



**Challenge your diagnostic acumen:** Study the following x-rays, electrocardiograms, and photographs and consider what your diagnosis might be in each case. While the images presented here are authentic, the patient cases are hypothetical. Readers are welcome to offer their own patient cases and images for consideration by contacting the editors at [editor@jujm.com](mailto:editor@jujm.com).

## 48-Year-Old With Foot Pain After Hiking



A 48-year-old man presents to urgent care complaining of pain in his right foot after hiking last weekend on a rough trail. He denies any trauma or specific injury.

Review the image 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](http://www.experityhealth.com/teleradiology)).*



### Differential Diagnosis

- Foot tendonitis
- 3rd metatarsal fracture
- Suspected 4th metatarsal stress fracture
- 2nd proximal phalange fracture

### Diagnosis

The correct diagnosis is a suspected 4th metatarsal stress fracture. The x-ray demonstrates periostitis adjacent to mid/distal 4th metatarsal. Fatigue fractures such as this are common in athletes and those in military service, which is why they are also known as “march” fractures. They may be distinguished from insufficiency fracture, which occurs in abnormal bone. Risk factors include female sex, low bone density, nutritional disorders or deficiencies, long-distance running, inappropriately short recovery time, and inadequate shoes.

### What to Look For

- Periosteal reaction/elevation may take up to 2 weeks to be detectable.
- Due to poor radiograph sensitivity, during the first few weeks after the onset of symptoms, x-rays of the affected area may look normal.

### Pearls for Urgent Care Management

- Rest and ice are the mainstays of treatment
- Consider a hard-soled shoe or cam boot to help with rest
- Non-steroidal anti-inflammatory drugs are the best agent for pain management
- Consider repeat imaging in 2-4 weeks if diagnosis is unconfirmed at the time of presentation



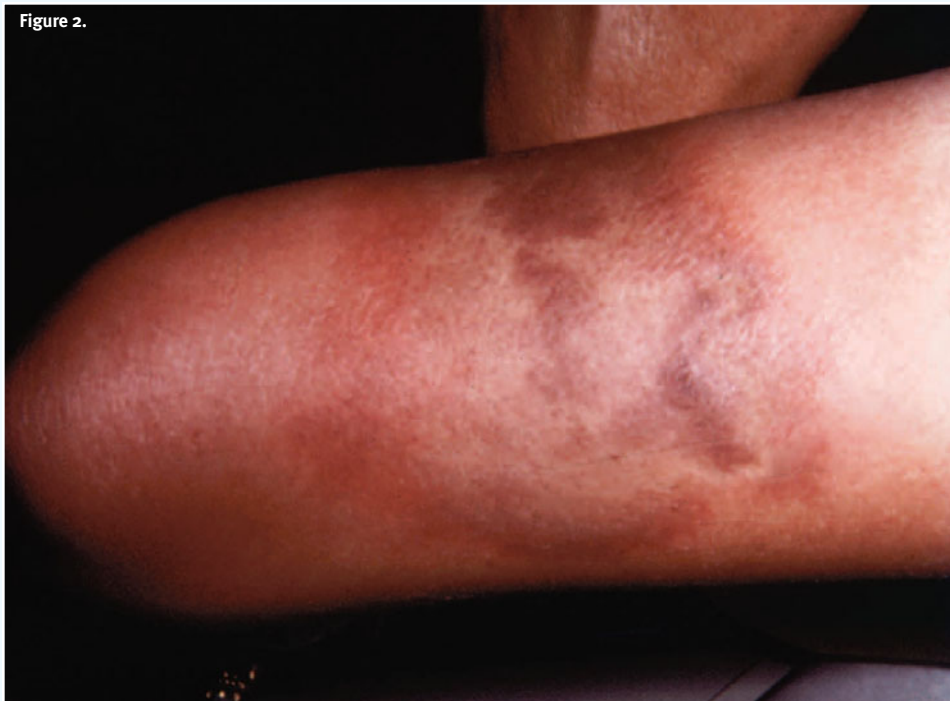
## 42-Year-Old With Stinging Sensation



A 42-year-old woman presented to urgent care early in the morning saying that she felt a stinging sensation on her arm while she was cleaning her basement the previous day. She thinks it might be an insect bite but didn't see anything. She had subsequent marked pain at the site and over the past few hours developed nausea and muscle aches. On physical examination, the patient had a temperature of 101.3°F (38.5°C). There were reddish-brown reticulate patches with intervening pallor and a rim of erythema on the posterior arm.

View the image above 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](http://www.VisualDx.com/jucm)).*



### Differential Diagnosis

- Mosquito bite
- Cellulitis
- Erythema migrans
- Recluse spider envenomation

### Diagnosis

The correct diagnosis in this case is recluse spider envenomation. *Loxosceles* spiders are typically brown in color, measure 2-3 cm from leg to leg, and exhibit a dark, violin-shaped spot on the cephalothorax. The initial spider bite is usually painless, however, it may produce a sharp, stinging sensation, and severe burning pain and pruritus develop at the bite site within 2-6 hours.

