A case of lower back pain (vertebral osteomyelitis)

Brian Lam

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Diagnostic Radiology, RAD 4001

Dr. Stanislav Belchuk, Dr. Karthik Bande

UTHealth
The University of Texas Health Science Center at Houston
McGovern Medical School

Clinical History

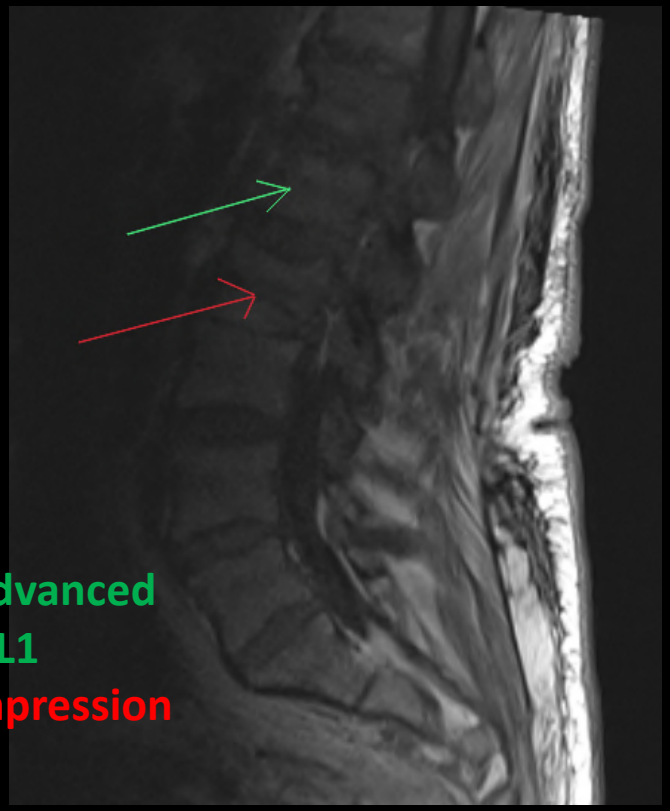
- 65 y.o. female with cirrhosis 2/2 HCV, hepatic encephalopathy, abdominal ascites, HTN, DM2, recent SDH presenting with acute lower back pain and FUO in the setting of oxacillin resistant staph species (non aureus)
- Current Symptoms:
  - Lower back pain, nausea
- Physical exam findings:
  - Stable vitals: 97.7 F, HR: 71, RR: 17, BP: 126/64
  - 1+ LE edema bilaterally
  - Skin: Jaundiced
  - Mild abdominal distention, nontender

Work up

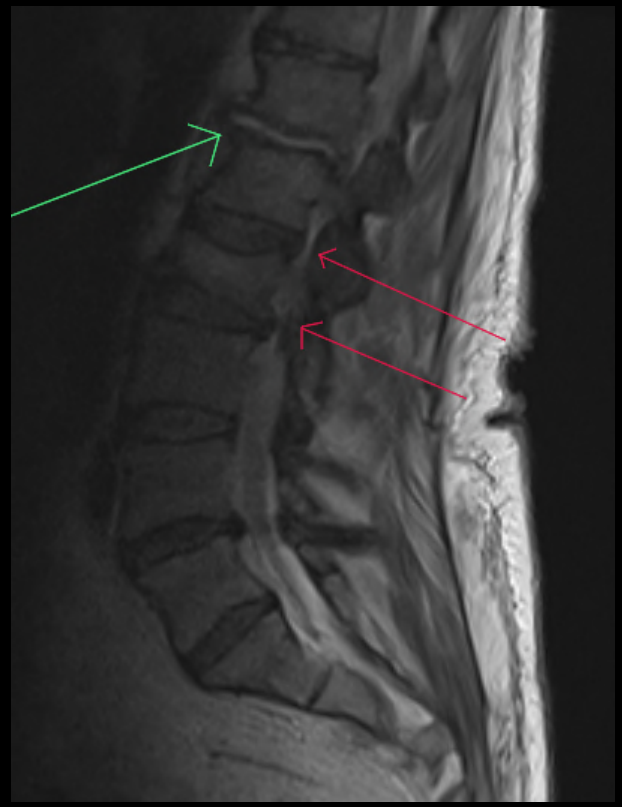
- Labs
  - BCx POS 3/4 - Staphylococcus species, not aureus
  - Repeat BCx NEG x2 s/p daptomycin
  - WBC 6.3 w/o shift
  - ESR 30, CRP 72.4
- Imaging
  - TEE, TTE negative
  - CT AP, CT Chest negative
  - MRI w/o contrast lumbar spine inconclusive
  - Bone scan negative

