COLORADO CENTER FOR BONE RESEARCH
at Panorama Orthopedics & Spine Center

Stress Reaction and Fractures

Adapted from: John Kiel, Kimberly Kaiser; StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan. 2021 Aug 4.

Stress injuries represent a spectrum of injuries ranging from periostitis, caused by inflammation of the periosteum, to a complete stress fracture that includes a full cortical break. They are relatively common overuse injuries in athletes that are caused by repetitive submaximal loading on a bone over time.

Stress injuries are often seen in running and jumping athletes and are associated with increased volume or intensity of training workload. Most commonly, they are found in the lower extremities and are specific to the sport in which the athlete participates. Upper extremity stress injuries are much less common than lower extremity stress injuries, but when they do occur, they are most commonly seen in the ulna. Similar to the lower extremity injuries, upper extremity stress injuries are the result of overuse and fatigue.

Rib stress fractures are an uncommon site of stress injuries.

- First rib fractures are the most common, and these are seen in pitchers, basketball players, weightlifters, and ballet dancers.
- Stress fractures in ribs 4 through 9 are seen in competitive rowers, and posteromedial rib stress fractures can be seen in golfers.

Stress fractures of the pelvis can be vague clinically and mimic other causes of groin and hip pain, for example, adductor strain, osteitis pubis, or sacroiliitis. The most common location is the ischiopubic ramus and sacrum. These injuries are seen most commonly in runners.

Femoral neck stress fractures make up approximately 11% of stress injuries in athletes. There are 2 types of femoral neck stress fractures: tension-type (or distraction) fractures and compression-type fractures. Tension-type femoral neck stress fractures involve the superior-lateral aspect of the neck and are at highest risk for complete fracture; compression-type fractures are seen in younger athletes and involve the inferior-medial femoral neck. This injury is common in runners.

Stress fractures of the femoral shaft are well documented in the literature, and in one study among military recruits, they represented 22.5% of all stress fractures.

The patella is a rare location for a stress fracture and can be oriented either transverse or vertical. Transverse fractures are at higher risk for displacement and immobilization is recommended.
Tibial stress injuries are the most common location of stress reactions and fractures. Medial tibial stress syndrome (MTSS), also known as shin splints or tibial periostitis, can be difficult to distinguish from medial tibial stress fractures.

Anterior cortex tibial stress fractures are less common than the posteromedial ones and are found in jumping and leaping athletes. These patients may have the “dreaded black line” on x-ray. They are at a greater risk of nonunion and full cortical break.

Stress fractures of the medial tibial plateau are uncommon but can be confused for meniscus injury or pes anserine bursitis, and thus, a high index of suspicion is needed.

Fibular stress fractures are common and most commonly located in the lower third of the fibula, proximal to the tibiofibular ligament.

Medial malleolus stress fractures are uncommon. Running and jumping athletes can develop vertical stress fractures at the junction of the medial malleolus and tibial plafond.

Stress fractures can develop in the calcaneum, navicular, medial cuneiform, lateral process of the talus, metatarsal and sesamoid bones.

Navicular stress fractures are difficult to diagnose early on and are at high risk of nonunion due to poor vascular flow, primarily in the middle third. These are common in basketball players and runners. Metatarsal stress fractures account for 9% of all stress fractures in athletes. The second and third metatarsals are most commonly affected and are usually in the neck or distal shaft. Dancer’s fracture is a stress fracture at the base of the second metatarsal. Stress fractures distal to the tuberosity of the fifth metatarsal are termed Jones fractures but must be distinguished from an acute Jones fracture.

It is important to evaluate every stress fracture to identify and treat correctible factors like calcium and vitamin D deficiency/insufficiency. Some stress fractures may be the only signal that may lead to diagnosis of rare bone disorders like hypophosphatasia (HPP). Excessive training, inadequate caloric intake and low BMI can impair normal bone formation and achieving the normal peak bone mass. This will have life-long consequences.

We do perform an extensive evaluation in order to correctly identify preventable factors and recommend individualized treatment protocols.

You can help reduce the risk for stress fractures in growing bones by following these guidelines:

- Eat balanced, nutritious diet rich in calcium and vitamin D for strong, healthy bones (milk-derived or plant-based milk derived foods, unprocessed or minimally processed foods, dark green fruits and vegetables, adequate protein intake).
- Participate in conditioning practice for sports.
- Do cross-training (alternating types of physical activities).
- Stick to sports that are age appropriate.

- Always warm up before practice or games and cool down afterward.
- Get a complete physical exam before participating in sports.
- Wear athletic shoes (and any other needed gear) that are appropriate for the sport and that offer plenty of protection and cushioning.
- See a healthcare provider for any persistent pain or limp.
- Drink plenty of fluids and stay hydrated for practices and games.
- Don't resume sports or exercise too quickly after a stress fracture or other injury.
- Avoid caffeine, tobacco, alcohol and drug use.
-

You can make the most of your appointment by bringing with you the following information:

- All over the counter supplements and prescription medications you are using now and used in the past
- Any medical information in regard with past medical, surgical, family history.
- Any laboratory or radiological result you have (or information about the facility where it was performed).

We are looking forward to seeing you and helping you feel better soon!

Dr. Irinel Stanciu MD and CCBR Team