The incidence of systemic involvement is rare and do not correlate with local findings. As early as 24 hours after envenomation, fever, arthralgias, nausea, vomiting, diarrhea, rash, myalgias, and headache can develop. With more severe systemic illness, hemolysis is the predominant feature. Thrombocytopenia, disseminated intravascular coagulopathy, proteinuria, renal failure, angioedema and death have been reported.

### What to Look For

- Over time, the bite wound typically develops an erythematous halo surrounding a central hemorrhagic

vesicle. Occasionally, the central vesicle will be surrounded by an area of ecchymosis, surrounded by a ring of pallor and an outer ring of redness.

- In most cases, the lesions at the site of the bite will resolve in a week.
- However, necrosis may form, usually with the hemorrhagic vesicle becoming necrotic with an eschar by day 3-4.
- After 2-5 weeks, the eschar sloughs, leaving an ulcer that often heals by secondary intention, though some may require skin grafting.
- In severe cases, there can be progressive tissue necrosis that is particularly severe in fatty regions such as the buttocks or thighs.

### Pearls for Urgent Care Management

- For local effects, use of wound care (ice and elevation) and pain management (acetaminophen and non-steroidal anti-inflammatory drugs) are the mainstay of therapy
- Consider tetanus prophylaxis
- If signs of infection such as erythema, induration or fluctuance, treatment with antibiotics for cellulitis is indicated
- For patients with necrosis or systemic symptoms, transfer to a higher level of care is needed





# 57-Year-Old With Progressive Dyspnea

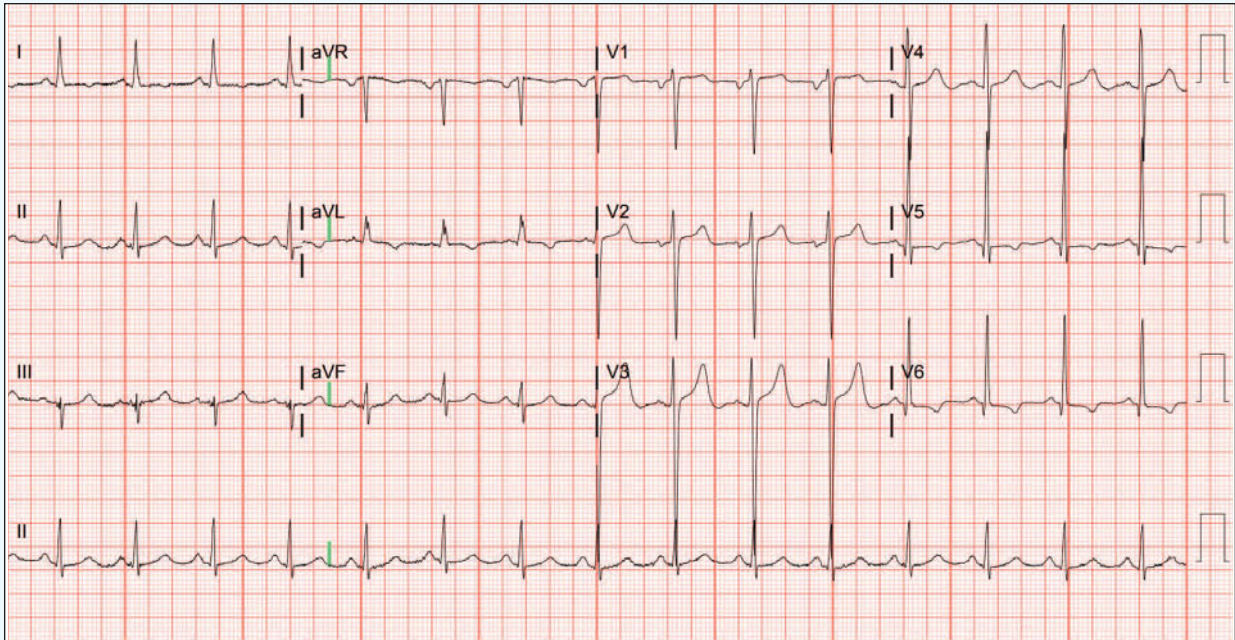


Figure 1: Initial ECG

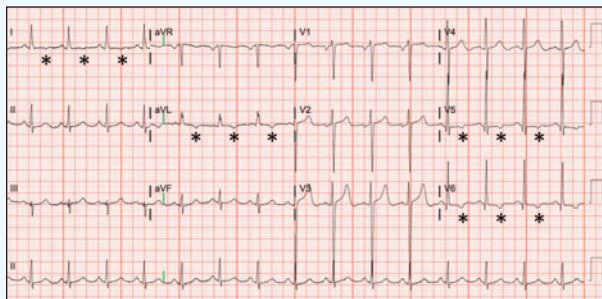
A 57-year-old man presents to urgent care with progressive dyspnea for 1 month. The patient has a history of unmanaged hypertension.

