Shin Splints with Underlying Posterior Tibial Tendinitis: A Case Report

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abstract: *Along with the recent growth in popularity of recreational running and jogging in the United States, there has been an increase in the number of participants whose musculoskeletal injuries will at some point limit their participation in these activities. This article describes the case of a middle-distance runner who suffered from anterior shin splints complicated by an underlying posterior tibial tendinitis. Standard medical and physical therapy approaches provided only short-term relief for this patient. It was not until chiropractic care was instituted that long-term relief was achieved. This care addressed the pertinent biomechanical intrinsic factors: enhancement of muscle relaxation through a long-axis distraction adjustive technique; specific adjustments as required to the feet, knees, hips, and spine; appropriate skeletal alignment by means of flexible, custom-made orthotics to support the pedal foundation; heel-strike shock absorption; and enhanced afferent-motor response. In addition, strengthening of the invertors and evertors was achieved through the use of low-tech, resistive exercise. After 6 wk, the patient was running 40 miles/wk without pain and was released from care.*

key words: Posterior Tibialis Muscle, Tendinitis, Orthotics, Chiropractic

INTRODUCTION

The number of recreational runners and joggers in the United States is estimated to be 30 million. The recent growth in popularity has resulted in an increase in associated injuries to the lower extremity. According to some reports, approximately 60% of these enthusiasts will eventually experience an injury that may limit their activities (1, 2).

Common injuries to runners and joggers include shin splints, patellofemoral pain syndromes, achilles tendinitis, plantar fascitis, compartmental syndromes, including posterior tibial tendinitis, and stress fractures. All of these conditions start as stress reactions to soft tissues and/or bone. Running places a tremendous stress on the lower extremities, as up to 250–300% of the runner's body weight may need to be absorbed by the musculoskeletal system at heel strike (3–5). That can be the equivalent of absorbing 375–450 lbs. per heel strike for a 150 pound runner. Over the course of 1 mile, the feet must endure this process between 1200 and 1600 times (6). Overuse injuries often result.

CASE REPORT

A 71-inch, 42-yr-old male recreational middle distance runner weighing 167 pounds suffered from chronic right anterior low leg pain. The patient was a well-conditioned athlete accustomed to a running base of 20–25 miles/wk. Approximately 3 months before treatment, he abruptly increased his mileage to 40–60 miles/week in preparation for an upcoming marathon. The onset of pain manifested approximately 2 weeks after the mileage increase. Over the next week, the intensity reached a level at which he could no longer 'run through the pain.'

The patient initially consulted his family medical doctor, who diagnosed the condition as shin splints and prescribed rest and nonsteroidal anti-inflammatory drugs (NSAIDs). After 1 wk, the symptoms decreased enough for the patient to attempt running again. Having lost 1 week of training, he resumed his running with two consecutive high-mileage runs of 10 miles each. The symptoms returned with full intensity.

The family practitioner next recommended a physical therapy consultation. The treatment regime consisted of rest, contrasting ice massages with warm whirlpool baths, and range of motion exercises. NSAIDs were taken as necessary for pain. Once again the pain subsided, this time over a 3-wk period. The patient was advised to resume activity gradually, progressing from walking to walk-run to jogging to running. Within 3 weeks of starting this graduated program, the pain returned and chiropractic care was sought.

Evaluation

Upon examination, the right anterior compartment of the lower leg was tender to palpation along the lateral border of

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the tibia. The belly of the anterior tibialis muscle was felt to be swollen in comparison with the left. No palpable pain was elicited on the medial border of the tibia. However, acute pain was elicited on palpation of the ankle inferoposterior to the medial malleolus. Though no obvious weakness was noted, an increase of pain and compensatory flexion of the toes was demonstrated with manual muscle testing of the posterior tibialis muscle. These two signs—palpable pain inferior/posterior to the medial malleolus and pain with active resisted ankle inversion—are suggestive of posterior tibial tendinitis.

Moderate pelvic unleveling was suspected via palpation but no standing radiographs were taken to confirm this. There was nothing in the patient's history (trauma, degeneration, congenital anomaly, infection, or neoplasm) to suggest an anatomic leg length inequality.

