INSIGHTS IN IMAGES

CLINICAL CHALLENGE: CASE 1

In each issue, *JUCM* will challenge your diagnostic acumen with a glimpse of x-rays, electrocardiograms, and photographs of conditions that real urgent care patients have presented with.

If you would like to submit a case for consideration, please e-mail the relevant materials and presenting information to *editor@jucm.com*.

A 28-Year-Old with Foot Pain After a Fall

Figure 1.

Case

The patient is a 28-year-old female who presents with pain in her left foot after a fall of roughly 10 feet while rock-climbing. She reports that she "landed hard" with the left foot taking the full force of the impact. On exam, she had left midfoot dorsal and plantar tenderness and bruising across top of foot.

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

THE RESOLUTION


Figure 2.

Differential Diagnosis

- Acute compartment syndrome
- Cuboid fracture
- Cuneiform fracture
- Lisfranc fracture dislocation

Diagnosis

This patient was diagnosed with a Lisfranc fracture dislocation and a longitudinal cuboid fracture. *Lisfranc fracture dislocation* is a term that describes fractures and dislocations that occur at the junction between the tarsal bones of the midfoot and the metatarsals of the forefoot. The x-ray above shows a widening of the space between metatarsal 1 and metatarsal 2 and a widening of the space between cuneiform 1 and metatarsal 2. Named after Jacques Lisfranc, a field surgeon in the French army under Napoleon, the original context was as a new technique for amputation used to treat frostbite of the forefoot in soldiers on the Russian front.

Learnings/What to Look for

- Lisfranc fracture dislocations are most likely to occur while playing a sport, as the result of a motor vehicle accident, or during a fall from a height (such as while walking down steps or off a curb—or falling from a rock)
- Clinical findings include pain at the tarsal-metatarsal joints, swelling, ecchymosis, and potential joint instability

Pearls for Urgent Care Management

- Weightbearing x-rays should be considered to determine joint stability and presence of displacement
- Nondisplaced injuries may be treated conservatively (non-weightbearing with immobilization in a boot or short leg cast for 6 weeks, followed by progressive weightbearing)
- Displaced Lisfranc injuries are likely to require closed or open surgical reduction

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

CLINICAL CHALLENGE: CASE 2

A 7-Year-Old Boy with Scaly Red-Brown Papules on His Trunk

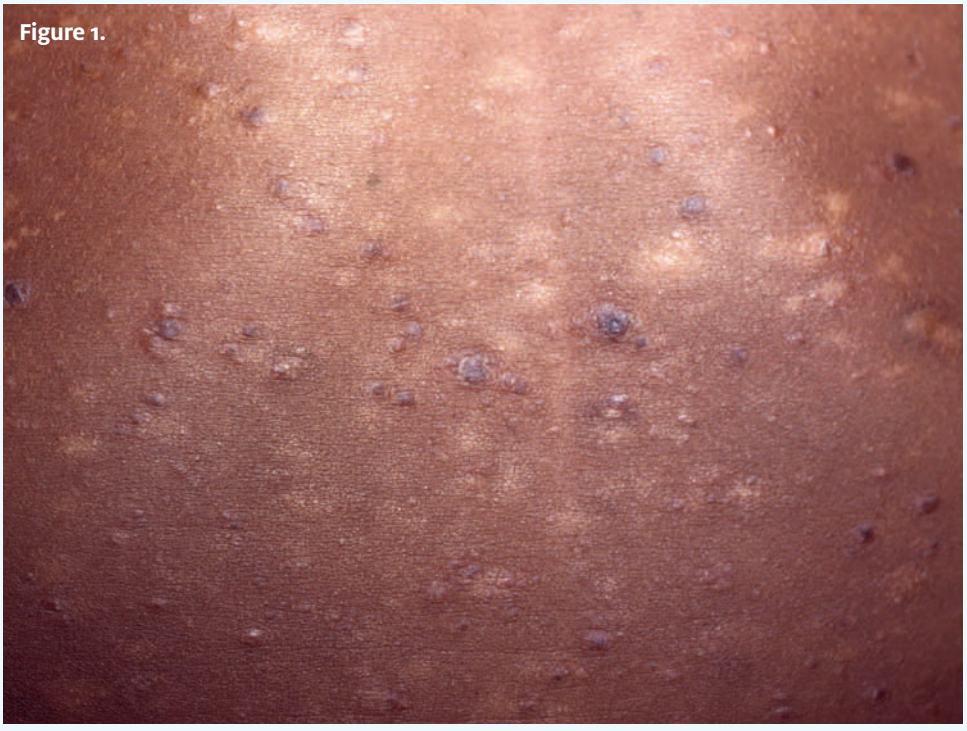

Figure 1.

