INTRODUCTION

The shoulder joint is the most commonly dislocated of all joints.[1–4] Shoulder dislocations were depicted in Egyptian murals as early as 3000 B.C.[1] Despite 5000 years of medical advancements, shoulder dislocations continue to be a major cause of Emergency Department visits. They account for more than 50 percent of all joint complications treated by Emergency Physicians.[2]

The human shoulder is remarkable for its degree of motion. The anatomic features that contribute to this mobility also contribute to its instability.[3] The shallow glenohumeral joint allows the shoulder to be dislocated anteriorly, posteriorly, or inferiorly. The anterior shoulder dislocation is the most common and accounts for 95 percent of all shoulder dislocations.[1–4] The overall incidence of shoulder dislocations is 17 per 100,000. There is a bimodal age distribution.[1,4] It occurs in males from 20 to 30 years of age most commonly related to athletics and trauma. The other large group is women from 60 to 80 years of age, primarily due to falls.

ANATOMY AND PATHOPHYSIOLOGY

The shoulder (glenohumeral) joint is a multiaxial ball-and-socket type of synovial joint that permits a wide range of motion. Unfortunately, the range of motion is at the expense of stability.[5] The shoulder has greater than 180 degrees of motion in both the sagittal and coronal planes as well as 180 degrees of rotary movement.[6] The spheroidal head of the humerus articulates with the shallow glenoid fossa of the scapula. The glenoid fossa accommodates roughly one-third of the humeral head. The bony landmarks surrounding the shoulder joint are the coracoid and acromion processes of the scapula. A loose, thin fibrous capsule encloses the glenohumeral joint. The muscular component of the shoulder is a fusion of four separate muscles (supraspinatus, infraspinatus, teres minor, and subscapularis) that together form the rotator cuff. These muscles have a tendency to be torn and injured in shoulder dislocations, especially posterior and inferior dislocations.[7] The shoulder receives its blood supply from the anterior and posterior circumflex humeral arteries. These arteries are branches of the axillary artery. Innervation of the shoulder is from branches of the suprascapular, axillary, and lateral pectoral nerves. The axillary nerve lies at the level of the humeral neck. When it is dislocated anteriorly, the humeral head is displaced into the quadrangular space where it may compress and damage the axillary nerve. This can result in neuropraxia or paralysis of the deltoid muscle and sensory loss to the skin over the shoulder.

Shoulder dislocations can occur anteriorly, posteriorly, or inferiorly depending on the mechanism of injury. Anterior shoulder dislocations are by far the most common and account for 95 percent of all dislocations. An anterior dislocation usually results from direct or indirect forces causing abduction, extension, and external rotation of the limb. Anterior dislocations are classified based on the location of the humeral head into subcoracoid, subglenoid, subclavicular, and intrathoracic. Subcoracoid dislocations account for 75 percent of all anterior shoulder dislocations. The dislocated humeral head can shift between the first three positions but generally remains in one anatomic location.[2] In younger patients, the injury is usually linked to athletics, such as spiking a volleyball or blocking a basketball shot. Older patients may sustain anterior shoulder dislocations from falling on an outstretched arm or from a direct blow on the posterior shoulder.[4] The patient will present in obvious distress, holding the affected arm in slight abduction and internal rotation. Typically, the elbow is flexed and supported by the unaffected arm. The shoulder will have the typical "squared off" appearance, with loss of the normal deltoid contour. The humeral head may be palpable anteriorly.[1]

Posterior shoulder dislocations account for 4 percent of all shoulder dislocations.[1–4] They have a tendency to be missed, even by experienced physicians. Delayed diagnoses have been made up to a year after the initial injury.[8] The mechanism of injury is usually indirect, with a combination of internal rotation, adduction, and

flexion. The most common precipitating mechanism is a seizure. Other etiologies include electrocution, direct trauma, and falls.[3] Direct trauma, such as a head-on motor vehicle collision in which the patient braces their hands against the dashboard, can result in bilateral posterior shoulder dislocations in rare instances. Posterior shoulder dislocations are classified based on the location of the humeral head into subacromial, subglenoid, or subspinous. Subacromial dislocations account for 98 percent of posterior shoulder dislocations.[2,8] The patient usually presents with the arm held in adduction and internal rotation.[9] The shoulder will appear flat anteriorly. The coracoid process of the scapula will be visually prominent and palpable.[1]

Inferior shoulder dislocations are the least common type.[1–4] They represent less than 0.5 percent of all shoulder dislocations. The inferior shoulder dislocation is also known as luxatio erecta, because the dislocated extremity is extended upward. Inferior shoulder dislocations are usually sustained from indirect forces with the arm hyperabducted, causing the rotator cuff to tear and the arm to rotate 180 degrees externally.[7] Alternatively, a direct axial force applied to the arm above the head, as in a fall or Olympic-style weight lifting, will drive the humeral head inferiorly.[10] The patient will present with the affected arm shortened and fixed above his or her head, with the hand rotated as if asking a question.[7] The humeral head may be palpable along the lateral chest wall. Inferior shoulder dislocations are often associated with fractures.[1] The fractures can involve the acromion process, coracoid process, clavicle, greater tuberosity, humeral head, and/or glenoid rim.[1,2,6,11] Complete disruption of the rotator cuff often occurs with inferior shoulder dislocations.[1,2,6,11] Dislocations can cause capsular and rotator cuff tears, compression or tears of the axillary artery and its branches, and injury to the subclavian vein. Because of their anatomic proximity, damage to the brachial plexus, suprascapular nerve, and the axillary nerve occur at a rate of 21 to 36 percent due to traction and compression of these nerves.[8] Prompt reduction of the dislocation may alleviate compression injuries and enable a more thorough examination and evaluation of all components of the shoulder.

Radiographs are required to classify the type of dislocation and diagnose fractures. Associated fractures are detected in up to 24 percent of anterior shoulder dislocations.[3] They include fractures of the greater tuberosity, humeral head, coracoid process, acromion process, clavicle, and glenoid. Anecdotal evidence suggests that clinically obvious dislocations without a high-energy mechanism can be reduced without prior radiographs. The current literature recommends that all patients have at least two-view pre-reduction plain radiographs of the affected joint.[12] Post-reduction films should be obtained both to document the reduction of the joint and any injury induced by the reduction technique as well as to document bony abnormalities (Hill-Sachs lesions, Bankart lesion) or previously hidden fractures that were not visible on the initial radiographs. There is some evidence that post-reduction radiographs may be unnecessary, but further study is required before this can be made the standard of care.[13,14]

The anteroposterior (AP) view will clearly demonstrate anterior dislocations, inferior dislocations, and humeral fractures. In evaluating radiographs of anterior shoulder dislocations, look for an impaction fracture defect in the posterolateral portion of the humeral head, called a Hill-Sachs deformity. These are found in up to 50 percent of all anterior shoulder dislocations.[2] A Bankart lesion is an avulsed fragment of the glenoid labrum with contiguous bone.[6] Both lesions tend to get worse the longer the humeral head remains dislocated.

In patients with posterior shoulder dislocations, however, the AP view often shows a "normal" picture, which accounts for the high incidence of missed dislocations. There are three features that suggest a posterior dislocation on AP films. First is the loss of the normal elliptical pattern produced by overlap of the humeral head and the posterior glenoid rim. Second, the distance between the anterior glenoid rim and the articular surface of the humeral head will be increased. This is also known as the "rim sign." Finally, internal rotation of the greater tuberosity makes the humerus take on a "lightbulb" or "ice cream cone" appearance.[2,4] If there is any question, a lateral view (either the Y view or an axillary view) will help delineate the posterior position of the humeral head behind the glenoid fossa.[1] One study showed that up to 50 percent of posterior shoulder dislocations were missed using only the AP view, whereas lateral views increased the diagnostic accuracy to 100 percent.[15] An isolated fracture of the lesser tuberosity on the AP view is suggestive of a posterior shoulder dislocation until proven otherwise.[2]

INDICATIONS

Shoulder dislocations, whether first-time or recurrent, are typically very painful and distressing for the patient. **All attempts should be made to reduce the joint as quickly as possible once the diagnosis is made.** In general, uncomplicated joint dislocations should be reduced within 20 to 30 minutes to alleviate further injury to surrounding neurologic and vascular structures. **A patient with a neurologic deficit or a compromised distal pulse in the setting of a shoulder dislocation should undergo immediate reduction.**

CONTRAINDICATIONS

There are no absolute contraindications to reducing a dislocated shoulder. The patient's airway, breathing, and circulation should be assessed and managed prior to reducing the dislocated shoulder. Any life- or limb-threatening injuries should be managed before the shoulder reduction is attempted.

An Orthopedic Surgeon should be consulted prior to the reduction of a shoulder dislocation in patients with posterior and inferior dislocations. They are relatively rare, there is a high incidence of complications requiring operative management, dislocations associated with fractures may make the reduction difficult, and other indications for surgical management may exist. The indications for surgical intervention in anterior shoulder dislocations include complete rotator cuff tears, fracture of the greater tuberosity with displacement of more than 1 cm, or fractures of the glenoid rim that are displaced more than 5 millimeters.[2] Posterior shoulder dislocations with major displacement of a fractured lesser tuberosity or an impression defect greater than 20 percent of the articular surface necessitate surgical intervention or open reduction.[2,3] Open dislocations require operative management but may be reduced in the Emergency Department if there is a delay in getting the patient to the Operating Room. Surgical reduction is indicated in patients with evidence of hemorrhagic shock from a suspected axillary artery injury sustained during a shoulder dislocation.

An Orthopedic Surgeon should be consulted before reducing a dislocated shoulder that presents greater than 7 to 10 days after the acute injury. There is a higher risk of vascular injury when an "old" dislocation is mistaken for an acute injury and subsequently reduced. The axillary artery, which is bound down by the pectoralis major muscle and anterior pericapsular scarring, becomes brittle and may not withstand the traction required to reduce an "old" dislocation. This is especially true in the elderly. A 1941 study reported a 50 percent hemorrhage-related mortality in patients who had shoulder reductions performed several weeks after initial injury.[11]

Shoulder dislocations in children present unique problems. Pediatric patients whose ossification centers have not yet fused tend to have Salter-Harris type fractures of the epiphyseal plate. **An Orthopedic Surgeon should be consulted prior to reduction of a pediatric shoulder dislocation unless neurologic or vascular compromise is present in the affected extremity.** Otherwise, the same techniques for reduction can be applied to both adult and pediatric patients.

EQUIPMENT

General Supplies

Emergency medications (Chapter 109)
Assistants
Sheets
10 to 15 pounds of weights
Sling and swath or shoulder immobilizer
Splinting material (plaster, fiberglass, prepackaged casting material)

Intraarticular Analgesia

Povidone-iodine solution
20 mL syringe
25 gauge, 2.5 inch needle
Local anesthetic (lidocaine, bupivacaine)

Analgesia

Commonly administered medications include morphine, meperidine, hydromorphone, and fentanyl.

PATIENT PREPARATION

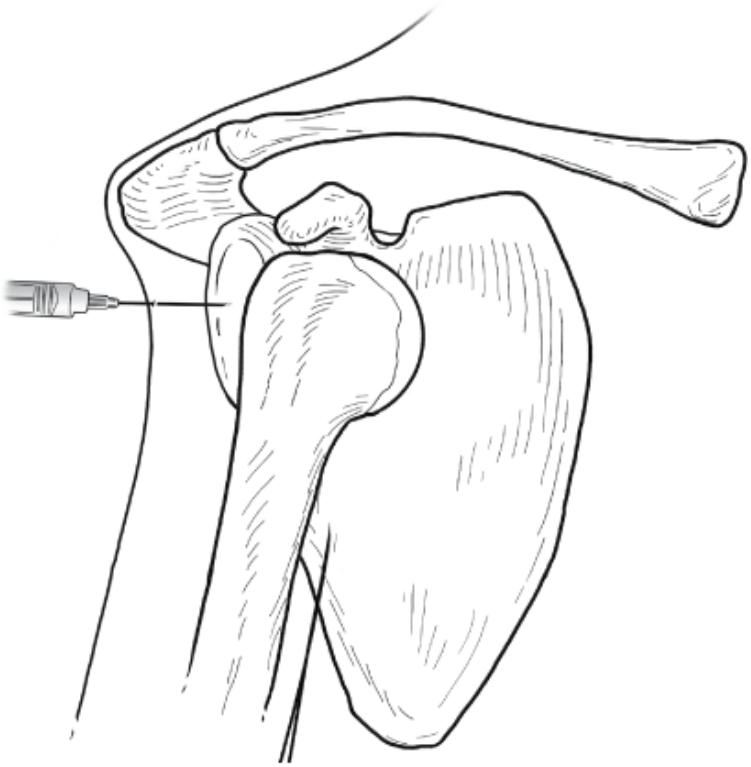
The risks, benefits, potential complications, and alternatives of the procedure should be explained to the patient and/or their representative. Obtain an informed consent for the reduction procedure. An informed consent should be obtained for procedural sedation and/or an intraarticular injection if they are performed in addition to the reduction procedure.

