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## STRESS FRACTURES IN SPORTS

Stephen Taylor, M.D.

Most bone fractures occur as the result of significant injury such as falls, motor vehicle accidents and work related injuries. Many of us have first hand knowledge as we have experienced a fracture ourselves. Irrespective of the type of injury or the age of the person, all of these fractures occur when a sudden force or impact exceeds the strength of bone and **immediate** fracture occurs.

Athletes of all skill levels – recreational, competitive or professional - may experience and suffer from a very different bone injury commonly called a **stress fracture**. Stress fractures occur when **repetitive mechanical** loading of bone eventually exceeds the strength and reparative capability of a particular bone. Bone has the remarkable ability to adapt, remodel and strengthen as a response to increased activity, but often the repetitive stress of vigorous sports overwhelms this remodeling and reparative process and microdamage or microfracture occur. If this imbalance is allowed to continue the accumulation of microfracture will lead to a painful, disabling stress fracture.

Today in the United States there is a continually increasing number of people participating in conditioning and sports activities. Regular exercise has become synonymous with improved physical and mental health. In addition, greater numbers are participating in longer and more intense exercise and sports. Distance running is clearly the dominant exercise activity for Americans. All of these factors will likely continue to increase the incidence of stress fractures.

Although intensive, repetitive exercise is the hallmark of stress fractures, other conditions may affect the **risk of stress fractures**. Women appear to have a much higher risk of stress fracture in running sports. Smaller bone size and density in women contribute to the difference. Young women who exercise vigorously may develop menstrual irregularities reflecting hormonal imbalance which can lead to osteoporosis (decreased bone mass). These women have a high risk of more serious and multiple stress fractures. Eating disorders may result in dietary deficiency, which can effect bone structure and strength. Alignment variations (e.g. bow leg) or foot variations (e.g. pronation) may lead to localized increased stress to bone and increased likelihood of stress fractures.

The repetitive stress of sports and exercise can produce an array of stress fractures. The lower extremity, particularly the **tibia**, is the most frequently involved. The small bones of the feet (metatarsals and tarsals) and the fibula are also frequent. These lower extremity stress fractures occur primarily with distance running which has the highest risk of stress fractures of all sports. **Training errors** such as a sudden change in intensity or duration of running routine, poor shoes or running on hard surfaces increase the risk of stress fracture in the runner. Track and field athletes have been reported to have an annual incidence of nearly 20%.

Although running and related sports are primary causes of stress fractures, the table indicates that many other sports are associated with less common stress injuries. For example, humerus fractures may occur in pitchers and spine stress fractures may occur in gymnasts or football lineman.

The runner with a potential stress fracture will complain of the gradual onset of **pain** with exercise that is mild initially, but will become severe with continued intense training. The pain diminishes with rest, but occurs more rapidly with shorter distances as the stress fracture progresses. Eventually any running becomes impossible.

The athlete will have considerable tenderness at the fracture site. Unfortunately, standard x-rays will not reveal a stress fracture until some healing response occurs which can be at least 4 – 6 weeks after the beginning of symptoms. If needed, a **bone scan** is the most sensitive indicator of an early stress fracture. With a bone scan the radioactive tracer technitium - 99 is rapidly taken up and localized to the osteoblasts (bone cells) attempting to heal the site of injury. The scan will be “hot” at the site of the stress fracture as soon as symptoms are present. An **MRI** scan can also identify a stress fracture site very early.



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The cornerstone for *treatment* of stress fractures is elimination of aggravating sports and exercise activities and rest. The period of reduced activity depends greatly on the site of fracture – varying from four to six weeks for a metatarsal fracture and up to eight to twelve weeks for a tibial stress fracture. Athletes can maintain fitness during treatment by cycling, swimming or other non-impact exercise activities. Cast immobilization is only required in certain fractures (tarsal navicular) with a higher risk of delayed healing or in the occasional patient who needs a “reminder” to rest. Crutches may be utilized for a short time if significant pain or limp is present with daily activity. Continued weight bearing exercises with pain risk displacement of a stress fracture requiring more difficult and longer treatment.

Fortunately, surgical treatment is rarely required for treatment of stress fractures. Femoral neck (hip) stress fractures in young women, however, have a substantial risk of delayed healing with potential serious complications. This fracture should be considered in the female runner with groin, thigh or knee pain. These fractures often need urgent surgical repair to prevent displacement of the fracture. Fifth metatarsal stress fractures in the foot of runners or basketball players heal very slowly and frequently benefit from surgical treatment.

Athletes should not be allowed to resume sports and exercise until all symptoms have resolved and the fracture is healed. To avoid recurrence of stress fractures any risk factors should be addressed. These include attention to the training program, better shoes, a softer running surface and in the female athlete correction of any nutritional or hormonal deficiency. All athletes should recognize that unexplained gradually increasing pain with sports and exercise activity could be caused by a stress fracture and require medical evaluation.

*Dr. Taylor is an Orthopaedic Surgeon at Des Moines Orthopaedic Surgeons in West Des Moines. Dr. Taylor specializes in Sports Medicine, Knee & Shoulder Surgery.*