



## Stress Fractures and Stress Injuries in Bone

### **General Info:**

Stress fractures, which occur as a result of repetitive loading of bones during a wide variety of athletic activities, can occur in nearly every bone in the body. Athletic training programs are specifically tailored for each particular sport, and many of these training programs put athletes at risk for stress fractures and other overuse injuries. Stress fractures may account for up to 10% of sports injuries and have been documented in virtually every sport. The severity of stress fractures varies among individual athletes and different sports, and the extent of injury also depends on skeletal site, type of bone, and local blood supply. Although a wide spectrum of stress injuries can occur, the common symptoms and basic mechanisms of injury are similar.

A stress fracture is defined as a partial or complete bone fracture resulting from repetitive application of a stress that causes damage to accumulate faster than it can be repaired. Stress fractures are not acute injuries, rather they occur over time. Patients typically report a gradual onset of pain that worsens during physical activity and initially subsides during rest. Injuries that have progressed further can produce pain even after sufficient rest. The appropriate treatment differs on a case-to-case basis.

Risk factors for stress fractures stem from three general sources: mechanical loading, bone strength, and bone physiology. Extrinsic loading factors such as training regimen and footwear can affect the forces applied to the skeleton. As many as 86% of athletes with stress fractures report recent changes in their training programs. Increases in training volume and changes in technique can lead to increased or altered loads on bones.

Stress fractures can be difficult to diagnose because they often produce vague symptoms that develop over an extended period. Early diagnosis is important because stress fractures that go undiagnosed or are misdiagnosed can lead to complete fracture and subsequent malunion or nonunion. Diffuse pain associated with stress fractures generally appears over a period of weeks. Patients typically report a dull ache that occurs with training and dissipates after a relatively short period of rest. As the injury becomes more advanced, pain occurs earlier in training and does not dissipate as quickly. Athletes with stress fractures often report a recent change in training volume or intensity, footwear, training surface, or technique. Eating disorders, previous stress injuries, leg-length discrepancy, skeletal malalignment, and muscle weakness or imbalance are also viewed as warning signs for stress fractures. When the site of an advanced stress fracture is examined, localized tenderness and swelling are often found.

### **Treatment:**

The appropriate treatment for a stress injury or stress fracture depends on the site and severity of the injury. Conservative treatment is successful for most of these injuries, but more aggressive approaches are necessary to treat severe injuries and for fractures that occur in sites that are known to commonly result in complications. Overall, modified rest and avoidance of the inciting activity are the cornerstones of stress fracture management. When rest does not sufficiently produce healing and reduce symptoms, treatments such as bracing and surgery may become necessary.

After the diagnosis of a stress injury or stress fracture is made, the patient should immediately begin a period of modified rest during which the offending activity and other forms of impact loading are eliminated but normal walking is

**Dale W. Boyd, Jr., MD | Debbie Sherman, PA-C**

**6019 Oleander Drive | Suite 200 | Wilmington | North Carolina | 28403 | t 910-790-9714 | f 910-791-1063**



permitted. During the period of rest, the bone is able to “catch up” with the damage accumulation that has progressed, and healing can occur. The length of the rest period depends on the patient’s symptoms. Although more aggressive treatments are available, a period of rest and gradual resumption of activity is successful for most patients.

### **Return to Running Following Stress Fracture of the Lower Extremity:**

To maintain fitness during the period of rest and resumption of activity, participate in activities such as cycling, aqua running, and resistance training in areas that avoid loading the fracture site.

Gradual resumption of activity should begin after the patient has been able to walk without experiencing pain for about 14 days.

Start with brisk walking for about 10 minutes per day and increase to 45 minutes per day over the course of approximately 1 week.

After this time, begin to incorporate a brief period of slow jogging within the walk, starting at 5 – 10 minutes, and then increase jogging time by about 5 minutes per day.

If symptoms recur during resumption of activity, 2 days of rest are recommended before continuing with the process.

Once able to jog without pain for 45 minutes, the pace can be gradually increased to full stride.

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