



## EM CASES SUMMARY

### Episode 135 Commonly Missed or Mismanged Shoulder Injuries – Approach and Glenohumeral Dislocations

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#### Why do we miss orthopedic extremity injuries so often?

- Under-relying or rushing through a history and physical
- Not considering a wide differential diagnosis
- Not ordering X-rays in the first place (13% of fractures missed [1])
- Over-relying on X-rays
- Failure to order the correct test (58% of cases in a malpractice cases study [5])
- Not ordering the most specific X-rays for the associated injury (for example, ordering a hand X-ray for a finger injury); a hand X-ray will include the finger with the rest of the hand, but a dedicated finger X-ray will focus on the finger with more detail to help identify any finger pathology
- Inadequate or improper X-ray views

- Misinterpretation of X-rays (37% of cases in a malpractice cases [5])
- Presence of occult fractures
- Presence of multiple fractures with premature closure after identifying one fracture

#### Dr. Arun Sayal's 'SCARED OF' mnemonic for orthopedic extremity emergencies in a patient with a normal appearing x-ray

We are not 'SCARED OF' this scenario!

Sepsis

Compartment Syndrome

Abuse

RE Radiology report wrong, Referred Pain

Dislocation/Subluxation that has reduced

Operative Soft Tissue Injury

Fracture (Occult)

#### 3 aspects of shoulder mechanics we should be aware of in our approach shoulder injuries

1. The rotator cuff is a unique set of muscles and tendons that tends to get injured along with many other shoulder injuries and contributes to the sometimes very prolonged recovery for some patients compared to other joints in the body.

2. The shoulder gets stiff with immobilization of >1-3 weeks and so for most **fractures**, early mobilization is important to prevent adhesive capsulitis (“frozen shoulder”) and chronic stiffness.
3. On the other end of the spectrum, the shoulder is the most unstable joint in the body and so is prone to dislocation/subluxation; so for glenohumeral **dislocations**, keeping patients immobilized for up to 3 weeks is advised by our experts to take advantage of the stiffness that occurs.

### Neurologic extremity exam of the patient with a shoulder injury

Test motor and sensation of the most distal part of the nerves in question involved with the shoulder. Compare sides.

#### Motor testing

- Make a fist with both hands
- ‘Shoot guns’ with both hands with the thumbs up
- Spread all the fingers against resistance

*Pearl: Keep the fingers spread at the end of motor testing, and then test for sensation directly for efficient testing*

#### Sensation testing

- Ulnar aspect of tip of pinky
- Radial aspect of tip of index

- 1<sup>st</sup> web space

#### Deltoid specific

- Motor: palpate for twitches of deltoid muscle
- Sensation: over the ‘military patch’ for *Axillary nerve*

*Pearl: If there is a mixed picture of neuro deficits (i.e. sensation deficits crossing over a few dermatomes, or motor deficits involving more than one nerve), consider brachial plexus injury.*

### X-ray ordering and interpretation in commonly missed or mismanaged shoulder injuries

Always obtain a **minimum of 2 views 90° to each other.**

*Pearl: If you see a fracture on 1 view, try to find it on the other views (both to get a better sense of the fracture, but also to familiarize yourself with spotting such fractures in other views for the next time you see these views)*

**Do not accept inadequate films!** If required, send the patient back to obtain proper views. The transcapular ‘Y’ view is most commonly inadequate (see below for how to ensure adequate transcapular ‘Y’ view)

## Standard x-ray shoulder views

### 1.AP internal rotation view



AP shoulder x-ray view in **internal** rotation

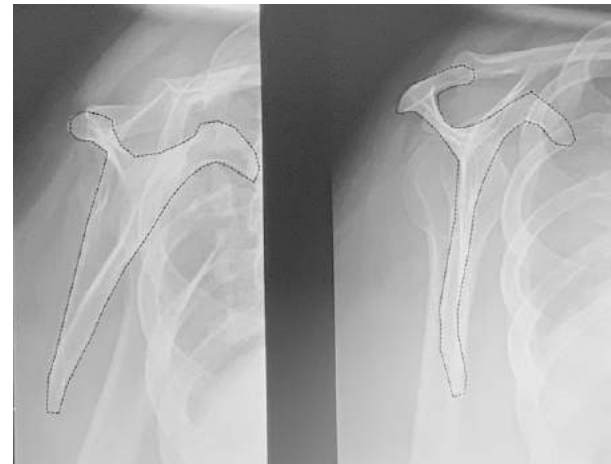
### 2.AP external rotation view



AP shoulder x-ray view in **external** rotation

### 3.Lateral trans-scapular 'Y' view

The scapula looks like a 'Y' with the humeral head in the middle ('Mercedes Benz' sign) on a normal shoulder x-ray. This is a profile view of the scapula and therefore the scapula should appear as a straight thin line. If you see the body of the scapula in this view, it is not an adequate film and the patient should have a repeated adequate x-ray. Below is an example of an anterior glenohumeral dislocation where a poor transcapular view makes the humeral head appear to be in normal position vs an adequate transcapular view showing the glenohumeral dislocation.



