Laudable Pus
An Introduction to Musculoskeletal Infection

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Disclosures

No relevant commercial relationships to disclose.

Objectives

At the conclusion of this session, participants should be able to:

1. To recognize the clinical, radiographic and laboratory presentation of musculoskeletal infection.
2. To understand the appropriate diagnostic workup and treatment of musculoskeletal infection.
3. To highlight five musculoskeletal infections in further detail: cellulitis, abscess, septic arthritis, osteomyelitis and necrotizing fasciitis.

Outline

- Introduction
- Five MSKL Infections
  1. Cellulitis (skin)
  2. Abscess (subq/muscle)
  3. Septic Arthritis (joint)
  4. Osteomyelitis (bone)
  5. Necrotizing Fasciitis (life threatening)
- Take Home Points

Introduction

- AC Celsus: 1st century AD
- Tetrad of Inflammation
  - Tumor = Swelling
  - Rubor = Redness
  - Calor = Warmth
  - Dolor = Pain
- Loss of function

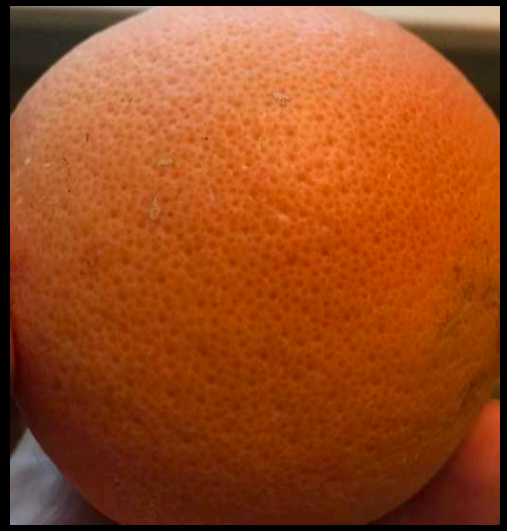
public domain

Introduction

- Labs: WBC (CBC), CRP, ESR
- Blood cultures
- Fluid or Bone Cultures
  - Consider AFB and fungal cultures in setting of immune compromise or tropical exposures

Cellulitis

- Redness (blanching erythema)
- Tenderness
- Peau D'Orange
- Strep pyogenes (superficial), Staph aureus (purulent)



Cellulitis

- Responsive to empiric antibiotics
  - nonMRSA: Keflex or dicloxacillin
  - MRSA: Bactrim
- Oral versus IV determined by severity of infection and setting
- Response should be fairly rapid
- Consider ultrasound or MRI to rule out abscess if no resolution

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Abscess

- Celsus' Tetrad
- Possible Peau D'Orange
- Fluctuance/Fluid wave
- Mass
- Staph aureus (MSSA/MRSA)

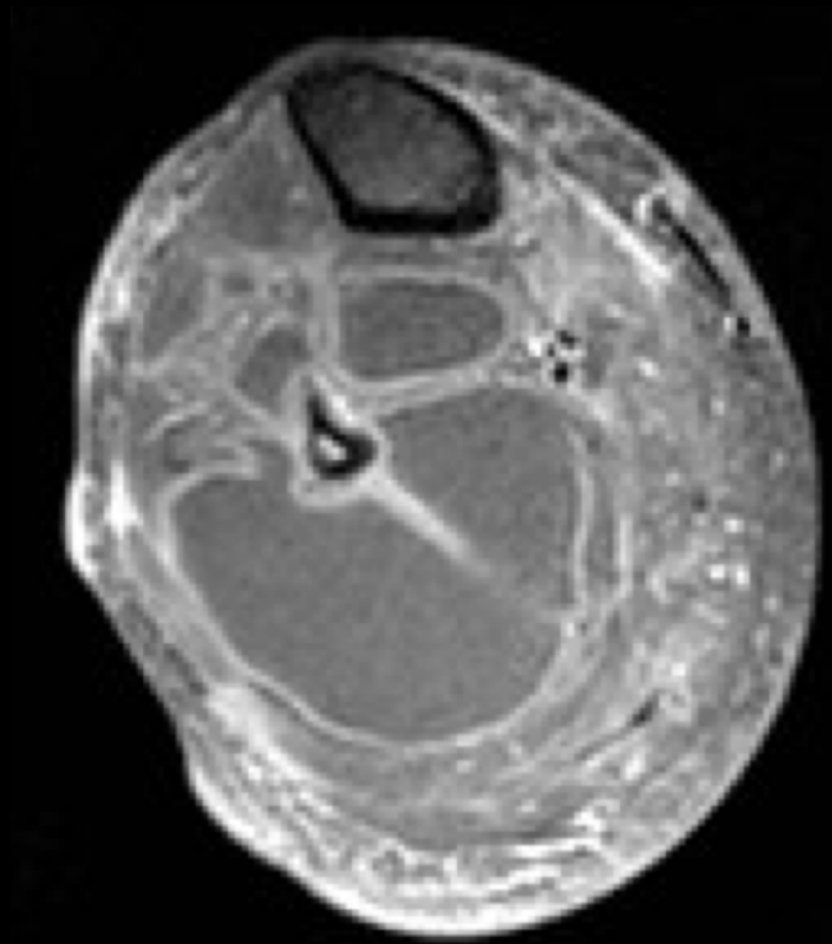
Abscess

- US can be helpful but not necessarily diagnostic
- Occasionally aspirate to confirm presence of fluid
  - Send for culture!
- RIM ENHANCEMENT on contrasted MRI

