



Musculoskeletal Infection

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Musculoskeletal Infection

Site		Term
Superficial	Subcutaneous tissues	Cellulitis
	Fascia	Septic fasciitis
	Muscle	Pyomyositis
Synovial	Tendon sheath	Septic tenosynovitis
	Bursa	Septic bursitis
	Articulation	Septic arthritis
Bone	Cortex	Osteitis
	Bone marrow	Osteomyelitis

Soft Tissue Infection Predisposing Factors

- **Penetrating injury**
 - Trauma
 - Retained foreign body.
 - Postoperative
- Vascular insufficiency
- **Immune compromised**



Soft Tissue Infection

Predisposing Factors

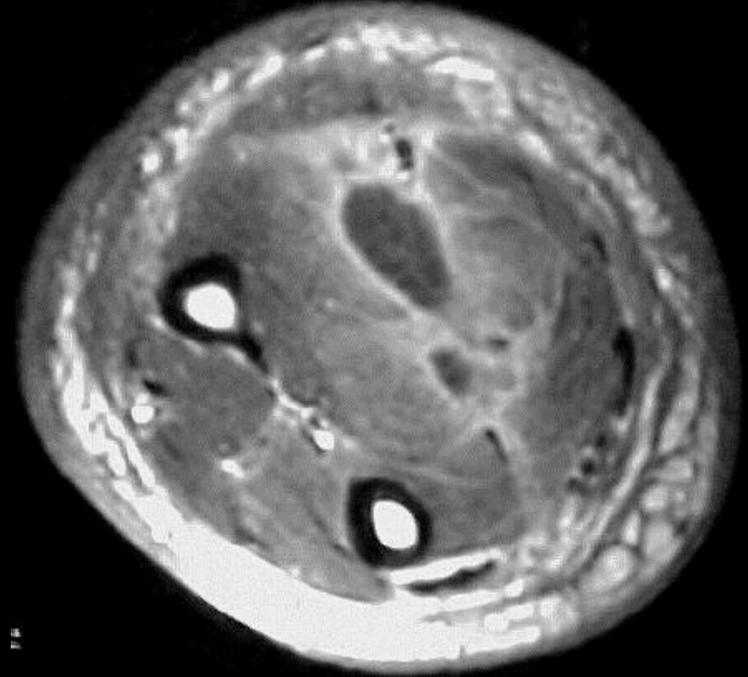
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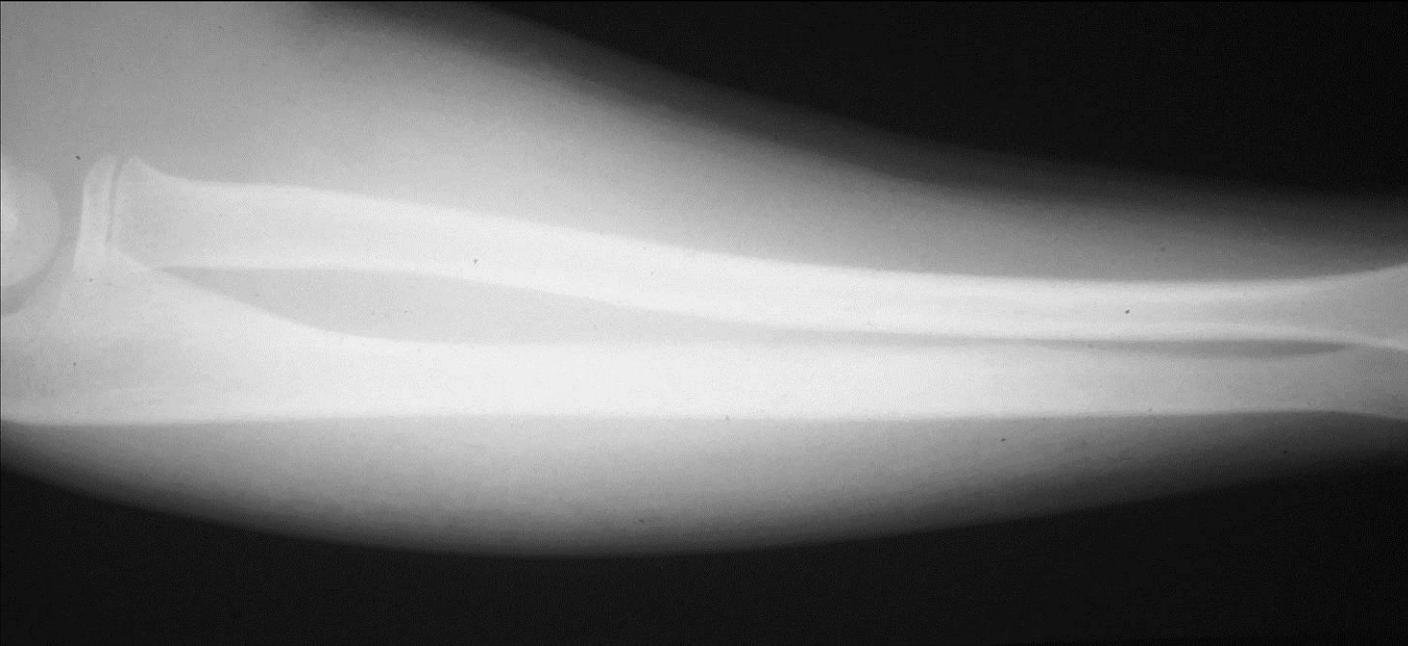
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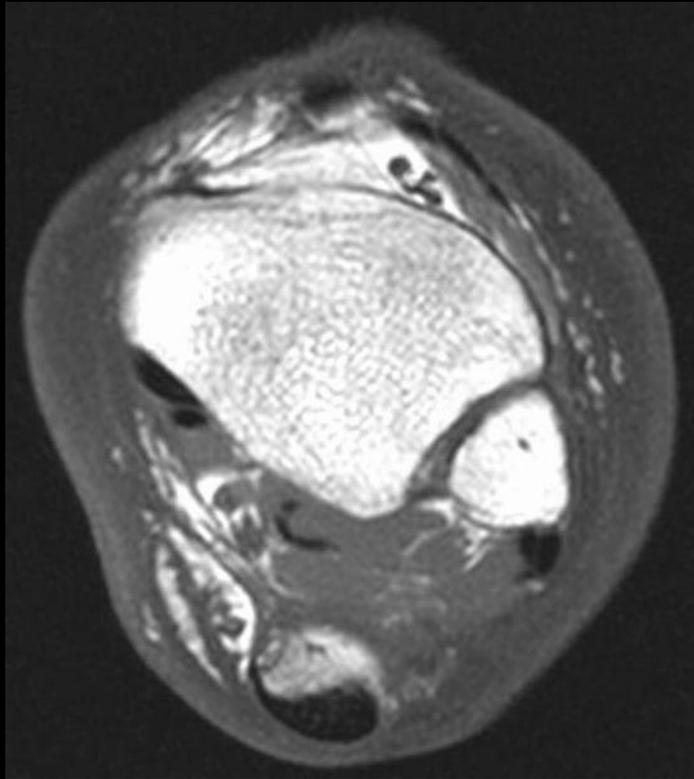


Cellulitis

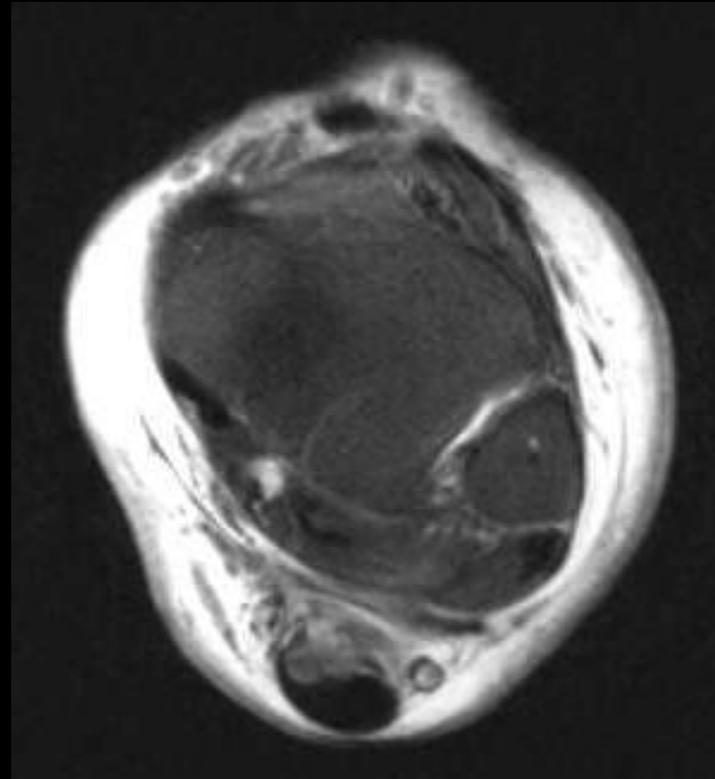


- Skin thickening
- Soft tissue swelling
- Obliteration of superficial fat planes

Cellulitis



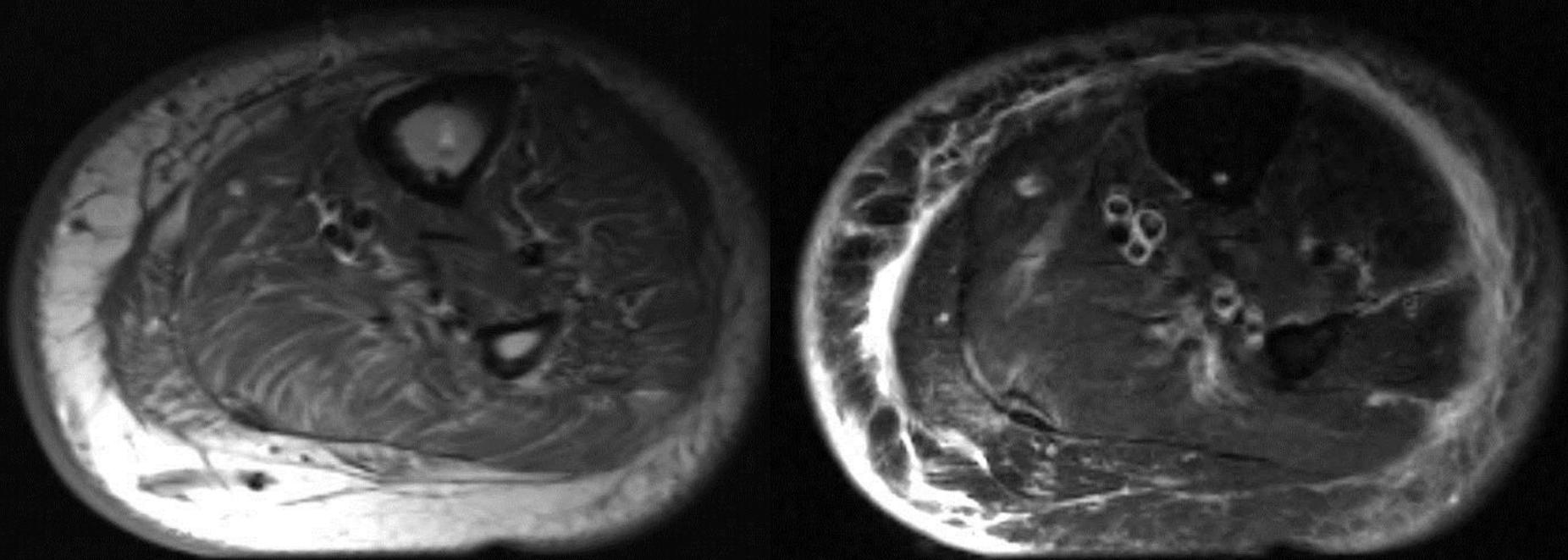
AxT1



AxT2FS

- Skin thickening
- Soft tissue swelling
- Obliteration of superficial fat planes

Cellulitis / Fasciitis



Fascial Infection

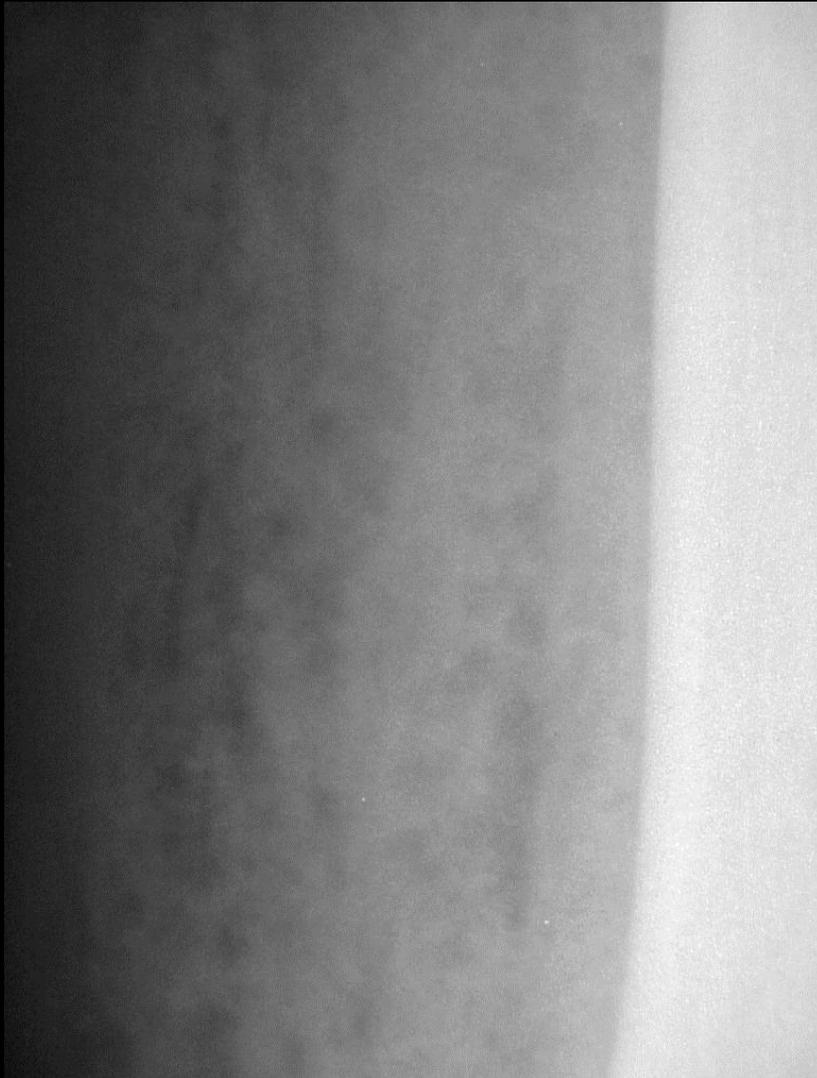
- Septic fasciitis
- Severe cases can progress to necrotizing fasciitis
- Gas within fascia and along fascial planes
- Thickening of fascia
- Fluid collection on outside and inside of fascia



Necrotizing fasciitis - MRI

- Nonenhancing necrotic fluid collections or rim-enhancing abscesses
- Gas-T1 + T2 signal voids
- Overestimate disease
 - Noninfectious edema of neighboring fascia
- False positive
 - Recent prior IM steroid injection with muscular and investing fascial enhancement

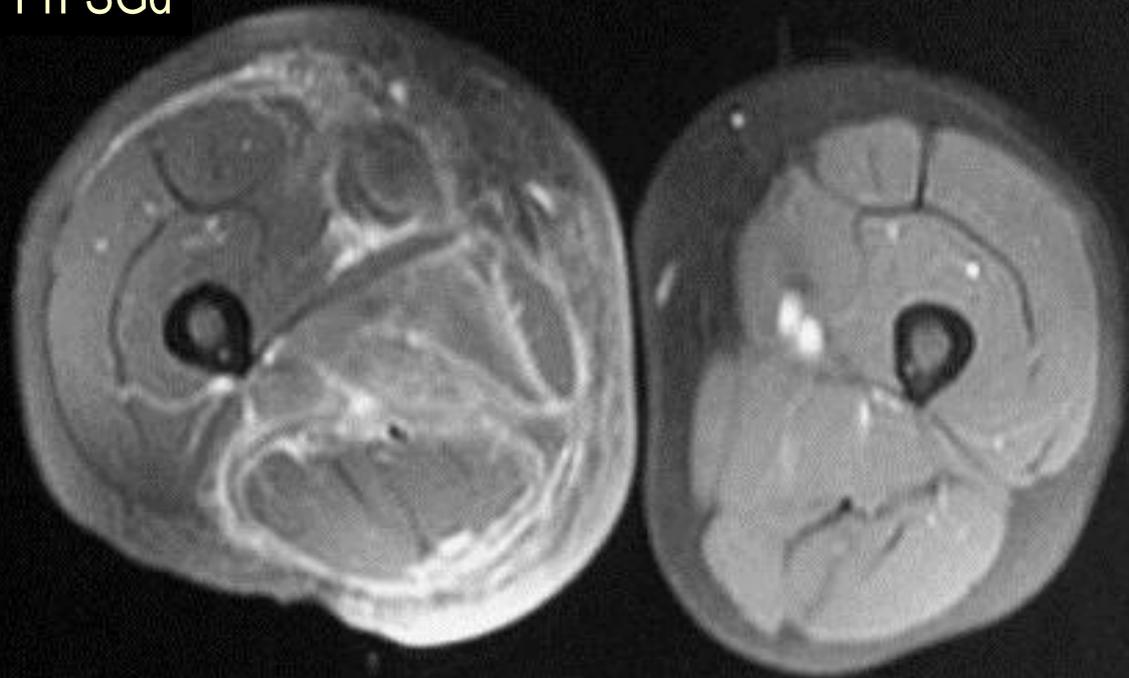
Necrotizing Fasciitis



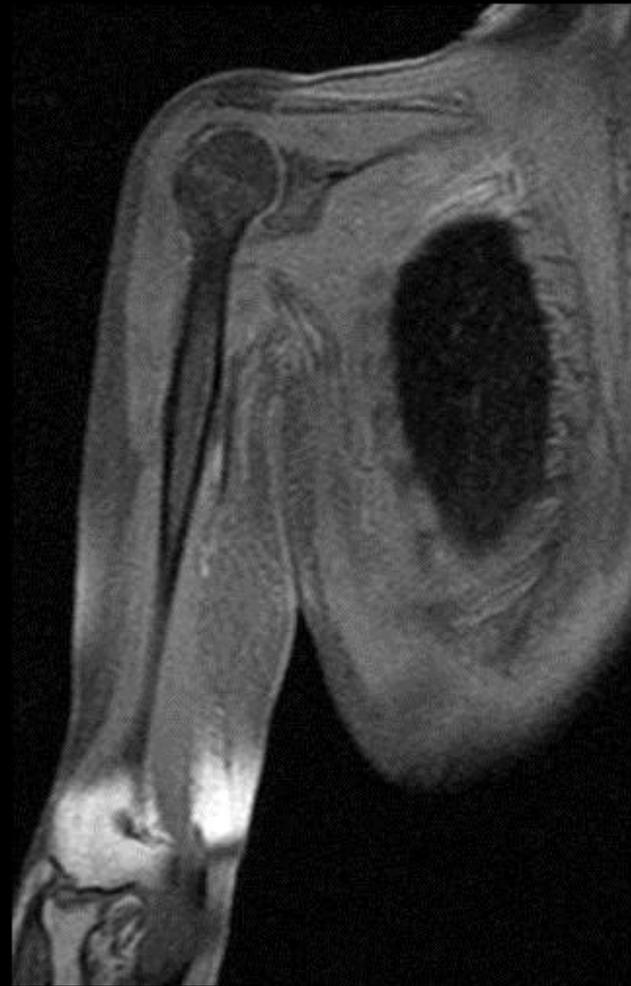
Necrotizing Fasciitis / Myositis



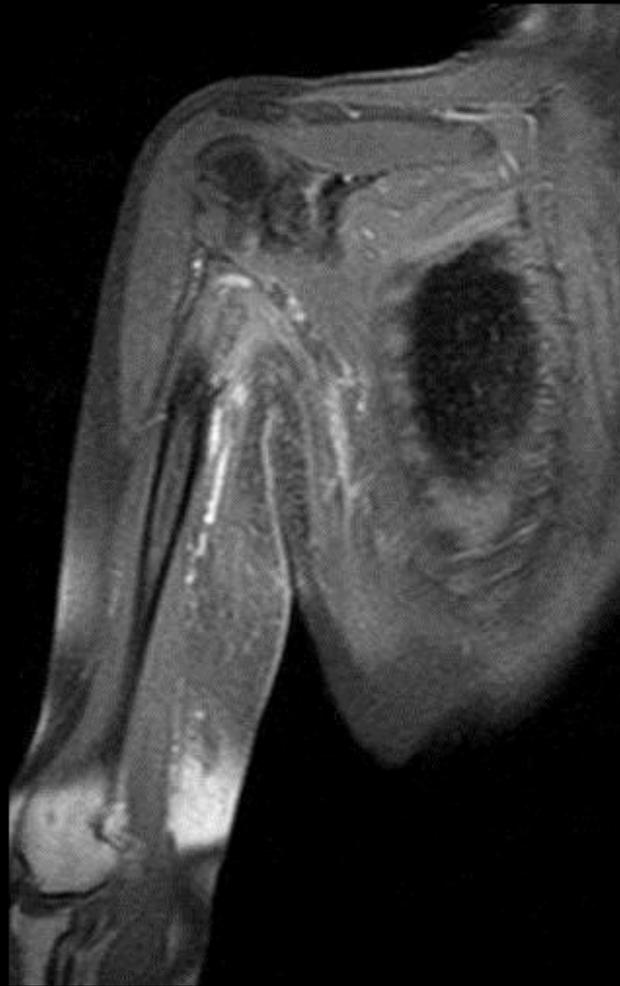
T1FSGd



Necrotizing Fasciitis



Cor T1FS



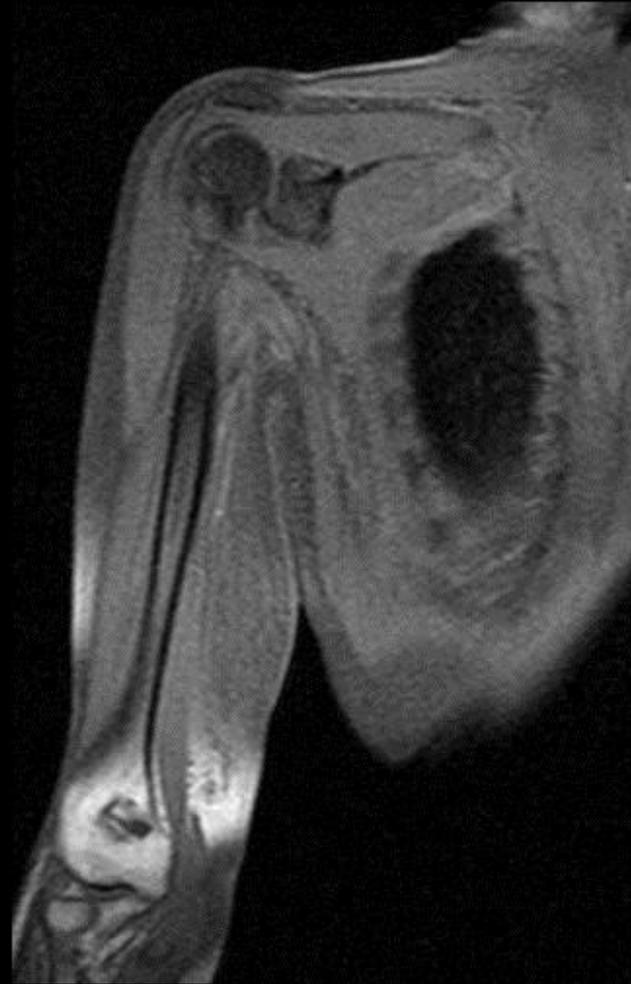
Cor T1FS IVGd



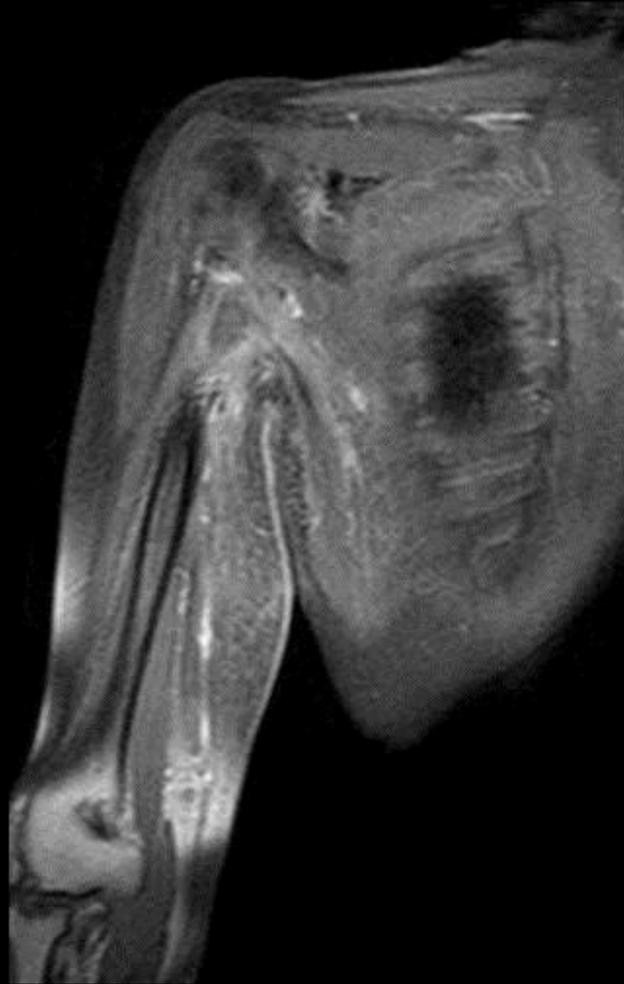
Cor PDFS

Nec fascitis path proven

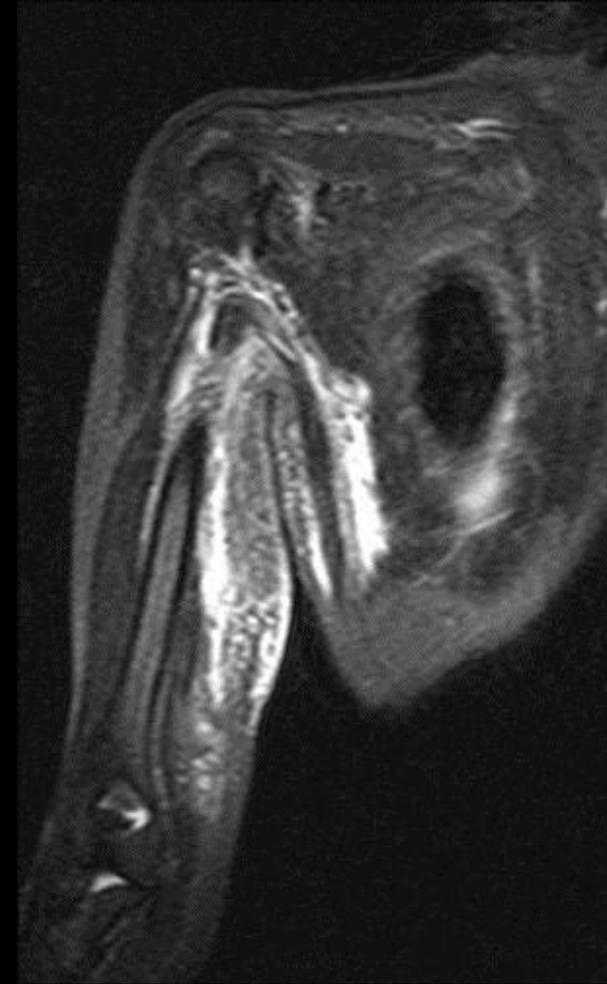
Necrotizing Fasciitis



Cor T1FS



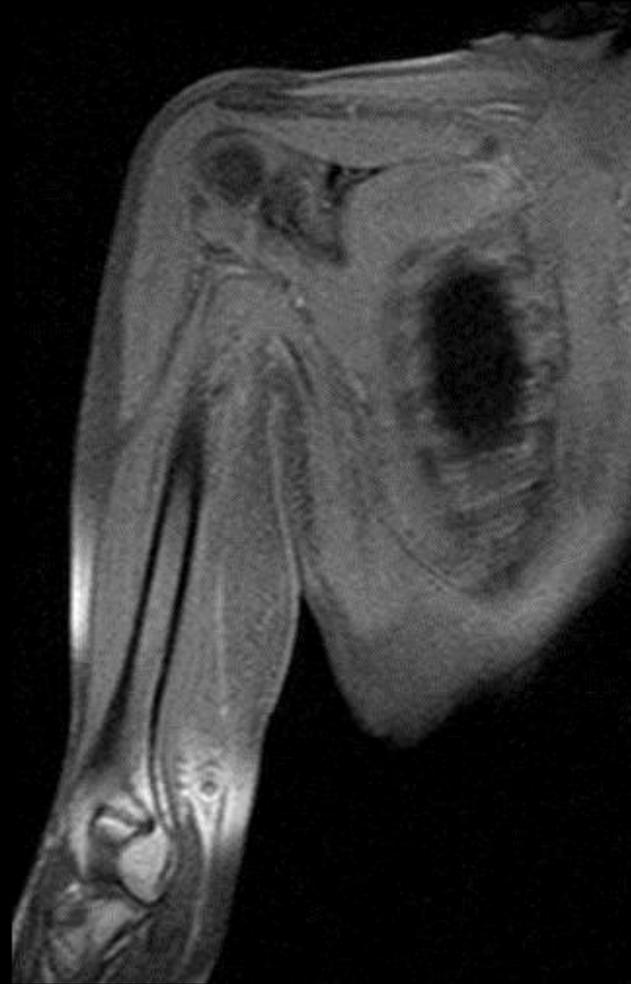
Cor T1FS IVGd



Cor PDFS

Nec fascitis path proven

Necrotizing Fasciitis



Cor T1FS



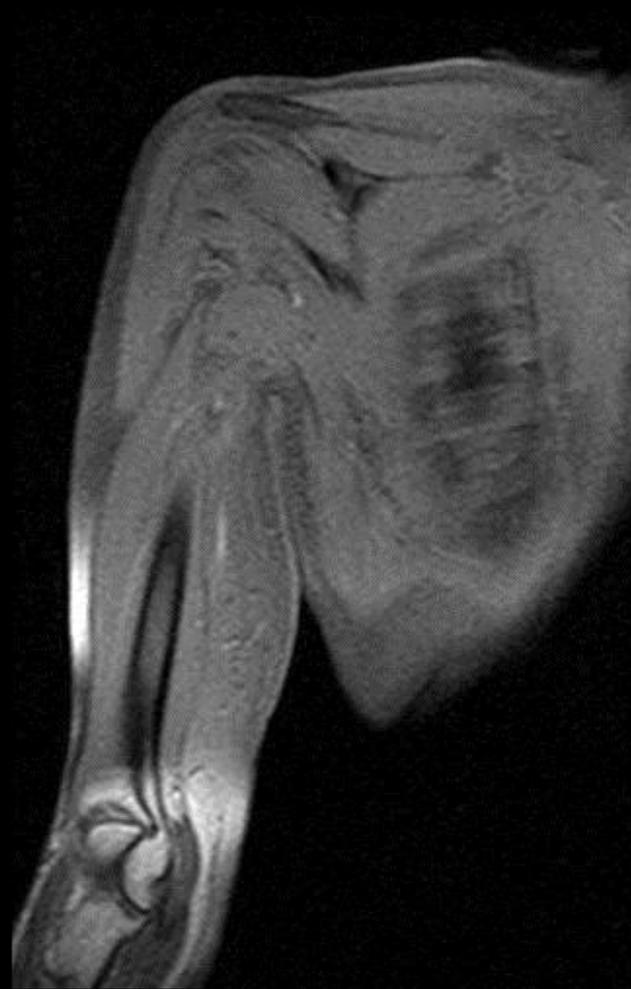
Cor T1FS IVGd



Cor PDFS

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Necrotizing Fasciitis



Cor T1FS



Cor T1FS IVGd



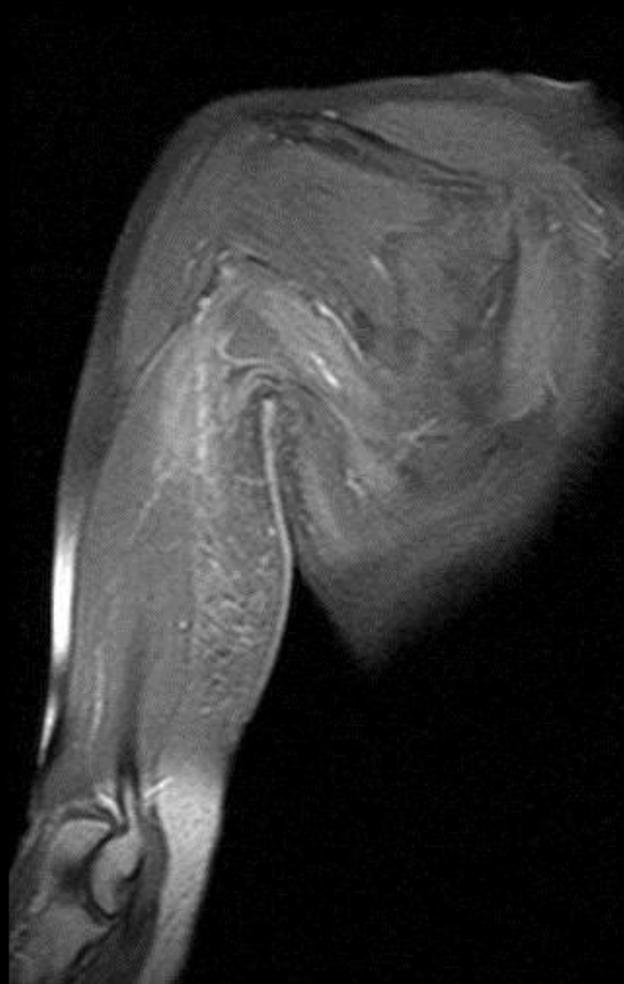
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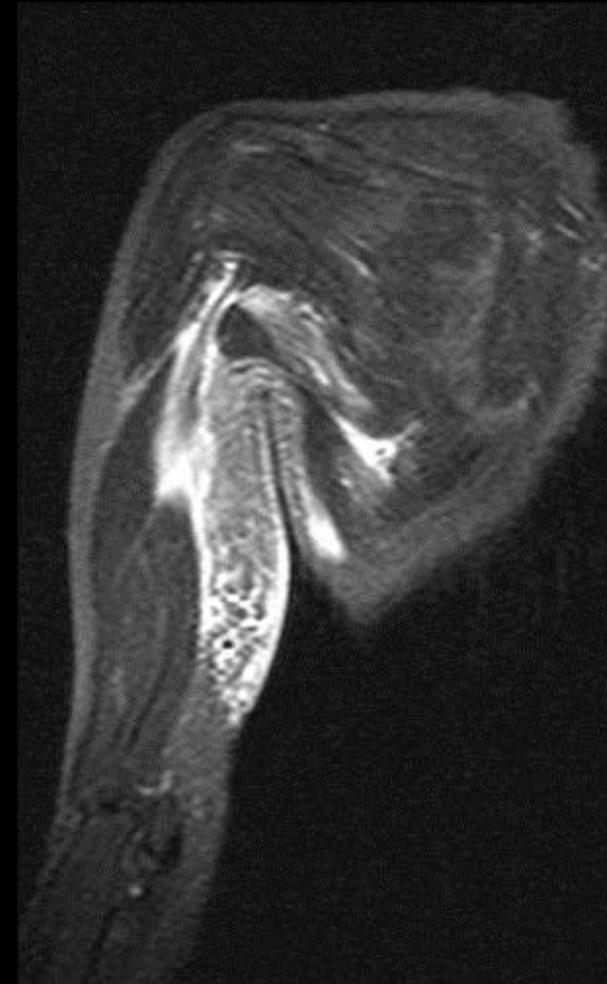
Necrotizing Fasciitis



Cor T1FS



Cor T1FS IVGd



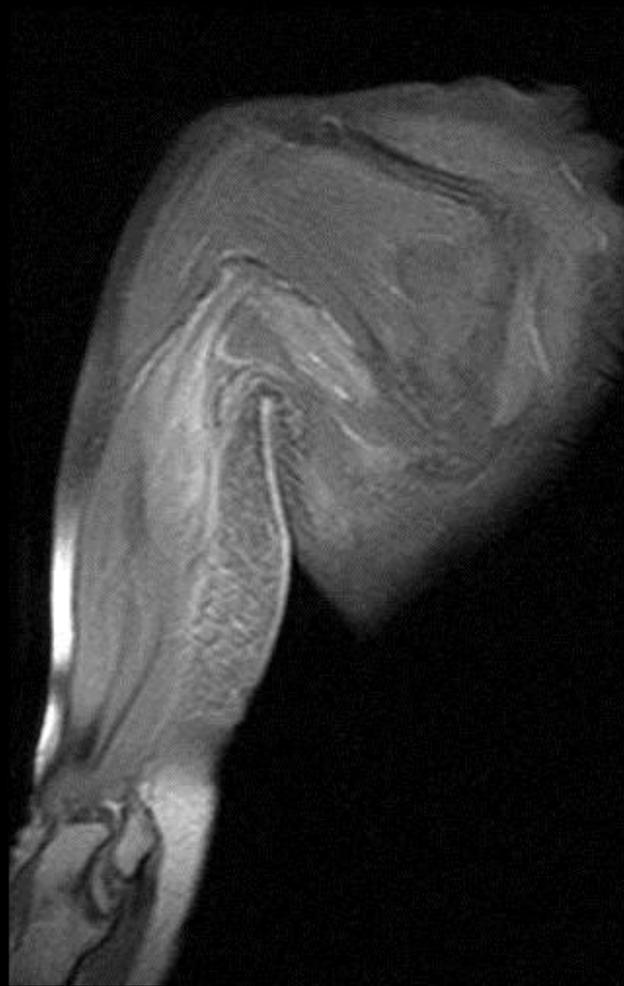
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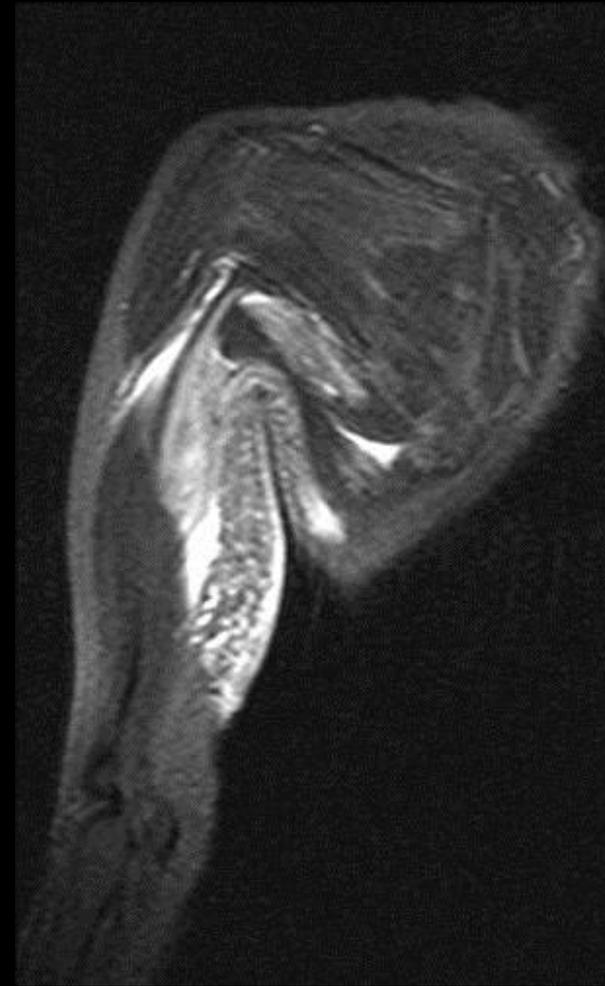
Necrotizing Fasciitis



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Cor T1FS IVGd



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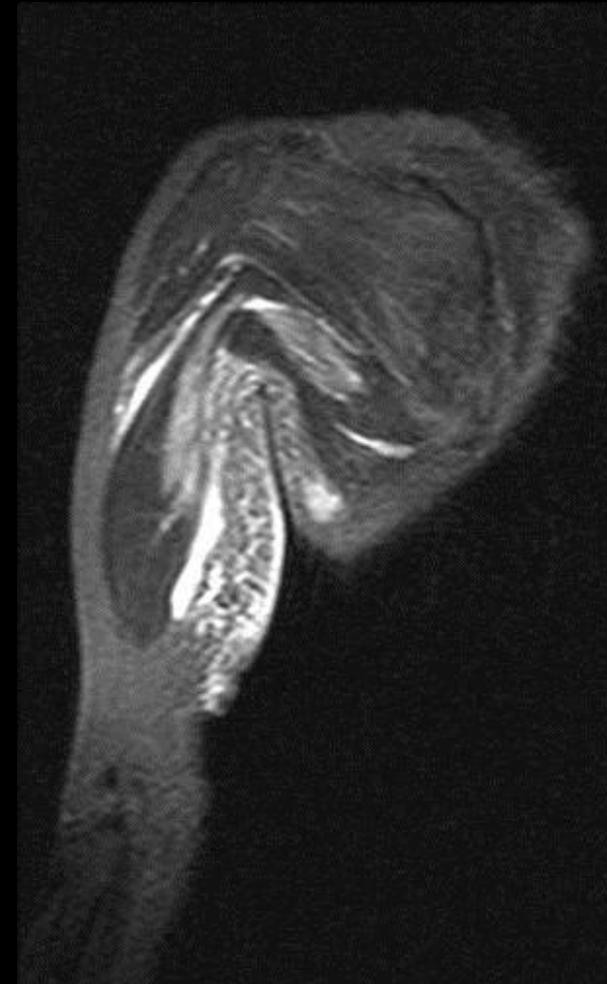
Necrotizing Fasciitis



Cor T1FS



Cor T1FS IVGd



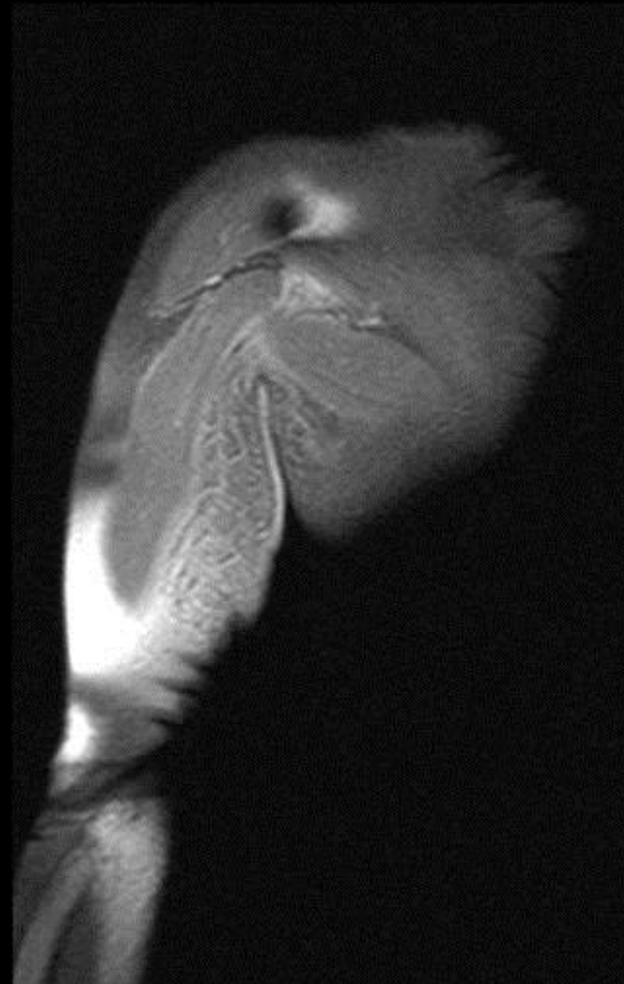
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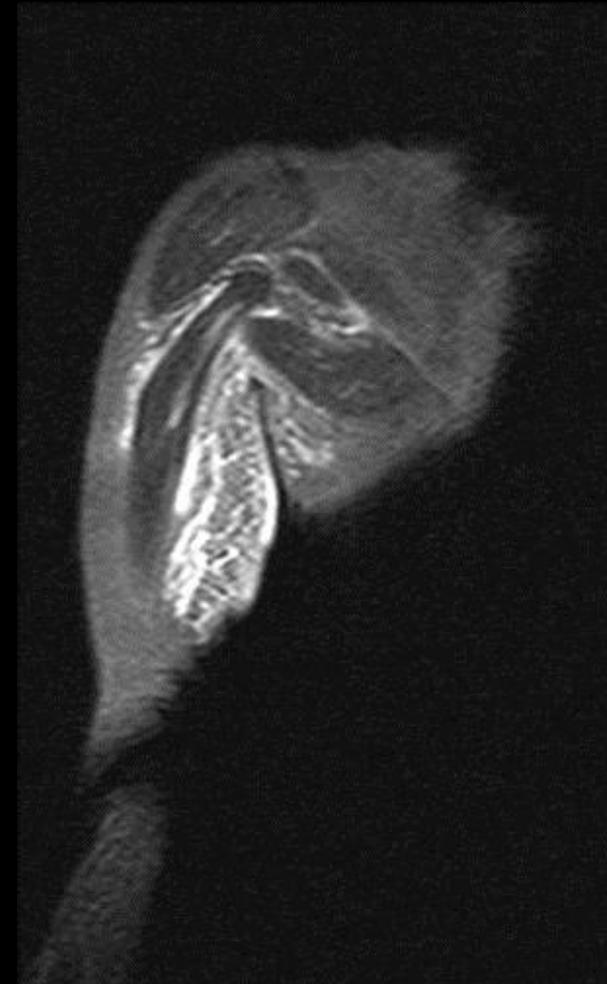
Necrotizing Fasciitis



Cor T1FS



Cor T1FS IVGd



Cor PDFS

Nec fascitis path proven

Necrotizing Fasciitis



Ax T1



Ax PDFS

Necrotizing Fasciitis



Ax T1

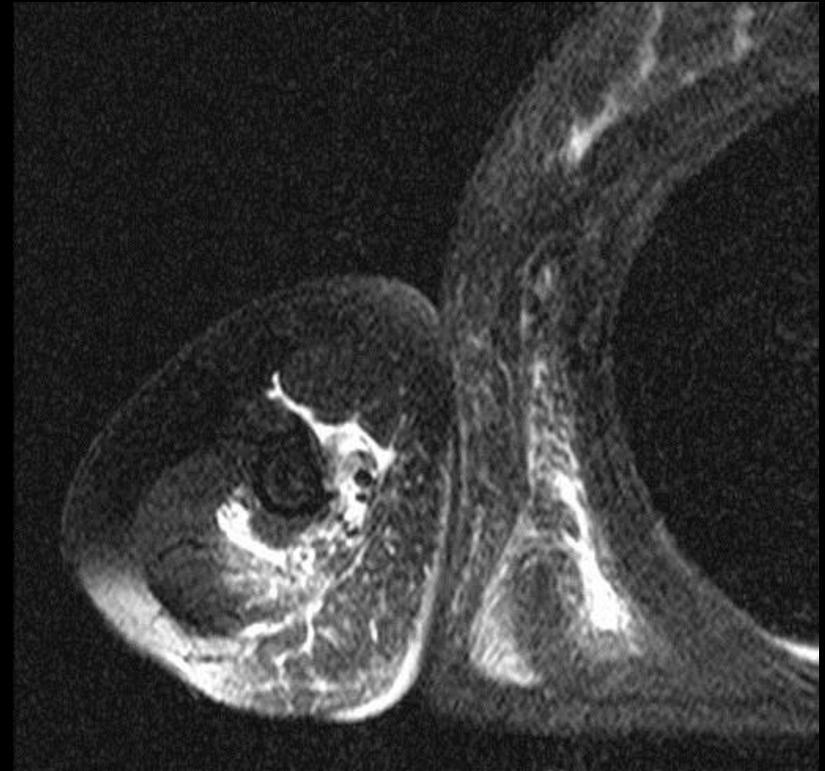


Ax PDFS

Necrotizing Fasciitis

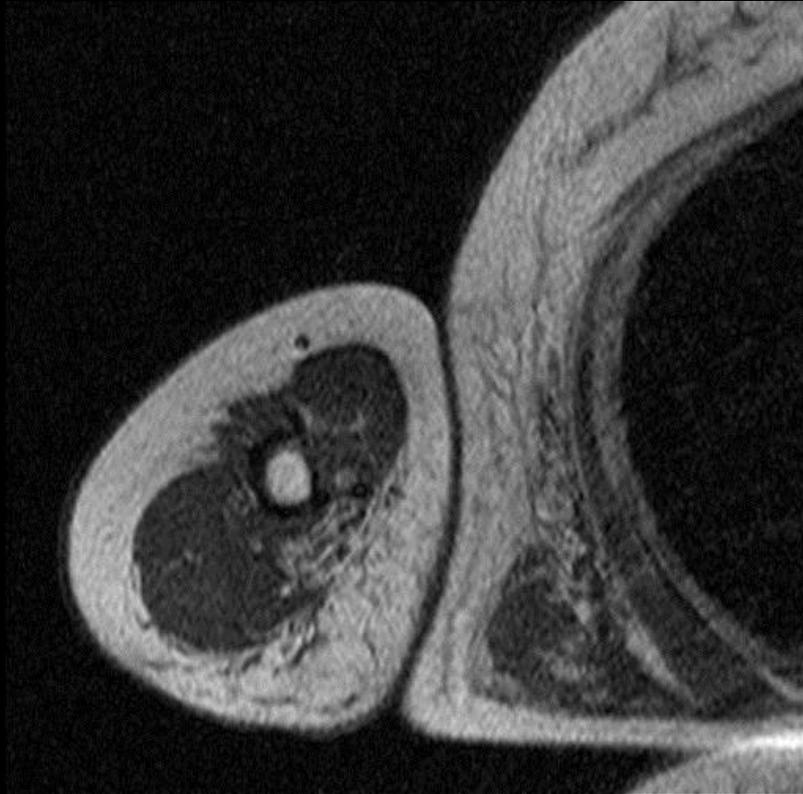


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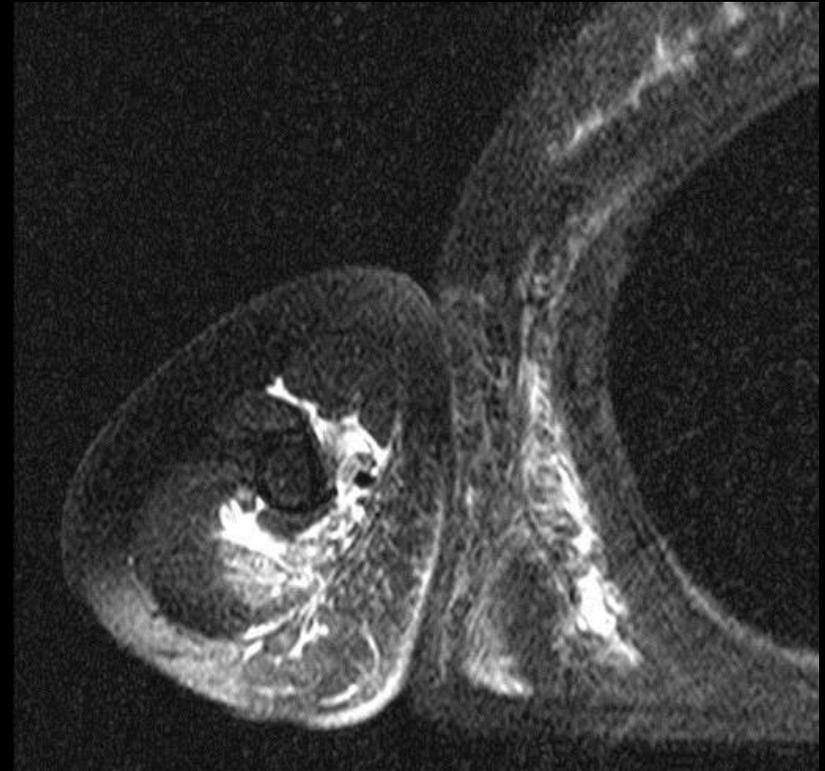


