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Corrective Neuromuscular Approach to the Treatment of Iliotibial Band Friction Syndrome: A Case Report

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Objective: To describe the evaluation and treatment process for inappropriate functional patterns of neuromuscular activity within the scope of an iliotibial band friction syndrome protocol.

Background: Runners with iliotibial band friction syndrome are frequently fitted with orthotic devices to restrict excessive midfoot or rearfoot, or both, motions during the stance phase. These devices may fail to yield favorable results when underlying neuromuscular factors are associated with functional iliotibial band tightening.

Differential Diagnosis: Distal biceps femoris tendinitis, popliteal tendinitis, lateral meniscus lesion.

Treatment: The athlete's physical examination revealed several patterns of inappropriate neuromuscular activity attributed partly to the prolonged daily wear of beach-type sandals. Modifications of casual footwear and a temporary reduction in training volume were recommended initially to prevent exacerbation of the athlete's condition. Stretching, massage, and soft tissue mobilization were administered in accordance with the athlete's specific needs. The protocol included progressions of nonweightbearing and weightbearing therapeutic exercises. Neuromuscular electric stimulation was incorporated into the protocol to re-educate the role of the first ray within the stance phase of the athlete's walking gait.

Uniqueness: Upon stationary examination, this athlete presented with normal lumbar and lower extremity postures. Gait analysis, however, revealed inappropriate dorsiflexion of the great toe during ambulation. Further, the athlete's performances on a series of tests to assess neuromuscular function were substandard. This athlete's response to previous treatment and unique physical findings required a corrective neuromuscular approach that deviates from iliotibial band friction syndrome protocols advocating the use of orthotics.

Conclusions: While the role of any single treatment in the athlete's recovery remains unknown, it seems that a corrective neuromuscular approach in the management of iliotibial band friction syndrome represents a viable alternative to orthotic intervention.

Key Words: sandal, re-education, first ray, pelvic stabilization

Iliotibial band friction syndrome (ITBFS), commonly linked with excessive lateral heel striking in the running gait cycle,[1] is among the more prevalent running injuries treated by the athletic trainer.[2] Beyond management techniques facilitating mobility within the lateral soft tissue structures of the knee, many[3–5] have advocated correcting footwear problems by restricting midfoot or rearfoot, or both, motions with orthotic devices. Whereas this therapeutic intervention may be the ideal course of action for runners with architectural problems of the foot,[5] this approach is of little benefit for those experiencing lateral knee pain associated with accessory distal and proximal neuromuscular control problems. We present the use of a corrective neuromuscular approach in the treatment of an athlete with ITBFS.

CASE PRESENTATION

On September 23, 1997, a 19-year-old female middle-distance runner reported to the athletic training room complaining of left lateral knee pain that had persisted for several years. The athlete's history was extensive. She underwent a partial iliotibial band (ITB) release of her left knee on August 26, 1996, after a period of unsuccessful conservative management for ITBFS. After surgery, the athlete received 4 months of postoperative physical therapy in her hometown and was fitted with rigid medial arch support orthotics. She returned to activity and discontinued the use of her orthotics shortly thereafter due to the development of bilateral knee pain. While the athlete was able to train 20 miles per week during the summer and early fall of 1997, her continued episodes of exercise-induced pain, particularly during hill training, caused her to seek our assistance.

We conducted a complete physical examination, including a variety of tests to assess neuromuscular function. Both knees were palpated, and patellofemoral joint play was assessed in the extended and 30°-flexed positions. The lateral aspect of the left knee was tender along the area of her surgical scar. The left patella yielded very little medial glide in the flexed position due to perceived soft tissue tightness of the lateral retinaculum and ITB. This joint play along with passive medial tibial rotation was associated with heightened lateral knee pain. The McMurray test[2] was negative for meniscal involvement, and a battery of tests for tibiofemoral instability and pain was unremarkable. Minor discrepancies were found when comparing bilateral flexibility and manual muscle strength. Of notable interest, the Ober test[6] was within normal limits for the

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involved limb, whereas the contralateral limb was mildly positive for ITB tightness.

