Take home points

1. **HIGH NDEX OF SUSPCICION.**
2. **History should provide the diagnosis and direct treatment.**
3. **Too much, too soon, too often.**
4. **Treat as stress # until otherwise ruled out.**
5. **Manage contributing factors+/-Mental health, Energy deficits**
6. **Consider image to confirm**

Stress Fracture Fact Sheet

What are they?

- Repetitive, submaximal loading of a bone, leading to microfractures that are unable to heal due to bone resorption and bone formation imbalances.
- Stress reactions can proceed or a signal of impending stress fracture
- Caveat-Stress fracture and an insufficiency fracture are not the same injury and occur via different mechanisms. Insufficiency fractures occur when the mechanical strength of a bone is reduced to the point that a stress, which would not be sufficient to fracture a healthy bone.

How do they occur?

- Repetitive tensile, compressive, or torsional stresses.
- Bone responds to stress on a continuum from a stress reaction to a fracture.
- Initial stage of bone failure is generally called a stress reaction.

When do they occur?

- Too often-Increased frequency of activity- such as exercising more days per week
- Too soon-Increased duration or intensity of an activity — such as running longer distances or starting a high-impact workout.
- Too much-Bone stress injuries are often seen 3 to 4 weeks after starting a new exercise routine or a new sports season.

Epidemiology

- Relatively uncommon injuries, accounting for approximately 1% to 7% of all athletic injuries.
- Incidence of these injuries is rising due to earlier and longer participation in sports, the emergence of more extreme sporting activities, and the heightened awareness of the diagnosis.
- Mechanism of injury explains the higher incidence of stress fractures among military recruits, runners, and those involved in jumping sports.

- Lower extremities have the highest prevalence. In a study of 320 athletes, the tibia (49.1%), tarsals (25.3%), and metatarsals (8.8%) were the most frequently involved bones affected by a stress fracture.

Who gets them?

- Female individuals have a higher incidence-wider pelvis and more common genu valgum results in a compensatory increased Q-angle and often foot pronation.
- Female individuals have 25% less muscle mass than male individuals, which can focus forces on to a smaller area of bone with less muscle protection.
- REDS ("female athlete triad")-low energy availability, amenorrhea, and osteoporosis
- Long-distance running, figure skating, light-weight rowing, swimming and gymnastics.
- Bone density issues-osteopenia/osteoporosis.
- Compulsive exercise-mental health issues, eating disorders

Where do they occur?

Low Risk:

- Calcaneus
- Cuboid
- Cuneiforms
- Lateral malleolus
    - ✓ Occur on the compression side of the bone; tend to heal without complication.

High Risk:

- Femoral neck (tension side).
- Patella (tension side)
- Anterior tibial cortex.
- Medial malleolus.
  Talar neck.
- Dorsal tarsal navicular cortex.
- 5th Metatarsal.
- Sesamoids of the great toe.
- ? Pelvis?

    - ✓ Typically tension side bone is less resistant to tensile than compressive forces.
    - ✓ In a watershed (relatively avascular) area of the vascular supply.
    - ✓ Have a predilection to progress to complete fracture.
    - ✓ Delayed union.
    - ✓ Nonunion.

Factors related to stress fractures of the foot and ankle

Intrinsic Factors;

- Cavus foot
- Leg length discrepancy
- Excessive forefoot varus
- Tarsal coalitions
- Prominent posterior calcaneal process
- Tight heel cords
- Osteopenia/osteoporosis
- Poor vascular supply
- Abnormal hormonal levels

Extrinsic Factors:

- Type of activity
- Excessive/new training
- Poor footwear
- Improper technique
- Training surface
- Sleep deprivation

Presentation

Initial Symptoms:

- May notice discomfort in a specific spot along the bone.
- At first, discomfort may occur only at the end of physical activity and for a short time after activity.
- Pain usually goes away with rest.

Later symptoms:

- Discomfort throughout physical activity, with regular walking, and during your activities of daily living (household chores, shopping, etc.).
- Pain may cause a limp.
- Aching while lying in bed at night.
- Swelling and bruising are possible.

Assessment

- Focused history
    - activity type
    - ? recent change in activity (duration, frequency etc) schedule,
    - training environment (trail, gym etc),

    - footwear (new, old),
    - new to activity/previous sport/activity.
    - sudden vs gradual onset, what helps/worsens.
- Past history of stress related injury +/- ED, mental health, other.
- Examination-palpation, Hop test, Fulcrum, ?tuning fork ? therapeutic ultrasound test.
- Consider assessment of mental health, nutritional health, menstrual cycle in females.

Diagnosis

High Index of Suspicion!!!-trust the history!

Imaging

- XRAY-positive in later stages.
- CT-later stages if x=XRAY positive and need to see fracture more clearly.
- NM (bone scan) Scan -occult?
- MRI-best if available.

Treatment

The history should direct treatment.

Treat as stress # until ruled out!

Low Risk:

- Activity modification/load management- cross training, reduced volume
- Tylenol (Avoid NSAIDS-in theory!)
- No Shock Wave Therapy
- Correct mechanical issues/gait etc
- Change in footwear

High risk:

- Non-weight bearing
- +/- walking boot
- ORIF
- ?Behaviour Modification/CBT/Counselling?

Non-modifiable risk factors:

- Biological sex: Females are at higher risk than males, but bone stress injury is common in both.
- Race: White people have lower bone density and weaker bone structure than other races.
- Age: Bone stress injury risk increases with age.
- Genetics.

- Alignment: Different degrees of foot arch height, foot length, leg length, and knee alignment can increase risk.
- Prior injury: An injury significantly increases your chances of having another injury in the future.

Modifiable risk factors:

- Strength: Weak muscle cannot absorb as much force, so the force is then put through the bone.
- Fatigue: Tired muscles and a tired body are not able to absorb forces which are then transferred to bones.
- Flexibility: Tight muscles and stiff joints will not absorb as much force, sending the force through the bone.
- Biomechanics: Style of run and jump can change the force transmitted from the ground through the body.
- Low energy intake (relative energy deficiency in sport, known as REDS): Not taking in enough fuel for the level of exercise will increase the risk of developing a bone injury.
- Recovery: Those who get less than 7 hours of sleep each night and do not take rest days (days where you do not exercise) are at higher risk for stress injury.
- Nutrition: Low levels of Vitamin D may lead to poor bone healing.
- Footwear: Worn-out, poorly cushioned shoes may increase risk.
- Training surface: Hard surfaces without spring (like concrete) will increase force through the body
- Volume and intensity of training (training load)