

## Fractures

by Jane Johnson, as featured in FHT 'Therapist' Magazine

### Anatomy

Bones are living tissues formed from cells called osteoblasts. Surrounded by a tough membrane called the periosteum they are abundant with mineral salts (mainly calcium phosphate) and respond actively to damage and disease. Penetrating the compact bone tissue are arteries, nerves and lymphatic vessels. A complex system of canals provide routes for nutrients and oxygen, important for the repair process. They respond to mechanical stress by producing minute electric currents (called the piezoelectric effect) which stimulates osteoblasts to create more bone. Repeated mechanical stress (such as running) increases the production of a hormone called calcitonin (released from the thyroid) and this inhibits osteoclasts (cells responsible for the resorption of bone) thus maintaining the integrity of bone tissue as a whole.

### Pathology

Although rigid, bones can absorb shock but will break (fracture) when forces become excessive. Where bones are weakened through disorders such as osteoporosis (a reduction in bone mineral density), bone cancer or through immobility, they may break far more readily than in the healthy tissues of an active person. However, physical activity brings with it the risk of stress and avulsion fractures. Stress fractures are tiny cracks in the bone which, if allowed will heal spontaneously. An avulsion fracture occurs where a small piece of bone is pulled off by wrenching of a ligament or contraction of a muscle. It is particularly important for therapists to be aware of stress fractures and the possibility of fractures occurring in clients with osteoporosis.

### Symptoms

Most people will know if they have a serious fracture because not only will it be painful, bone may protrude through the skin or there may be an obvious change in the contour of the body (as is common with fractures of the clavicle). Such fractures are the result of a traumatic event and easily diagnosed. The main symptom of a fracture is going to be that it is painful, although the severity of the pain does not necessarily equate with the severity of the fracture. Whilst pain may be a limiting factor, being able to use the affected body part is no guarantee that it is fracture free. It is quite possible to walk on a fractured foot or use your hand if you have a fractured wrist.

### Diagnostic testing

Fractures may be revealed on x-ray. However, stress fractures are particularly tricky to spot as there is often no history of trauma. X-rays are used to help diagnose stress fractures and are repeated if symptoms persist. Bone scans may be preferable as these reveal changes within 72 hours following the start of symptoms.



Other signs of stress fracture include:

- insidious onset
- no history of trauma
- pain is localized to a specific point
- the fracture site is painful to the touch
- there may be swelling over the site
- pain worsens with activity
- pain may persist at rest and even at night as symptoms worsen

## **Etiology**

### **Osteoporosis**

Teenage female athletes are at risk from developing osteoporosis as the result of the Female Triad. The Triad is a syndrome comprising the interrelationship between eating disorders, amenorrhea and osteoporosis. In physical activities where appearance is paramount (such as ballet and gymnastics) young women may engage in unhealthy eating practices and may even develop bulimia or anorexia. Without proper nutritional support bones weaken, so osteoporosis may be more common in this client group. When a woman fails to menstruate for 3-6 consecutive cycles this is termed amenorrhea, also sometimes caused through impaired nutrition. Such amenorrhea may be present in 40% of female athletes in America.

With athletic amenorrhea there is a reduction in ovarian hormones and this can lead to osteoporosis (estrogen regulates the use of calcium). Such osteoporosis may in some cases be irreversible.

Stress fractures occur from normal but repetitive loads. They are common in runners, with around 50% of cases occurring in the tibia. They may occur in any bone but do not affect the same spot twice. In the fibula they occur most commonly in the lower two thirds of the bone. They are also common in the metatarsals of the foot where they are known as 'march' fractures (because they classically occurred in military recruits).

### **Treatment**

Most fractures need to be reduced by a physician. This means bringing the broken ends of the bone together so that they may regrow, taking care to safeguard adjacent blood vessels, nerves and tissues. Splints are sometimes used and the limb elevated to reduce bleeding and swelling. In severe cases they may be immobilized in a cast or even fixed with pins or screws. There is



little for a therapist to do in the initial stages of fracture repair.

The treatment for stress fractures is rest, abstaining from the activity that is giving rise to the fracture. Unfortunately, not all clients will rest, with some runners hoping to 'run through' their pain. These kinds of fractures tend to be self limiting as constant activity worsens the symptoms and eventually pain prevents activity. Massage is contraindicated locally until healing is complete.

In later stages of repair sports massage may be especially helpful. Both during and after the healing process exercise is essential. Correct exercise helps improve joint mobility (a reduction of which is especially apparent following immobilization), and restore muscle strength (decreased due to atrophy). Even where weight-bearing exercise needs to be avoided it is often possible to perform exercises to improve ROM. Where movement is completely inhibited (as in the case of casting) isometric contractions are sometimes used to maintain muscle integrity. Swimming is commonly used to help restore normal movement and improve strength prior to full weight bearing activities. Exercises such as static cycling may sometimes be used to maintain or improve aerobic capacity, essential as part of the healing process.

Unfortunately, adherence to exercise is poor so whilst therapists may not be qualified to give exercise advice, they can help a client to work with a physiotherapist and to stick to the exercises that have been prescribed. Anyone who has ever had to use crutches will know that it causes tremendous discomfort in the upper limbs. Not only in the adductors of the arm but also the forearm muscles as even partial weight-bearing using crutches requires increased effort to support the body and clients on crutches quickly fatigue. Providing there are no other contraindications therapists can help to massage the upper limbs in clients recovering with lower limb fractures. In later stages of healing massage can be essential to help improve joint ROM by helping to stretch associated tissues. In most cases, clients with fractures tend to compensate by overusing the non-fractured limb, Massage to this limb can be beneficial. Finally, immobility can have a huge psychological impact on clients who are used to being physically active. Therapists can play an important role in helping clients to stay motivated and positive about their rehabilitation process.

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