Companion Case

• 35 year old with low back and left hip pain. History of fall on ice. Except, she didn’t actually fall, just slipped.

• Oh yeah, she is also a competitive long distance runner.
Superomedial Iliac Stress Fracture

- Relatively rare type of stress fracture.
- Associated with long distance running.
- More common in females.
- Look for classic “female athlete triad’’ of amenorrhoea, osteoporosis and eating disorders.
- Usually treated conservatively with rest and NSAIDS. May restart training gradually after several asymptomatic weeks.
Stress Fracture

Occur after repetitive stress that is insufficient to cause an acute fracture.

- **Fatigue Fracture** – *Abnormal stress on normal bone*.
  - Usually in athletes, especially runners and dancers.
  - Originally reported in military recruits.

- **Insufficiency (Fragility) Fracture** – *Normal stresses on abnormal bone*.
  - Predisposing conditions include metabolic disorders, inflammatory conditions, bone dysplasias, neurologic disorders and drug therapy.
Fatigue Fractures

Mechanism
• Repetitive stress responsible for accelerated bone remodeling (*bone resorption prevails over bone replacement*) and quicker increase in muscle strength relative to bone strength leads to mechanical imbalance and bone fatigue. Additionally, there may be decreased dissipation of bone stress by fatigued muscle.

Timing
• Most stress fractures occur 4 to 5 weeks after the onset of a new exercise, are usually relieved by rest, but progress if activity is continued.

Morphology
• Fractures may be primarily cortical or cancellous, depending on the fracture site.
  – In one series, *77% of fractures were cancellous and 23% cortical*. Radiographs are more helpful with cortical fractures.
Common Sites of Stress Fracture

**High risk sites of stress fracture:**
- Posterior tubercle of calcaneus
- Base of 5th metatarsal
- Neck of 2nd to 4th metatarsal
- Great toe sesamoids
- Talar neck
- Tarsal navicular
- Anterior cortex of tibia
- Medial malleolus
- Superior side of femoral neck
- Femoral head
- Patella
- Pars interarticularis of the lumbar spine

**Low risk sites of stress fracture:**
- *Pubic rami*
- *Sacrum*
- Ribs
- Proximal humerus/humeral shaft
- Posterior medial tibial shaft
- 2nd to 4th metatarsal shafts

Adapted from https://radiopaedia.org/articles/stress-fractures
## Sites and Associations

**Table 1. Lower limb stress fractures in athletes**

<table>
<thead>
<tr>
<th>Site</th>
<th>Stress fractures [2, 4] (%)</th>
<th>Predominant sporting associations</th>
<th>Predominant bone type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metatarsals</td>
<td>8.0–24.6</td>
<td>Second and third metatarsal distal shaft and neck: long-distance runners&lt;br&gt;Jones fracture: long-distance runners</td>
<td>Cortical</td>
</tr>
<tr>
<td>Tarsals</td>
<td>7.0–25.3</td>
<td>Calcaneum: long-distance runners; jumpers&lt;br&gt;Navicular: track and field athletes; rugby and basketball players&lt;br&gt;Talus: long-distance runners; gymnasts</td>
<td>Trabecular</td>
</tr>
<tr>
<td>Tibia</td>
<td>16.0–49.1</td>
<td>Transverse (posterior): long-distance runners&lt;br&gt;Transverse (anterior): jumpers&lt;br&gt;Longitudinal: long-distance runners</td>
<td>Cortical</td>
</tr>
<tr>
<td>Fibula</td>
<td>1.3–12.1</td>
<td>Long-distance runners; jumpers</td>
<td>Cortical</td>
</tr>
<tr>
<td>Femur</td>
<td>4.2–48.0</td>
<td>Neck: long distance runners</td>
<td>Trabecular</td>
</tr>
<tr>
<td>Pelvis</td>
<td>1.3–5.6</td>
<td>Shaft: long distance runners; gymnasts&lt;br&gt;Sacrum: long-distance runners&lt;br&gt;Apophyseal: soccer players; gymnasts&lt;br&gt;Pubic rami: long-distance runners</td>
<td>Cortical</td>
</tr>
</tbody>
</table>
From the Literature

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Insufficiency Fracture

- Generally seen in the elderly and more frequently in women.
- Osteoporosis the most common predisposing factor.
- Less common but well documented types include calcaneus insufficiency avulsion in diabetics and proximal femoral fractures in bisphosphonate use.

Case courtesy of Dr Matt Skalski, Radiopaedia.org, rID: 21011
References


5. Radsourse.us/stress-fractures-foot-ankle/

6. Radiopaedia.org/articles/stress-fractures/

7. Radiopaedia.org/articles/insufficiency-fracture/