Shin Splints and Orthotic Support

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The term “shin splints” is a non-specific description of pain in the lower leg. Several conditions can produce pain in this area, and must be differentiated for effective treatment. Since most causes of shin splints develop from overstress or inappropriate sports training, they are easily treated with conservative means. Evaluation of the biomechanics of the lower extremity is an important component of treatment, since orthotic support with shock absorption is often necessary. Factors that predispose to the development of shin splints include: excessive pronation, pes planus, pes cavus, tarsal coalition, leg length discrepancy, and muscle imbalance. (1)

Pain from Repeated Strain

Shin splints are muscle injuries that develop insidiously in one or both lower legs. The pain is usually described as an “aching soreness” that has been getting worse, and is particularly noticed during walking. This is an overuse condition that develops secondary...
to repetitive strain at the muscle insertion – either in the very active athlete, or in a patient who has started or increased a new walking or jogging routine. Therefore, a careful history of recent weight bearing exercise habits is vital to identifying the causative activities.

The involved leg is tender to palpation along the muscle insertions in the middle or lower third of the tibia, along primarily either the anterolateral or the posteromedial aspect. Manual testing finds mild to moderate weakness of the involved muscles, and the isometric testing often causes increased pain of the muscle. There are normally no sensory or reflex changes, and no significant asymmetry in muscle mass or leg diameter.

**Looking for the Cause**

There are two major types of shin splints, differentiated by location and involved muscles. The underlying biomechanical abnormalities (and therefore the type of orthotic support needed) are also quite different:

**Anterolateral.** The shin splint that affects primarily the anterior and lateral aspect of the leg involves the tibialis anterior, extensor hallucis longus, and extensor digitorum longus muscles. (2) Since these muscles decelerate the foot and absorb the shock stress at heel strike, they are placed under increased demand when there is excessive running on hard or downhill surfaces or when the shoe has lost its shock-absorbing qualities. In addition to biomechanical support and a better heel pad, good forefoot cushioning in the shoe or in an orthotic has also been recommended for the anterolateral type of shin splint.
**Posteromedial.** When there is excessive pronation, the muscles that try to stabilize the ankle become overstrained and cause shin splints. These are the muscles along the posterior and medial aspect of the lower leg, including the tibialis posterior, flexor hallucis longus, and flexor digitorum longus muscles. Occasionally the soleus muscle is implicated. Support for the arches and especially a medial pronation wedge under the calcaneus are needed to reduce the stress on these muscles. Shock absorption is helpful, but supporting the foot and ankle biomechanics is most important for patients with posterolateral shin splints.

**Ruling Out Other Conditions**

Besides shin splints, there are other causes of pain in the lower legs. Thankfully, these alternate sources of leg pain are much less common. There are, though, two conditions that are of particular concern because of their disabling potential. Both must be ruled out during the initial examination, and they also need to be reconsidered in any case of shin splints that does not respond rapidly to specific treatment:

**Stress reaction/fracture.** Pain in the lower leg from sports activities may be an early sign of a developing stress reaction of bone. This occurs when the bone is exposed to levels of recurrent stress more rapidly than it can respond. If the repetitive overloading of the bone continues, an actual stress fracture may develop, requiring a prolonged period of limited activity and a closely-monitored return to sports. (3)
To differentiate, palpate and percuss over the exposed tibial shaft in the area of pain. Tenderness localized directly over the bone and increased pain with bone percussion indicates a tibial stress fracture. (4) Vibration with a tuning fork is not a reliable test. Further evaluation must include referral for a bone scan (radionuclide scintigraphy). (5)

**Compartment syndrome.** Pain in the lower leg following sports activities may indicate an increase in intramuscular pressure in one of the osteofascial compartments. Repetitive dorsiflexion and plantar flexion of the ankle (as in walking and running), or (rarely) an acute trauma can cause the internal pressure of a muscle to elevate excessively during exercise and stay high for a prolonged period post-exercise. (6) While there are five fascial compartments, the anterior compartment is most frequently involved, making the pain area similar to shin splints.

A compartment syndrome should be suspected when the leg pain subsides only gradually after exercising. Palpation will find a leg muscle to be very tight and firm, and it appears to be swollen. Sensory changes are often evident distally; paresthesias may involve the first web space, the instep, or the lateral aspect of the foot. If this has developed acutely, after an injury, early surgical decompression of the involved compartment is mandatory. (7) If elevated intracompartmental pressures persist, permanent damage to muscle tissue and nerves develops.

**Seven Management Steps**
• The first step in treatment is to stop the causative activity and substitute other, non-stressful exercises. This may mean avoiding hill climbs or sprinting, or simply decreasing the amount of running and/or walking. A switch to swimming or cycling can maintain aerobic endurance.

• Specific adjustments of all lumbosacral, pelvic, and foot/ankle joint dysfunctions are necessary. The most common foot problems are a dropped navicular or a posterior calcaneus.

• Inflammation in the area of the muscle injury should be dealt with conservatively, using frequent cryotherapy as well as electrotherapy if necessary. The most effective method seems to be ice massage (the frozen Dixie cup technique). (8)

• Gentle stretching, massage, and even transverse friction treatment may speed the healing response in the involved muscle tissues.

• Dynamic (isotonic) exercises are necessary to strengthen the weakened support muscles (tibialis anterior and/or posterior) and help prevent future recurrences. An excellent program for strengthening the involved muscles uses elastic tubing with a series of ankle exercises.
• As the patient returns to weight bearing exercise, methods to decrease lower leg stress should be reviewed. These include: better fitting and more supportive shoes, softer running surfaces, smoother gait and running style, better warm-ups and cool-downs, and even increased dietary calcium intake. (9)

• Custom-made, flexible orthotics are necessary for many athletes to support the arches and reduce pronation, as well as to decrease the stress of heel strike on the foot and leg. A heel lift may be necessary for even mild amounts of anatomic leg length discrepancy. The orthotics should include lightweight, shock-absorbing components. Anterolateral shin splints may respond more quickly to an orthotic with additional forefoot cushioning.

Conclusion

Shin splints respond well to conservative care, including isotonic exercises and custom orthotics for biomechanical imbalances. To prevent recurrences, athletes should replace their shoes before they are obviously broken down, and to avoid abrupt changes in training. Patients experiencing shin splints should have their postures and gaits analyzed. Often, small changes in biomechanical function can significantly improve athletic performance.

References


**About the Author**

An enthusiastic speaker, Dr. William Austin provides an energetic approach to learning. He draws from over 35 years of healthcare experience, which includes Athletic Training, Emergency Medicine, English Bonesetting, and Chiropractic. Dr. Austin has developed two successful practices. His patients range from newborns to centenarians, couch potatoes to professional athletes. Dr. Austin is a 1986 graduate of Logan College of
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