Case

A 7-year-old boy is brought to your urgent care center by his mother because she's concerned about a rash of scaly papules on his trunk, some of which had crusted or healed. A few of the lesions are hemorrhagic. She notes that they appeared a few days ago, accompanied by a mild fever. She dismissed the possibility that the source could be chickenpox because her son had been vaccinated. The boy reports that the papules are "really itchy." During the exam, you detect generalized lymphadenopathy.

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

THE RESOLUTION

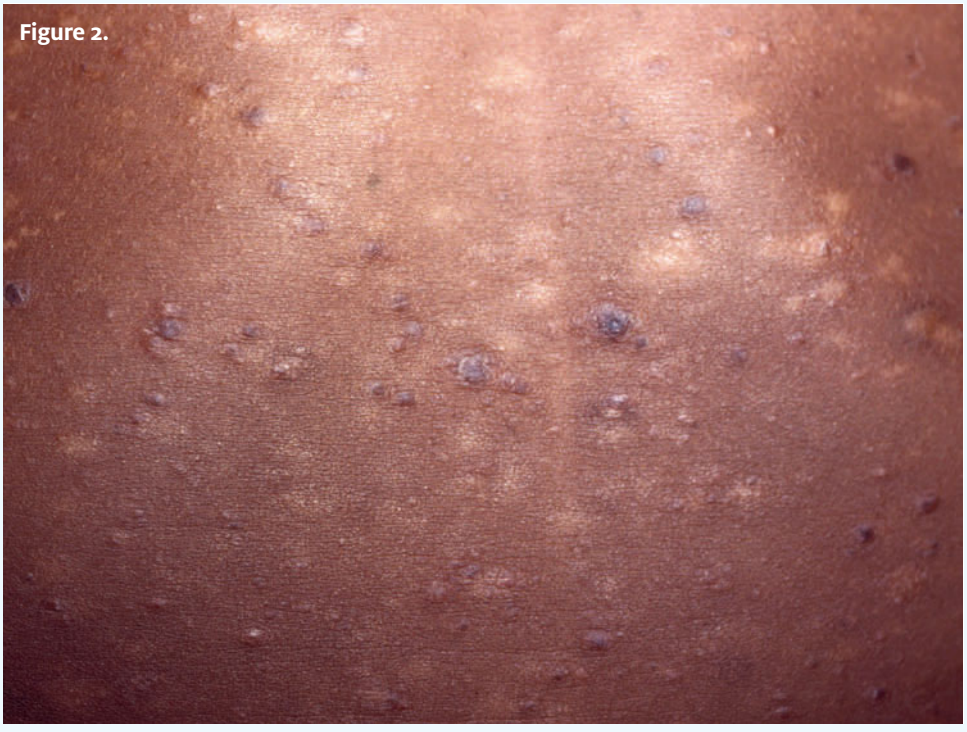
Figure 2.

Differential Diagnosis

- Scabies
- Pityriasis lichenoides et varioliformis acuta (PLEVA)
- Pityriasis rosea
- Varicella

Diagnosis

This patient was diagnosed with pityriasis lichenoides et varioliformis acuta (PLEVA), or Mucha-Habermann disease. This is a T-cell lymphoproliferative disorder characterized by acute onset of asymptomatic to mildly pruritic crops of red or brown, 2- to 3-mm macules, and papules that rapidly develop vesiculation and necrosis, sometimes becoming hemorrhagic. Ulcerated and crusted lesions are common. The crops usually recur over weeks to months before spontaneously resolving, often leaving varioliform scars. Biopsy shows CD8 lymphocytes.

