CLINICAL IMAGE CHALLENGE
X-RAY

Editor's Note: While the images presented here are authentic, the patient cases are hypothetical.

28-Year-Old Female With Rolled Right Ankle

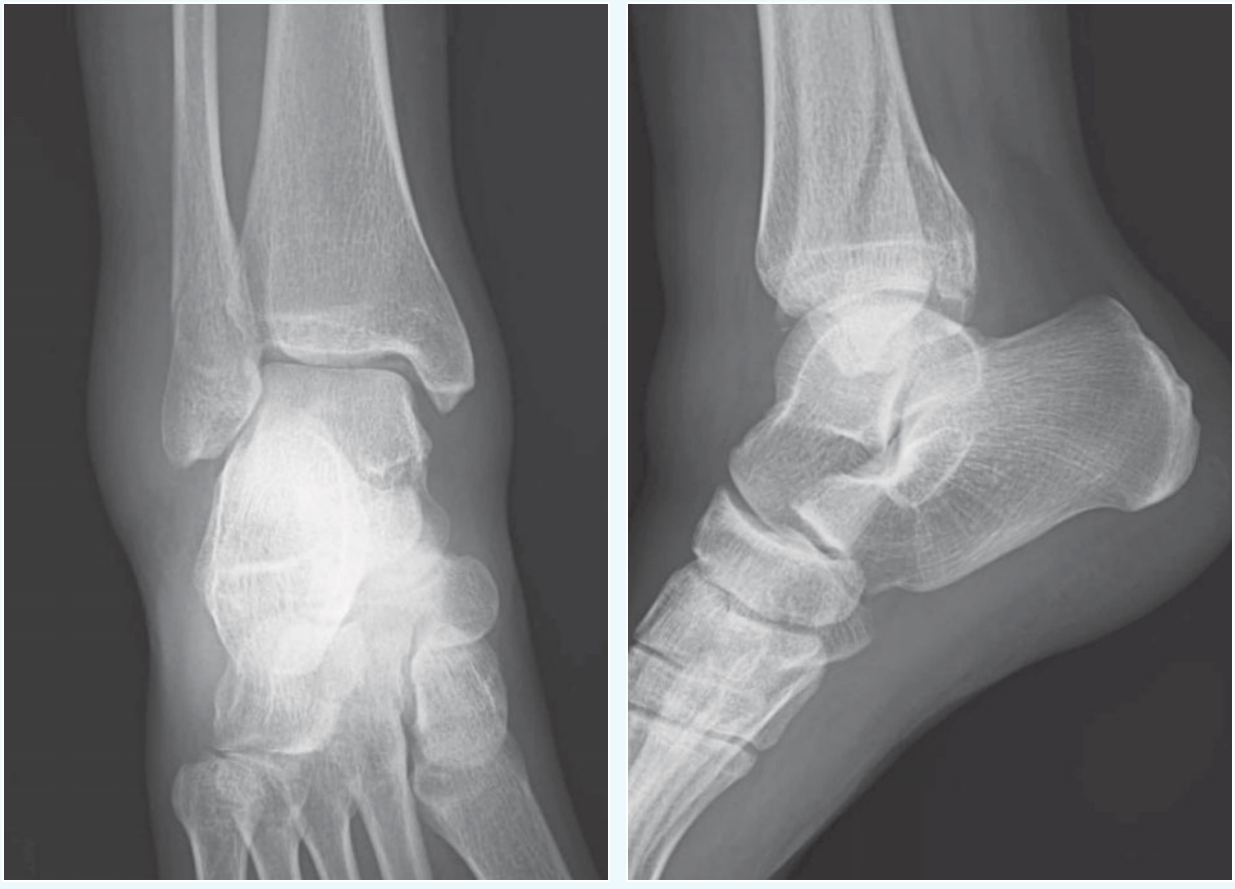
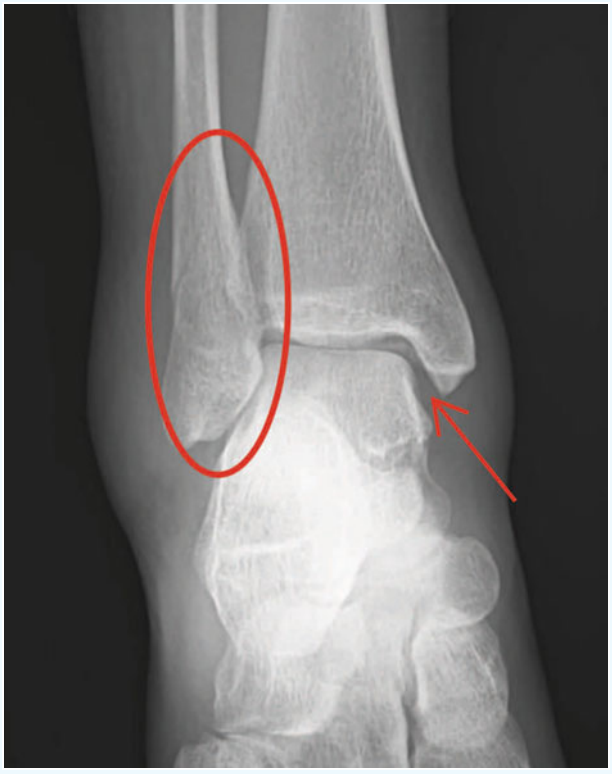