MRI

- 10/31/19: MRI Lumbar spine w/o contrast (T1 Flair, T2 Dixon)



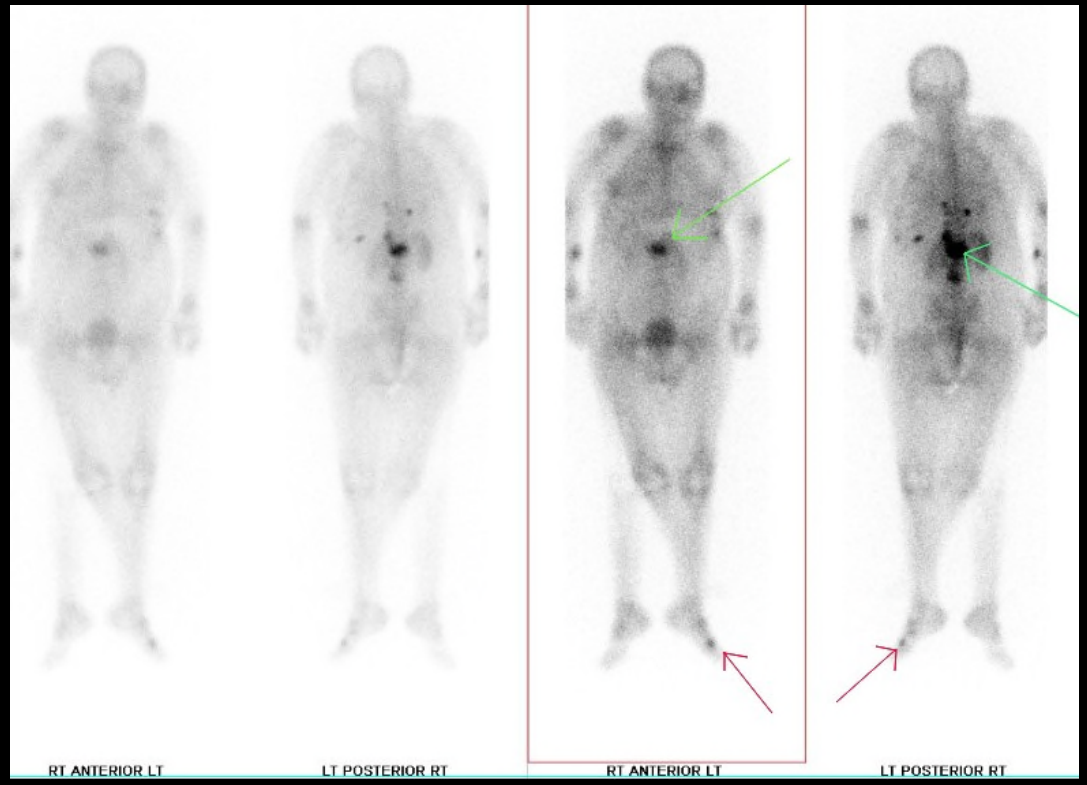
Green arrow – advanced degeneration at L1
Red arrow – compression deformity of L2



Green arrow – Hyperintense disc space at T12-L1
Red arrow – foraminal narrowing, degenerative changes

