

Series: EM Orthopedics for the Medical Student: I. The Shoulder

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Editor's Note

This is the first of a series of articles on Orthopedics for the Emergency Medicine trainee. The series is intended to dispel the fear of the emergency physician when encountering orthopedic injuries and to show that they can be appropriately managed in the emergency setting.

MeSH Words: Shoulder dislocation, shoulder fracture

INTRODUCTION

This article describes the main types of shoulder injuries seen in the emergency department and outlines the treatment of those that can be managed appropriately in this setting.

ANATOMY OF THE SHOULDER

The shoulder has more range of movement than any other joint in the body. It can move away from the body (abduction), across the body (adduction), and backwards (flexion) and forwards (extension). Circular motion is achieved by coordination of the shoulder musculature.

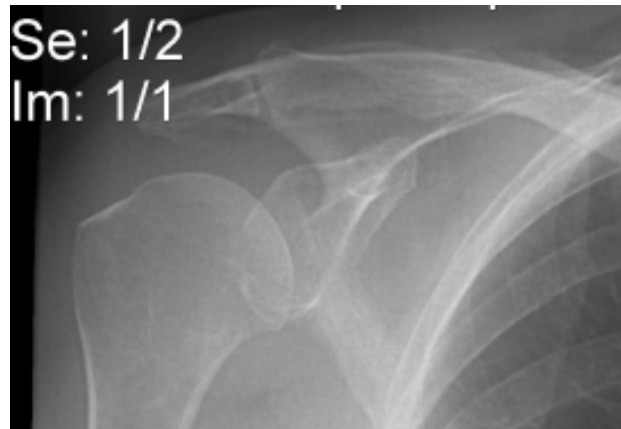


Fig. 1. Normal shoulder and humerus

TYPES OF SHOULDER INJURIES

Shoulders are at risk of fractures, dislocations, and soft tissue injuries. Like all joints, they can become infected as well.

Fractures

The surgical neck (Fig. 2) is the most common site of fracture in the shoulder girdle. Nondisplaced surgical neck fractures are often subtle and may be missed. Fortunately, they heal well and typically do not require immobilization in a cast. Displacements of up to 1 cm and angulations of less than 45 degrees can usually be managed conservatively in the ED. Although the impairments in neurological function associated with these types of injury are usually not serious enough to require more than conservative treatment, you must test sensation. X-rays typically confirm the diagnosis. *If the physical findings do not agree with the x-ray findings, consider an alternate means of imaging (such as computed tomography) or call for help.*

Figure 2a shows a typical x-ray of a normal shoulder, and Figure 2b, a fracture of the surgical neck.

Conservative treatment of an nondisplaced fracture is immobilization with a commercial shoulder immobilizer or a cuff and collar with an elastic bandage (velpeau sling). Early physiotherapy is paramount to prevent frozen shoulder.

Other, less common, sites of fracture are the greater tuberosity and the anatomic neck. Fractures of the greater tuberosity are typically treated with analgesia only. Anatomic neck fractures are associated with neurovascular problems.

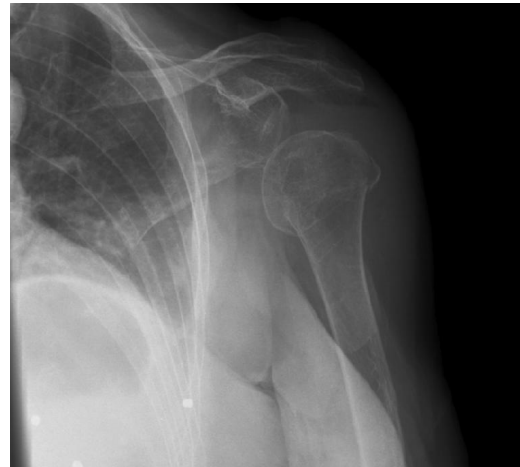


Fig. 2b. X-ray: impacted surgical neck fracture

Special Considerations in Children

Clavicle fractures are very common in children, and these will be dealt with separately, below. Epiphyseal fractures in a child require the involvement of an orthopedist. Children can tolerate displacement better than adults, and you need not reduce fractures of less than 1cm displacement or less than 40 degrees angulation in this age group.