Learnings/What to Look for

- PLEVA occurs most commonly occurs in male children and young adults, but can occur in both sexes, in all ages, and in all ethnicities
- Similar to pityriasis rosea, the rash is predominantly on the trunk, sometimes pruritic, and generally symmetric. However, PLEVA lesions are more red, brown, or hemorrhagic, which gives PLEVA its characteristic appearance. Generalized lymphadenopathy may be present

Pearls for Urgent Care Management

- PLEVA often resolves on its own within several weeks to several months
- Persistent cases may require treatment by a dermatologist, which could include oral antibiotics, topical or systemic steroids, immunomodulators, phototherapy, or sun exposure

Acknowledgment: *Images and case presented by VisualDx (www.VisualDx.com/JUCM).*

CLINICAL CHALLENGE: CASE 3

A 61-Year-Old Woman with a 2-Day History of Chest Pain

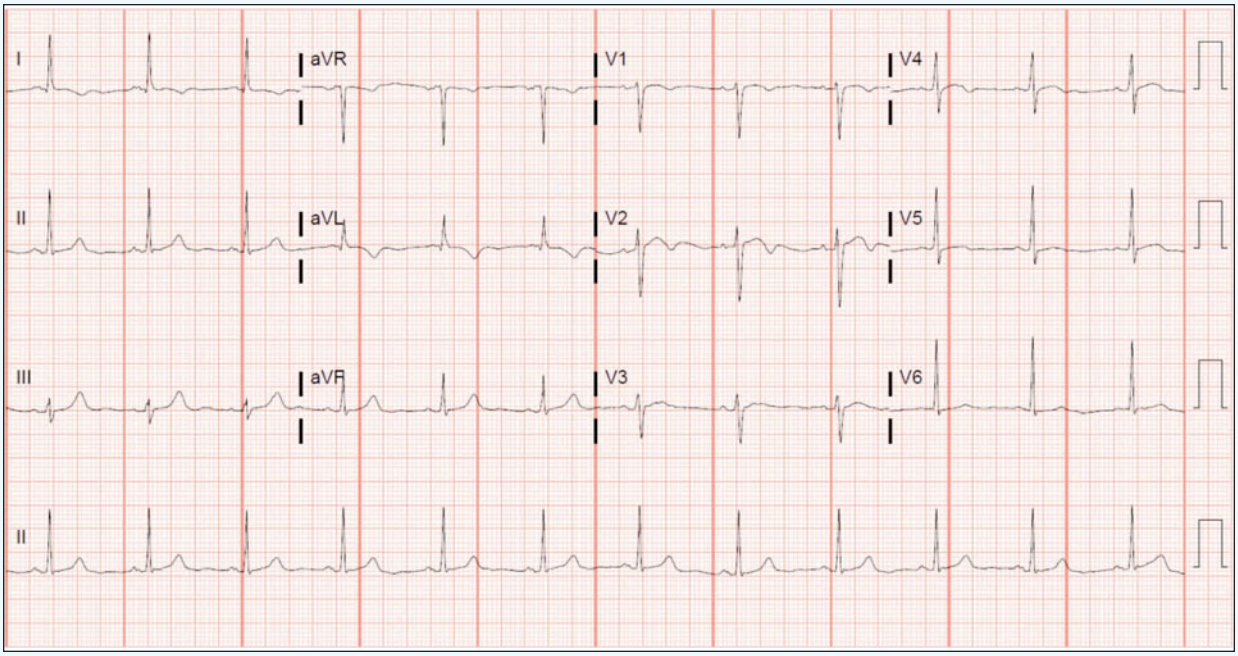

Figure 1.

A 61-year-old female presents to urgent care with chest pain for 2 days. She describes it as "mild right now" but says that it varies in intensity; it was so severe the previous night that it kept her from sleeping. Today the pain has been stuttering, lasting a couple of minutes at a time. Pain is substernal, nonradiating, and is associated with vomiting and diaphoresis. Vital signs are normal.

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

(Case presented by Benjamin Cooper, MD, McGovern Medical School, Department of Emergency Medicine, The University of Texas Health Science Center at Houston.)