Shoulder

Abscess

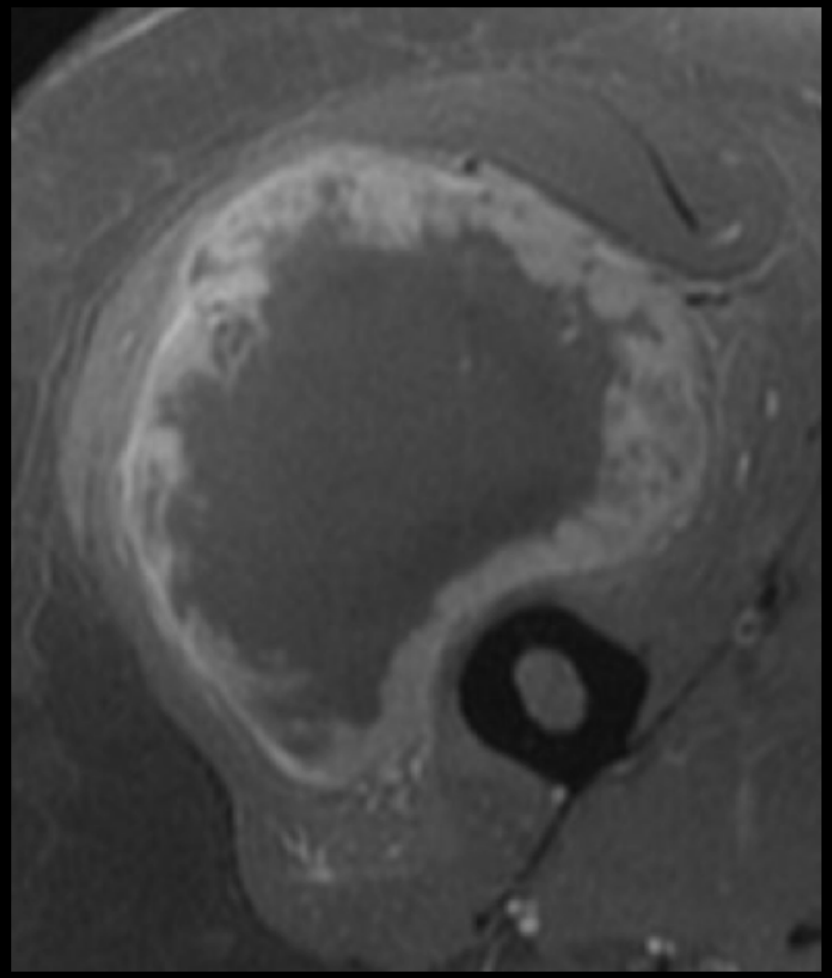
- US can be helpful but not necessarily diagnostic
- Occasionally aspirate to confirm presence of fluid
  - Send for culture!
- RIM ENHANCEMENT on contrasted MRI



Lower leg

Abscess

- US can be helpful but not necessarily diagnostic
- Occasionally aspirate to confirm presence of fluid
  - Send for culture!
- RIM ENHANCEMENT on contrasted MRI