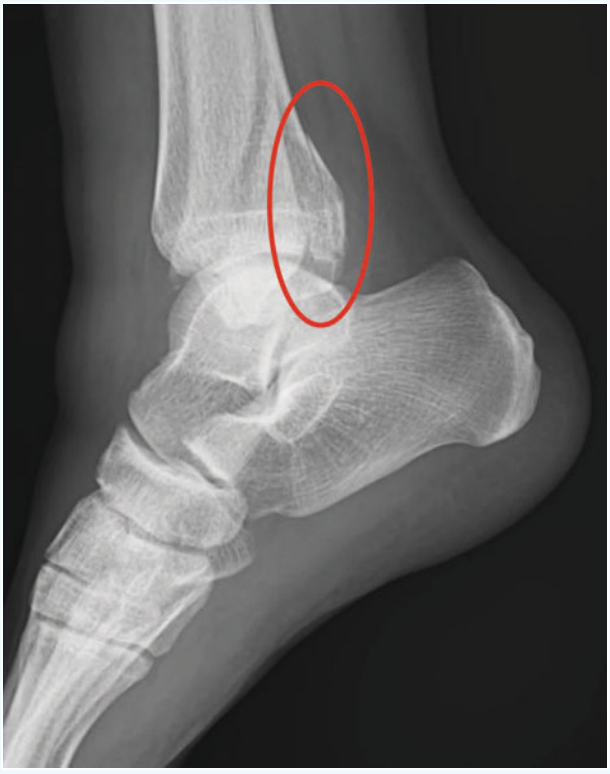
Figure 1: Initial X-ray

A 28-year-old female presents to urgent care complaining of right ankle pain after awkwardly stepping off a high curb, subsequently rolling her ankle while running outside earlier today. She is unable to bear weight on her ankle. She has no past medical history, takes no medications regularly, and has not tried any treatments since the injury. Physical exam reveals she is afebrile with normal vital signs, and she has marked tender edema to the lateral malleolus. Pain is elicited with all planes of ankle range of motion. Pulses are normal, and sensation is intact.

View the x-ray images taken and consider what your diagnosis and next steps would be. Resolution of the case is described on the following page.

Acknowledgment: Images and case provided by Experity Teleradiology (www.experityhealth.com/teleradiology).





Differential Diagnosis

- Isolated malleolar fracture
- Unstable ankle fracture
- High-grade ankle sprain
- Peroneal tendinopathy

Diagnosis

The diagnosis of an unstable ankle fracture is confirmed by radiographic findings. Images show a minimally displaced, syndesmotic spiral fibula fracture with subtle posterior malleolus involvement and possible mortise widening. This is consistent with a Weber B/C type injury. This mechanism typically involves forced supination of the foot and external rotation of the talus, often associated with ligamentous injury (e.g., anterior talofibular ligament or deltoid ligament). Instability is present if 2 or more significant injury sites exist. Bimalleolar and trimalleolar (including the posterior malleolus, seen best on lateral x-ray views) fractures are inherently unstable and require specialist referral for orthopedic surgical management.

Ligamentous injury must also be evaluated by checking the medial clear space (talus to medial malleolus) on x-ray. A medial clear space >4 mm on standard or weight-bearing views suggests deltoid ligament disruption. Weight-bearing radiographs require ≥50 body weight and are the gold standard for assessment. Bearing weight on the ankle is often intolerably painful after the initial injury; gravity stress views are an appropriate alternative. Magnetic resonance imaging/ultrasound may further delineate deltoid ligament integrity, though they do not always determine stability. Complications of unstable ankle fractures can include acute compartment syndrome as well as chronic pain and instability.