THE RESOLUTION

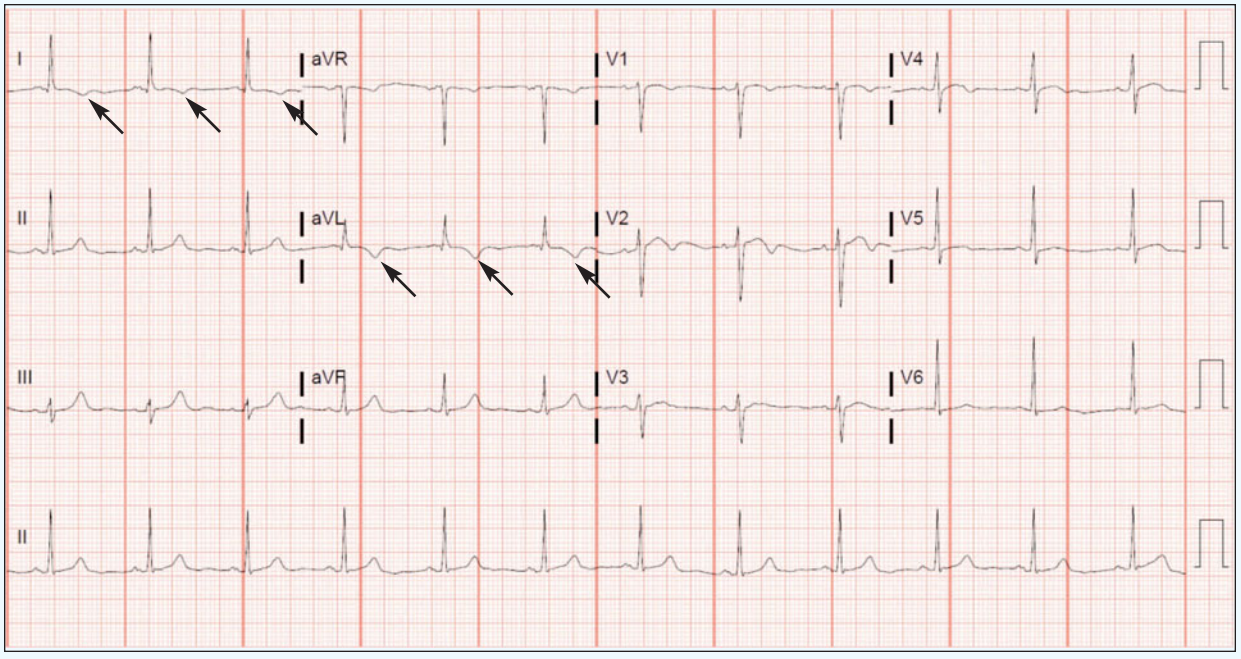

Figure 2. Symmetric T-wave inversions are seen on this ECG, illustrated in leads I and aVL with arrows.

ECG Differential Diagnosis

- ST-Elevation myocardial infarction (STEMI)
- Acute right heart strain
- Left ventricular hypertrophy (LVH)
- Ischemic T-wave inversions/myocardial ischemia
- Hypertrophic cardiomyopathy

Diagnosis

This patient was diagnosed with ischemic T-wave inversions/myocardial ischemia. The ECG reveals a sinus rhythm at a rate of 72 beats per minute. There is a normal axis and normal intervals. There are symmetric T-wave inversions in the high lateral leads (1, aVL), as well as a biphasic t-wave in V2. There are no ST elevations or depressions.

T-wave inversions in leads aVR and V1 are normal characteristics on the ECG, and an isolated T-wave inversion in lead III is a normal variant ("a flipped T is *free* in *III*"). Inverted T-waves can also be a normal finding in pediatric ECGs. New T-wave inversions when compared to old ECGs are always abnormal.

