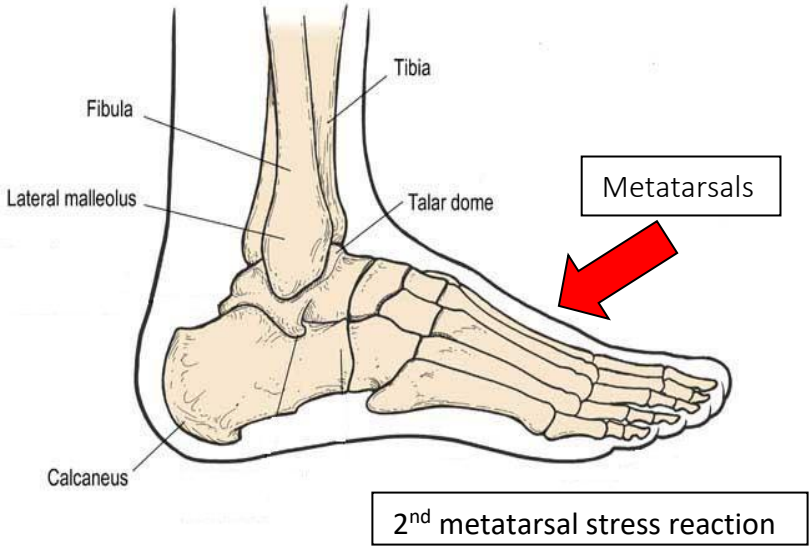
STEVEN CHUDIK MD
SHOULDER, KNEE & SPORTS MEDICINE

Metatarsal Stress Fracture

A metatarsal stress fracture is a complete or incomplete break in the foot involving one or more of the longer foot bones (metatarsals) typically caused by overuse, repetitive and excessive forces on the bone without sufficient rest and recovery or nutritional support. These forces exceed the bone's ability to heal and repair itself, resulting in a breakdown of the bone and eventual fracture. This is the second most common bone to sustain a stress fracture in athletes. It can occur anywhere within the metatarsal, although it most commonly affects the lower third of the second metatarsal (next to the big toe's metatarsal).



2nd metatarsal stress reaction

Frequent Signs and Symptoms

- Pain, tenderness, and sometimes swelling at the fracture site
- Pain increases with activity and improves with rest
- Weakness and inability to bear weight on the injured extremity
- Vague, diffuse pain or ache and occasionally tenderness and swelling in the foot
- Uncommonly, bleeding and bruising in the foot
- Weakness and inability to bear weight on the injured extremity

Etiology (Causes)

Stress fractures are caused by repetitive forces greater than the bone can withstand. This usually follows a change in training or performance schedule, equipment, or intensity of

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activity. It is also associated with other factors involving a bone's ability to heal including poor diet and amenorrhea (lack of regular periods and estrogen important for bone maintenance).

Risk Factors

- Previous stress fracture
- Certain sports associated with specific fractures:
    - Leg: running, soccer, ballet, basketball
    - Foot: running, walking, marching, swimming, soccer, ballet
    - Heel bone: basketball, volleyball
    - Thigh: running, basketball, jumping
    - Kneecap (patella): basketball, catching in baseball
    - Hand: tennis, handball, baseball (batting)
    - Forearm: tennis, javelin
    - Arm: baseball (pitching), cricket
    - Ribs: tennis, baseball, golf, rowing
    - Spine: gymnastics, football, cricket, waterskiing, swimming
- Bony abnormalities (including osteoporosis, tumors)
- Metabolic disorders, hormone problems, and nutritional deficiencies and disorders (anorexia, bulimia)
- Loss of or irregular menstrual periods and normal hormone support
- Poor physical conditioning (strength and flexibility)
- Training on hard surfaces or worn out equipment (running with shoes with more than 600 miles of wear), hard orthotics (arch supports made from metal or hard plastic)

Prevention

- Appropriately warm up and stretch before practice or competition.
- Maintain appropriate conditioning:
    - Muscle strength and endurance
    - Flexibility
    - Cardiovascular fitness
- Wear proper protective equipment, including proper footwear; change shoes after 300 to 500 miles of running.
- Use proper technique with training and activity.
- Gradually increase activity and training.
- Women with menstrual period irregularity can be a sign of exerting more calories than consumed and should be evaluated for nutritional deficiency.
- Runners with flat feet may consider cushioned arch supports.

- Proper caloric intake. Calorie and nutrition deficiency does not allow for normal bodily functions including supportive hormone levels, bone maintenance, etc. that results in poor bone quality and fracture risk.
- Avoid alcohol and caffeine that negatively affect calcium and bone metabolism.
- Proper calcium intake
    - Ages 1 to 3: 700 mg/day
    - Ages 4 to 8: 1000 mg/day
    - Ages 9 to 18: 1200 mg/day
    - Adults: 1000 to 1200 mg/day
- Proper Vitamin D intake
    - Children and Adolescents: 400 IU (10 mcg.)/day
    - Ages 19-70: 600 IU (15 mcg.)/day
    - Ages 71+: 800 IU (20 mcg.)/day

Outcomes

This condition is usually curable with appropriate treatment.

Potential Complications

- Failure to heal (nonunion)
- Delayed healing
- Recurrence of stress fracture
- Stress fracture progressing to a complete and displaced fracture
- Risks of need for surgery to achieve healing
- Recurrence of stress fractures, not necessarily in the same bone or location (occurs in 1 in 10 patients)

Treatment Considerations

Initial treatment consists of unloading the bone sufficiently to allow healing. Most often, crutches and non-weightbearing is required for 3 to 6 weeks to adequately rest the bone and allow for healing. Bones that are continuing to be overstressed will cause pain during the activity or afterward and therefore, pain is a good clinical guide to follow when treating stress fractures. If pain is encountered at any point during the treatment, the patient is not adequately unloading the bone and is preventing proper and timely healing from occurring.

After an initial period of protected weight-bearing, loading of the bone must be gradually advanced over time and the athlete may slowly resume activities. After a period of protected weight-bearing the bone is only used to a minimal level of stress and advancing too quickly back to weight-bearing activities will result in the return of pain and failure for the stress fracture to heal. Bone will naturally adapt (get stronger) in response to the stress it experiences only if the

stress/load applied is increased gradually over time (6 to 12 weeks) with appropriate periods of rest and recovery between loading workouts.

Occasionally, immobilization in cast or surgery may be needed for some specific types of stress fractures. Surgery may be needed in fractures that are at high risk for not healing and having other complications (hip). Immobility for a long period and surgery can cause loss of muscle bulk, stiffness in nearby joints, and swelling. Physical therapy is sometimes necessary to regain motion, strength and function after prolonged treatment of stress fractures to allow a timely and safe return to sports and activities.

Proper nutrition is also imperative. See “prevention section above”

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