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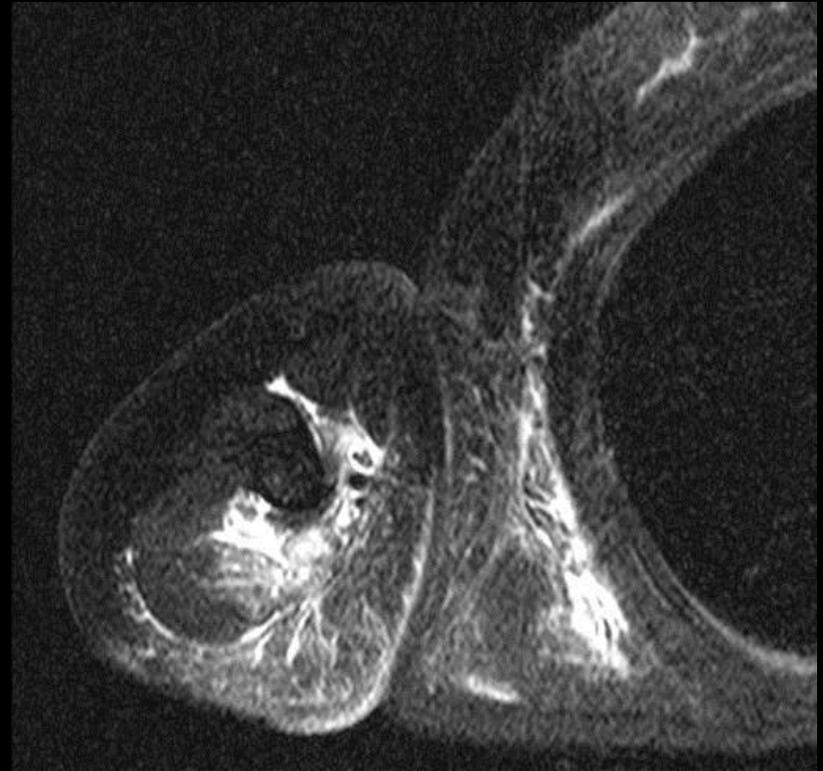


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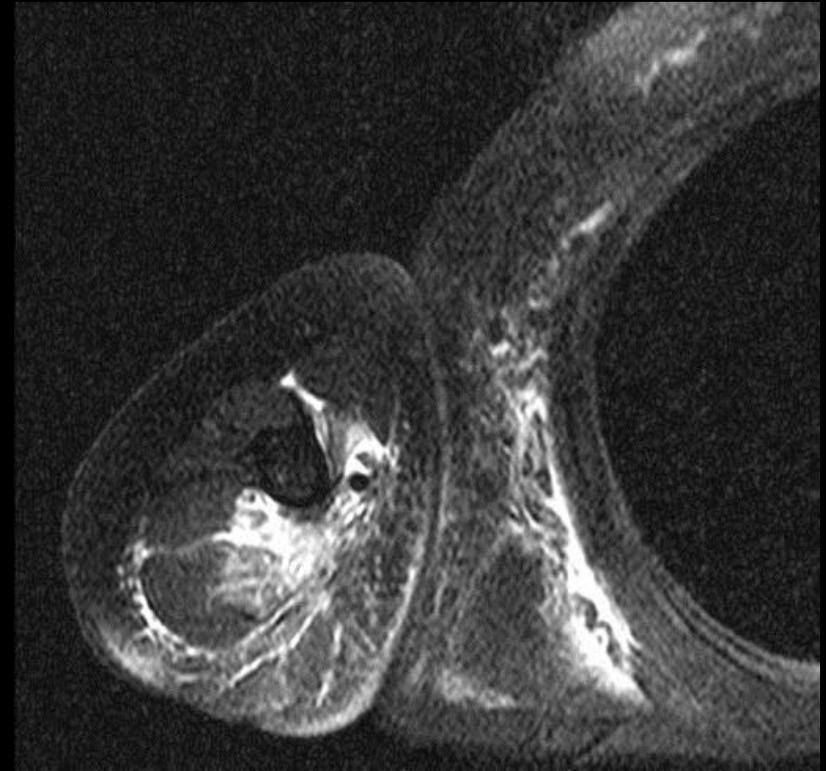


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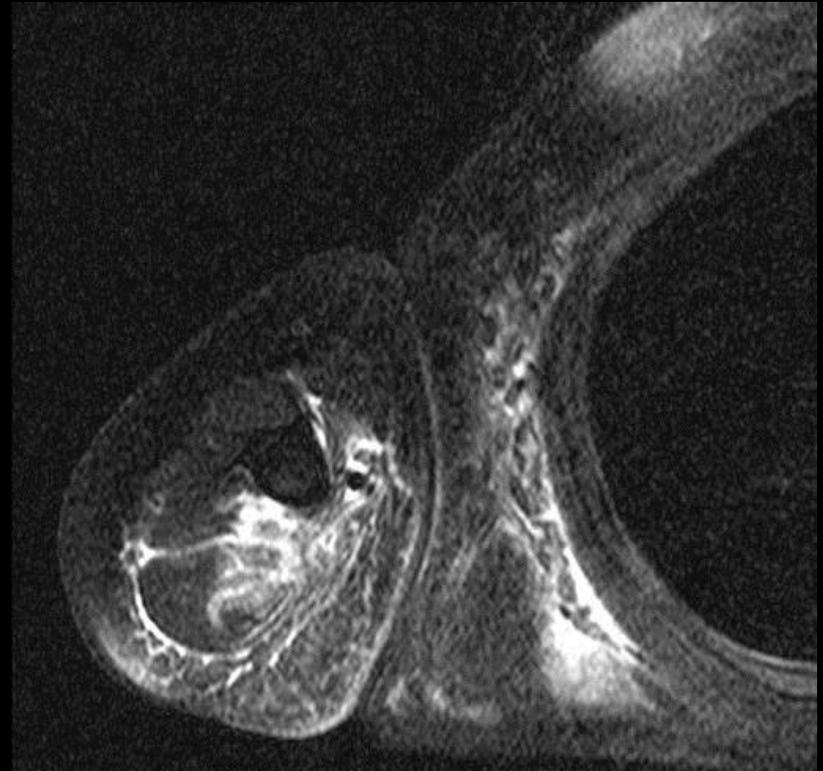


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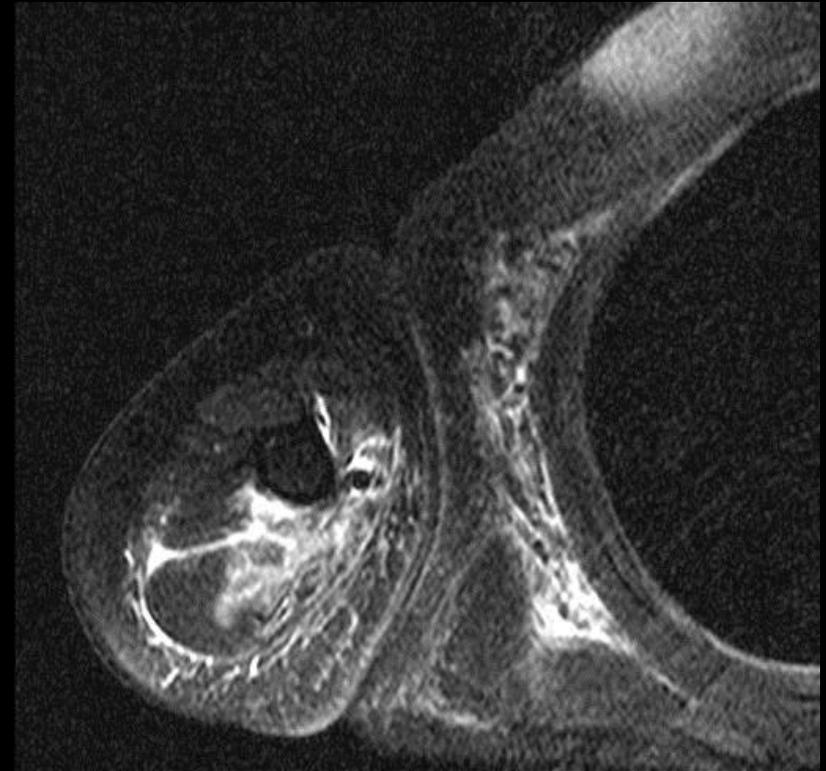


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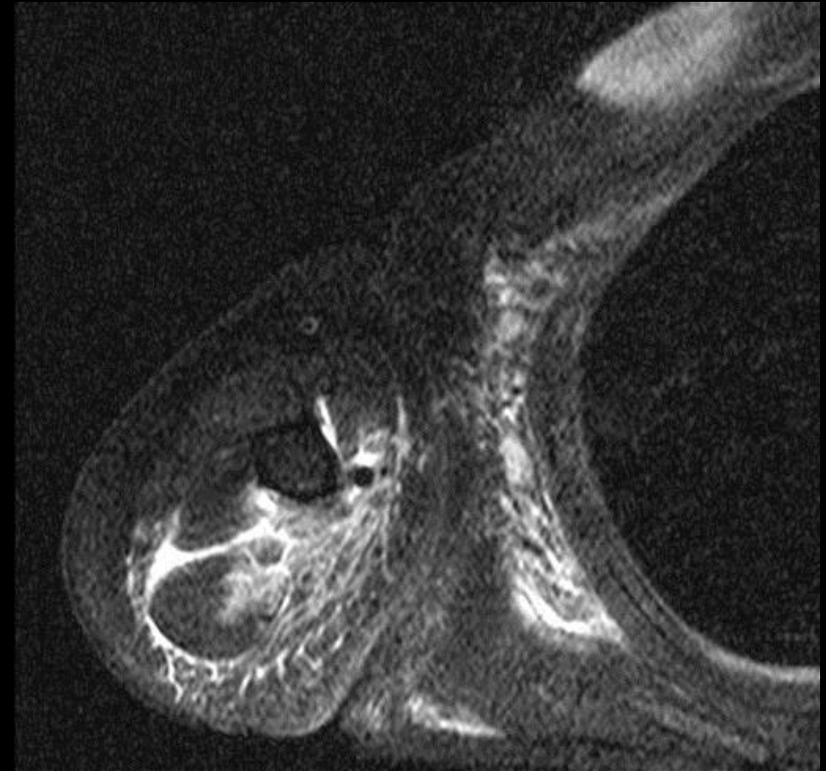


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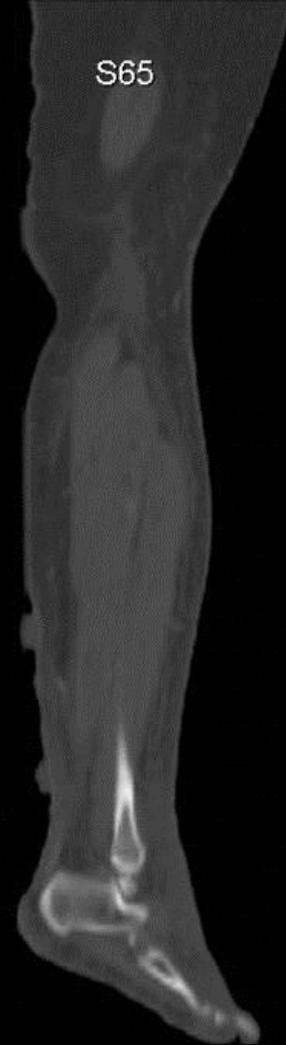
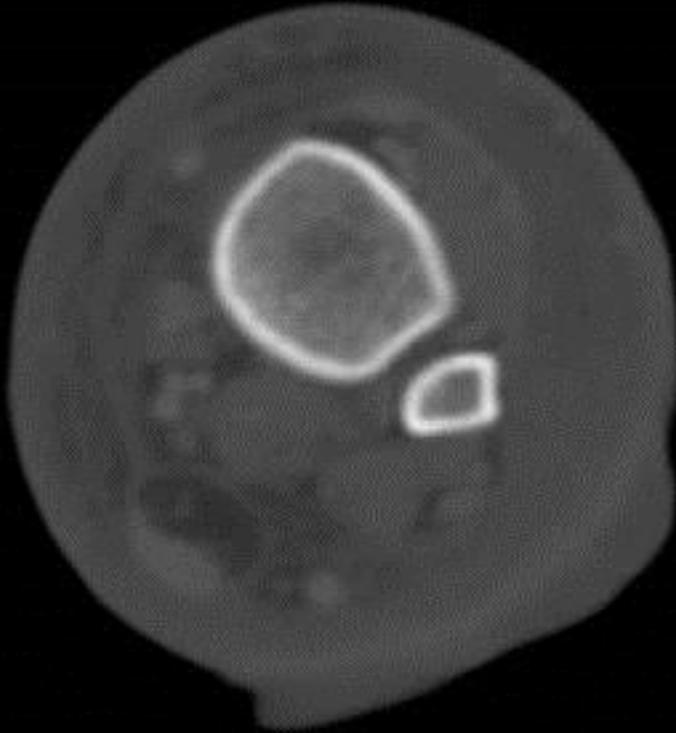


Ax T1



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Necrotizing Fasciitis

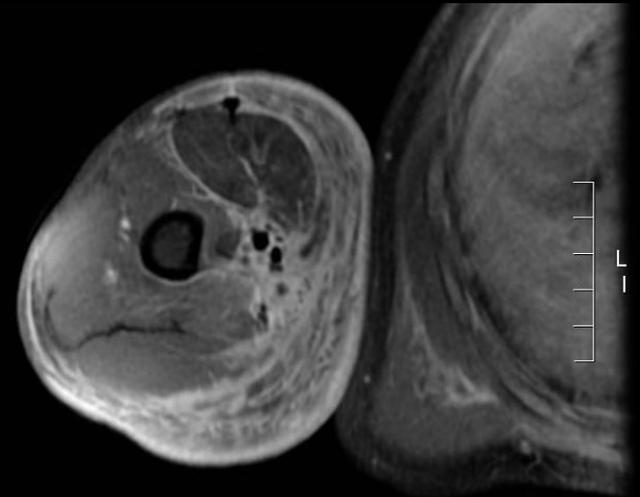
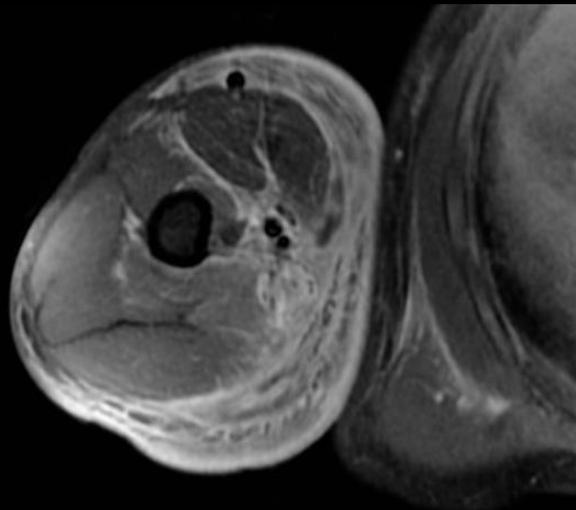
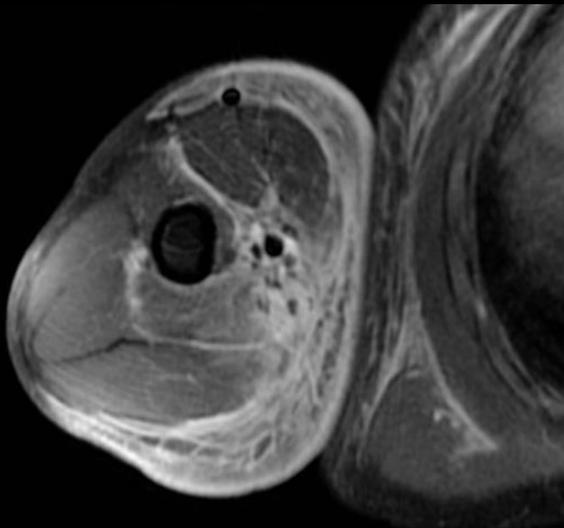
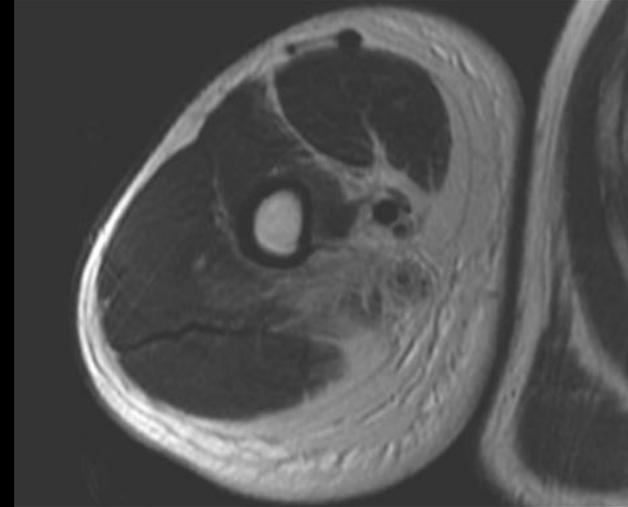
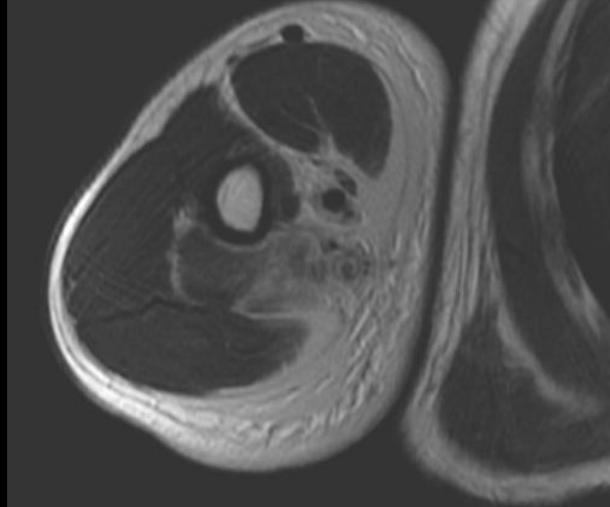
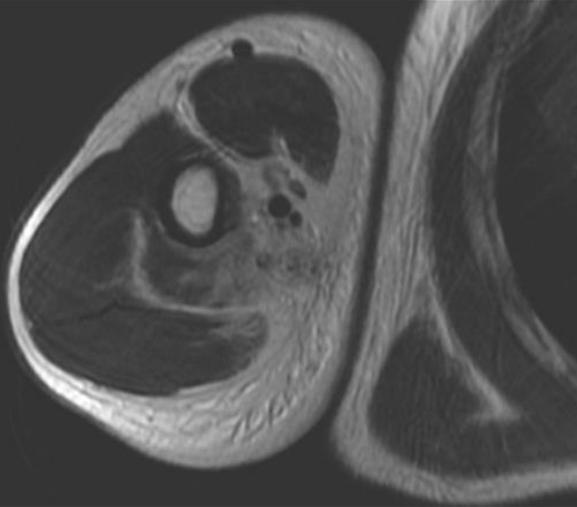


Blisters on CT not Necrotizing fasciitis clinically 35F

Necrotizing Fasciitis



Necrotizing fasciitis



39 year-old man with AIDS and upper extremity cellulitis now septic

Soft Tissue Gas

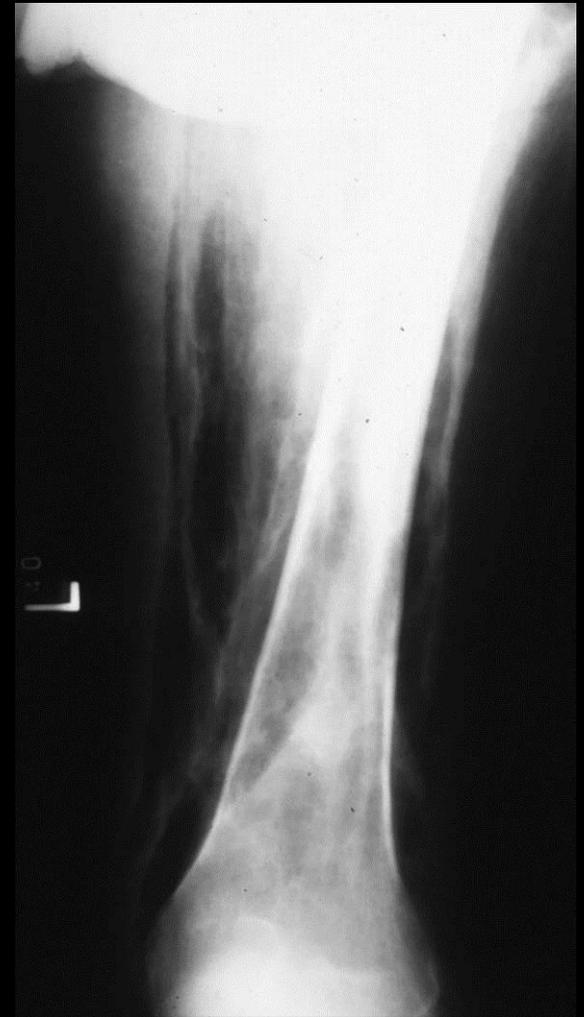
- Penetrating trauma
- Postoperative
- Superficial ulcer
- **Soft tissue infection**
- Rapid tissue necrosis.
- Barotrauma
- Hydrogen peroxide lavage
- Pneumatocyst
- Air gun Injury



Infected foot with gas 68M

Soft Tissue Gas

- Penetrating trauma
- Postoperative
- Superficial ulcer
- Soft tissue infection
- **Rapid tissue necrosis**
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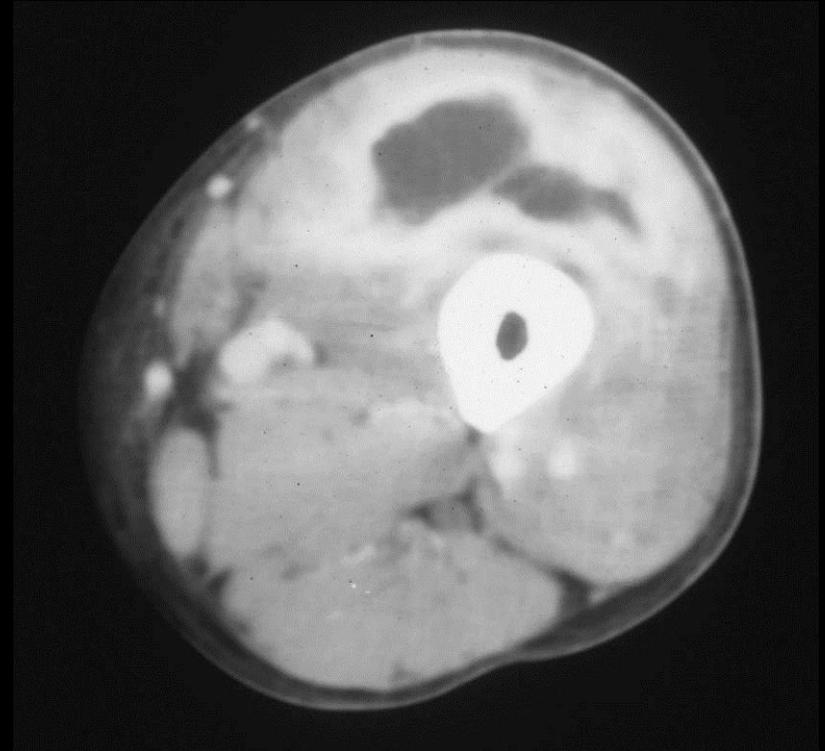
Soft Tissue Abscess

- Focal ill-defined mass surrounded by edema
- Central fluid collection
- Thick enhancing wall
- Inner lining of cellular inflammation
- Gas-fluid level or multiple bubbles



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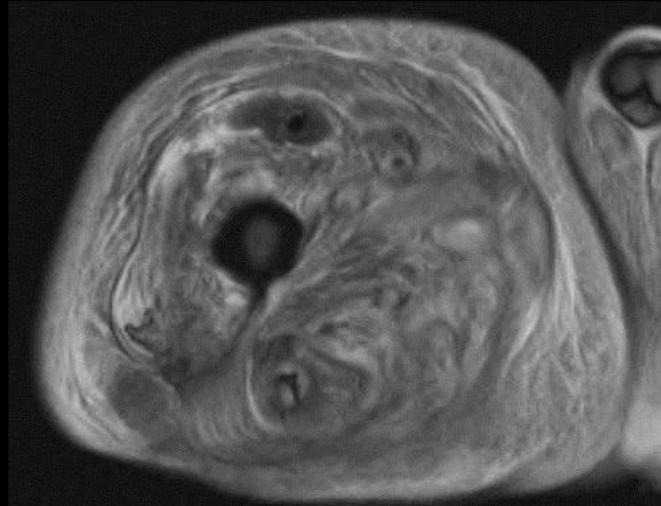


Loculated Thigh Abscess

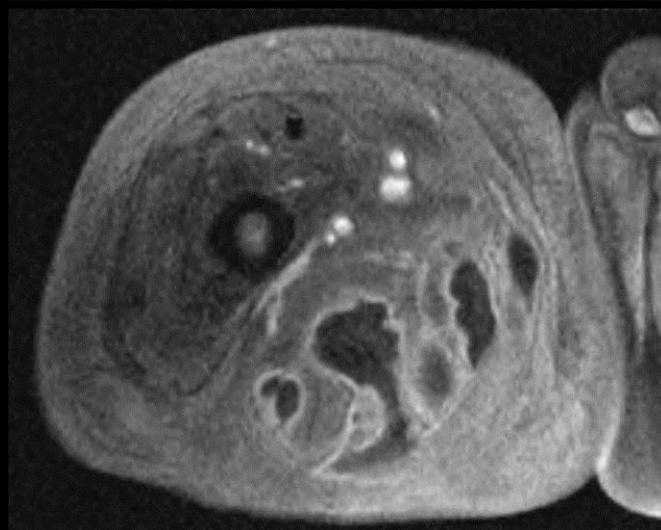
T1FSGd



T2

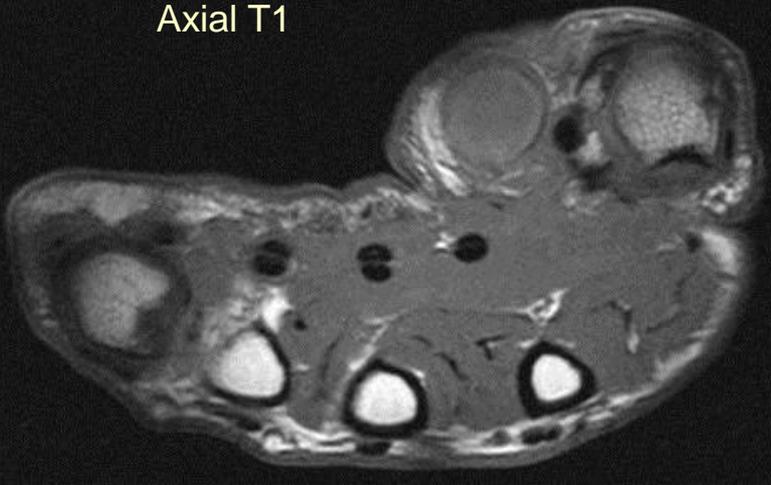


T1FSGd

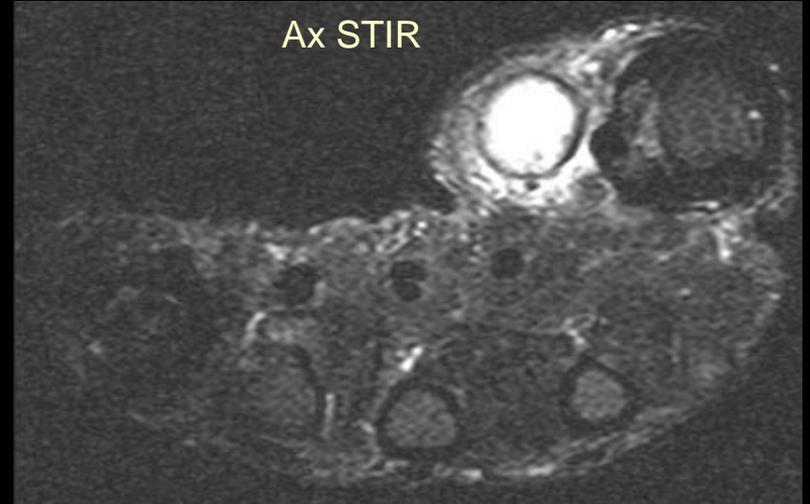


Soft Tissue Abscess

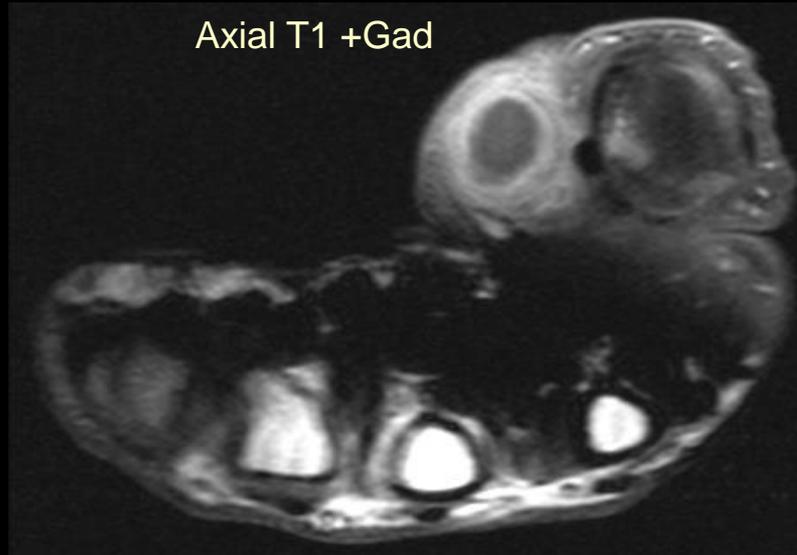
Axial T1



Ax STIR

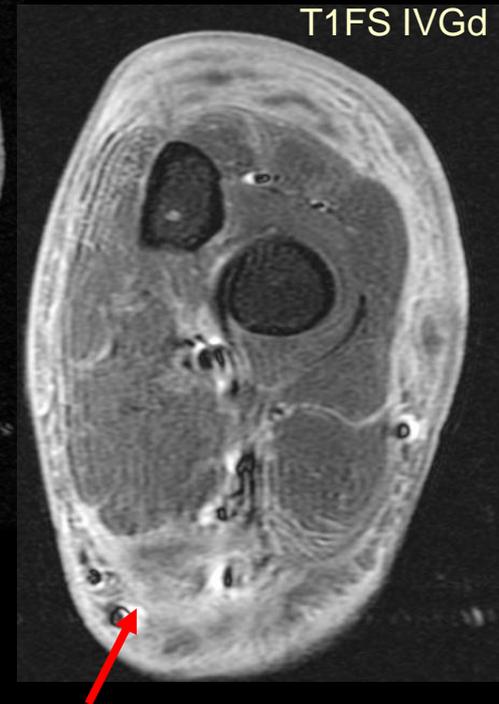
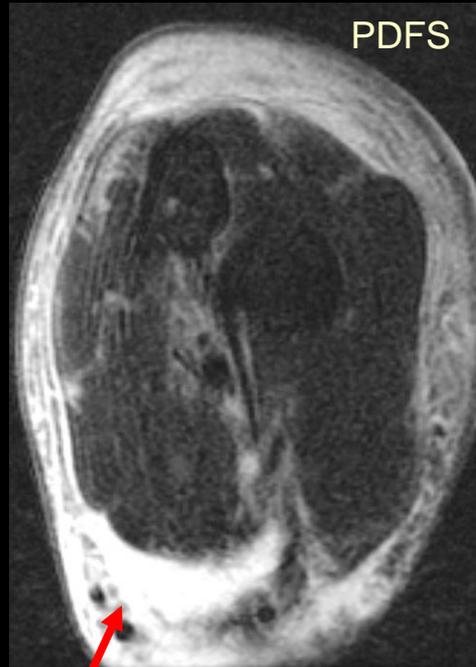


Axial T1 +Gad



63 y/o male with mass in hand present for 1 year. Recently noticed mild growth. Staphylococcus

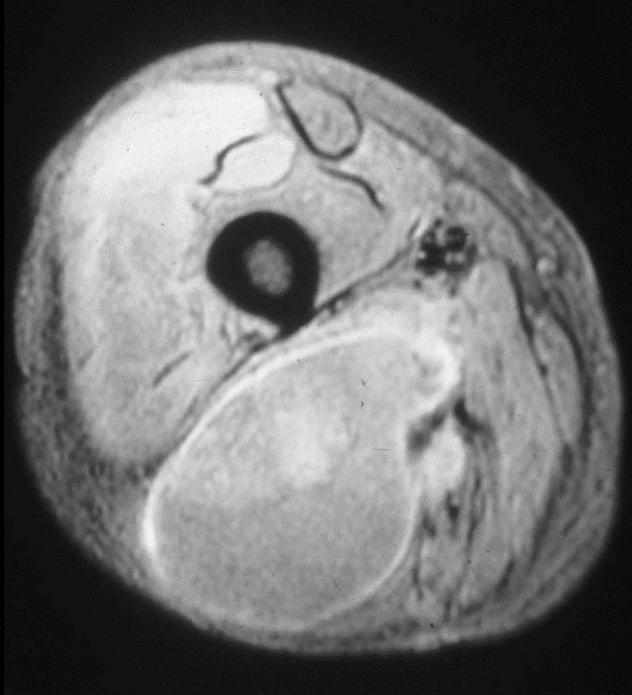
Soft Tissue Abscess



Dog bite forearm with abscesses 49M

AIDS related Pyomyositis

- Obliteration of intermuscular fat planes
- Muscle edema
- Fluid collections and/or gas within muscle

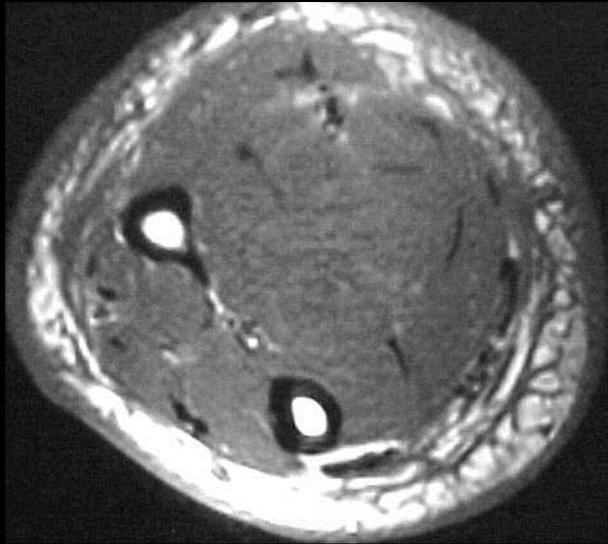


T1FS IVGd

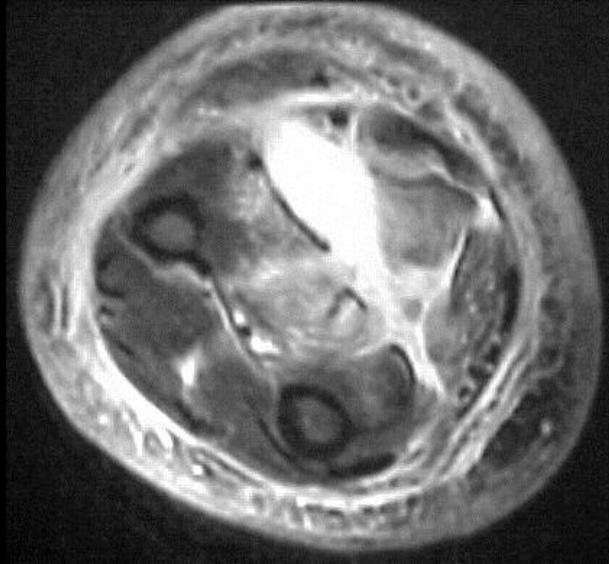


T2

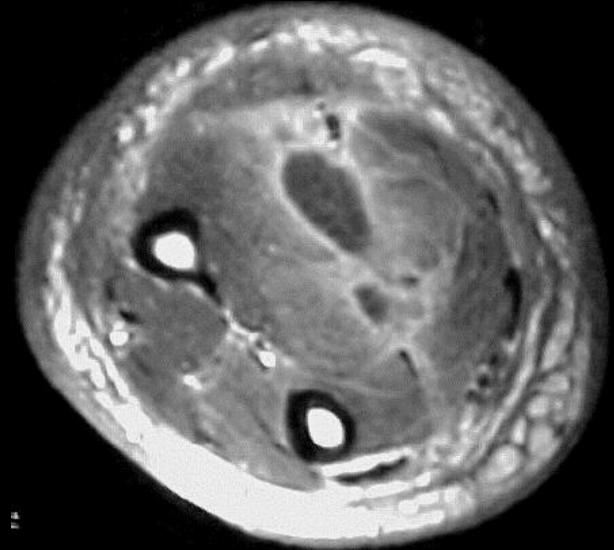
Pyomyositis in AIDS



T1



T2FS



T1FSGd

Pyomyositis is muscle inflammation with abscess in immunocompromised

Cat Scratch Disease



Coronal T1w

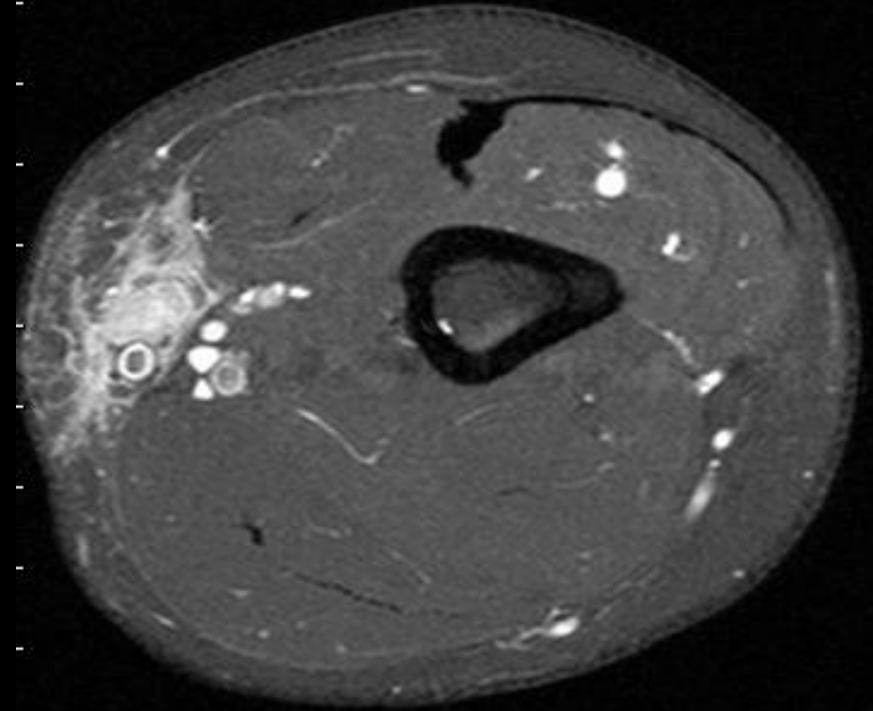


Coronal T2w

Cat Scratch Disease



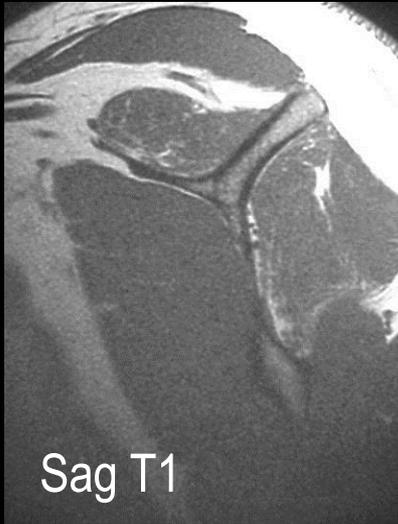
Coronal T1w post contrast



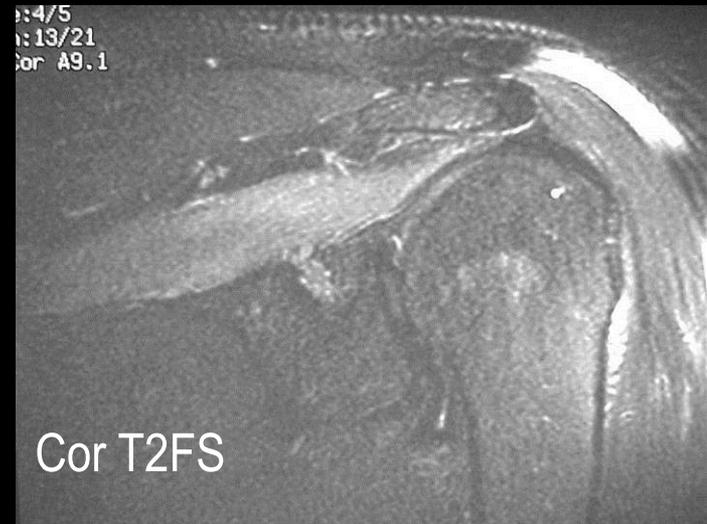
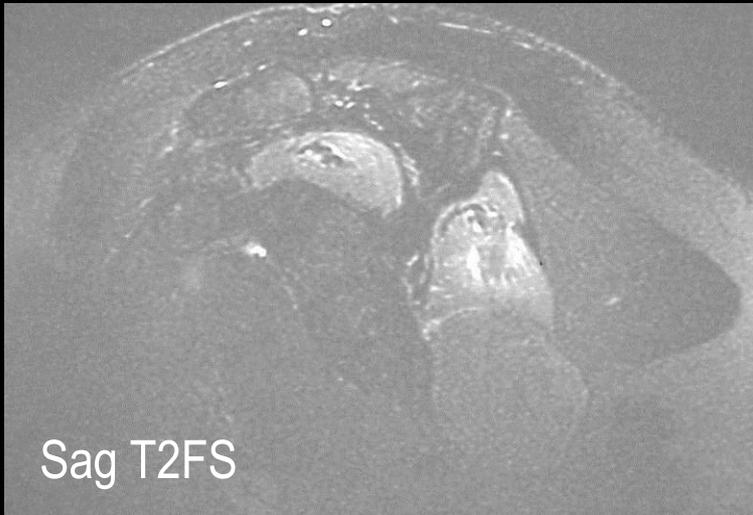
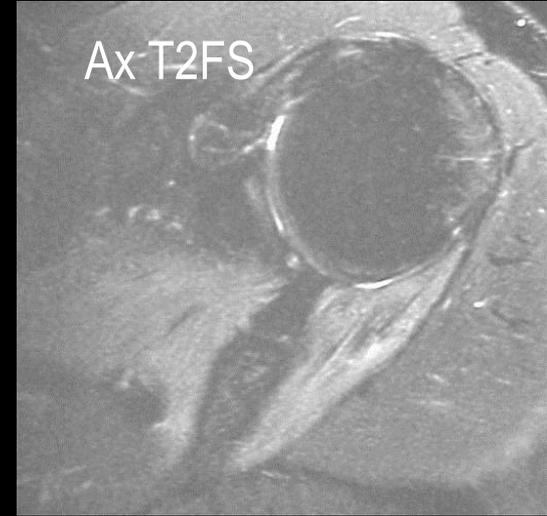
Axial T1w post contrast