Gallium Scan

- 11/11/19: Ga-67 scan

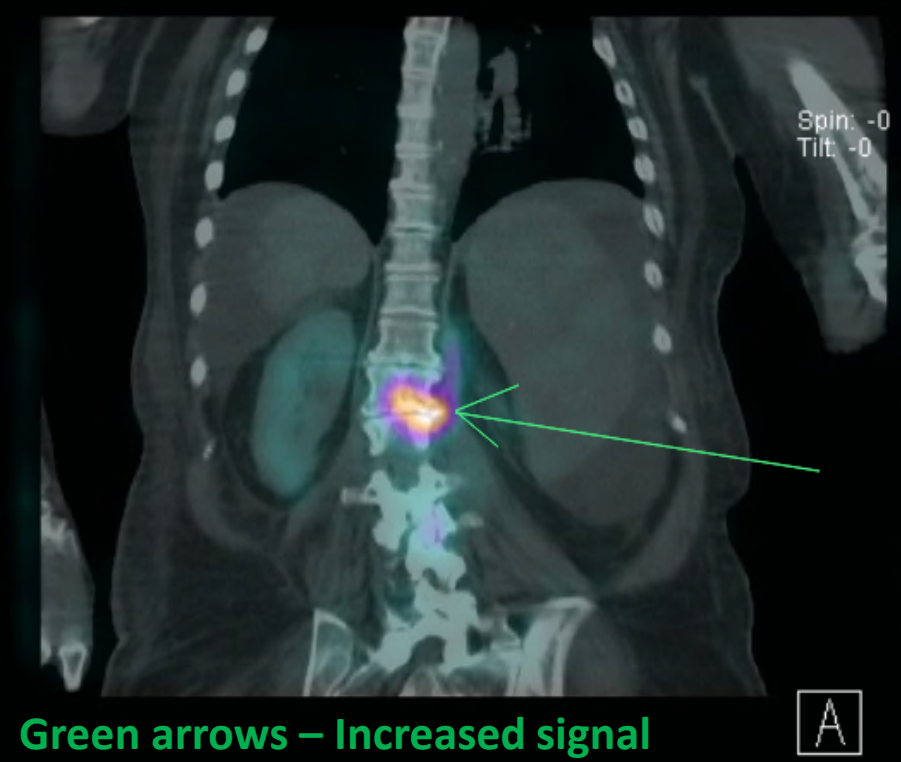


Green Arrows – Increased uptake in lumbar spine

Red Arrows – Increased signal in left foot

Abscess Localization Scan

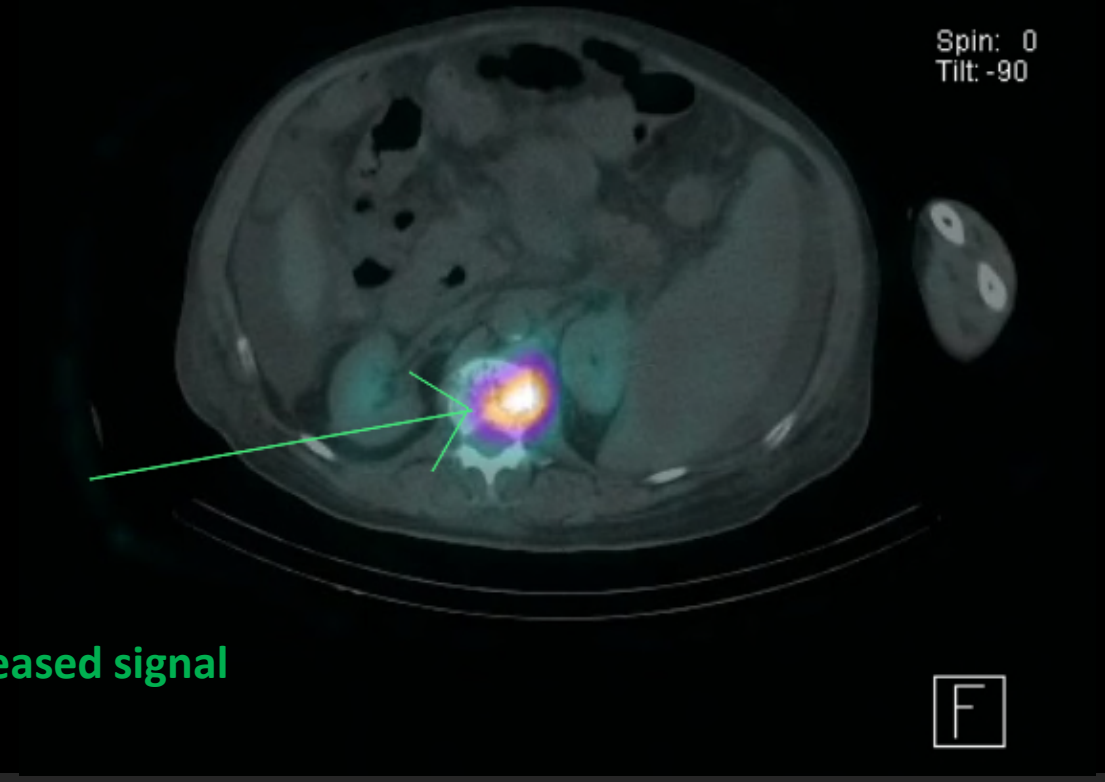
- 11/11/19: SPECT CT Scan fused (Ga-67) (coronal and sagittal views)