Extreme asymmetric flexible hyperpronation was noted bilaterally. The apparent medial longitudinal arch, noted when the patient placed no weight on his foot, clearly 'flattened' upon weightbearing because of excessive motion of the mid- and hind-foot medial rotation.

Treatment

A multifaceted treatment approach was used. Custom-made, flexible orthotics—to support the skeletal alignment in a more appropriate range for weightbearing posture—provided increased heel-strike shock absorption and enhanced afferent-motor response. Though plantar fascia and ligamentous laxities were noted, no joint fixations/subluxations were dictated in the foot-ankle complex. However, a long-axis distraction adjustive technique was administered to enhance muscle relaxation, circulation and pain reduction. Manipulation of the navicular, cuboid, and metatarsal heads was administered bilaterally to prepare the feet for the custom-made orthotics, and to reduce the 'break-in' period. Ice massages were recommended every 2 hr while the pain was acute, with an increase in the time interval as indicated by pain reduction. Specific chiropractic adjustments to the knees, hips, and spine were administered as required. Rehabilitation of the invertors (primarily the posterior tibialis) and the evertors were strengthened with low-tech resistive exercises (Figs. 1 and 2). The protocol consisted of three sets to fatigue, starting with the unaffected side first to institute neurologic facilitation via the cross-over mechanism. The exercise was done in the pain-free