19 year old man with painful nodule above the elbow

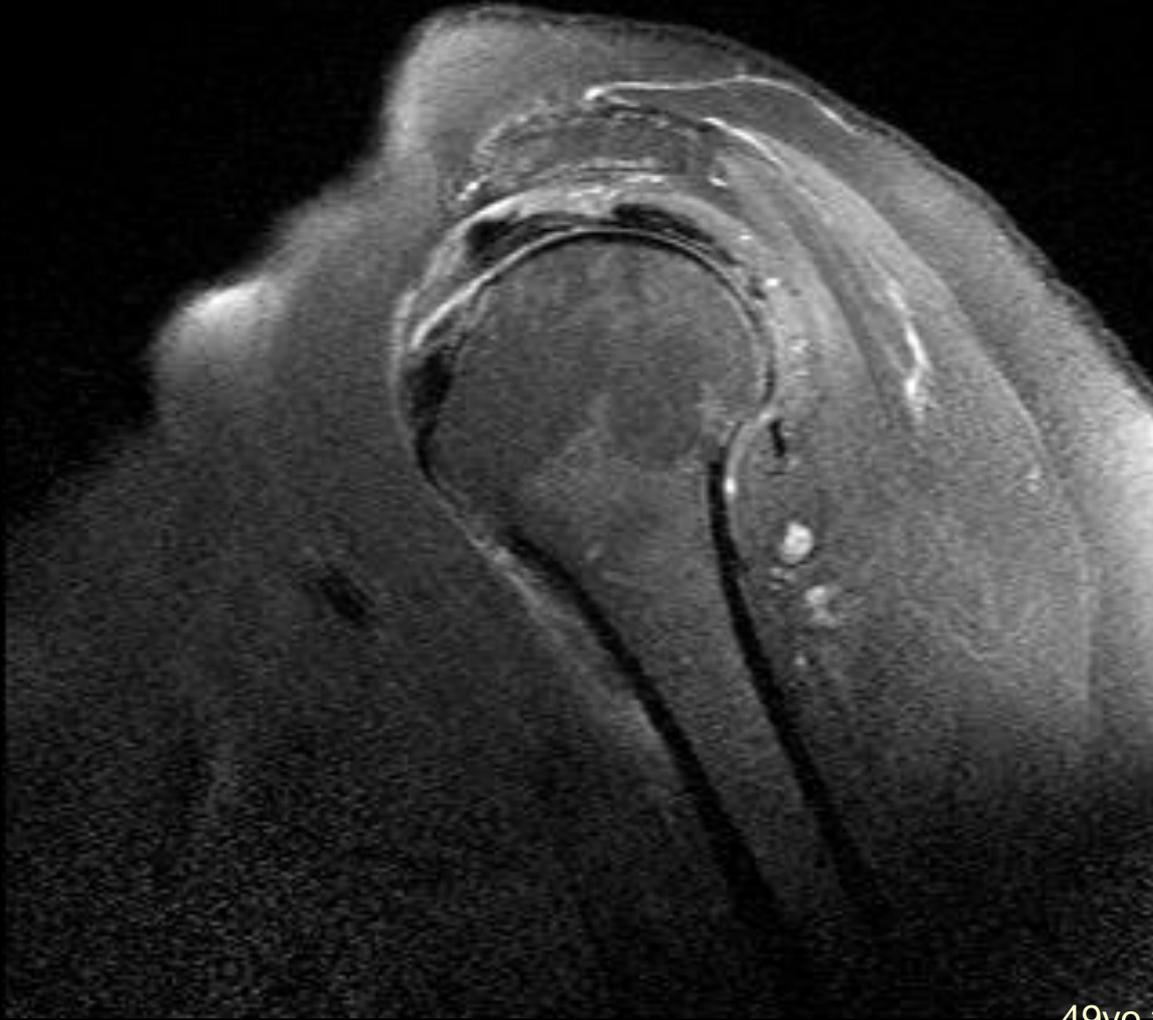
Viral



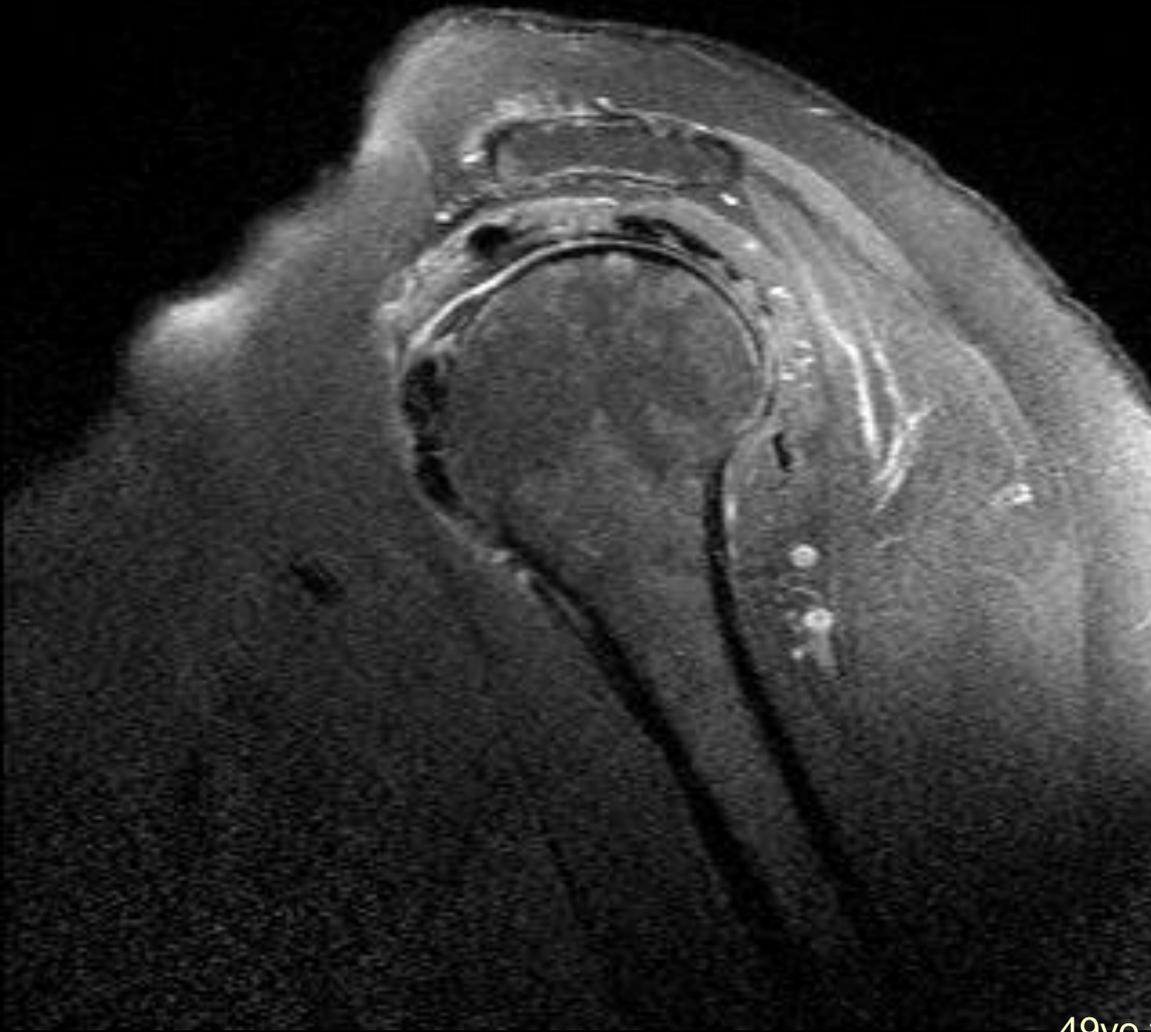
35M
Parsonage Turner
syndrome



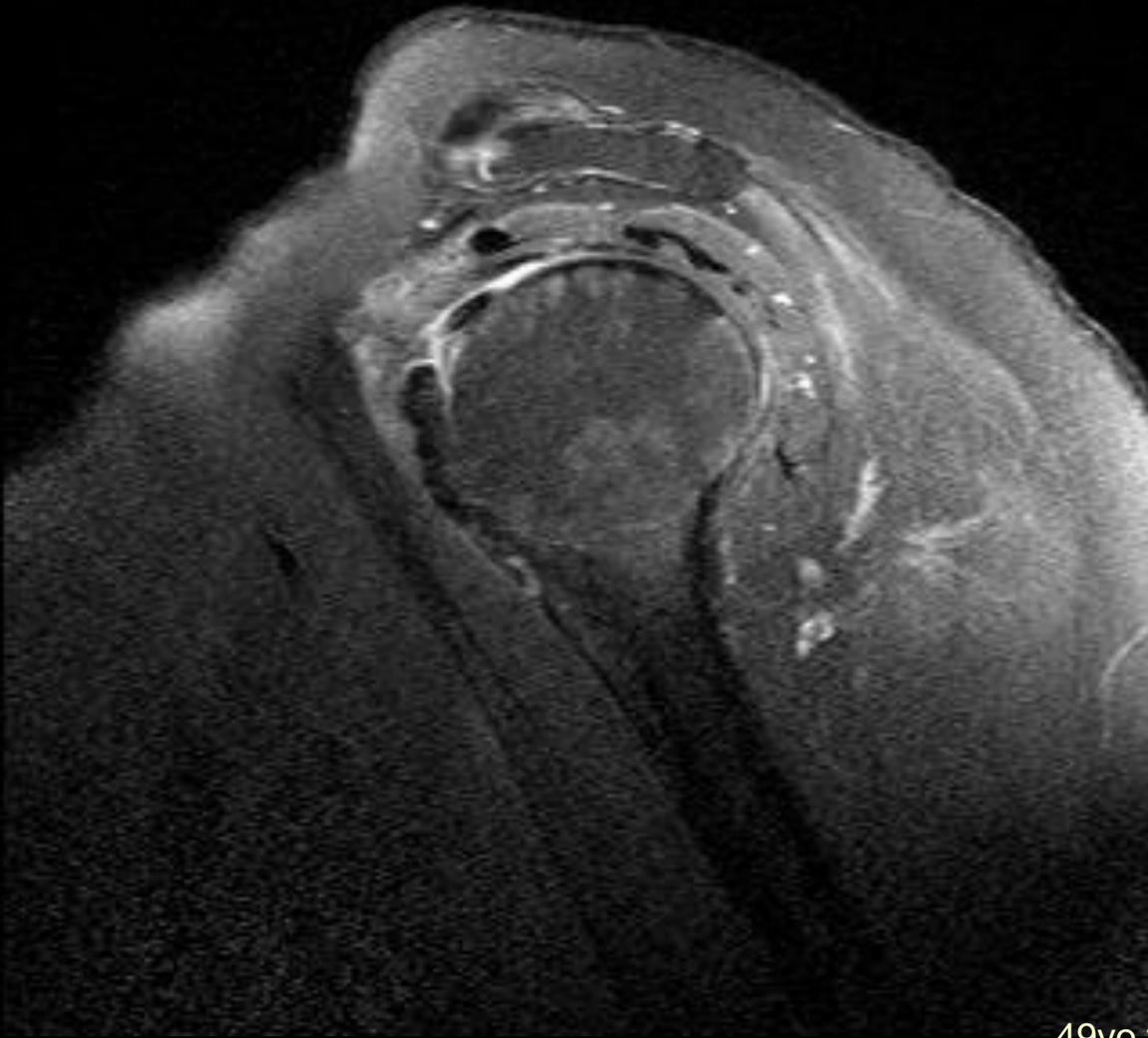
Viral - Parsonage Turner Syndrome



Viral - Parsonage Turner Syndrome

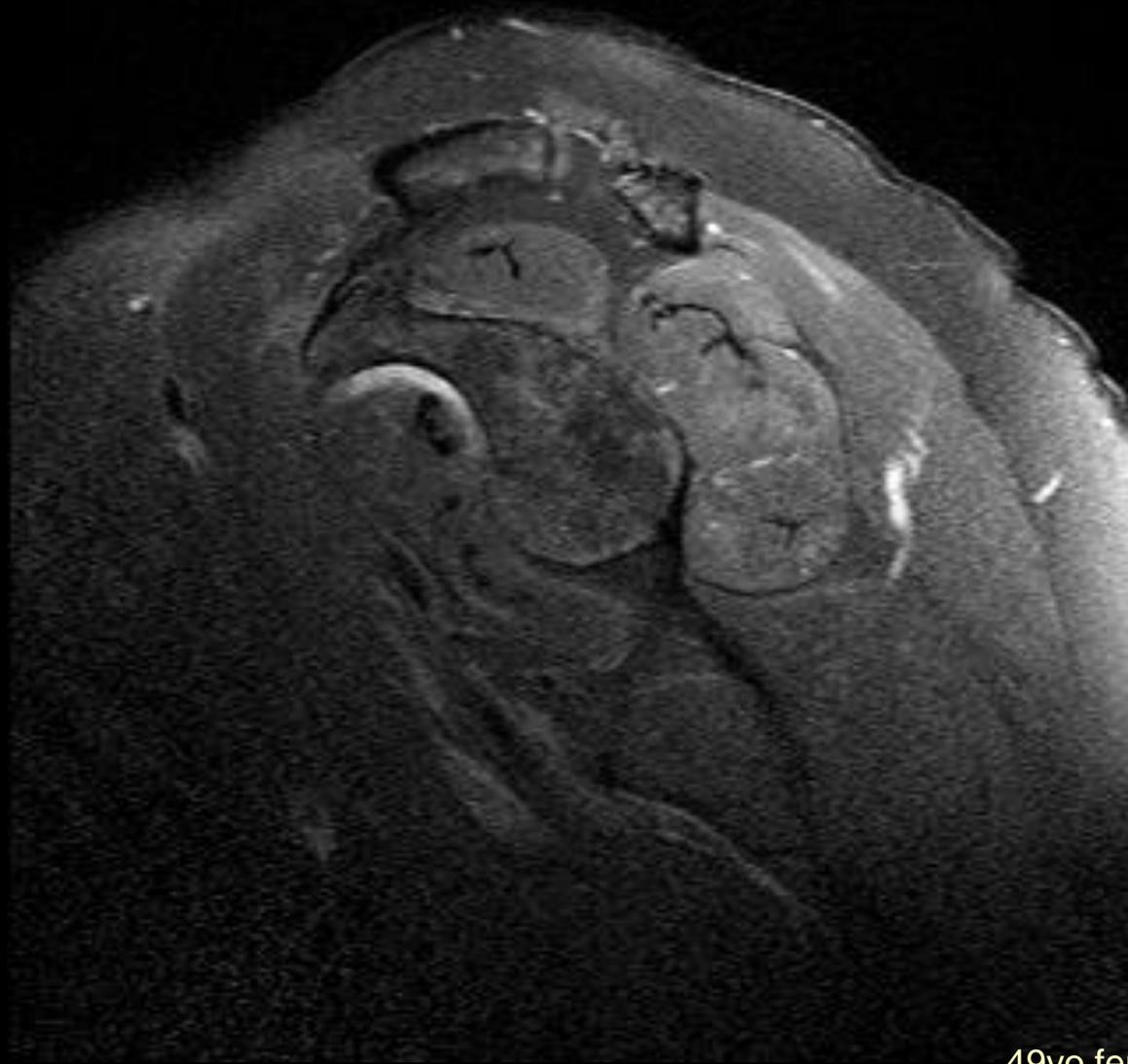


Viral - Parsonage Turner Syndrome

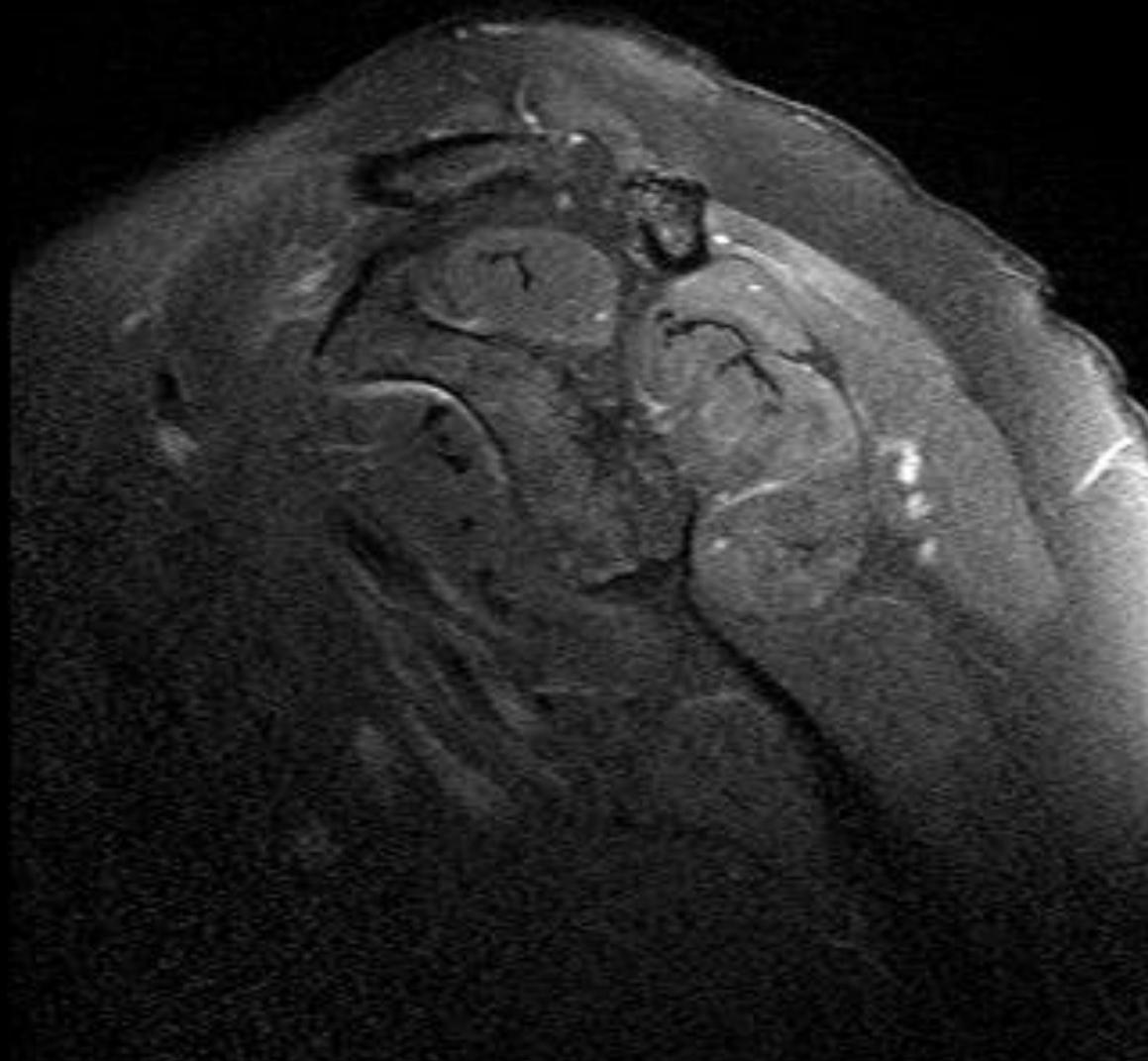


49yo female with shoulder pain

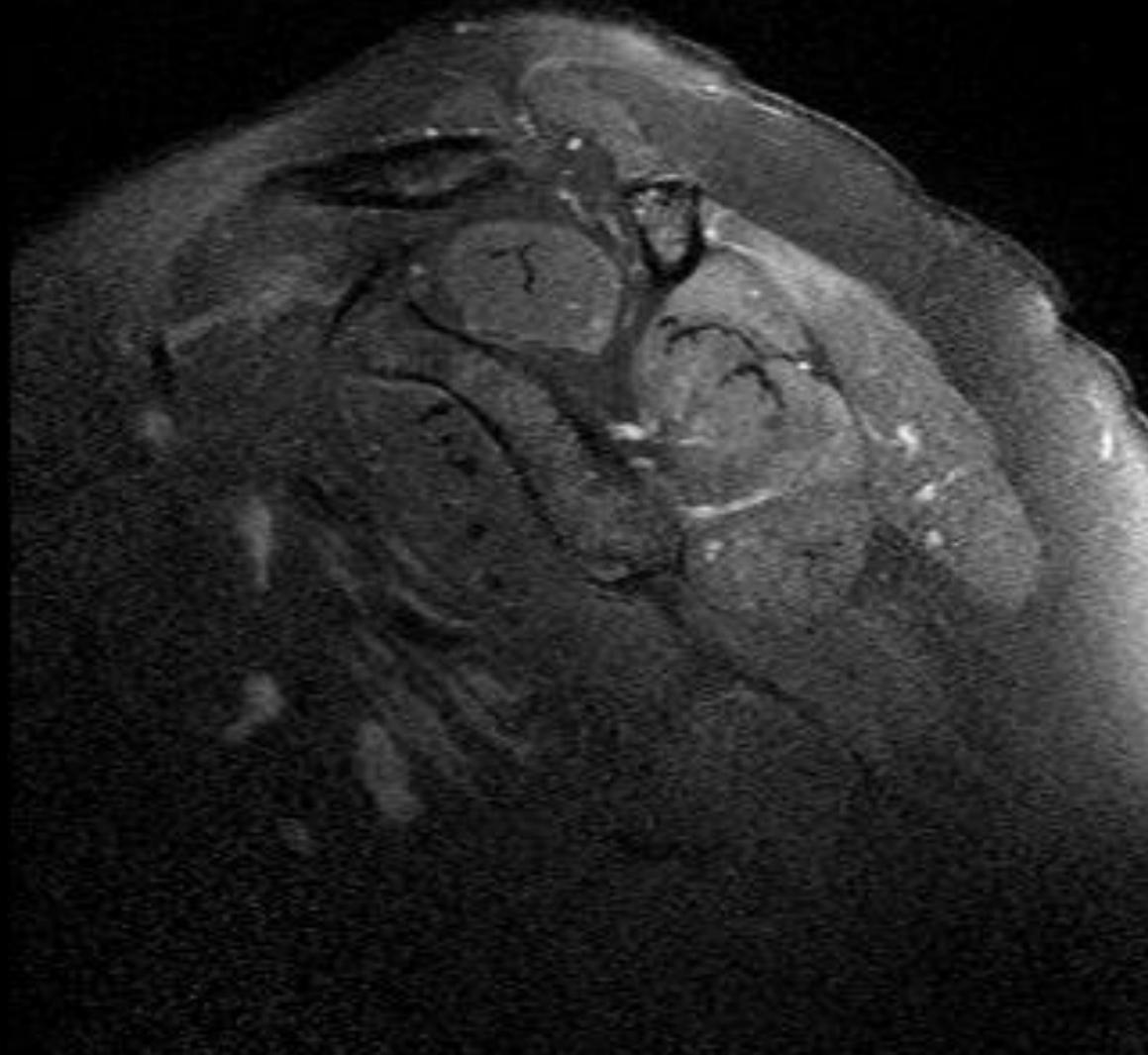
Viral - Parsonage Turner Syndrome



Viral - Parsonage Turner Syndrome

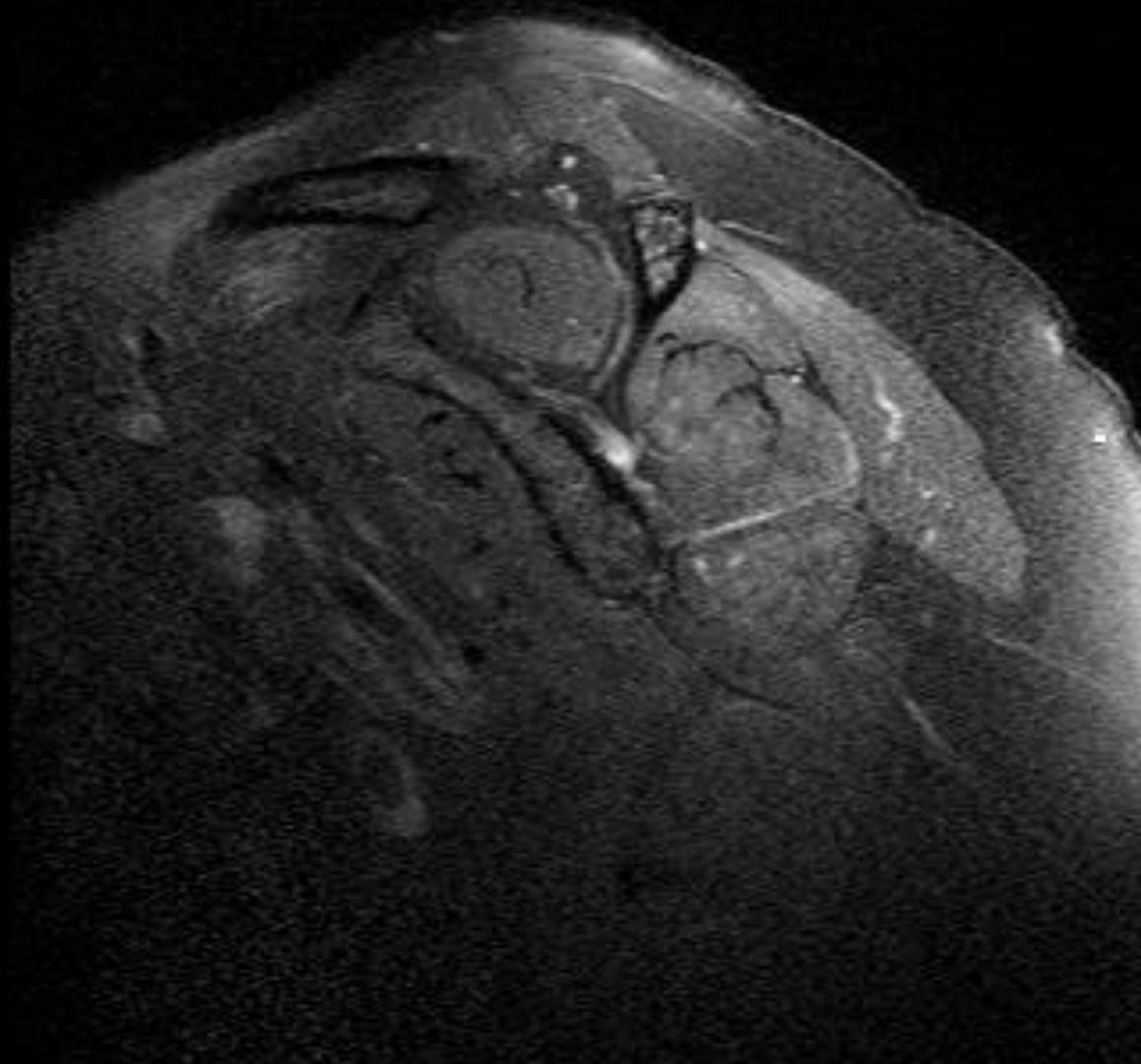


Viral - Parsonage Turner Syndrome

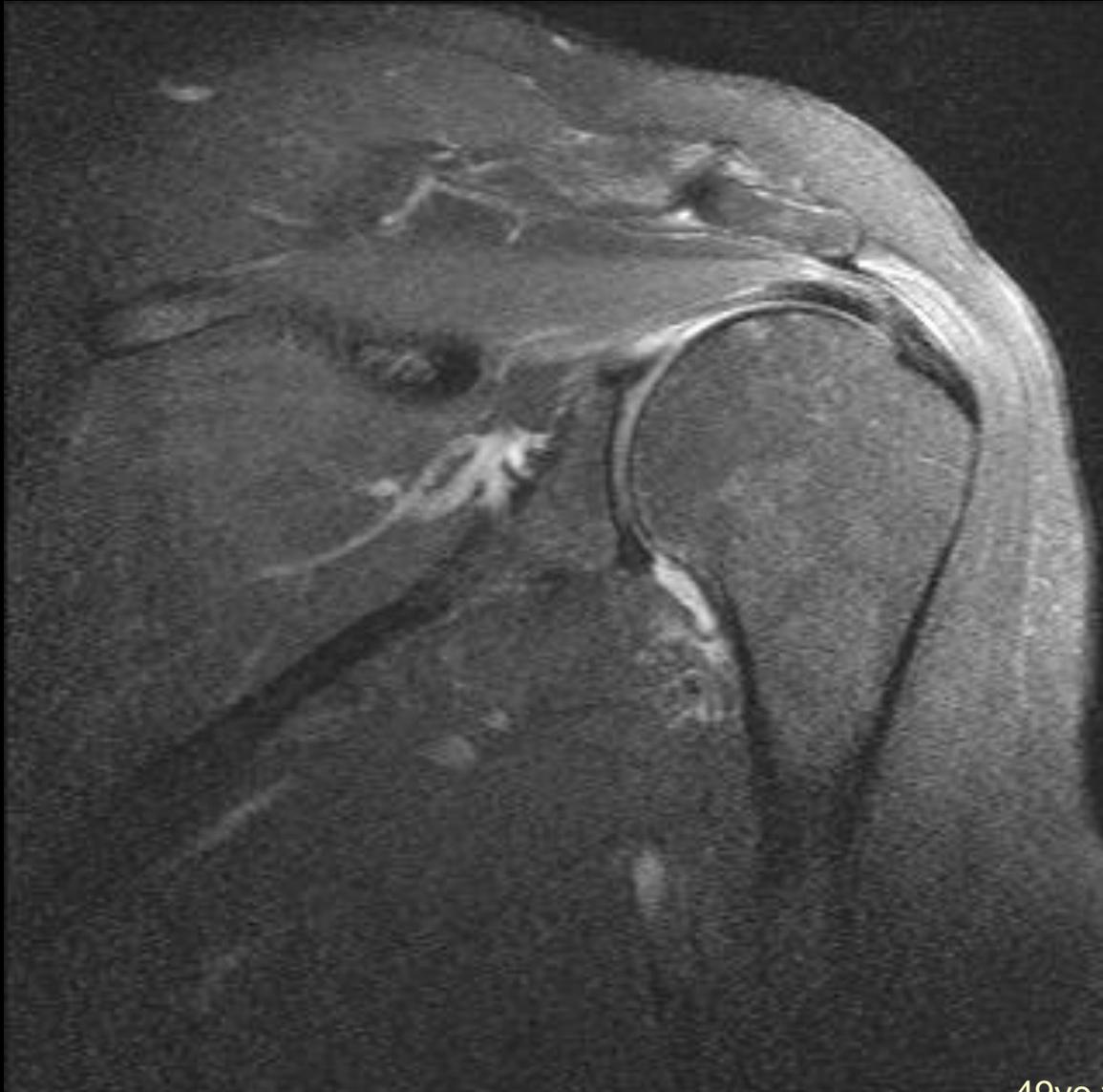


49yo female with shoulder pain

Viral - Parsonage Turner Syndrome

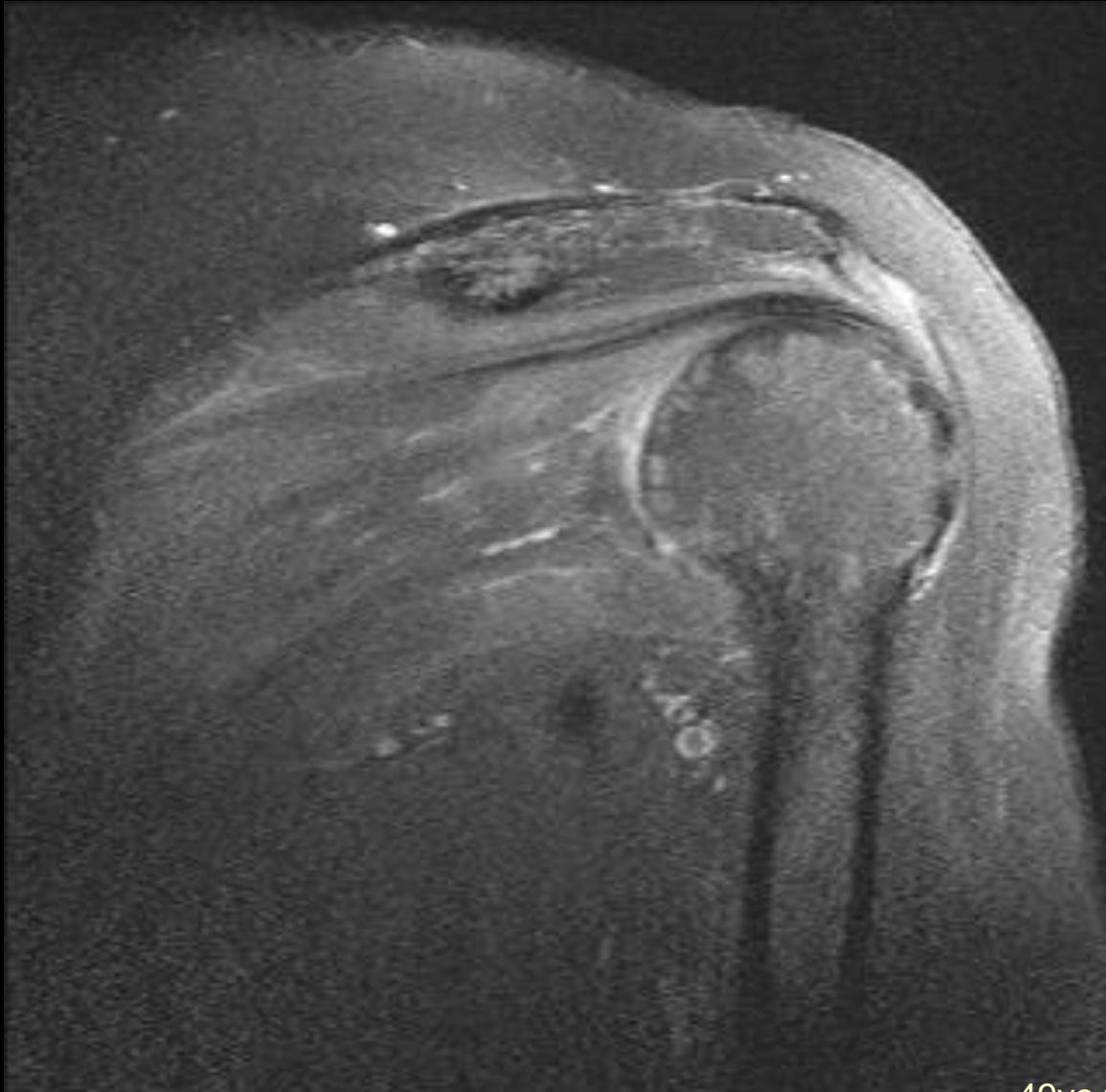


Viral - Parsonage Turner Syndrome



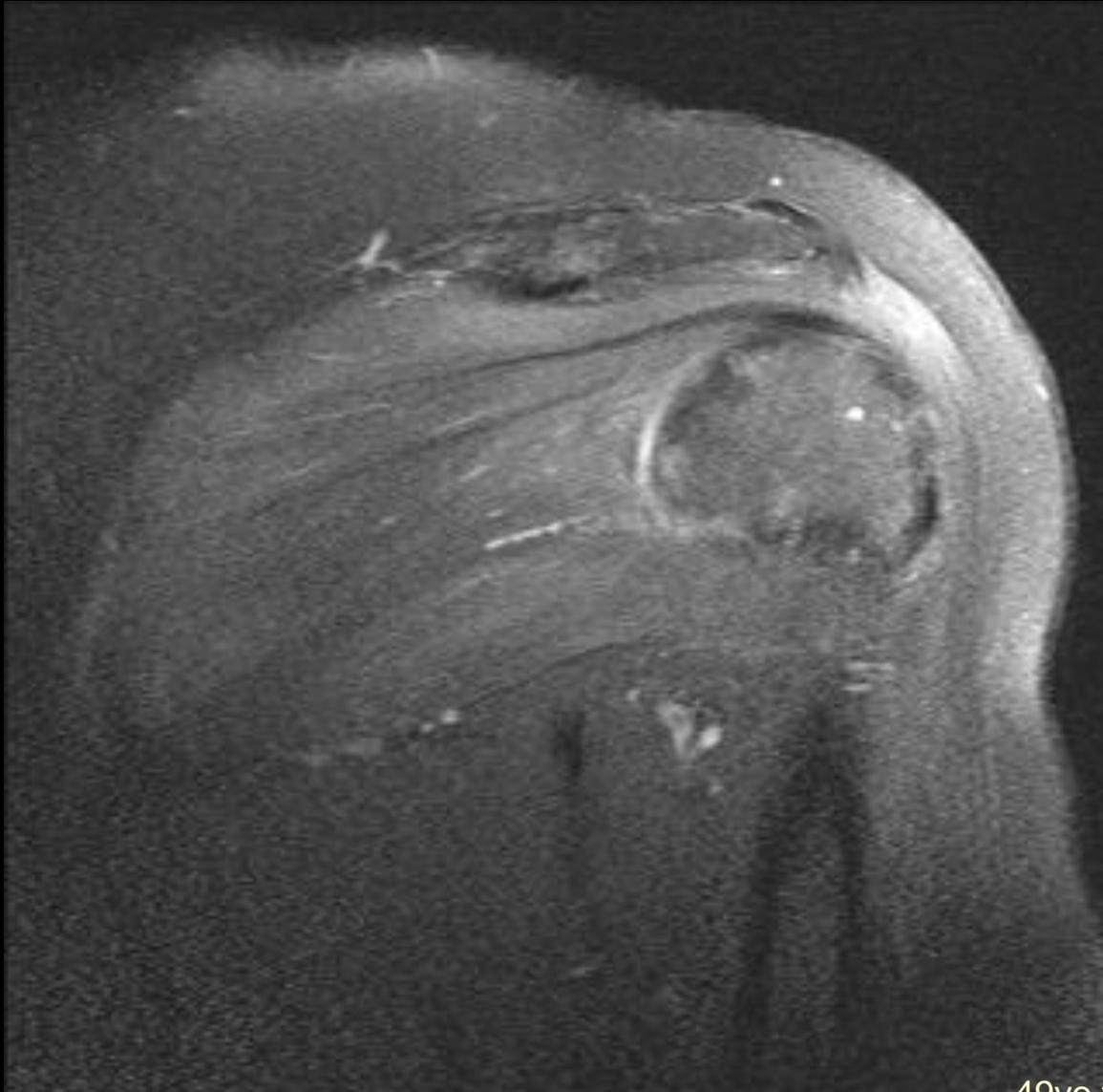
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Viral - Parsonage Turner Syndrome



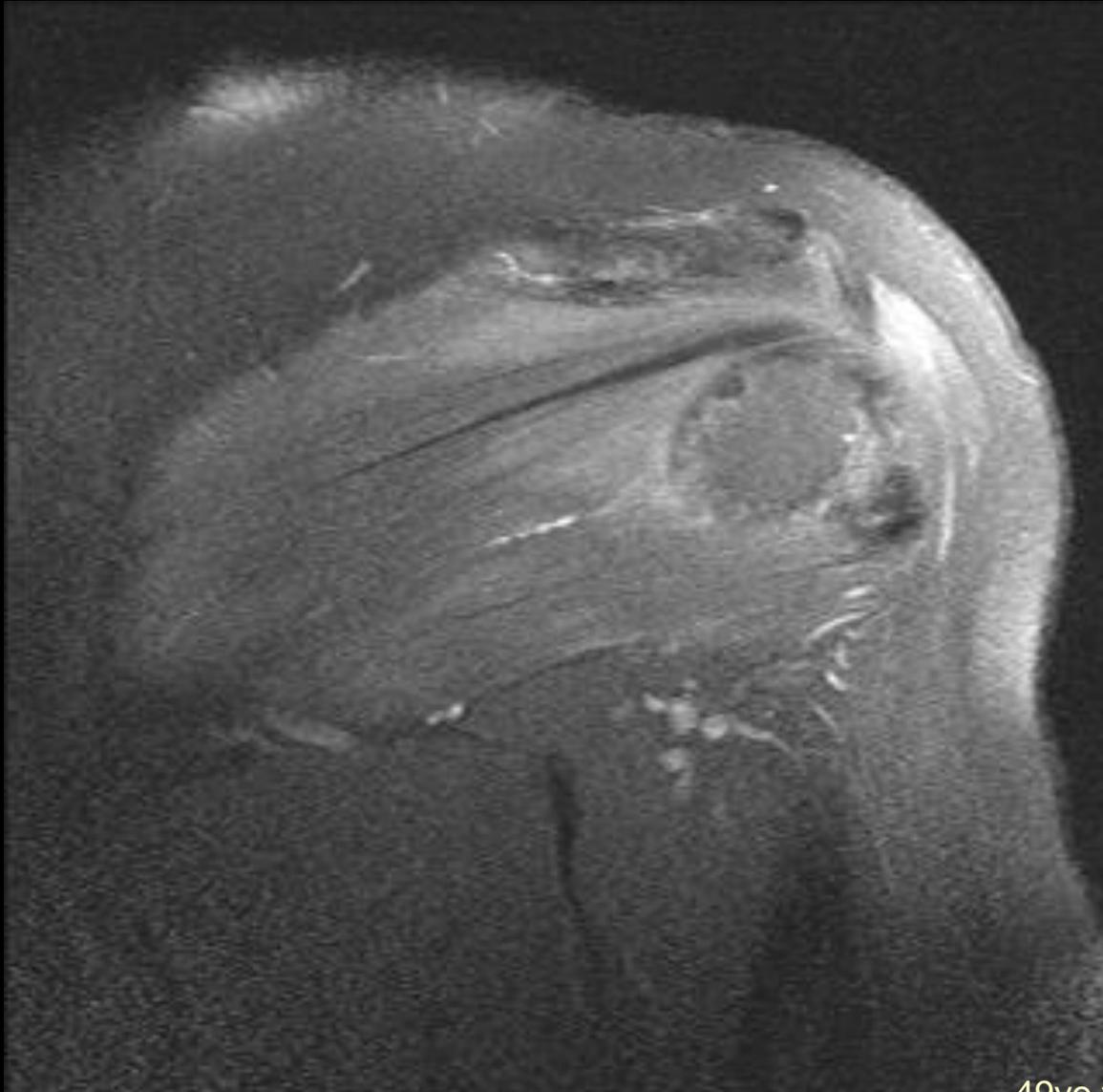
49yo female with shoulder pain

Viral - Parsonage Turner Syndrome



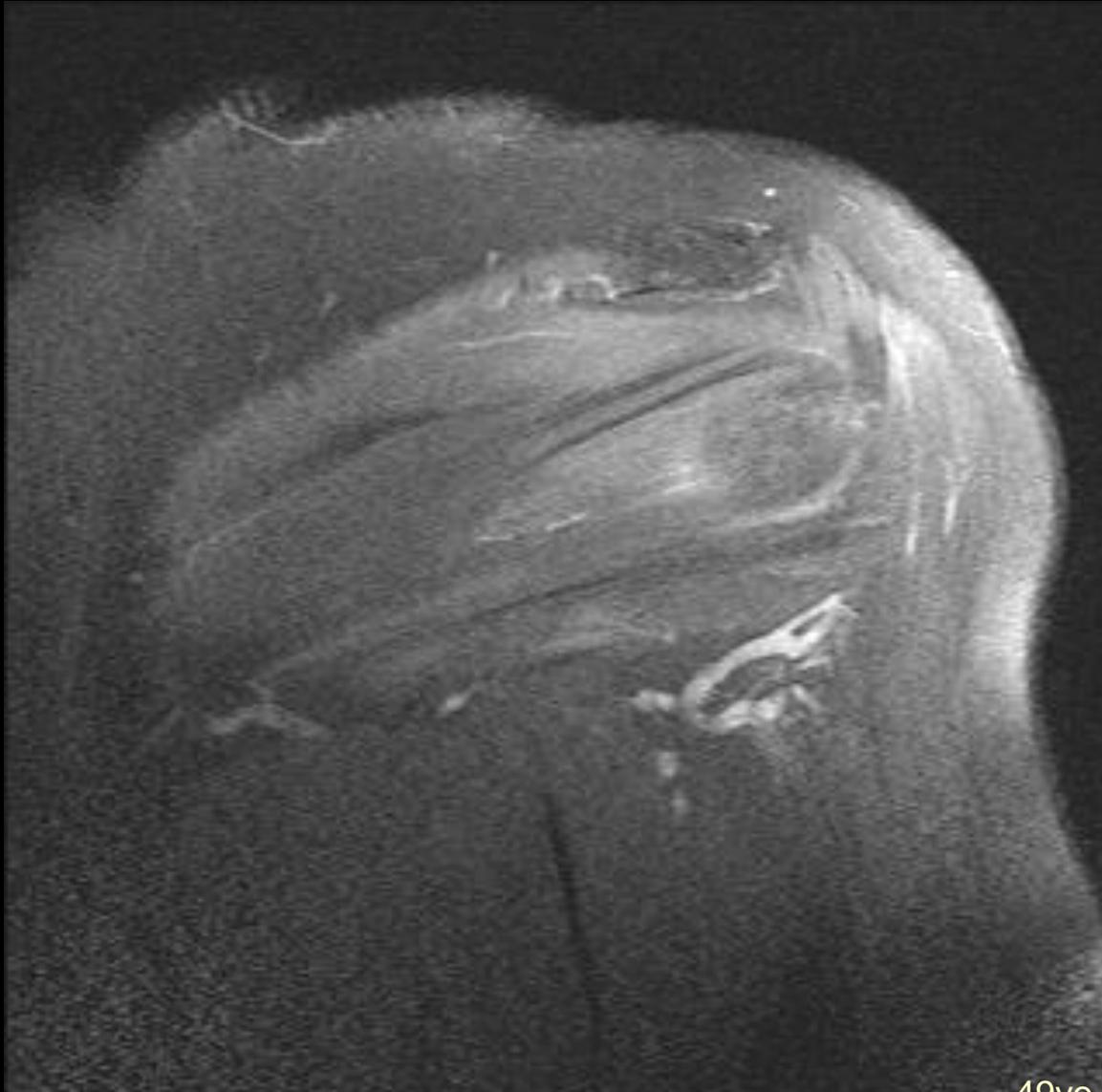
49yo female with shoulder pain

Viral - Parsonage Turner Syndrome



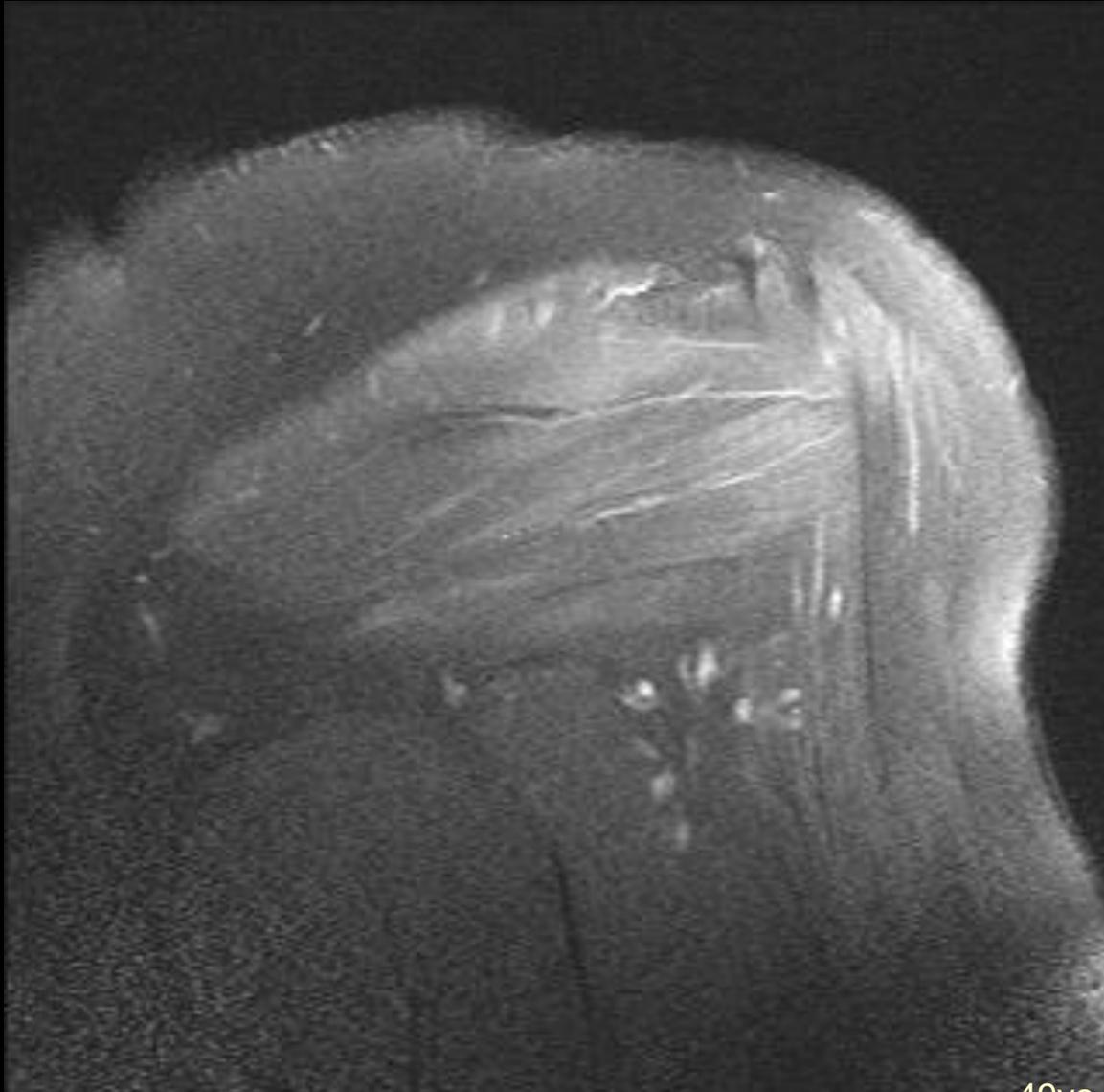
49yo female with shoulder pain

Viral - Parsonage Turner Syndrome



49yo female with shoulder pain

Viral - Parsonage Turner Syndrome

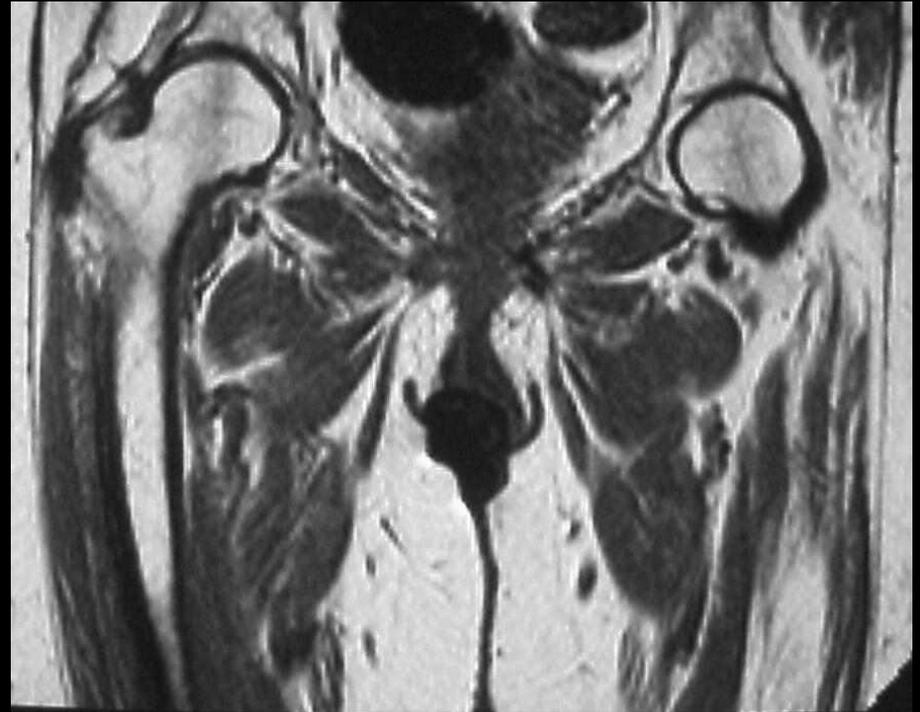
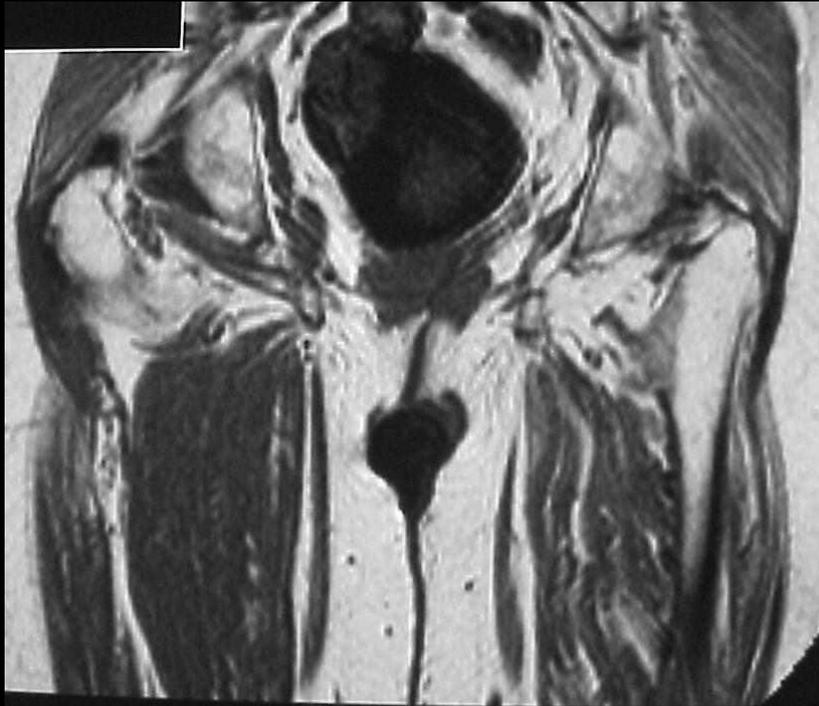


49yo female with shoulder pain

Parsonage Turner Syndrome

- Also known as brachial neuritis or neuralgic amyotrophy.
- Unknown etiology, but possibly viral.
- Causes symptoms of shoulder pain and weakness. Usually self limited.
- Men more often than women.
- Bilateral reported in up to 30% of cases.

