

EM CASES SUMMARY

Episode 136 Occult Shoulder Injuries & Proximal Humerus Fractures

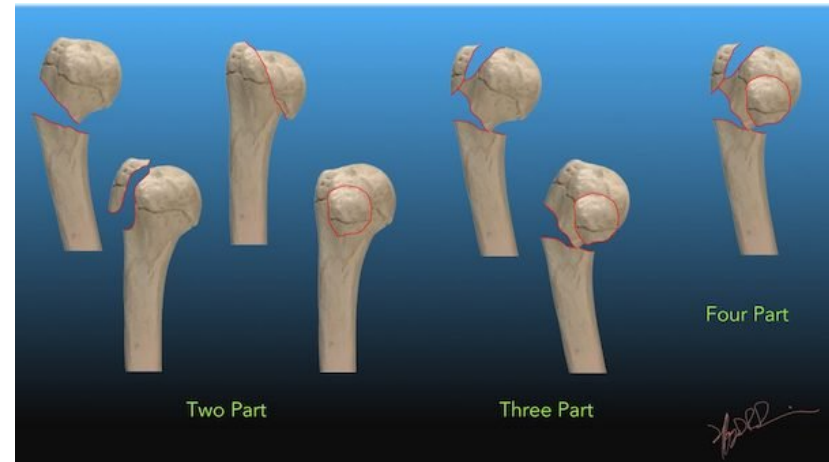
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ED management of proximal humerus fractures

Surgery for proximal humerus fractures offer little benefit over conservative for the vast majority of proximal humerus fractures [1,2,3] and is associated with increased costs, adverse event rates, and risk of mortality [4]. There is geographical variation in the proportions of patients that undergo surgical management of proximal humerus fractures with rates ranging from 9%-21% [5].

There are four general considerations in the decision for surgical management of these fractures: The Neer classification suggest that the **more bone fragments**, the more likely surgery will benefit the patient [6]. Furthermore, the **more displaced the humeral head**, the more likely **avascular necrosis** may result (although AVN is rare), and the more likely a benefit from surgery. **Greater tuberosity fractures that displace proximally** enough to disrupt the joint usually require surgery, and **head split fractures** usually require surgery.



Neer classification proximal humerus fractures, University of Washington

Patients should be made aware that **about 90% of recovery of the shoulder** from proximal humerus fractures occurs in **the first 3-4 months** and the remaining **10% takes 6 months or longer** – much longer than other major joints in the body [7]. In addition, simple range of motion exercises such as pendulum swings and wall walk-ups should be encouraged and can be quickly demonstrated in the ED. These exercises help to prevent adhesive capsulitis (frozen shoulder).

Pitfall: Patients with proximal humerus fractures who are instructed to remain immobilized for more than three weeks are put at increased risk for adhesive capsulitis. Early range of motion exercises are key in preventing frozen shoulder.

Methods of shoulder immobilization

There are **4 ways to immobilize** the shoulder: simple sling, Velpeau sling ('shoulder immobilizer'), **collar and cuff** and **sugar tong splint**. The simple and Velpeau slings take the weight of the arm off the shoulder. In patients with clavicular fractures or acromio-clavicular (AC) separations, such slings that take the weight off the shoulder help to relieve pain and may promote healing. In contrast, sugar tong splints and cuff and collar take advantage of the weight of the arm and the resulting force of gravity that provides axial traction to the fracture. For patients with impacted proximal humerus fractures, a sugar tong may be beneficial to align the fracture fragments, while for patients with displaced/angulated midshaft humerus fractures a sugar tong splint may promote reduction of the fracture.

Occult shoulder injuries: those with a normal appearing x-ray or subtle findings

There are 6 significant shoulder injuries which often have subtle or no specific findings on x-ray that one should consider:

1. **Posterior shoulder dislocation (Episode 135)**
2. Glenohumeral subluxation
3. Rotator cuff injuries
4. AC separation
5. Sternoclavicular subluxation/dislocation
6. Occult pediatric clavicle fracture

Glenohumeral subluxation

Glenohumeral subluxations are typically seen after a sports injury or in **young females with a history of hypermobility** [8]. Patients may report that they felt like their shoulder move out of place and then "pop back in".

The **apprehension test and relocation tests** confirm the diagnosis of glenohumeral subluxation – the caveat being the patient who has dislocated their glenohumeral joint recently where the test may be falsely positive [9]. There is little value in doing this test if dislocation occurred within a few weeks of presentation.

Treatment is immobilization in a sling in the position opposite to the mechanism of injury. For **anterior subluxation**, immobilize with the shoulder internally rotated (forearm against the abdomen); for **posterior subluxation**, immobilize in an external rotation shoulder brace with the shoulder in 10-15 degrees of external rotation.



External rotation shoulder brace for immobilization of reduced posterior glenohumeral subluxation or dislocation

Rotator Cuff Injuries: Difficult to diagnose clinically or with ultrasound

There are 3 types of pathology to consider in rotator cuff injuries. These include rotator cuff tendonitis, acute rotator cuff tear, and chronic rotator cuff tear.