Green arrows – Increased signal uptake at T12-L1

Abscess Localization Scan

- 11/11/19: SPECT CT Scan fused (Ga-67) (axial view)



Green arrow – Increased signal uptake at T12-L1

Summary of Key Imaging Findings

- Patient PMH: back pain, fever of unknown origin
- Patient CC: acute lower back pain
- Imaging Findings:
  - MRI Lumbar Spine – chronic degenerative changes in multiple levels, Increased disc signal intensity T12-L1
  - Gallium scan – Increased signal in lumbar spinal segments and left foot
  - SPECT CT – Increased signal in T12-L1 segment indicating likely osteomyelitis

Differential Diagnosis

- Osteomyelitis
- Discitis
- Metastatic tumor
- Vertebral compression fracture
- Degenerative spine/disc disease
- Abscess

Diagnosis: Vertebral Osteomyelitis/Discitis

- Clinical History: new back pain with fever and persistent bacteremia
- Labs: ESR, CRP, BCx
- Imaging
  - MRI: T12-L1 disc involvement
  - Ga-67 with SPECT imaging: increased uptake in T12 and L1 vertebrae with loss of disc space
- Biopsy is recommended
  - Obtain even after abx initiated[1]

Treatment

- Pathogen-directed therapy
  - No RCTs comparing antibiotic regimens
  - Biopsy or Cultures
- Empiric Therapy
  - Common causes – staph, strep, gram-negative bacilli
  - Vancomycin + cefotaxime/ceftazidime/ceftriaxone/cefepime/ciprofloxacin
  - Anaerobes uncommon – consider coverage (metronidazole) if indicated (e.g. abdominal abscess)
- Duration – 6 weeks
  - Similar efficacy to 12 weeks[2]
- Monitor
  - ESR/CRP
  - Symptoms
  - Routine imaging unnecessary unless no improvement after treatment[3]

Discussion

- MRI with contrast is commonly used to diagnose disc infections[4]
  - High sensitivity – paraspinal/epidural inflammation (97.7%), disc enhancement (95.4%), T2 hyperintensity disc signal (93.2%)
- Ga-67 scintigraphy with SPECT can be a reliable alternative to MRI[4]
  - 91% sensitivity

Alternative/Adjunctive Imaging modalities

- Bone Scan: false positives in fractures, false negatives in early infection with bone infarction
- PET/CT with fluorodeoxyglucose (FDG): sensitivity 100%, PPV 83.3%, NPV 90.9%[5]
  - MRI more useful for abscesses
  - 80F-FDG-PET/CT more useful for metastatic infection

ACR Appropriateness Criteria[6]

Suspected osteomyelitis, septic arthritis, or soft-tissue infection (excluding spine and diabetic foot). First study.