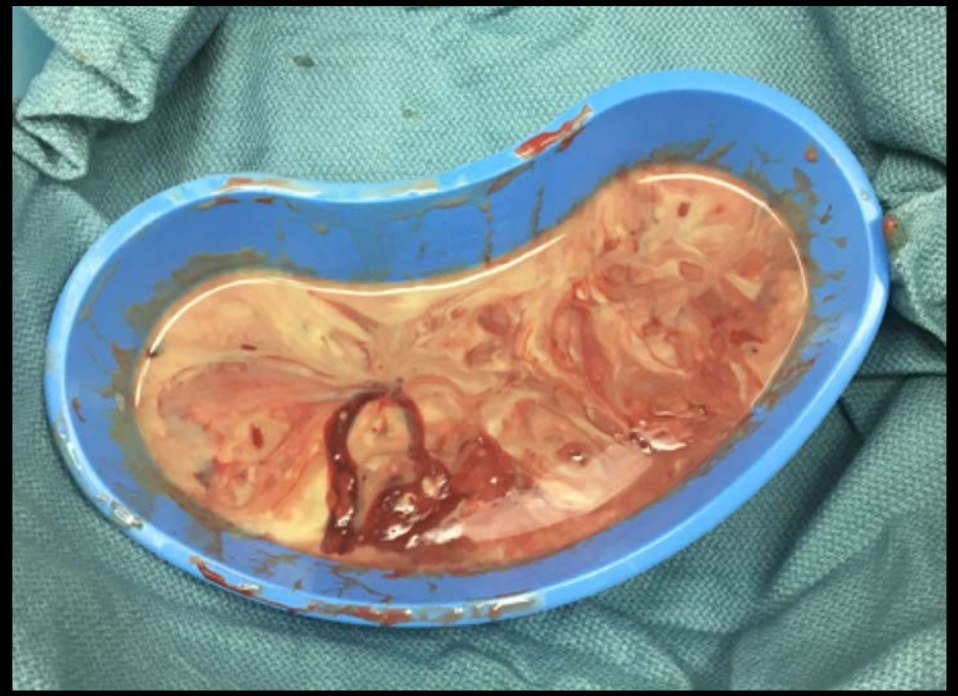
Thigh

Abscess

- The solution to pollution is…
  - ➢**A KNIFE**

- Severity, size and organism guide:
  - Setting (Bedside vs. OR)
  - Need for repeat debridement
  - Drain placement
  - Oral vs IV antibiotics

- Low threshold for ID involvement



Abscess

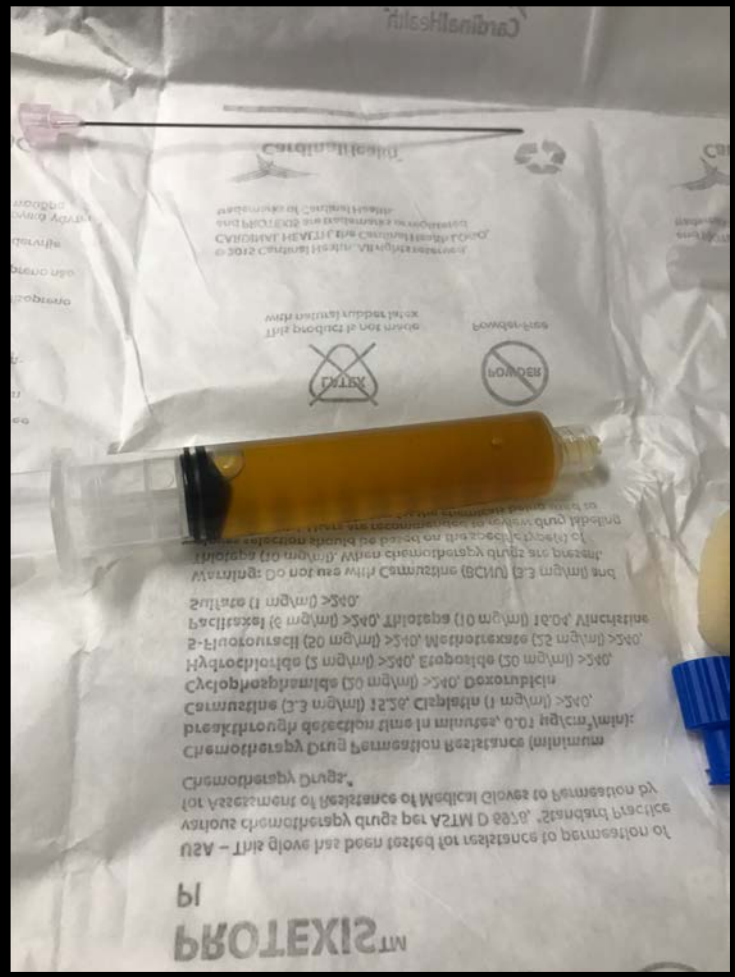
CULTURE WHAT YOU BIOPSY AND
BIOPSY WHAT YOU CULTURE

Septic Arthritis

- Redness, warmth, effusion
- Position of maximal joint volume (ex: hip - FABER)
- Painful PROM and WB
- Synovial fluid analysis is the gold standard

Septic Arthritis – Aspiration

- Cell count
  - "Total nucleated cell" counts are helpful in setting of native joints but there are no hard and fast cutoffs
    - <10K – normal
    - 10 – 50K – inflammatory arthropathy (gout)
    - >50K – septic arthritis
- Neutrophil %
- Culture (MC Staph aureus)



Septic Arthritis

- Urgent I&D is critical
- Open versus arthroscopic
- High rate of repeat debridement
- ID consult is essential for adjuvant IV therapy
- Long term risk for chronic infection, osteomyelitis and post infectious arthritis

Septic Arthritis – Prosthetic Joint Infection

- TNC cutoffs
  - Acute **<90 days** post op: >10-25K cells
  - Subacute/Chronic **>90 days** post op: >3K cells