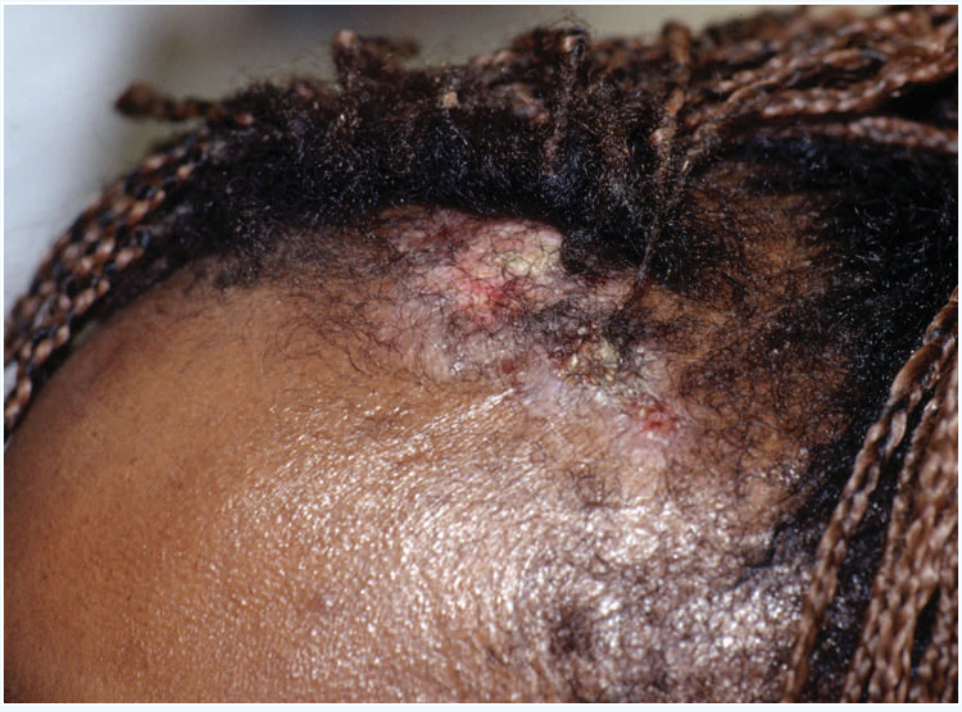
What to Look For

- Since these are often high-impact mechanisms of injury, evaluate for other injuries to the lumbar spine, head, hip or knee.
- Given the higher risk of complications from unstable ankle fractures, include a thorough neurovascular exam.

Pearls For Urgent Care Management

- Emergency conditions such as open fracture or neurovascular impairment require immediate surgical consultation and treatment in an emergency department.
- Urgent ortho consult and/or referral is recommended. Counsel patient that surgical internal fixation will likely be required if ankle is unstable.
- Acute management includes short-leg posterior splint immobilization in neutral position at 90 degrees; sugar-tong splint can be added for additional mediolateral support.
- Counsel patient to maintain non-weight-bearing status until orthopedic follow-up. ■

