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ORTHOPAEDIC SURGERY

Diagnosis of osteomyelitis

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Orthopaedic Surgery

May 9, 2015



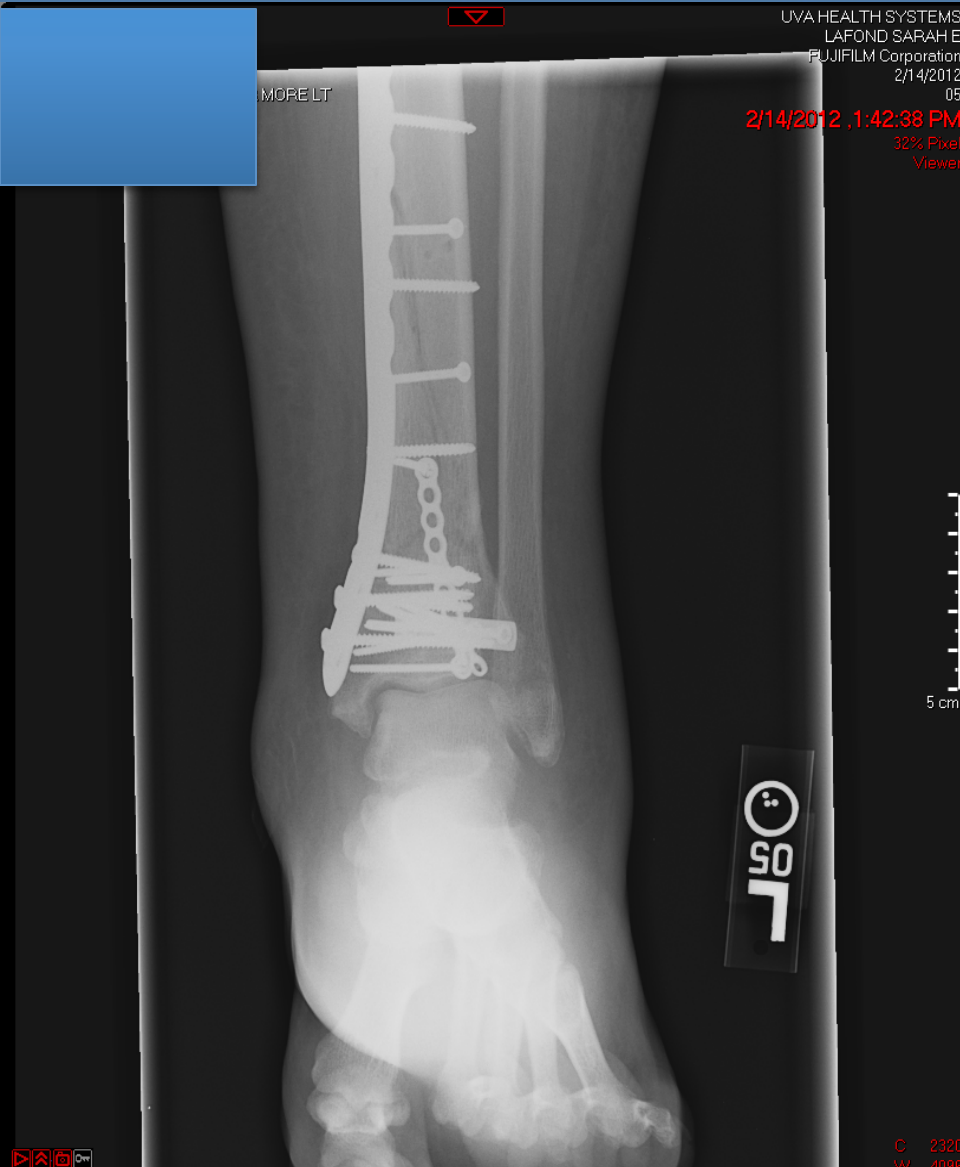