Place the patient in a position of maximal comfort with the affected extremity supported and its motion limited. Placing the patient supine or prone is difficult, painful, and often requires analgesia before being attempted. The patient presenting in spinal immobilization should remain supine. If the spine cannot be cleared, shoulder reduction can be performed without changing the patient's position. Intravenous access should be obtained if indicated. Pain should be addressed quickly and aggressively.

There are several methods to control pain for patient comfort before and during the joint reduction procedure. Intravenous or intramuscular narcotics should not be withheld pending prolonged radiographic studies. Commonly administered medications include morphine, meperidine, hydromorphone, and fentanyl.

An alternative to intramuscular or intravenous narcotics is the intraarticular instillation of local anesthetic solution.[16] This was formally introduced in 1991 as an effective method of analgesia for anterior shoulder dislocations. It is often used in addition to procedural sedation. It can also be used as the only method of analgesia when procedural sedation is contraindicated. Clean the anterolateral shoulder of any dirt and debris. Apply povidone iodine solution to the shoulder area and allow it to dry. Identify the hollow 2 cm inferior to the lateral border of the acromion process (Figure 67-1). Using sterile technique, insert a 25 gauge needle perpendicular to the skin and into the hollow to a depth of 2 cm (Figure 67-1). Inject 10 to 20 mL of a 50:50 mixture of sterile saline and local anesthetic solution. This technique is effective in controlling muscle spasm and pain. The editor and one of the authors (EFR) believe this should be performed on every dislocated shoulder before attempts at reduction.

FIGURE 67-1



Local anesthesia for a shoulder dislocation. The needle is introduced in the hollow under the lateral surface of the acromion process.

Several sources suggest that patients with an anterior shoulder dislocation without a significant trauma history may actually accept some degree of discomfort as a trade-off for the prompt resolution of pain by reduction without anesthesia.[17–19] Patient comfort should not be sacrificed for expediency. Anterior shoulder dislocations may require procedural sedation prior to reduction, depending on the patient's level of discomfort and the reduction method chosen. Posterior and inferior shoulder dislocations require procedural sedation prior to reduction.

ANTERIOR SHOULDER DISLOCATION REDUCTION TECHNIQUES

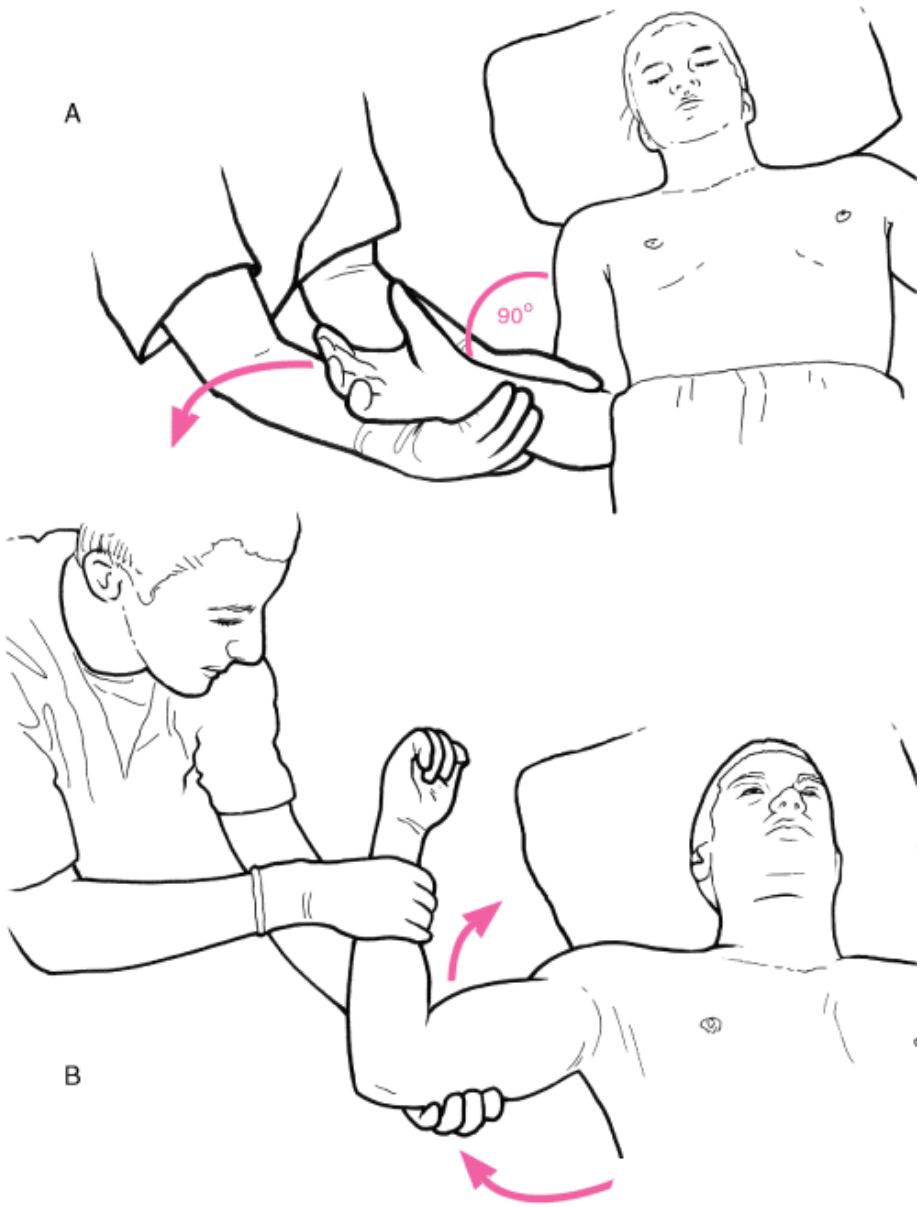
The methods for treating a closed shoulder dislocation depend on overcoming muscular spasm to relocate the humeral head into the glenoid fossa. Reduction techniques are classified into traction techniques, leverage techniques, scapular manipulation, and combinations of the three previous techniques. A study evaluating the various reduction techniques found similar success rates of 70 to 90 percent regardless of the technique.[20] However, postreduction complications rates are variable.[20] The major considerations in deciding which technique

to use are physician experience, familiarity with the technique, availability of time, and the presence or absence of an assistant.[20]

Hennepin Technique

The Hennepin technique, popularized at Hennepin County Medical Center, is often the preferred method to reduce anterior shoulder dislocations (Figure 67-2). This technique can be accomplished with no anesthesia or with the intraarticular instillation of local anesthetic solution. Procedural sedation is not required but may be used if the patient has severe pain and muscle spasms.

FIGURE 67-2



Source: Reichman EF, Simon RR: *Emergency Medicine Procedures*: http://www.accessemergencymedicine.com.

The Hennepin technique to reduce an anterior shoulder dislocation. *A.* Patient positioning and external rotation of the humerus. *B.* Abduction of the arm with the elbow flexed 90 degrees.

Place the patient seated, supine, or reclined 45 degrees on a gurney (Figure 67-2*A*). Place the affected arm in adduction. Flex the elbow 90 degrees. Support the patient's flexed elbow against their torso with the

nondominant hand. Grasp the patient's forearm with the dominant hand. Slowly rotate the arm externally. **If pain becomes severe, typically as a result of rotator cuff spasm, stop the motion and wait until the spasm subsides. Do not release the arm or return it to its original position.** Continue to rotate the arm externally until the humeral head reduces or the arm reaches the coronal plane (90 degrees of external rotation). This can take up to 10 minutes to accomplish. If the humeral head is still dislocated, slowly abduct the arm until the humeral head reduces or full abduction is obtained[2] (Figure 67-2*B*). Full abduction occurs when the patient's hand crosses over their head and is able to touch the contralateral ear. Adduct the arm until it is against the patient's torso. Another technique should be attempted if the humeral head is still dislocated.

The advantages of this technique include little to no patient manipulation or positioning, the relative ease of reduction, minimal equipment, the requirement of only a single operator, and the ability to perform the reduction without analgesia. The success rate when performed by Emergency Physicians is approximately 80 percent, with 36 percent of patients not requiring analgesia.[3] The major disadvantage is that patients are often too apprehensive and experiencing too much discomfort to relax their arms sufficiently to allow for reduction to occur. This problem can be eliminated by the intraarticular instillation of local anesthetic solution. Occasionally, patients will require procedural sedation.

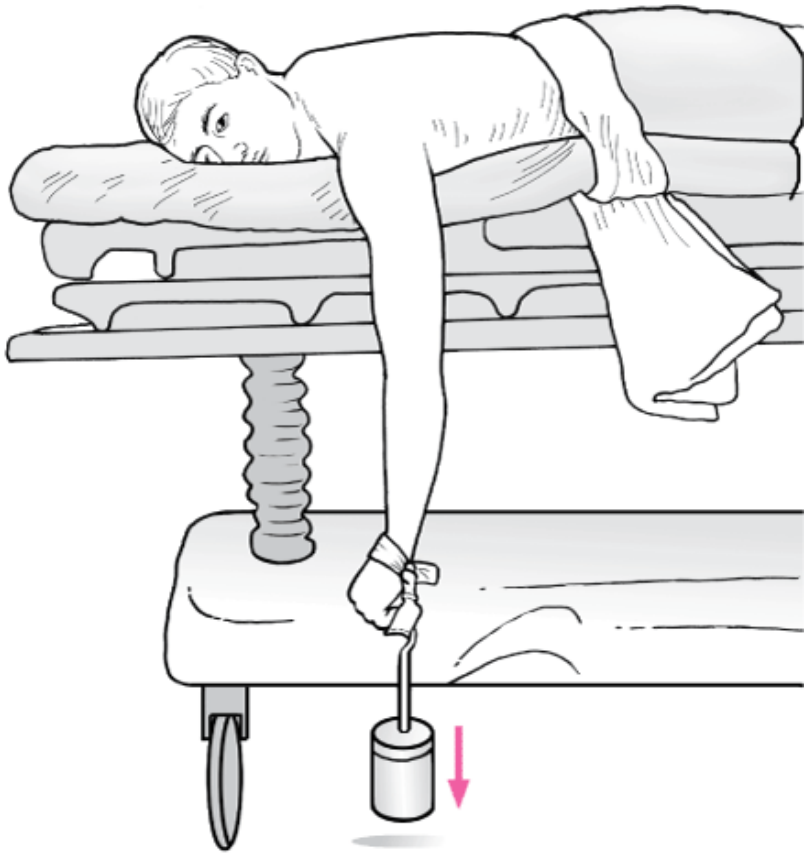
External Rotation Technique

This is a modified version of the Hennepin technique.[21–24] The technique is identical to the Hennepin technique except that the procedure is terminated when the arm reaches 90 degrees of external rotation. The step of abduction is not performed. The advantages and disadvantages are as listed for the Hennepin technique.

Stimson Technique

The Stimson technique is a safe first-line technique that uses gravity and weights to overcome muscle spasm and reduce the dislocated shoulder[25–28] (Figure 67-3). Instill intraarticular local anesthetic solution into the shoulder joint prior to attempting the reduction. Procedural sedation is usually not necessary. The patient must be under constant observation to monitor pulse oximetry and respiratory status if procedural sedation is used because of the patient's prone positioning.

FIGURE 67-3



The Stimson technique to reduce an anterior shoulder dislocation.