Viral - Polio



Cor T1

Viral - Polio



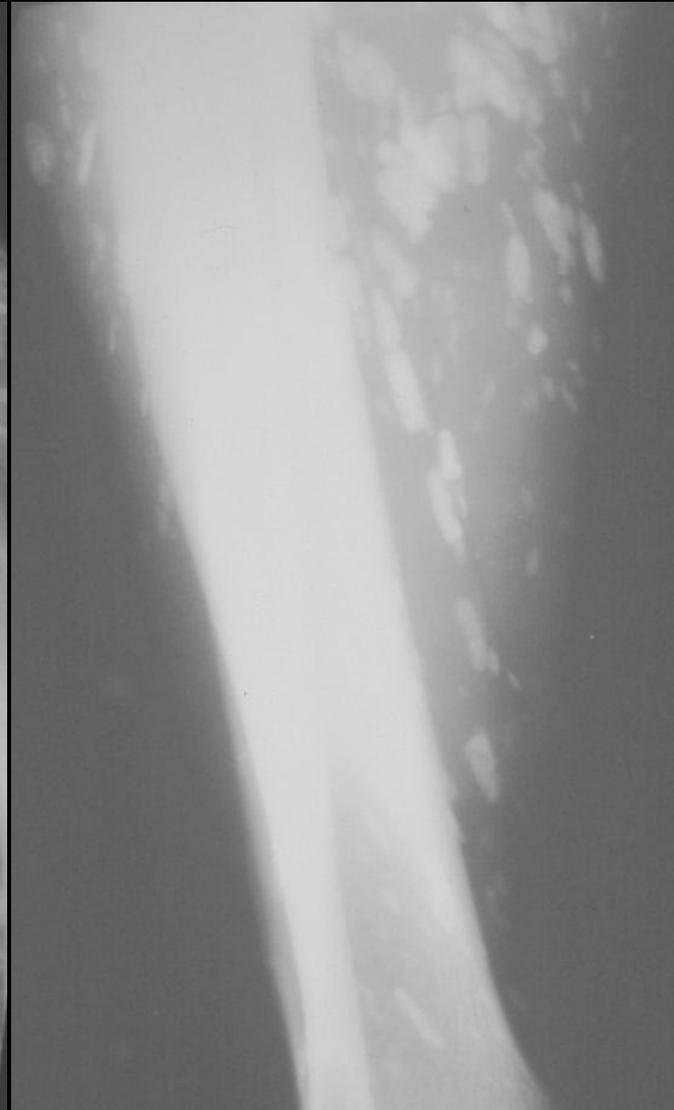
Cor T1



Sag PD

Parasites

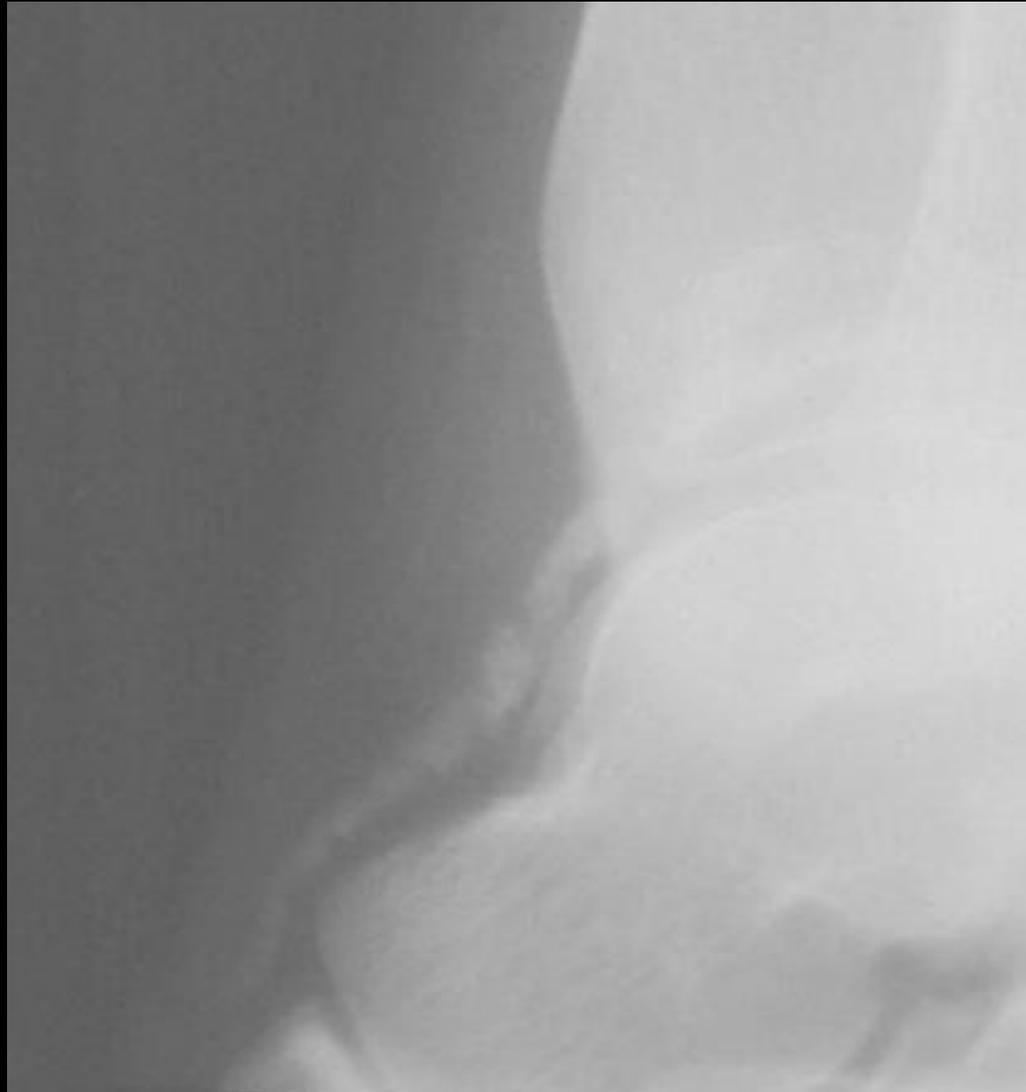
Cystercercosis



Pork tapeworm

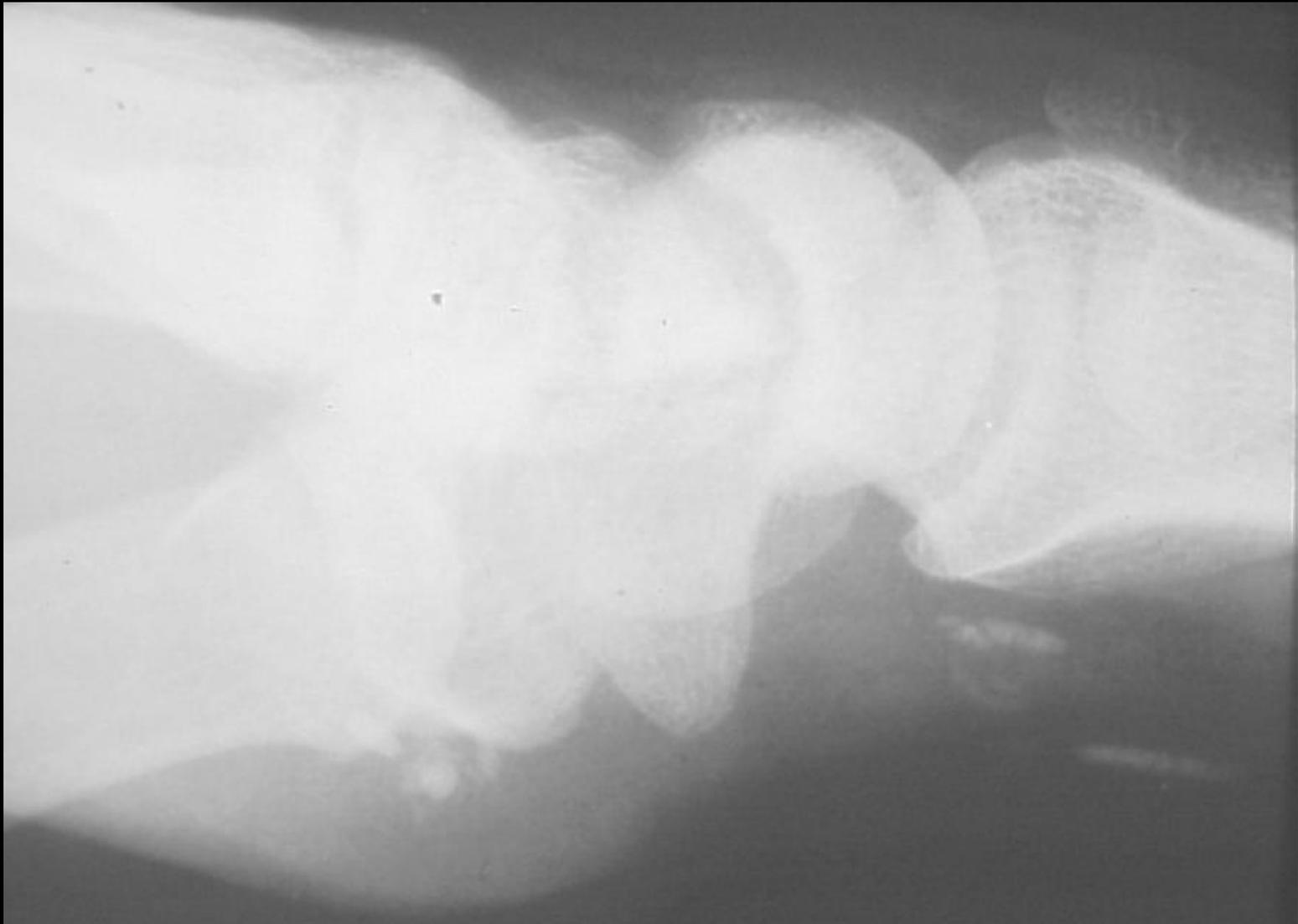
Parasites

Guinea worm



Dracunculus Medinensis

Parasites
Loa loa



Synovial Infection

- Septic tenosynovitis
- Septic bursitis
- Septic arthritis

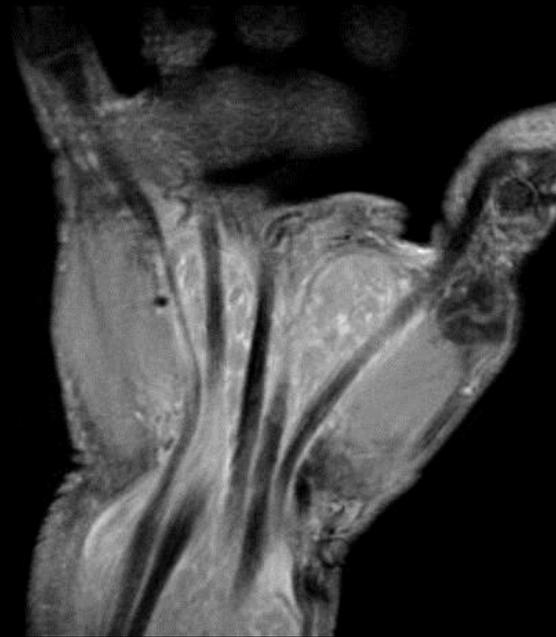


Synovial Infection

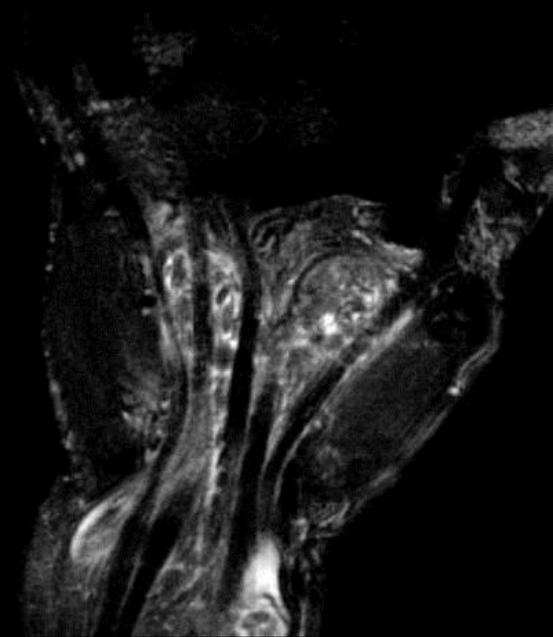
- Septic tenosynovitis
- Septic bursitis
- Septic arthritis



T1FSGd

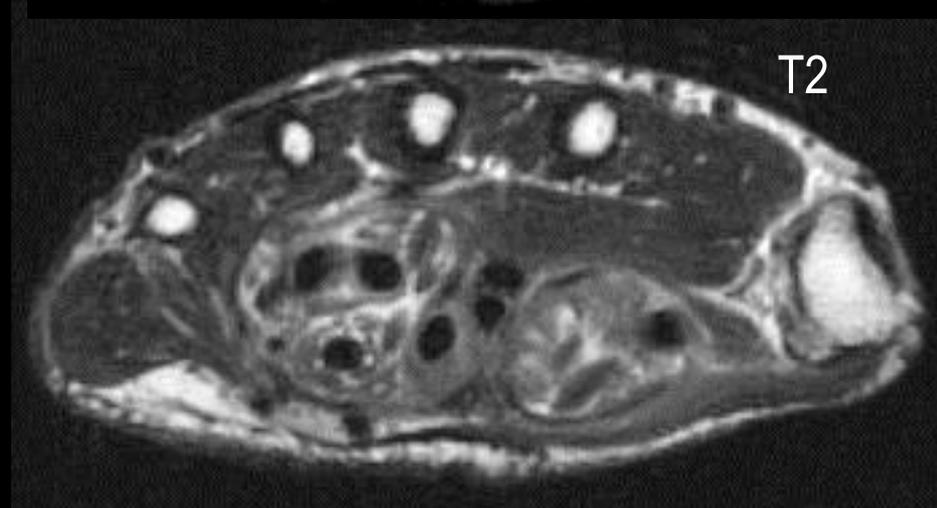
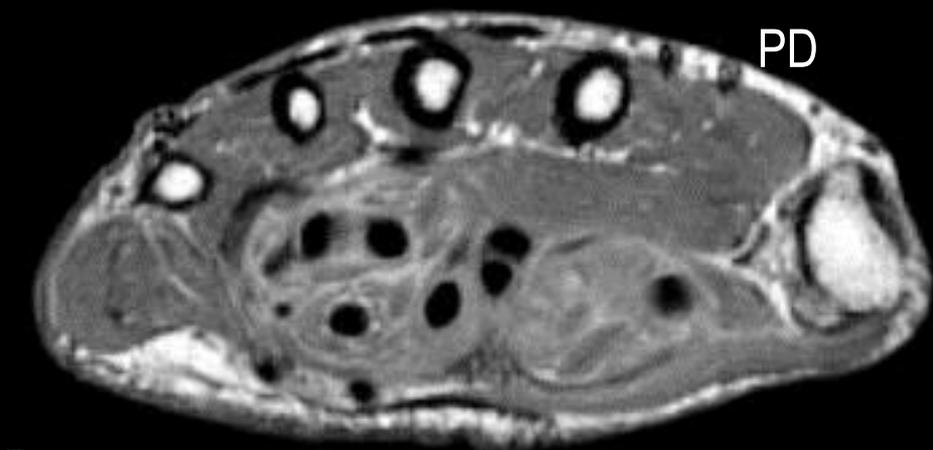
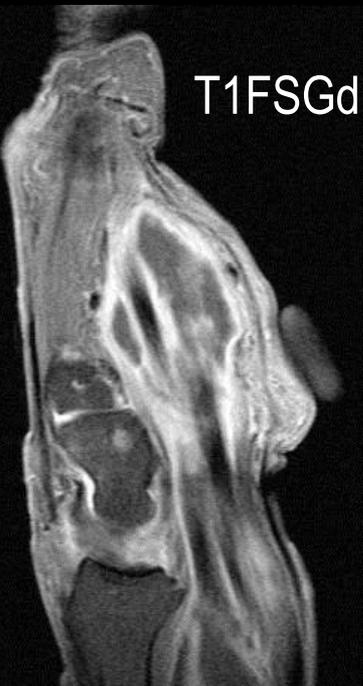


PDFS



T2FS

Septic Bursitis



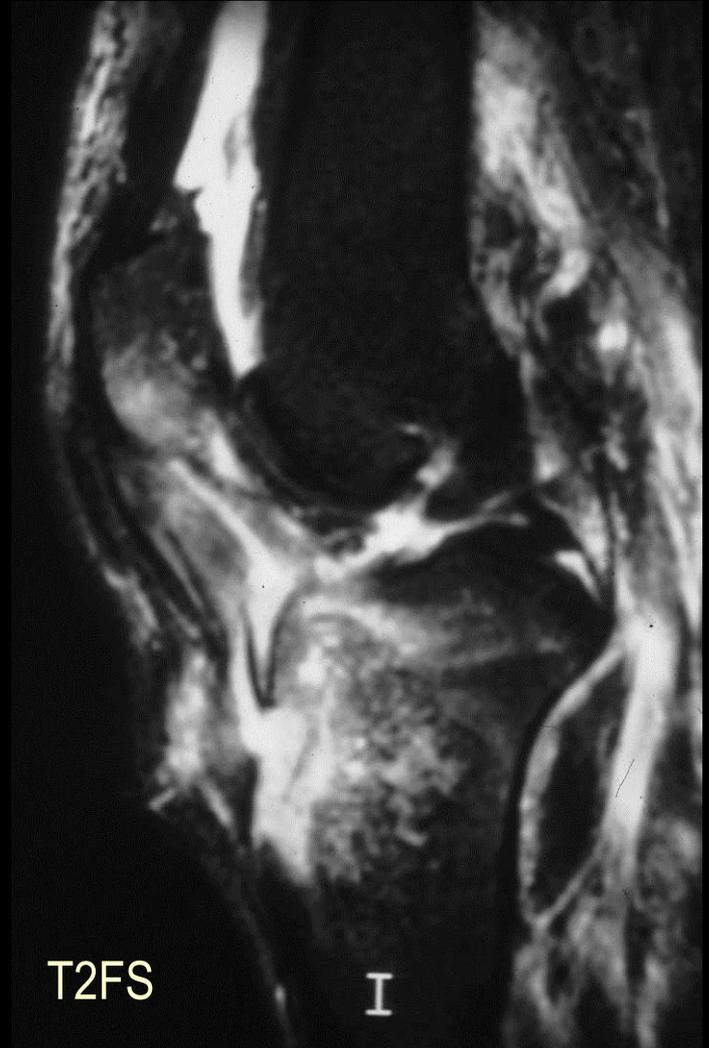
Septic Bursitis

- Superficial bursae
 - Prepatellar
 - Olecranon
 - Subacromial
- Fluid within bursa
- Synovitis, internal debris, or gas formation



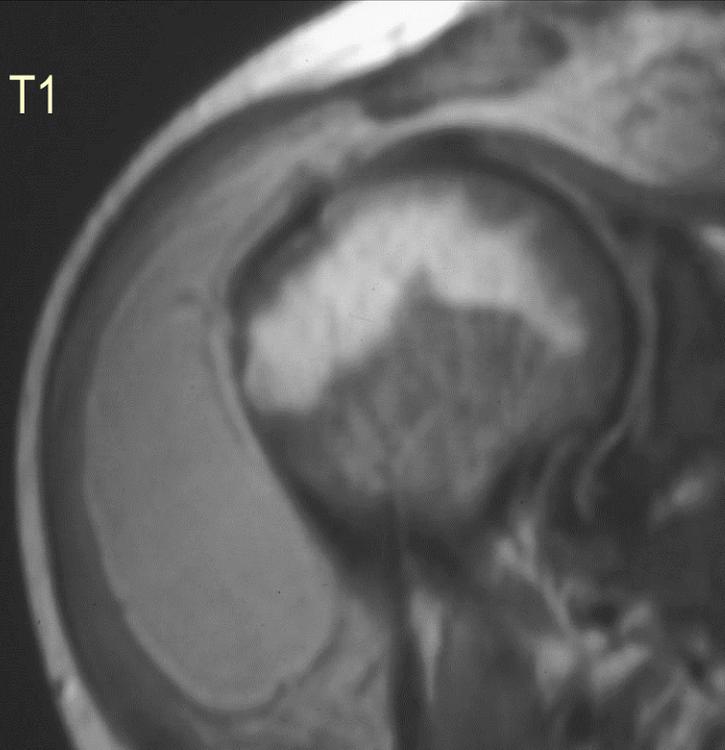
Penetrating soft tissue injury, knelt on object

Septic Bursitis

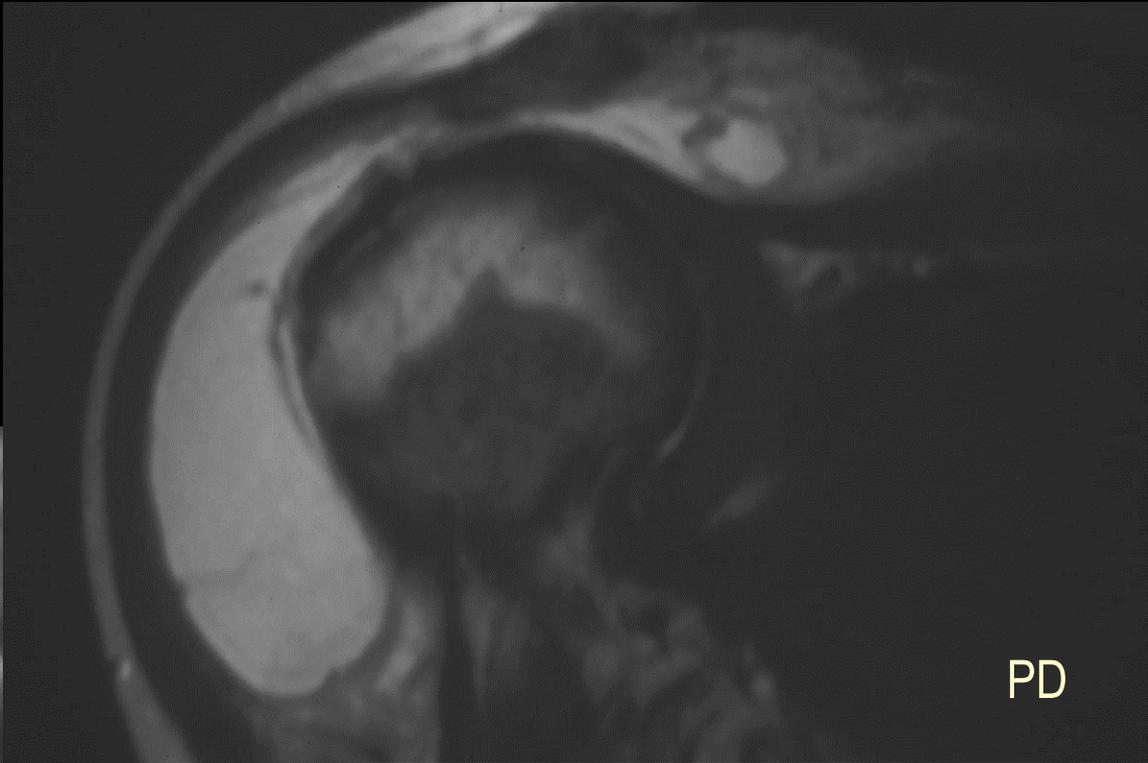


Septic Bursitis

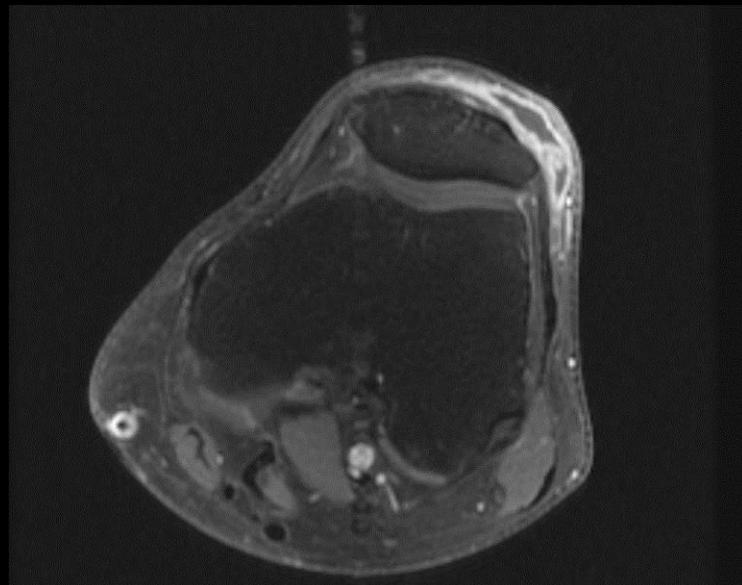
T1



PD



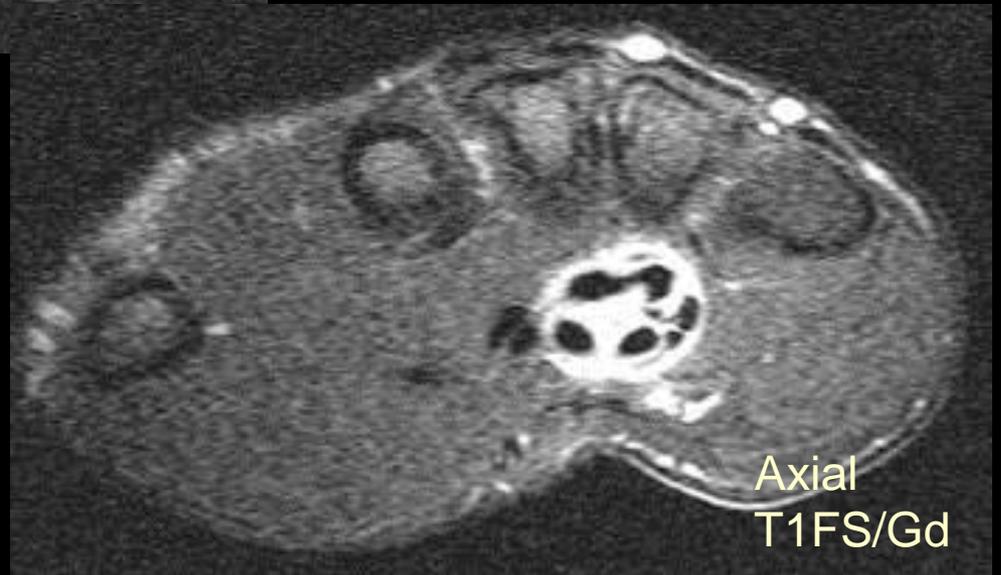
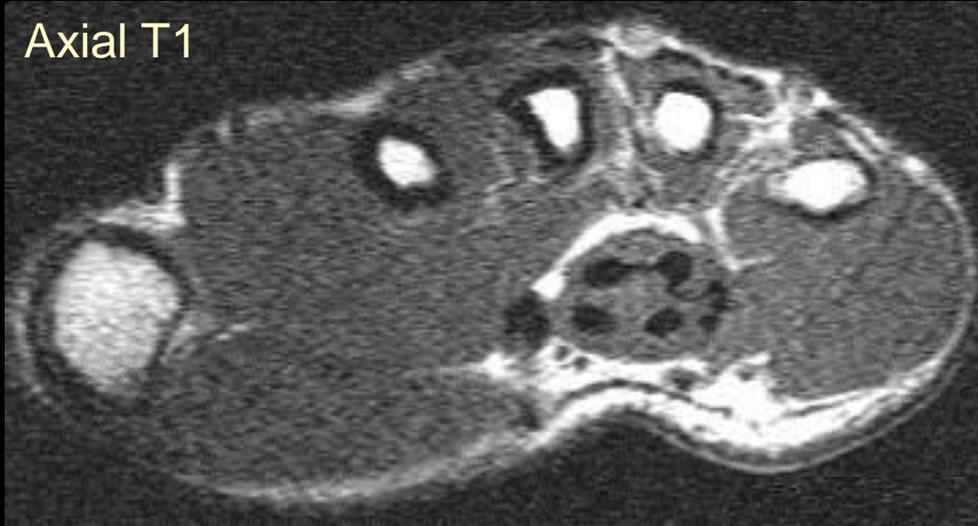
Septic Bursitis



Fungal prepatella bursitis 53M

Septic Bursitis

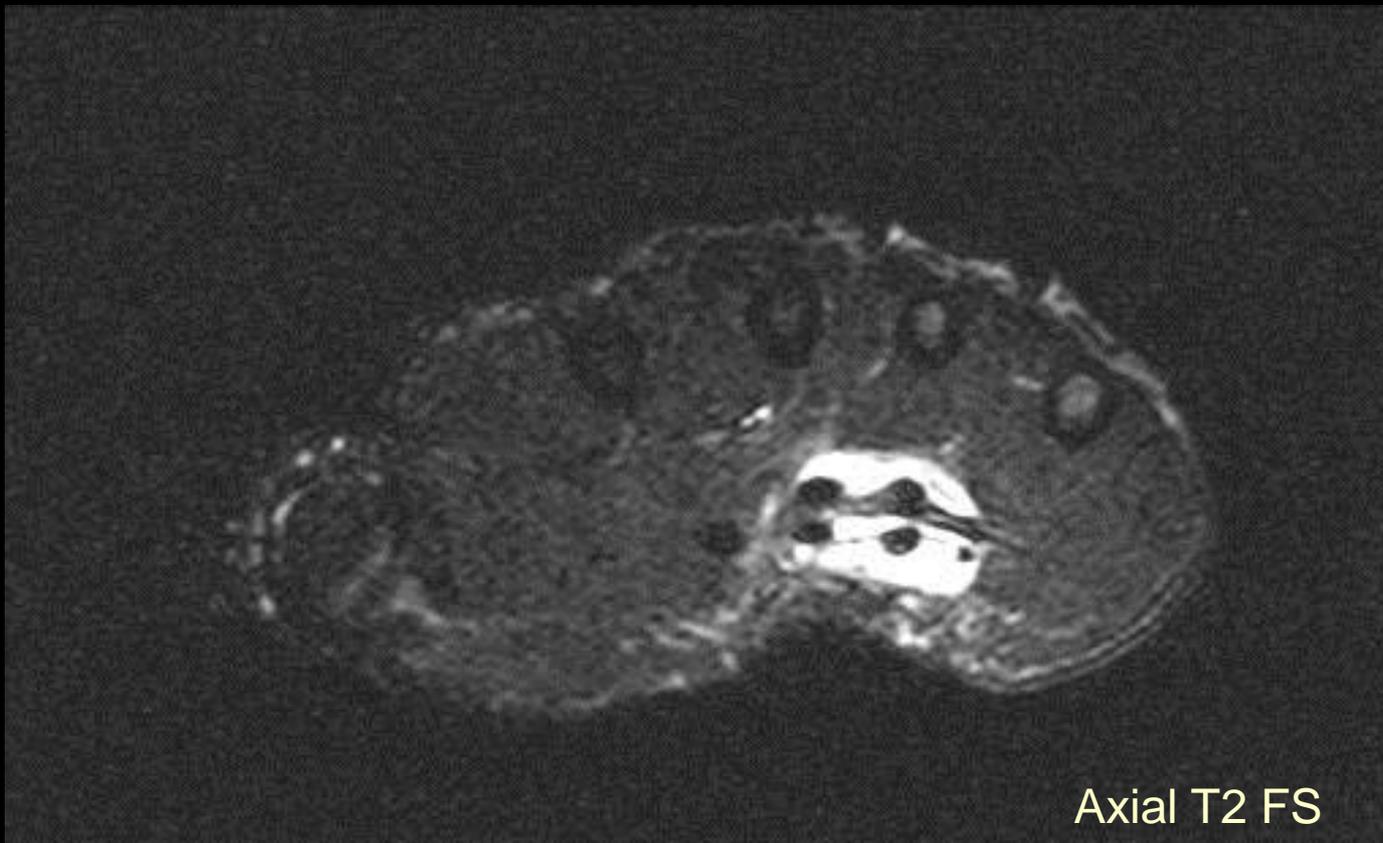
Axial T1



Axial
T1FS/Gd

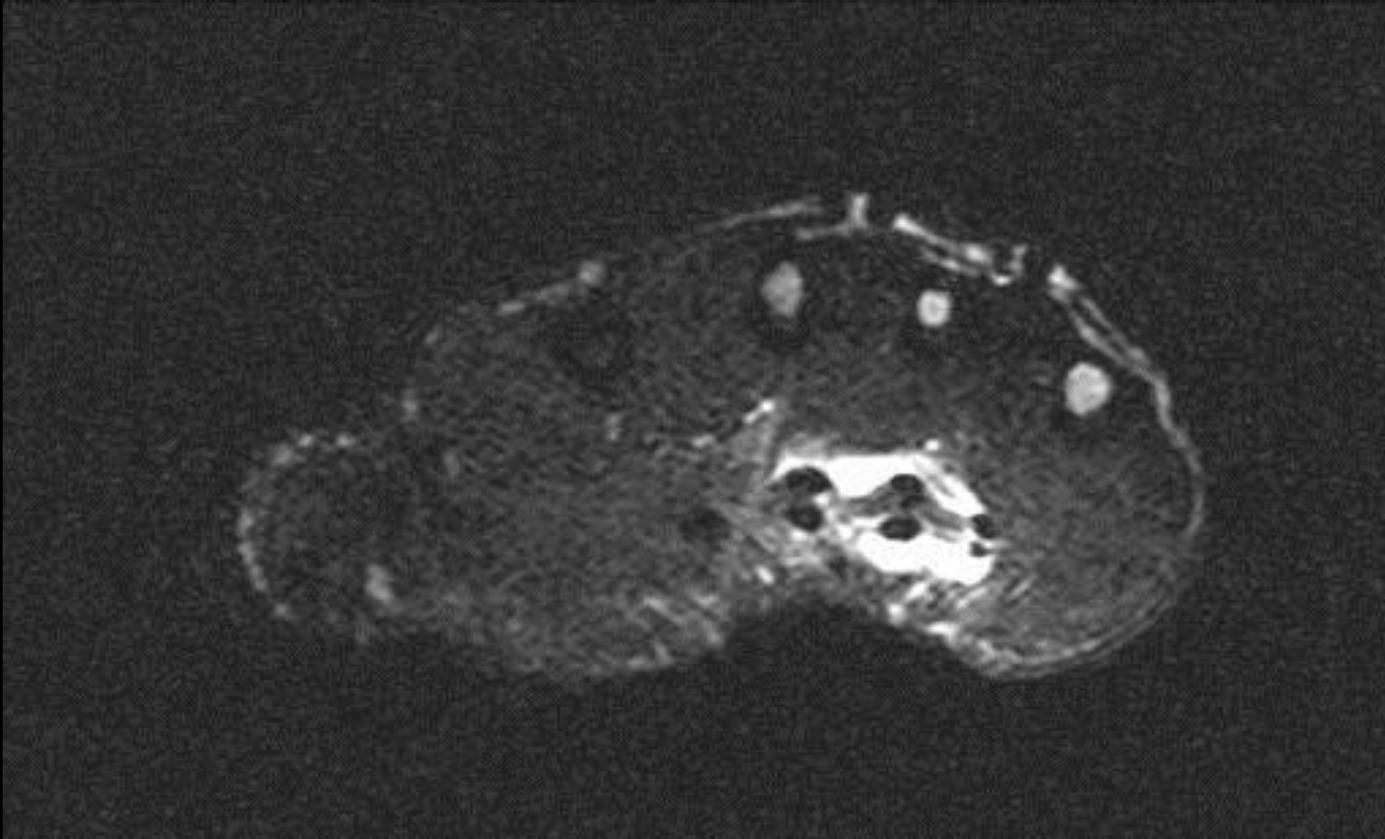
20 yo minor league baseball player with history of aspergillus infection 1 yr ago.
Recurrent pain and swelling in the hand and wrist.

Septic Bursitis



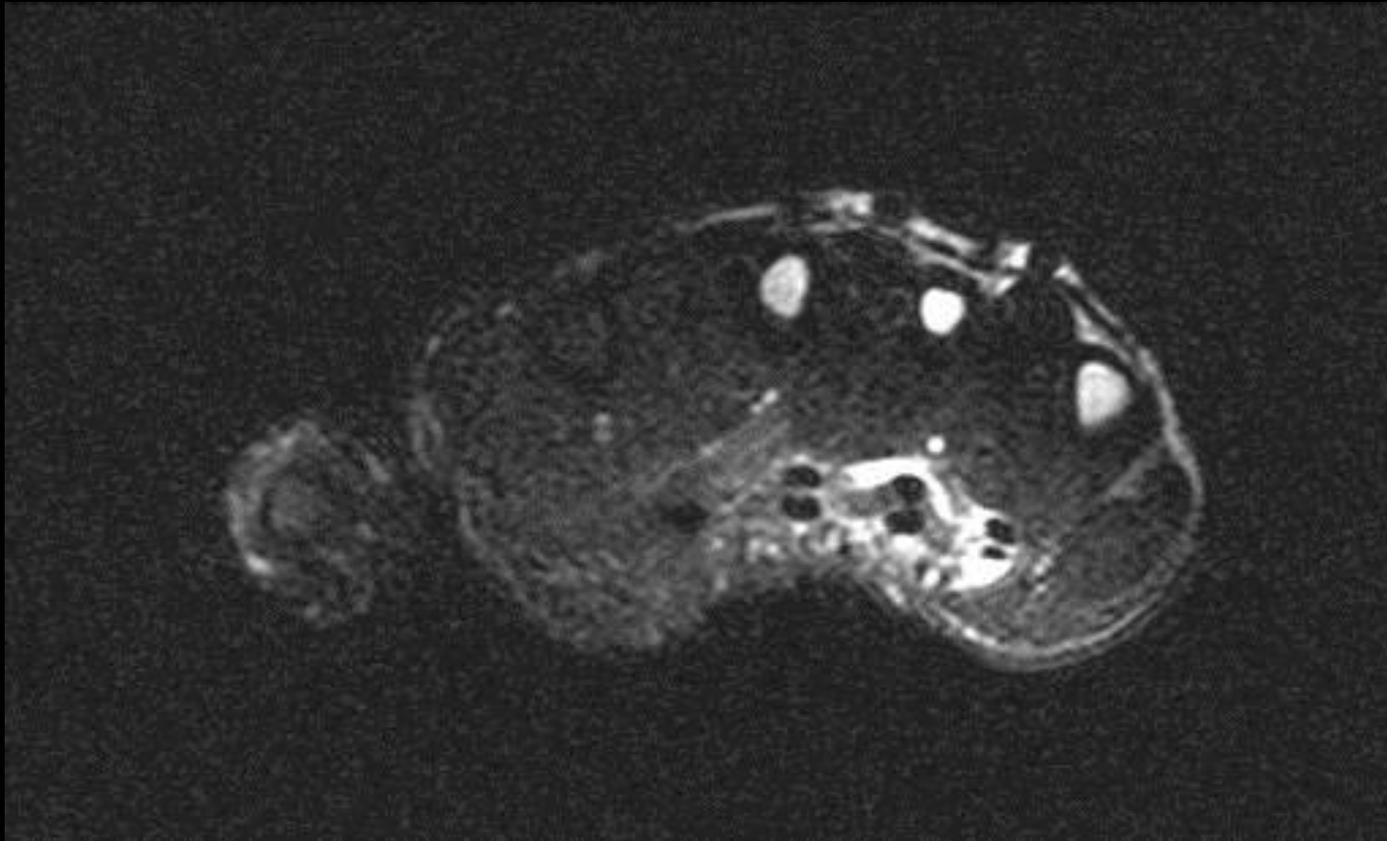
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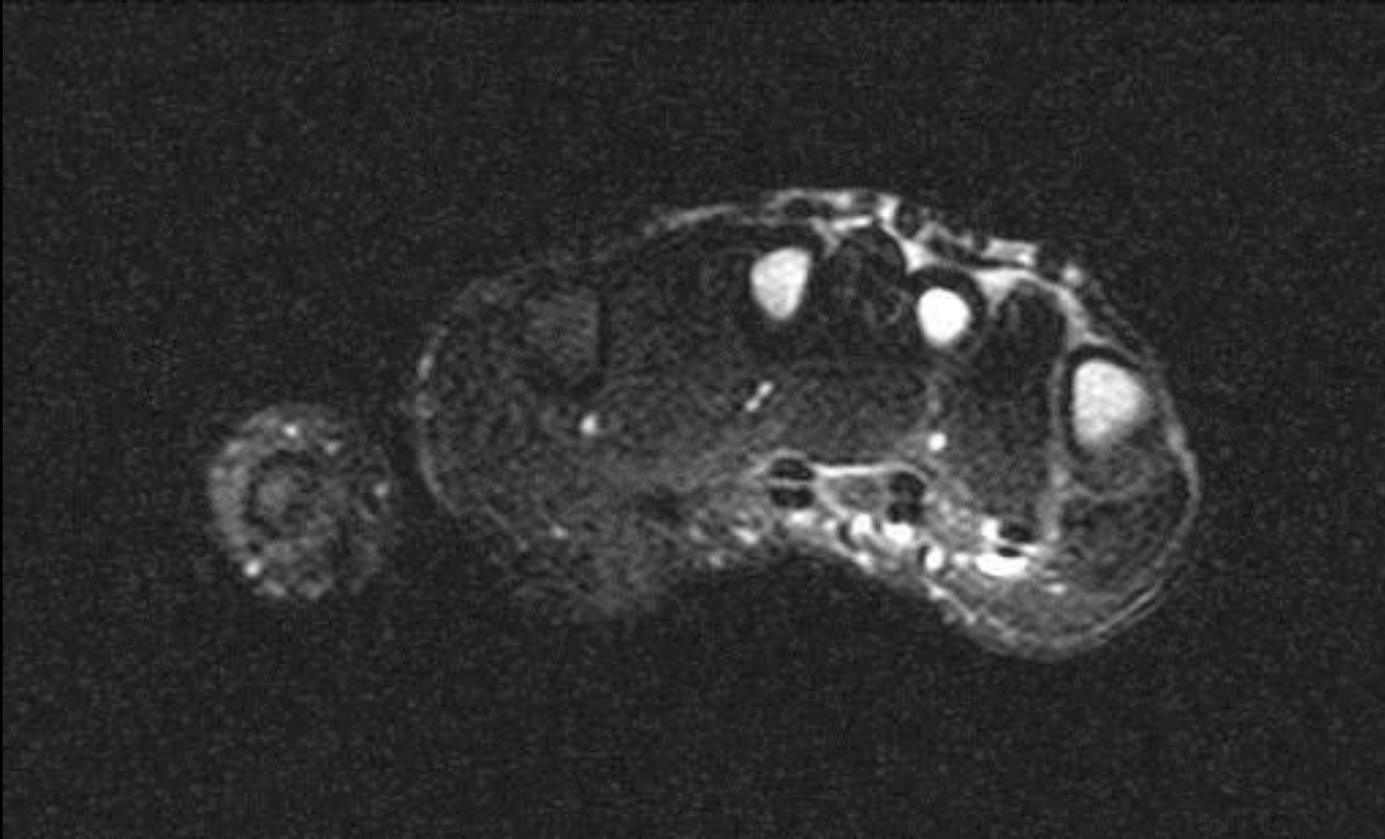
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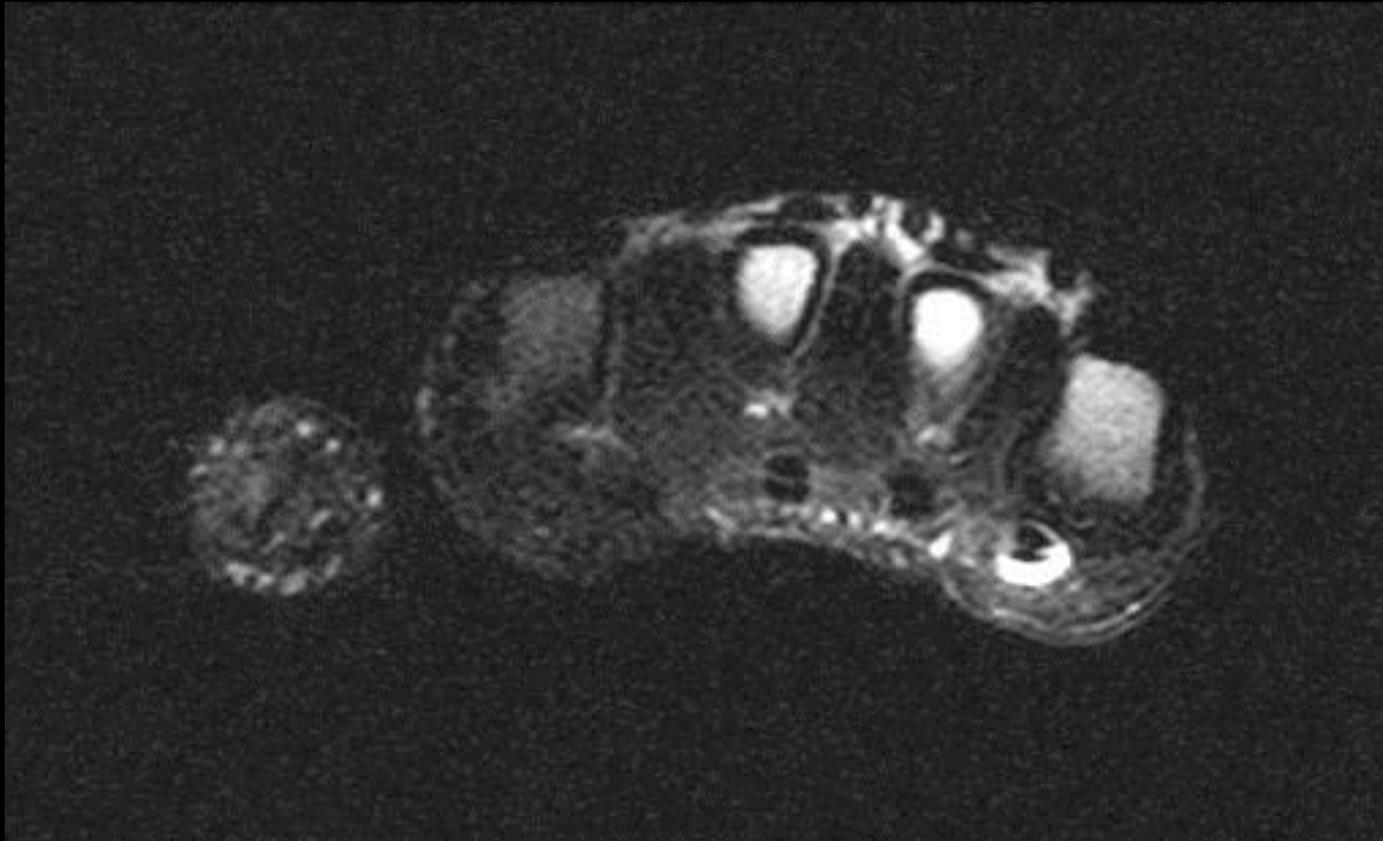
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Septic Bursitis



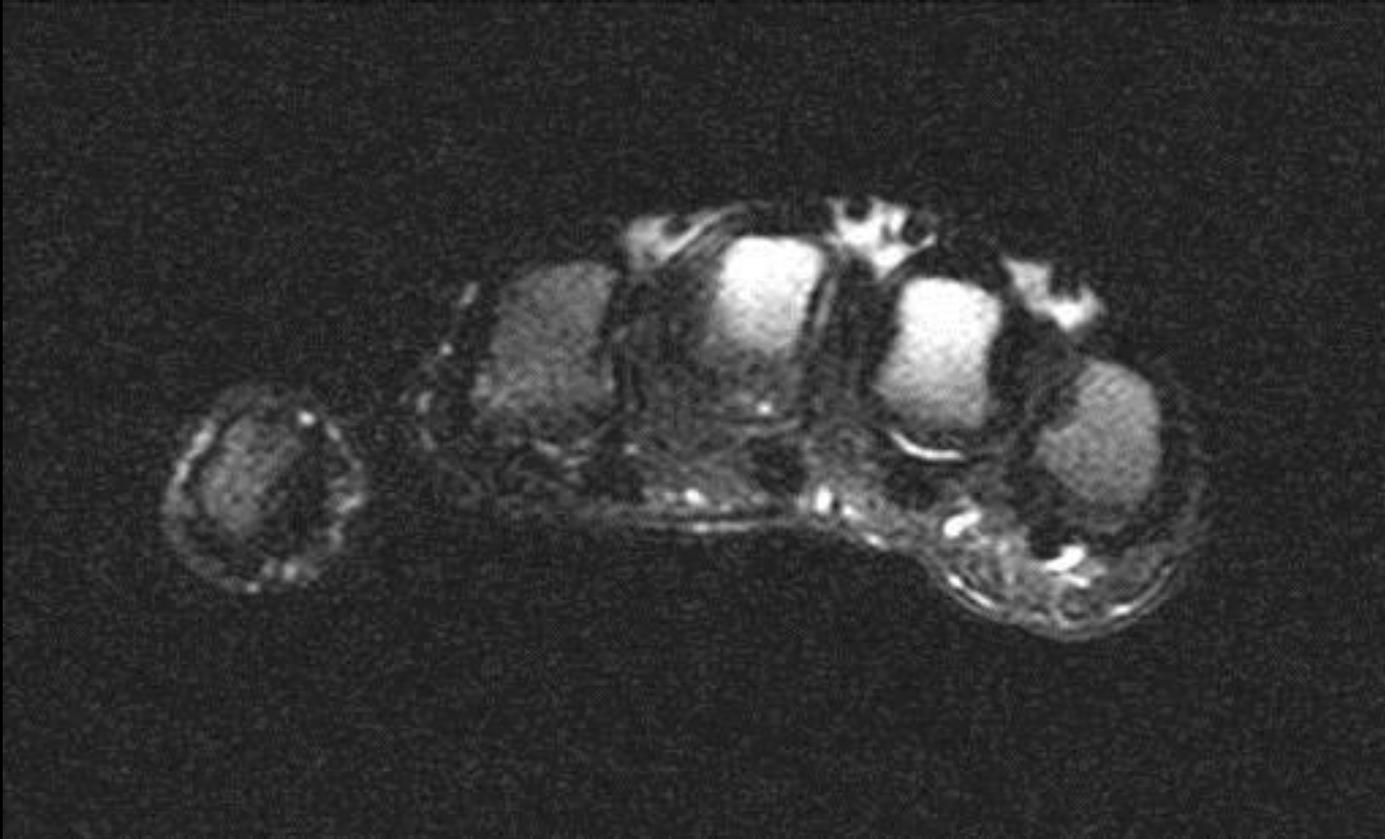
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Septic Bursitis



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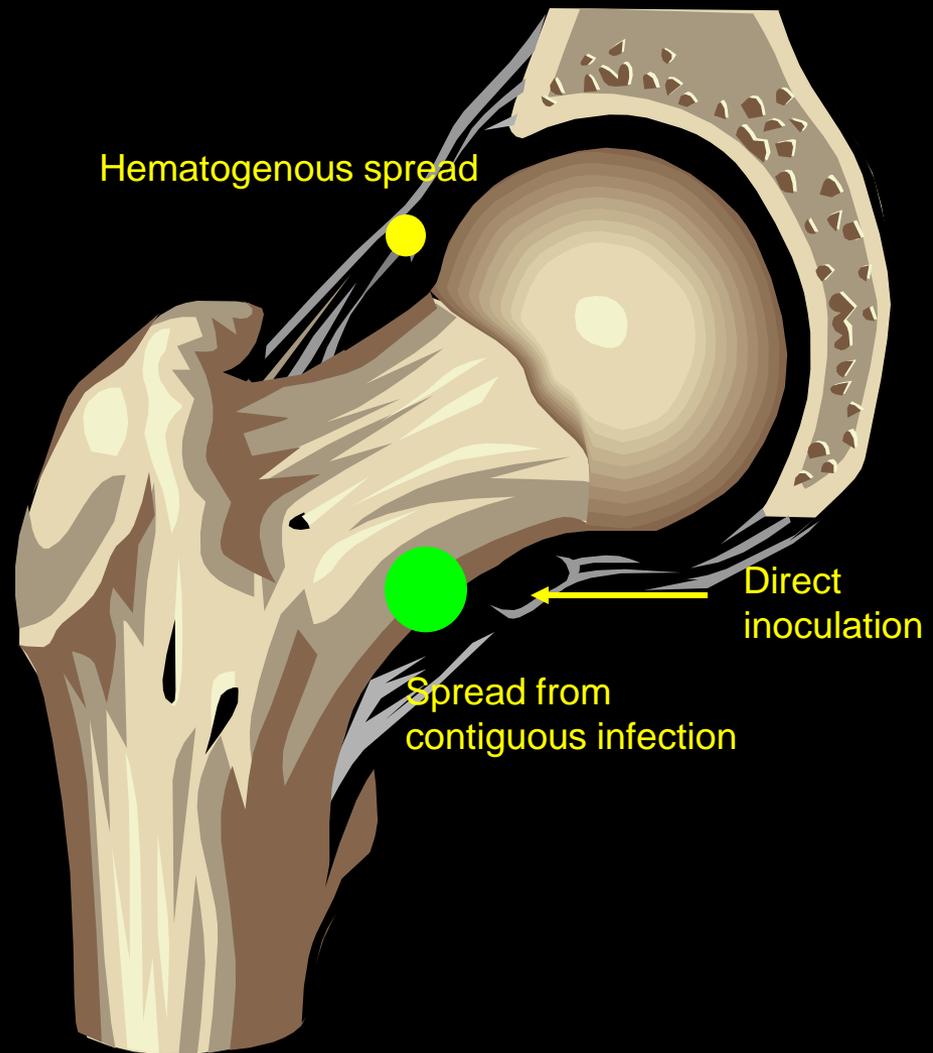
20 yo minor league baseball player with history of aspergillus infection 1 yr ago.
Recurrent pain and swelling in the hand and wrist.