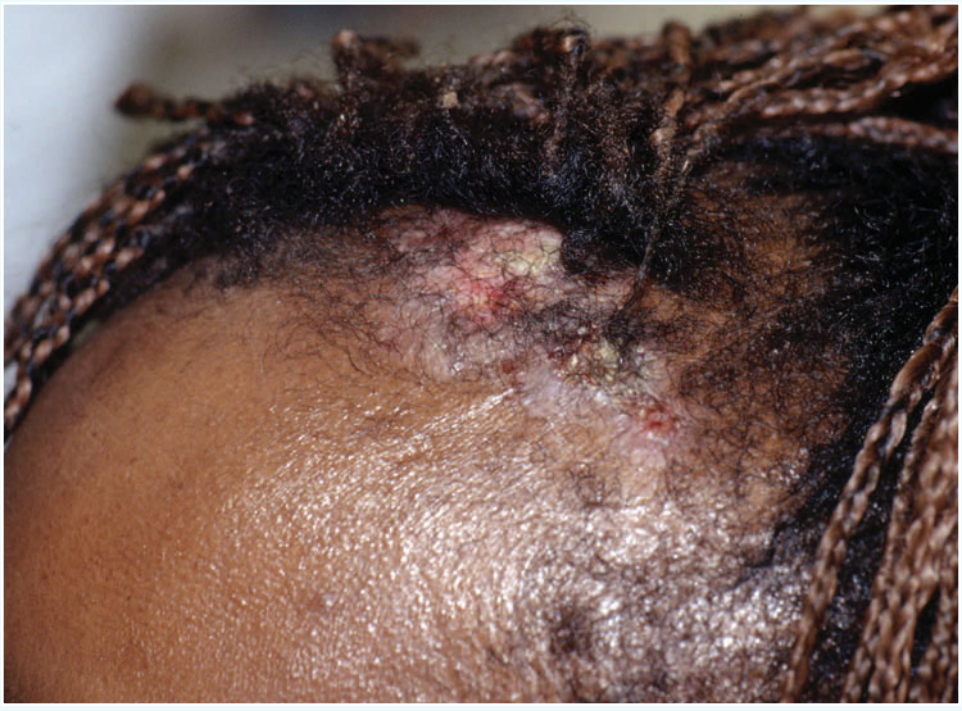
63-Year-Old Female With Growth on Scalp



A 63-year-old woman visits urgent care with the chief complaint of an asymptomatic scabby growth on her scalp that developed 10 months prior and is gradually getting larger. The patient has no systemic symptoms and is otherwise well. She has a history of working as a welder in a metal fabrication plant for the past 35 years. On dermatological examination, an eroded and crusted plaque is seen on the frontal scalp. A punch biopsy reveals strands and cords of epithelial cells with prominent nuclear atypia, squamous pearls, and pleomorphic and hyperchromatic squamous cells with variable nuclear size.

View the image taken and consider what your diagnosis and next steps would be. Resolution of the case is described on the following page.

Acknowledgment: Image and case presented by VisualDx (www.VisualDx.com/jucm).



Differential Diagnosis

- Keratoacanthoma
- Actinic keratoses
- Superficial basal cell carcinoma
- Seborrheic keratosis
- Cutaneous squamous cell carcinoma
- Psoriasis

Diagnosis

The correct diagnosis is cutaneous squamous cell carcinoma in situ (cSCC), or Bowen disease. Occupational risks for cSCC are primarily driven by chronic, long-term exposure to sun-related ultraviolet radiation (UVR) and specific chemical carcinogens. cSCC can develop on any surface of the skin, but sun-exposed sites are the most common locations. Involvement of other areas, particularly the lower legs and anogenital regions, is more common in people with darkly pigmented skin.

cSCC in situ lesions tend to grow slowly, enlarging over the course of months or years. Although clinical findings may strongly suggest a diagnosis of cSCC, histopathologic examination is necessary to confirm the diagnosis and determine factors which are important for tumor staging and prognosis.

What To Look For

- Bowen disease typically presents as an erythematous, well-demarcated, scaly patch.
- Lesions can be skin colored or hypopigmented, particularly in individuals with darkly pigmented skin.
- Unlike the inflammatory disorders that may resemble cSCC in situ, such as psoriasis or chronic eczema, cSCC in situ lesions are usually asymptomatic.
- Full skin exam: If there is concern for malignancy, patients should be given a full body skin examination that includes palpation of regional lymph nodes.

Pearls for Urgent Care Management

- Shave, punch, or excisional biopsies may be used for diagnosis. Biopsies that extend at least into the mid-reticular dermis are preferred to allow for adequate evaluation of invasive disease.
- Prompt referral to dermatology: Surgical excision (including Mohs surgical approaches depending on the location) is the preferred treatment for cSCC.
- Patients with a small, isolated lesion of Bowen disease can be treated with surgical excision, topical fluorouracil, or imiquimod. Large lesions (>3cm) may also be treated with photodynamic therapy, if available. ■