Place the patient prone with the dislocated arm hanging over the side of the gurney (Figure 67-3). Flex the shoulder 90 degees. A pillow or folded sheets may be placed beneath the affected shoulder for patient comfort. Tie a sheet around the patient's hips and the gurney to prevent them from falling off the bed (Figure 67-3). Apply 10 to 15 pounds of weight to the wrist or forearm. The weights can be attached by a commercially available device, hung off a padded wrist restraint, or hung off gauze wrapped circumferentially around the wrist. Raise the gurney so that the weights are suspended off the ground (Figure 67-3). The weights will provide traction in a position of forward flexion and are usually sufficient for reduction to take place within 15 to 30 minutes.[4] If the reduction is unsuccessful after 30 minutes, grasp the patient's forearm and twist it to gently rotate the humerus externally and then internally while the patient is prone and the arm is maintained under traction. This maneuver will often reduce the dislocation if the weights alone are unsuccessful.

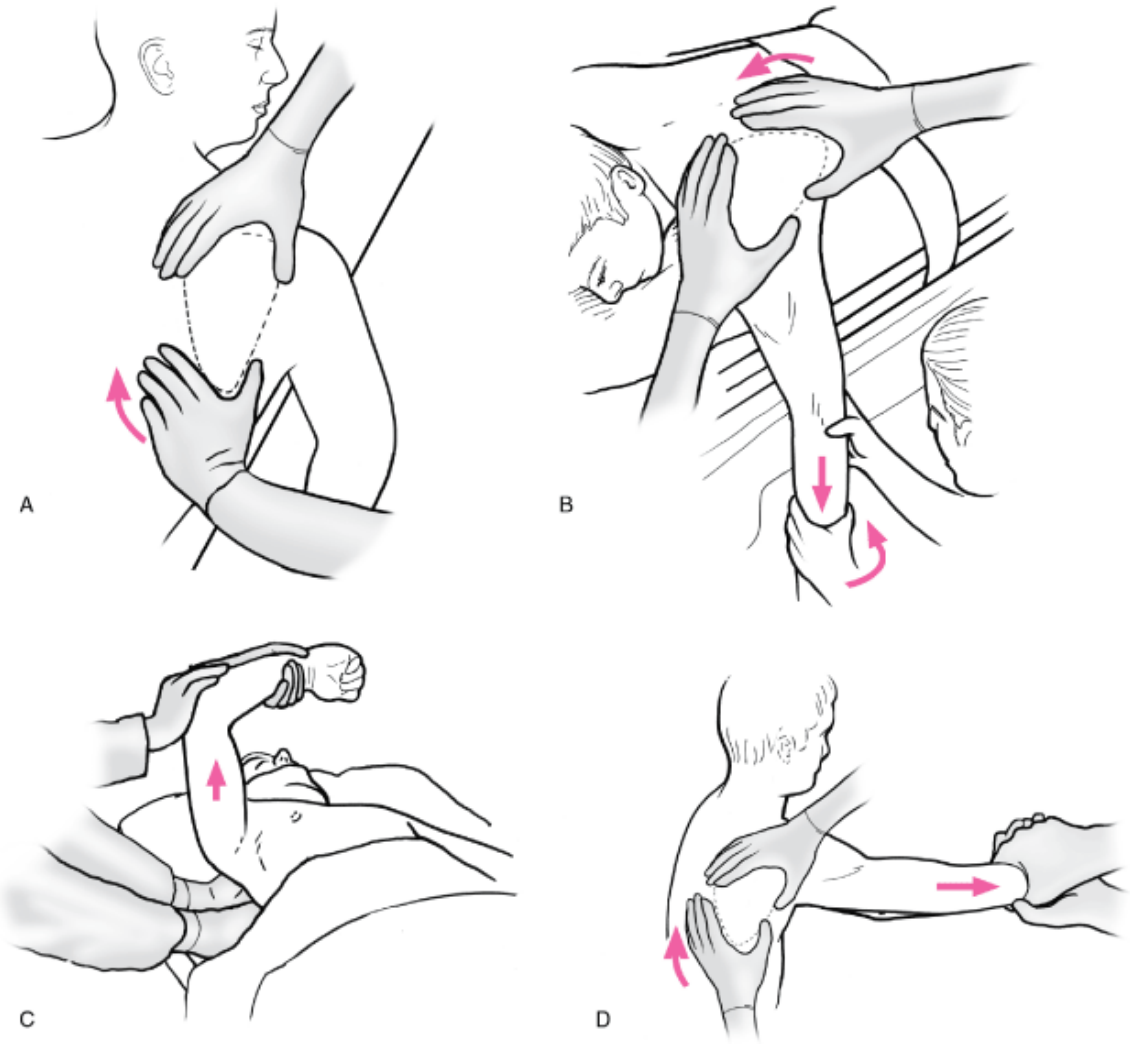
An alternative method is to have the patient grip a bucket approximately half full of water. This will provide the necessary traction weight to reduce the joint. The disadvantage of the bucket technique is that the patient will have to grip the bucket for a considerable length of time without releasing it.

The advantage of the Stimson technique is that it is safe and does not require the presence of an assistant. A 96 percent success rate has been reported with this technique.[3] The disadvantage of the procedure is that the patient must be placed in a prone position that may be painful, uncomfortable, or impossible because of other injuries. There is a small risk of the patient slipping off the elevated gurney. A strap or sheet tied around the patient and the gurney is recommended in order to prevent this. Procedural sedation is not recommended due to the prolonged prone positioning required, which may interfere with the patient's respiration. Additionally, procedural sedation for 15 to 30 minutes is relatively contraindicated and difficult to maintain without potential complications.

Scapular Manipulation Technique

Scapular manipulation accomplishes reduction by repositioning the glenoid fossa rather than manipulating the humeral head[4,29–33] (Figure 67-4). This is a popular technique due to its low complication rate and high patient satisfaction. This technique can be accomplished with no anesthesia or with the intraarticular instillation of local anesthetic solution. Procedural sedation is not required.

FIGURE 67-4



The scapular manipulation technique to reduce an anterior shoulder dislocation. *A.* Proper hand positioning. The upper hand stabilizes the base of the scapula while the lower hand applies medial and upward pressure on the tip of the scapula (*curved arrow*). *B.* Reduction with the patient prone. Traction is applied by an assistant (*straight arrow*). Occasionally, external rotation is also required (*curved arrow*). *C.* Reduction with the patient supine. Traction is applied on the humerus to elevate the shoulder off the bed (*arrow*). *D.* Reduction with the patient sitting. Traction is applied on the humerus (*arrow*).

Place the patient prone with the dislocated extremity hanging over the side of the gurney (Figures 67-4*A* and *B*). Flex the shoulder 90 degrees. A pillow or folded sheets may be placed below the affected shoulder for patient comfort. Place 5 to 15 pounds of weights suspended from the patient's wrist or in their hand. If weights are not available, an assistant may apply downward traction on the extremity (Figure 67-4*B*). The weights or the assistant will provide in-line traction to the arm.

Identify the scapula and its borders. The scapular tip will "wing" laterally. Stabilize the superior portion of the scapula with one hand (Figure 67-4*A*). Place the thumb of the stabilization hand along the superolateral border of the scapula. Apply constant and firm medial and upward pressure to the inferior tip of the scapula using the

other hand or thumb. The thumb of the stabilizing hand can also be used to apply medially directed pressure to the tip of the scapula. Push the tip of the scapula as far medially as possible. The shoulder should reduce within 1 to 3 minutes. A small degree of dorsal displacement of the scapular tip has also been recommended.[3,33] If the reduction is unsuccessful, slight external rotation of the humerus (by an assistant) while the scapula is being manipulated and the arm is under traction may facilitate reduction (Figure 67-4*B*). This maneuver releases the superior glenohumeral ligament and presents a favorable profile of the humeral head to the glenoid fossa.[31,33]

The scapular manipulation technique may be performed with the patient supine (Figure 67-4*C*). This is particularly helpful when other injuries or conditions preclude using the prone position. Flex the affected shoulder 90 degrees. Instruct an assistant to grasp the forearm and apply upward traction to elevate the shoulder off the bed. Apply your hands to stabilize and manipulate the scapula as described in the previous paragraph.

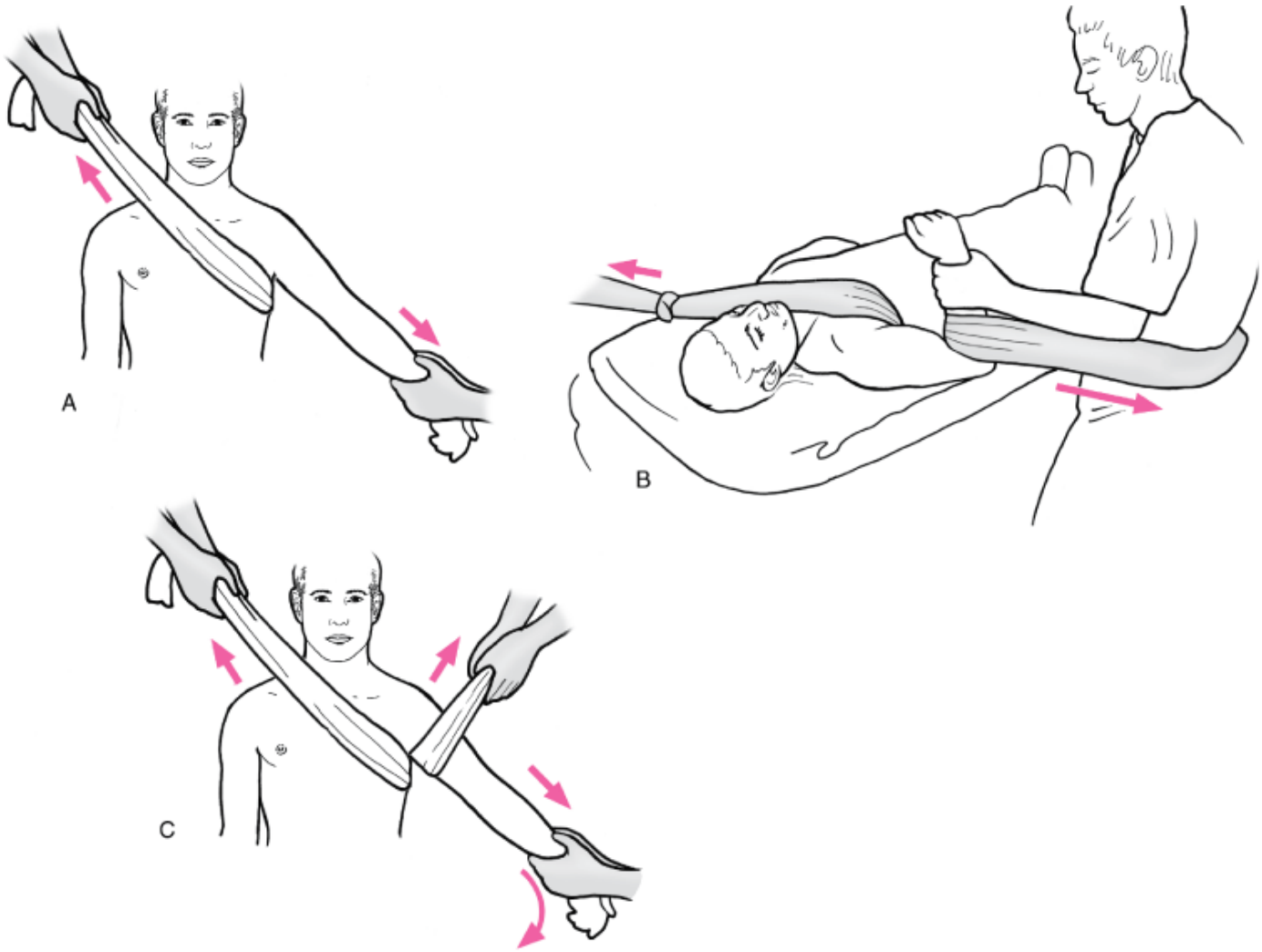
This technique may also be performed with the patient sitting (Figure 67-4*D*). This is particularly helpful when other injuries or conditions preclude using the prone or the supine position. Flex the affected shoulder 90 degrees. Instruct an assistant to grasp the forearm and apply horizontal traction. Apply your hands to stabilize and manipulate the scapula as described in the previous paragraphs. This method is technically a more difficult version of the scapular manipulation technique because the patient's torso is not stabilized and moves during the traction and scapular manipulation.[3,31,33]

The reduction of an anterior shoulder dislocation by the scapular manipulation technique is usually quite subtle and may be missed by both the patient and the physician. In a few rare cases, the act of lying prone will be sufficient to relocate the shoulder. Success rates of over 90 percent have been reported with this technique.[3,30–33] The procedure is well tolerated.[3,29–33] In addition, there is a very low incidence of complications with this procedure and it can be performed without analgesia and monitoring. Disadvantages include the prone position and the need for an assistant to apply traction on the arm.

