AMSER Case of the Month January 2023

81-year-old male with foot pain and swelling

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Pathology Images courtesy of Chadni Desai MD, DDS

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Patient Presentation

- HPI: 81 year old M with several days of foot pain and swelling after cutting side of foot on metal fan.
- PMHx: Long-standing DM2, not on any medication
- Meds: None
- PE:
  - Vitals: T 97.7F, 104/53, HR **102**, RR 20, SpO2 94-100% on RA
  - General: Well appearing man NAD
  - Neuro: **Bilateral foot numbness**
  - Skin: **Necrotic wound extending of left 5th digit** with associated erythema extending throughout the entire dorsum of the foot

On inspection...

Pertinent Labs

- HbA1c: **10.8 (H)**

- WBC: **21.1k (H)**
- ESR: **120 (H)**
- CRP: **248 (H)**

What Imaging Should We Order?

ACR Appropriateness Criteria

Variant 1: **Suspected osteomyelitis of the foot in patients with diabetes mellitus. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography foot	Usually Appropriate	☢
CT foot with IV contrast	Usually Not Appropriate	☢
CT foot without and with IV contrast	Usually Not Appropriate	☢
CT foot without IV contrast	Usually Not Appropriate	☢
FDG-PET/CT whole body	Usually Not Appropriate	☢☢☢☢
WBC scan and sulfur colloid scan foot	Usually Not Appropriate	☢☢☢☢
WBC scan foot	Usually Not Appropriate	☢☢☢☢
MRI foot without and with IV contrast	Usually Not Appropriate	O
MRI foot without IV contrast	Usually Not Appropriate	O
3-phase bone scan and WBC scan and sulfur colloid scan foot	Usually Not Appropriate	☢☢☢☢
3-phase bone scan and WBC scan foot	Usually Not Appropriate	☢☢☢☢
3-phase bone scan and WBC scan with SPECT or SPECT/CT foot	Usually Not Appropriate	☢☢☢☢
3-phase bone scan foot	Usually Not Appropriate	☢☢☢
US foot	Usually Not Appropriate	O

This imaging was ordered by the ED provider

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Findings (unlabeled)

Findings (labeled)

Subcutaneous gas in the region of the 4th and the metatarsals

No evidence of cortical disruption or loss

NB: It can take up to 2 weeks for osseous changes to be evident on plain films even though the bone may be infected; as many as 80% of patients with osteomyelitis may present with initially normal xrays

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Consideration of Additional Imaging

Variant 2: **Soft-tissue swelling without ulcer. Suspected osteomyelitis or early neuropathic arthropathy changes of the foot in patients with diabetes mellitus. Additional imaging following radiographs.**

Procedure	Appropriateness Category	Relative Radiation Level
MRI foot without and with IV contrast	Usually Appropriate	O
MRI foot without IV contrast	Usually Appropriate	O
CT foot with IV contrast	May Be Appropriate	☢
CT foot without IV contrast	May Be Appropriate	☢
3-phase bone scan and WBC scan with SPECT or SPECT/CT foot	May Be Appropriate	☢☢☢☢
FDG-PET/CT whole body	May Be Appropriate	☢☢☢☢
WBC scan foot	May Be Appropriate	☢☢☢☢
3-phase bone scan and WBC scan foot	May Be Appropriate	☢☢☢☢
WBC scan and sulfur colloid scan foot	Usually Not Appropriate	☢☢☢☢
3-phase bone scan and WBC scan and sulfur colloid scan foot	Usually Not Appropriate	☢☢☢☢
CT foot without and with IV contrast	Usually Not Appropriate	☢
3-phase bone scan foot	Usually Not Appropriate	☢☢☢
US foot	Usually Not Appropriate	O

This imaging was considered, however the decision to proceed to OR was made with only the xrays, given concern for necrotizing soft tissue infection

Example of Osteomyelitis of 5th metatarsal and toe (another patient)

Coronal T1

T1 hypointensity: indicates **cortical destruction/marrow replacement**

High signal on fluid sensitive sequence: indicates **bone marrow edema**

Coronal PD Fat-Saturated

Sinus tract draining to skin: classic finding in osteomyelitis

Coronal PD Fat-Saturated

Case from: https://radiopaedia.org/cases/osteomyelitis-of-the-5th-metatarsal-and-toe?lang=us