86-Year-Old With Palpitations

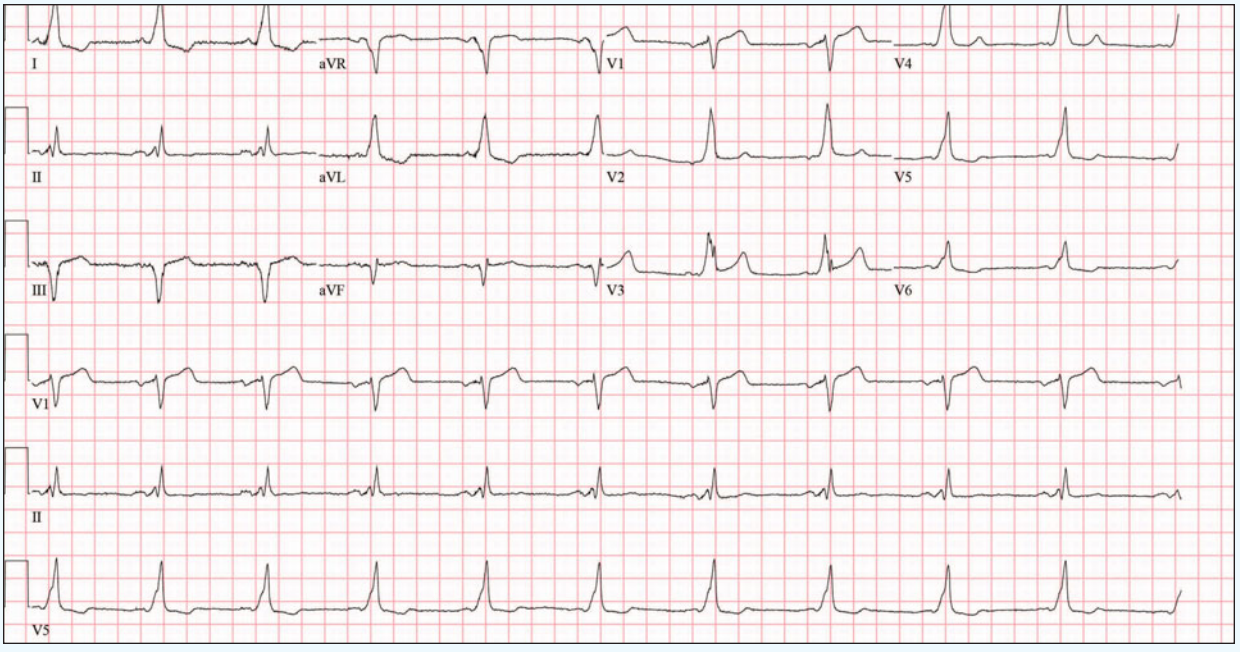


Figure 1: Initial ECG

An 86-year-old male presents to urgent care with intermittent palpitations for the past several days. He says he has a history of Wolff-Parkinson-White syndrome. An ECG is obtained.

View the ECG and consider what your diagnosis and next steps would be. Resolution of the case is described on the next page.

Case presented by Catherine Reynolds, MD, McGovern Medical School at UTHealth Houston.
Case courtesy of ECG Stampede (www.ecgstampede.com).

ECG STAMPEDE

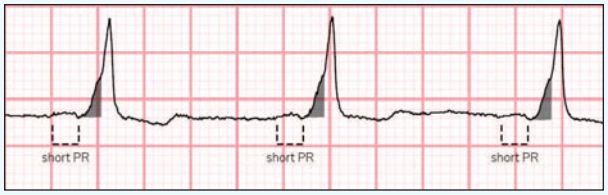


Figure 2: PR interval < 120 ms (dotted lines) and delta waves (shaded region) in the V5 rhythm strip.

Differential Diagnosis

- ST-elevation myocardial infarction
- Ventricular pre-excitation
- Junctional rhythm
- Normal sinus rhythm

Diagnosis

The diagnosis in this case is ventricular pre-excitation. The ECG reveals a normal sinus rhythm. The findings on this ECG are classic for ventricular pre-excitation: a delta wave, a shortened PR interval, and a slightly widened QRS **(Figure 2)**.

Discussion

Ventricular pre-excitation occurs when an accessory pathway connects the atria and the ventricles. When the accessory pathway conducts in an anterograde (forward) direction, bypassing the atrioventricular (AV) node, the ventricles are "pre-excited," yielding the characteristic delta wave on the ECG **(Figure 2)**.

Patients with an accessory pathway are at risk of developing reentrant tachycardias. With *orthodromic* tachycardia, conduction moves down the atrioventricular node and returns via the accessory pathway, creating a narrow-complex rhythm. With *antidromic* tachycardia, impulses travel down the accessory pathway into the ventricles and then back up through the atrioventricular node, resulting in a wide-complex rhythm **(Figure 3)**.

When arrhythmia occurs involving the accessory pathway, it is referred to as the Wolf-Parkinson-White (WPW) syndrome. These abnormal conduction pathways are formed during cardiac development and can exist in a variety of anatomical locations.

Accessory pathways can transmit atrial tachyarrhythmias to the ventricles at dangerously high rates. Unlike the AV node, which limits ventricular conduction by delaying and filtering impulses, an accessory pathway can conduct signals with little or no restraint. The highest-risk situation is atrial fibrillation in WPW syndrome, in which disorganized atrial activity is relayed rapidly and irregularly to the ventricles. Ventricular rates may reach 200–300 beats per minute, raising the risk of progression to ventricular fibrillation. Rarely, the accessory pathway conducts only retrograde (ventricle-to-atrium) while antegrade conduction continues normally through the AV node. As a result, the resting sinus-rhythm ECG lacks evidence of pre-excitation though re-entrant tachycardia may still occur.[1–3]

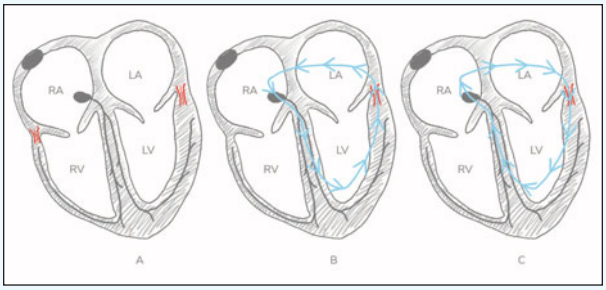


Figure 3: The red bars in panel A represent possible locations of the accessory pathway. The blue line in panel B represents orthodromic conduction (narrow complex) and the blue line in panel C represents antidromic conduction (wide complex).
RA - right atrium; RV - right ventricle; LA - left atrium; LV - left ventricle.