Traction-Countertraction Technique

The traction-countertraction technique is commonly performed in the Emergency Department, mostly out of tradition (Figure 67-5). It may be used as a first-line technique or a backup for patients who have failed the Stimson technique.[2] This technique requires anesthesia and analgesia. Instill local anesthetic solution intraarticularly. This may be sufficient, but most patients will require procedural sedation. This technique can cause significant patient discomfort.

FIGURE 67-5



The traction-countertraction technique to reduce an anterior or posterior shoulder dislocation. *A.* In-line traction is applied to the affected extremity after it is abducted 45 degrees. An assistant provides equal and opposite countertraction with a sheet. *B.* An alternative method. A sheet is looped around the flexed forearm and the physician's hips. The physician leans back (*arrow*) to allow their body to do the work of reduction. *C.* An additional assistant is applying traction 90 degrees to the traction-countertraction axis with a sheet in the axilla. Simultaneous adduction (*curved arrow*) and in-line traction by the physician may aid in the reduction.

Place the patient supine. Pass a sheet around the chest and axilla of the affected arm (Figure 67-5*A*). Abduct the affected arm 45 degrees. Instruct an assistant to grasp the loose ends of the sheet firmly. Grasp the patient's wrist and apply slow and steady traction. Instruct the assistant to apply countertraction. The assistant and physician should be exerting equal and opposite forces. **If pain becomes severe, typically as a result of rotator cuff spasm, stop the motion and wait until the spasm subsides. Do not release the arm or return it to its original position.** After the spasm subsides, continue applying traction and countertraction until the shoulder reduces.

Direct traction on the extended arm may result in rapid operator fatigue. This is especially true if the physician is creating most of the force of traction through contraction of their biceps (Figure 67-5*A*). A less strenuous alternative is available and preferred (Figure 67-5*B*). Position the patient as above. Flex the elbow of the affected arm 90 degrees. Place a looped sheet over the proximal forearm and the physician's hips. Do not loop the sheet around the physician's back, as this can cause low back strain. This method allows the physician to lean back slowly and use their body weight to supply the traction force. The physician's arms should be extended with the hands grasping the patient's distal forearm. When leaning back to apply traction, the hands should

maintain the patient's forearm upright with the elbow flexed 90 degrees.

Traction may have to be applied for several minutes. The application of gentle and limited external rotation to the affected arm while under traction may speed up the reduction. Alternatively, a second assistant can apply lateral pressure (lateral traction) on the humeral head with their hands. A variation of this technique involves a second assistant with a looped sheet placed high in the patient's axilla and around the assistant's hips (Figure 67-5*C*). This second assistant is used to create lateral traction at the proximal humerus that is perpendicular (90 degrees) to the traction-countertraction axis.[2] As lateral traction is applied, the physician continues in-line traction and can simultaneously adduct the patient's arm to maneuver the humeral head back into position (Figure 67-5*C*). The second assistant may also be used with the technique demonstrated in Figures 67-5*A* or *B*.

Successful reduction is noted by a lengthening of the arm, a noticeable "clunk," and/or a brief fasciculation of the deltoid muscle. Disadvantages of the traction-countertraction technique include the need for more than one operator, the significant degree of force required, the prolonged time and endurance required of the operator, and the need for procedural sedation. **This technique should not be used to reduce shoulder dislocations associated with significant fractures. The force required for this technique can displace fracture fragments,** necessitating an open reduction or operative management of the displaced fragments.

Snowbird Technique

The Snowbird technique was named after a ski area in Utah where this technique originated.[34] It was developed in order to reduce the large number of ski-related glenohumeral dislocations quickly while also conserving time and resources. This is an effective alternative reduction technique as compared with the more traditional methods. While this technique can be accomplished with no anesthesia, the intraarticular instillation of local anesthetic solution is highly recommended. Procedural sedation is not required for this reduction technique.

Place the patient in a sitting position on a chair with a back (Figure 67-6). Completely adduct the affected arm. Flex the elbow to greater than 90 degrees. Support the affected arm with the other arm or a pillow. Make a 3 foot long loop of 4 inch wide cast stockinette. Place the stockinette around the proximal forearm. Instruct the patient to sit as straight as possible. Instruct an assistant to maintain the patient in an upright position by standing adjacent to the unaffected shoulder and clasping their hands around the chest, in the axilla, of the affected shoulder. The physician then places one foot in the stockinette loop and applies firm downward traction with the foot while the patient tries to keep the shoulder relaxed and the affected elbow flexed. Instruct the assistant to provide countertraction to keep the patient from moving. The shoulder may reduce. If not, with continued downward traction on the stockinette, the physician will have both hands free to apply gentle rotation and pressure on the humeral head until the shoulder is reduced.[34]

FIGURE 67-6

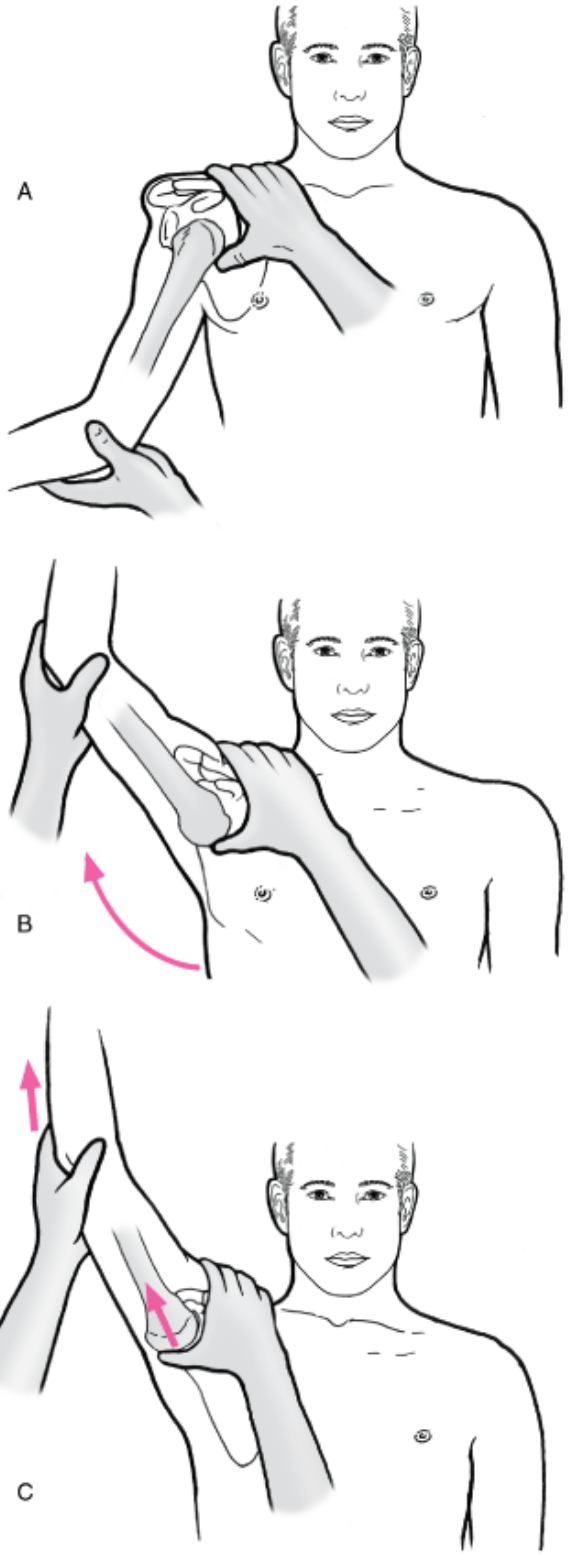
The Snowbird technique to reduce an anterior shoulder dislocation.

The Snowbird physicians had a 97 percent success rate and were able to reduce 93 percent of anterior shoulder dislocations without any form of analgesia.[34] The advantages of this technique include the relative ease of setup, the rapid nature of the technique, limited use of analgesia, and limited patient positioning. Potential disadvantages include the use of an assistant and the fact that this technique was used and developed on a limited patient population (young, healthy skiers).

Milch Technique

Milch, in describing this technique, wrote that a fully abducted arm is in a natural and neutral position in which there is little tension on the muscles of the shoulder girdle.[35–37] Accordingly, the technique that Milch developed relies on gentle manipulation through abduction, external rotation, and traction on the arm.[19,35–40] The patient's affected arm moves in a gradual arc, assisted by the physician, to reduce the dislocation without extensive or forceful manipulation (Figure 67-7). While this technique can be accomplished with no anesthesia, the intraarticular instillation of local anesthetic solution is highly recommended. Procedural sedation is not required for this reduction technique.

FIGURE 67-7



Source: Reichman EF, Simon RR: *Emergency Medicine Procedures*: http://www.accessemergencymedicine.com.

The Milch technique to reduce an anterior shoulder dislocation. *A.* The distal humerus is grasped with one hand while the thumb of the other hand is placed under the dislocated humeral head. *B.* The arm is abducted to 180 degrees. *C.* In-line traction is applied to the humerus while the thumb pushes the humeral head into the glenoid fossa.

Place the patient supine. Position one hand with the thumb under the dislocated humeral head (Figure 67-7*A*). Slowly abduct the affected arm 180 degrees to an overhead position (Figure 67-7*B*). This can be accomplished by having the patient lift the affected arm. Many patients are unable to do this due to pain, muscle spasm, or

apprehension. Gently grip the elbow or wrist and slowly abduct the arm to 180 degrees(Figure 67-7*B*). Once the arm is fully abducted, grasp the patient's distal arm or proximal forearm with one hand. Apply gentle longitudinal traction with slight external rotation to the arm (Figure 67-7*C*). The humeral head may reduce. If not, while maintaining traction with external rotation, apply upward pressure under the humeral head with the other hand to guide it into the glenoid fossa (Figure 67-7*C*).

Successful reduction is attained in 70 to 90 percent of the cases with no requirement for assistance, other equipment, or medications.[19,35–40] Advantages of the Milch technique include its gentleness, high success rate, limited complications, and good patient tolerance. Disadvantages include positioning the arm in full abduction with or without analgesia, as many patients cannot attain the optimal position due to severe pain, muscle spasm, and/or apprehension.

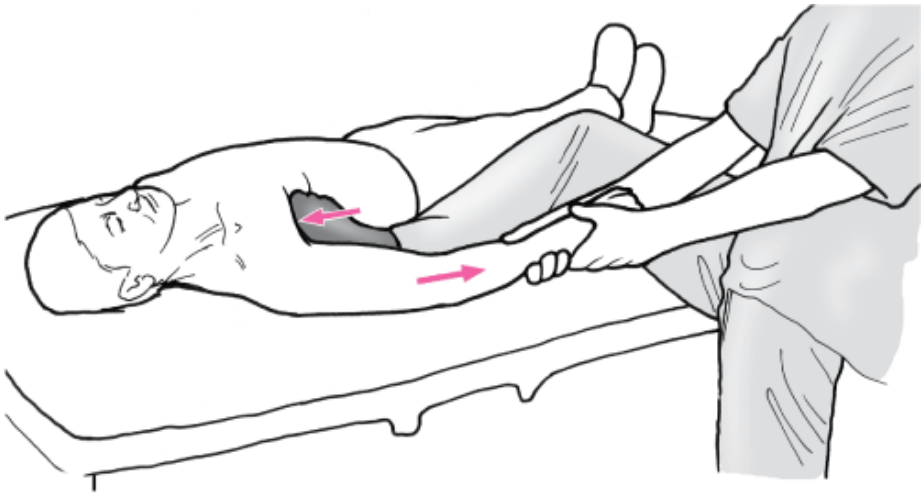
ALTERNATIVE ANTERIOR SHOULDER DISLOCATION REDUCTION TECHNIQUES

Numerous alternative and less commonly used techniques are available to reduce an anterior shoulder dislocation. Some of these are modifications of existing methods. Others are original techniques that had too many associated complications and were modified with time and experience. Some are well known and effective techniques that have been used for many years. **None of these techniques are advocated as first-line treatments for the reduction of shoulder dislocations. Their inclusion here is for the sake of completeness; it does not constitute an endorsement for their use.** Only a select few of these techniques are discussed.

