

AMSER Case of the Month

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9 y.o. with persistent left toe pain

Wesley Jong, MS4

Drexel University College of Medicine

Julie Adhya, DO, PGY-4

Jason Long, MD

Matthew Hartman, MD

Allegheny Health Network



Patient Presentation

HPI: 9 y.o. female soccer player with persistent left 2nd toe pain for ~1 month. Initial symptoms occurred after her foot was stepped on. Conservative measures included rest and a walking boot with no improvement. She described her pain as mild, aching, constant, and exacerbated with flexion. She has been weight bearing without any weakness, instability, numbness, or tingling.

PMHx: None

Meds: None

Allergies: No known allergies

Physical Exam: Tenderness to palpation at the distal 2nd metatarsal head, but otherwise unremarkable

Labs: None

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 1: Chronic foot pain. Unknown etiology. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography foot	Usually Appropriate	⊕
US foot	Usually Not Appropriate	○
MRI foot without and with IV contrast	Usually Not Appropriate	○
MRI foot without IV contrast	Usually Not Appropriate	○
CT foot with IV contrast	Usually Not Appropriate	⊕
CT foot without and with IV contrast	Usually Not Appropriate	⊕
CT foot without IV contrast	Usually Not Appropriate	⊕
Bone scan foot	Usually Not Appropriate	⊕⊕⊕

This imaging modality was ordered for initial evaluation

Variant 3: Chronic metatarsalgia including plantar great toe pain. Radiographs negative or equivocal. Clinical concern includes sesamoiditis, Morton's neuroma, intermetatarsal bursitis, chronic plantar plate injury, or Freiberg's infraction. Next imaging study.

Procedure	Appropriateness Category	Relative Radiation Level
MRI foot without IV contrast	Usually Appropriate	○
US foot	May Be Appropriate	○
MRI foot without and with IV contrast	May Be Appropriate	○
CT foot without IV contrast	May Be Appropriate	⊕
Bone scan foot	May Be Appropriate	⊕⊕⊕
CT foot with IV contrast	Usually Not Appropriate	⊕
CT foot without and with IV contrast	Usually Not Appropriate	⊕

This imaging modality was ordered due to continued pain and further evaluation of growth plate and possible stress response

Initial Imaging (unlabeled)

X-ray of Left Foot



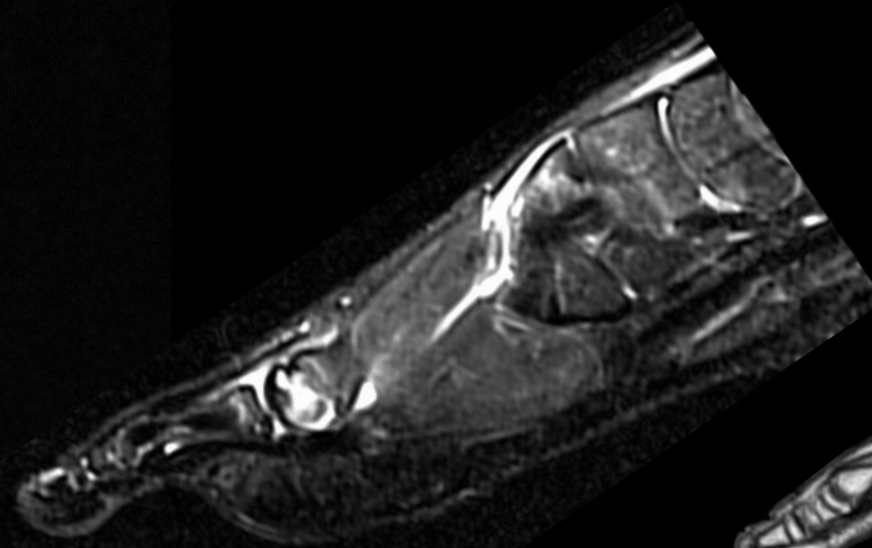
AP view

Follow-up Imaging (unlabeled)