- Treatment:
  - Acute (<3 weeks Sx): I&D with poly/liner exchange
  - Chronic (>3 weeks Sx): gold standard is a two stage revision
    - Explant/antibiotic spacer placement
    - 6 weeks IV antibiotics
    - Wait for cultures and inflammatory markers to normalize
    - Reimplantation

Septic Arthritis

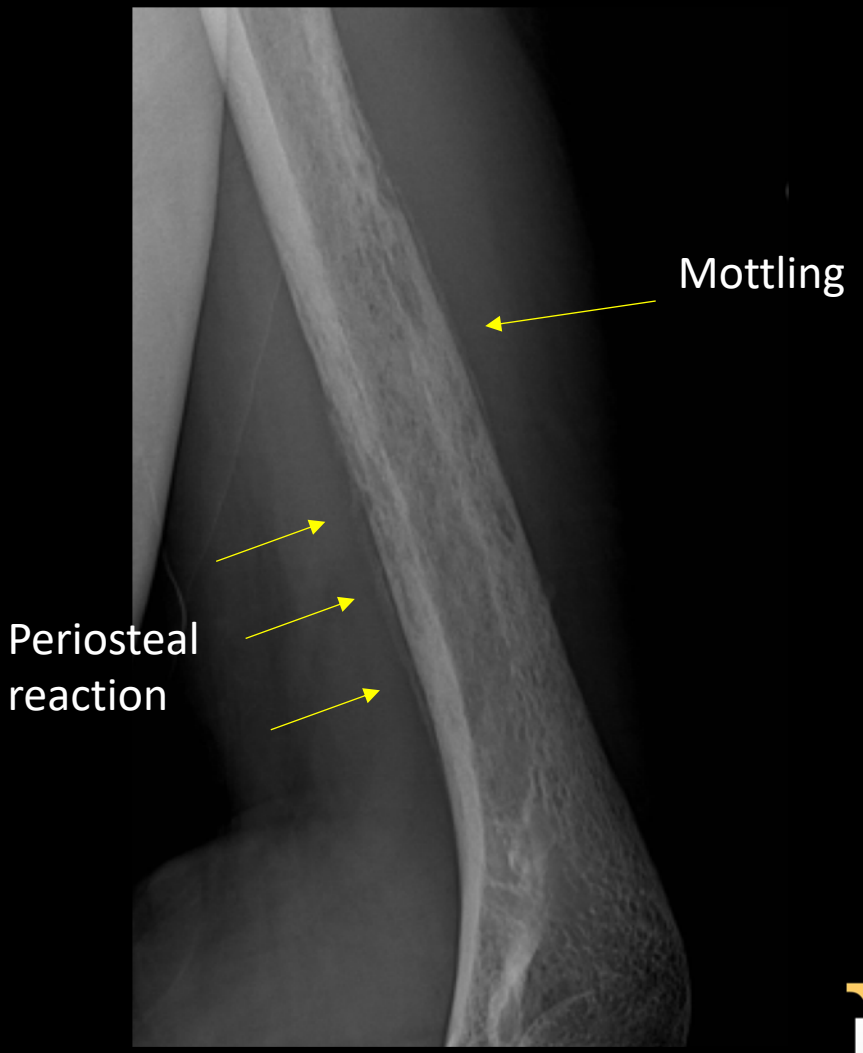
CULTURE WHAT YOU BIOPSY AND
BIOPSY WHAT YOU CULTURE