Hippocratic Technique

The Hippocratic technique is the original traction-countertraction technique[41] (Figure 67-8). It is one of the oldest documented techniques to reduce a shoulder dislocation.[2,11,26,41] This technique has the advantage that it can be performed by a single operator in any setting. It is not recommended due to the great force required to achieve reduction. Common complications of the technique include fractures, brachial plexus injury, vascular injury, and poor patient tolerability.[2,6,11]

FIGURE 67-8



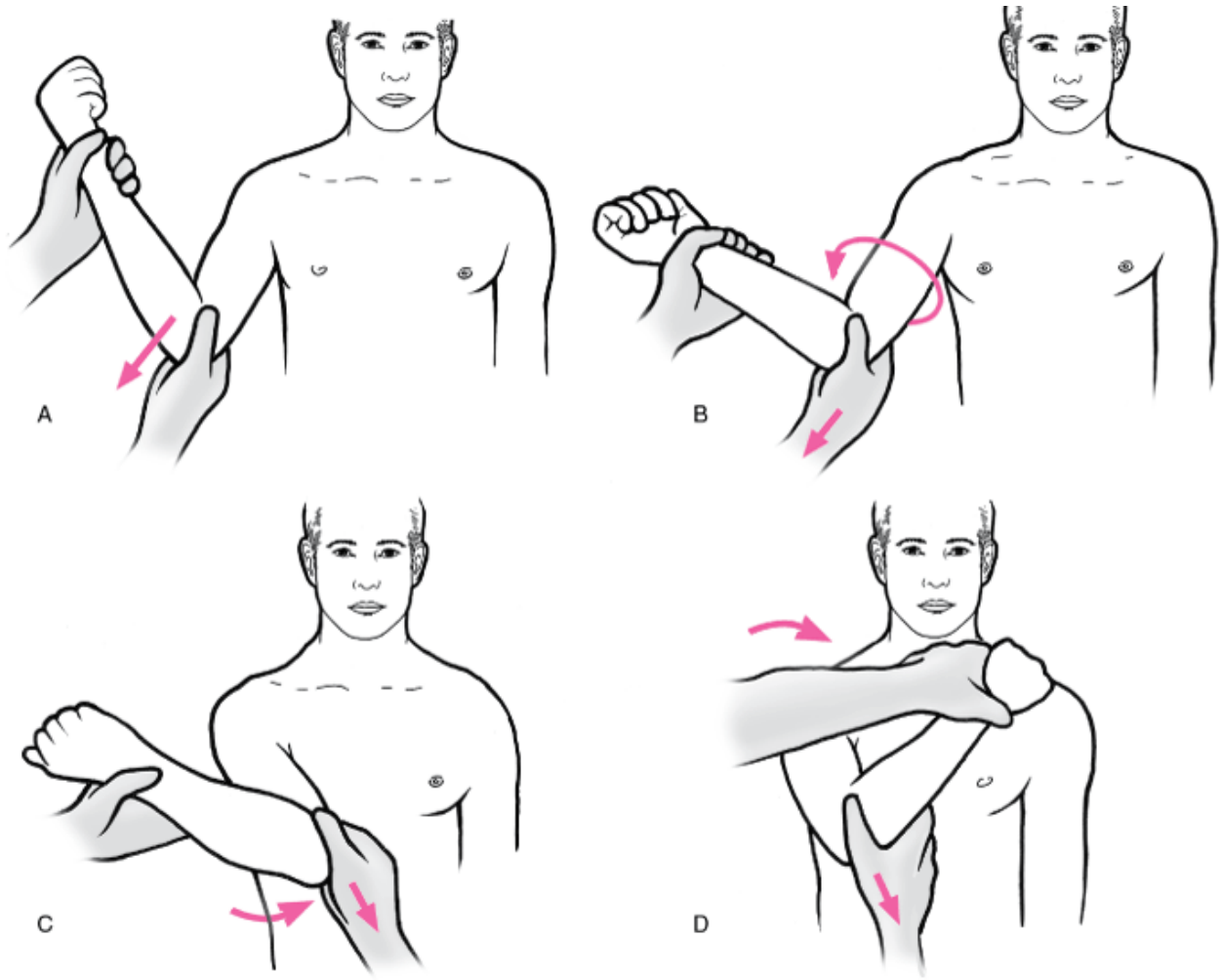
The Hippocratic technique to reduce an anterior shoulder dislocation.

The patient is placed supine (Figure 67-8). The wrist of the affected arm is grasped and the arm abducted 20 to 30 degrees. The physician places one foot into the axilla of the affected arm. With a firm grasp of the patient's wrist, the physician applies traction to the arm while the foot in the axilla is extended to provide countertraction.

Kocher Technique

The Kocher technique was first recorded on an Egyptian mural dated 1200 B.C.[42] It is another traditional method that has come into disfavor. This maneuver relies upon leverage and humeral manipulation to reduce the shoulder (Figure 67-9). The humeral head is levered on the anterior glenoid while the humeral shaft is levered against the anterior thoracic wall until reduction is achieved.[11,42,43] A substantial amount of force must be applied while adducting and externally rotating the arm in order to reduce the joint.

FIGURE 67-9



The Kocher technique to reduce an anterior shoulder dislocation. *A.* The arm is abducted 45 degrees with the elbow flexed 90 degrees. In-line traction is applied to the humerus (*arrow*). *B.* The arm is rotated externally (*curved arrow*) while traction is maintained (*straight arrow*). *C.* The elbow is brought across the chest to the midline while the arm is still rotated externally and traction on the arm is maintained (*straight arrow*). *D.* The arm is rotated internally until the patient's hand touches their opposite shoulder.

The patient is placed sitting at a 45 degree incline or supine. The affected arm is abducted 45 degrees and the elbow flexed 90 degrees (Figure 67-9*A*). The physician grasps the patient's distal humerus with the dominant hand and the patient's wrist with the nondominant hand (Figure 67-9*A*). In-line traction is applied to the distal humerus. The arm is then rotated externally to its maximal extent while in-line traction is maintained (Figure 67-9*B*). The patient's elbow is brought across their chest and to the midline while traction is maintainted (Figure 67-9*C*), with the elbow held tightly against the patient's chest. Finally, the arm is rotated internally until the patient's hand touches their opposite shoulder (Figure 67-9*D*).

The main advantage of this method is that it is a single-operator technique that has withstood the test of time.

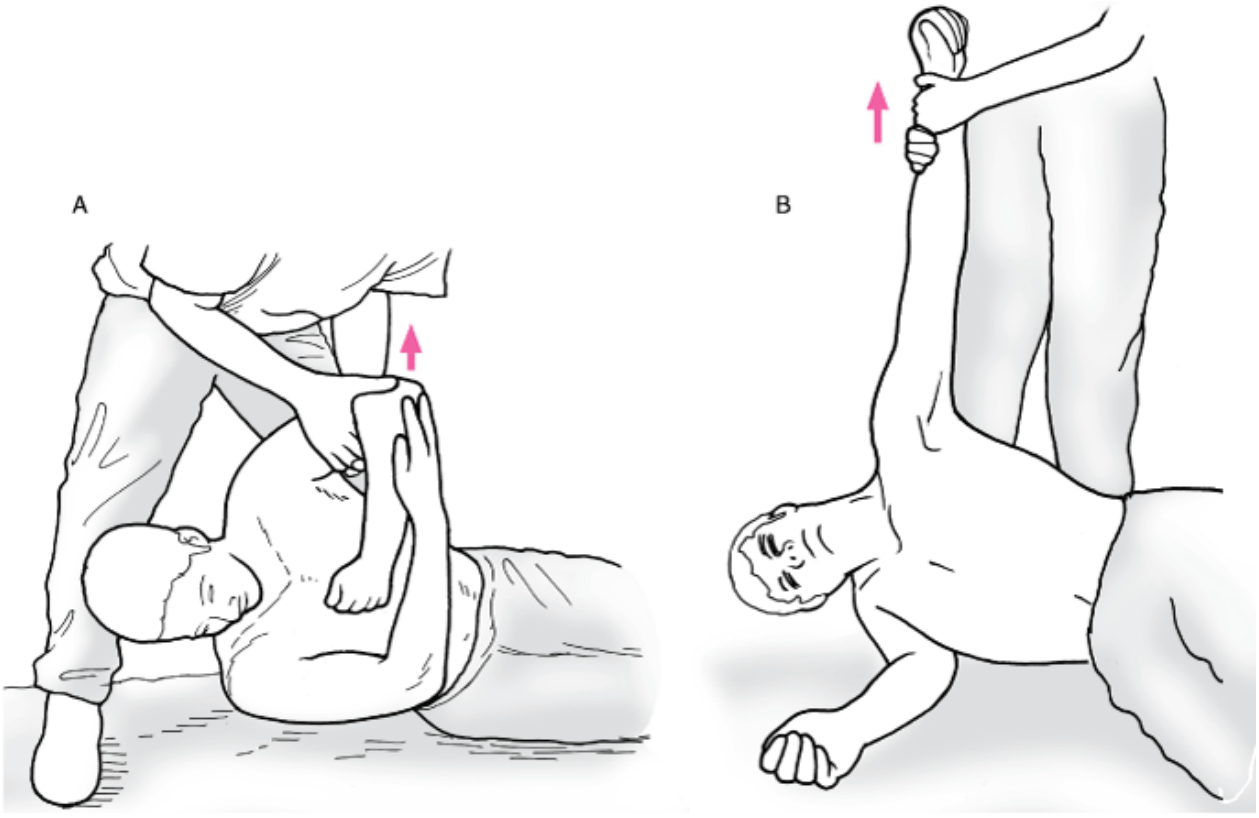
However, studies have shown that the forces generated are sufficient to cause fractures of the humeral neck, spiral humeral fractures, vascular trauma, and brachial plexus injury.[11]

Eskimo Technique

The Eskimo technique uses the patient's body weight and gravity as a traction mechanism to reduce an anterior shoulder dislocation.[44] It can be performed in the field, where access to a health care facility may be limited. Disadvantages of this technique include the strength and stamina required to lift the patient, physician injury due to heavy lifting, poor patient tolerability, and increased stress on the brachial plexus and axillary vessels.

The patient is placed on the floor and lying on the unaffected side (Figure 67-10). The affected arm is placed tightly adducted, with the elbow flexed 45 degrees (Figure 67-10*A*). The physician grasps the injured arm and slowly lifts the patient 6 to 12 inches off the ground (Figure 67-10*A*) so that the patient's body weight produces enough traction to reduce the joint. Poulsen initially described this technique and reported a 74 percent success rate.[44] Alternatively, the patient can be positioned on the unaffected side with the affected arm abducted 90 degrees (Figure 67-10*B*). One or two people can then grasp the patient's wrist and forearm and lift the patient 6 to12 inches off the ground (Figure 67-10*B*).

FIGURE 67-10



Source: Reichman EF, Simon RR: *Emergency Medicine Procedures*: http://www.accessemergencymedicine.com.

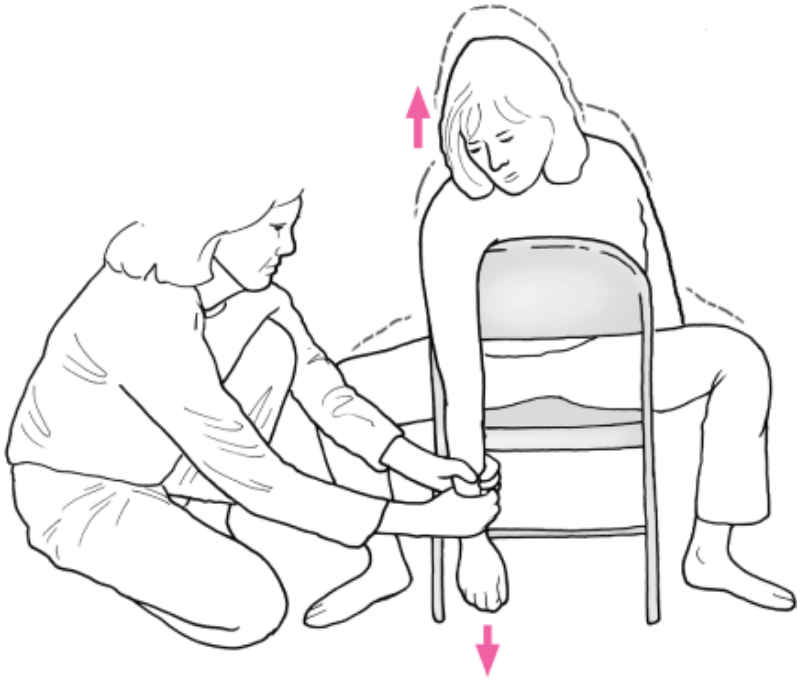
The Eskimo technique to reduce an anterior shoulder dislocation. The patient is lying on the floor on the unaffected side. *A.* The patient is lifted off the ground by grasping the adducted arm. *B.* The patient is lifted off the ground by grasping the distal forearm of the affected arm.