**Anterior glenohumeral dislocation. Left image: Poor transcapular view** showing much of the scapula's body with the humeral head appearing in good position ('Mercedes Benz Sign') despite being dislocated. **Right image: adequate transcapular view** where only the edge of the scapula is visible showing the humeral head dislocated (care of Dr. Arun Sayal)

When standard views have come back normal in patients with an ongoing suspicion for shoulder injury, **consider special views.**

### Special x-ray shoulder views

**Axillary view** – for subtle posterior dislocations and glenohumeral fractures.



**Axillary view** revealing humeral head and glenoid in normal opposition

**Serendipity view** (40° cephalic tilt) – for suspected medial clavicle fractures and or sterno-clavicular (SC) joint injuries



**Serendipity view** to improve visualization of SC joint

**Zanca view** (10-15° cephalic tilt) – good view for suspected distal clavicle and acromio-clavicular joint injuries



**Zanca view** for improved visualization of the AC joint

***Pearl:** If you do not have experience reading these special views consider obtaining the same views on the contralateral side for comparison.*

## Posterior glenohumeral dislocation

While posterior glenohumeral dislocations are much less common than anterior dislocations, they are often missed (50-80% of posterior glenohumeral dislocations are missed by the first physician that sees the patient) because x-rays in patients with posterior dislocations often look normal or have very subtle findings. It is important to pick up shoulder dislocations **early**. Any dislocation left longer than 24 hours may lead to a more difficult reduction and may prolong healing. However, the diagnosis can almost always be made easily with a thorough clinical exam.

## Mechanism of injury of posterior glenohumeral dislocations

The most common mechanism is an **awkward fall with internal rotation of the shoulder with or without forward flexion**. The other less common causes that we learn for exam purposes include **the classic 3Es**: epilepsy (the most common cause of the 3Es), ethanol, and electricity.

*Myth: A common misunderstanding is that the 3Es are the only mechanisms of injury for posterior shoulder dislocations.*

## Clinical clues to posterior glenohumeral dislocations

On physical exam, the arm is **locked in internal rotation**. Try to passively externally rotate the shoulder. There is a **mechanical block to external rotation** (caused by engagement of a Reverse Hill Sachs deformity on the posterior aspect of the glenoid). This is a classic example of importance of testing active and passive range of motion in all orthopedic injuries.

*Pearl: If the X-ray tech unable to shoot external rotation views and sends patient back with a note stating "unable to externally rotate shoulder", or shoots very poor quality external rotation views, suspect a posterior glenohumeral dislocation.*

The **axillary view** is ideal to identify a posterior dislocation. It may be difficult to perform due to limited abduction. Other possible views to consider are Velpeau, apical oblique and modified axial views to aid in the diagnosis.

## Signs on an x-ray of posterior glenohumeral dislocations

The **light bulb sign** is usually seen in retrospect after confirming the diagnosis using other views. It is due to loss of the **loss of the half moon overlap** between humeral head and glenoid fossa.



**Light bulb sign** of posterior shoulder dislocation. Notice the symmetric appearance of the humeral head.

**Rim Sign** – distance between anterior glenoid rim and articular surface of humeral head is increased >6mm



**Rim Sign** of posterior glenohumeral dislocation

**Trough line sign** is a dense vertical line in the medial humeral head resulting from an impaction of the humeral head. The resulting impaction fracture of the antero-medial aspect of the humeral head is **the Reverse Hill-Sachs lesion**.



**Trough line sign** indicates a Reverse Hill-Sachs lesion of posterior shoulder dislocation

## Posterior glenohumeral shoulder dislocation reduction techniques

### Cunningham technique

<https://www.youtube.com/watch?v=d9HjtQr0c64>

The Cunningham technique involves no sedation, instructing the patient to sit in an erect position, coaching them to relax their muscles while the provider massages the trapezius, biceps and deltoid muscles sequentially until the glenohumeral joint is reduced. It carries a very high success rate *when performed properly* for anterior glenohumeral dislocation reduction, has been recommended for both posterior and anterior shoulder dislocations and is the preferred first line technique of our experts as it precludes the need for sedation [13].

### External rotation technique

In sitting position, downward traction on proximal forearm and external rotation by one provider (similar to reduction of anterior

glenohumeral dislocation) plus push on humeral head from behind the patient by a second provider.