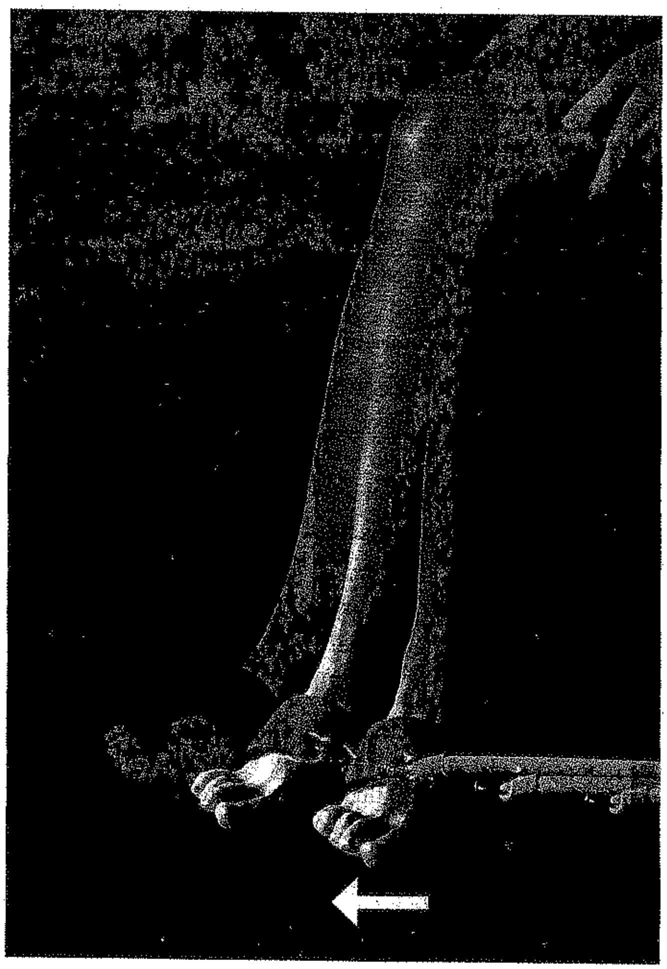

Figure 1. *Eversion rehabilitation.*

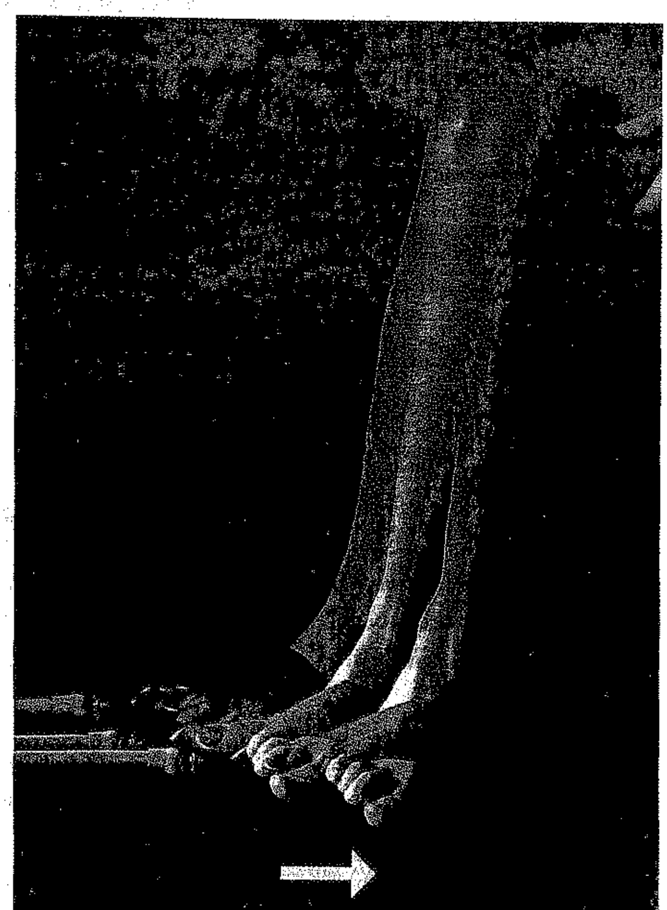

Figure 2. *Inversion rehabilitation.*

range of motion, guided by the cardinal rule: "No pain for maximum gain."

After 2 wk of care, the patient was able to begin the return to activity as described above, with strict precautions to stop if pain increased at all. After 3 wk of care, he was able to resume running at a moderate pace and distance (2–3 miles every other day, 10 miles that week). After 6 weeks, he was running 40 miles/wk without pain and was released from care. Approximately 3 months (12 wk) after being released from care, this patient was able to complete the marathon without reinjury.

DISCUSSION

Posterior tibial tendinitis refers to the inflammation of the posterior tibial tendon. One important function of this muscle/tendon unit is to decelerate the normal midfoot pronation at the subtalar joint after heel strike (7). The posterior tibial muscle works to slow the velocity of subtalar joint pronation. However, increased ligamentous laxity associated with this and the surrounding joints of the foot and ankle can increase the joint's range of motion. Subsequently, the muscle can rapidly fatigue as it attempts to decelerate the pronation force. Continuous overloading of the muscle/tendon unit may result in microtears and the associated inflammatory response typical of an overuse syndrome (Fig. 3) (8).

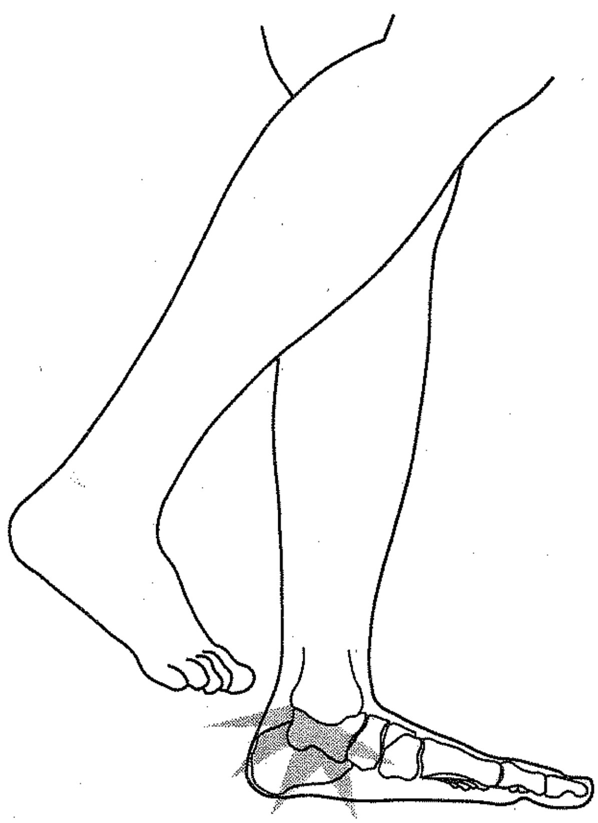

Figure 3. *Area of pain in a foot with fallen arches.*

Any underlying structural deficit of the lower extremity may magnify the effects of overuse (9). Hyperpronation and leg length inequality (with its associated pelvic unleveling) are common intrinsic findings in the general population, and athletes are no exception (Fig. 4).