When pre-excitation is discovered incidentally, no urgent action needs to be taken. However, when the patient (as in this case), is symptomatic, transfer to an electrophysiology-capable center is indicated.

What To Look For

- Pre-excitation is caused by an accessory pathway that bypasses the AV node.
- Patients with accessory pathways are at risk for developing reentrant tachycardias that can be narrow (orthodromic) or wide (antidromic).
- Pre-excited atrial fibrillation may result in dangerously fast ventricular rates.

Pearls For Initial Management, Considerations For Transfer

- Symptomatic patients with evidence of pre-excitation should be transferred to a cardiac care center.
- Asymptomatic patients with evidence of pre-excitation can follow up in the outpatient setting.
- Narrow re-entrant tachycardias can be managed like supraventricular tachycardia with adenosine or cardioversion.
- Avoid AV nodal blocking agents with pre-excited atrial fibrillation, as it can precipitate ventricular fibrillation.
- Place defibrillation pads on patients awaiting transport and electrically cardiovert if unstable. ■

References

1. Wagner GS, Strauss DG. *Marriott's Practical Electrocardiography*. 12th ed. Lippincott Williams & Wilkins; 2014.
2. Benson DW, Cohen MI. Wolff-Parkinson-White syndrome: Lessons learnt and lessons remaining. *Cardiol Young*. 2017;27(S1):S62-S67. doi:10.1017/S1047951116002250
3. Moore EN, Spear JF, Boineau JP. Recent Electrophysiologic Studies on the Wolff-Parkinson-White Syndrome. *New England Journal of Medicine*. 1973;289(18):956-963. doi:10.1056/nejm197311012891808

28-Year-Old Male With Suspected Shoulder Dislocation

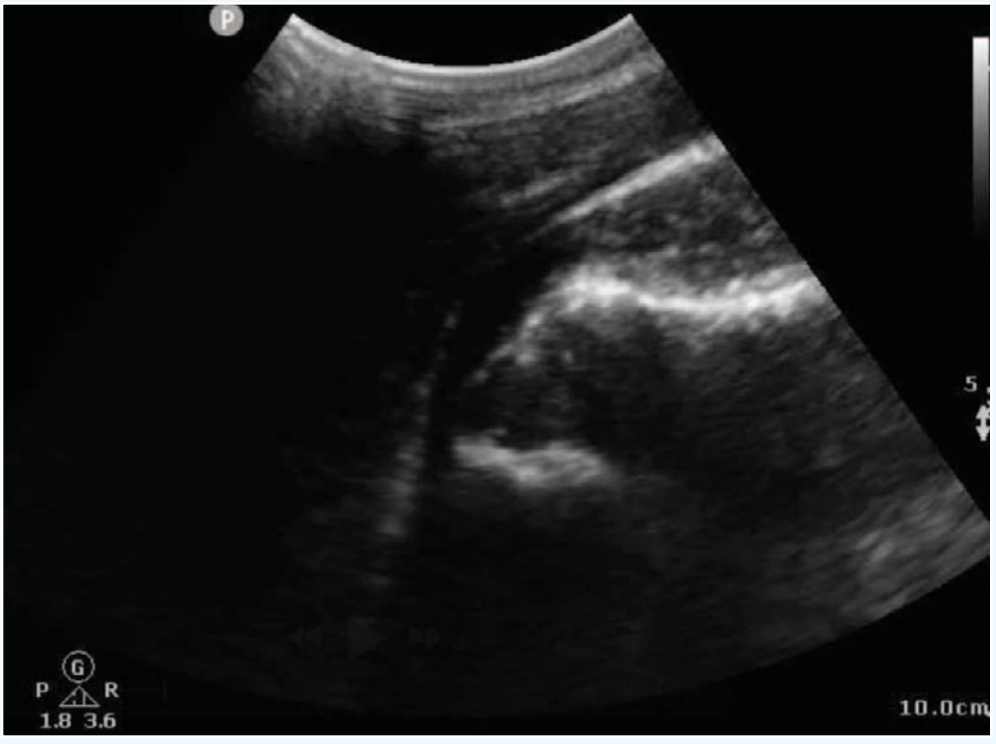


Image 1

A 28-year-old male with history of left shoulder dislocations presents to urgent care with severe left shoulder pain. He reports an inability to move the arm after injuring his shoulder while taking off his shirt. He reports feeling the shoulder "shift out of place" during the movement.