Septic Arthritis

- Direct inoculation of joint

- Spread from contiguous soft tissue or bone infection

- Hematogenous spread to synovium



Septic Arthritis

Penetrating trauma



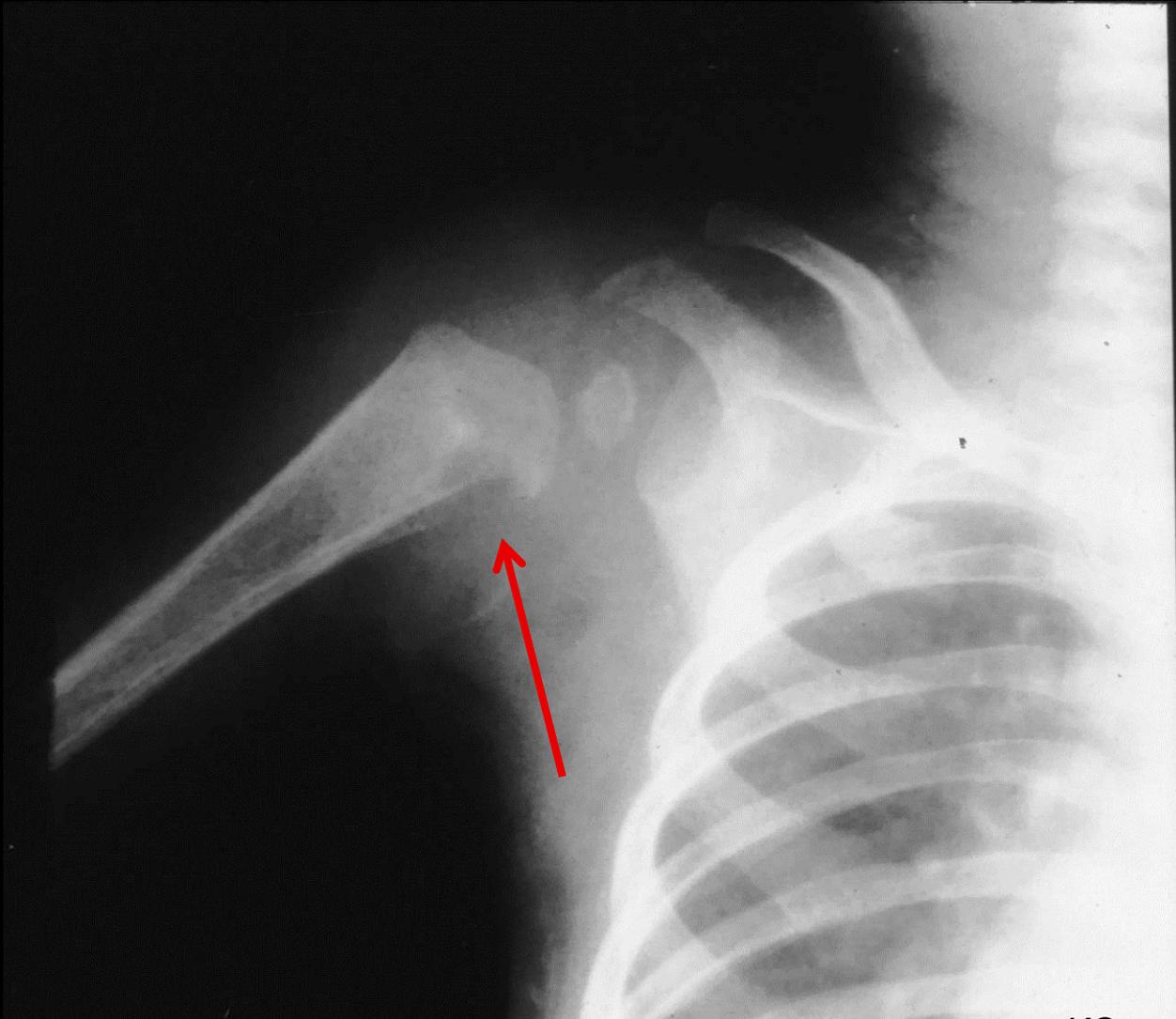
Septic Arthritis

Penetrating trauma



Septic Arthritis

Spread from contiguous osteomyelitis



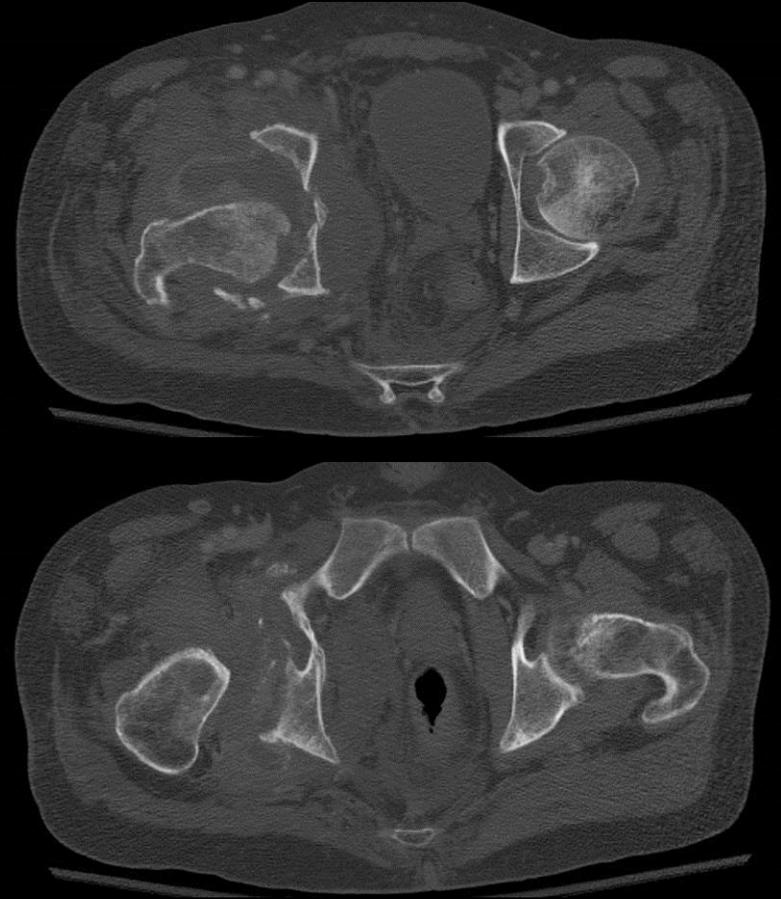
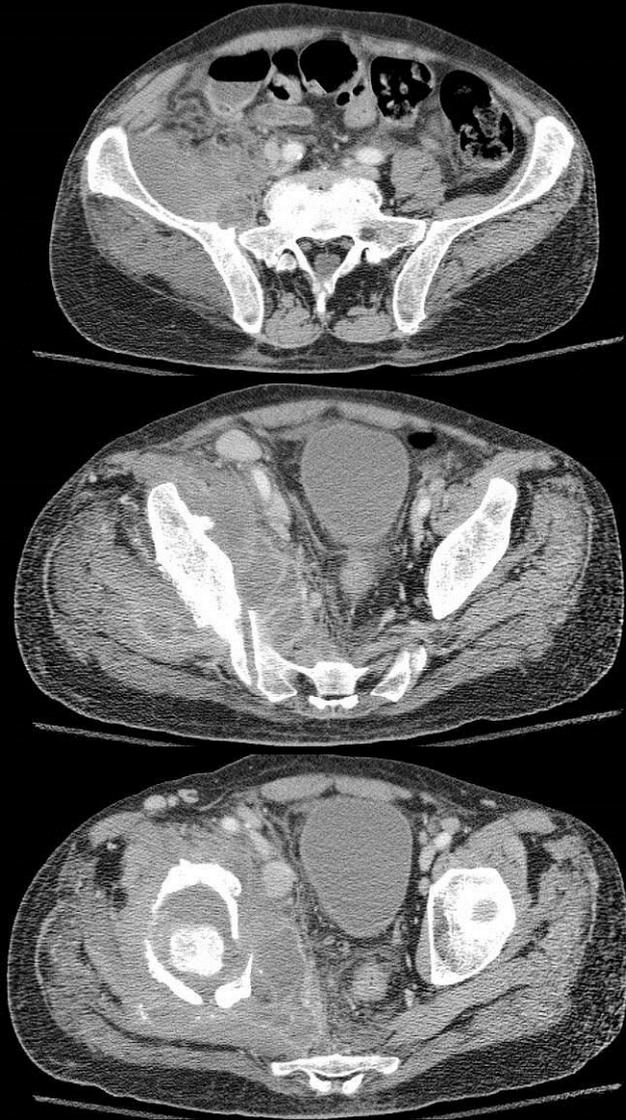
Septic Arthritis

Spread from contiguous soft tissue



Septic Arthritis

Spread from contiguous soft tissue



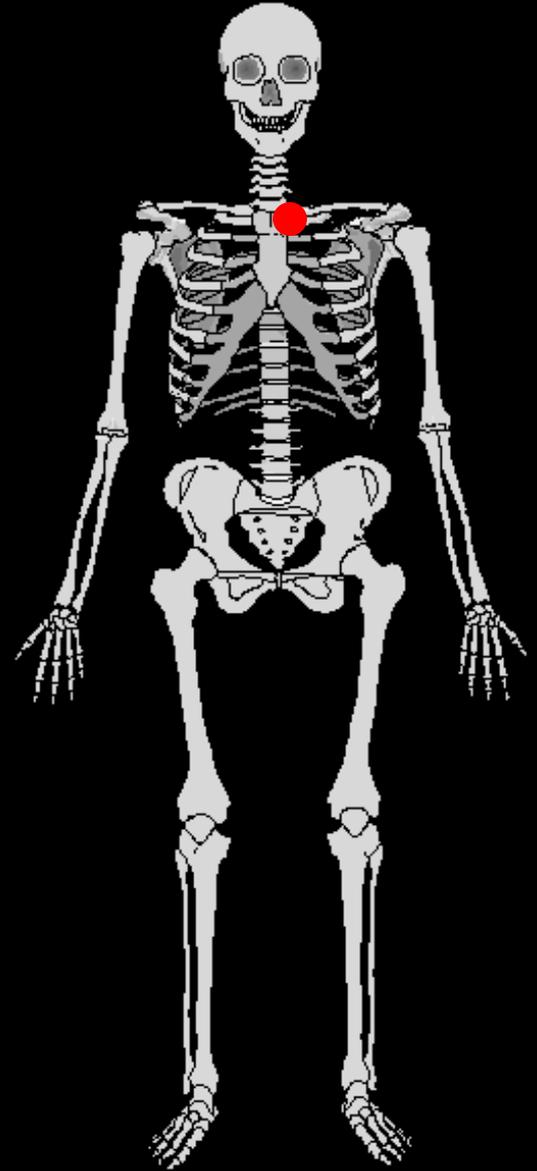
Hematogenous Septic Arthritis

- Children –
 - hip, **knee**, shoulder
- Adults –
 - the five “S” joints
 - Sternoclavicular
 - Shoulder - ACJ
 - Spine
 - Sacroiliac
 - Symphysis



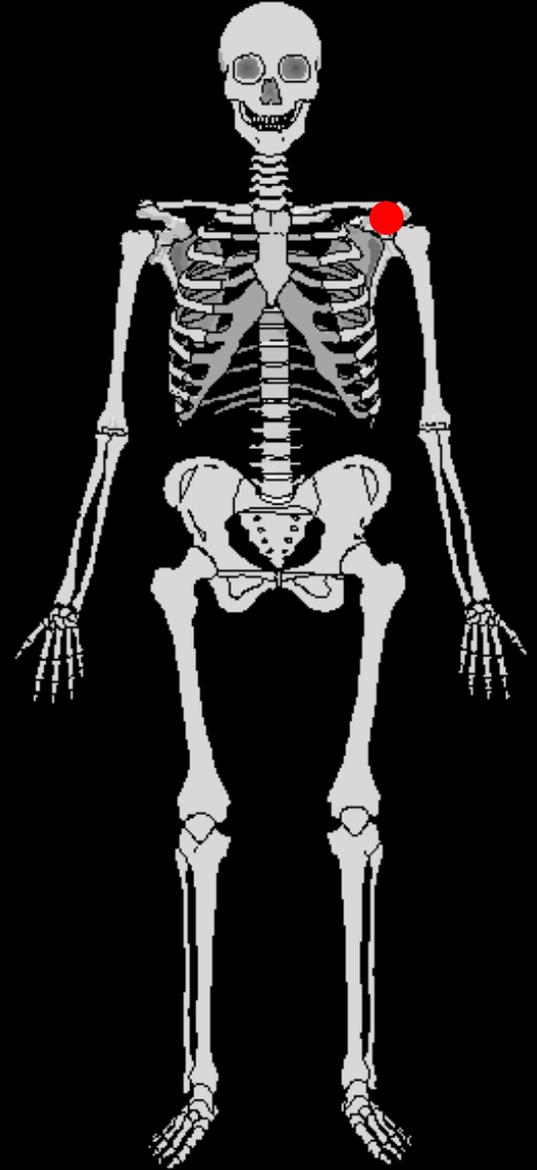
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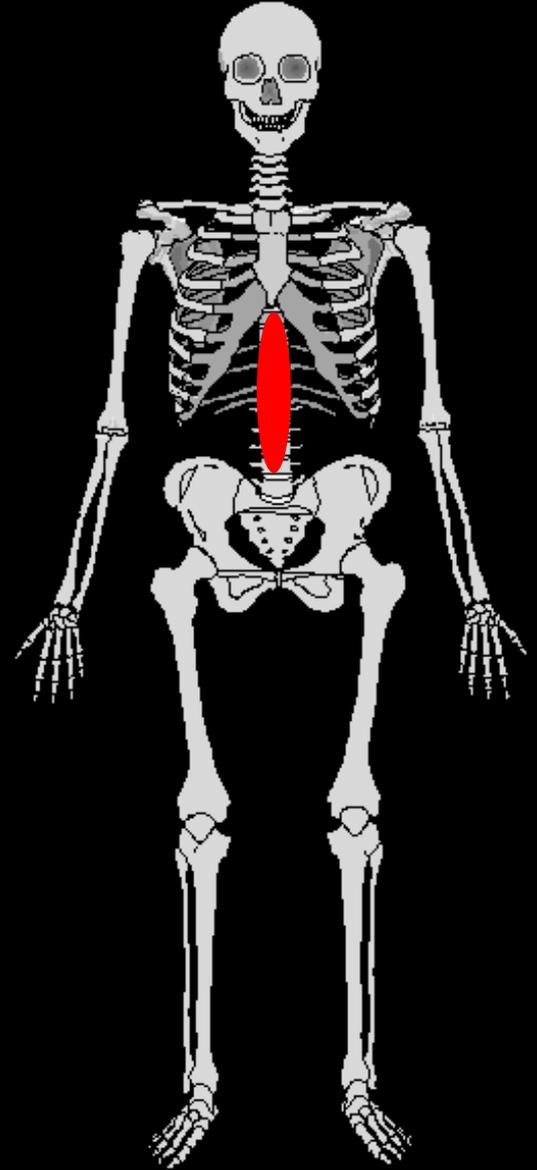
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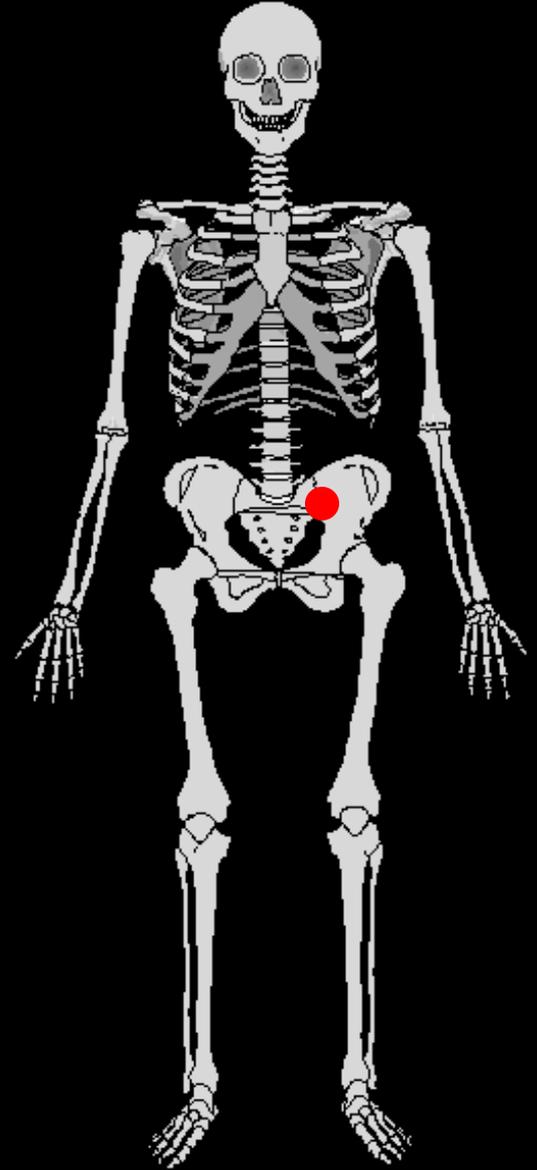
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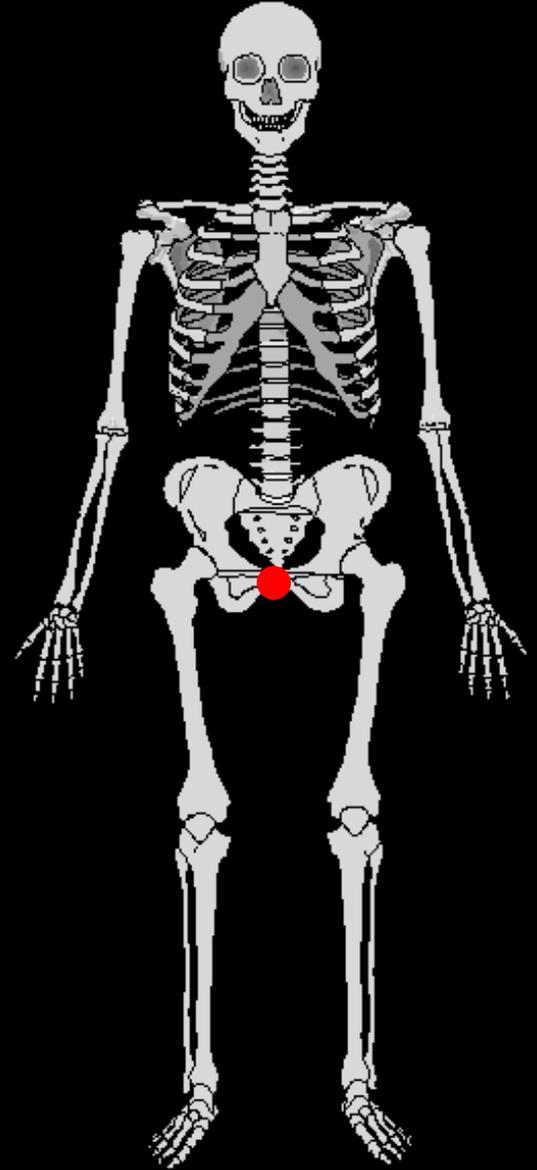
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Hematogenous Septic Arthritis

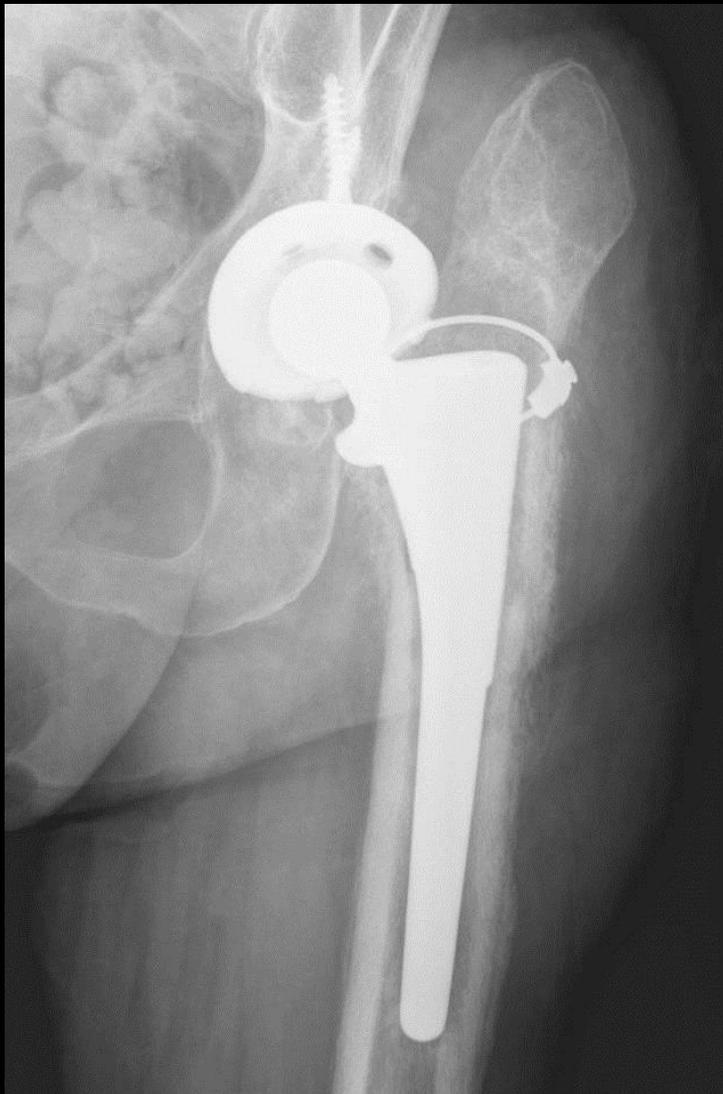
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 - Sternoclavicular
 - Shoulder - ACJ
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Predisposing factors - SLE

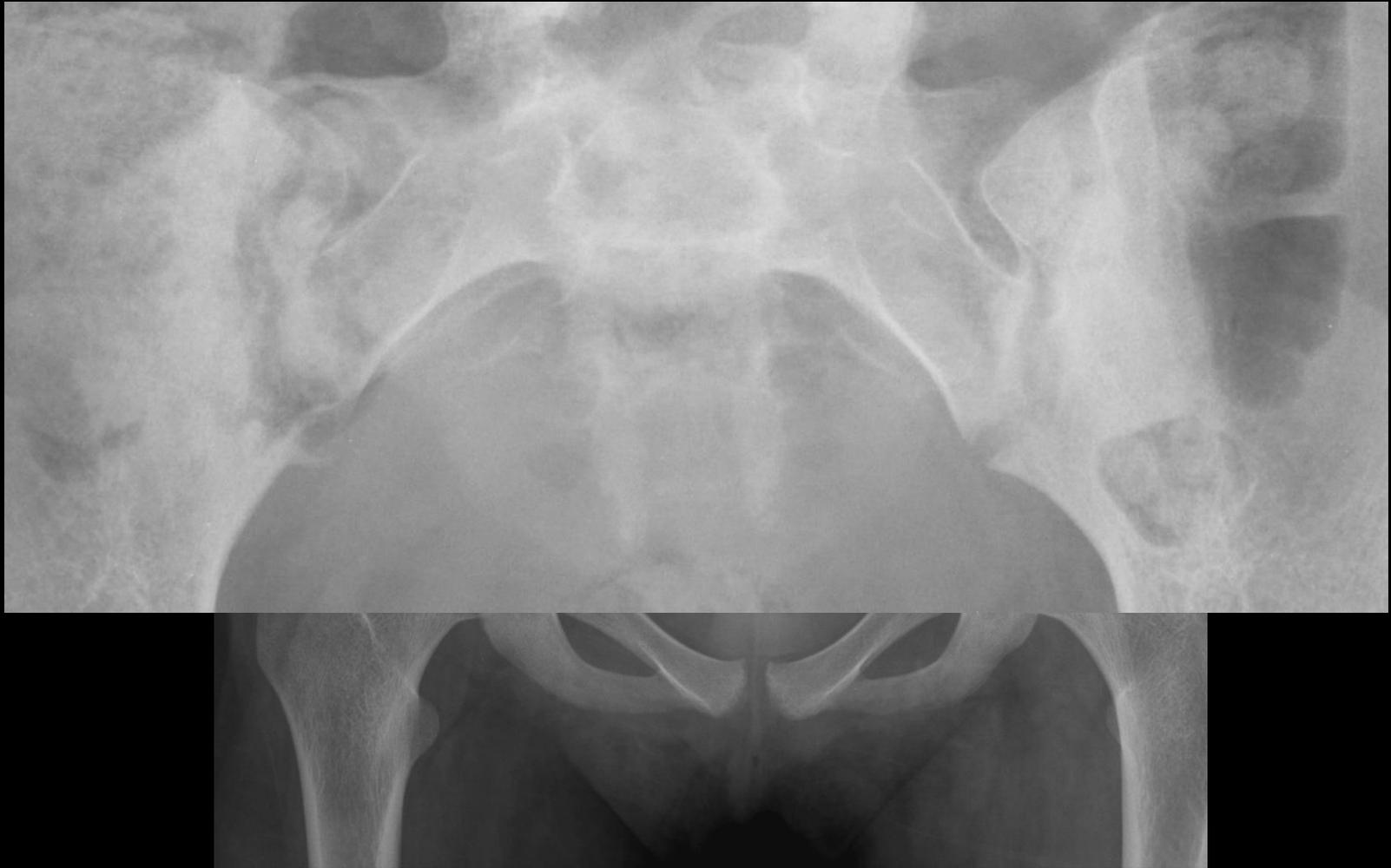


Predisposing factors – Foreign body



Septic Arthritis

Predisposing factors – Pregnancy



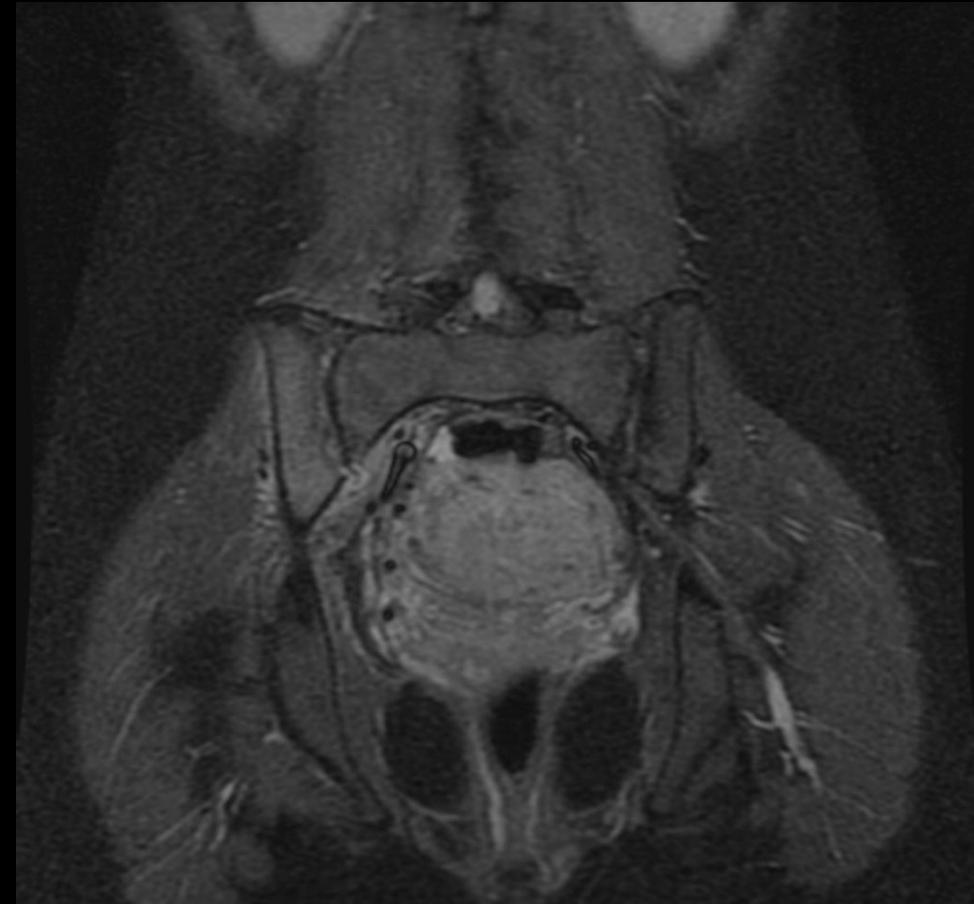
Recently postpartum young female
with severe pain localized to R sacroiliac joint radiating down leg, decreased ROM

Septic Arthritis

Predisposing factors – Pregnancy



Cor T1

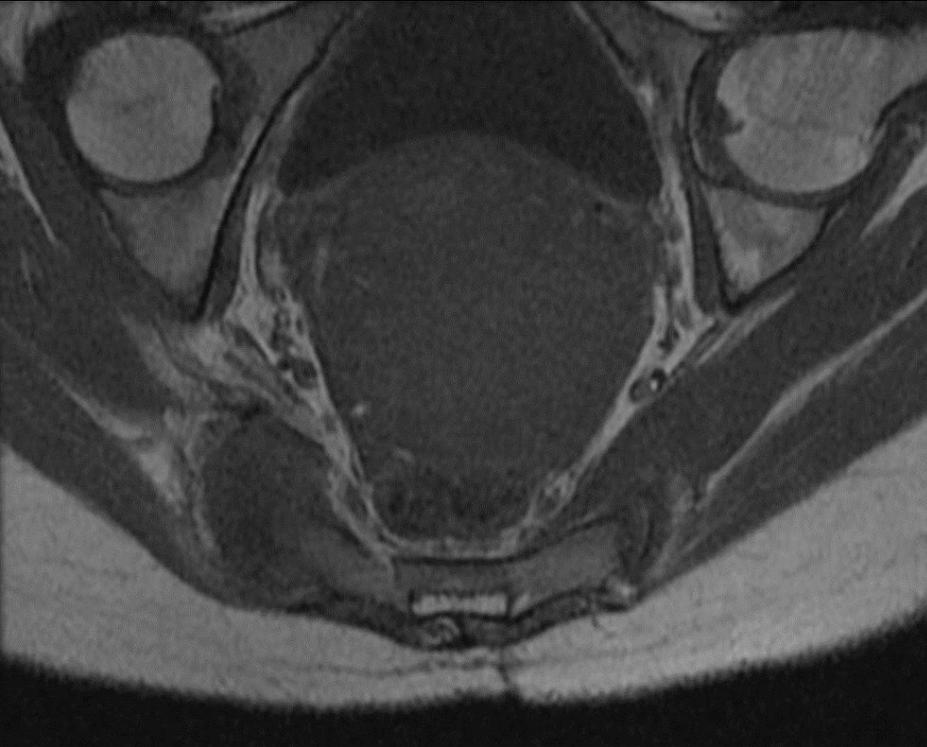


Cor T1FS IVGd

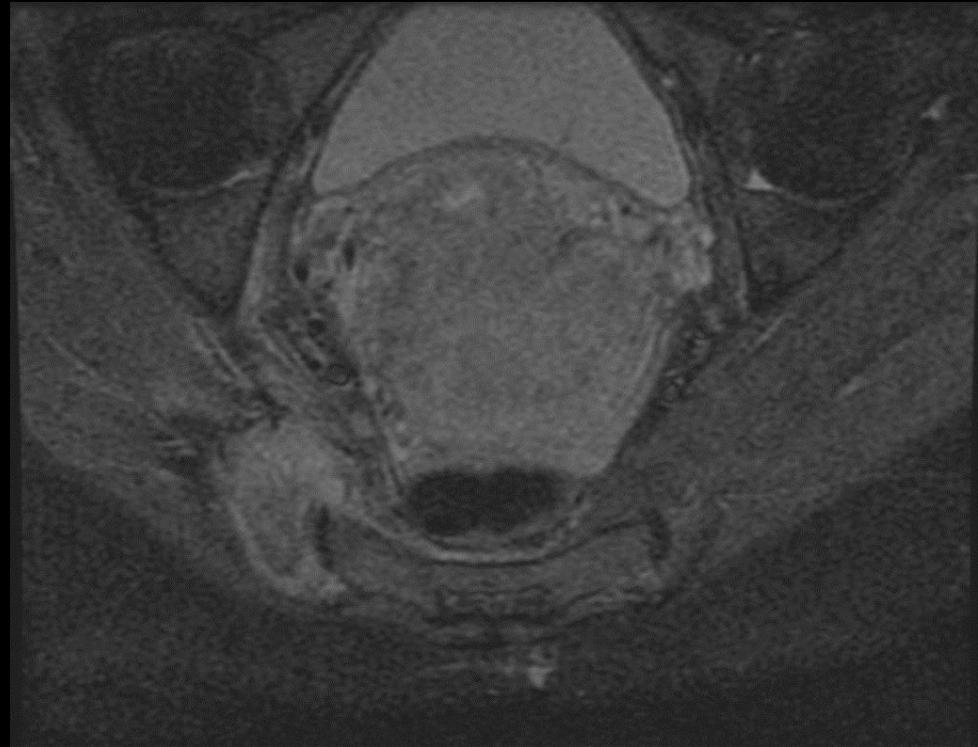
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Septic Arthritis

Predisposing factors – Pregnancy



Ax T1

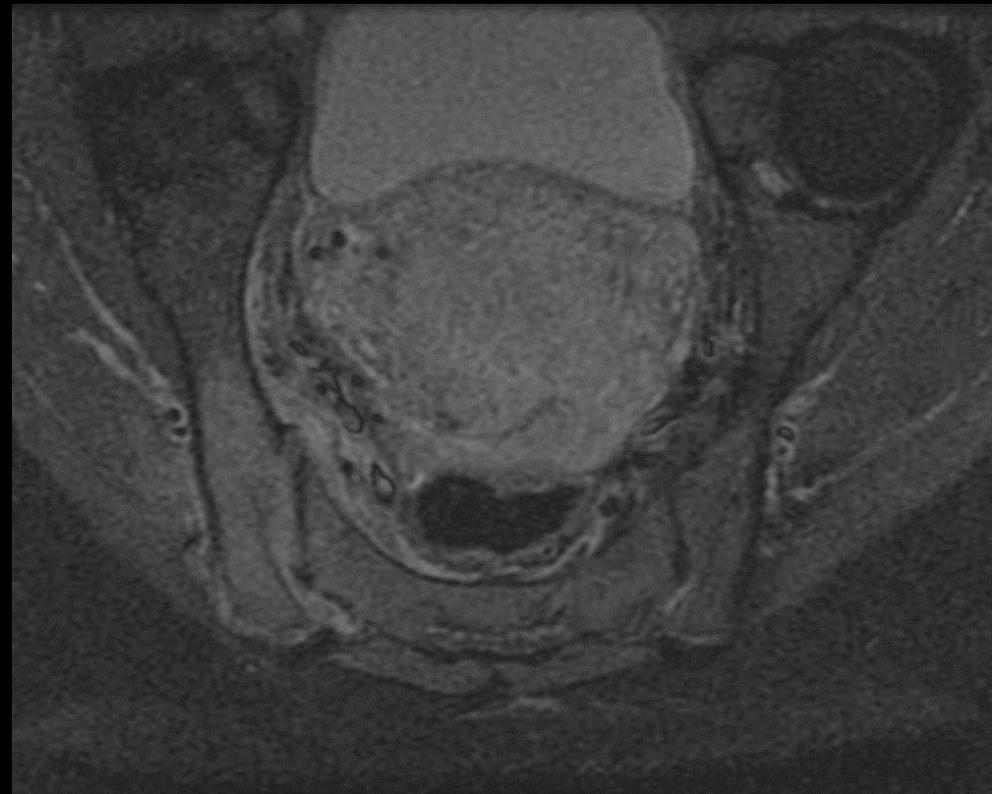
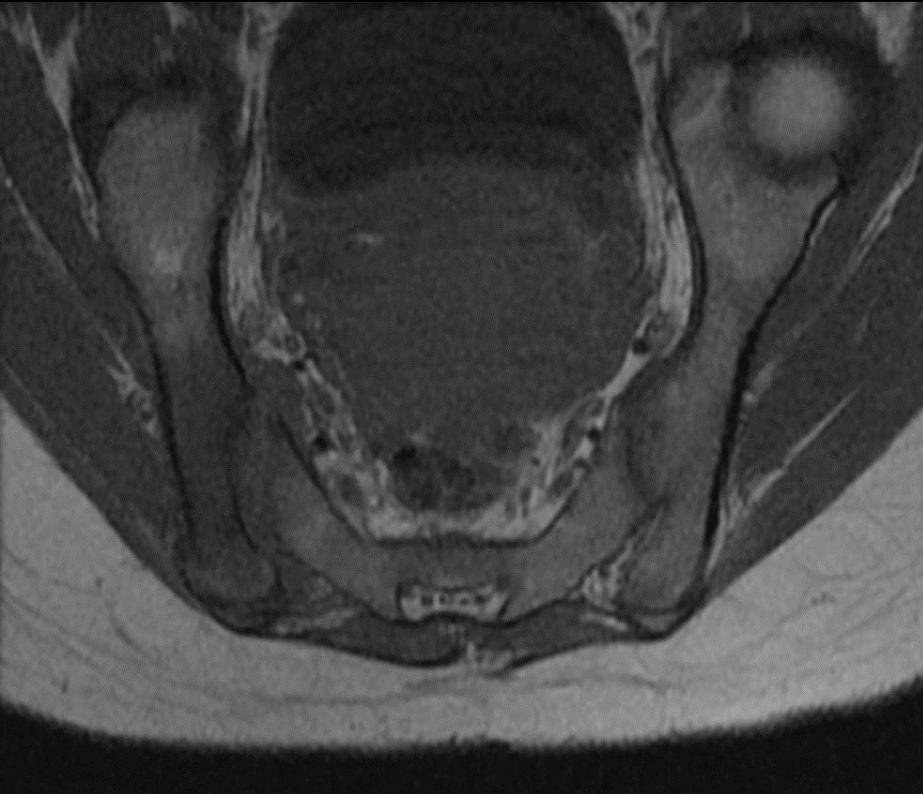


Ax PDFS

Recently postpartum young female
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Septic Arthritis

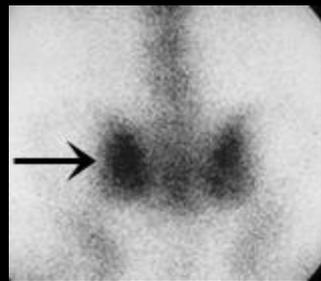
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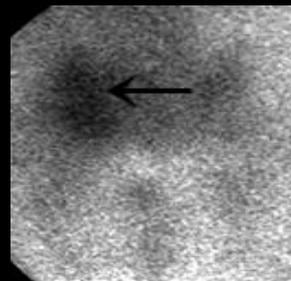
Recently postpartum young female
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Diagnosis

- Positive blood culture may make diagnosis
- Synovial Cultures technically difficult to obtain
- Open biopsy and culture may be required for diagnosis and to identify infectious agent
- Can use Bone Scan and Gallium scans



Bone scan

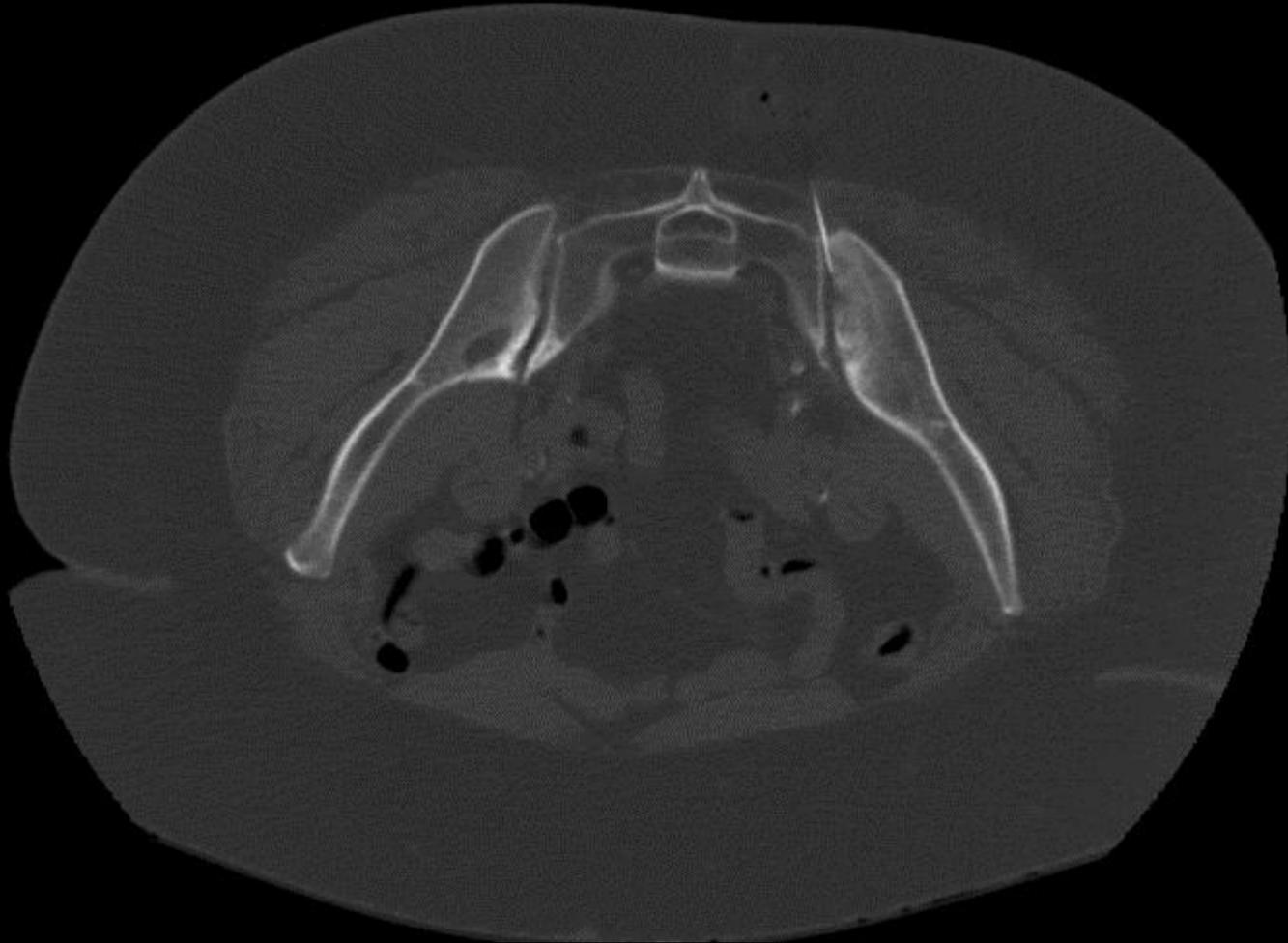


Gallium

Recently postpartum young female

with severe pain localized to R sacroiliac joint radiating down leg, decreased ROM

CT Guided SI Joint Aspiration



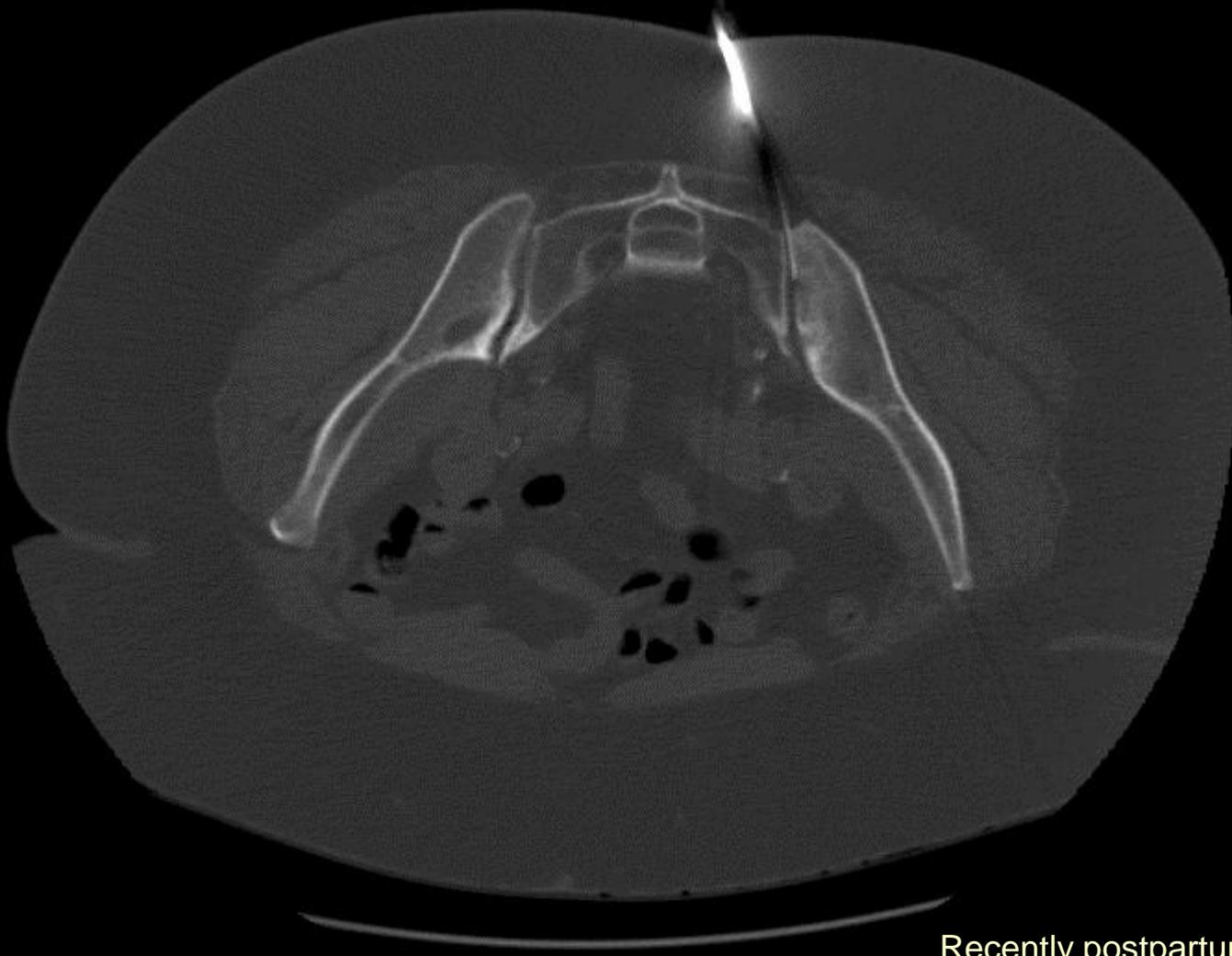
Recently postpartum young female
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CT Guided SI Joint Bx



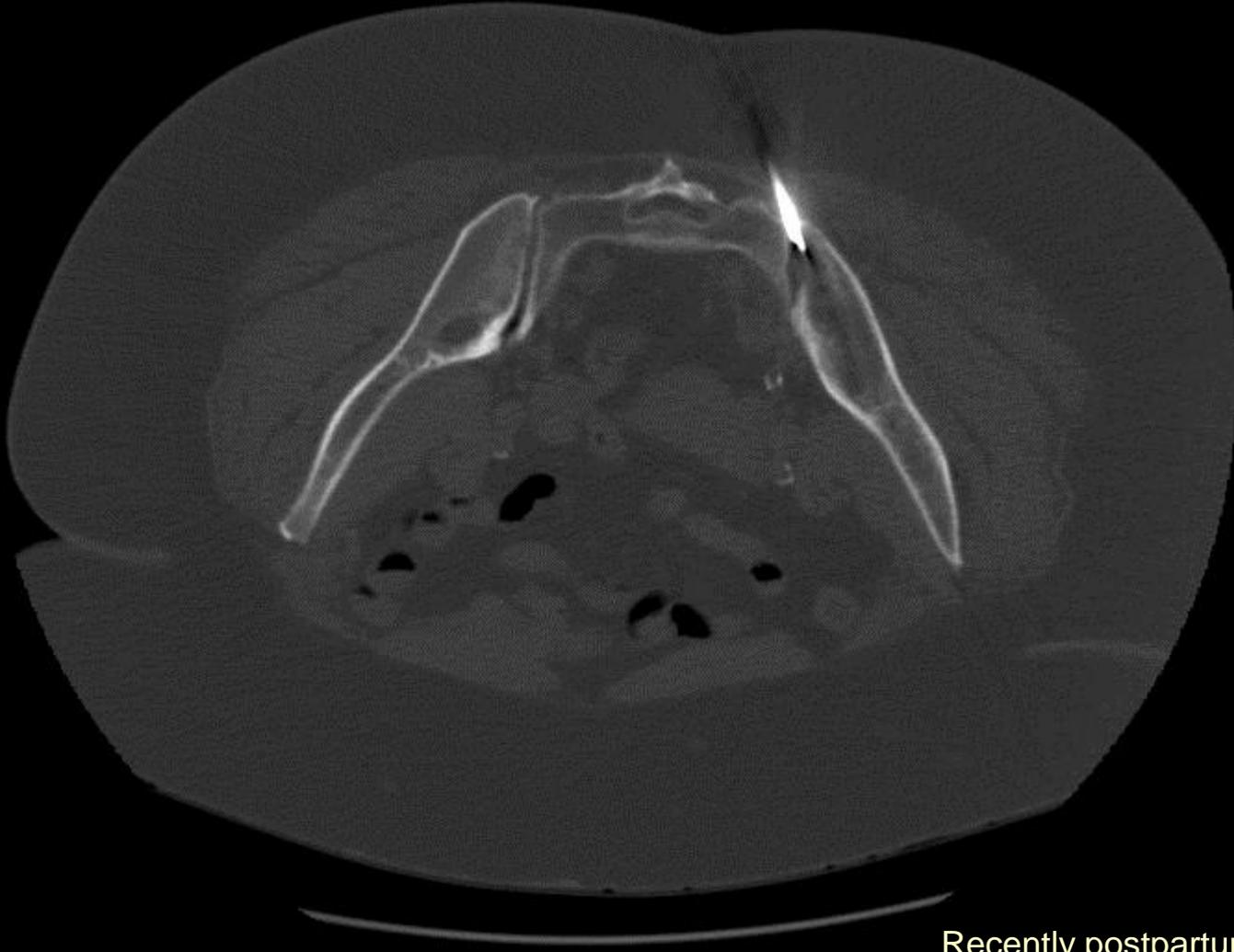
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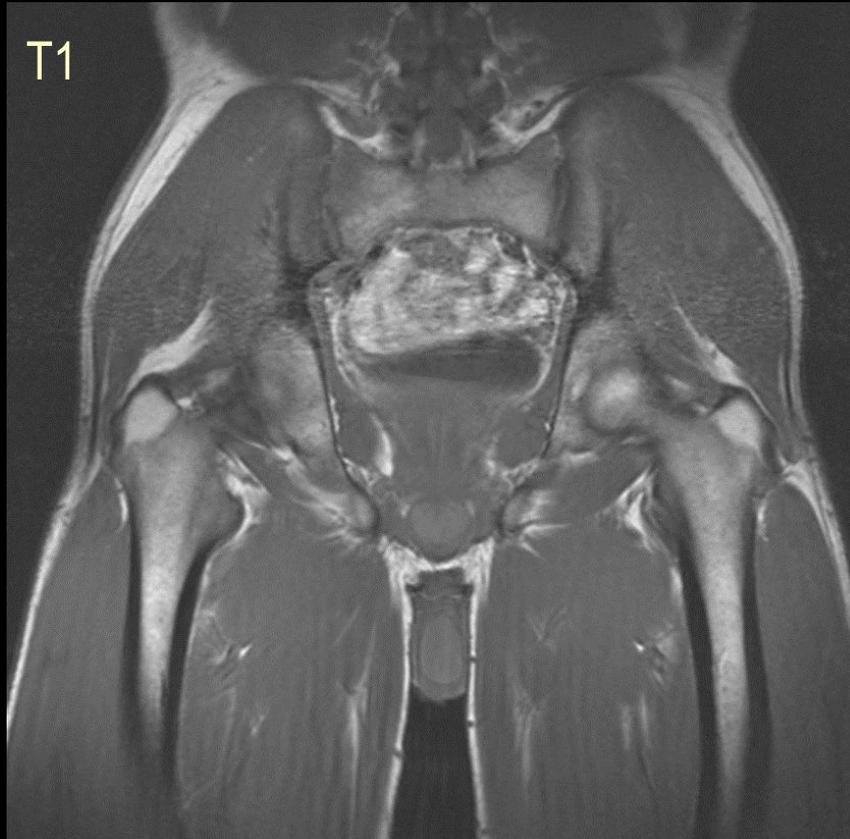
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CT Guided SI Joint Bx



Recently postpartum young female
with severe pain localized to R sacroiliac joint radiating down leg, decreased ROM

Any destructive mono-articular arthritis should be regarded as infection until proved otherwise.



Septic Arthritis

Organisms



Sequence of findings

- Soft tissue swelling
- Joint effusion.
- Rapid osteoporosis
- Rapid uniform joint space narrowing
- Ill-defined erosions



Sequence of findings

- Soft tissue swelling
- Joint effusion
- Rapid osteoporosis
- Rapid uniform joint space narrowing.
- Ill-defined erosions



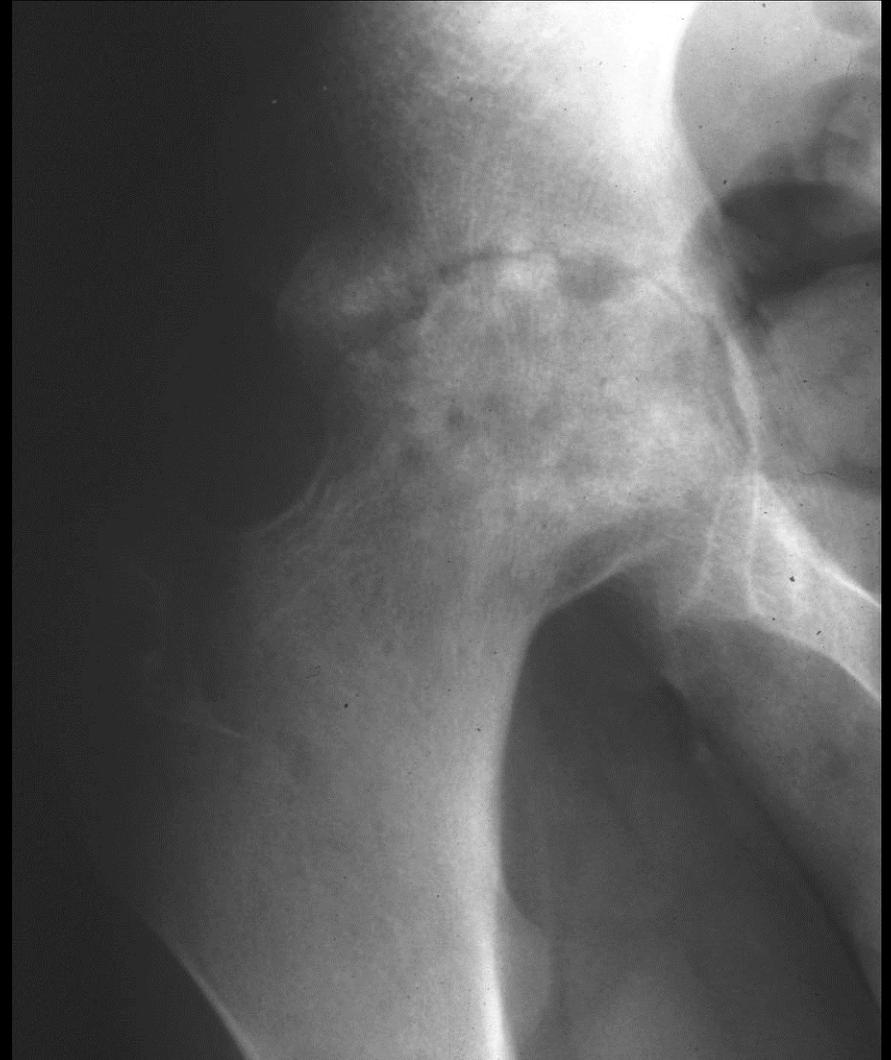
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Sequence of findings

- Soft tissue swelling
- Joint effusion
- Rapid osteoporosis
- Rapid uniform joint space narrowing
- Ill-defined erosions



Nonpyogenic Tuberculous Arthritis

- Indolent course
- Phemister's triad
 - Prominent osteoporosis
 - Slow loss of joint space
 - Ill-defined erosions



August



December

Nonpyogenic Tuberculous Arthritis



September



Nonpyogenic Tuberculous Arthritis



September

TB wrist 68M

Fungal Arthritis

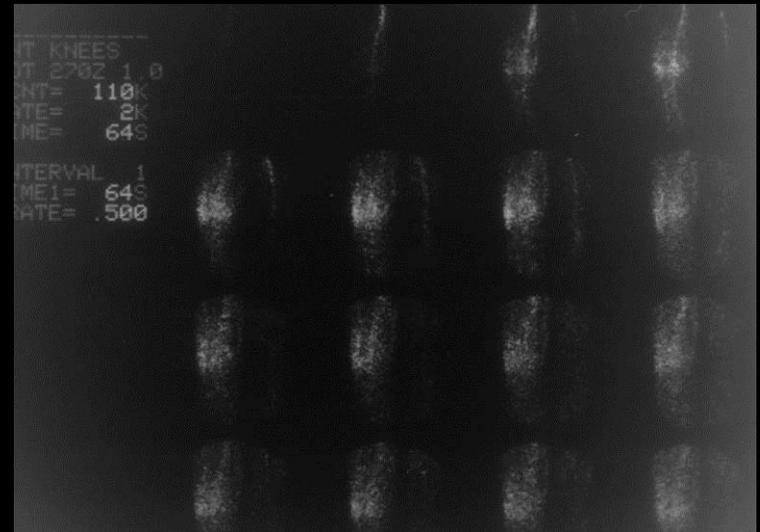


Ultrasound



Scintigraphy

- Increased periarticular flow and blood pool
- Decreasing or normal uptake on delayed images
- High pressure effusion may result in false negative study



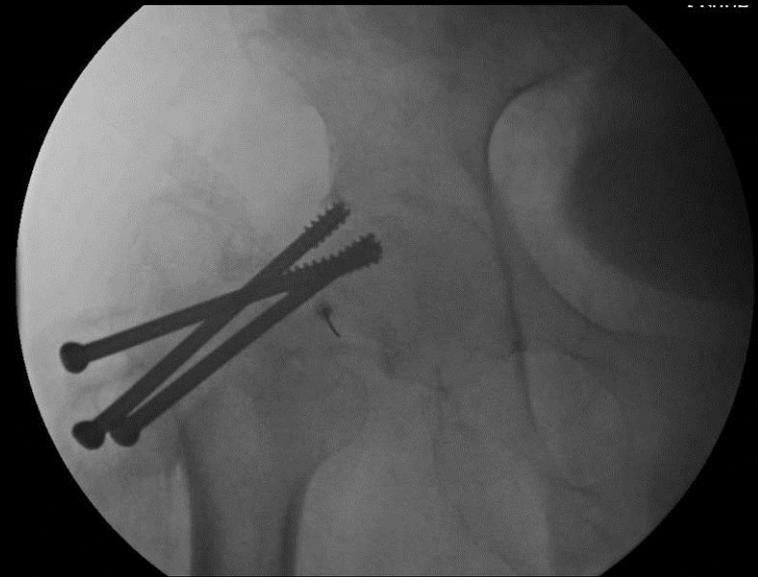
Arthrography

- Contrast injected after aspiration to document needle placement
- Irregular synovial lining
- Intraarticular debris
- Rapid lymphatic filling
- Communication with abnormal bursae or soft tissue abscesses.