It is not unusual for the chiropractor, especially the sports-minded practitioner, to be consulted for the vague pain and nonspecific symptoms accompanying the gradual onset of a stress reaction to the soft-tissues and/or bone. These conditions can be effectively managed if identification is early and an appropriate treatment program is followed.

Overuse syndromes and stress reactions develop as a microtrauma condition. There is no single traumatic causative event that the patient can recall; these problems develop insidiously over time because of repetition. The source of these 'overuse' syndromes is biomechanical stress that exceeds the body's inherent capacity to repair and adapt (10). The repair process cannot keep up with the stressor and is overcome, with the eventual result that the tissues (ligaments, muscles, cartilage, disc, and bone) fail. Overuse injuries can be very disabling to an athlete, recreational or competitive, who is then unable to continue with his or her usual activities and demands of sports.

Sources of Stress Reactions

The three major sources of microtrauma that may result in a stress reaction are:

- **Overuse:** when a specific area in the body is exposed to an excessive amount of repetitive trauma, such as starting a new running program or workout regime.
- **Poor training technique:** such as downhill or uphill running, or running on one side of the road or a banked track only, where the angulation of the road increases the weight-bearing stress and shear forces to one side of the lower extremity more than to the other.
- **Inherent imbalances:** excessive pronation or supination will result in poor shock-absorption capacity (11).

Clinical Evaluation

Clinical evaluation of stress reactions is challenging; clear objective findings are usually not evident (12). Palpable pain within the muscle and pain with resisted activity suggest a myositis or tendinitis. However, deep palpation that discovers pinpoint tenderness directly over the bone may reveal a stress reaction worthy of following up with more advanced diagnostic imaging. Traditional radiographs are not very sensitive to early osseous changes. Magnetic resonance imaging is arguably the most useful imaging procedure in the evaluation of reactions of soft tissues and bone in the early stages, when tis-