While some studies have suggested that various combinations of historical and physical examination findings are highly accurate in diagnosing rotator cuff tears [10], while others have found only moderate diagnostic accuracy with low prediction value for prediction models [11], our experts believe that there is no finding or combination of findings on history or physical

that can accurately diagnose rotator cuff tear in the acute setting. While it may be tempting to order an ultrasound in the ED, *many patients over the age of 60 will have pre-existing rotator cuff abnormalities (including chronic bilateral full thickness tears) found on ultrasound* and it is very rare that any of them will require surgery. The quality of ultrasound reporting is also highly variable and there are many false positives with sensitivities and specificities of 89% and 84% respectively[12]. Our experts suggest that in the ED, **U/S of the shoulder is rarely required**, as most of the time, **the management is non-surgical**. Refer **only young patients** with **highly suspected acute rotator cuff tear** and arrange **outpatient ultrasound** for confirmation.

Acromioclavicular (AC) separation

The mechanism of an AC separation is typically a fall on to the tip of shoulder (direct blow to the lateral acromion) with the arm adducted [13]. On exam there is tenderness with or without a prominence at the AC joint. While the diagnosis is usually obvious from the history and physical, x-rays are nonetheless indicated to rule out a distal clavicle fracture. Place a sling on the patient for comfort before sending them for x-rays. **X-rays with weights are no longer recommended**, however, it is recommended to obtain **bilateral x-ray views** to compare the acromioclavicular distance of the normal to the injured side. While there are numerous classifications systems described, a simple rule of thumb for consideration of surgical intervention is if the **AC distance is increased 100%** or more on the injured side compared to the normal side – referral to orthopedics for consideration of surgery is advised [14].

Sternoclavicular (SC) subluxation/dislocation

Anterior SC dislocation (90% of all SC dislocations) is usually the result of a direct blow to **anterolateral shoulder**, which levers the proximal clavicle anteriorly, while **posterior SC subluxation** is usually the result of a direct blow to the **posterolateral shoulder** (rather than the rarer direct

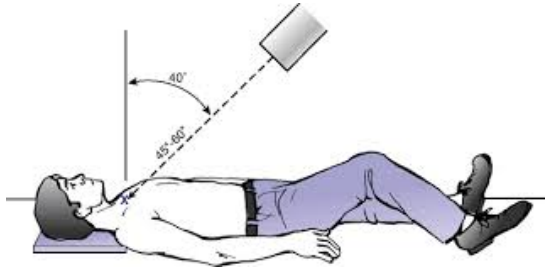
blow to the proximal clavicle mechanism) [15]. This is why we should always systematically start the shoulder exam at the SC joint.

Posterior SC dislocation can be **life-threatening** due to the structures that lie beneath the SC joint. Potential injuries include a pneumothorax, tracheal, esophageal, neurologic (brachial plexus) or vascular (subclavian vein) injury. It is not always obvious on physical exam if the dislocation/subluxation is anterior or posterior as there is usually significant swelling and tenderness at the SC joint. Some clinical clues to the dreaded posterior dislocation are a hoarse voice, difficulty swallowing, SOB, cyanosis, weak/numb arm from brachial plexus injury.

Serendipity view is the view of choice for SC subluxation/dislocation where an anterior subluxation would appear superior on the film and a posterior subluxation would appear inferior. Even these are difficult to interpret, and many patients end up needing a CT scan, which is advised for all suspected posterior dislocations to assess the integrity of vital structures beneath.



Serendipity view x-ray to assess for sternoclavicular dislocation/subluxation



Reduction may be attempted in the ED for **anterior SC dislocations**, but because the stable structures around the dislocated joint are damaged, re-dislocation occurs frequently after reduction [15]. The reduction technique involves procedural sedation followed by placing a bolster between the shoulders of the supine patient. Next, traction is applied to the arm in 90 degrees of abduction and a direct downward force is applied over the medial clavicle. **Posterior dislocations** are best reserved for the OR with thoracics back up in the event that a blood vessel that is damaged (but tamponaded by the clavicle) bleeds as a result of the reduction, and for any repair to thoracic organs that may be required [16].

Pediatric occult clavicle fracture

The x-ray of a child with a mid-clavicle fracture may appear normal [17]. If a child presents after a fall onto the adducted shoulder, with pain and tenderness over the mid-clavicle, they should be treated as an occult clavicle fracture with a shoulder sling and follow up.

Which adult patients with clavicle fractures should be referred for consideration of surgery?

Patients who undergo surgery for middle-third clavicle fractures have a lower incidence of nonunion and symptomatic malunion, however functional outcomes are similar to non-surgical treatment, and complication rates are higher in those that undergo surgery [18].

Four indications for referral to orthopedics for an adult with a clavicular fracture for surgical consideration include:

1. Mid-clavicle fracture with shortening $\geq 2\text{cm}$
2. Distal 1/3 clavicle fracture or displaced medial 1/3 clavicle fracture
3. The presence of skin tenting or open fracture
4. Neurovascular injury

Pearl: For a fracture that causes tenting of the skin, apply a surgical prep (sterile dressing) in case it converts to an open fracture while awaiting surgery.

Figure of 8 bandages are no longer recommended for treatment of clavicle fractures [19]. A simple sling or Velpeau sling is the immobilization technique of choice.

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