Chair Technique

The chair technique is a simple method to reduce an anterior shoulder dislocation.[45–47] It is a variation of the traction-countertraction technique. The patient is placed sitting sideways or backwards in a chair with the affected arm draped over the back rest (Figure 67-11). The physician supinates the patient's wrist and applies

downward traction while the patient attempts to stand and provide countertraction (Figure 67-11). This technique has a 72 percent success rate.[3] The advantages include the simplicity of the technique and the fact that analgesia is not required. Unfortunately, a large amount of force is required to reduce the shoulder. These forces can cause injury to the brachial plexus and axillary vessels as the axilla is impinged on the back of the chair.

FIGURE 67-11



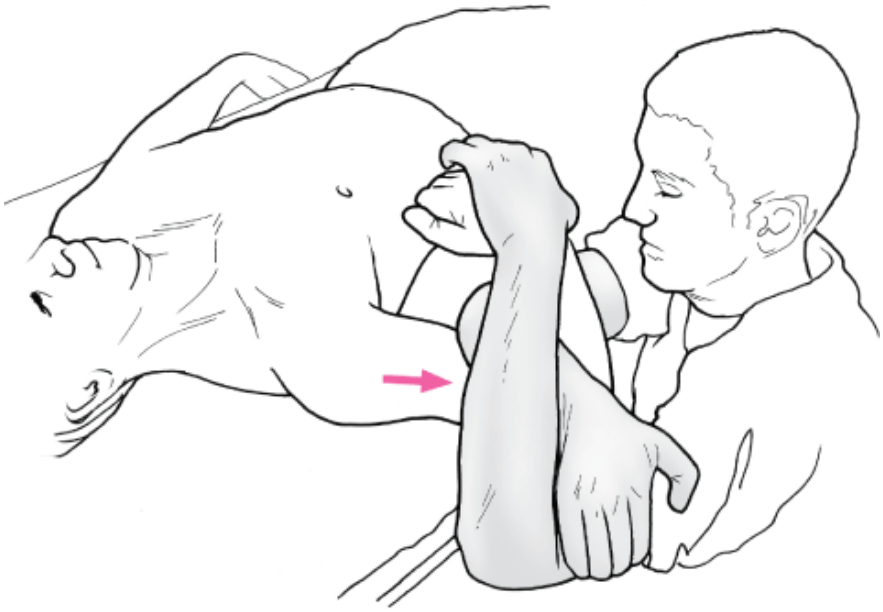
Source: Reichman EF, Simon RR: *Emergency Medicine Procedures*: http://www.accessemergencymedicine.com.

The chair technique to reduce an anterior shoulder dislocation.

Wrestling Technique

Zahiri recently described a new technique based on optimal anatomic positioning with limited complications.[48] The patient is placed supine with the elbow of the affected shoulder flexed 120 degrees. With one hand, the physician grasps the dislocated arm just above the humeral condyles and applies distal traction to the arm. The physician grasps the distal forearm overhanded with the opposite hand and moves the hand from the condyles through the acute angle of the arm, grasping the wrist of the hand holding the forearm. The wrestling hold is now established (Figure 67-12). With the hold in place, the patient's forearm will be used as a fulcrum. The patient's shoulder is abducted 45 degrees while constant traction is maintained. The arm is then rotated externally in a slow, smooth motion. While maintaining traction and external rotation, the physician brings the patient's arm over the chest wall and rotates it internally.[1] The shoulder should then reduce.

FIGURE 67-12



The wrestling technique to reduce an anterior shoulder dislocation.

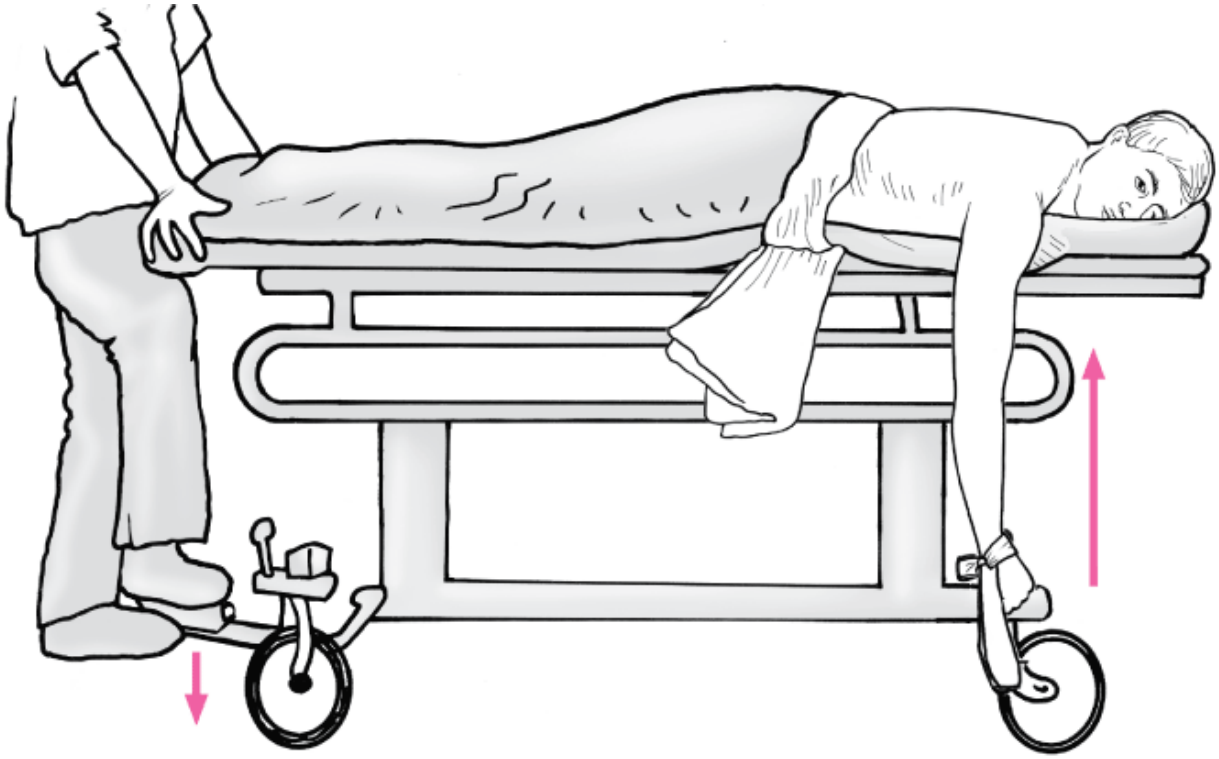
This technique has the advantages of requiring no equipment, no analgesia, and no assistants. It may be used in the field where a health care facility is not readily available. The main disadvantage is the amount of force applied to the shoulder and surrounding structures. The twisting of the forearm as a lever can displace fracture fragments or cause fractures. This technique also requires the physician to have a significant amount of upper body strength and arms long enough to accomplish the wrestling hold, especially if the patient has large arms. The series of movements is difficult to accomplish while always maintaining distal traction.

Pneumatic Stretcher Technique

This technique was developed to reduce a shoulder dislocation when assistants were not available or if the physician did not have the physical strength required to use other techniques.[49] It is a modification of the traction-countertraction technique. **This technique should never be used to reduce a shoulder dislocation.** It will cause stretching and possible rupture of the brachial plexus, ligaments of the shoulder region, muscles and tendons crossing the shoulder, nerves of the upper extremity, vascular structures of the upper extremity, and injury to other joints. Tremendous forces are applied to the extremity with this technique.

The patient is placed prone, with the affected arm hanging off the gurney (Figure 67-13). A sheet is wrapped around the patient's waist and hips and the gurney to hold the patient in position. The ends of the sheet are tied into a knot or held by an assistant. The patient's wrist is wrapped with gauze and then tied to the base or wheel of the gurney, which is then elevated until the dislocation is reduced.

FIGURE 67-13



The pneumatic stretcher technique to reduce an anterior shoulder dislocation.

POSTERIOR SHOULDER DISLOCATION REDUCTION TECHNIQUE

An Orthopedic Surgeon should be consulted before attempting to reduce the shoulder due to the rarity of posterior shoulder dislocations, the difficulty of reduction, the high incidence of associated injuries, and the need to operate to repair the associated injuries.[2,4,8,11] **The only exception is when the affected extremity has signs of neurologic or vascular compromise and the Orthopedic Surgeon is not immediately available to reduce the shoulder.** The patient will require intraarticular instillation of local anesthetic solution and procedural sedation for the performance of this technique.

Place the patient supine. Perform procedural sedation. Pass a sheet around the axilla and torso of the affected arm in the same manner as in the traction-countertraction technique (Figure 67-5*A*). Grasp the distal forearm. Apply axial traction in-line with the humerus. Instruct an assistant to apply countertraction on the sheet looped around the patient's torso. The traction and countertraction should be equal in force and in opposite directions. While maintaining traction, gently internally rotate and adduct the arm. The shoulder may reduce. If not, instruct a second assistant to apply simultaneous lateral pressure on the humeral head.[3] While continuing to exert pressure on the humeral head, in trying to work it over the glenoid rim, the arm may need to be gently rotated externally. If this fails to reduce the shoulder, apply lateral traction, with a second assistant using a sheet looped around the proximal humerus, and repeat the process (Figure 67-5*C*). If the shoulder will still not reduce, this is an indication for general anesthesia and an open or closed reduction in the Operating Room.[4,9] The shoulder joint is usually unstable and may not remain articulated once it is reduced.

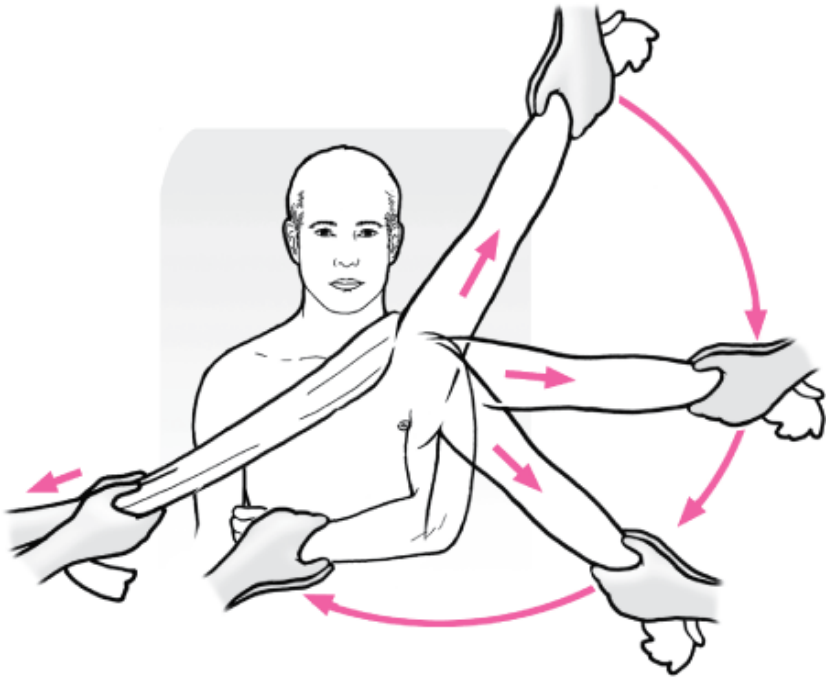
An alternative to grasping the forearm is to apply a padded wrist restraint. Tie the loose ends of the restraint straps to create a loop around the physician's hips. A second alternative is to loop a sheet around the patient's flexed forearm and the physician's hips as in the traction-countertraction technique (Figure 67-5*B*). These two alternatives are preferred, as they allow the physician's body to reduce the shoulder rather than depending on biceps strength.