Pilon fracture





Pilon fracture





Pilon fracture – Hardware removal

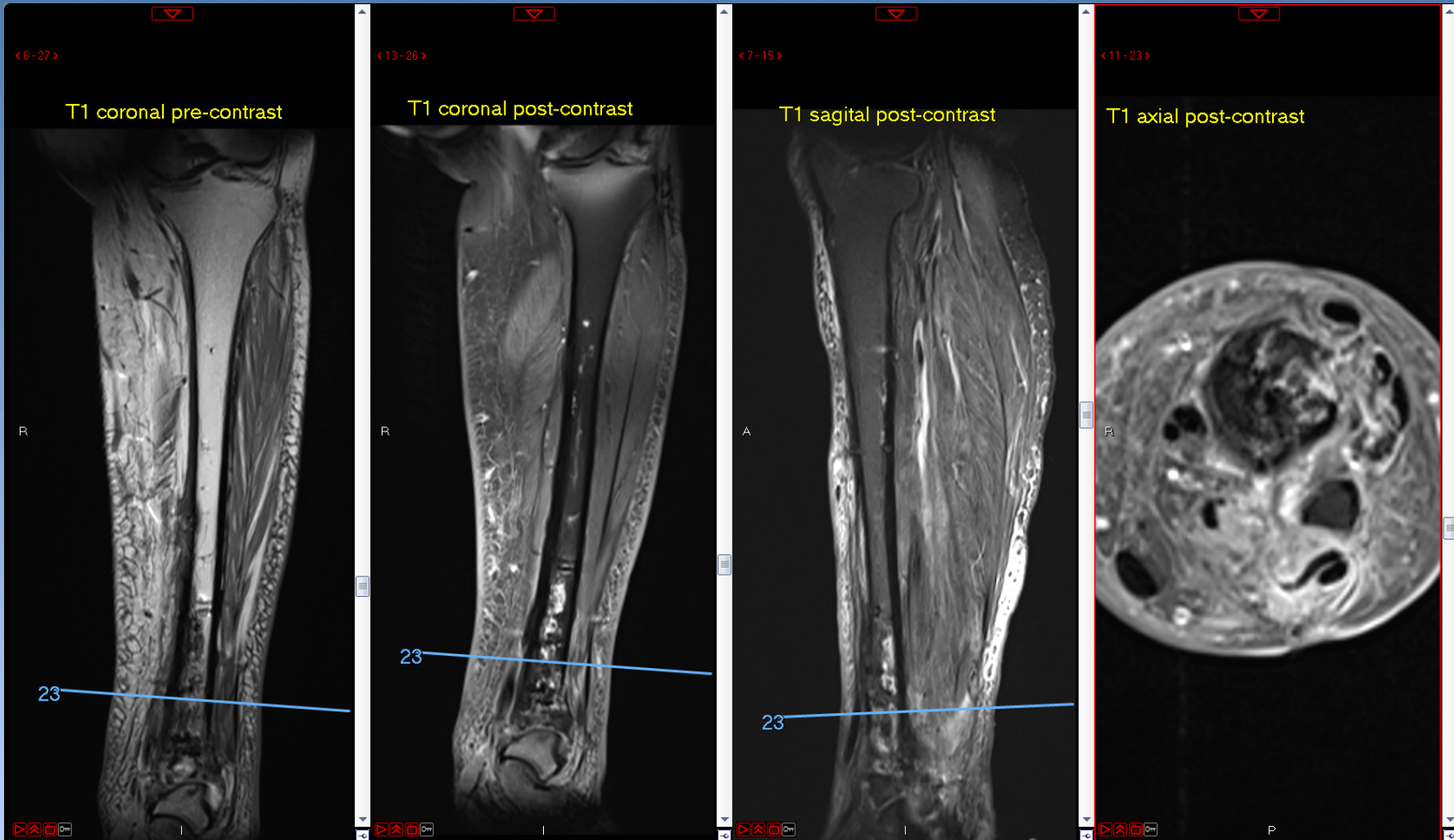
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MRI with contrast 1 year S/P I&D