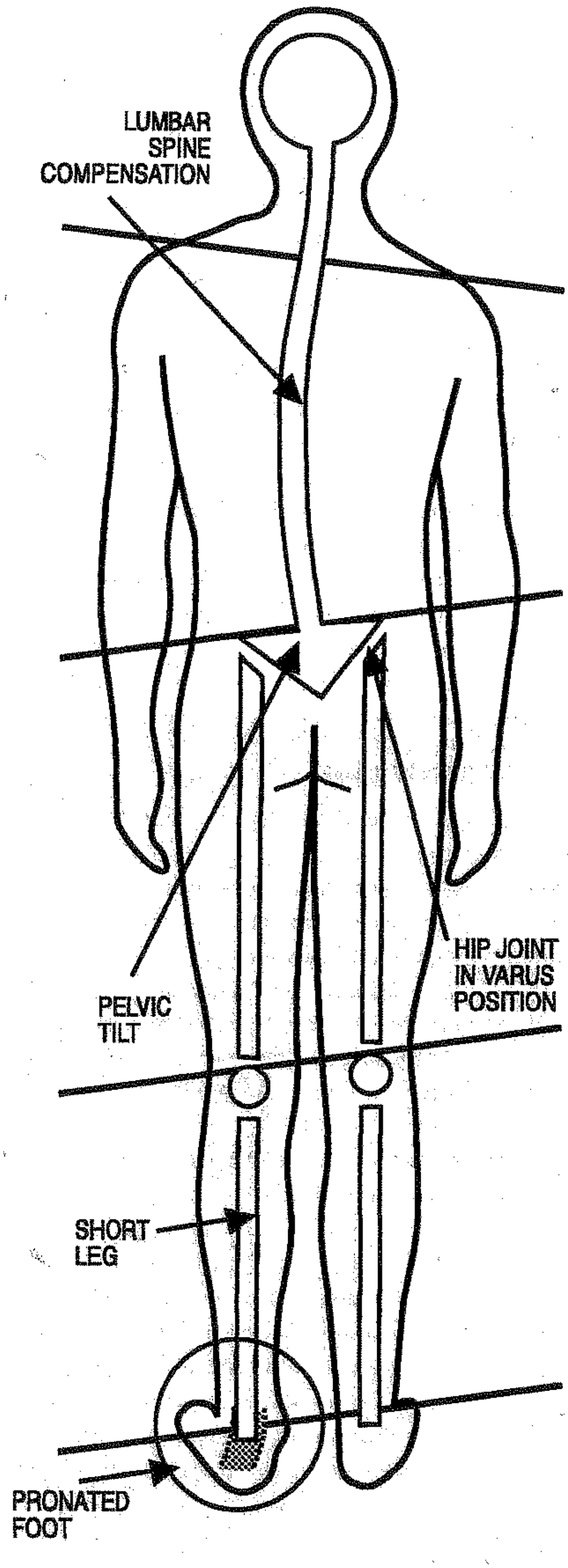

Figure 4. *Hyperpronation, leg length inequality, and pelvic unleveling.*

sue repair from the increases in biomechanical stresses is taking place (13). Magnetic resonance imaging is not only more sensitive but also more specific, helping to rule out other skeletal conditions, such as tumors, infections, and other pathologies. For most patients, these procedures are not initially indicated unless the patient is not responding to conservative treatment.

It is relatively easy to adjust the extrinsic factors which may initiate stress reactions—improve and/or modify training technique, schedule, and intensity. Early treatment usually will alleviate the symptoms in a relatively short time (14). However, any stress reaction symptom should serve as an indicator of an underlying intrinsic cause. A common source of excessive biomechanical stress to ligaments, muscles, and bones of the lower extremity is malalignment or asymmetry. Because standing, walking, and running require the lower extremity and pelvis to be in a closed-pack position, compression forces are increased if there is any structural deficit (developmental or acquired), no matter how slight.

Excessive pronation—the rolling inward of the hindfoot and midfoot beyond the normal acceptable parameters during standing, walking, or running—may be caused by either arch collapse (acquired) or poor arch development (developmental). In either case, excessive torsional (twisting/shearing) forces are transmitted from the overpronated foot into the leg with each step taken (15). During the gait cycle of a normal, healthy foot, there should be a rolling inward of the foot/ankle complex, with internal rotation of the leg upon contact and a rolling outward with external rotation as the foot moves into midstance and toe off. Both are required to effectively dissipate heel strike shock at the subtalar joint and knee (16). Prolonged internal rotation of the lower extremity caused by excessive pronation transmits stress up to the pelvic region. There is increased stress at the knee. Inward rotation of the femur brings the greater trochanter forward and outward, stretching the piriformis muscle. Because the piriformis originates at the anterolateral aspect of the S2–S4 segments, the sacrum may be pulled into its most common subluxation pattern—anterior and inferior (17). This hip/pelvis/sacrum rotation pattern is commonly associated with myofascial back pain (18).

Pelvic unleveling may develop because of excessive pronation. The presenting condition of leg length inequality is usually revealed during the clinical examination, postural evaluation, or on anteroposterior lumbosacral radiographs. It must be determined if the discrepancy is attributable to an anatomical/structural short leg or from a functional short leg caused by a biomechanical deficit in the biostatic chain of the lower extremity and/or pelvis. There are many orthopedic