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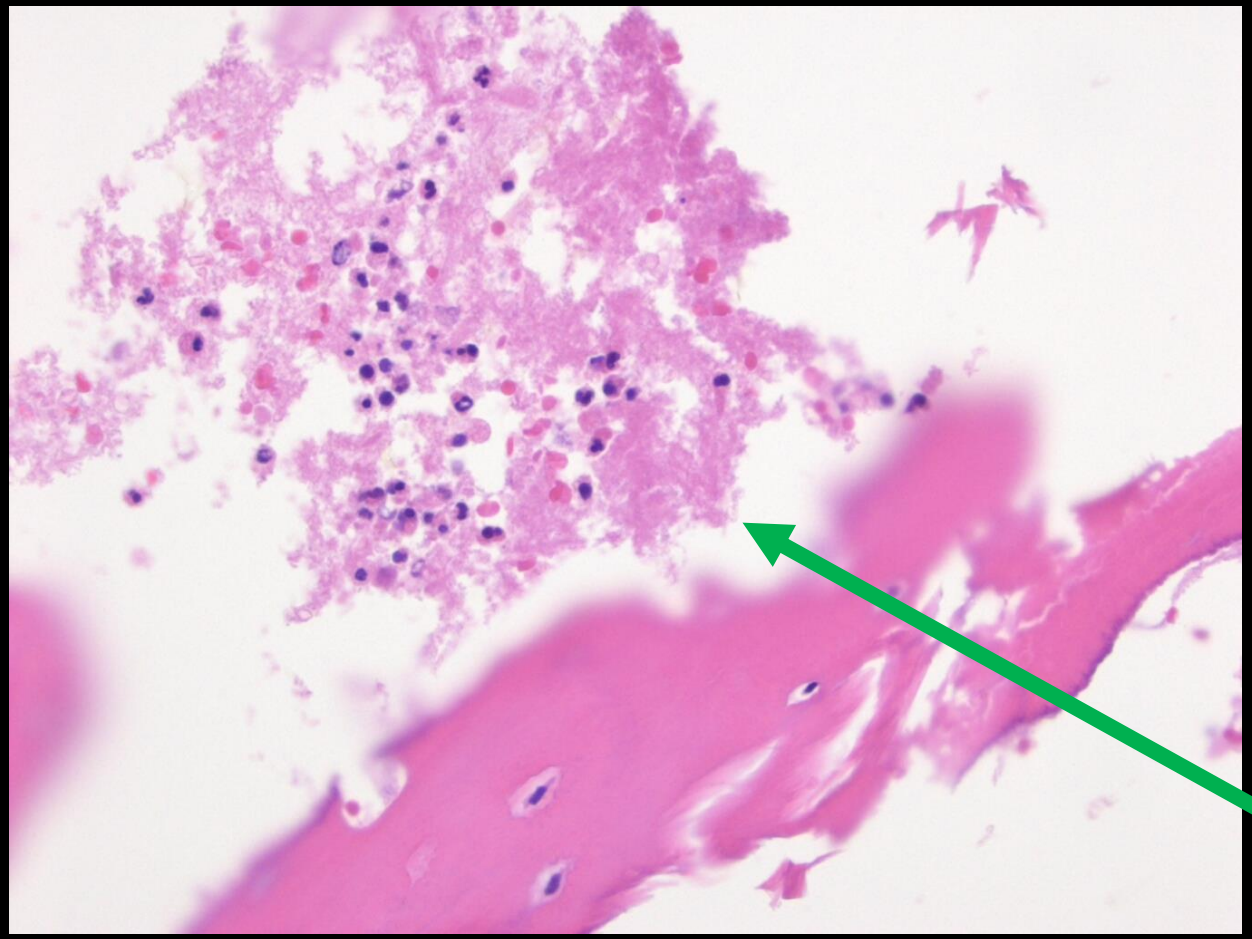
Intraoperative Pathology



FINAL PATHOLOGIC DIAGNOSIS

Fifth toe, left foot; amputation:

- Gangrenous necrosis, involving soft tissue margin.
- Acute osteomyelitis, no definite involvement of marrow margin.

Neutrophilic focus within the marrow space eroding the bone. (Hematoxylin-eosin [H&E] stain. Magnification x 40)

Pathology courtesy of Dr. Chandni Desai, MD, DDS at Uchicago Hospital

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Final Dx:

Osteomyelitis of the 5th metatarsal

Case Discussion

- Approximately 60% of diabetic foot wounds become complicated by infection
- Risk factors for diabetic foot infection are longstanding wounds (>30 days), wounds that penetrate to bone, traumatic etiology of wounds, and concomitant peripheral artery disease
- Diabetic foot osteomyelitis is a consequence of foot infections that spread to bone. It should be suspected in all cases of diabetic foot wounds, particularly those that are chronic or have overt infectious signs

Case Discussion (cont.)

- Early signs of diabetic foot infection on imaging include soft tissue swelling and blurring of normal fat planes
- Osteomyelitis is often not apparent on initial radiographs. The earliest sign of osteomyelitis is bone marrow edema, which is a radiographically silent finding
- The gold-standard for imaging of osteomyelitis is MRI
  - 90% sensitive, 80% specific
  - Low T1 signal (cortical destruction/marrow replacement) combined with high signal on fluid-sensitive sequence (bone marrow edema) is the hallmark of osteomyelitis
- Triple phase bone scan using technetium-99m is another imaging study with excellent sensitivity for osteomyelitis, even in the early phase.
  - Can help differentiate cellulitis from osteomyelitis
  - Specificity of the study is lowered in cases of trauma, malignancy, or previous surgery

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