Osteomyelitis

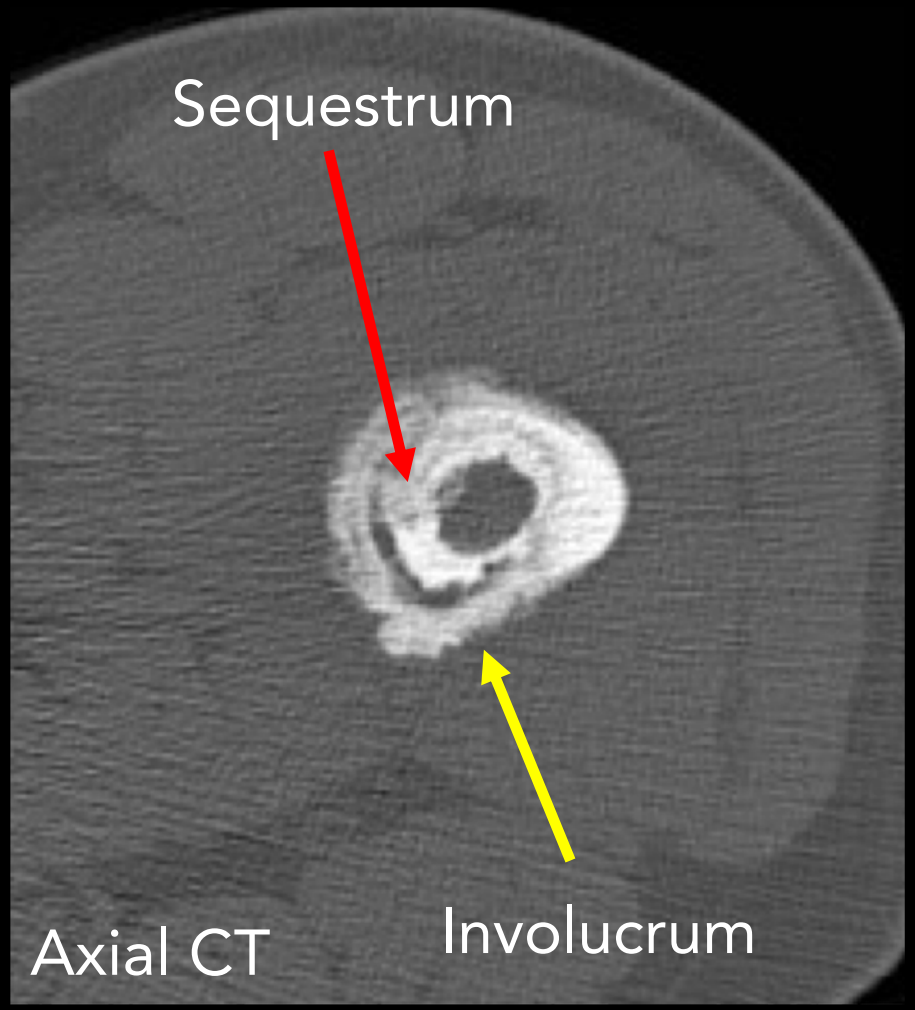
- Pain, fever, swelling
- May or may not have an inciting event
  - Open fracture
  - History of systemic infection
  - Immune compromise
- Acute (<2 weeks) vs. Chronic (draining sinus)
- Elevated inflammatory markers

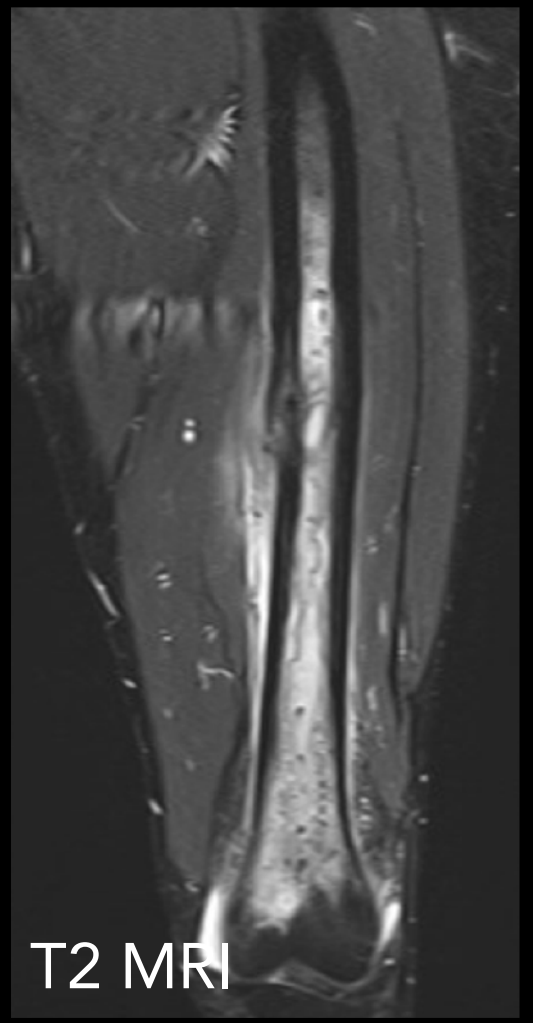
Osteomyelitis

- XR
  - Bony erosion or mottling
  - Sclerosis
  - Periosteal reaction
  - Pathologic fracture
- CT
  - Sequestrum: necrotic bone
  - Involucrum: new bone surrounding the necrotic bone
- MRI
  - High T2 signal
  - Contrast enhancement
- MRI and WBBS highly sensitive (if negative, rule out osteomyelitis)
- One of the "Great Mimickers"