INFERIOR SHOULDER DISLOCATION REDUCTION TECHNIQUE

Like posterior shoulder dislocations, **inferior shoulder dislocations require an Orthopedic Surgeon to be consulted before attempting closed reduction unless neurologic or vascular compromise is present in the affected extremity.** Consultation is required because of the rarity of inferior shoulder dislocations, the difficulty of reduction, the high incidence of associated injuries, and the need to operate to repair the associated injuries.[2–4,10,50–52] The patient will require intraarticular instillation of local anesthetic solution and procedural sedation for the performance of this technique.[4]

Place the patient supine. Loop a sheet over the clavicle of the affected shoulder with the loose ends of the sheet at the opposite hip (Figure 67-14). Stand above the patient's head and grasp the distal forearm. Apply axial traction to the arm. Instruct an assistant to apply equal countertraction on the sheet. While maintaining axial traction on the humerus, gently adduct the arm in a full arc from the patient's head to their side (Figure 67-14). The shoulder should reduce. The shoulder joint is usually unstable and may not remain articulated once reduced. In rare instances, buttonholing of the joint capsule will prevent closed reduction and require an open reduction.[2]

FIGURE 67-14



Reduction of an inferior shoulder dislocation (luxatio erecta). Axial traction (*straight arrows*) is applied and maintained on the dislocated extremity while it is simultaneously hyperadducted (*curved arrows*).

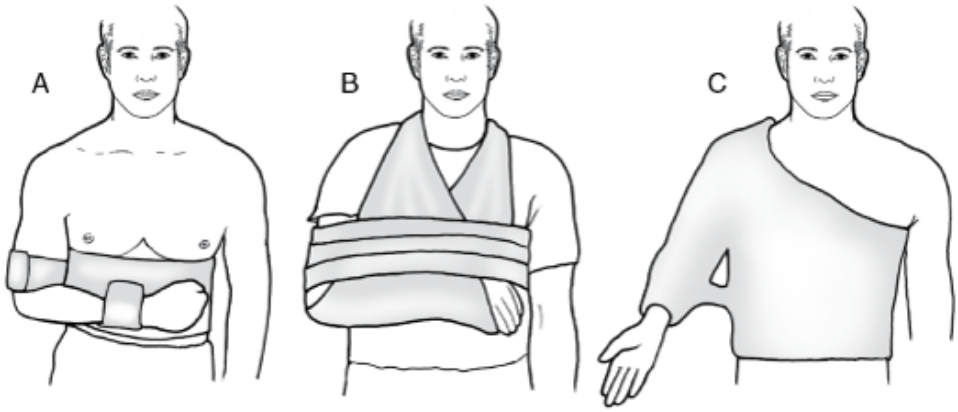
ASSESSMENT

The post-procedural care of the dislocated shoulder is as important as the initial reduction. Successful shoulder reduction is usually sensed by the operator as a shift or "clunk" in the shoulder joint. Sometimes this can be a very subtle sign. Generally, the normal contour of the shoulder is restored and patients often report marked improvement in their pain. A simple test to evaluate the success of the reduced joint, especially in anterior and posterior dislocations, is to have the patient touch their nose or contralateral shoulder with the hand of the affected limb.[3] The ability to do so usually signifies a relocated shoulder joint. **The patient should have a thorough examination to evaluate the extremity for vascular and/or neurologic compromise.** Any compromise requires immediate consultation with an Orthopedist.

It is important to prevent further external rotation or abduction of the reduced shoulder. Place the affected extremity in a shoulder immobilizer (Figure 67-15*A*) or a conventional sling with a swath (Figure

67-15*B*).[1,2,11,20,53,54] The shoulder should be immobilized in external rotation in a spica cast if a successful reduction is unstable[3] (Figure 67-15*C*). Post-reduction films are indicated after immobilization to confirm the reduction of the joint, to rule out missed fractures on the original radiographs, to rule out a fracture from the reduction procedure, and to evaluate for displacement of fracture fragments. There is some evidence that post-reduction radiographs may be unnecessary, but further study is warranted before this can be routinely recommended.[13,14]

FIGURE 67-15



Methods of shoulder immobilization after reduction of a dislocation. *A.* Shoulder immobilizer. *B.* Velpeau dressing. *C.* Spica cast.

AFTERCARE

Following procedural sedation, the patient will need to be observed before being discharged home in the care of friends or family. It is necessary to have the patient awake, alert, oriented, and to have the pain adequately controlled before discharge. The patient should be discharged with adequate pain control and follow-up care by an Orthopedic Surgeon. Generally, oral nonsteroidal anti-inflammatory drugs are sufficient to control pain. Oral narcotics may be given as needed for 2 to 3 days to aid with pain during the acute inflammatory response period. Orthopedic follow-up should be arranged within 24 hours for anterior shoulder dislocations complicated by fractures or soft tissue injuries beyond ligamentous strain. Orthopedic follow-up within 5 to 7 days is generally sufficient for uncomplicated anterior shoulder reductions.

The duration of immobilization depends on the patient's age.[2,11,20] The only large-scale prospective study of first-time anterior shoulder dislocations followed patients over a 10 year period. It found that the duration of immobilization had no effect on the incidence of recurrence. Age was the only prognostic factor for recurrence. Patients under 20 years of age should be immobilized for 3 weeks and then begin active range-of-motion exercises. Patients aged 20 to 40 years should be immobilized for 1 to 2 weeks and begin active range-of-motion exercises 5 days post-reduction. Patients older than 60 years of age should have minimal immobilization—less than 1 week—and begin active range-of-motion exercises within 72 hours post-reduction to limit subsequent shoulder stiffness.[2,11] Patients should be instructed to avoid external rotation and abduction activities, such as combing their hair, to avoid a recurrent dislocation.[1]

Range-of-motion exercises should include dangling-arm rotation.[2,11] While supporting the torso with the other arm, the patient makes a small circular motion with the injured arm against the force of gravity. For anterior dislocations, strengthening the subscapularis muscle by doing internal rotation against a resistance band with the elbow flexed 90 degrees is advocated.[2]

COMPLICATIONS

Complications of shoulder dislocations can occur as a result of the initial injury, the reduction technique, or a

combination of both. Complications are discussed with respect to both the initial injury and the reduction. They include fractures, displacement of fracture fragments, rotator cuff tears, vascular injury, neurologic injury, recurrence of dislocation, hemarthroses, and the inability to reduce the shoulder.

Fractures

Most fractures are caused during the dislocation and rarely during the reduction procedure if the proper techniques are used.[2,4,8,11,50] Pre-reduction radiographs will identify most fractures. Post-reduction radiographs are required to identify fractures initially missed or new ones associated with the reduction. Fractures of the humerus and coracoid process are rare and almost always associated with traumatic anterior shoulder dislocations.[1,2,8] These fractures make closed reduction very difficult and should generally be treated under general anesthesia by an Orthopedic Surgeon or by open reduction.

More common bony injuries include the Hill-Sachs deformity and the Bankart lesion, both caused during and from the dislocation. The Hill-Sachs lesion occurs in up to 50 percent of shoulder dislocations.[1,2] More significant fractures can occur during reduction in rare situations in which the humeral head is dislocated anteriorly with impaction on the glenoid rim.[1,2,8,11] The Bankart lesion is more commonly seen in recurrent dislocations and is associated with rupture of the joint capsule, but it spares the rotator cuff.[1,2,8,11]

Displacement of Fracture Fragments

Pre-reduction radiographs should be obtained on all shoulder dislocations. They will identify most fractures and any associated displacement. Many of the reduction techniques use significant force and may displace a fracture fragment. Post-reduction radiographs are required to evaluate for displacement of fracture fragments. The displacement of fracture fragments may make reduction difficult or impossible, in some cases necessitating operative reduction under general anesthesia.

Rotator Cuff Tears

Rotator cuff injury is most commonly seen in inferior dislocations and in patients greater than 60 years of age.[11,51,52] Overall, 38 percent of shoulder dislocations will have associated rotator cuff tears at the time of injury. This injury is not typically seen as a complication of the reduction technique.[3,11] Rotator cuff tears generally do not impede reduction, as they are often missed during the initial evaluation. One study showed that 86 percent of shoulder dislocations had rotator cuff tears diagnosed by arthroscopy an average of 7 months after the dislocation.[1,4] Rotator cuff injuries complicate restoration of normal shoulder function and may require surgical correction.

Vascular Injury

Vascular injuries are seen in the arteries and veins of the shoulder region in association with shoulder dislocations.[1,8,11,50,55,56]**An evaluation for the signs of an axillary artery injury should be sought before and after any reduction attempt.** The most common vessel injured, during both dislocation and forceful reduction, is the axillary artery. Such an injury is usually seen in older patients who have brittle vessels that have lost some elasticity. Inferior dislocations have the highest association with vascular injuries.[11] The second and third parts of the axillary artery are deep to the pectoralis major muscle and sustain the most damage.[8] These injuries include decreased radial pulse, an axillary mass, an axillary bruit, or lateral chest wall bruising.[1] An angiogram is indicated if a vascular injury is suspected.

The subclavian vein is rarely injured. Direct injuries to venous vessels are atypical. The most common injury is a venous thrombosis. Physical signs include extremity edema and occasionally paresthesias. However, these signs are typically seen days after the reduction. The diagnostic test of choice for venous evaluation is an ultrasound with Doppler study.[8]

Neurologic Injury

Neurologic injury is seen in 5 to 12 percent of all shoulder dislocations.[8,11,50,56–59]**An evaluation for the signs of any neurologic injury should be sought before and after any reduction attempt.** Anterior shoulder

dislocations with humeral fractures have a 45 percent incidence of nerve injury, with the axillary nerve being injured in up to 36 percent of cases.[8] Older patients tend to be more prone to nerve injury from the dislocation and the reduction techniques.[8] Of the techniques described, those that cause significant downward traction typically cause more reduction-induced neurologic injuries. Fortunately, most neurologic injuries are neuropraxias and will completely resolve within 2 to 5 months.[11] A small percentage of axillary nerve injuries that do not resolve may require nerve grafting. Brachial plexus injuries are much more common in posterior and inferior shoulder dislocations. Because the brachial plexus surrounds the axillary artery, injuries to the artery should raise the suspicion for a brachial plexus injury.

Dislocation Recurrence

The incidence of recurrence is variable, age-dependent, and gender-dependent.[54,60] Among patients under the age of 20 years, 90 percent will dislocate again, while only 14 percent of those over the age of 40 will redislocate.[1] Recurrences are much more common in men, with a ratio of 4:1 to 6:1 as compared to women.[11] Recurrent shoulder dislocations have other associated morbidities. A triad of lesions—including a detached labrum and anterior capsule, a Hill-Sachs deformity, and erosion of the anterior glenoid—develops in 85 percent of recurrent shoulder dislocations.[4] The methods for reduction are not different from those of a first-time shoulder dislocation. Patients who have had multiple shoulder dislocations are generally easier to reduce using nonanalgesic manipulation techniques. The orthopedic literature suggests that three shoulder dislocations in a single extremity indicate the need for surgical repair.[11]

Hemarthrosis

Blood collections in the shoulder joint are rare complications and are seen almost exclusively in traumatic shoulder dislocations associated with fractures. Typically, older patients (greater than 60 years of age) will return to the Emergency Department within 24 to 48 hours with a tense, swollen, painful shoulder. The shoulder joint should be aspirated. Refer to Chapter 65 for the complete details regarding shoulder arthrocentesis. Aspiration is usually sufficient to relieve pain and restore function.

Inability to Reduce

There are a few reasons for the inability to reduce a dislocated shoulder completely. The most common is inadequate medication and sedation to overcome muscle spasm and pain. Occasionally, the humeral head may be "buttonholed" through the joint capsule.[11] A fracture fragment may be impinged or interposed between the humeral head and the glenoid cavity. Significant or complete disruption of ligamentous structures, as in an inferior or posterior dislocation, will not allow the humeral head to remain in the glenoid cavity. The inability to reduce a shoulder dislocation is an indication for reduction, open or closed, under general anesthesia.

