

THE STRESSES of Running!

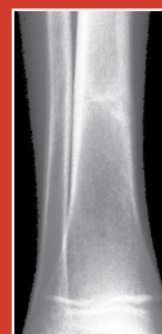


Figure 1 An X-Ray of a shinbone that shows no signs of a stress fracture.

Everything you wanted to know about stress fractures—and more! by Richard Beauchamp

Possibly the most serious injury that can befall a runner is a stress fracture.

What causes stress fractures?

Bones, like a steel girder, can eventually fatigue under repetitive loading and develop cracks. In the case of bones, this condition can be accelerated by inadequate support of the bones by the surrounding soft tissues, i.e., the muscles. These cracks lead to localized pain and tenderness in the bone. Therefore, maintaining both ideal muscle and bone strength and balance is the best way to avoid a stress fracture. Stress fractures occur most frequently in the shinbone (tibia), the foot (metatarsal) and the hip (femur or pelvis). Stress fractures occur in the foot bones in about 60% of cases and in the tibia or shinbone in 25% of cases. Upper extremity stress fractures have also been reported, but they are extremely rare. Bones are the skeletal structures that provide anchors or attachments for the muscles, ligaments and tendons so that they can exert force in order to generate movement. The bones also receive their strength from proper use of the adjacent muscles—so any situation where there is muscle weakness, anatomical conditions or malalignment can lead to weakening of the bones, which may lead to fractures. Maintaining bone health through proper nutrition is obvious. Adequate calcium, sunlight and vitamin D are required. It has been shown in some studies that supplements of calcium and vitamin D reduce the risk of stress fractures in female athletes between the ages of 18 to 35 years. (1)

Bones also must be used in order to remain strong—activity is important. Beware of the “female athlete triad”: amenorrhea, anorexia and osteoporosis! These are leading causes of the higher incidence of stress fractures in women. Training in running shoes older than six months (about 300 to 500 miles for the average runner) has also been shown to be a risk factor for stress fractures. (2)

The development of stress fractures seems to be dependent on both the magnitude of force produced by running as well as by the loading exposure. This means that speed and time are important factors, but speed is more important than exposure (duration of your run). (3) The typical scenario of a runner who is developing a stress fracture often begins with the non-diagnostic complaint of “my leg/foot/hip, etc., hurts after my long run.” Stress fractures of the pelvis have been identified as a cause of low back pain in some women. (4) Symptoms of a stress fracture can mimic those of shin splints, particularly early on in the condition. With continued running, the pain will progressively worsen. Initially, the pain improves with rest and avoidance of running. However, until the fracture heals completely, the pain remains or may even get worse. Eventually, there is pain in the involved area with even simple movements, such as walking slowly. If the affected bone can be easily felt with your hand, there might be tenderness when touching it. There may be swelling in the area and the skin overlying the bone may seem warm. Eventually, especially if untreated, a stress fracture can lead to a complete break in the bone, which means you might not even be able to stand without severe pain.

If you suspect you may have a stress fracture, the wisest thing to do is to curtail your running for a week or two. Running up until the point of pain is probably a practical suggestion

for any injury. However, persistent pain is often the most important signal that something is amiss. The usual remedies of rest, ice and training modifications should always be tried first. Pain that does not go away and when there is also local bony tenderness should alert the runner to the possibility of an underlying stress fracture; you should visit your doctor.

A useful self-test that can also help you figure out if you are dealing with a stress fracture is the one-legged hop test. With most stress fractures, you are unable to hop repetitively on that leg without significant pain. If a patient had a typical history as just described, I would then proceed to further investigations. Once you have tried non-medical approaches (physiotherapy) and the problem has not been rectified, then you need to find out if there is another, remote cause for the pain.

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Following a thorough local physical examination, more invasive and expensive tests may be needed. Conventional or plain X-rays are the standard tests to assess bony integrity and assure that there are no gross bony injuries, deformities or other conditions (see Figure 1). Some may argue that plain X-rays are probably not necessary and proceed directly to a bone scan. However, it may take several weeks to schedule a bone scan, whereas a plain X-ray is available immediately



Figure 2 A Bone Scan showing "hot" spots indicating an area of stress fracture. (Black areas.)



Figure 3 MRI of a knee showing a bone bruise (arrow.)



Figure 4 The same athlete as in Figure 1 but now showing a complete fracture.

at a relatively low cost. If the plain X-ray is positive and discloses some pathology, then treatment can be undertaken immediately. If the plain X-ray is not diagnostic, then further investigations such as a bone scan or even MRI (magnet resonance imaging) can later be done (see Figure 2 and 3).

If any of the tests confirm a stress fracture, then immediate weight restrictions are required. Notice I didn't say "complete non-weight bearing." Some degree of weight training, bearing or limb loading is required for speedier healing of the bone. Bone responds to weight-bearing by producing or laying down more bone in the healing process. Generally, some degree of weight restrictions coupled with graduated weight increase and weight-bearing with the addition of external support (crutches, splints, braces, etc.) should be done. This could also include aqua-therapy and other forms of supervised physical activity. Selective cross training is an excellent way to stay in shape without causing further injuries to your bone. I also want to emphasize that a proper diet is essential for complete and speedy bone healing. Adequate protein and vitamin intake is required for bone and soft tissue healing. Most stress fractures are healed in six to eight weeks. A graduated return to training and running is then possible.

PROGNOSIS: One of the complications of a stress fracture is the development of a complete fracture where the bone breaks right through (see Figure 4). This may have the same implications for a fracture occurring from a severe, single event trauma (e.g., skiing and fracturing your tibia). That can be devastating and may require 6 to 12 months of treatment with no running. The time to heal a stress fracture takes longer than a usual fracture does to heal; the reason being that with repetitive overloading as the cause, the blood supply and hence the healing ability of the bone is compromised. Hence the importance of treating stress fractures early and adequately before they become complete fractures. Most stress fractures respond to an aggressive approach of restricted weight bearing with alternative activities to maintain general fitness—some weight transmission through the injured bone is allowed. This is best conducted under the supervision of a trainer or therapist who can monitor your activity and gradually increase your extremity usage according to your recovery trend. ❖

Causes of Stress Fractures:

- "Female Athlete Triad"
- Training Errors
 - too much
 - too soon
 - too quickly
- Anatomical Factors—Malalignment
- Muscle Weakness or Imbalance
- Improper/Worn-out Shoes

References:

- (1)Phy Med & Rehab 2(10): 945-9, 2010
- (2)Clin Sports Med 29: 399-416, 2010
- (3)Clin Biomech 25(4): 372-7, 2010
- (4)Acta Ortho Belgica 76(6): 838, 2010

About Richard

Richard Beauchamp is a runner as well as an orthopedic surgeon. His running career has spanned about 10 years and involved seven marathons. His orthopedic surgery career extends over 25 years.

He is the medical director of the Shriner's Gait Lab at the Sunny Hill Health Centre in Vancouver and a clinical professor in the Department of Orthopaedics at the University of British Columbia.

He runs out of the Alma Running Room along with his wife and "cookie maker" Dorothy.

