Use of an Ultrasonic Bone-Growth Stimulator to Promote Healing of a Jones Fracture

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Fracture at the base of the fifth metatarsal, just distal to the proximal diaphysis, is referred to as a Jones fracture. Fractures at this site usually result from a combination of forced inversion and plantar flexion of the foot. These types of fractures can be classified into three types: Type 1—early, Type 2—delayed union, Type 3—nonunion. Treatment for a Jones fracture varies depending on the type and location of the fracture. In most cases, fractures that are nondisplaced, or noncomminuted, are treated conservatively, for example, with casting. Another type of conservative, non-invasive procedure that can be used for a nondisplaced, nonunion, or delayed-union Jones fracture is the use of a bone-growth stimulator. The purpose of this article is to describe a case in which an ultrasonic bone-growth stimulator was used in the treatment of a Jones fracture.

Case Report

A 19-year-old female intercollegiate basketball player presented with acute pain and tenderness localized at the base of her right fifth metatarsal. The injury occurred as the athlete went to pivot and turn, resulting in an inverted rolling motion of the foot and ankle. Radiographs confirmed a nondisplaced fracture at the base of the fifth metatarsal, otherwise known as a Jones fracture. They also revealed moderate metatarsus adductus, a congenital deformity of the foot resulting in an inward rotation of the forefoot toward the midline of the body while the heel remains straight.

Surgical and nonsurgical treatment options were discussed with the athlete, who chose a nonsurgical approach to care. There were two key factors in this decision. One was that in the physician’s experience with this type of fracture, surgery resulted in a high incidence of complications from the hardware used to stabilize the fracture. The other factor for choosing a nonsurgical approach was the athlete's moderate metatarsus adductus. It was felt that there might be increased complications when trying to use a “straight” pin to secure the fracture in a foot with such excessive curvature.

The nonsurgical approach required that the athlete remain non-weight-bearing in a Cam boot for approximately 10–12 weeks. In addition, the physician reported that he had had previous success using ultrasonic bone-growth stimulators for this type of fracture and felt that this athlete would benefit from the use of this device, as well. Ultrasonic bone stimulators use ultrasound rather than electrical stimulation to help promote callous formation in fractures.

Paperwork and authorization information needed by the athlete’s insurance company caused a delay in obtaining the bone-growth stimulator of about 28 days. Radiographs were then taken before the athlete was fitted with the bone-growth stimulator, and they showed that the fracture continued to be in satisfactory alignment. The athlete was reminded that non-weight-bearing compliance was crucial to a successful outcome.

The athlete was rechecked every 3–4 weeks. Each time, radiographs revealed an increase in callous formation, especially on the compressive side of the fracture. The athlete was instructed to discontinue using the bone-growth stimulator by the physician approximately 10 weeks after she had been fitted with the device.
Low-Intensity Bone-Growth Stimulators

Ultrasonic bone-growth stimulators (see Figures 1 and 2) use sound waves to facilitate the healing process of bone by bombarding the tissue with low-frequency sound waves to speed healing of acute fractures. The devices can be used with or without casting. In order for ultrasonic bone-growth stimulators to be effective, it is essential that they be used in conjunction with conventional fracture management such as non-weight-bearing, use of a Cam boot, or cast immobilization.

There are criteria that must be met in order for ultrasonic bone-growth stimulators to be prescribed:

- The fracture must be both acute and closed.
- The patient must be skeletally mature.
- The patient must be at high risk for delayed fracture healing, nonunion, or complications from surgery. For example, in a patient with a congenital condition such as metatarsus adductus (metatarsus varus), a noninvasive treatment such as the use of a bone-growth stimulator could result in faster healing without the risk of hardware complications from surgery.

Caution should be taken when using low-intensity ultrasonic bone-growth stimulators for individuals who lack skeletal maturity, who have an underlying pathology, or who have vascular disorders.

Strauss and McCabe\(^1\) reported that low-intensity ultrasound accelerates metatarsal fracture healing. When dealing with a physically active population, a common question is, How long will the fracture take to heal? In the same study, Strauss and McCabe\(^1\) also found that, when treated with low-intensity ultrasound, Jones fractures can heal in 6 weeks, as compared with the same type of fracture treated without the low-intensity ultrasound healing by Week 10, and that Jones fractures that were not treated with low-intensity ultrasound had a 20–25% chance of incomplete healing.

When low-intensity ultrasound is used as an alternative to surgery, healing time is usually similar but surgical complications are nonexistent. In addition, it is important to remember that healing time varies from patient to patient, regardless of the type of treatment used.

Treatment Protocol

Low-intensity ultrasonic bone stimulators are typically used on a daily basis for approximately 20 min per session. Most ultrasonic bone stimulators will automatically terminate the treatment session after 20 min. There should be at least 12 hr between treatment sessions. Having the patient use the device at the same time each day can optimize compliance. This protocol is continued until the physician determines that the fracture has sufficiently healed, which is confirmed by periodic radiographs.

Figure 1 Exogen 2000 ultrasonic bone-growth stimulator by Smith & Nephew, Inc., Memphis, TN.

Figure 2 Application of an ultrasonic bone-growth stimulator to promote healing of a Jones fracture.