**Lever technique** – adduct arm as much as possible across the chest while pulling the arm laterally by grabbing the proximal medial arm near the armpit and pulling laterally, (or if single provider, place your fist in the axilla and lever the arm by adducting it).

### Two-part technique

First, gentle internal rotation and lateral traction (90 degrees flexion and abduction) to disimpact the humeral head from glenoid rim. This is followed by anteriorly directed force on the posterior humeral head from behind the patient with gentle external rotation.

Immobilize the patient with a reduced posterior glenohumeral dislocation in **10-15° external rotation**. Avoid shoulder immobilizers and simple slings as these tend to internally rotate the shoulder and increase the risk of recurrent dislocation.

Consider a low cost external rotation shoulder brace with two 14-inch cotton rolls inside some stockinette then strapped to the wrist and slinged to the opposite shoulder and around the waist [12].



External rotation shoulder brace for immobilization of reduced posterior shoulder dislocation

### Anterior glenohumeral shoulder dislocation

The mechanism of injury for an anterior glenohumeral dislocation is usually a posterior force against **AB**ducted and **Externally Rotated** ('**ABER**') arm. On physical exam, the patient holds their arm in slight abduction and the shoulder appears 'squared off' compared to the contralateral side. Don't forget to check axillary nerve sensation and power which is not uncommonly injured with anterior glenohumeral dislocations.

### Common pitfalls in the management of anterior glenohumeral shoulder dislocations

Be sure you are not dealing with a **chronic dislocation**, for example in the elderly demented patient so that you do not mistakenly cause further tissue damage by attempting to reduce it in the ED.

An anterior shoulder dislocation in conjunction with a **surgical neck fracture** of the humerus should **not** be reduced in the ED, because reduction attempts in the ED are often unsuccessful and may separate previously undisplaced segments. Instead, call orthopedics for consideration of reduction in the operating room.

**Always do pre and post reduction x-rays** for anterior shoulder dislocations because you can miss a significant bony Bankart lesion or big Hill-Sachs deformity that may require surgery. The exception is the young, frequent dislocater, who has had multiple x-rays for the same injury, with a benign mechanism of injury such as putting on a jacket.

### Analgesia for reduction of glenohumeral shoulder dislocations

While a systematic review comparing intra-articular injection of lidocaine vs procedural sedation for reduction of anterior glenohumeral dislocations showed no difference in success rate [6], our experts favour procedural sedation because muscle relaxation may be an important prerequisite for reduction in some patients that intra-articular analgesia does not provide.

### Anterior glenohumeral shoulder reduction

There are many techniques described including Cunningham, Stimson, Milch with a success rate of 67-100%. Our experts

recommend starting with the Cunningham technique. To confirm reduction while the patient is sedated perform passive range of motion of the affected shoulder and compare to the contralateral side or consider POCUS.

### POCUS in glenohumeral shoulder dislocations

<https://www.youtube.com/watch?v=UrcAAn4aSJo&list=TLPOMDcwMjIwMjBVtdq-UFRSnw&index=1>

### 3 fractures to look for in a post-reduction x-ray of a patient with an anterior glenohumeral shoulder dislocation

1. **Avulsion of greater tuberosity** is most commonly seen in older patients. The reduction of the glenohumeral dislocation usually improves the position of the displaced greater tuberosity.



Avulsion of the greater tuberosity fracture

2. **Hill-Sachs deformity** is also most commonly seen in older patients. It is best viewed in the AP external view. Size matters:



while it is difficult to quantify size a large one is usually obvious (looks like a piece of humeral head missing) and may require surgery.



Hill-Sachs deformity associated with anterior glenohumeral dislocation

**3. Bony Bankart lesion** is a fracture of the anteroinferior aspect of the glenoid. Using a golf analogy, the glenoid can be thought of as a golf tee and the humeral head as a golf ball. If a piece of glenoid (a piece of the golf tee) has broken off, it will be difficult to keep the golf ball on the tee and will likely require surgery for stability. Again, size matters as the larger the bony fragment, the more likely the need for surgery.



Bony Bankart Lesion associated with anterior glenohumeral dislocation

## Immobilization after reduction of anterior glenohumeral dislocation

The key concept to understand when it comes to the length of time to immobilize anterior glenohumeral dislocations is to take advantage of the **stiffness that develops over time**. For this reason, our experts recommend **immobilization in a sling for 3 weeks for all patients** (as opposed to a proximal humerus fracture, which usually requires early range of motion exercises as early as 1 week to prevent adhesive capsulitis -'frozen shoulder'- or chronic stiffness, for dislocations, one wants to take advantage of the stiffness that develops over time to help stabilize the joint).

***Pearl:** Age is inversely proportional to risk of recurrence. < 30 years old have a 50%- 64% risk of recurrent dislocation and this risk decreases with age. [7]*

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