On examination, the patient is in significant discomfort. He is holding the left arm in slight abduction with left shoulder external rotation. His elbow is flexed, and his forearm is pronated. There is no obvious left upper extremity deformity. The left upper extremity is neurovascularly intact distally. Left shoulder range of motion is severely limited due to pain. Inspection and bony palpation are limited by large muscle bulk. Plain radiography is unavailable.

A point-of-care ultrasound (POCUS) of the left shoulder is performed using a posterior approach.

View the POCUS image and consider the likely diagnosis and next steps. The resolution of the case is described on the following page.

Acknowledgment: Case presented by Tatiana Havryliuk, MD, an emergency physician based in New York, New York, and the founder of Hello Sono. Case and images provided courtesy of Hello Sono (www.hellosono.com).

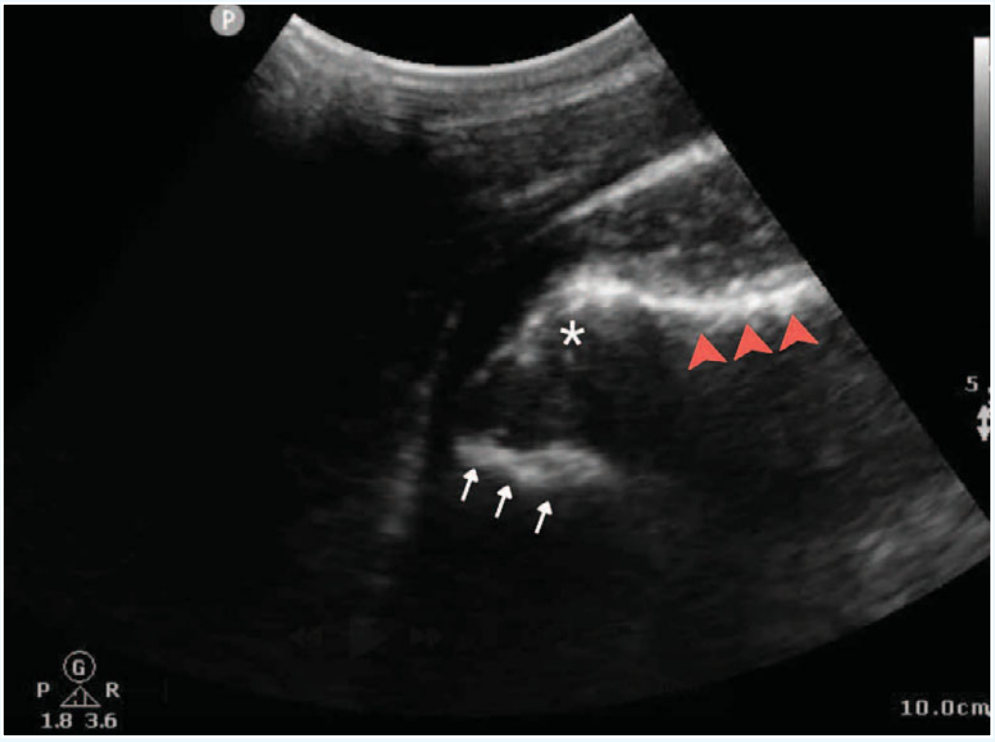


Image 2

Differential Diagnosis

- Anterior shoulder dislocation
- Anterior shoulder subluxation
- Acute labral tear
- Posterior shoulder dislocation
- Occult proximal humerus fracture
- Rotator cuff injury

Diagnosis

The correct diagnosis in this case is an anterior shoulder dislocation.

POCUS demonstrates that the humeral head (white arrows) is displaced anterior and inferior to the glenoid fossa (asterisk) **(Image 2)**. Because the posterior approach was used, the anteriorly displaced humeral head appears deep relative to the glenoid and scapular spine (coral arrow heads). No cortical disruption suggestive of fracture is identified. Note that the humeral head sits in the glenoid fossa post-reduction **(Image 3)**.

Discussion

Anterior shoulder dislocations account for approximately 95-98% of shoulder dislocations and are the most common type encountered in urgent care and emergency medicine settings.[1] The classic mechanism involves forced abduction and external rotation. However, patients with recurrent instability may experience dislocation during low-force or atraumatic activities, such as dressing or undressing, as seen in this case.

Patients with anterior shoulder dislocations typically hold the affected arm in slight abduction and external rotation. Posterior shoulder dislocations, by contrast, are associated with adduction and internal rotation and are commonly seen after seizures, electrocution, or significant anterior shoulder trauma.