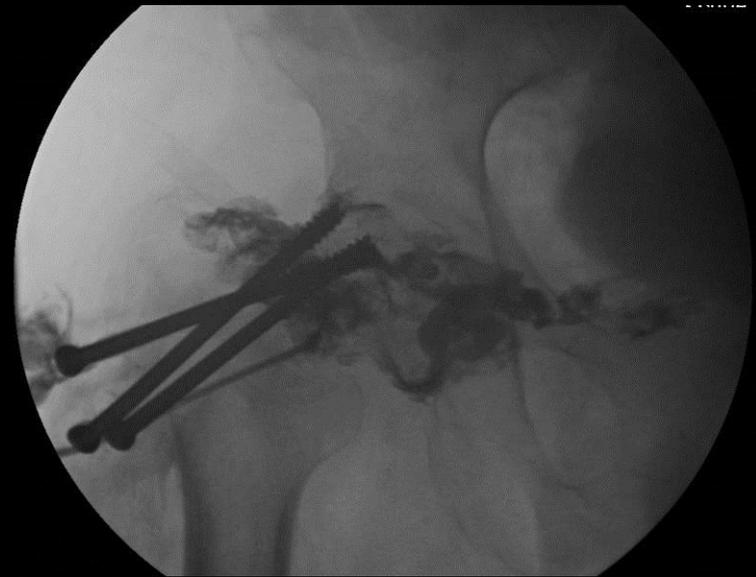
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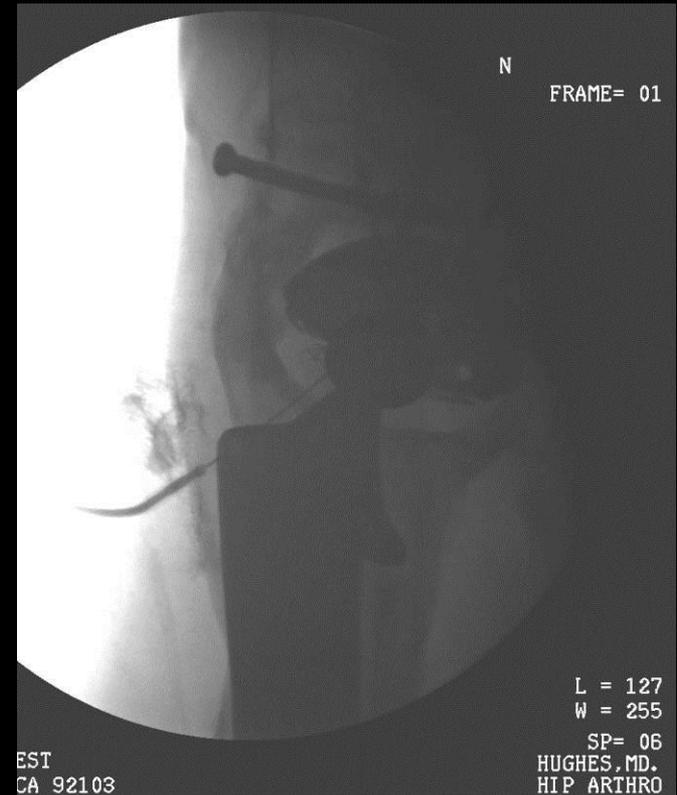
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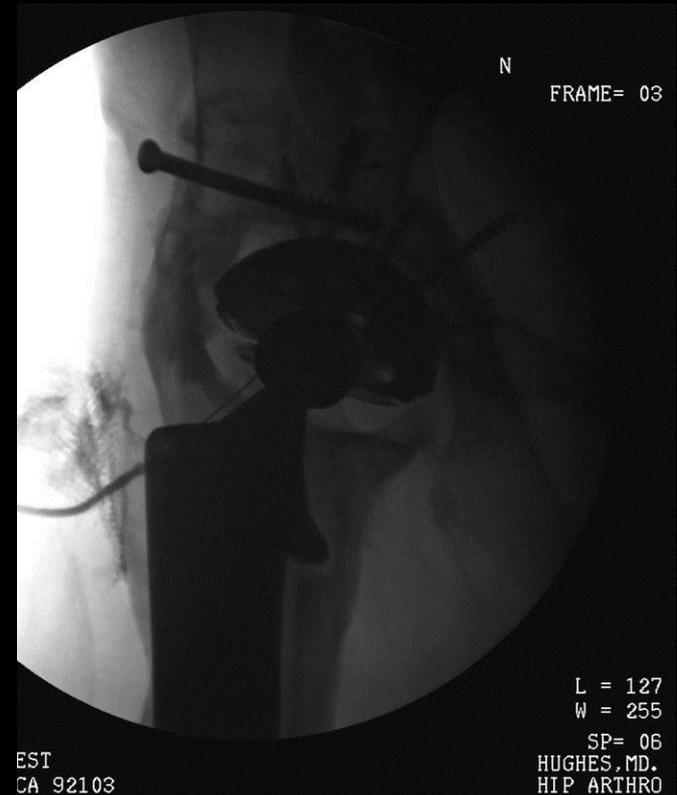
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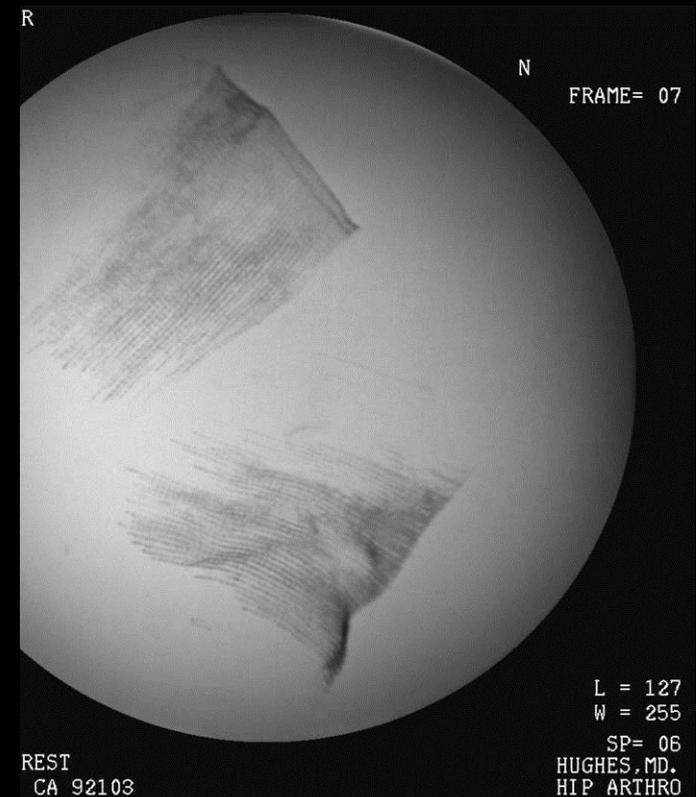
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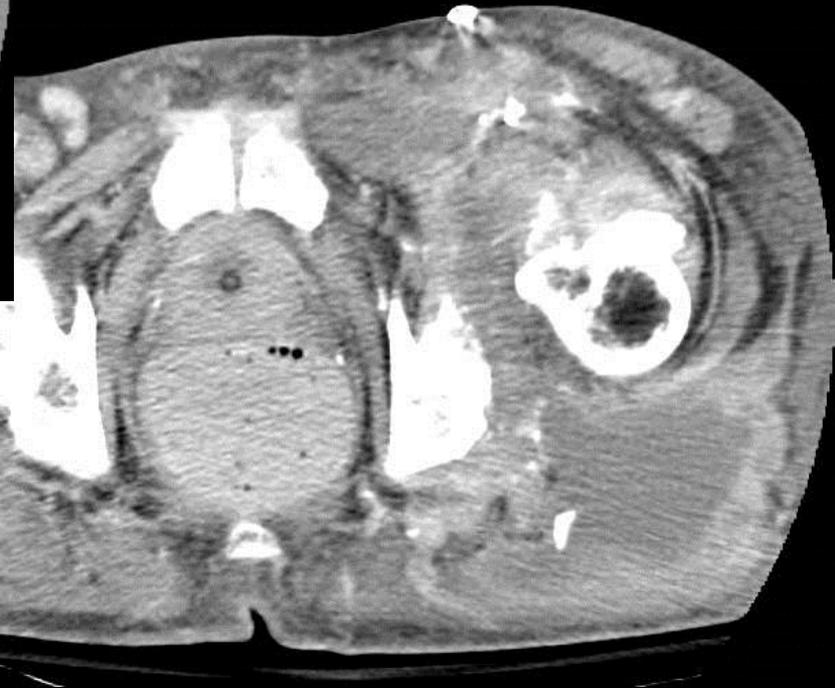
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Imaging Techniques: of Pyogenic arthritis

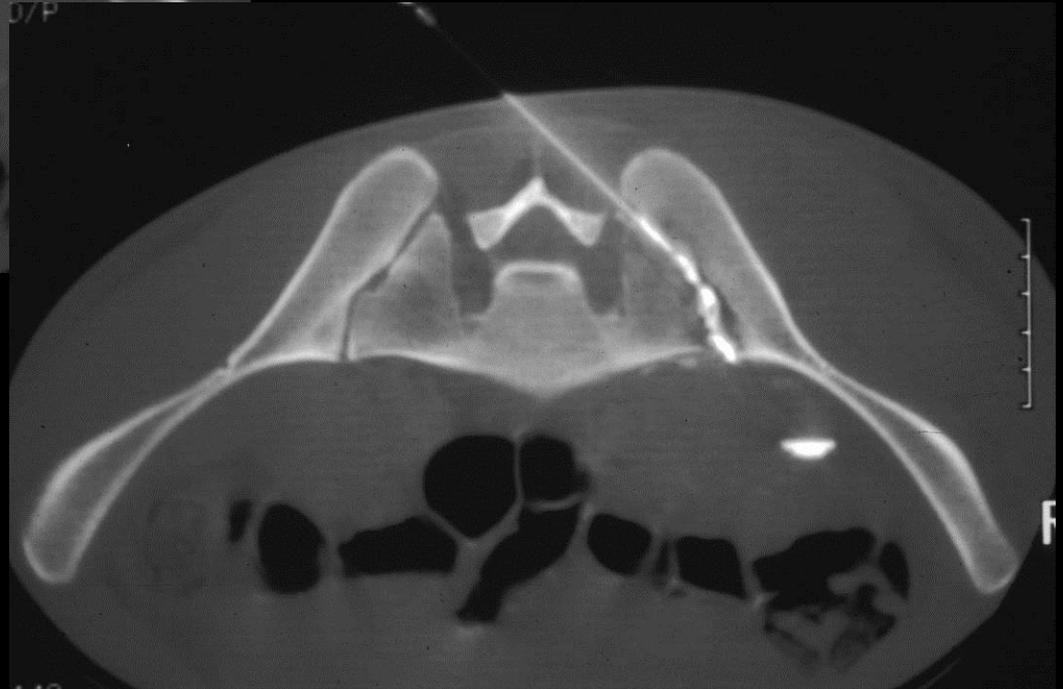
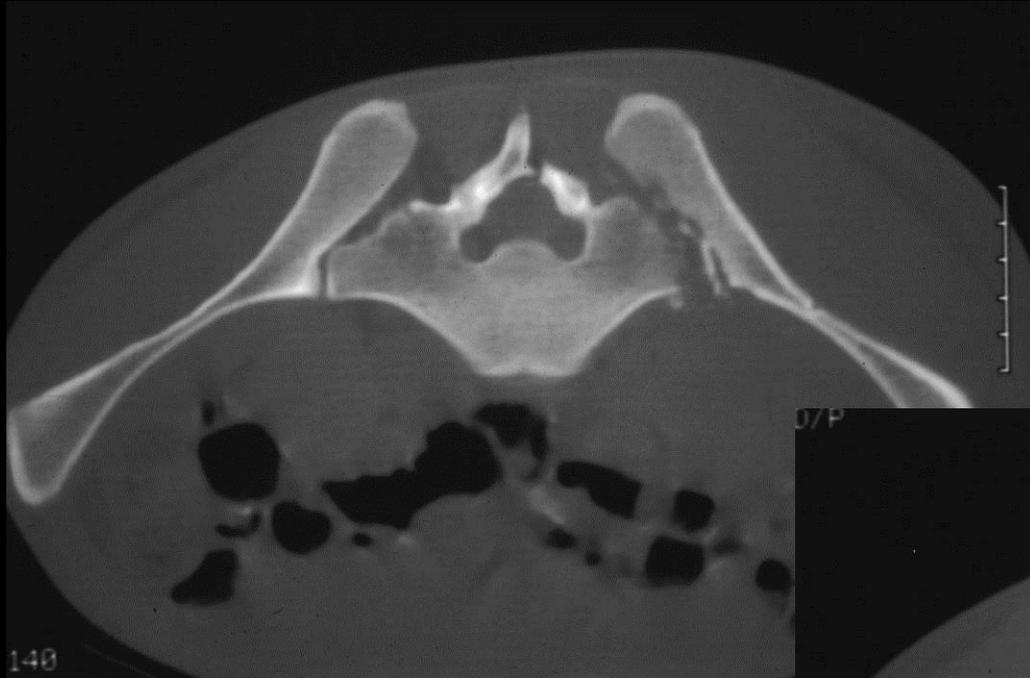
CT



C+

74M septic arthritis following resection of left femoral head for osteomyelitis

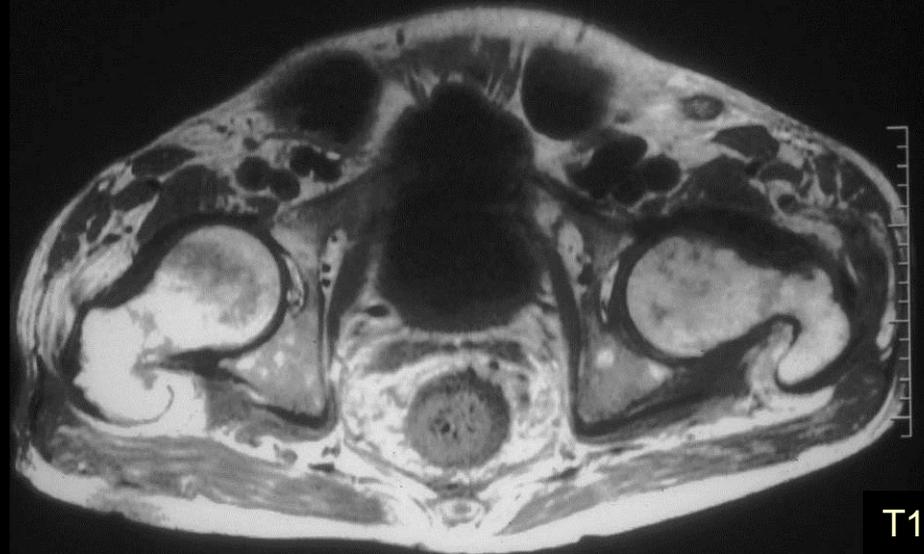
CT - Arthrography



Imaging Techniques: of Pyogenic arthritis

MRI

- Nonspecific effusion
- Synovial thickening.
- Intraarticular debris
- Periarticular edema
- Lymph nodes
- Periarticular abscess
- Joint space narrowing



T1



T2FS

MRI

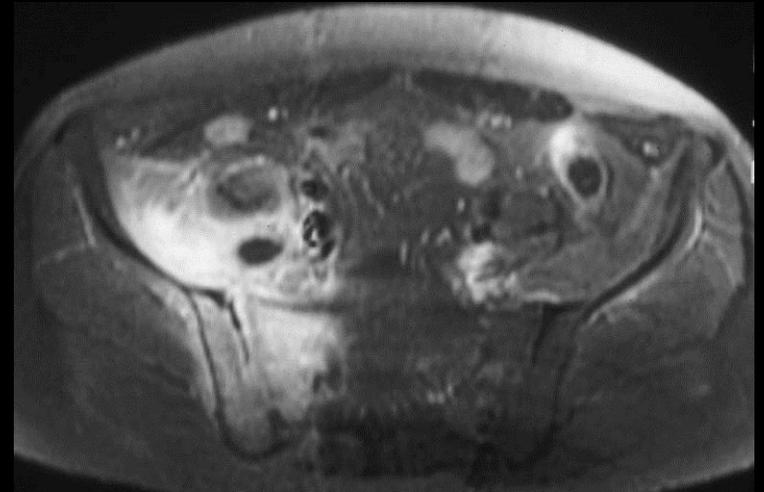


- Nonspecific effusion
- Synovial thickening
- Intraarticular debris
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- Lymph nodes
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Imaging Techniques: of Pyogenic arthritis

MRI

- Nonspecific effusion
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- **Periarticular edema**
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Ax PDFS

Cor T1



Imaging Techniques: of Pyogenic arthritis

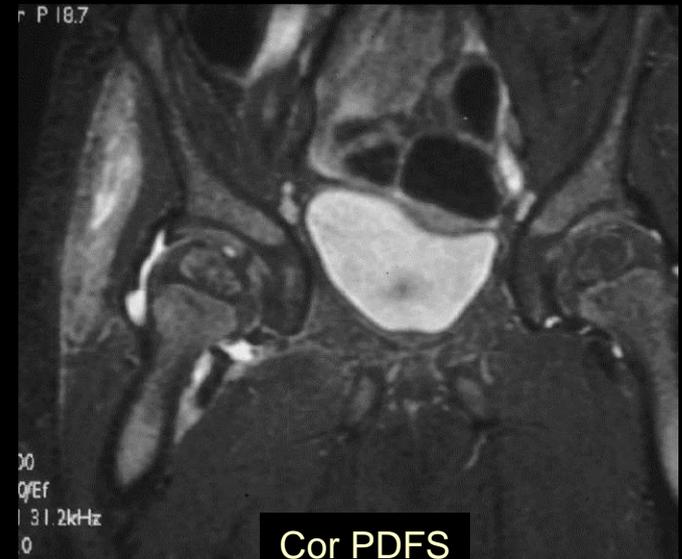
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- **Lymph nodes**
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- Joint space narrowing



MRI

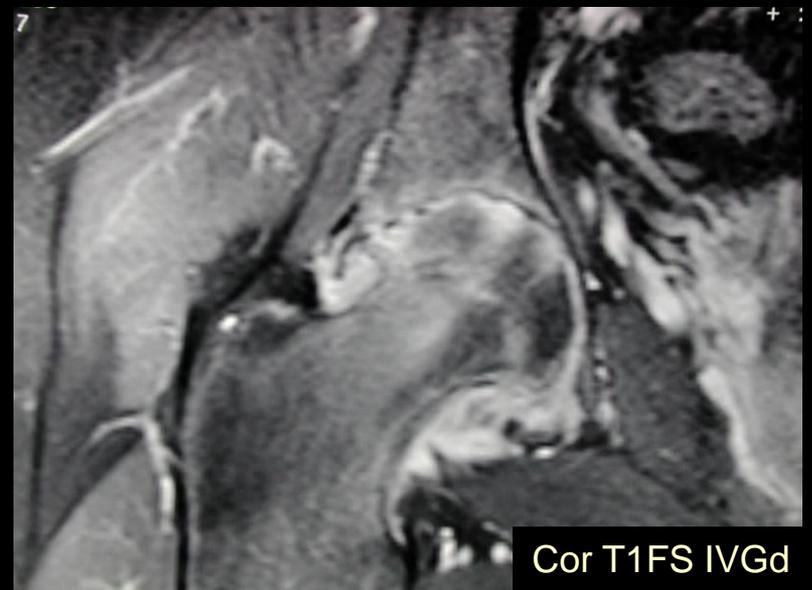
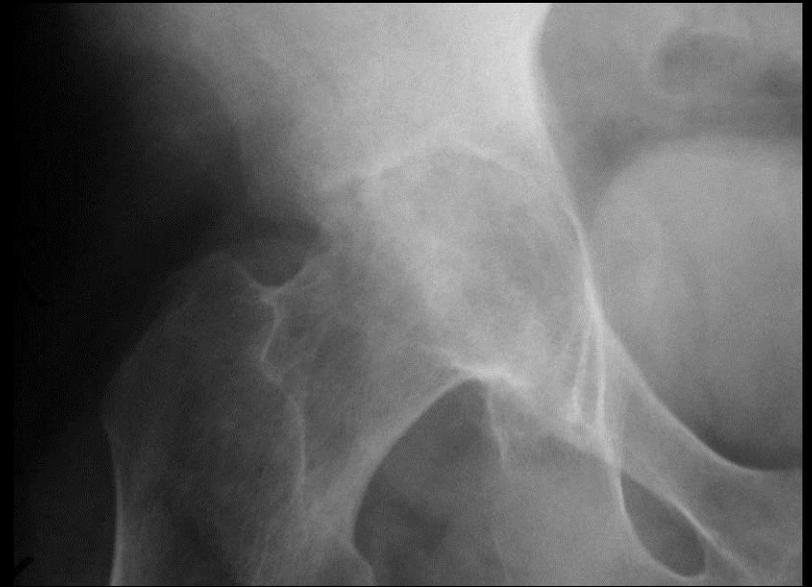
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Imaging Techniques: of Pyogenic arthritis

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Cor T1FS IVGd

Septic Arthritis: Complications

- Premature physeal closure
- Avascular necrosis.
- Premature osteoarthritis
- Internal derangement
- Osteomyelitis
- Ankylosis



57M diabetic, septic knee with marrow oedema and internal derangement

Septic Arthritis: Complications

- Premature physeal closure
- *Avascular necrosis*
- Premature osteoarthritis
- Internal derangement
- Osteomyelitis
- Ankylosis



Septic Arthritis with Osteomyelitis

- Periarticular bone edema is not enough
- Cortical erosion
- Extensive marrow involvement
- Periosteal new bone
- Extrasosseous fat fluid level



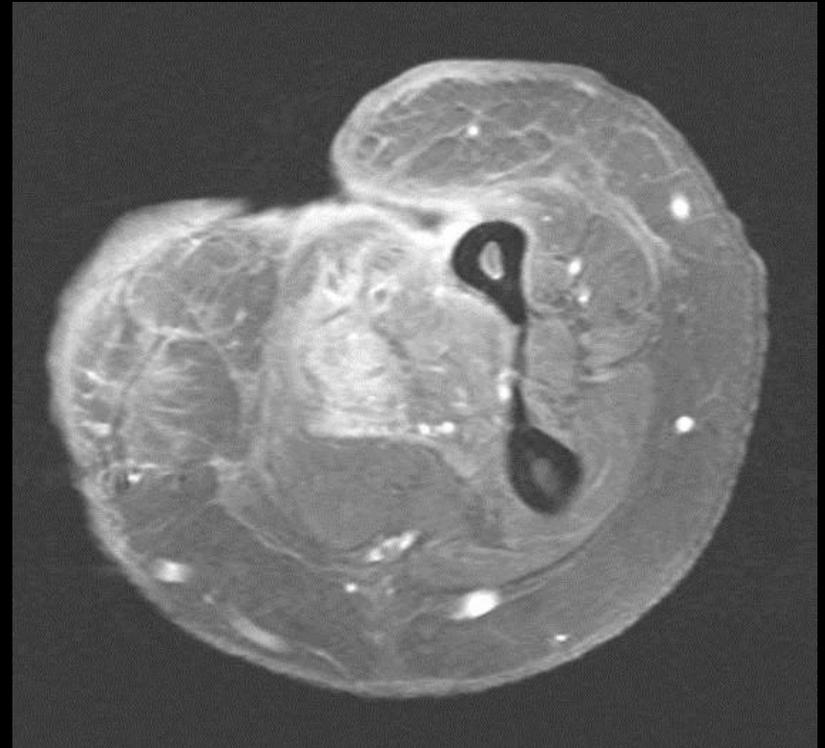
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- Periarticular bone edema is not enough
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Infectious Periostitis

- Hematogenous spread to periosteum or cortex
- Implantation – IVDA.

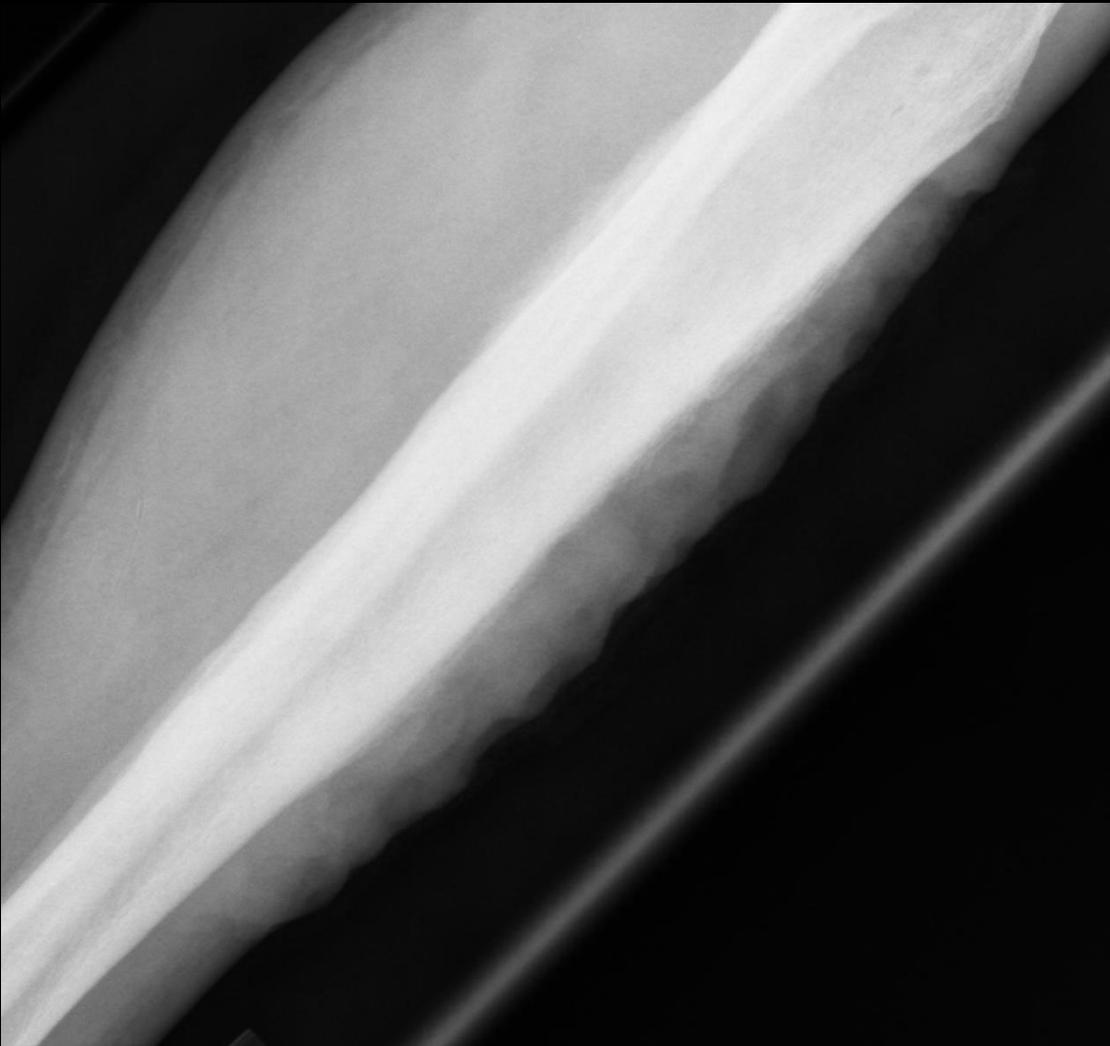


Infectious Periostitis

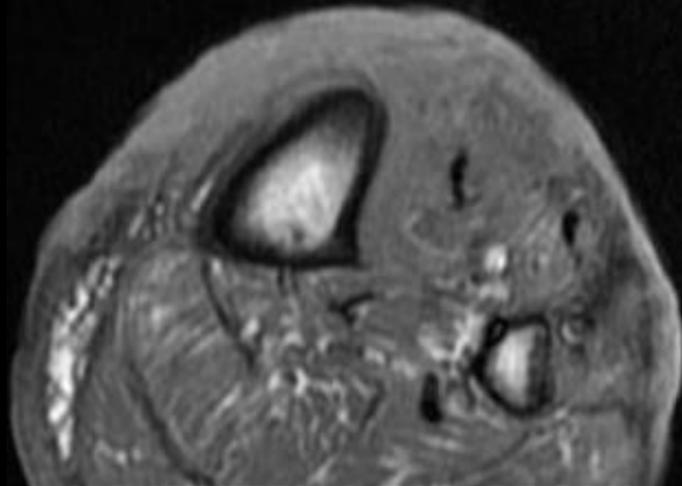


Tibial periostitis IVDA 41F

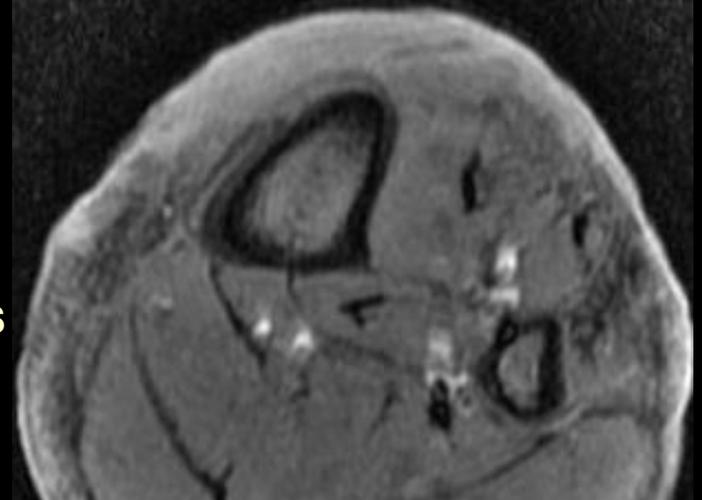
Infectious Periostitis



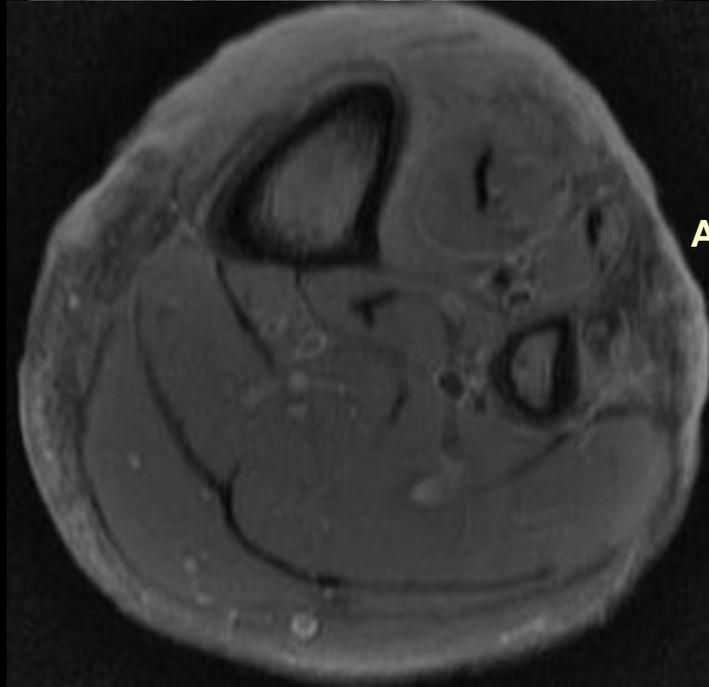
Infectious Periostitis



Ax T1



Ax PDFS



Ax T1FS

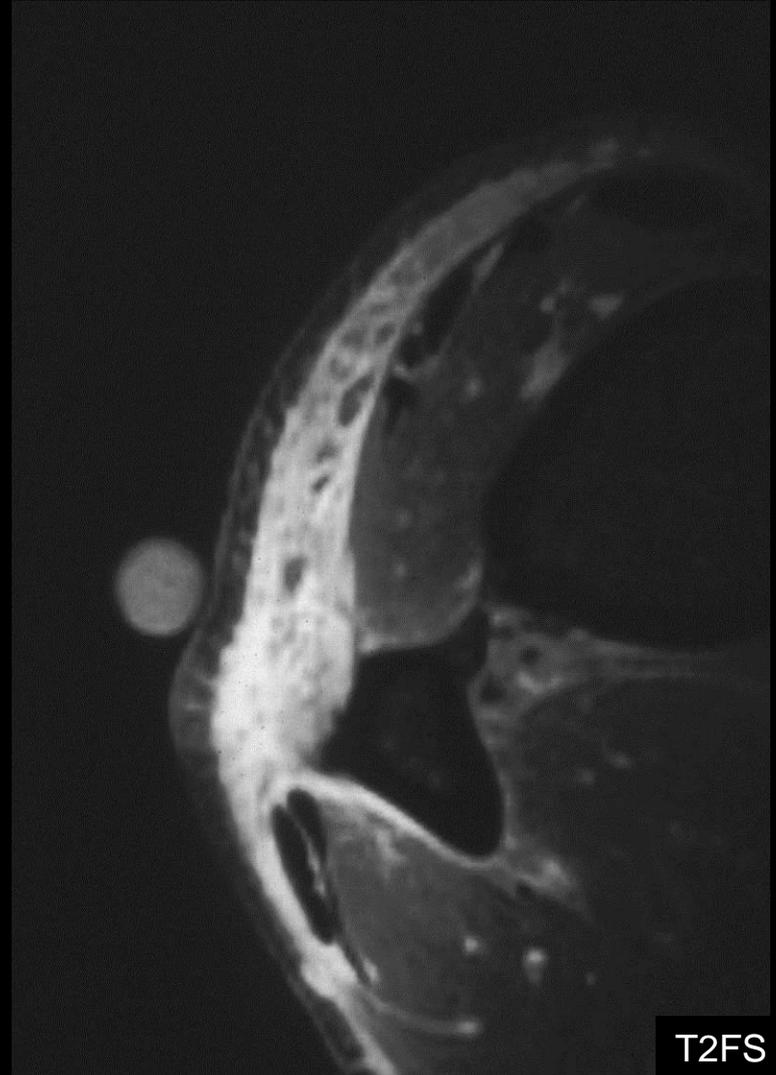
Ax T1FS IVGd



Tibial periostitis IVDA 41F

Infectious Osteitis

- Cortical infection
- Spread from contiguous soft tissue infection or ulcer
- Hematogenous spread to periosteum or cortex
- Difficult to distinguish from osteomyelitis



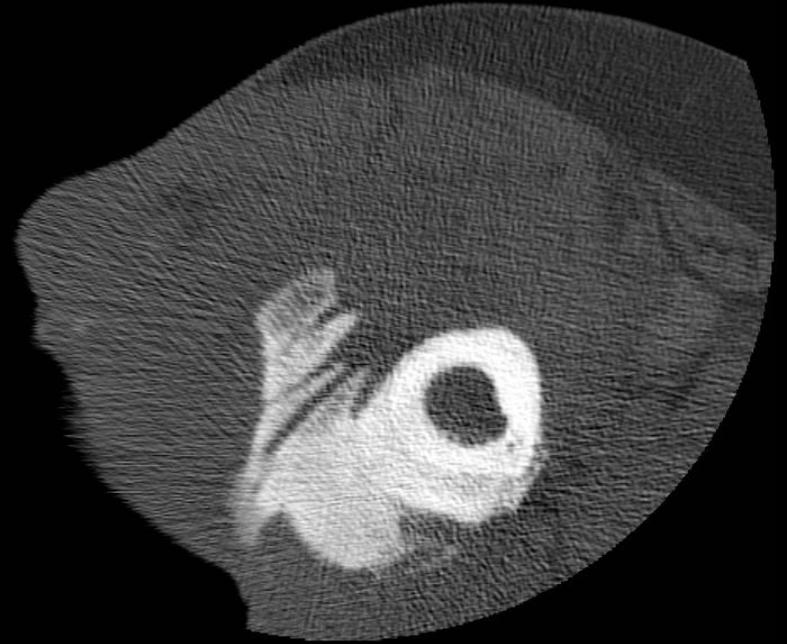
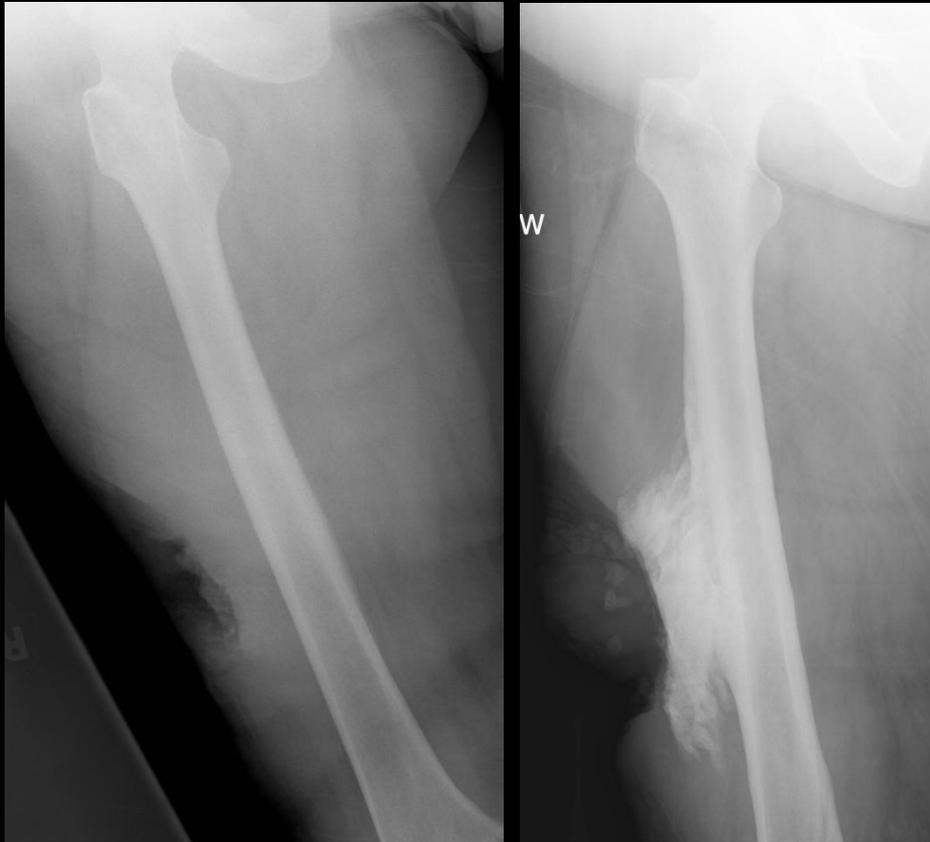
T2FS

Reactive Osteitis



- Bony proliferative response adjacent to chronic soft tissue infection
- Can mimic osteoma

Reactive Osteitis



- Bony proliferative response adjacent to chronic soft tissue infection
- Can mimic osteoma

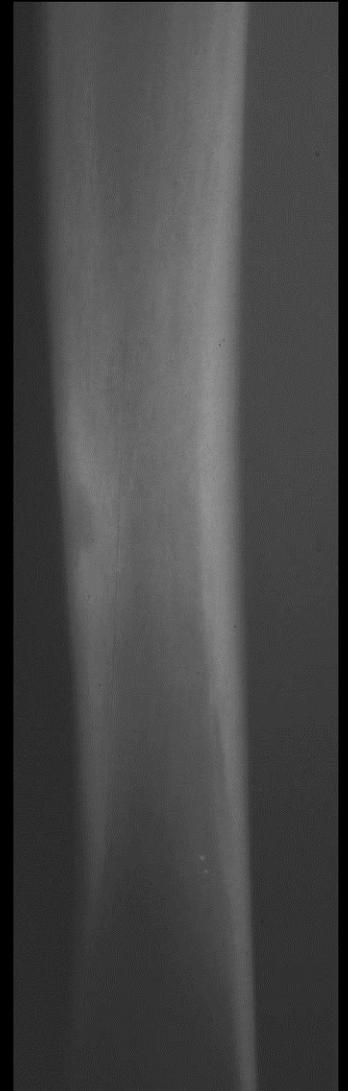
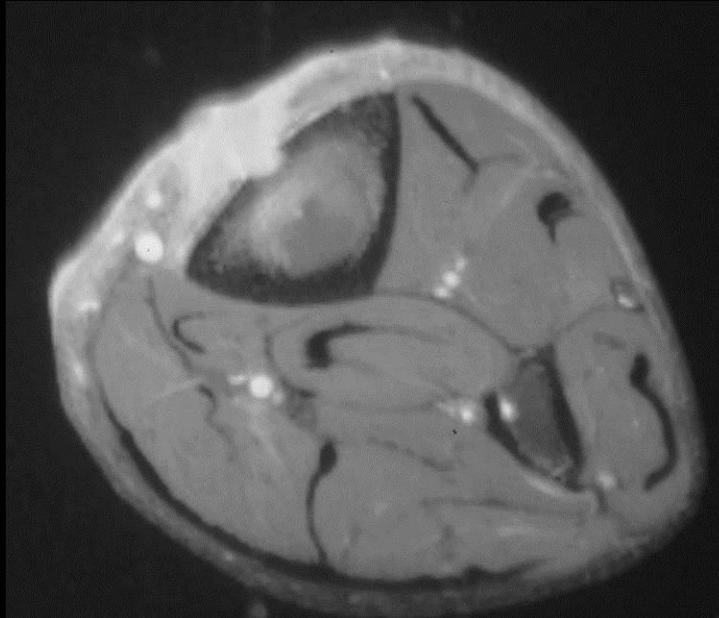
Intracortical Abscess

- Mimics osteoid osteoma
- Tends to be larger and more irregular
- May show serpiginous channel



Intracortical Abscess

- Mimics osteoid osteoma
- Tends to be larger and more irregular
- May show serpiginous channel



Intracortical Abscess



30M Cortical abscess, sequestrum being expelled in sinus tract

Osteomyelitis

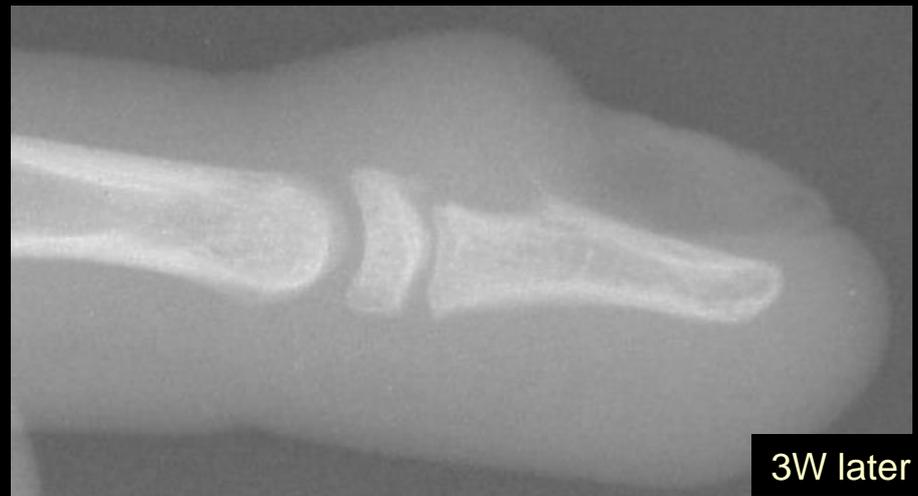
- Infection involving bone marrow
- Location of infection varies with;
 - age
 - underlying disease
 - status of overlying soft tissue
- Marrow replaced by inflammatory cells, pus, organisms and adjacent inflammation



Osteomyelitis

Risk Factors

- Penetrating trauma
 - Postsurgical
- Vascular insufficiency
 - Diabetes mellitus
 - Sickle cell disease
- Closed trauma
- Bacteremia
 - IV drug abuse
 - Other sites of infection
- Immunocompromised



Osteomyelitis

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 - Diabetes mellitus
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 - IV drug abuse
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- Immunocompromised

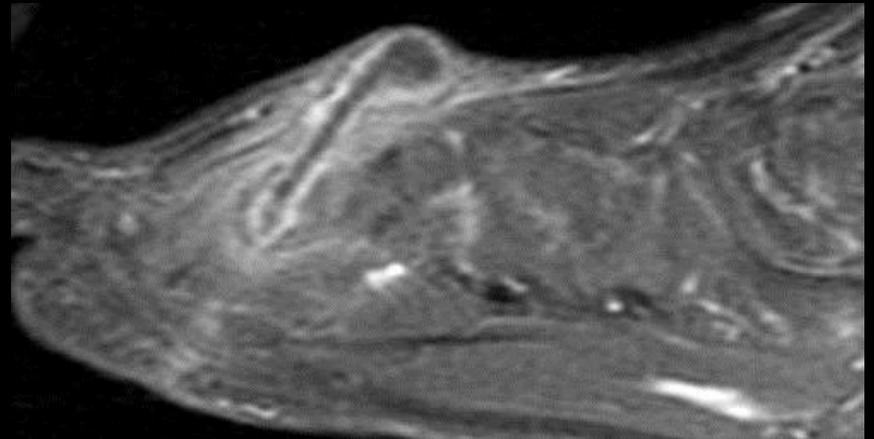
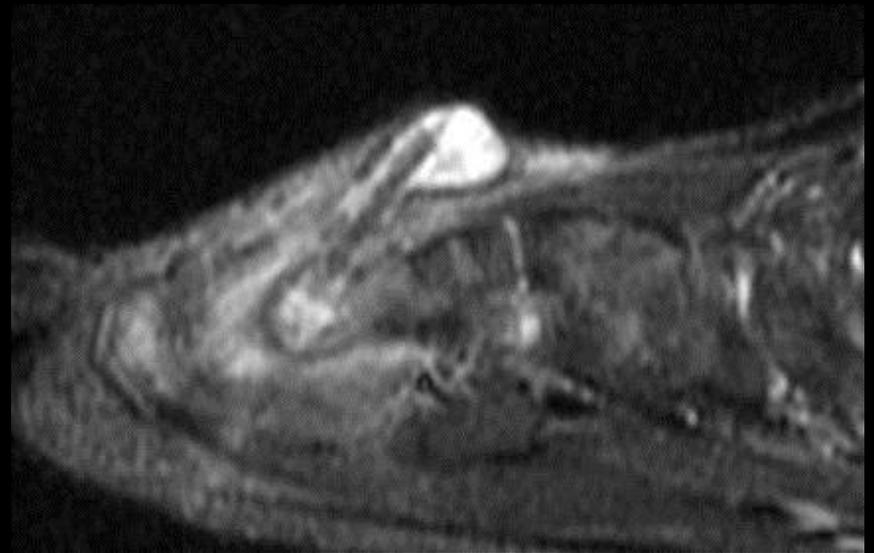


3yo presents with the complaint of “his brother stuck him with a toothpick”

Osteomyelitis

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 - Postsurgical.
- Vascular insufficiency
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 - Sickle cell disease
- Closed trauma
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3yo presents with the complaint of “his brother stuck him with a toothpick”

Osteomyelitis

Risk Factors

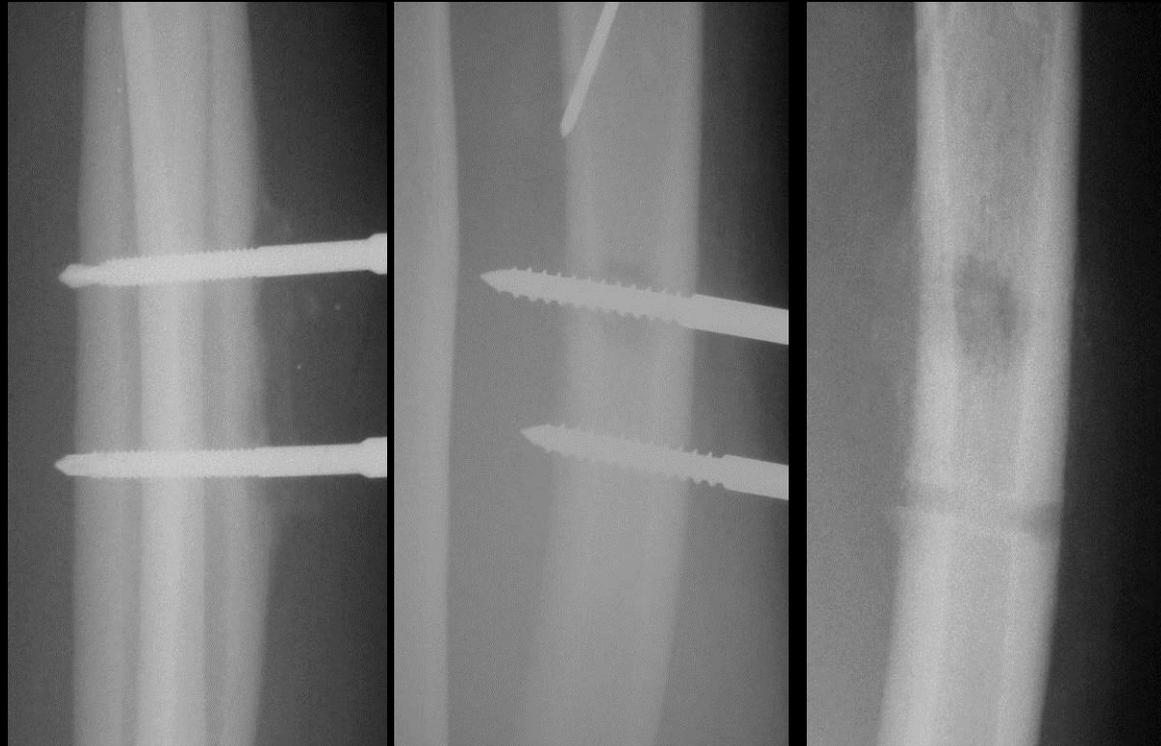
- Penetrating trauma
 - Postsurgical
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- Bacteremia
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Osteomyelitis