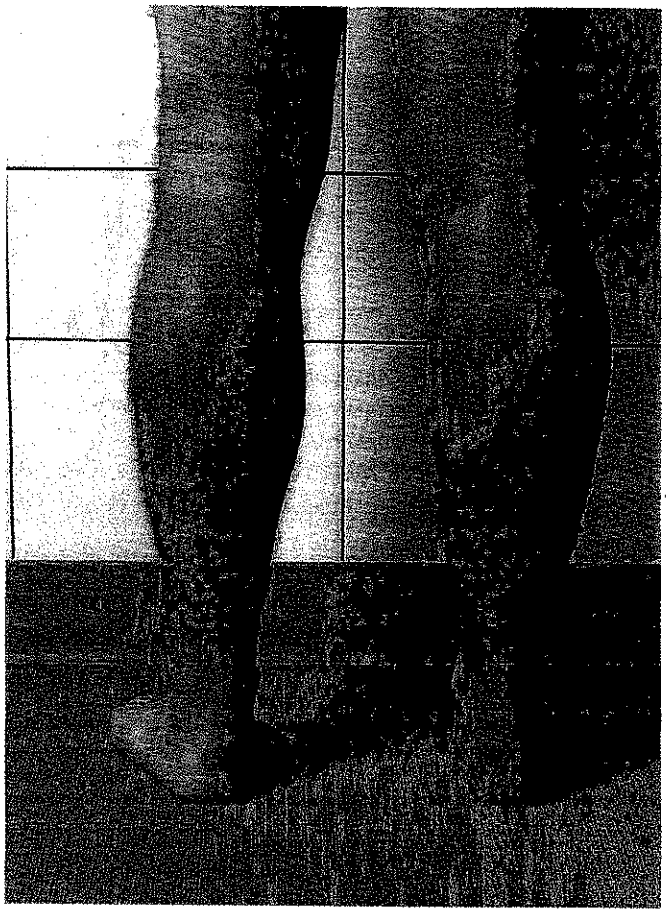

Figure 5. *Asymmetrical bilateral pronation. Pronation (flat feet) is an inward rotation of the hind- and midfoot region, usually bilaterally but not to the same degree. In this photograph, both feet are pronated, but the right is pronated to greater degree.*

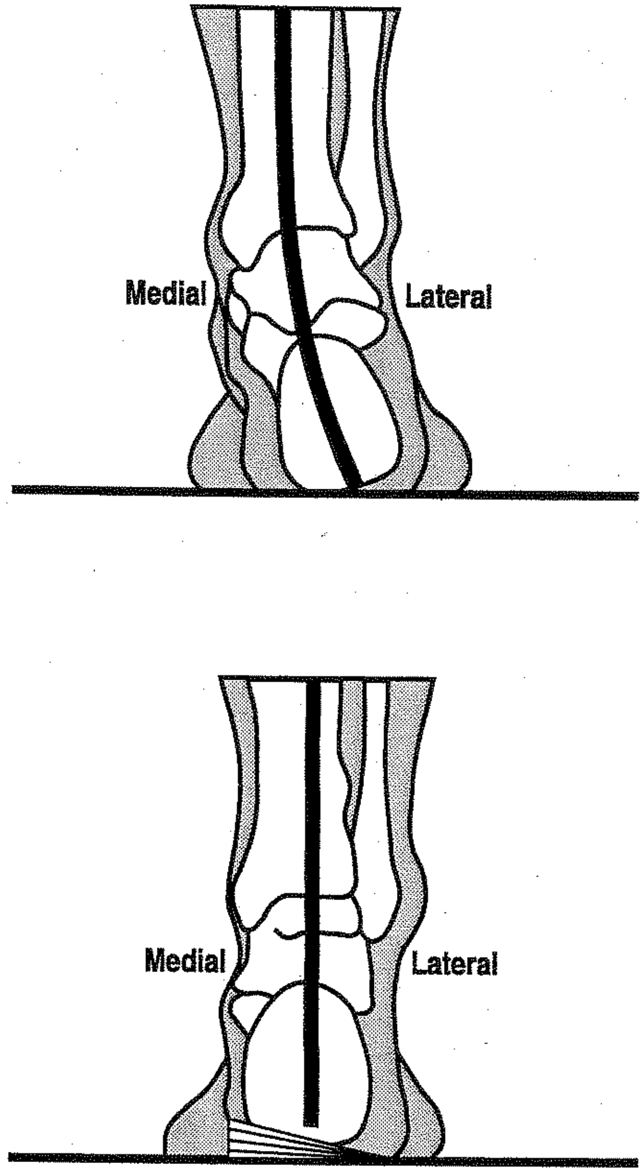

Figure 6. ***Top,*** *Excessive pronation with medial bowing of Achilles tendon.* ***Bottom,*** *Orthotic correction with medial heel wedge.*

tests and tape measurements which can indicate a leg length inequality; however, unless the patient's history or diagnostic examination confirms there is an anatomical short leg, it is reasonable to assume the short leg syndrome has a functional cause. The most common underlying cause of a functional leg length inequality is asymmetrical bilateral pronation (Fig. 5).