POCUS is a rapid and highly accurate modality for diagnosing shoulder dislocations. The most recent and largest meta-analysis (10 studies, 1,836 assessments, 636 dislocations) found POCUS was 99.1% sensitive and 99.9% specific for shoulder dislocation (likelihood ratio [LR] + 796.2; LR – 0.01), with the posterior technique showing greater sensitivity than the anterior/lateral approach.[2]

Even novice sonographers achieved 100% sensitivity and specificity across 84 patients after brief ultrasound training in 1 prospective cohort study.[3]

POCUS also offers a significant time advantage, with one study demonstrating diagnosis a median of 43 minutes faster than standard radiography and image acquisition

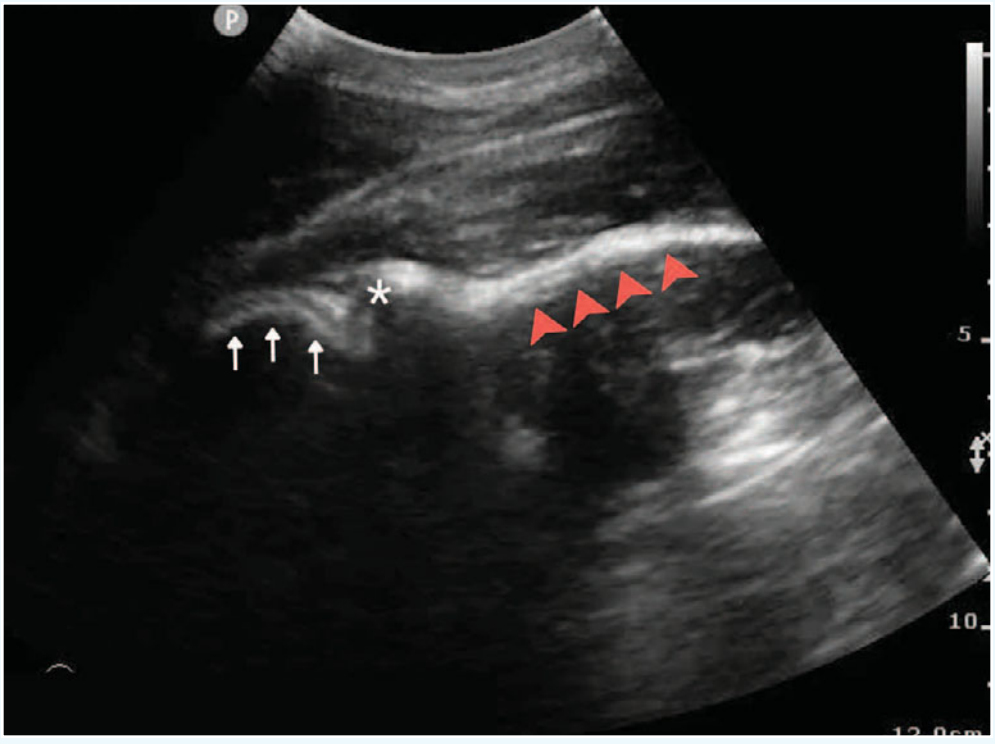


Image 3

times averaging only 19 seconds.[4]

Ultrasound allows for rapid bedside diagnosis, avoids ionizing radiation, and can be particularly valuable in urgent care settings where radiographs may be unavailable or delayed. Additionally, ultrasound may be used to confirm successful reduction immediately after the procedure.

Radiographs should still be obtained in select situations, including first-time dislocations following reduction, high-impact injuries with concern for associated fractures, or cases requiring preoperative planning.[5]

What to Look For

- Humeral head not centered over the glenoid fossa on the posterior approach.
  - **Anterior dislocation:** Humeral head appears inferior/deep to the glenoid.
  - **Posterior dislocation:** Humeral head appears superior/superficial to the glenoid.
- Compare with the contralateral shoulder when uncertain.
- Evaluate for cortical disruption suggestive of fracture.

Pearls for Urgent Care Management

- Ultrasound is highly sensitive and specific for diagnosing shoulder dislocations.
- Recurrent anterior shoulder dislocations may occur with minimal trauma.
- Small internal and external shoulder rotations can help identify the humeral head.
- POCUS can rapidly confirm successful reduction after the procedure. ■

References

1. Pulavarti RS, Symes TH, Rangan A. Surgical interventions for anterior shoulder instability in adults. *Cochrane Database Syst Rev.* 2009;(4):CD005077. doi:10.1002/14651858.CD005077.pub2.
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5. Herring SA, Kibler WB, Putukian M, et al. Initial assessment and management of select musculoskeletal injuries: a team physician consensus statement. *Med Sci Sports Exerc.* 2024;56(3):385-401. doi:10.1249/MSS.0000000000003324.