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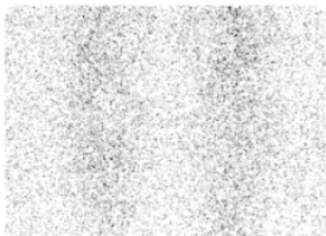
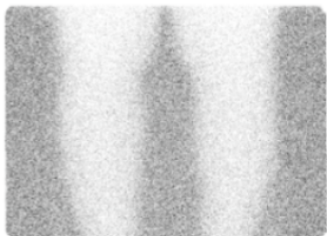
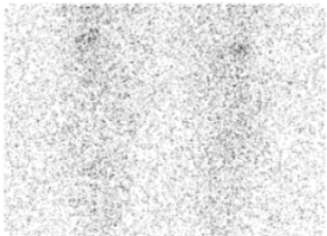

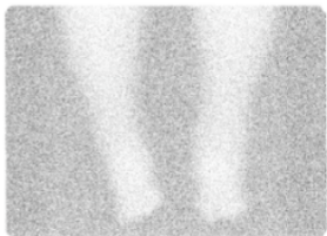

Tagged WBC scan ~18 mos S/P I&D

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< 1000 - 1 (ALL) >

Patient ID: 0504546 DOB: 1/1/1961 Series Date: 2/5/2013

IN111 WBC SCAN
24 HR DELAYS

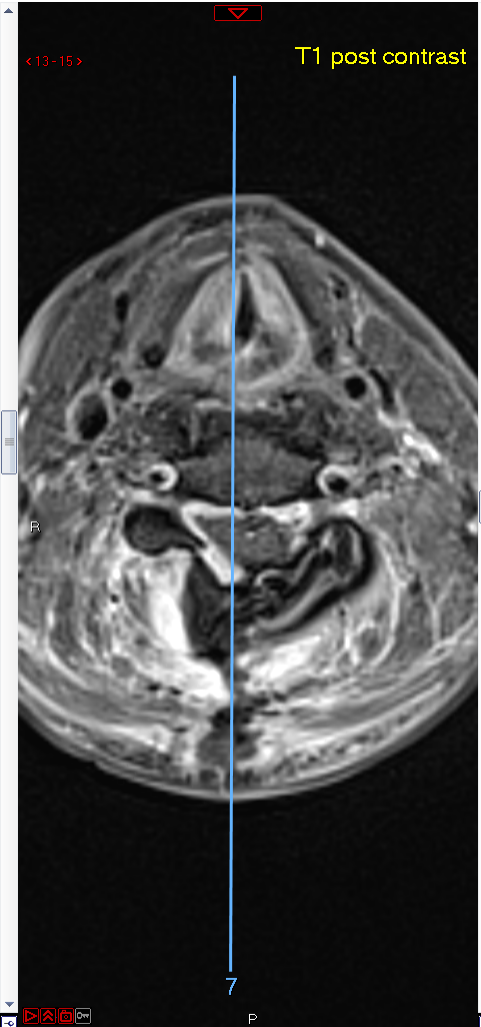
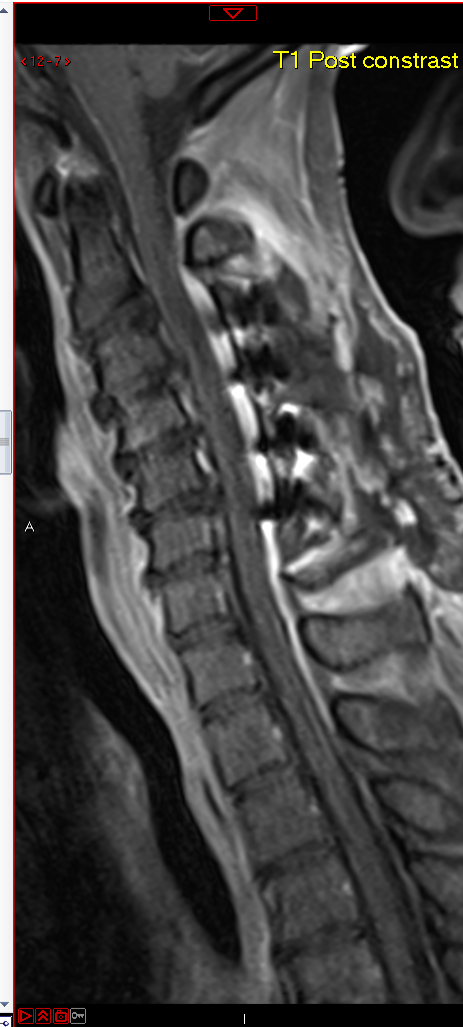
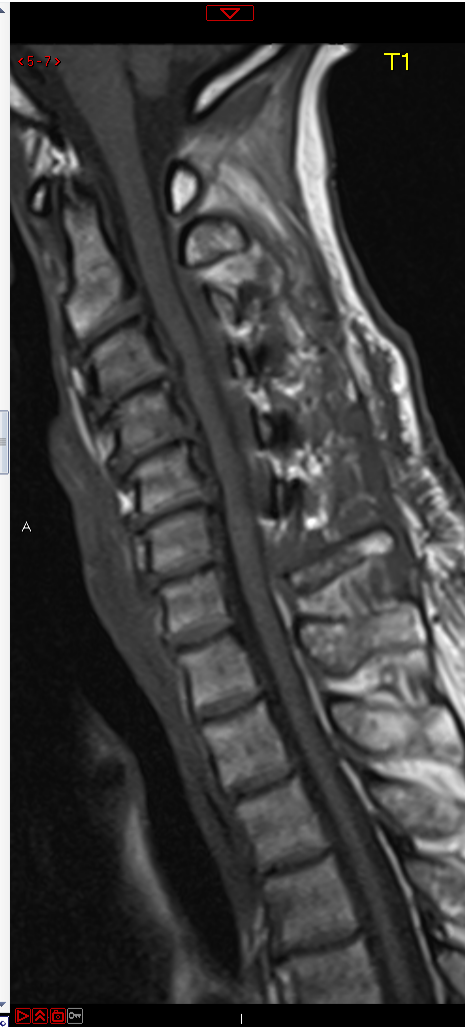
		