There are many causes of T-wave inversions, and ECG interpretation should occur within the clinical context of the patient's presentation; our patient is presenting with symptoms consistent with acute coronary syndrome, and the finding of symmetric T-wave inversions in contiguous anatomical leads (lateral leads) is consistent with myocardial ischemia. Dynamic T-wave inversions on serial ECGs are typically seen with acute ischemia,

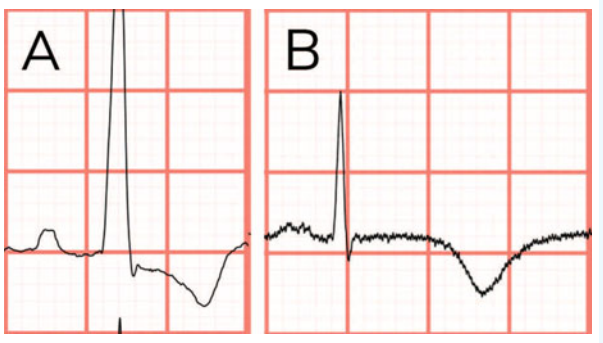

Figure 3. Comparison of "strain" T-wave inversion (panel A) and ischemic T-wave inversion (panel B) found in precordial lead V6. Note the tall QRS complex (extending 6 mm beyond the margin of the image) and an asymmetric T wave inversion characteristic of the "strain" pattern of left ventricular hypertrophy. The "strain" morphology in panel A is contrasted with the symmetric T-wave inversion in panel B, consistent with ischemia.

whereas fixed T-wave inversions are seen after infarction and are often associated with pathologic Q-waves.[1]

Other causes of T-wave inversions include persistent juvenile T-wave pattern, normal repolarization changes after a bundle branch block, left ventricular hypertrophy, acute right heart strain as often seen in pulmonary embolism, hypertrophic cardiomyopathy, takotsubo cardiomyopathy, arrhythmogenic right ventricular cardiomyopathy,[2] and cardiac memory,[3] as well as elevated intracranial pressure.

Distinguishing between ischemic T-wave inversions and T-

THE RESOLUTION

wave inversions of ventricular hypertrophy is important for accurate diagnosis. Ischemic T-waves are found in contiguous leads and tend to be symmetric and deep, whereas T-wave inversions secondary to the "strain" of left ventricular hypertrophy are found in the lateral and high lateral leads (I, aVL, V5 and V6) and are asymmetric (**Figure 3**).[4] ECGs consistent with the "strain" of left ventricular hypertrophy should also meet voltage criteria for the diagnosis.

Learnings/What to Look for

- The differential for T-wave inversions is broad and includes:
  - Juvenile T-wave pattern
  - Normal repolarization changes after a bundle branch block
  - Left ventricular hypertrophy
  - Acute right heart strain as often seen in pulmonary embolism
  - Hypertrophic cardiomyopathy
  - Takotsubo cardiomyopathy
  - Arrhythmogenic right ventricular cardiomyopathy
  - Cardiac memory
  - Elevated intracranial pressure
  - Normal in pediatric patients
- The correct interpretation of T-wave inversions relies on the clinical presentation
- Dynamic T-wave inversions on serial ECGs are consistent with acute ischemia in the setting of acute coronary syndrome
- Differentiating between ischemic T-wave inversions and the strain pattern of ventricular hypertrophy is based on the morphology of the T-wave and voltage criteria of the QRS

Pearls for Urgent Care Management

- Utilize the clinical history in tandem with the ECG to identify the cause of T-wave inversion
- Serial ECGs, as well as comparison to prior ECGs, can help guide decision making
- In the setting of acute coronary syndrome, identification of acute ischemic T-wave inversions on ECG should prompt the provider to transfer the patient to a coronary intervention-capable facility

References

1. Wagner GS, Strauss DG. *Marriott's Practical Electrocardiography*. 12th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2014.
2. Haugaa KH, Haland TF, Leren IS, et al. Arrhythmogenic right ventricular cardiomyopathy, clinical manifestations, and diagnosis. *Europace*. 2016;18(7):965–972.
3. Polito SC, Giordano JA, Cooper BL. Cardiac memory-induced T-wave inversions. *Clin Pract Cases Emerg Med*. 2020 Apr 14;4(2):181-184.
4. Wagner GS, Macfarlane P, Wellens H, et al. AHA/ACCF/HRS Recommendations for the Standardization and Interpretation of the Electrocardiogram. Part V: Electrocardiogram Changes Associated with Cardiac Chamber Hypertrophy. *Circulation*. 2009;53(11):1003-1011.

ECG STAMPEDE