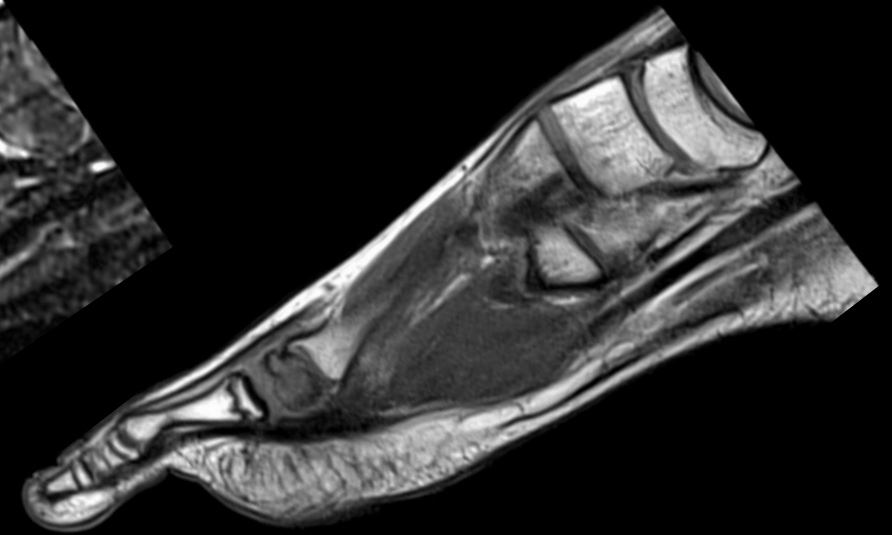
MRI of Left Foot



Axial T2 Fat Sat



Sagittal STIR



Sagittal T1

Initial Imaging (labeled)

X-ray of Left Foot



2nd Metatarsal

Subcortical sclerosis

AP view

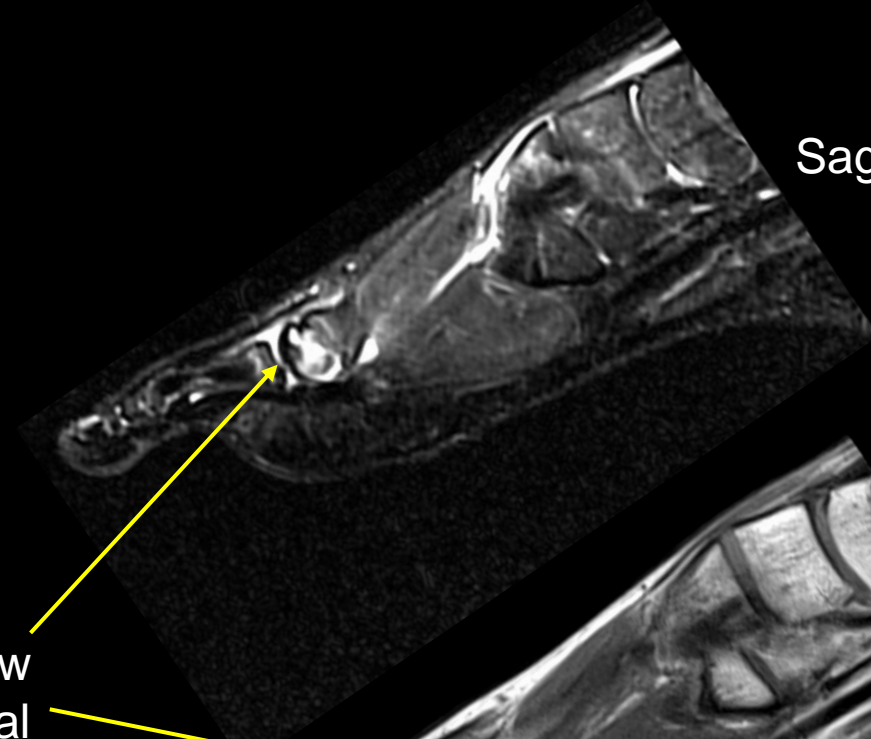
Follow-up Imaging (labeled)