Indications for Orthopedic Consultation

In summary, the emergency physician should be able to handle minimally displaced surgical neck and greater tuberosity fractures in non-athletes. Patients with very displaced or very comminuted humeral head fractures and intra-articular fractures should be referred to an orthopedist, as should athletes, children and adolescents, and any patients with fractures who present with neurovascular compromise.

Dislocations

Dislocations of the shoulder are very common, and the emergency physician must know how to reduce them. Shoulders usually dislocate anteriorly, but 10% of the time they dislocate posteriorly. Even rarer are Luxatio erecta dislocations (superiorly), with patients presenting with their hand raised above their head.

At the initial physical examination in the emergency department, note that the glenoid is

indeed empty and check neurovascular status, like for shoulder fractures. Usually, the neurovascular problems resolve once the shoulder is repositioned.

It is important to obtain both anteroposterior (AP) and trans-scapular (“Y”) views. Figures 3a and 3b show the typical x-ray appearance of a shoulder dislocation.



Fig. 4a. This is an obvious dislocation on AP view. However, without the transscapular view, you may miss a posterior dislocation or a subtle anterior dislocation.



Fig. 4b. Transscapular view: If the humeral head is located at the junction of the “Y” (the so-called “Mercedes sign”), then a dislocation is unlikely. A finding of the humeral head behind the Y suggests posterior dislocation; in front, an anterior dislocation. Here you see the humeral head located behind the center of the Y (the glenoid).

There are many methods of reduction of dislocated shoulders. Often times an attempt at gentle reduction can be done using 'verbal sedation' and eliciting the cooperation of the patient in relaxing, as an adjunct or alternate to procedural sedation. You should consider several factors to guide you in selecting the proper one for the individual patient:

1. The longer the head of the humerus is out of joint, the harder it is to reposition it.
2. Complete relaxation of the joint musculature is imperative. Relaxation can be achieved with procedural sedation. An alternative is injecting the joint with lidocaine. The latter is associated with a small risk of infection but avoids the greater risk of sedation in patients who may not be candidates for it.
3. Reduction in the operating room under general anesthesia is sometimes required.
4. Fracture dislocations may warrant consultation with an orthopedist.

The emergency physician should be familiar with at least 2 methods of reduction, in case the first one tried is unsuccessful:

- The *Kocher technique* can damage the brachial plexus, brachial vessels, rotator cuff, and humerus. (In this method, the arm, bent at the elbow is pressed against the body. The arm is externally rotated until resistance is experienced.) For this reason, alternative methods are suggested.
- The *Stimson technique*, which is the easiest to apply, requires the patient to lie prone with the affected arm hanging over the side of the bed. A weight (e.g., sandbag, bucket of water) is attached to the wrist and suspended off the ground. After about 15 minutes, the muscles experience spasm fatigue, and the humeral head should reduce into place by itself. (Be cautious to avoid neurovascular insult at the wrist when using this method.)
- In the *Hennepin technique*, the patient lies supine, with the arm adducted and flexed to 90° at the elbow. Slowly rotate the arm externally, pausing for pain. The shoulder should reduce before reaching the coronal plane. This procedure often
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requires only one physician, no sedation, and little force.

- The *scapular manipulation* has been described primarily in the emergency medicine literature. Unlike the other procedures that bring the humerus up to meet the clavicle, this technique brings the glenoid down to meet the dislocated head of the humerus. With the patient lying prone, have an assistant apply manual traction (or 5-15 lb of hanging weight) to the wrist. As the shoulder relaxes, rotate the inferior tip of the scapula medially and the superior aspect laterally. Alternatively, have the patient sit while an assistant provides traction-counter traction by pulling on the wrist with one hand and bracing the upper chest with the other. Apply the same scapular rotation described above.



Fig.4. Scapular manipulation technique

- *Traction/counter traction* is also known as the "*Hippocratic method*". A sheet is tied underneath the axilla of the affected arm and over the neck to the other side. The physician pulls on the arm, and an assistant provides counter-traction (Fig. 5). This technique requires some degree of strength. Adequate relaxation of the musculature is essential.