In-shoe orthotics have been called "the only method of controlling overpronation at the subtalar joint" (6); ultra-lightweight, flexible orthotics can play a major role in preventing many overuse injuries in runners and joggers. Blake and Denton performed a retrospective study of 180 patients (primarily runners) who received functional foot orthotics (19). The diagnoses included foot/ankle, knee, leg, and hip conditions. The success rate (a response of 'definitely helped') was greater than 70%. Orthotics designed to correct excessive pronation will need an effective, built-in, shock-absorbing material to help dissipate shock forces. It has been found that Zorbacel can dissipate more than 90% of the energy of deformation, yet fully return to shape on removal of the force well within the interval between steps.

Depending on the degree of pronation and its effect on the forefoot, the orthotic may have a medial post or wedge built into the heel to help stabilize the calcaneus from rolling too far inward (Fig. 6). Creating a bilateral symmetrical foundation in the correct physiologic range for weight-bearing feet will aid in natural balancing and stabilization of the pelvis.

CONCLUSION

When assessing overuse injuries, it is imperative to look for intrinsic as well as extrinsic factors. Addressing one without the other in the treatment regime may lead to unsatisfactory or only short-term results. However, correcting or supporting the faulty biomechanics often makes the difference in providing long-term relief of symptoms and return to activities of daily living, including intense athletic training programs.

References

1. *Jacobs SJ, Berson BL. Injuries to runners: a study of entrants to a 10,000 meter race. Am J Sports Med 1986;14:151–155.*
2. *Lysholm J, Wiklander J. Injuries in runners. Am J Sports Med 1987;15:168–171.*
3. *Lutter LD. Foot-related knee problems in the long distance runner. Foot Ankle 1980;1:112–116.*
4. *Robbins SE, Hanna AM. Running-related injury prevention through barefoot adaptations. Med Sci Sports Exerc 1987;19:148–156.*
5. *Cavanaugh PR, LaFortune MA. Ground reaction forces in distance running. J Biomech 1980;13:397–406.*
6. *Baycroft CM, Culp V. Running shoes: design facts and functional fantasies. Chiro Sports Med 1993;7:6–8.*
7. *Blake RL, Anderson K, Ferguson H. Posterior tibial tendinitis: a literature review with case reports. J Am Podiatr Med Assoc 1994;84:141–149.*
8. *Herring SA, Nilson KL. Introduction to overuse injuries. Clin Sports Med 1987;6:225.*
9. *Adelaar RS. The practical biomechanics of running. Am J Sports Med 1986;14:497–500.*
10. *O'Connor FG. Five-step treatment for overuse injuries. Physician Sports Med 1992;20:128–142.*
11. *Simkin A. Combined effect of foot arch structure and an orthotic device on stress fractures. Foot Ankle 1989;10:25–29.*
12. *Hersham EB. Stress fractures. Clin Sports Med 1990;9:183–214.*
13. *Lee JK. Stress fractures: MR imaging. Radiology 1988;167:217–220.*
14. *Griffiths HJ. Magnetic resonance spectrum of stress injury to bone and its clinical relevance. Presented at the Annual Symposium of the American College of Chiropractic Radiology, 1992, .*
15. *Michaud TC. Recurrent lower tibial stress fracture in a long distance runner. Chiro Sports Med 1988;2:78–87.*
16. *Root ML, William PO. Normal and abnormal function of the foot. Vol. 2. Los Angeles: Clinical Biomechanics Corporation, 1977.*
17. *Schäfer RC. Clinical biomechanics: musculoskeletal actions and reactions. Baltimore: Williams & Wilkins, 1983.*
18. *Greenawalt MH. Spinal pelvic stabilization. 4th ed. Roanoke, VA: Foot Levelers, Inc., 1990.*
19. *Blake RL, Denton JA. Functional foot orthoses for athletic injuries. J Am Podiatry Assoc 1985;75:359–362.*