R Anterior L	ANT TIBS TRANS	L Posterior R
		
ANT FEET	ANT FEET TRANS	POST FEET

Navigation icons: back, forward, home, print, refresh





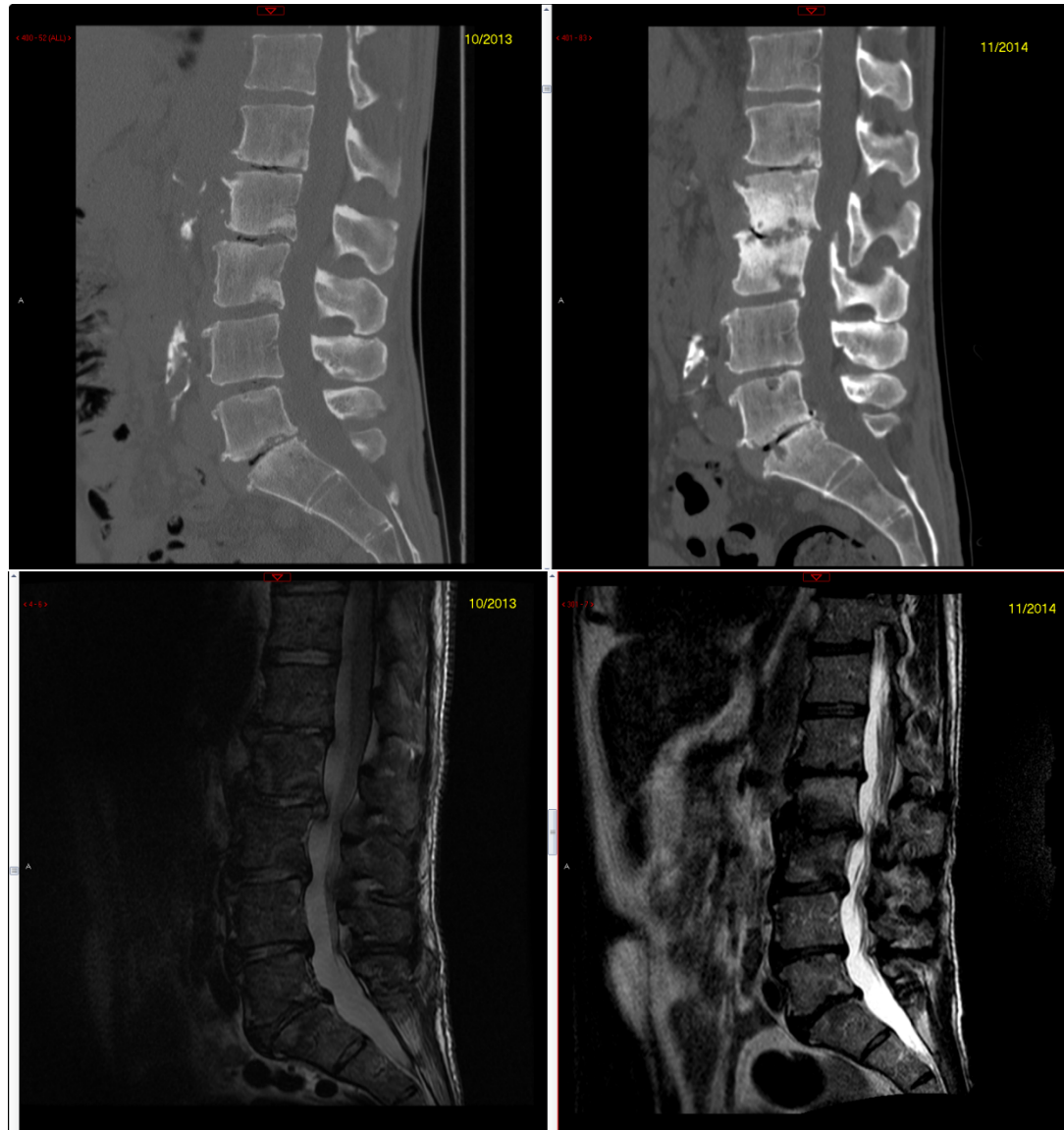
Laminoplasty 1 Week Postop





Degenerative inflammation vs. infection

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Current Diagnosis

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- History and examination
- Bone culture
- Radiographs
- CT
- Nuclear medicine
- MRI