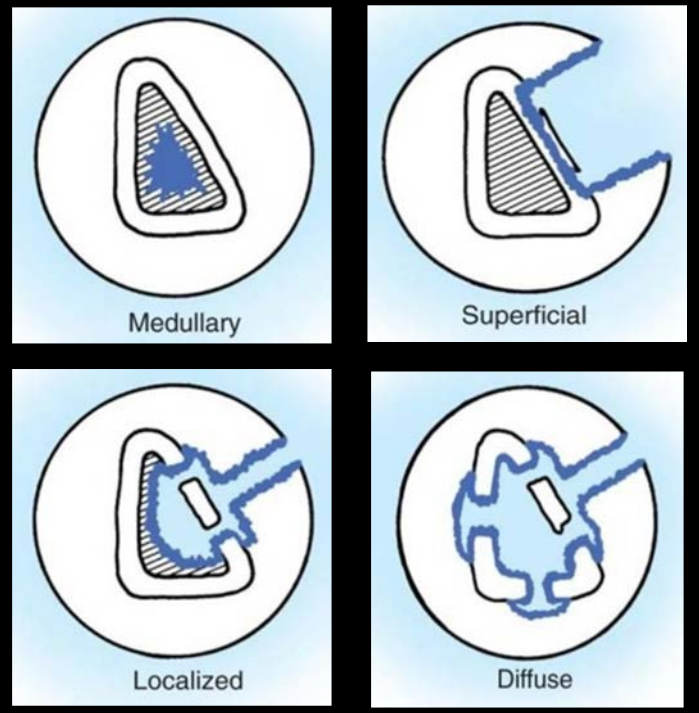
Osteomyelitis





Osteomyelitis

- Cierney-Mader classification
  - I: Medullary
  - II: Superficial
  - III: Localized
  - IV: Diffuse
- Brodie's abscess: Intramedullary abscess
- Organisms:
  - Most common: Staph aureus
  - Sickle Cell: Salmonella
  - Animal bites: Pasteurella
  - Immune compromise: Fungal
  - IV drug use: MRSA and pseudomonas
- Infectious Disease needs to be involved



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Osteomyelitis – Medullary

- Bone often inoculated by circulating bacteria
  - Spine
  - Metaphysis
- Bone biopsy or blood cultures can be helpful to determine an organism
- Antibiotics alone are sufficient so long as bone integrity is maintained
- Surgery can destabilize the bone and risk the need for hardware placement in an infected field

Osteomyelitis – Medullary

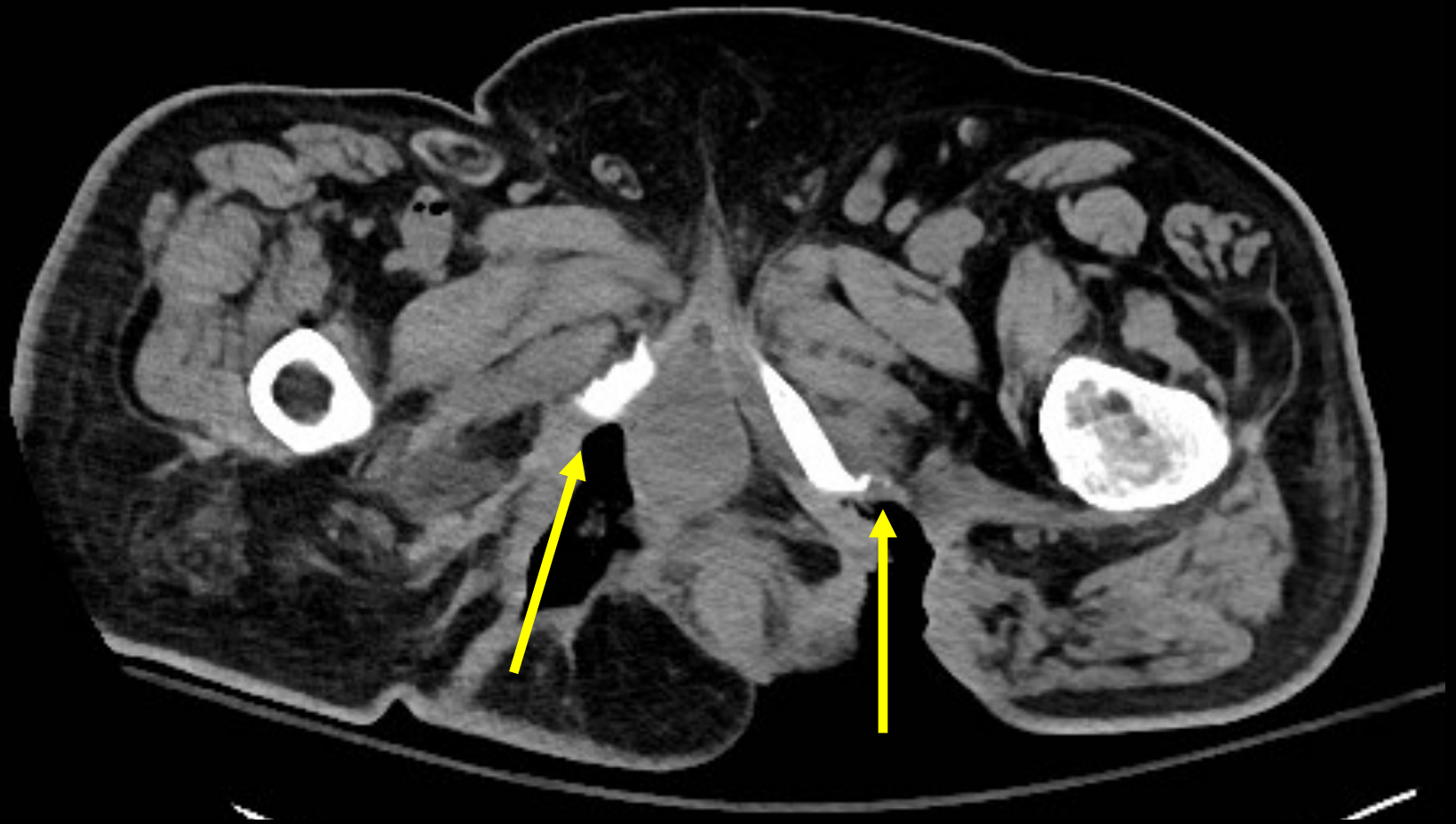
71M h/o DM with several weeks of significant R leg pain.

