AMSER Case of the Month
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9 y.o. with persistent left toe pain

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Patient Presentation

HPI: 9 y.o. female soccer player with persistent left 2\textsuperscript{nd} toe pain for \textasciitilde1 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 2\textsuperscript{nd} 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.

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<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiography foot</td>
<td>Usually Appropriate</td>
<td>☑</td>
</tr>
<tr>
<td>US foot</td>
<td>Usually Not Appropriate</td>
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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.

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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

- Subcortical sclerosis
- 2\textsuperscript{nd} Metatarsal
- AP view
Follow-up Imaging (labeled)

MRI of Left Foot

- Axial T2 Fat Sat
- Periarticular edema
- Sagittal STIR
- Epiphyseal marrow edema surrounding focal subcortical sclerosis
- Sagittal T1
Final Dx:

Freiberg Infraction of the Left 2\textsuperscript{nd} Metatarsal Bone
Background

• Epidemiology
  • Most commonly in females ages 10-18, particularly athletes
  • Bilateral involvement less than 10%
  • 2\textsuperscript{nd} metatarsal more commonly affected than 3\textsuperscript{rd} 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
References:


