent on early mobility. Prolonged immobilization without range-of-motion exercises often results in adhesive capsulitis or a marked reduction in mobility of the glenohumeral joint. Patients should be encouraged to perform circumduction range-of-motion exercises after a few days of immobilization, especially elderly patients.
HUMERAL SHAFT FRACTURES
Unless the fracture is open, most patients can be discharged home. The coaptation splint or hanging cast should remain in place until the patient sees the orthopedic surgeon 2 to 3 days following the injury. The patient should be given potent oral analgesics for pain.

SUPRACONDYLAR HUMERAL FRACTURES
Patients with type I fractures are usually discharged with a long arm splint in 90 degrees of flexion at the elbow and orthopedic follow-up scheduled within 2 weeks. Patients with type II and III fractures are generally admitted to the hospital and undergo ORIF. The most common complication is loss of the normal carrying angle, which results in a cubitus varus deformity. This complication has decreased in incidence as the practice of percutaneous pinning of the fracture has evolved. More serious complications of supracondylar fractures include brachial artery injury and injuries to the radial, median, and ulnar nerves. Most often these injuries are due to contusion or stretching of the nerves, and full recovery is the rule.

ROTATOR CUFF TENDINITIS/SUBACROMIAL BURSITIS, ROTATOR CUFF TEARS, AND IMPINGEMENT SYNDROMES
Conservative therapy for rotator cuff tears consists of improving the patient’s ability to abduct the arm. Having the patient “crawl up the wall” with the affected hand until the pain is unbearable and repeat this exercise daily is beneficial. In addition, subacromial injection of a local anesthetic and steroid mixture reduces pain and allows greater range of motion. This should probably be limited to two or three times per year because of the tendency for steroids to cause tendon rupture. Treatment of subacromial bursitis and supraspinatus tendinitis is similar to that for conservative therapy for rotator cuff tears, with initial treatment consisting of the application of ice and NSAIDs and, in refractory cases, subacromial steroid or local anesthetic injections.

SUGGESTED READINGS

REFERENCES
References can be found on Expert Consult @ www.expertconsult.com.
REFERENCES