Osteomyelitis – Superficial

- Often in setting of chronic wound
- If bone is exposed it is infected (or "colonized")
- Treatment is multifaceted and multidisciplinary
  - Pressure relief
  - Nutritional support
  - Systemic antibiotics
  - Optimize modifiable risk factors: Glucose control, smoking, viral load
  - Bone debridement
  - Soft tissue coverage

Osteomyelitis – Superficial

Axial CT



Osteomyelitis – Localized/Diffuse

- Surgery is often warranted
- Must debride necrotic bone
- Consider local adjuvants
  - Antibiotic powders
  - Cement
  - Calcium sulphate
- Immediate versus staged stabilization

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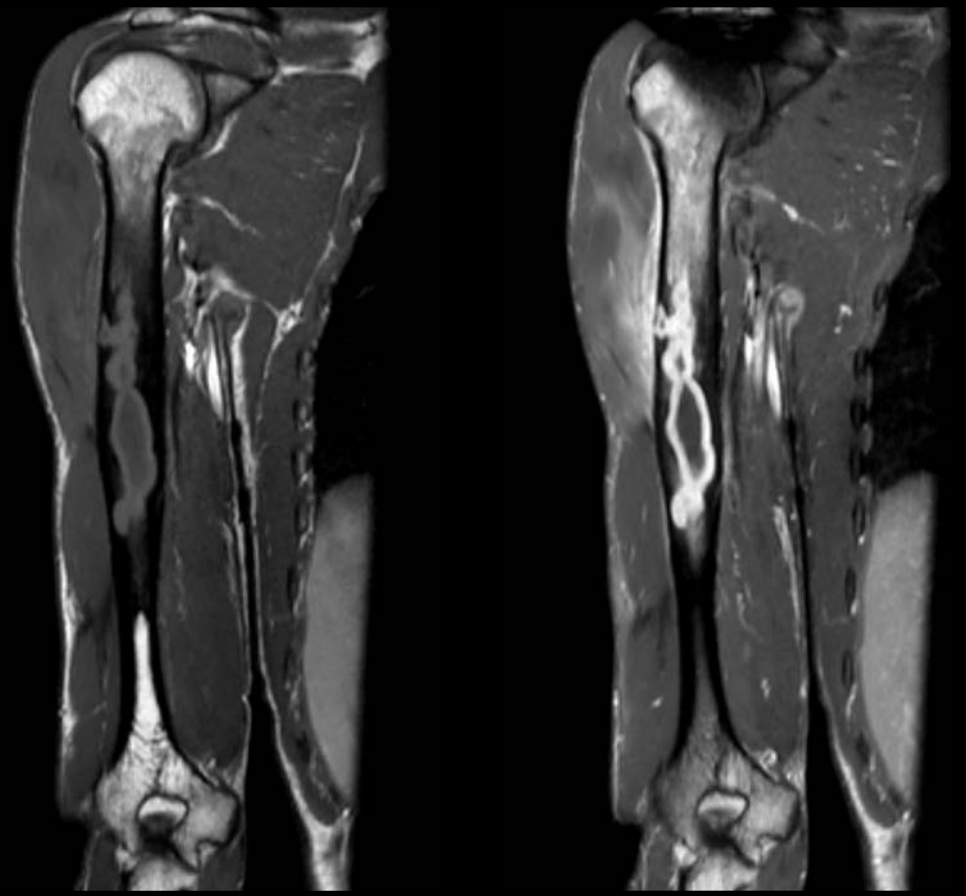

