

Stress Fractures in Endurance Athletes: Diagnosis & Treatment

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The Skeletal System is an amazing feat of biologic engineering! Unfortunately, like many other structures, it is also prone to breakdown and mechanical failure. Stress fractures are an unfortunate reality in the world of endurance sports, especially in the lower extremities of runners. Running can result in forces applied to the bone and joints in excess of 6-8 times an athlete's body weight. Over extended periods of time, and without proper recovery between workouts, these forces can result in stress fractures, most commonly in the pelvis, leg, and foot.

Most people think of bones as the passive framework of the body. In reality, bones are dynamic and constantly changing structures. On a daily basis, bones are repairing microscopic damage that occurs as the result of normal wear and tear. In an ideal situation; the damage accumulated and the repairs made balance each other out. Stress fractures result when this remodeling system becomes unbalanced. Simply put, damage outweighs repair!

The precipitating factors of stress fractures are multiple, but typically result from repetitive high impact activities, such as running; especially when there has been a sudden increase in intensity, duration, or frequency of workouts without proper recovery. Training errors such as poor running mechanics, improper shoe selection, and muscular fatigue can also predispose a runner to fractures. Each of these factors can cause excessive mechanical forces to be concentrated at key locations in the lower extremities, thereby exceeding the stress-bearing capacity of the bone. Other factors can also predispose an athlete to stress fractures. Hormonal and nutritional imbalances are thought to be responsible for the high rate of these injuries found in female athletes. This is often referred to as the "female athlete triad": (eating disorder, disruption of normal menstrual cycles, and osteoporosis)

In the general athletic population, the incidence of stress fractures is reported to be around 1%, although in

runners it may be up to 20%. The tibia, (shin) is the most commonly involved bone, while the bones of the foot represented the next most common location. Stress fractures of the hip, although uncommon, are worth special mention. Hip stress fractures represent a "high risk" location for this injury as it can easily progress to a complete fracture which may require surgery, potentially resulting in significant disability!

Diagnosis

An evaluation with a sports medicine specialist is beneficial in providing an early accurate diagnosis, and is essential for avoiding complications and a prolonged delay of return to competition. Symptoms are generally localized to the involved bone, are aggravated by activity, and relieved by rest. Athletes typically describe a progressive increase in pain that becomes more severe and localized over time. Eventually, the pain becomes severe enough to prevent continued participation in sports. Many times the symptoms prevent the athlete from running, but will allow relatively pain free walking.

Bone tenderness is the most obvious finding on physical examination. Superficial bones like the shin may also demonstrate local swelling or feel warm to the touch. Bones that are close to joints may demonstrate tenderness with gentle range of motion. An evaluation of limb biomechanics and gait analysis are also important in identifying any additional risk factors such as muscular imbalance, limb length discrepancy, or excessive pronation.

Although a stress fracture is usually suspected after a thorough history and physical examination, imaging studies are typically required to confirm the diagnosis. Plain X-rays of the involved bone are many times negative in identifying the fracture in the first 2-4 weeks. This is because bones do not show signs of healing on an X-ray until approximately 4-6 weeks after the onset of symptoms, and even then, the findings may be very subtle. In these cases, an MRI of the involved bone will

usually provide early visual evidence of the fracture. MRI's are more sensitive in the early phases, and have the ability to show inflammation at the site of the fracture that plain x-rays cannot see.

Treatment

Once diagnosed, the first step in treating stress fractures is to identify the cause. Hormonal imbalances and nutritional issues must be resolved. Training and equipment errors should also be addressed. Shoe selection, training conditions, workout intensity and volume should all be analyzed by an experienced trainer or coach! Most cases are directly related to overuse and poor recovery. In these cases, strict avoidance of impact activity, dialing back your workout schedule, and using non-impact cross-training exercises to maintain fitness are usually successful in allowing the body to heal.

Time to healing is very dependent on the bone involved, but in most cases 6 weeks of activity modification is sufficient. There are now "anti-gravity" treadmills and aqua-therapy programs that are designed specifically for the treatment of stress fractures. Pneumatic bracing has also shown promise in returning athletes to sport faster. Additionally some "hard to treat" fractures may benefit from electrical or ultrasound stimulation, which has been shown to speed healing by up to 20% in some cases. Very rarely do stress fractures go on to become

surgical problems. However, in cases of missed diagnosis, improper treatment, or fractures involving "high risk" bones such as the hip, the complication rate may be higher.

In summary, stress fractures are caused by repetitive overuse that exceeds the healing ability of bone. Training errors are the most common predisposing factors, although other factors such as hormonal and nutritional imbalances, poor equipment, and biomechanical abnormalities should not be overlooked. Early diagnosis is key for a rapid return to sport, and generally treatment involves little more than activity modification. That being said; prevention is the best medicine! Give yourself adequate rest and recovery time, and listen to your body! Whatever your sport, have a great season, and stay healthy!

Dr. Bernardini is a former Division I Collegiate Academic All-American Football Player, and Track & Field Team captain. He is currently Co-Director of the Virtua sports medicine program and voted one of South Jersey Magazine's Best Sports Medicine Physicians as voted by its readers. He maintains his passion for athletics as a competitive Triathlete and three time Ironman finisher. He is the co-founder of the Jersey Devils Multisport Club, and has achieved distinction as a USA Triathlon Certified Level I Coach. He currently sees patients at his Vineland and Washington Township Offices, and has privileges in the Virtua, Inspira, and Kennedy Healthcare systems.



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