Radiologic Procedure	Rating	Comments	RRL
X-ray area of interest	9		Varies
CT area of interest with IV contrast	1		Varies
CT area of interest without IV contrast	1		Varies
CT area of interest without and with IV contrast	1		Varies
MRI area of interest without IV contrast	1		○
MRI area of interest without and with IV contrast	1		○
US area of interest	1		○

ACR Appropriateness Criteria[6]

Soft-tissue or juxta-articular swelling. Suspected soft-tissue infection. Additional imaging following radiographs.

Radiologic Procedure	Rating	Comments	RRL
MRI area of interest without and with IV contrast	9	Radiographs and MRI are both indicated and complementary. This procedure provides better delineation of fluid collection and areas of necrosis with contrast.	○
MRI area of interest without IV contrast	7	This procedure is an alternative to MRI without and with contrast if contrast is contraindicated.	○
CT area of interest with IV contrast	6	Contrast is preferred to help with soft-tissue evaluation if it can be given.	Varies
US area of interest	5	This procedure may be useful following radiographs for evaluation of juxta-articular regions.	○
CT area of interest without IV contrast	4		Varies
CT area of interest without and with IV contrast	1		Varies

Soft-tissue or juxta-articular swelling with a history of prior surgery. Suspected osteomyelitis or septic arthritis. Additional imaging following radiographs.

Radiologic Procedure	Rating	Comments	RRL
Aspiration area of interest	9	This procedure is recommended if there is concern for septic arthritis.	Varies
MRI area of interest without and with IV contrast	9	This procedure is recommended for evaluation of osteomyelitis and extent of infection. It may be complementary to aspiration for evaluation of septic arthritis. Contrast is preferred if not contraindicated.	○
MRI area of interest without IV contrast	7	This procedure is recommended for evaluation of osteomyelitis and extent of infection. It may be complementary to aspiration for evaluation of septic arthritis. Contrast is preferred if not contraindicated.	○
CT area of interest with IV contrast	6	This procedure may be helpful if MRI is contraindicated or extensive MRI artifact from metal is present.	Varies
CT area of interest without IV contrast	5	This procedure may be helpful if MRI is contraindicated or extensive MRI artifact from metal is present.	Varies
Labeled leukocyte scan (In-111 or Tc-99m) and Tc-99m sulfur colloid marrow scan area of interest	5	This procedure may be appropriate but there was disagreement among panel members on the appropriateness rating as defined by the panel's median rating.	☢☢☢☢
Labeled leukocyte scan (In-111 or Tc-99m) area of interest	2		☢☢☢☢
Tc-99m three-phase bone scan and labeled leukocyte scan (In-111 or Tc-99m) area of interest	2		☢☢☢☢
CT area of interest without and with IV contrast	1		Varies
US area of interest	1		○
Tc-99m three-phase bone scan area of interest	1		☢☢☢
Tc-99m three-phase bone scan and labeled leukocyte scan (In-111 or Tc-99m) and Tc-99m sulfur colloid marrow scan area of interest	1		☢☢☢☢
FDG-PET/CT area of interest	1	This is promising new technology but data are limited.	☢☢☢☢

Cost Estimates (Memorial Hermann TMC)

Mri Spine Lumbar W/O Con	$2,136
Mri Spine Lumbar Wo/W Con	$2,767
Bone Scan Three Phase Stu	$1,198
Tumor Localization Spect	$1,443
Chest Xray Exam 1 View	$246
Chest Xray Exam 2 Views	$274

Example of imaging/procedural costs for uninsured patients at Memorial Hermann TMC.[7]

Take Home Points

- MRI is the recommended imaging modality for vertebral osteomyelitis
- Radioisotope studies may be useful for confirmation
  - Bone scan
  - Gallium studies
  - FDG
- Routine follow up imaging is not always necessary

References

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