SUMMARY

Shoulder dislocations are common due to the inherent instability of the glenohumeral joint. There are three different types of dislocation, each of which has different mechanisms of injury and incidences of associated injuries. The vast majority are anterior shoulder dislocations. The diagnosis of a shoulder dislocation is generally uncomplicated given the history and patient presentation. The physician must be expeditious in reducing the dislocated joint once the patient is stabilized, other injuries have been ruled out, pain control has been addressed, and radiographs have been obtained to confirm the type of dislocation along with associated injuries.

Orthopedic Surgeons may need to be involved with the acute care of a dislocated shoulder. They should be involved in the initial reduction care of all posterior and inferior dislocations because of the rarity of these shoulder dislocations, the difficulty of reduction, the high incidence of associated injuries, and the need to operate to repair the associated injuries.

Multiple closed reduction techniques are available. They have similar success rates. The method chosen, as well as the decision to use analgesia, is individualized to the physician and the patient. Certain traditional techniques (Hippocratic and Kocher) have been demonstrated to have a higher incidence of complications and should be avoided. Patients should be thoroughly evaluated before and after any closed reduction attempt for neurologic, vascular, soft tissue, or bony injury. The shoulder should be immobilized after it is reduced.

Patients should be instructed on proper aftercare and should be provided with adequate oral analgesia. This can be accomplished with nonsteroidal anti-inflammatory drugs supplemented with narcotics. All patients discharged from the Emergency Department should follow-up with an Orthopedic Surgeon within 24 hours to 5 days based on associated injuries and age.

REFERENCES

1. Price DD, Wilson SR: *Shoulder Dislocations.* 1999:1–11. http://www.E-medicine.com.

2. Simon R, Koenisknecht S: *Emergency Orthopedics: The Extremities,* 3rd ed. Stamford, CT: Appleton & Lange, 1996:388–400.

3. McNamara R: Management of common dislocations, in Roberts JR, Hedges JR (eds): *Clinical Procedures in Emergency Medicine,* 3rd ed. Philadelphia: Saunders, 1998:818–830.

4. Daya M: Shoulder, in Rosen P, Barkin R, Danzl DF, et al (eds): *Emergency Medicine: Concepts and Clinical Practice,* 4th ed. St. Louis: Mosby, 1998:726–732.

5. Moore K: *Clinically Oriented Anatomy,* 3rd ed. Baltimore: Williams & Wilkins, 1992:611–615.

6. Blake R, Hoffman J: Emergency department evaluation and treatment of the shoulder and humerus. *Emerg Med Clin North Am* 1999; 17(4):859–870. [PMID: 10584106]

7. Bruno RG, Carter W: Shoulder dislocation, in Rosen P, Barkin RM, Hayden SR, et al (eds): *The 5 Minute Emergency Medicine Consult.* Philadelphia: Lippincott, Williams & Wilkins, 1999:1032–1033.

8. Beeson M: Complications of shoulder dislocations. *Am J Emerg Med* 1999; 17(3):288–295. [PMID: 10337892]

9. Neviaser JS: Posterior dislocations of the shoulder, diagnosis and treatment. *Surg Clin North Am* 1963; 43(6):1623–1630. [PMID: 14090211]

10. Brady WJ, Knuth CJ, Pirrallo RG: Bilateral inferior glenohumeral dislocation: luxatio erecta, an unusual presentation of a rare disorder. *J Emerg Med* 1995; 13(1):37–42. [PMID: 7782623]

11. Rockwood CA Jr, Wirth MA: Subluxations and dislocations about the glenohumeral joint, in Rockwood CA Jr, Green DP, Bucholz RW, et al (eds): *Rockwood and Green's Fractures in Adults,* 4th ed. Philadelphia: Lippincott-Raven, 1996:1193–1340.

12. Ferkel RD, Hedley AK, Eckardt JJ: Anterior fracture-dislocations of the shoulder: pitfalls in treatment. *J Trauma* 1984; 24(4):363–367. [PMID: 6708162]

13. Harvey RA, Trabulsy ME, Roe L: Are postreduction anteroposterior and scapular Y views useful in anterior shoulder dislocations? *Am J Emerg Med* 1992; 19(2):149–151.

14. Hendey G, Kinlaw K: Clinically significant abnormalities in postreduction radiographs after anterior shoulder dislocation. *Ann Emerg Med* 1996; 28(4):299–402.

15. Elberger S, Brody G: Bilateral posterior shoulder dislocations. *Am J Emerg Med* 1995; 13(3):331–332. [PMID: 7755831]

16. Matthews DE, Roberts T: Intraarticular lidocaine versus intravenous analgesic for reduction of acute anterior shoulder dislocations. *Am J Sports Med* 1995; 23(1):54–59. [PMID: 7726351]

17. Kolb JC, Krupnick J: Shoulder reduction without anesthesia. *Ann Emerg Med* 1996; 28(5):581–582. [PMID: 8909280]

18. Parvin RW: Closed reduction of common shoulder and elbow dislocations without anesthesia. *AMA Arch Surg* 1957; 75:972–975. [PMID: 13478276]

19. Garnavos C: Technical note: modifications and improvement of the Milch technique for the reduction of anterior dislocation of the shoulder without premedication. *J Trauma* 1992; 32(6):801–803. [PMID: 1613841]

20. Wen DY: Current concepts in the treatment of anterior shoulder dislocation. *Am J Emerg Med* 1999; 17(4):401–407. [PMID: 10452444]

21. Liedelmeyer R: Reduced! A shoulder, subtly and painlessly. *Emerg Med* 1977; 9:233–234.

22. Mirick MJ, Clinton JE, Ruiz E: External rotation method of shoulder dislocation reduction. *JACEP* 1979; 8(12):528–531. [PMID: 513410]

23. Plummer D, Clinton J: The external rotation method for reduction of acute anterior shoulder dislocation. *Emerg Med Clin North Am* 1989; 7(1):165–175. [PMID: 2917505]

24. Danzl DF, Vicario SJ, Gleis GL, et al: Closed reduction of anterior subcoracoid shoulder dislocation, evaluation of an external rotation method. *Orthop Rev* 1986; 15(5):311–315. [PMID: 3453939]

25. Stimson LA: An easy method of reducing dislocations of the shoulder and hip. *Med Rec* 1900; 57(9):356–357.

26. Riebel GD, McCabe JB: Anterior shoulder dislocation: a review of reduction techniques. *Am J Emerg Med* 1991; 9(2):180–188. [PMID: 1994950]

27. Lippert FG: A modification of the gravity method of reducing anterior shoulder dislocations. *Clin Orthop Rel Res* 1982; 165:259–260. [PMID: 7075068]

28. Rollinson PD: Reduction of shoulder dislocations by the hanging method. *S Afr Med J* 1988; 73:106–107. [PMID: 3340911]

29. Doyle WL, Ragar T: Use of the scapular manipulation method to reduce an anterior shoulder dislocation in the supine position. *Ann Emerg Med* 1996; 27(1):92–94. [PMID: 8572458]

30. Anderson D, Zvirbulis R, Ciullo J: Scapular manipulation for reduction of anterior shoulder dislocations. *Clin Orthop Rel Res* 1982; 164:181–183. [PMID: 7067283]

31. Kothari RU, Dronen SC: The scapular manipulation technique for the reduction of acute anterior shoulder dislocations. *J Emerg Med* 1990; 8:625–628. [PMID: 2254612]

32. Kothari RU, Dronen SC: Prospective evaluation of the scapular manipulation technique in reducing anterior shoulder dislocations. *Ann Emerg Med* 1992; 21(11):1349–1352. [PMID: 1416331]

33. McNamara RM: Reduction of anterior shoulder dislocations by scapular manipulation. *Ann Emerg Med* 1993; 22(7):1140–1144. [PMID: 8517564]

34. Westin CD, Gill EA, Noyes ME, et al: Anterior shoulder dislocation: a simple and rapid method for reduction. *Am J Sports Med* 1995; 23(3):369–371. [PMID: 7661270]

35. Milch H: The treatment of recent dislocations and fractures-dislocations of the shoulder. *J Bone Jt Surg* 1949; 31A(1):173–180.

36. Milch H: Treatment of dislocation of the shoulder. *Surgery* 1938; 3:732–740.

37. Milch H: Pulsion-traction in the reduction of dislocations or fracture dislocations of the humerus. *Bull Hosp Jt Dis* 1963; 24:147–152. [PMID: 14173211]

38. Lacey T II, Crawford HB: Reduction of anterior dislocations of the shoulder by means of the Milch abduction technique. *J Bone Joint Surg* 1952; 34A(1):108–109.

39. Russell JA, Holmes EM III, Keller DJ, et al: Reduction of acute anterior shoulder dislocations using the Milch technique: a study of ski injuries. *J Trauma* 1981; 21(9):802–804. [PMID: 7277546]

40. Janecki CJ, Shahcheragh GH: The forward elevation maneuver for reduction of anterior dislocations of the shoulder. *Clin Orthop Rel Res* 1982; 164:177–180. [PMID: 7067281]

41. Hippocrates: Injuries of the shoulder, dislocations (Tsemanis VS, trans). *Clin Orthop Rel Res* 1989; 246:4–7.

42. Hussein MK: Kocher's method is 3,000 years old. *J Bone Joint Surg* 1968; 50B(3):669–671.

43. Thakur AJ, Narayan R: Painless reduction of shoulder dislocation by Kocher's method. *J Bone Joint Surg* 1990; 72(3):524. [PMID: 2341466]

44. Poulsen SR: Reduction of acute shoulder dislocations using the Eskimo technique: a study of 23 consecutive cases. *J Trauma* 1988; 2B(9):1382–1383.

45. Parisien VM: Shoulder dislocation, an easier method of reduction. *J Maine Med Assoc* 1979; 70(3):102. [PMID: 438643]

46. White ADN: Dislocated shoulder—a simple method of reduction. *Med J Aust* 1976; 2:726–727. [PMID: 1004324]

47. Noordeen MHH, Bacarese–Hamilton IH, Belham GJ, et al: Anterior dislocation of the shoulder: a simple method of reduction. *Injury* 1992; 23(7):479–480. [PMID: 1446937]

48. Zahiri CA, Zahiri H, Tehrany F: Anterior shoulder dislocation reduction technique revisited. *Orthopedics* 1997; 20:515–521. [PMID: 9195634]

49. Shackelford HL: Hydraulic stretcher reduction technique for anterior dislocation of the shoulder. *W Va Med J* 1982; 78(1):9. [PMID: 6950593]

50. Davids JR, Talbott RD: Luxatio erecta humeri: a case report. *Clin Orthop Rel Res* 1990; 252:144–149. [PMID: 2302879]

51. Pirrallo RG, Bridges TP: Luxatio erecta: a missed diagnosis. *Am J Emerg Med* 1990; 8(4):315–317. [PMID: 2363754]

52. Saxena K, Stravas J: Inferior glenohumeral dislocation. *Ann Emerg Med* 1983; 12(11):718–720. [PMID: 6638635]

53. Pick RY: Treatment of dislocated shoulder. *Clin Orthop Rel Res* 1977; 123:76–77. [PMID: 852194]

54. Relovszky K: Prognosis of primary dislocation of the shoulder. *Acta Orthop Scand* 1969; 40:216–224. [PMID: 5365161]

55. Kirker JR: Dislocation of the shoulder complicated by rupture of the axillary vessels: a case report. *J Bone Joint Surg* 1952; 34B(1):72–73.

56. Curley SA, Osler T, Demarest GB: Traumatic disruption of the subclavian artery and brachial plexus in a patient with Ehlers-Danlos syndrome. *Ann Emerg Med* 1988; 17(8):850–852. [PMID: 3394992]

57. DeLaat EAT, Visser CPJ, Coene LNJEM, et al: Nerve lesions in primary shoulder dislocations and humeral neck fractures: a prospective clinical and emg study. *J Bone Joint Surg* 1994; 76B(3):381–383.

58. Toolanen G, Hildingsson C, Hedlund T, et al: Early complications after anterior dislocation of the shoulder in patients over 40 years: an ultrasonographic and electromyographic study. *Acta Orthop Scand* 1993; 64(5):549–552. [PMID: 8237322]

59. Travlos J, Goldberg I, Boome RS: Brachial plexus lesions associated with dislocated shoulders. *J Bone Joint Surg* 1990; 72B(1):68–71.

60. Hoelen MA, Burgers AMJ, Rozing PM: Prognosis of primary anterior shoulder dislocation in young adults. *Arch Orthop Trauma Surg* 1990; 110:51–54. [PMID: 2288807]