MRI of Left Foot



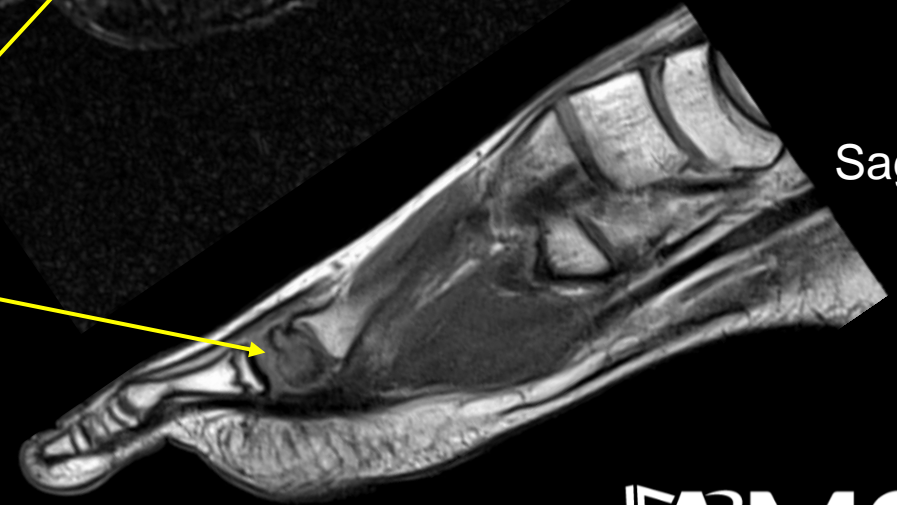
Axial T2 Fat Sat

Periarticular edema



Epiphyseal marrow edema surrounding focal subcortical sclerosis

Sagittal STIR



Sagittal T1

Final Dx:

Freiberg Infracture of the Left 2nd Metatarsal Bone

Background

- **Epidemiology**
 - Most commonly in females ages 10-18, particularly athletes
 - Bilateral involvement less than 10%
 - 2nd metatarsal more commonly affected than 3rd metatarsal
- **Etiology**
 - Osteochondrosis affecting metatarsal heads
 - Injury to epiphysis causes changes in enchondral ossification, producing joint surface irregularities
 - Multifactorial: Traumatic, vascular compromise, other systemic diseases
- **Presentation**
 - Typically, gradual pain and swelling to involved metatarsal bone
 - Symptoms worsen with walking
 - Exam- possible swelling of affected toe, dorsiflexion of affected toe, reduced ROM and crepitation

Diagnosis

- Clinical exam and imaging
 - Foot plain radiograph
 - Early: Joint space widening, flattening and cystic lesions of affected metatarsal head
 - Late: Central joint depression, increase cortical thickening, loose bodies, sclerosis of metatarsal head
 - MRI- used when radiographs are normal
 - Edema signal localized to affected metatarsal head
 - Progression of disease shows hypointense signal on T1, mixed hypo and hyper-intense signals on T2 with flattening of metatarsal head

Classification

- Radiographic Smillie classification
 - Stage 1- subchondral fracture visible only MRI
 - Stage 2- dorsal collapse of articular surface on plain radiographs
 - Stage 3- collapse of dorsal metatarsal head with intact plantar articular portion
 - Stage 4- plantar articular portion involved, loose body forms; collapse of entire metatarsal head
 - Stage 5- flattening of metatarsal head with secondary degenerative changes

Management

- Nonoperative (Stages 1-3)
 - Minimize epiphyseal deformity and disease progression
 - Activity modification, NSAIDS
 - Good prognosis
- Operative (Stages 4-5 or failure of conservative measures)
 - Altering abnormal physiology/biomechanics
 - Core decompression, corrective osteotomies
 - Restoring joint congruency
 - Debridement, osteotomy, grafting, arthroplasty
- Complications without intervention
 - Progression to advanced arthritis

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