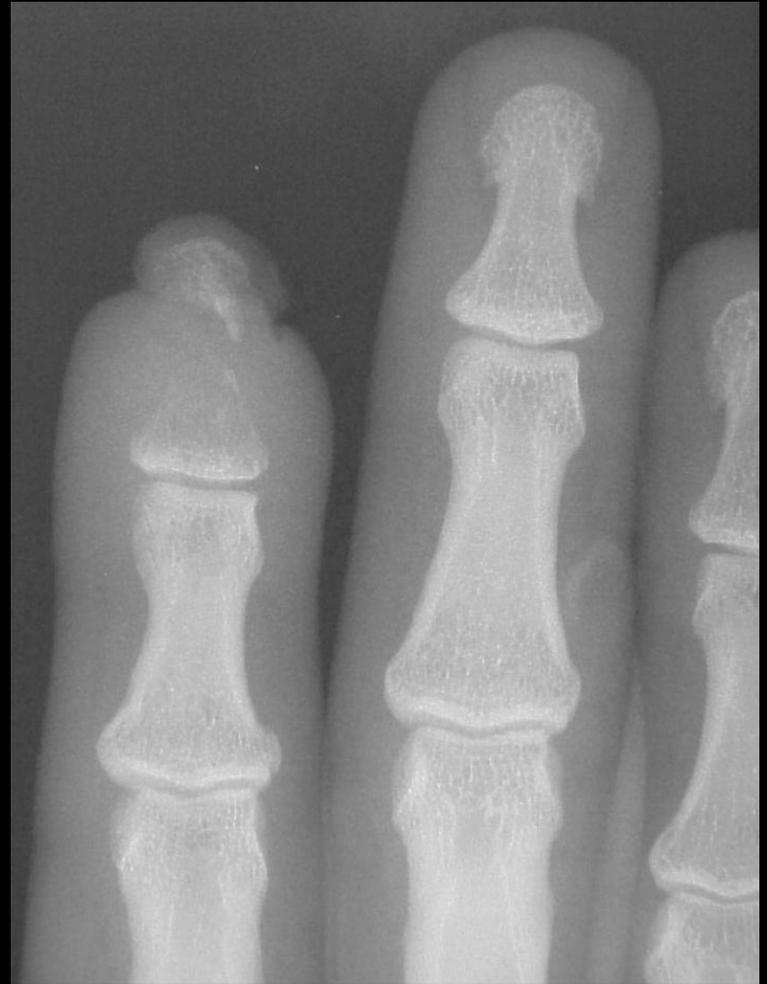
Risk Factors

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Osteomyelitis

Risk Factors

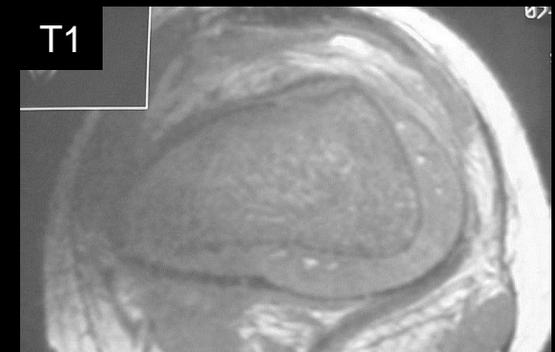
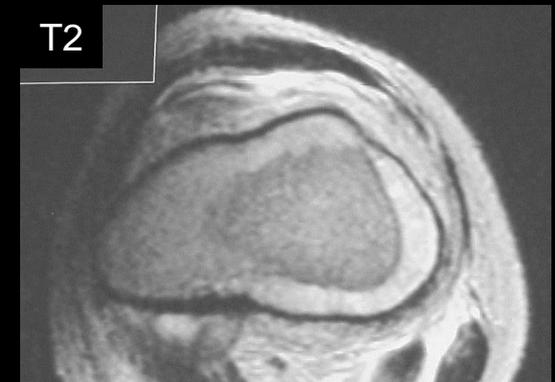
- Penetrating trauma
 - Postsurgical
- Vascular insufficiency
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- Closed trauma.
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Osteomyelitis

Risk Factors

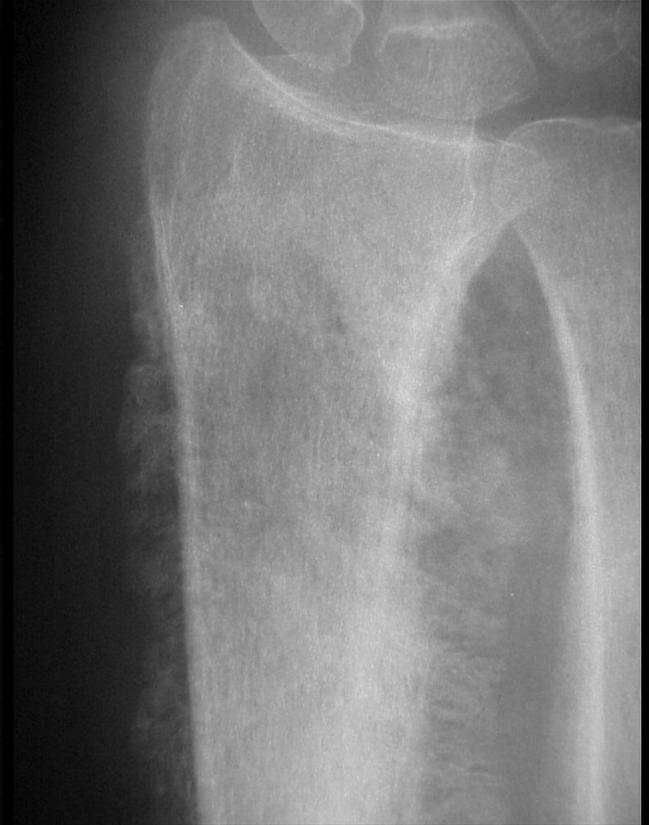
- Penetrating trauma
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Osteomyelitis

Risk Factors

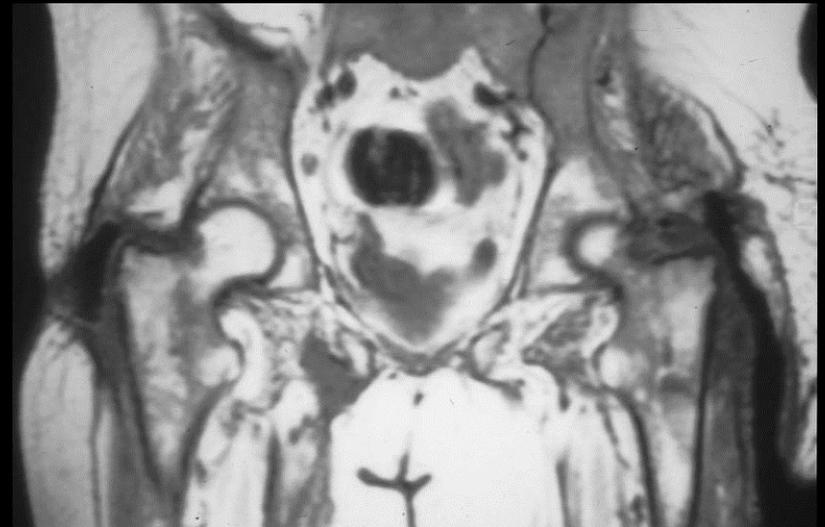
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Osteomyelitis

Risk Factors

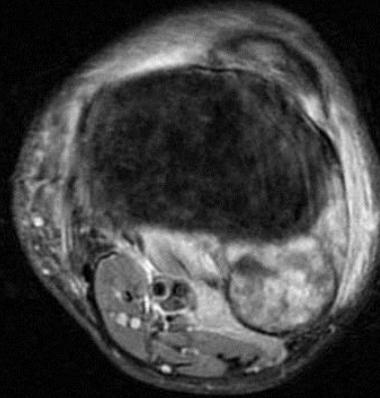
- Penetrating trauma
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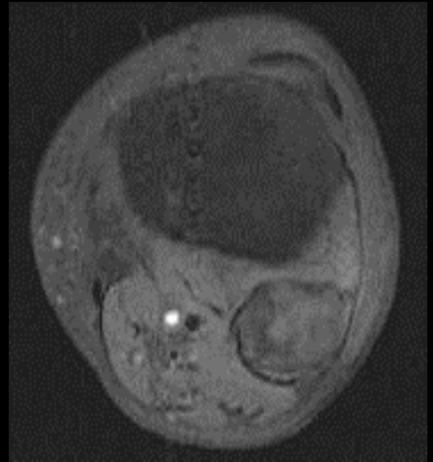
Osteomyelitis

Risk Factors

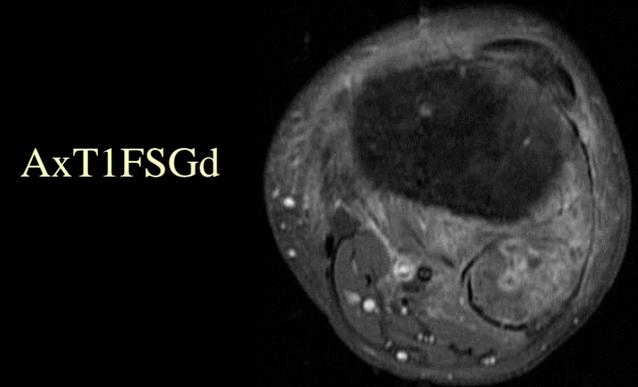
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 - Postsurgical
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Ax PDFS



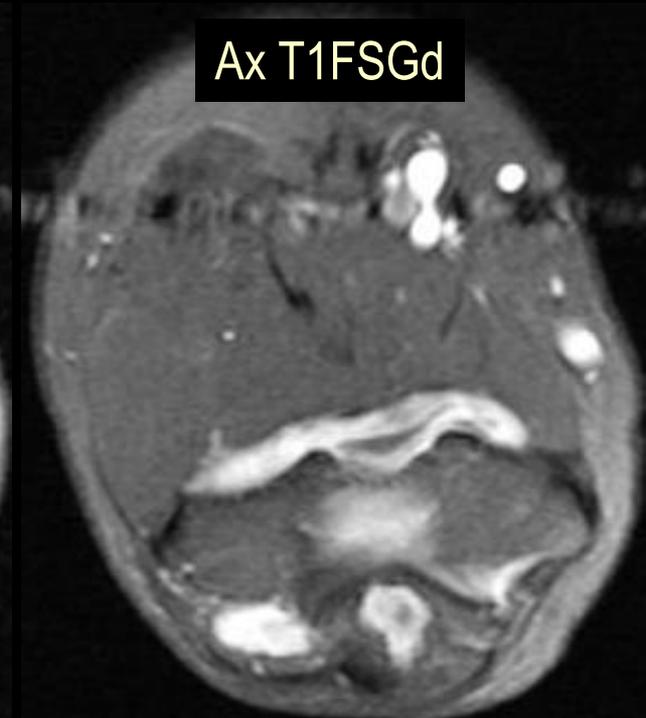
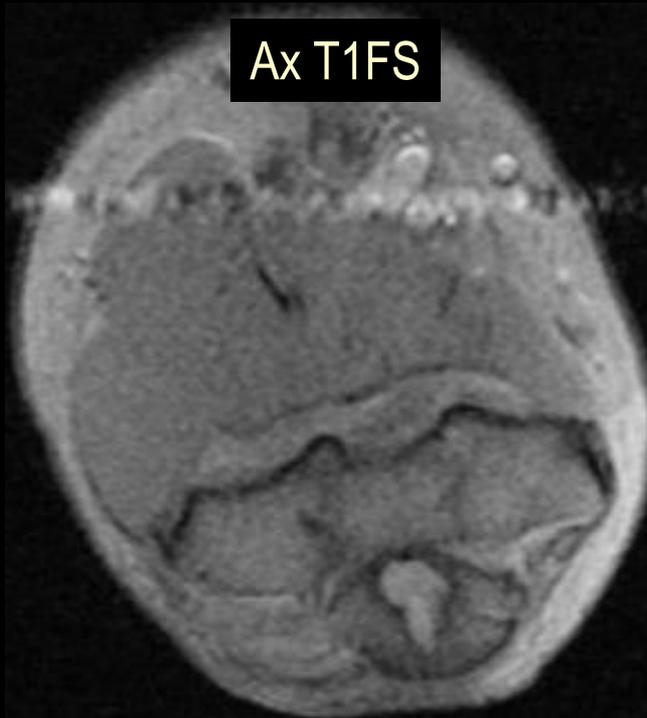
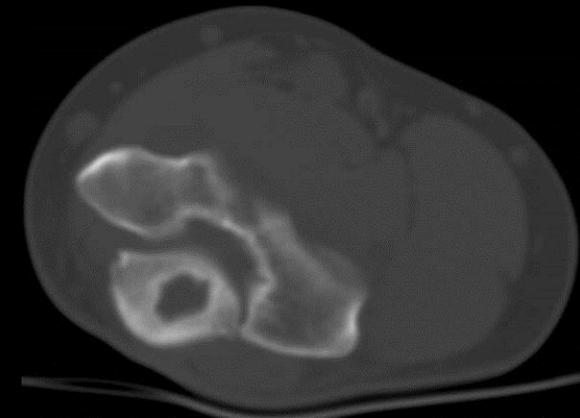
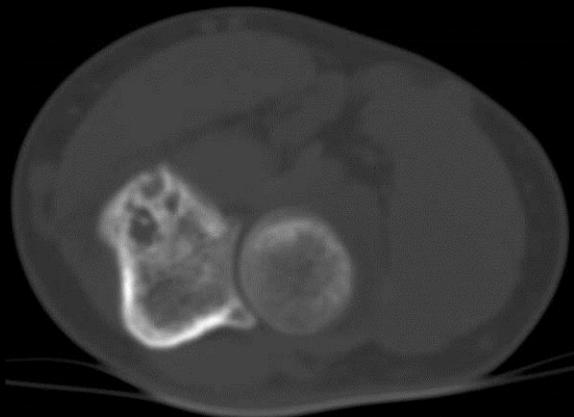
Ax T1FS



AxT1FSGd

Risk factors - Location

Coccidioidomycosis infection



Risk factors - Location



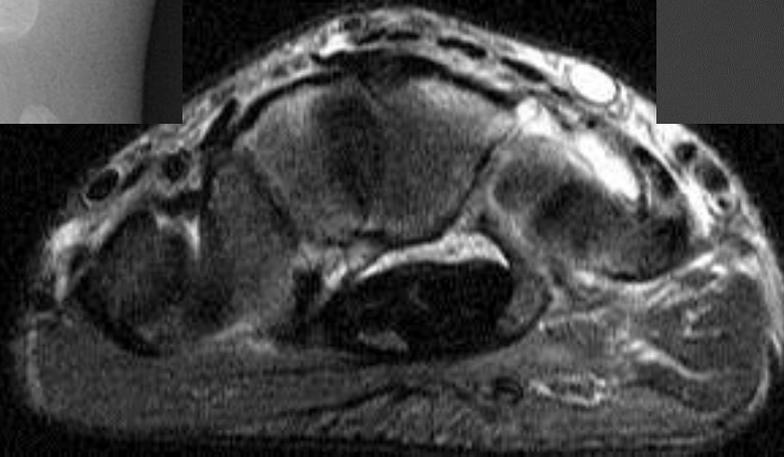
2004

Risk factors - Location



2007

Risk factors - Location



Osteomyelitis

Risk factors – Location



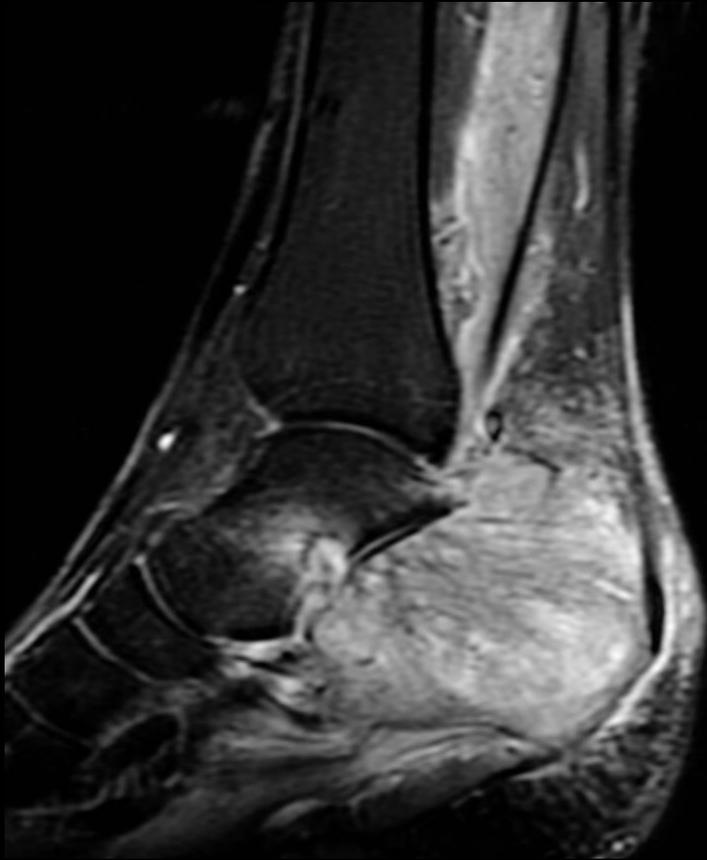
Madura Foot 57 years old patient with 15 years of pain and edema at the hindfoot.

Osteomyelitis

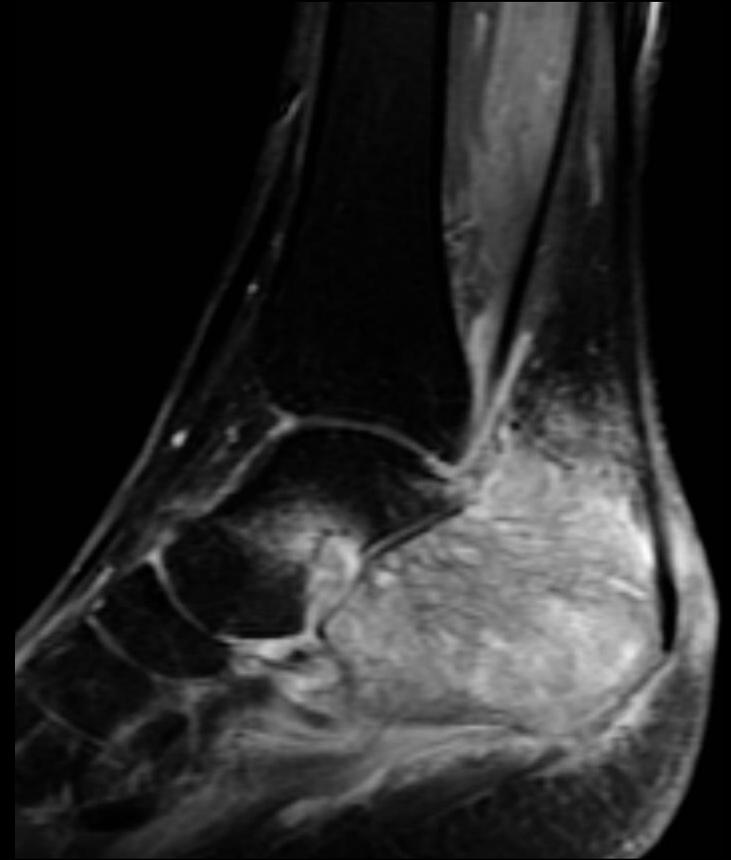
Risk factors – Location



Risk factors – Location

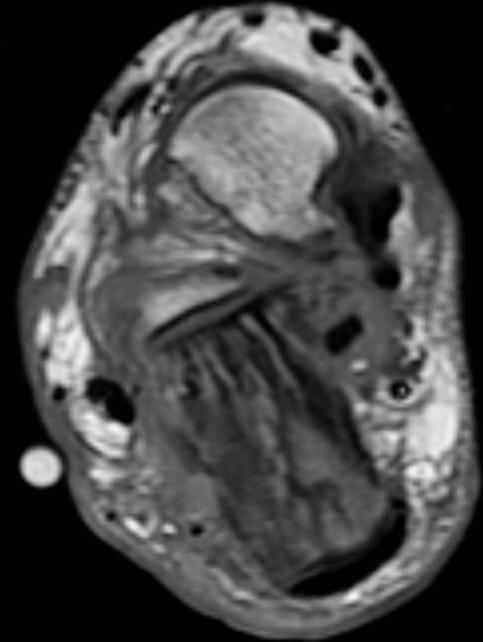


Sag PDFS



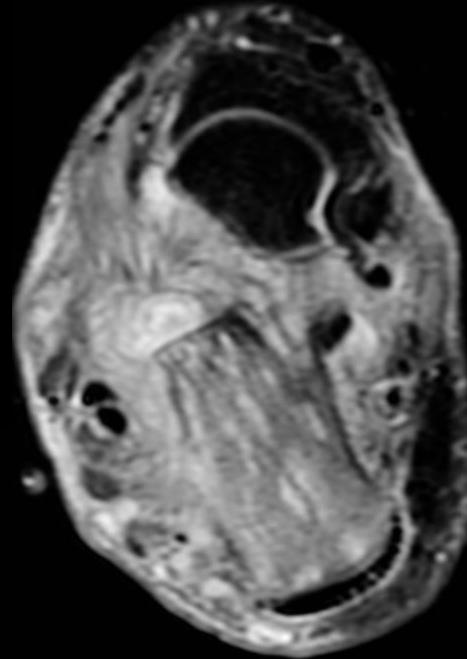
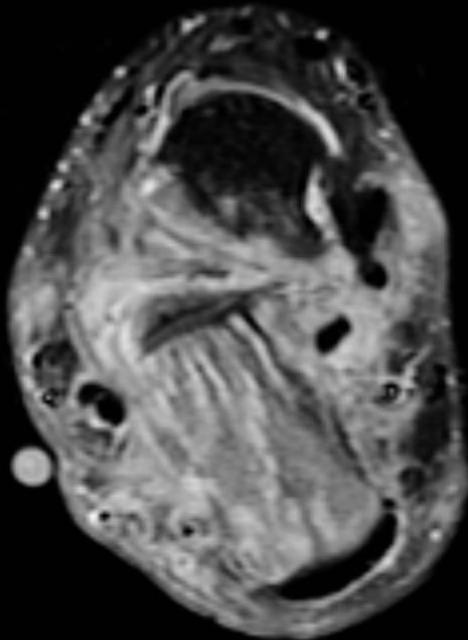
Sag T1FS IVGd

Risk factors – Location



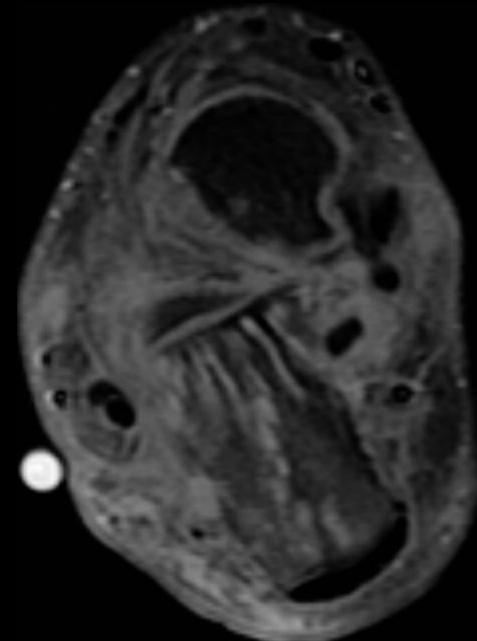
Ax T1

Ax T1FS IVGd

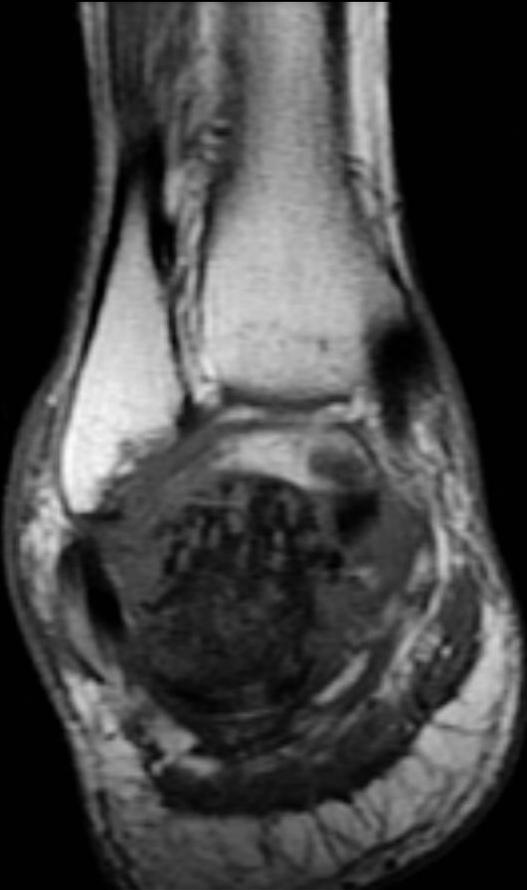


Ax T2FS

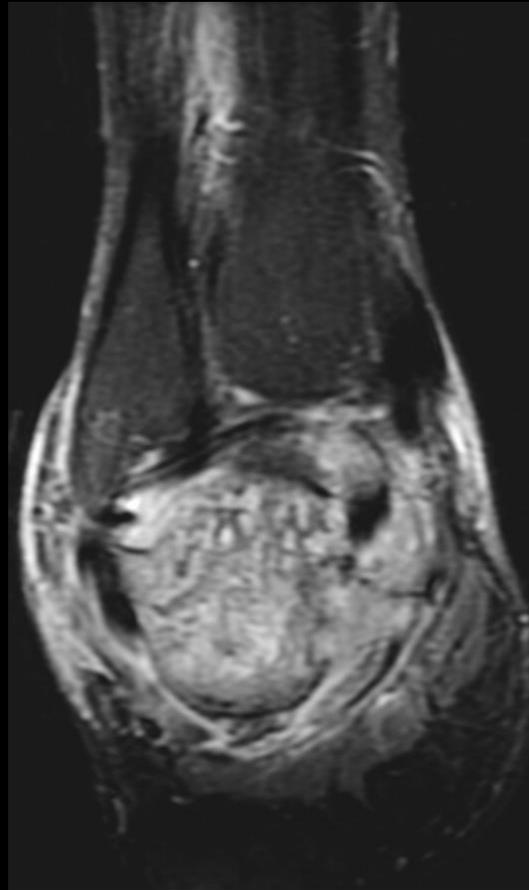
Ax PDFS



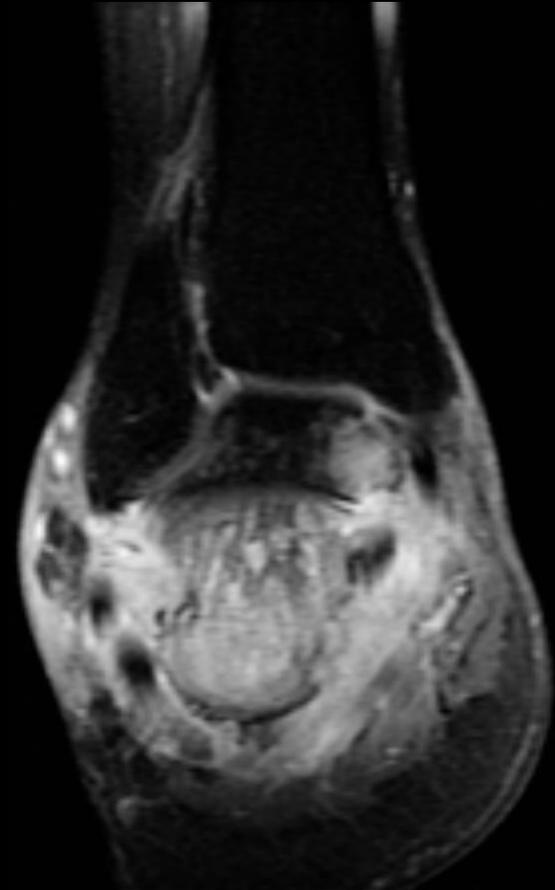
Risk factors – Location



Cor T1



Cor PDFS



Cor T1FS IVGd

Diabetic Foot

- Prone to:
 - Soft tissue infection and Osteomyelitis
 - Vascular disease
 - Neuroarthropathy
 - Tendon rupture

Diabetic Foot Infection

- Outside in process
 - Vascular insufficiency
 - Ischemia of vasa nervorum
 - Sensory nerve axonal degeneration
 - Ulcer
 - Soft tissue infection
 - Cortical invasion
 - Osteomyelitis



Diabetic Foot Infection

- It is rare to have osteomyelitis in the diabetic foot without an overlying ulcer



Clinical Situation

- Soft tissue ulcer
- Need to differentiate ST infection from Osteomyelitis
- Affects length of antibiotics
- Need for surgical debridement
- Extent of surgical debridement

Sites of pressure points in diabetic foot

- Plantar aspect 1st metatarsal head
- Plantar aspect 5th metatarsal head
- Calcaneal tuberosity
- Distal phalanges of toes
- Malleoli of ankles

Diabetic Foot Infection

Sequence of imaging

- Plain radiography
- CT if MRI or Nuclear medicine not available
- MR imaging.
- Three-phase ^{99m}Tc -MDP scan.
- An equivocal ^{99m}Tc -MDP scan should be followed by MR imaging.
- ^{111}In white blood cell scan. To exclude osteomyelitis at a site of neuroarthropathy.
- ~~• Biopsy; percutaneous core biopsy is the procedure of choice, with the entrance of the needle well beyond the edge of the subjacent ulcer~~

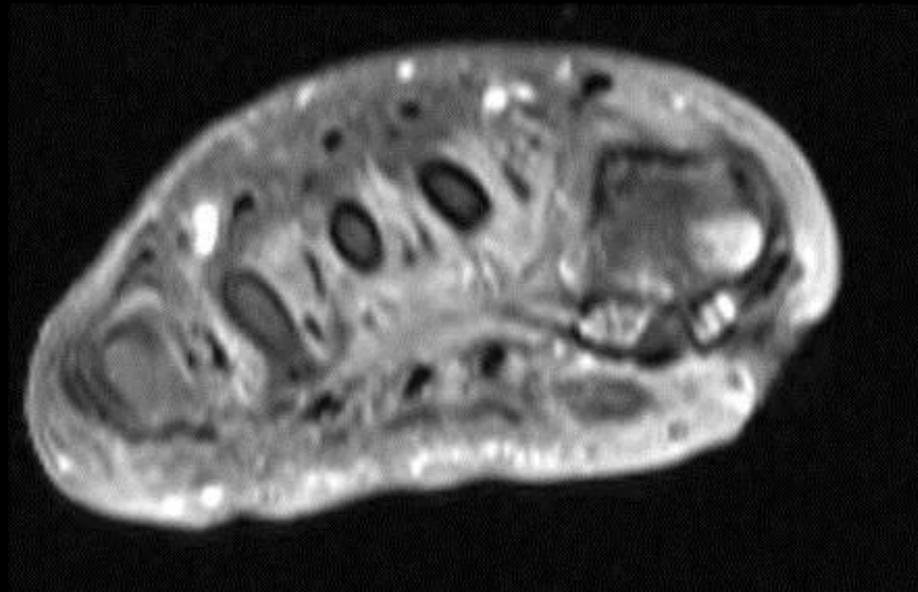
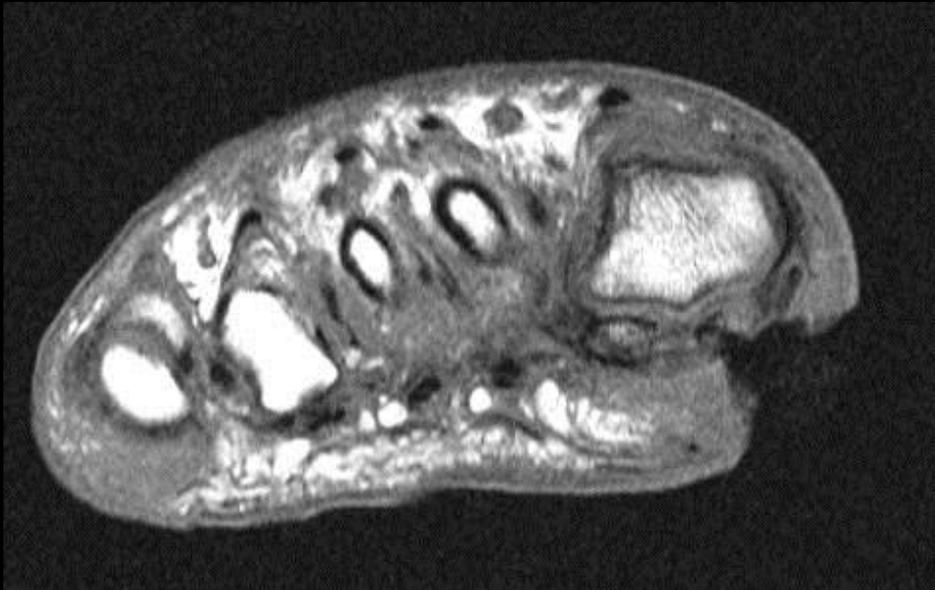
Imaging

- MRI more cost effective than NM
- MRI faster to perform
- MRI also shows;
 - Sinus tract
 - Abscess
 - Tendon pathology

Diabetic Foot Infection

Ulcer on MRI

- Soft tissue defect of low signal on both T1W and T2W images



MRI marrow signal in diabetic feet

Diagnosis	T1 marrow signal	T2 (STIR) marrow signal
No osteomyelitis	High	Low
Reactive marrow edema	High	High
Chronic neuropathic	Low	Low
Osteomyelitis	Low	High
Marked reactive marrow edema		
Acute neuropathic edema		

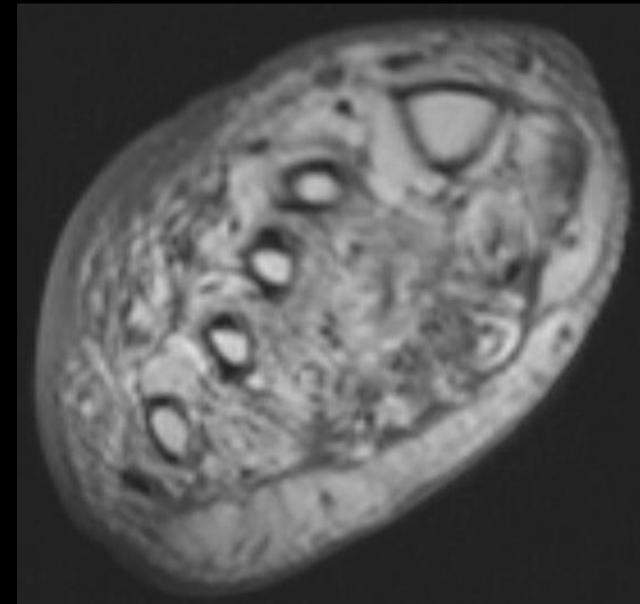
MRI is good at excluding osteomyelitis if normal signal on STIR

To diagnose osteomyelitis in diabetic foot

- Low T1 (dark) and high T2 (bright) signal
- Adjacent soft tissue ulcer or sinus tract
- Cortical destruction
- Intraosseous abscess
- Sequestrum
- Soft tissue abscess or cellulitis
- Adjacent joint effusion

Osteomyelitis verses Neuroarthropathy

- Neuroarthropathy
 - Affects joints
 - Causes fragmentation
 - Causes subluxation
 - Commonly
 - Lisfranc (TMTJ)
 - Chopart (TNJ, CCJ)
 - Subtalar
 - Ankle
 - Associated muscle atrophy

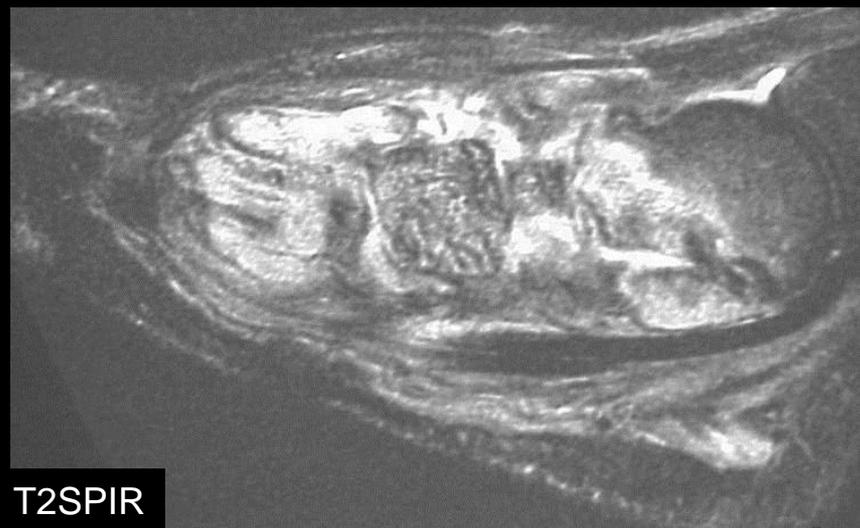
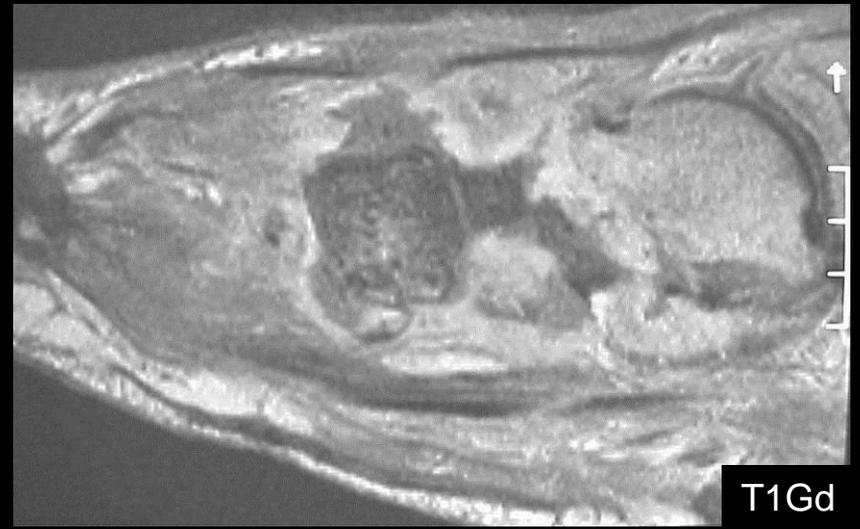
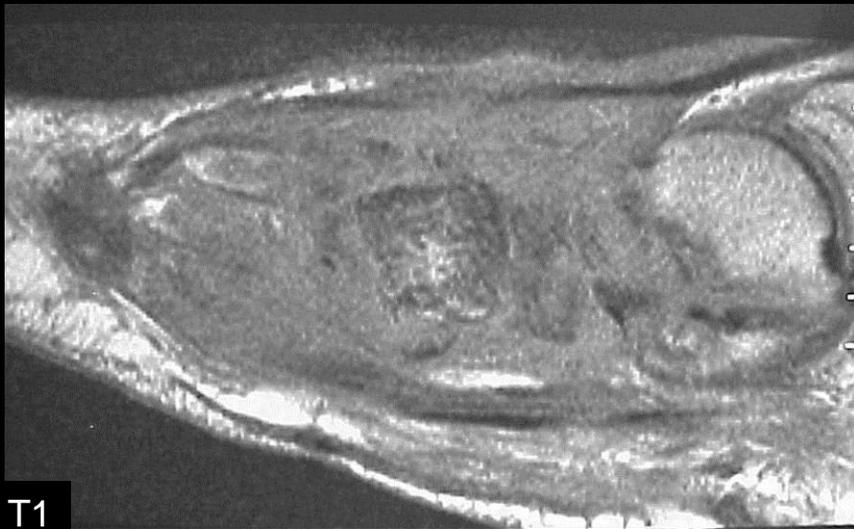


Cor T1 muscle atrophy

Diabetic Foot



Diabetic Foot



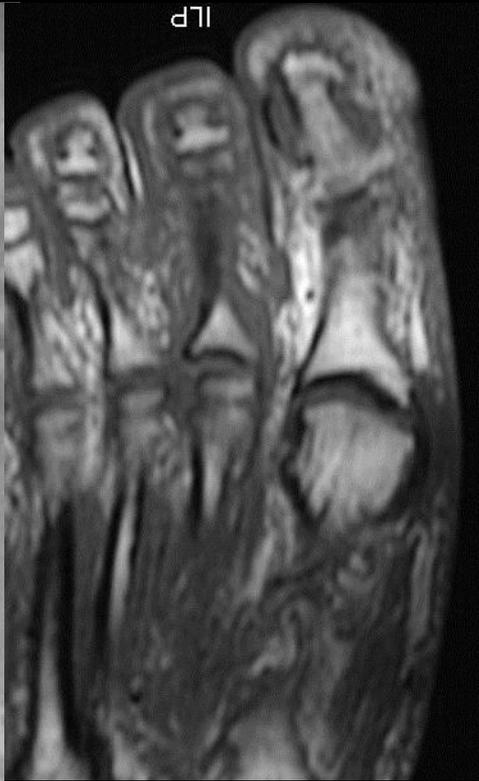
67M DM, abscess, sinus and dead navicular and cuneiform bone

Neuroarthropathy

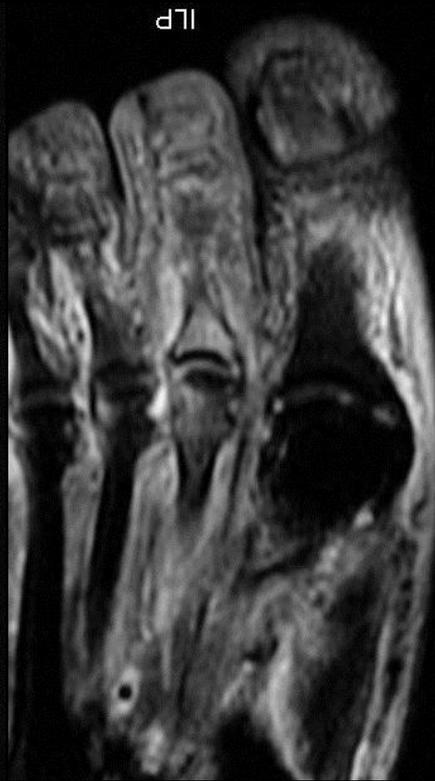
- Scintigraphy useful
- Literature suggests that inactive neuroarthropathy low signal on both T1 and T2 images



Diabetic Foot



Ax T1

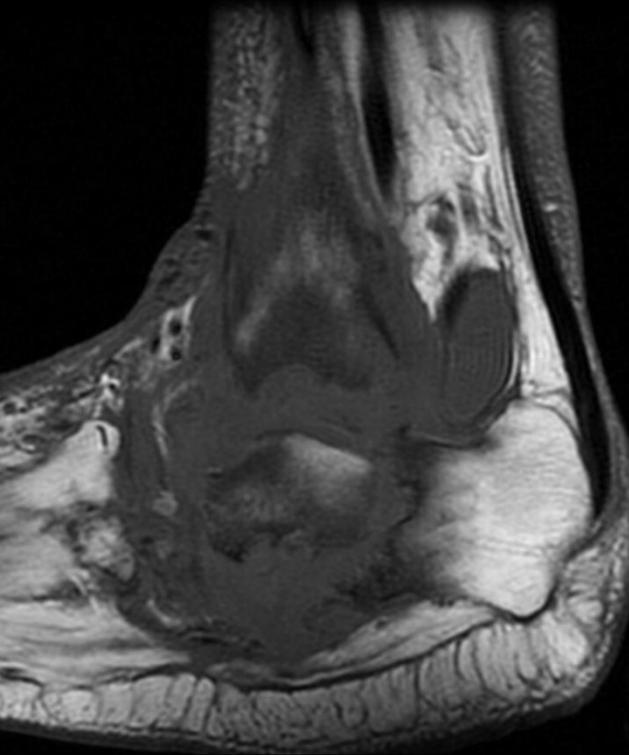


Ax T2FS

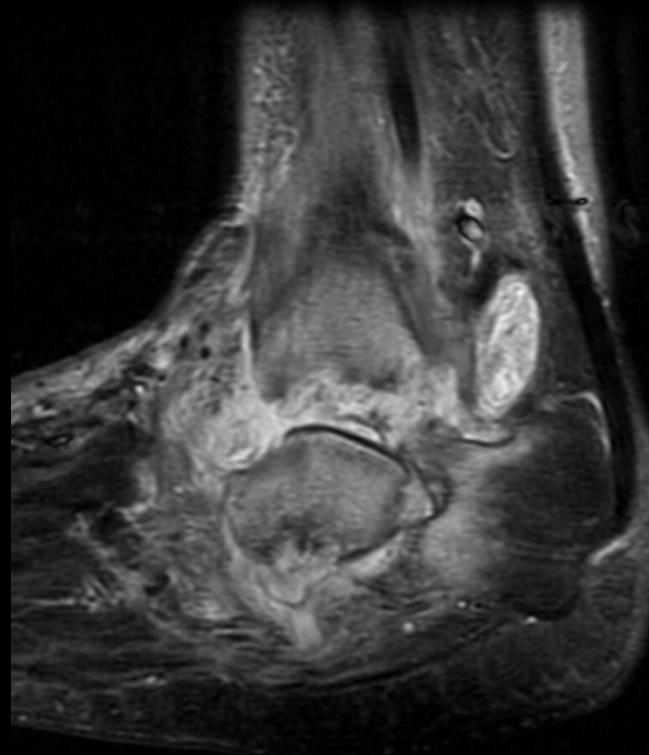


Diabetic Foot Infection

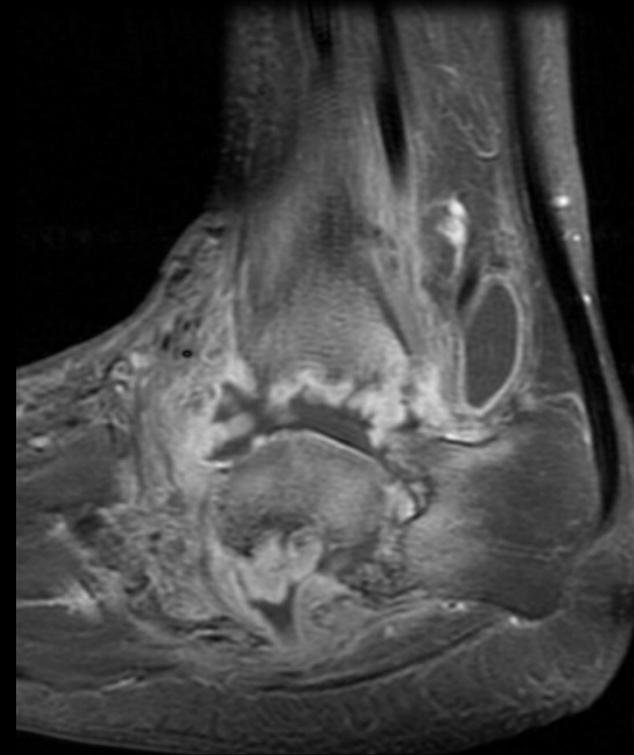
Infected Neuropathic Foot



Sag T1



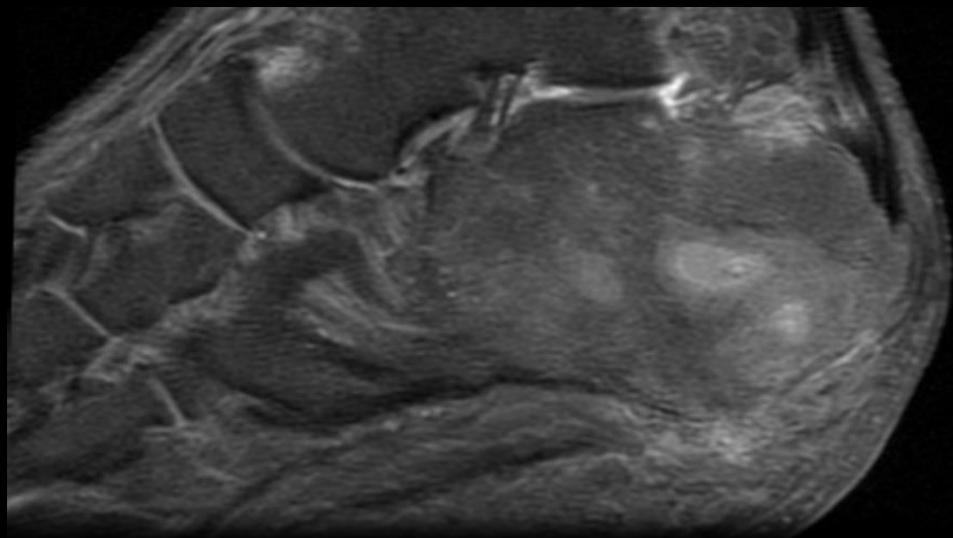
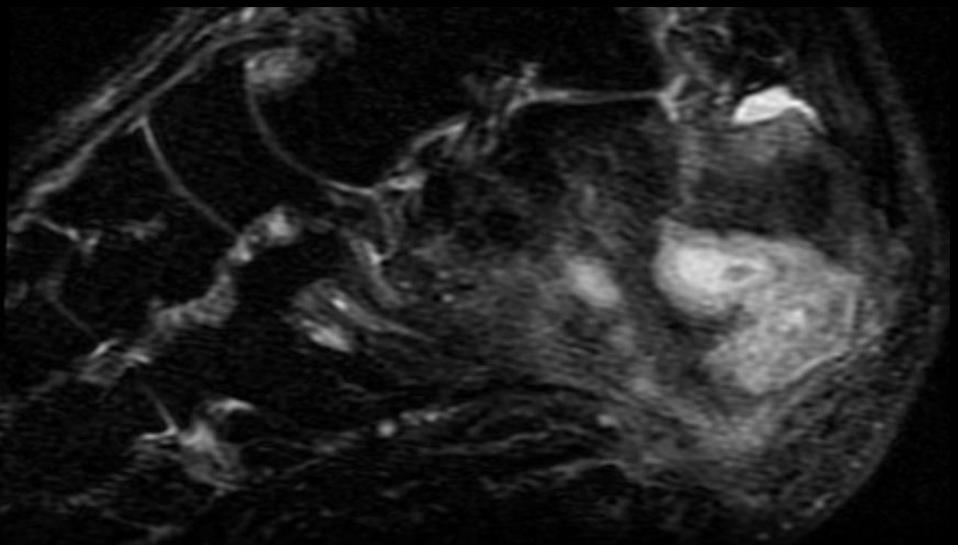
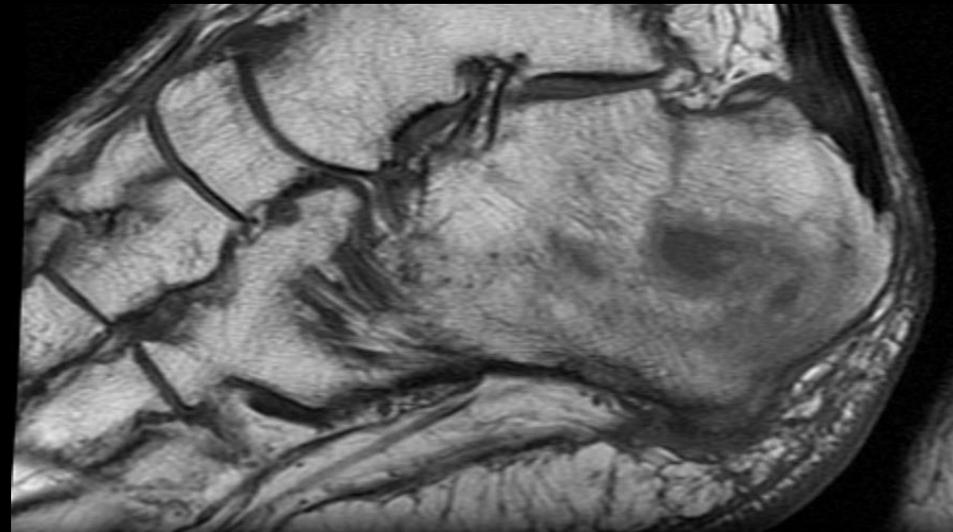
Sag PDFS



Sag T1FS IVGd

Diabetic Foot Infection

Intraosseous abscess

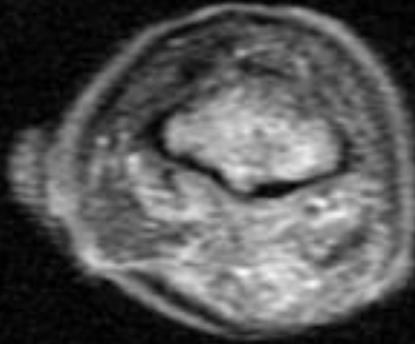


Calcaneal ulcer and osteo with abscess

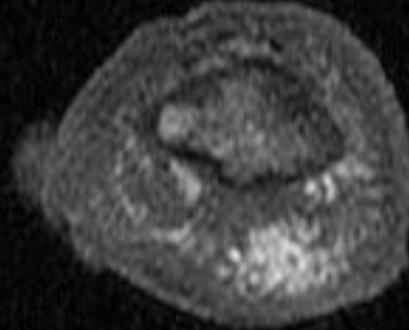
Dry Gangrene



Dry Gangrene



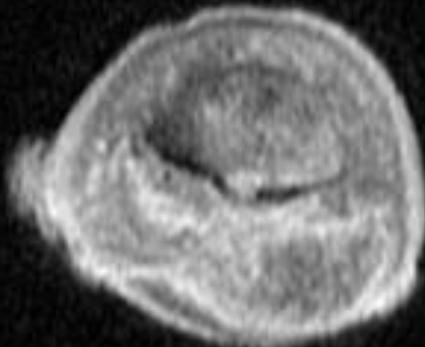
Cor T1



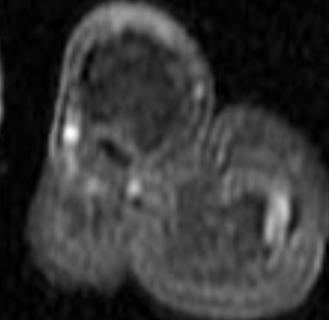
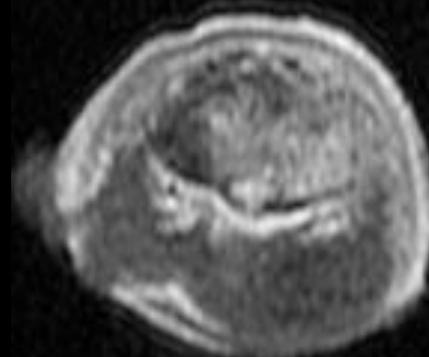
Cor T1FS