Fig. 5. Traction/counter-traction technique

- In the *Milch technique*, the physician slowly abducts the shoulder all the way to 90 degrees, and then externally rotates it 90 degrees. (Fig. 5a, 5b).



Fig.5a. Milch technique

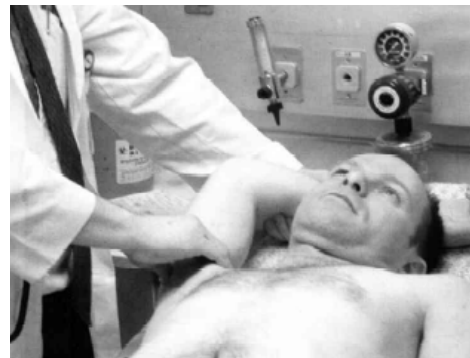


Fig.5b. Milch technique

Posterior Dislocation: Apply gentle, prolonged axial traction on the humerus. Then, add anterior pressure, while coaxing the humeral head over the glenoid rim. Slow external rotation may be helpful.

Special Considerations in Children

Shoulder dislocations are rare in young children (except in birth injuries) and become more common as the skeleton matures. Therefore, suspect other injuries when parents say they think the arm is dislocated. What often appears to be a dislocated shoulder in children is usually a pulled elbow (nursemaid's elbow) or a buckle fracture. Be aware that less force is required during reduction in younger patients. A neurovascular examination should be performed before and after treatment as the axillary nerve is particularly vulnerable in the pediatric age group.

Indications for Orthopedic Consultation

Many shoulders cannot be repositioned because of muscle spasm or interposition of fat. This is often true for dislocations that are left untreated for a long period, as seen in nursing home patients. In these cases, if attempt at treatment in the emergency department fails, reduction under general anesthesia may be indicated. Fracture dislocations and luxatio erecta dislocations also warrant referral to the orthopedist.

Complications and Aftercare

Dislocations may be complicated before or after reduction by Hill Sachs lesions (flattening of the humeral head) and Bankart lesions (glenoid rim fractures). Immediate surgical repair after the first dislocation remains controversial, and many surgeons advocate more conservative methods. Surgery may be indicated if patients are unable or unwilling to change their occupation or avoid participating in high-risk sports and have recurrent dislocations or subluxations. The type of conservative care is also controversial.

Acromioclavicular Dislocations

Acromioclavicular (AC) dislocations of the shoulder are fairly common and usually due to direct trauma. They are classified by severity into 6 grades as follows:

- Grade 1 -- tenderness over the joint with normal x ray findings.
- Grade 2 -- tenderness with perhaps palpation of a step-off on the physical examination.

On x-ray, some separation of the joint (less than 1 cm) may be seen.

- Grade 3 -- clear palpation of a step-off on physical examination. The X-ray film reveals a separation of more than 1 cm and an increased joint space between the coracoid and clavicle.
- Grades 4-6 -- obvious dislocation seen on x-ray film, with the clavicle markedly displaced.

On x-ray, look for lifting of the clavicle in relation to the coracoid. Again, make sure you check neurovascular status at diagnosis.

Unless the patient is an athlete, the treatment for grades 1-3 AC dislocations consists of a shoulder immobilizer. However, conservative management may result in pain, disability, or both. Higher grades A-C separations generally require surgical repair.

Special Considerations in Children

The treatment of AC dislocations is similar in children and adults. AC dislocations occur more rarely in children, in whom there is a greater tendency for fracture in this area rather than tearing of the ligaments or opening of the joint. You might, however, encounter AC separations in adolescents.

Indications for Orthopedic Consultation

Higher-grade AC injuries must be referred for treatment to an orthopedist. There is no need to try to reduce them in the emergency department.

CONCLUSION

Emergency physicians can deal with shoulder problems, even in children, by being on guard for fractures, dislocations, and infection. Most of these can be successfully managed by the emergency physician. Orthopedist intervention is necessary when emergent methods fail, and when operative intervention is required.

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