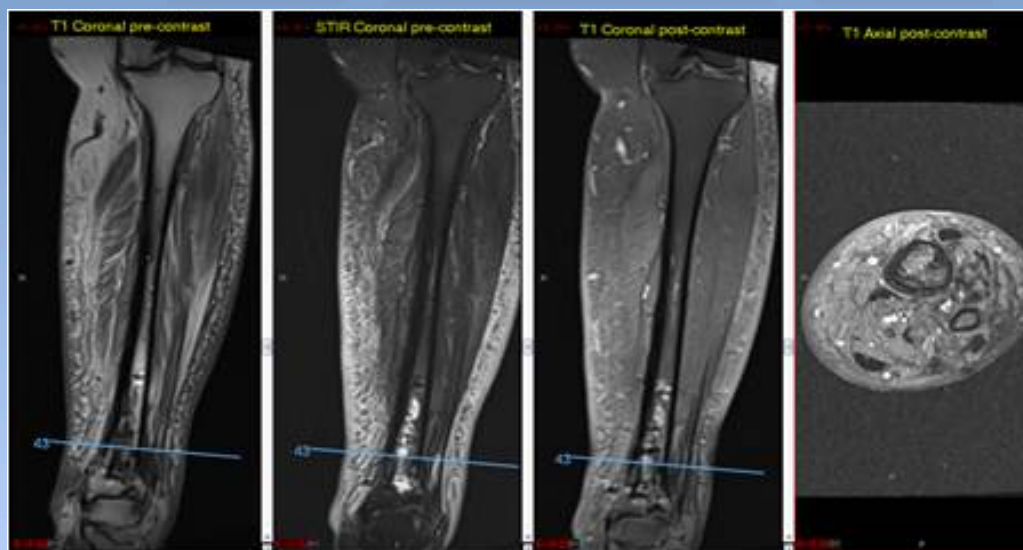




MRI

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- High sensitivity >90%
- Low specificity 50-60%
- Difficult to **differentiate from sterile inflammation**





Macrophages in chronic osteomyelitis

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- **High number in osteomyelitis**
 - the most frequent cell type
- **Low incidence of macrophages at the aseptic inflammatory site**
 - in aseptic inflammation, macrophages represent less than 10% of cells
 - the major cellular infiltrations are fibroblasts





Identification of macrophages in osteomyelitis

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- CD68
- CD14
- CD36
 - CD36, a pattern recognition receptor mediating innate immune responses to pathogens present in macrophages, participates in innate sensing and the phagocytic clearance of both Gram-positive and Gram-negative bacteria

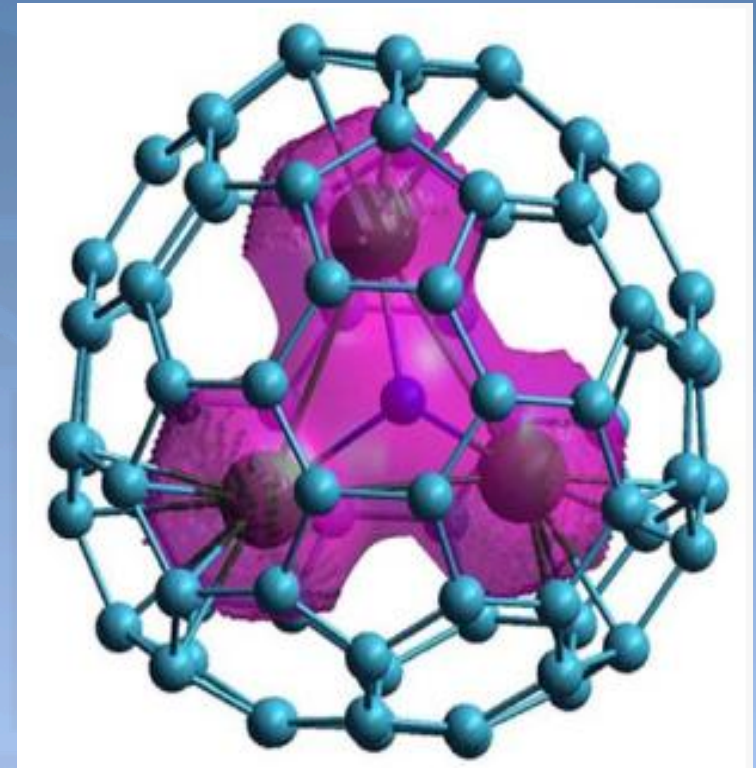




MRI contrast agent on Fullerene platform

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- Stable encapsulation of metal ions
- More Gadolinium atoms and incr sensitivity
- Low Concentration and Molecular Targeting
- Safe





Specific aims

- **Aim 1:** To characterize the binding and the imaging activity of a functionalized CD36 targeted nanofullerene $Gd_3N@C_{80}$ -CD36Ligand compound in macrophages *in vitro*.
- **Aim 2:** To detect the presence of infection using $Gd_3N@C_{80}$ -CD36Ligand compound in a chronic mouse post-traumatic tibia osteomyelitis model.