Cor PDFS

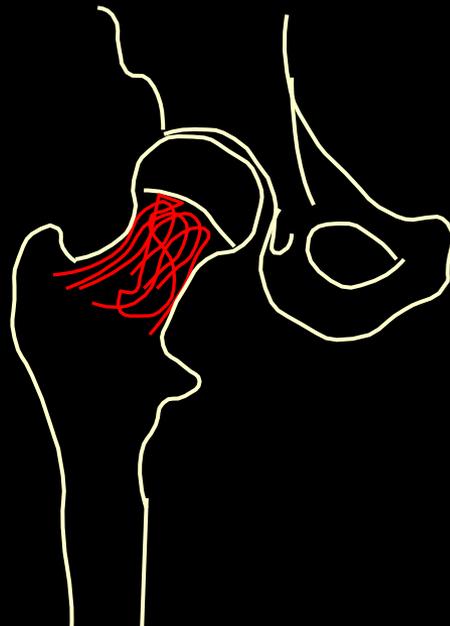


Cor T1FS IVGd



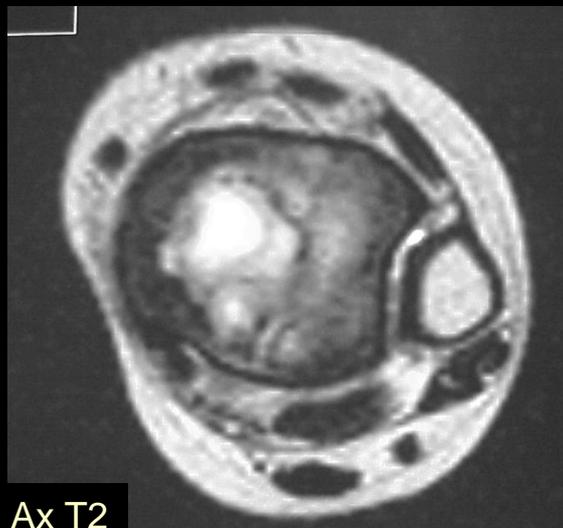
Hematogenous Osteomyelitis

Infant	Child	Adult
Epiphyseal	Metaphyseal	Axial, epiphyseal
Hip, knee	Hip, knee	Spine, SI joint
S. aureus, Group D Strep	S. aureus, H. influenza	S. aureus, Gram negative



Osteomyelitis

Blood supply



Ax T2



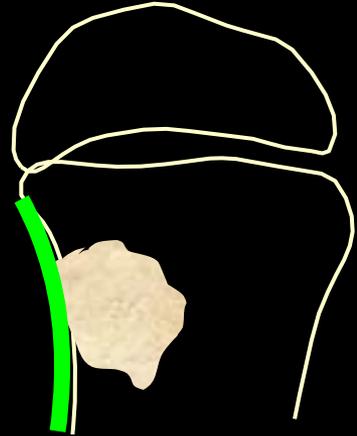
Cor T1

Stages of Osteomyelitis

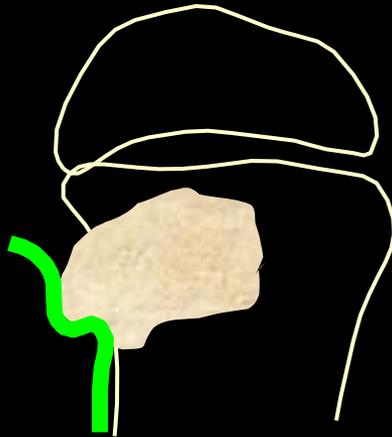
1. Intramedullary metaphyseal infection



2. Cortical destruction



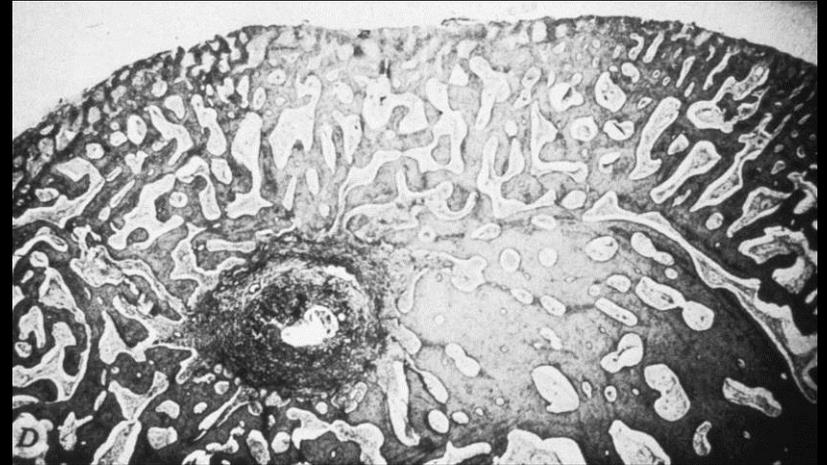
3. Periosteal elevation



4. Periosteal new bone formation



Stages of Osteomyelitis



Stages of Osteomyelitis



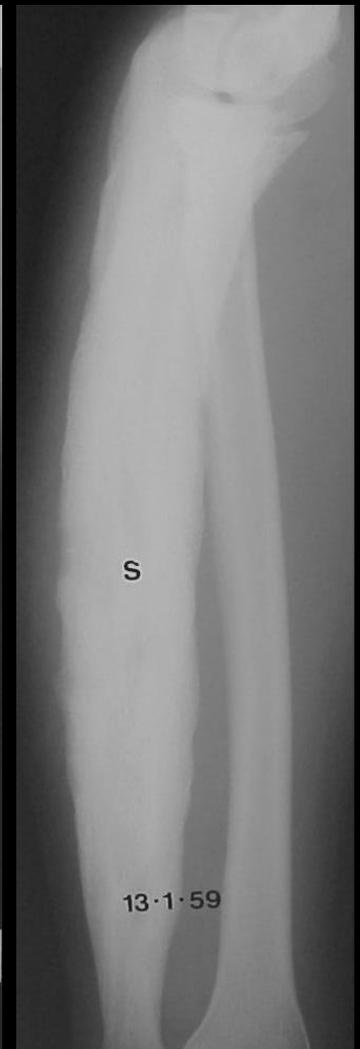
Presentation



2w



3m



6m

Radiography

- Adjacent swelling and effusion
- Permeative osteolysis.
- Cortical tunneling and splitting
- Immature, continuous periostitis



Radiography

- Adjacent swelling and effusion
- **Permeative osteolysis**
- Cortical tunneling and splitting.
- Immature, continuous periostitis



Radiography

- Adjacent swelling and effusion
- Permeative osteolysis
- Cortical tunneling and splitting
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Radiography

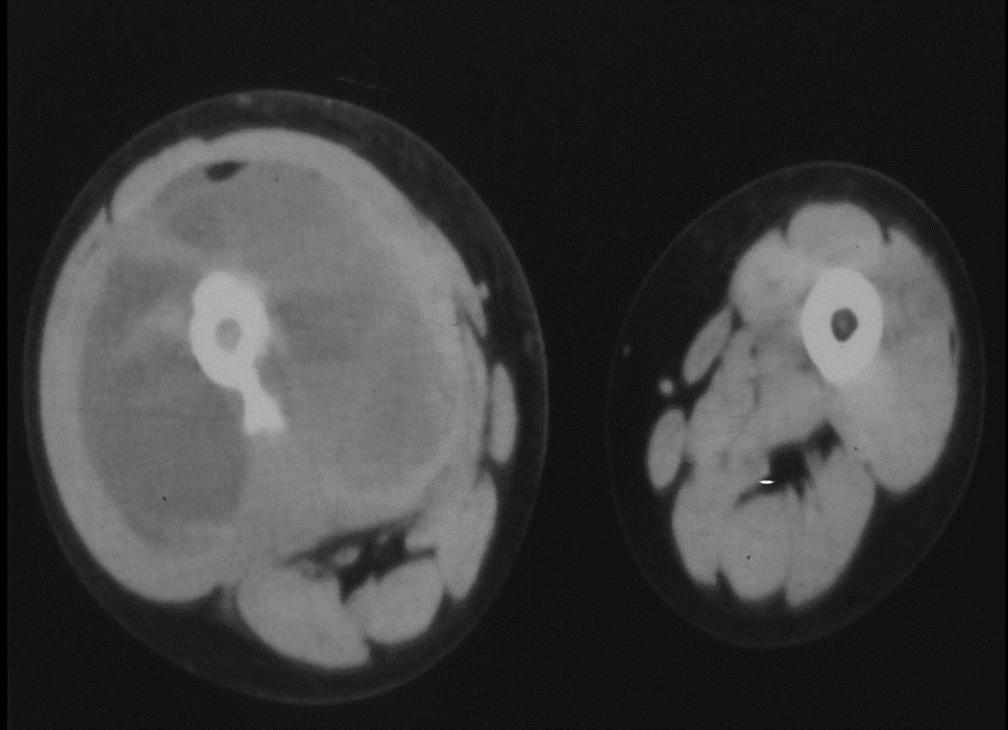
- Adjacent swelling and effusion
- Permeative osteolysis
- Cortical tunneling and splitting
- Immature, continuous periostitis



6 Weeks apart

Computed Tomography

- Low sensitivity
 - Marrow attenuation >20 HU compared to other side
- Trabecular and cortical destruction
- Periosteal proliferation
- Subperiosteal and soft tissue abscess



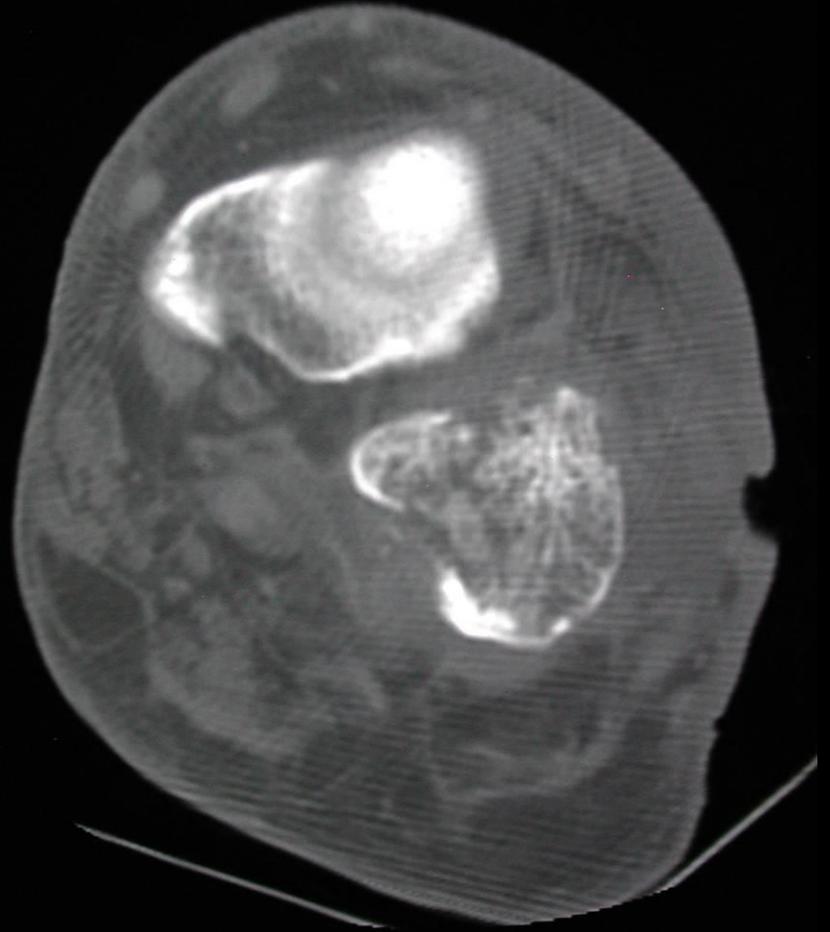
Computed Tomography

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Marrow attenuation
>20 HU compared
to other side
- Trabecular and cortical
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Imaging of Acute Osteomyelitis

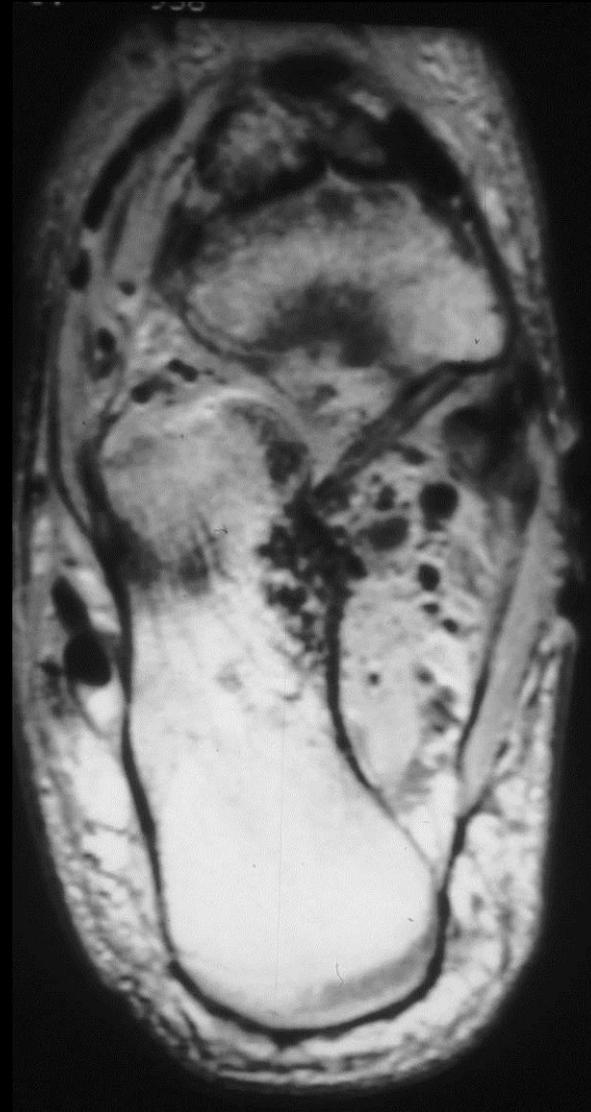
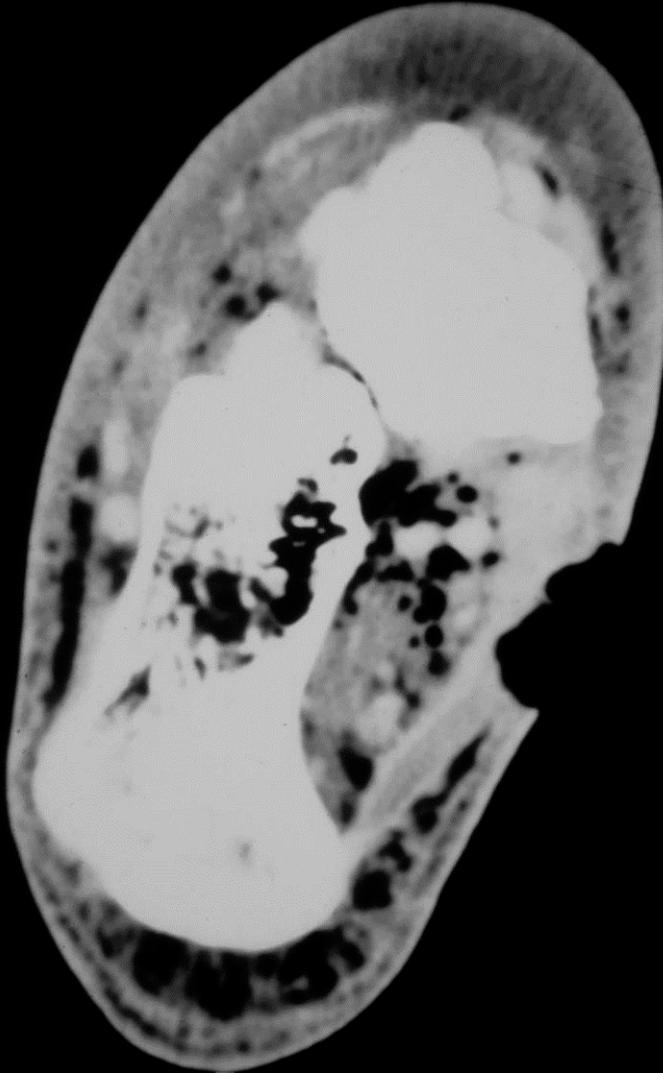
Computed Tomography



Cuboid osteomyelitis

Imaging of Acute Osteomyelitis

Computed Tomography



Scintigraphy

- More sensitive than radiography
- MDP routinely.
- Gallium imaging useful in chronic osteomyelitis
- Indium-labeled WBC scan increases specificity
- Sulphur colloid to compare marrow with infection



Occult radiographic osteomyelitis

Scintigraphy

- More sensitive than radiography
- **MDP routinely**
- Gallium imaging useful in chronic osteomyelitis
- Indium-labeled WBC scan increases specificity
- Sulphur colloid to compare marrow with infection



Scintigraphy

- Increased flow and blood pool
- Persistent or increased activity on delayed images (3rd and 4th phase)
- May be false negative in areas of low flow



Perfusion

Blood Pool

3h

Imaging of Acute Osteomyelitis

MR

- Decreased signal on T1w
- Increased signal on T2w and STIR
- Gadolinium enhancement



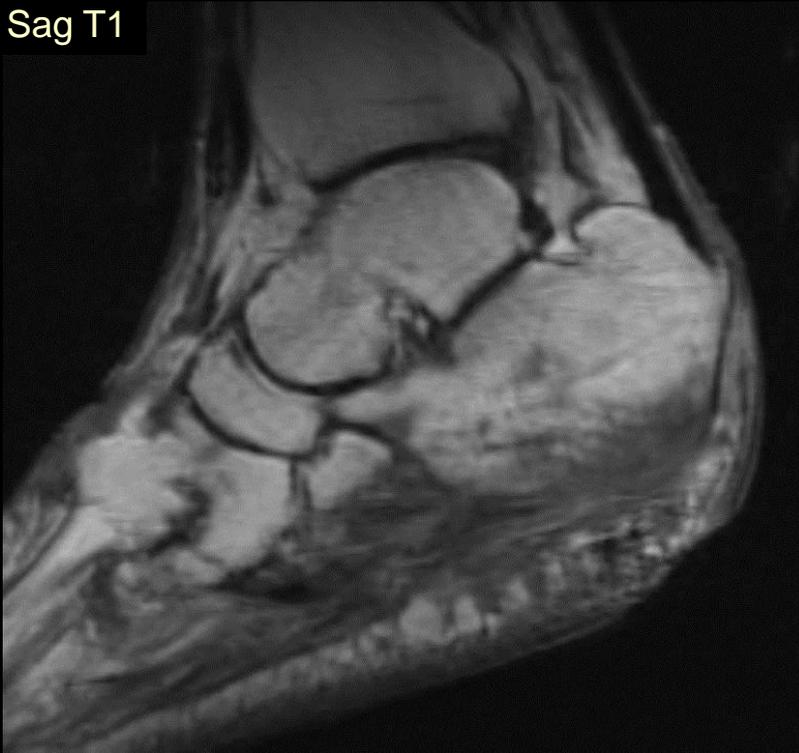
Ax T1FS Gd

Imaging of Acute Osteomyelitis

MR

- Decreased signal on T1w
- Increased signal on T2w and STIR
- Gadolinium enhancement

Sag T1



Sag T2FS



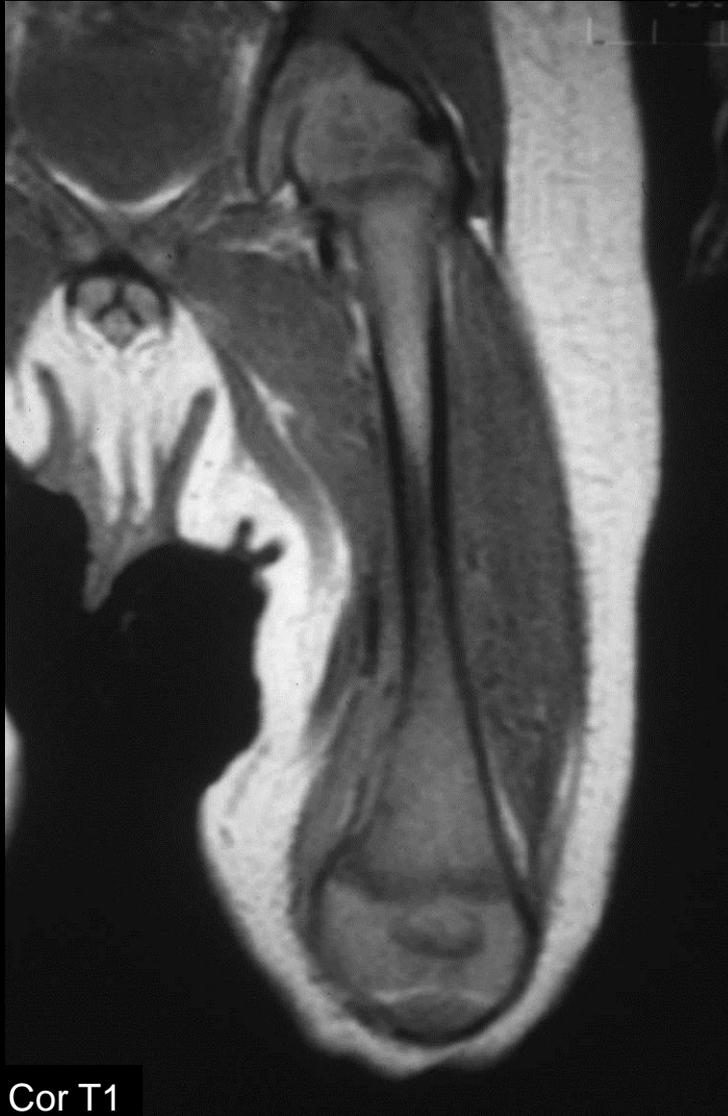
Imaging of Acute Osteomyelitis

MR



Imaging of Acute Osteomyelitis

MR



2 mo old,

Imaging of Acute Osteomyelitis

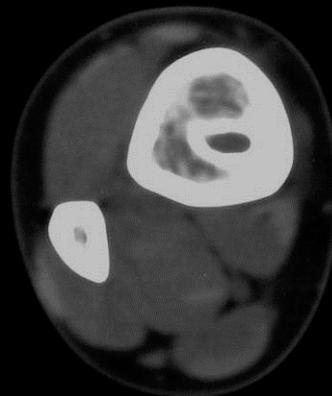
MR

- Very sensitive
- Not very specific
- Often overestimate extent of infection
- Difficult to differentiate infected marrow from edema



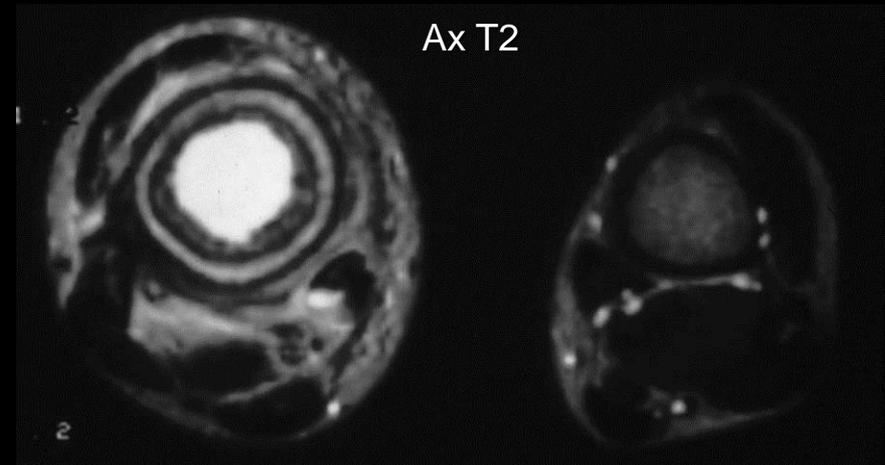
Brodie's Abscess

- Chronic active osteomyelitis, typically due to *S. aureus*
- Most common in distal tibial metaphysis
- 1-4 cm lytic oval lesion with surrounding sclerosis
- Connection to epiphyseal plate or cortex by serpiginous lucent channel



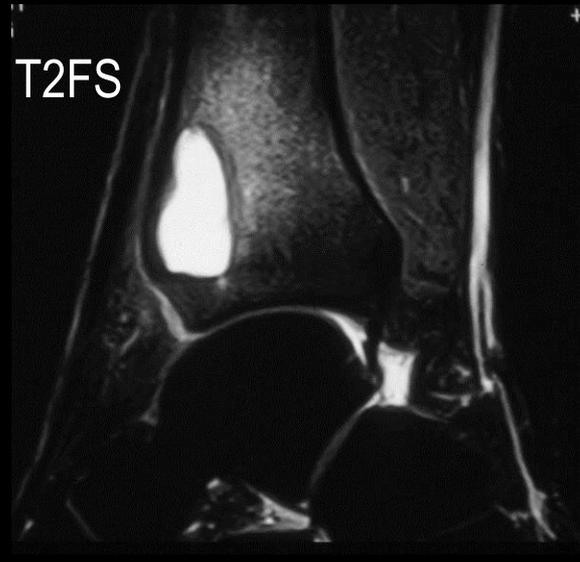
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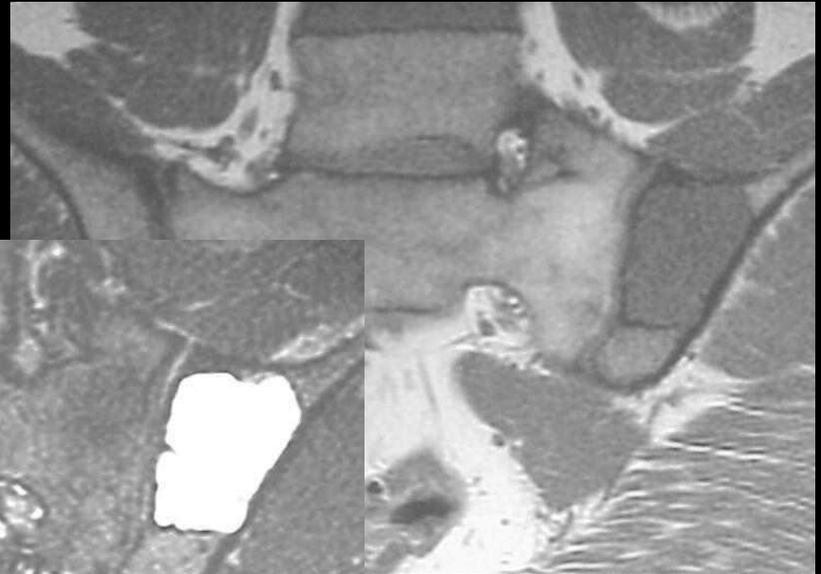


Brodie's Abscess

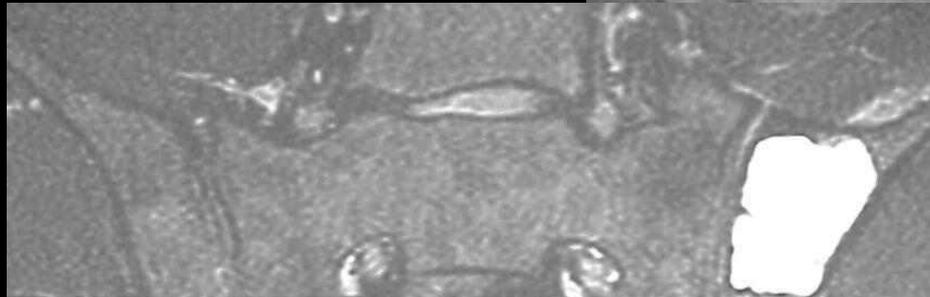
- High signal rim around abscess on T1w MRI very specific
- Represents dead granulocytes

Brodie's Abscess

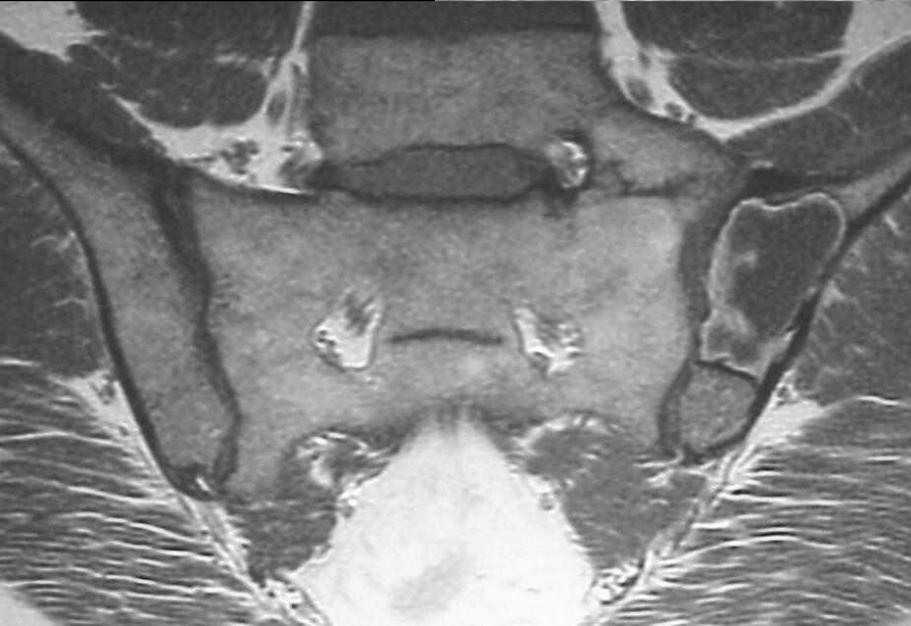
T1



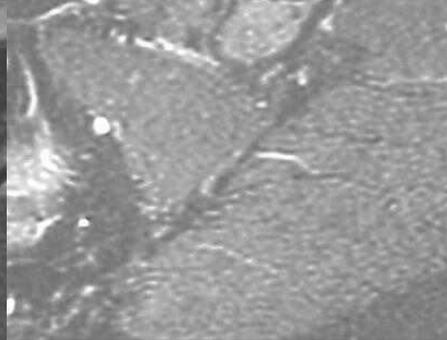
T2FS



T1Gd



Coronal



Chronic Osteomyelitis

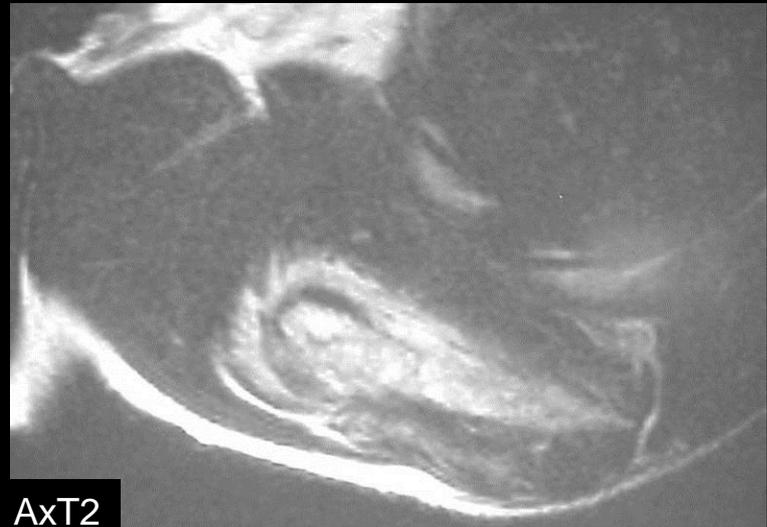
- **Sequestrum**
Necrotic bone separated from living bone by inflammatory tissue
- **Involucrum**
Layer of living bone deposited around the necrotic fragment
- **Cloaca**
Opening within involucrum which allows drainage or extrusion



Chronic Osteomyelitis



Ax T1

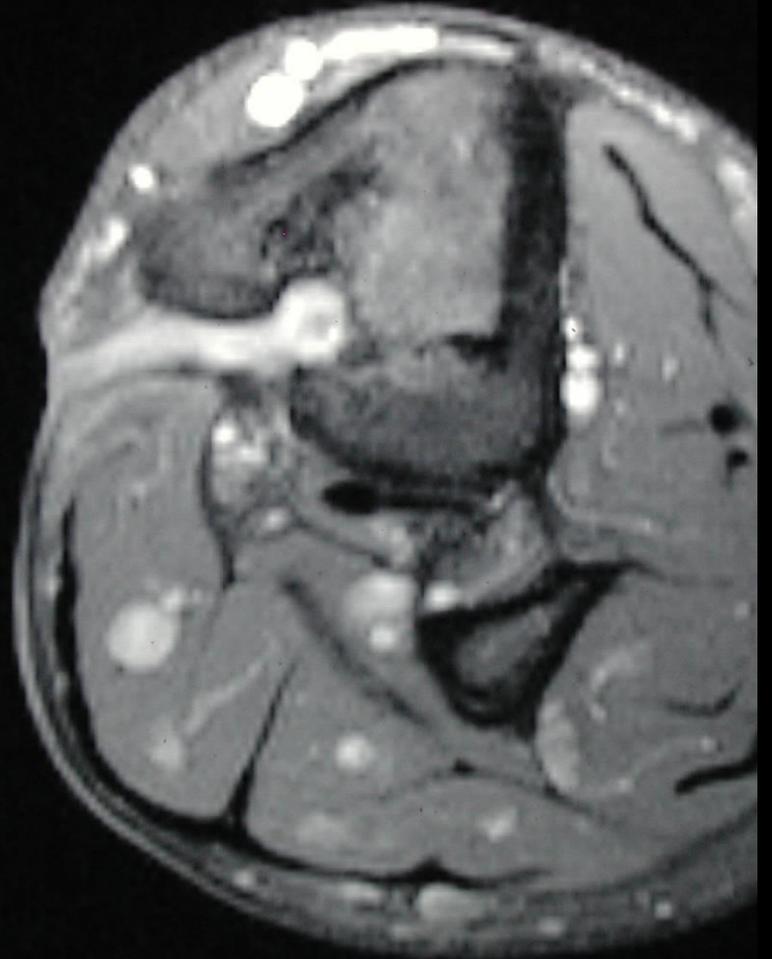


AxT2

Chronic Osteomyelitis
Sequestrum



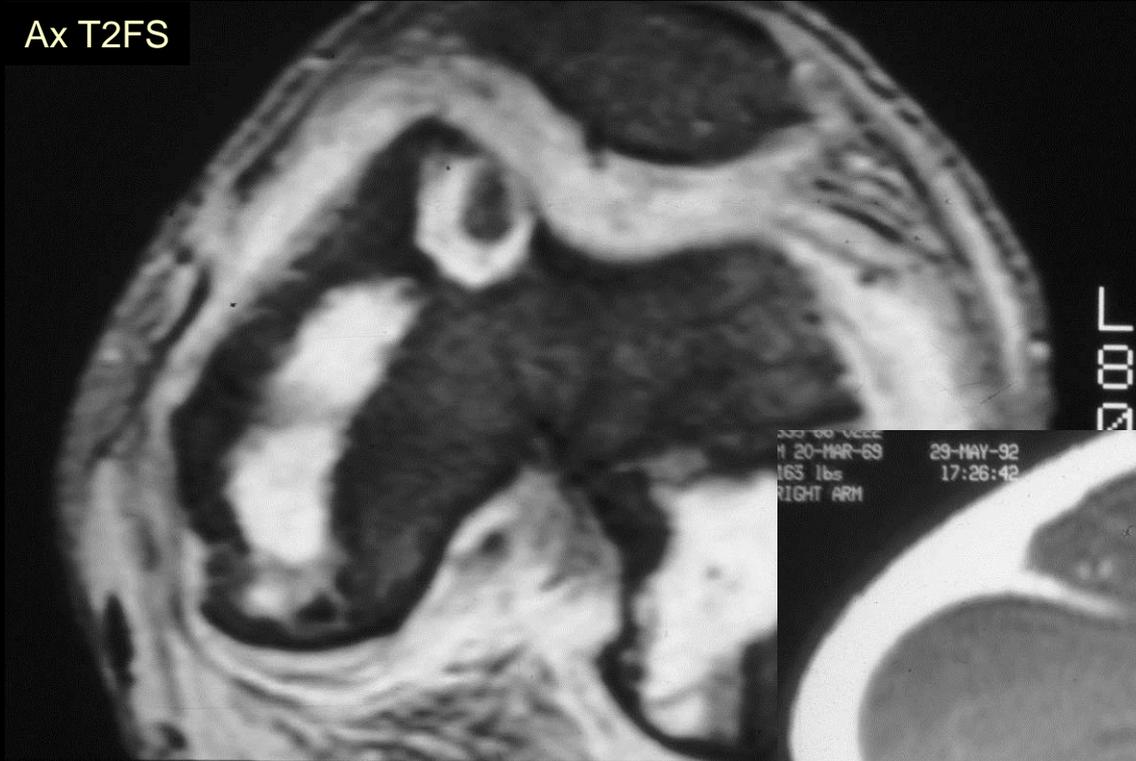
Chronic Osteomyelitis
Sequestrum



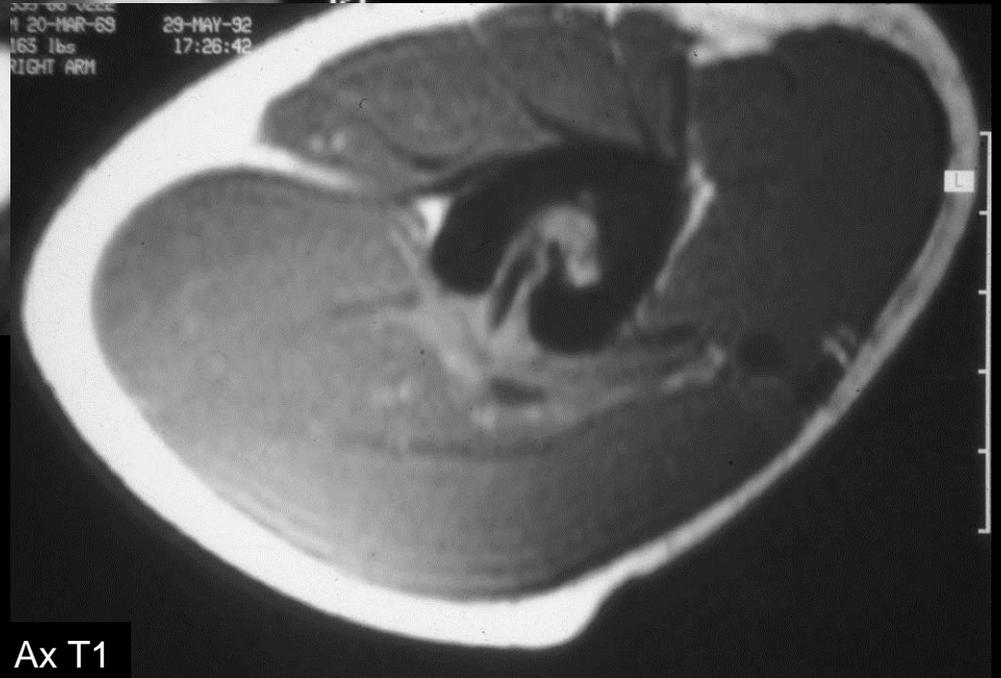
Chronic Osteomyelitis

Sequestrum

Ax T2FS

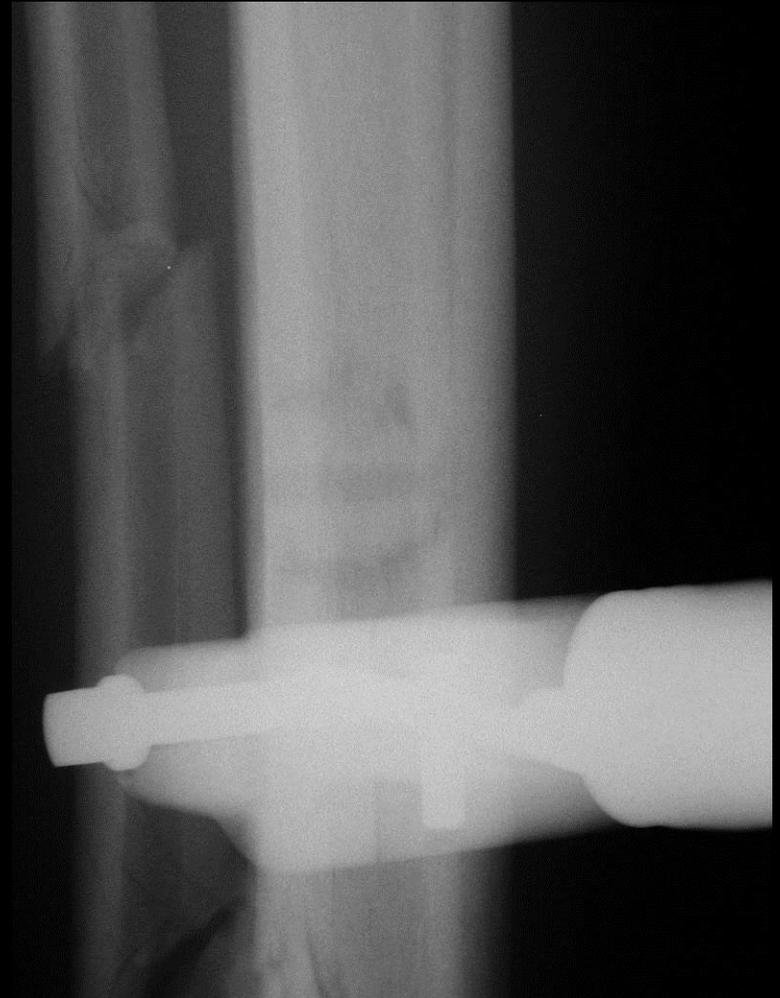


Ax T1



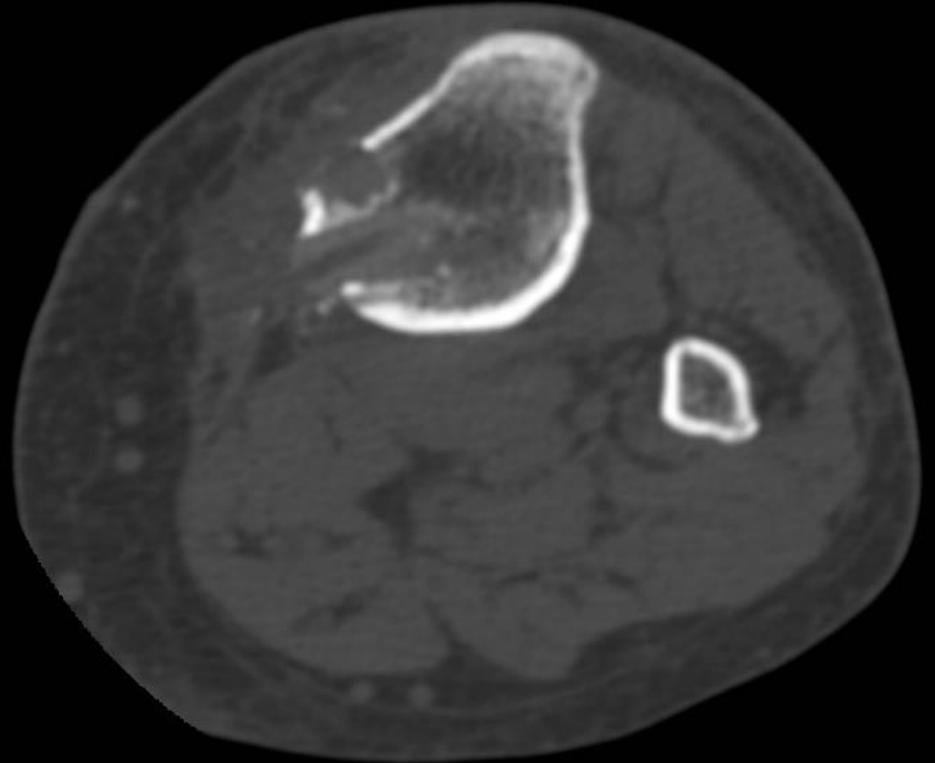
Chronic Osteomyelitis

Ring sequestrum

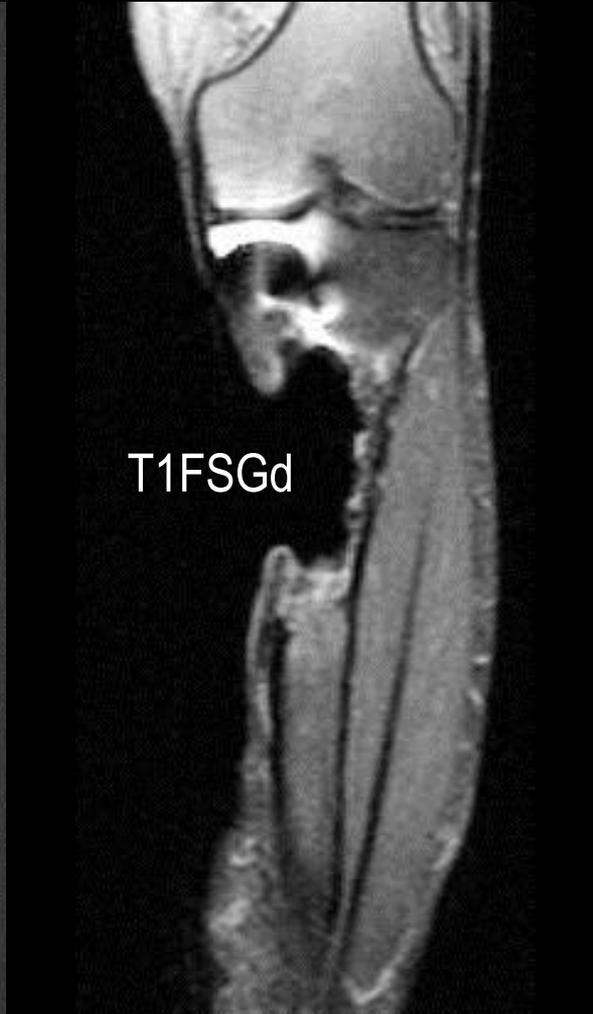


Chronic Osteomyelitis

Ring sequestrum

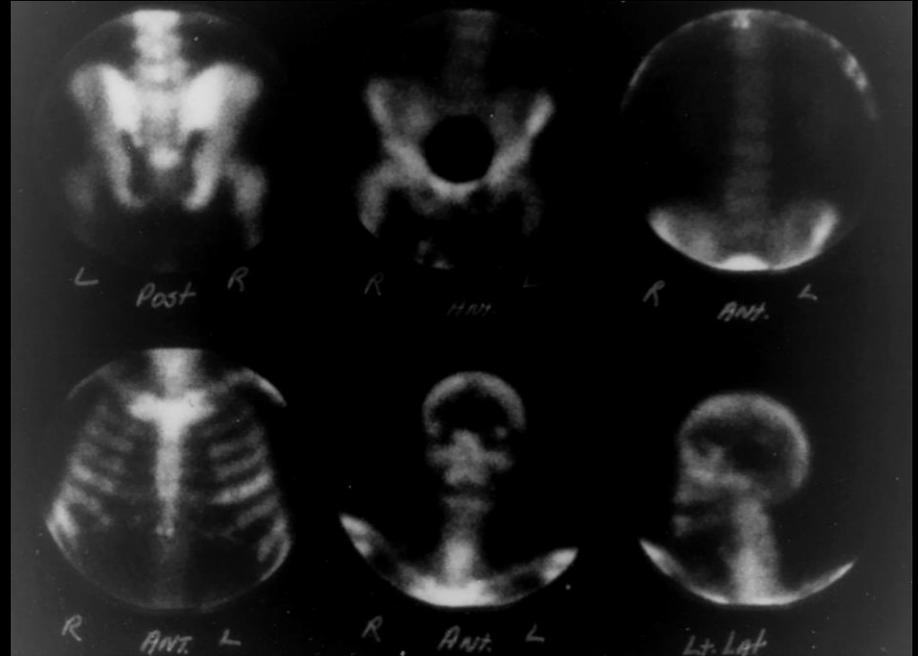


Chronic Osteomyelitis Contamination



CRMO

- Chronic recurrent multifocal osteomyelitis
- Part of SAPHO syndrome
- Organisms usually not cultured



CRMO

- Most common in children
- Palmar and plantar pustulosis
- Clinical course self-limited
- Symmetric sclerotic metaphyseal lesions, clavicular involvement



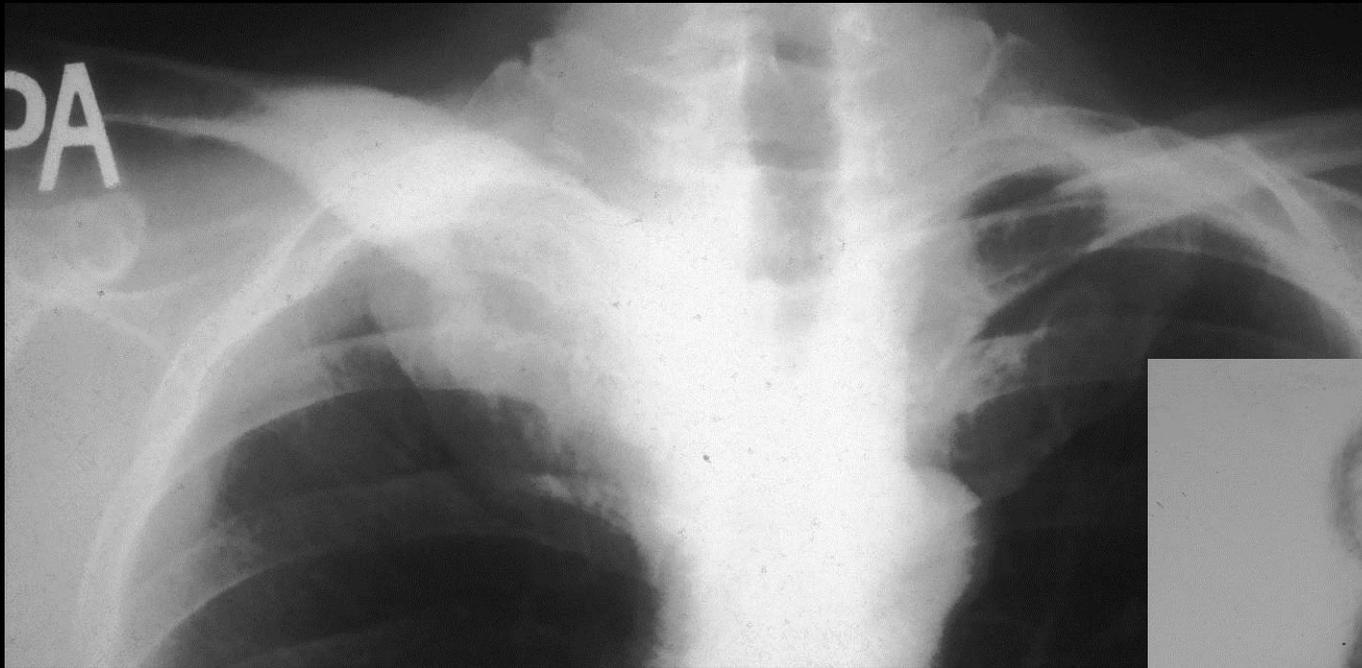
CRMO

CorT1



- Symmetric sclerotic metaphyseal lesions
- Clavicular involvement

CRMO



- Symmetric sclerotic metaphyseal lesions
- Clavicular involvement



Treatment of Osteomyelitis

Antibiotics

Decompression

Curettage

Hyperbaric O₂

Amputation

Osteoset.



Hematogenous osteomyelitis with surgical burr holes

Treatment of Osteomyelitis

Antibiotics

Decompression

Curettage

Hyperbaric O₂

Amputation

Osteoset



Complications of Osteomyelitis



Spine

- Chronicity
- Deformity
- Fracture.
- Amyloid
- Neoplasm
- Fistula
- Growth disturbance
- Spread to adjacent tissues

Osteomyelitis tibia with fibula hypertrophy

Complications of Osteomyelitis



- Chronicity
- Deformity
- Fracture
- Amyloid
- Neoplasm
- Fistula
- Growth disturbance
- Spread to adjacent tissues.

Complications of Osteomyelitis



- Chronicity
- Deformity
- Fracture
- Amyloid
- Neoplasm
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[Spine](#)

Mastoid osteomyelitis with abscess and sigmoid sinus thrombosis



Lake Wanaka, NZ