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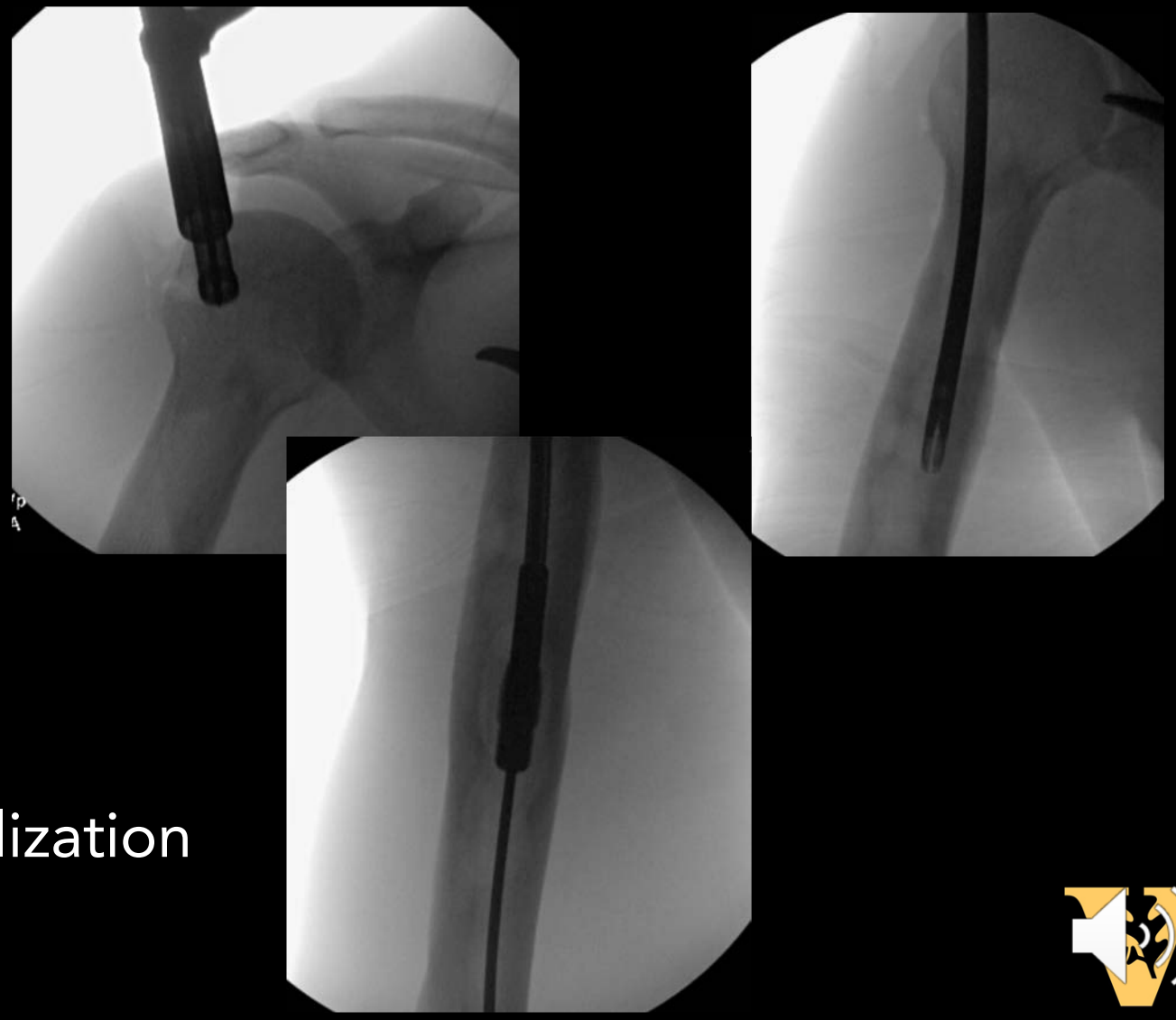

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presentation

6 months post-op

Necrotizing Fasciitis

- Pain
- Erythema
- Crepitus
    - Subcutaneous emphysema
    - “Rice Krispies”
- Ecchymosis
- Bullae
- Question the timeline (inciting event? Systemic Sx?)

Necrotizing Fasciitis

- Co-morbidities
  - Diabetes
  - Immunosuppression
  - Obesity
- Rapid spread
- Life > Limb
- Serial examinations are CRITICAL
- SIRS (systemic inflamm response) and Lab values
- XR/CT/MRI with gas on imaging
- Microbe: Classically Group A strep
  - 80-90% of cases are polymicrobial
  - Can also be caused by marine bacteria

LRINEC score

score > 6 -> 92%

- Sodium <135
- Creatinine >1.6
- Glucose >180
- Hgb <11
- WBC >25
- CRP >150

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Necrotizing Fasciitis – Treatment

- True surgical emergency
- Rapid debridement – or amputation is critical
- DON'T CLOSE THE WOUND
- Consider repeat debridement 12-24 hrs later to confirm lack of progression
- Don't wait to start broad spectrum antibiotics, include Clindamycin to cover anaerobes

Take Home Points

- MSKL infection is one of most common entities in our field
- Five MSKL Infections (continuum; anatomically based)
  1. Cellulitis (skin)
  2. Abscess (subq/muscle)
  3. Septic Arthritis (joint)
  4. Osteomyelitis (bone)
  5. Necrotizing Fasciitis (life threatening)
- Infection can mimic tumor on presentation and imaging
- Take MSKL infection seriously!

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Questions? Email me.
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Thank you

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