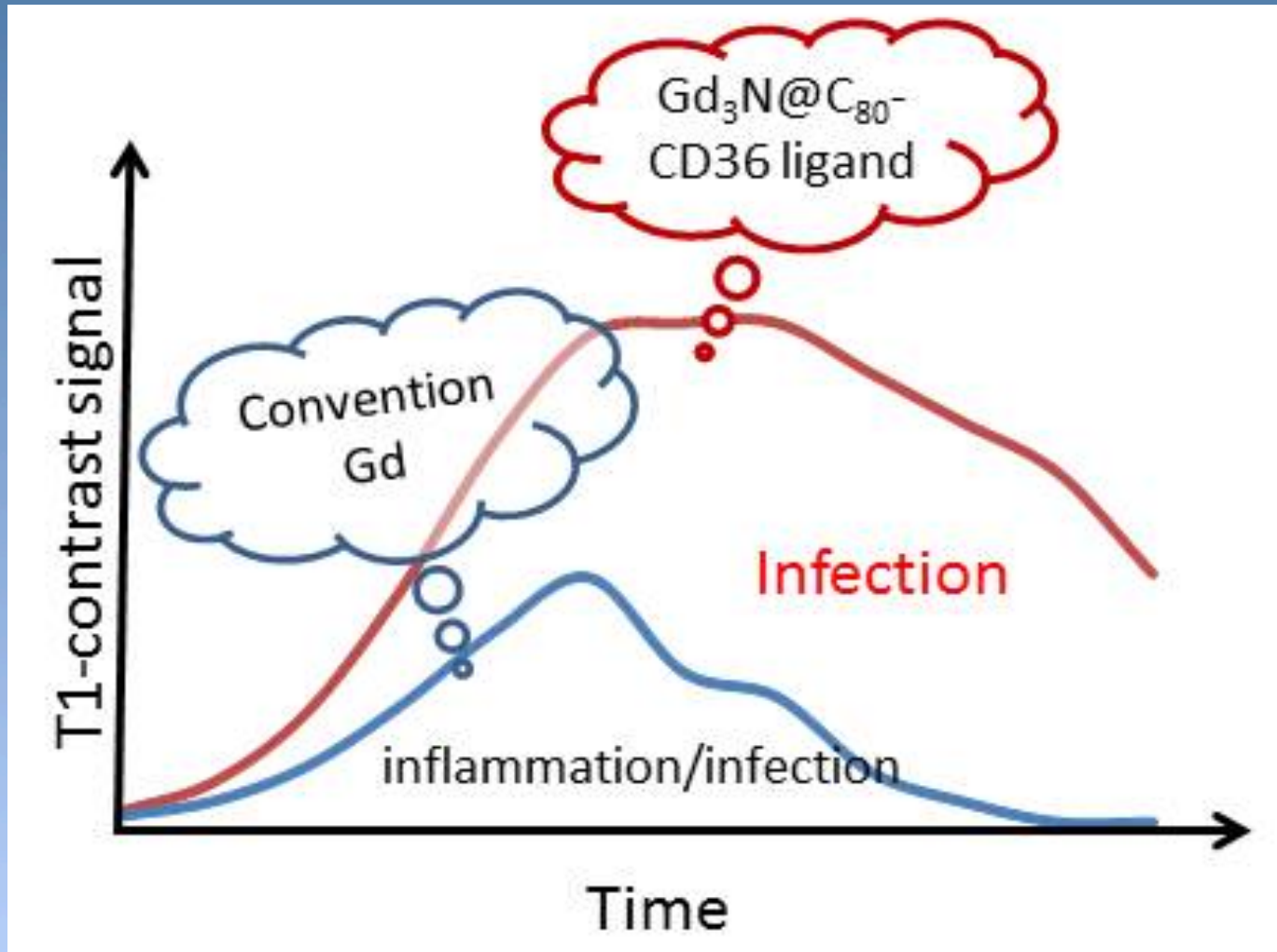
In Vivo Experiment

In vivo experimental groups





Hypothesis



- Awarded grant from Orthopaedic Trauma Association in 2015
- \$20,000
- Applied for R21 grant from NIH