View the ECG captured above 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, The University of Texas Health Science Center at Houston, Department of Emergency Medicine.

Case courtesy of ECG Stampede ([www.ecgstampede.com](http://www.ecgstampede.com)).





**Figure 2:** LVH with asymmetric T-wave inversions and ST-depressions in the lateral leads (asterisks)

### Differential Diagnosis

- Diffuse subendocardial ischemia
- Left ventricular hypertrophy (LVH)
- ST-elevation myocardial infarction (STEMI)
- Non-ST-elevation myocardial infarction (NSTEMI)
- Wellens syndrome

### Diagnosis

The correct diagnosis in this case is left ventricular hypertrophy. The ECG reveals a sinus rhythm with a rate of 91 beats per minute, large amplitude QRS complexes, and T-wave inversions primarily in the lateral leads (I, aVL, V<sub>5</sub>, V<sub>6</sub>). The morphology and distribution of the T-wave inversions are particularly important to note as this distinction can help differentiate chronic, stable changes from acute changes that require more immediate attention.

Several electrocardiographic criteria exist for left ventricular hypertrophy, and none of them are particularly sensitive (~50%), but they are quite specific (85-90%).<sup>1</sup> Two of the more commonly cited criteria are shown in **Table 1**.

Repolarization abnormalities are commonly associated with left ventricular hypertrophy, namely asymmetric T-wave inversions and ST-depressions that predominate in the lateral leads—the so-called “strain” pattern, as with this ECG. It is not uncommon to see discordant ST changes associated with LVH, meaning ST changes in the opposite direction as the QRS complex. Notice that ST-depressions are seen in leads with up-going QRS complexes (I, II, aVL, V<sub>5</sub>, V<sub>6</sub>), and ST-elevations are seen in leads with down-going QRS complexes (V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>). While multilead ST-depression and aVR ST-elevation has been described as a

pattern strongly associated with left main or triple vessel disease (i.e. diffuse subendocardial ischemia), it is also commonly seen with LVH.<sup>2</sup>

T-wave inversions can also indicate acute ischemia, but the T-wave inversions of acute ischemia tend to be symmetric. When deep and symmetric T-waves are seen in the anterior precordial leads while the patient is chest-pain free, it may indicate critical stenosis of the left anterior descending artery—Wellens syndrome.<sup>3,4</sup>

Although there are ST-elevations in V<sub>1</sub> through V<sub>3</sub>, they do not represent STEMI. ST-elevations associated with STEMI are often straight or convex upward in appearance (ie, “tombstone” morphology). If the patient were having an acute myocardial infarction, a more acute presentation would be expected, as opposed to 1 month of progressive dyspnea. Most importantly, comparison to a prior ECG is quite helpful, if available. This patient was transferred to an emergency department and ultimately diagnosed with severe aortic stenosis.

### What to Look For

- Electrocardiographic findings of LVH include large-amplitude QRS complexes.
- LVH can have associated repolarizations abnormalities including ST-depressions and asymmetric T-wave inversions in the lateral leads (I, aVL, V<sub>5</sub>, V<sub>6</sub>).
- Compare to prior ECGs when available.

### Pearls For Initial Management, Considerations For Transfer

- If the patient is acutely symptomatic with either chest pain, shortness of breath, or with unstable vital signs (ie, hypoxia) then immediate referral to the emergency department is indicated.
- If ECG reveals classic LVH findings but is not acutely symptomatic, the patient likely needs their blood pressure controlled as hypertension is the most likely culprit; however, acute control is not necessary.

### References

1. 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. doi:10.1016/j.jacc.2008.12.016
2. Knotts RJ, Wilson JM, Kim E, Huang HD, Birnbaum Y. Diffuse ST depression with ST elevation in aVR: Is this pattern specific for global ischemia due to left main coronary artery disease? *J Electrocardiol*. 2013;46(3):240-248. doi:10.1016/j.jelectrocard.2012.12.016
3. Zwaan D, Bijn FWHM, Wellens HJJ. Characteristic electrocardiographic pattern indicating a critical stenosis high in left anterior descending coronary artery in patients admitted because of impending myocardial infarction. *Am Heart J*. 1982;103(4):730-736.
4. Kontos MC, de Lemos JA, Deitelzweig SB, et al. 2022 ACC Expert Consensus Decision Pathway on the Evaluation and Disposition of Acute Chest Pain in the Emergency Department: A Report of the American College of Cardiology Solution Set Oversight Committee. *J Am Coll Cardiol*. 2022;80(20):1925-1960. doi:10.1016/j.jacc.2022.08.750

**Table 1. Select Electrocardiographic Criteria for Left Ventricular Hypertrophy (QRS Amplitude)**

Sokolow-Lyon Criteria	$SV_1 + RV_{5,6} > 35 \text{ mm}$ OR $R_{aVL} > 11 \text{ mm}$
Cornell Criteria	$R_{aVL} + SV_3 > 28 \text{ mm}$ for men OR $> 20 \text{ mm}$ for women