Hip: Osseous Injuries in Sports

Athletic activity
- Acute fracture v. stress injury
- Stress fracture v. reaction
- Fatigue v. insufficiency

Osseous stress injury
- Failure of skeleton
  to withstand *submaximal* forces
- Acting over time
Osseous stress injury

**Fatigue fracture:**
normal bone, abnormal forces

**Insufficiency fracture:**
abnormal bone, normal forces

Fatigue fracture

- nearly 70% in runners
  - among athletes
- new activity
- ↑’d mileage
- new shoes, surface

Fatigue fracture

- difficult XR diagnosis
  - periosteal RXN, callus
- T2, STIR: fx line
  - high-lighted by BME
- T1: fx line obscured
Pathogenesis

• cumulative load
  – osteoclastic resorption > osteoblastic repair

• endosteal, periosteal reaction
  – serous exudate, cellular infiltrate
  – trabecular microfracture

• MR: pericortical, cancellous edema

Pathogenesis

• continued cumulative load
  – healing response

• cortical, trabecular remodeling
  – periosteal, endosteal resorption
  – callus formation, compaction

• MR: cortical, cancellous fracture line

28y new runner, hip pain
28y new runner, hip pain

73y, walking after internal fixation

49y, “Spring training” running to lose weight
Unilateral fracture

6 mos later, no symptoms

Healed sacral fracture
33y with myeloma s/p chemo, BM transplant, new LBP, sacral pain
MR: r/o plasmacytoma

Met v. fracture? no line... met

Stress v. acute fracture

- line orientation
  - stress: perpendicular to trabeculae
  - acute: curvilinear, intra-articular
- degree of marrow edema
  - stress: activity level, healing phase
  - acute: traumatic mechanism
68y, walking on beach

46y, progressive knee pain
s/p prtl med meniscectomy
r/o recurrent meniscal tear

Tibial fatigue fx
11y 1st time tri-athlete

increasing heel pain
r/o plantar fasciitis

19y weight-lifter

Stress reaction

- pain, normal radiographs
- MR: bone marrow edema
  - no discrete line
- “pre-fracture” diagnosis
  - cortical, trabecular micro-fx
  - extra-osseous edema, periosteal reaction
Stress reaction v. fx

33y, trail runner with progressive, intermittent hip and groin pain.

r/o labral tear

45y, obese, new trainer
29y runner  thigh splints

29y runner  non-shin splints

6 weeks after MR
22y RH pitcher
pain during spring training

Is this a fracture??

No fx line BUT:

- periosteal & endosteal reaction
- extra & intra-osseous edema
- cautionary diagnosis
  - stress reaction v. early stress fx
- activity level determines outcome
BME femoral head: etio?

- subchondral fracture
- ON: early detection
  - core decompression
  - delay collapse, DJD, THR
- transient osteoporosis
- DJD: mechanical edema

49y healthy male decides it's time to start running

3 months later
Hip: marrow injury

- Stress fracture
  - fatigue, insufficiency
  - line orientation
- stress reaction v. fracture
  - imaging criteria indeterminate
  - clinical scenario determines Rx