A standing examination revealed normal static anatomical postures, including observations of the lumbar, pelvic, knee, ankle, and foot resting positions. The Trendelenburg test[6] was negative. With gait, a marked dorsiflexion of the great toe occurred bilaterally from heel strike to heel rise during the stance phase. The athlete was asked to perform several functional tests, including a parallel squat, a forward lunge, and a step-up on an Achilles tendon stretch board. During the lunge with the right leg in a forward position, the athlete reported clicking and pain in the lateral aspect of the left knee as her forward hip and knee approached full flexion. This clicking and pain did not occur during the squatting test. The left leg step-up test[7] revealed that the athlete lacked proper pelvifemoral control, lending to a medial bowing appearance of the leg in the frontal and transverse planes (Figure 1). The results of the step-up and lunge tests, along with daily reporting of her training mileage, were used in the protocol to gauge the athlete's functional progress.

REHABILITATION

Eliminating conditions that would further exacerbate the athlete's symptoms was our primary initial goal. After further interviewing, we believed that the dorsiflexion of her great toe during ambulation was the result of a habit formed from prolonged use of beach-type sandals. Suspecting that this neuromuscular pattern may have transferred to her running gait, potentially causing her to dynamically invert the rearfoot at heel strike or overpronate, or both, during midstance before toe-off, the athlete was encouraged to refrain from wearing this type of footwear. In addition, her training volume was temporarily reduced, and abstinence from hill training and situations involving running with excessive stride lengths was recommended until all biomechanical influences to her functional ITB tightening were corrected. A weekday regimen of soft tissue treatment and postactivity cryotherapy was established. Concurrently, formal rehabilitation sessions were scheduled with a certified athletic trainer 3 days per week.

Soft Tissue Treatments

We taught the athlete a stretching program addressing all flexibility deficits and administered effleurage massage to the tender area 5 minutes each weekday. The perceived lateral soft tissue tightness was treated using medial patellar mobilizations against the resistance of electrically induced muscle contractions of the lateral musculature via motor point stimulation (Mettler SysStim 206 & 730, AC, 32 Hz; Mettler Electronics Corp, Anaheim, CA). The 30° knee-flexed position was chosen because this aids in aligning the fibers of the ITB and lateral retinaculum over the lateral femoral epicondyle[8-10] (Figure 2). Thera-Band (Hygenic Corp, Akron, OH) was used to improve adherence of the palm against the lateral patellar border and minimize epidermal irritation during the mobilization. Restoration of lateral tissue extensibility and abolition of tenderness required 7 mobilization treatments.

Therapeutic Exercises

We used a variety of nonweightbearing exercises in the early stages of the protocol. These exercises included manual resistance rotary and diagonal proprioceptive neuromuscular facilitation patterns using a repeated-contraction sequence,[11] short-arc quadriceps extensions, prone straight-leg raises, and hamstring curls. Integration of weightbearing exercise progressions was guided by the athlete's response to the soft tissue treatments. These progressions consisted of multiple joint exercises such as wall squats, bilateral and single-leg terminal extensions (Figure 3), parallel squats, and lunges. Standing hip flexion, extension, and abduction using a cable column for resistance served as exercises to enhance proprioception and retrain the neuromuscular regulation of pelvic stability. Modification of the plantar base of support using a slant board (Figure 4) and a flat wooden box (Figure 5) was incorporated to progress difficulty of the exercises.

Neuromuscular electric stimulation (Respond II; EMPI, Inc, St. Paul, MN) applied to the flexor hallucis longus muscle was used to re-educate the role of this muscle as a subtalar joint stabilizer during the standing hip-flexion exercise (Figure 4). The settings of the neuromuscular electric stimulation were selected to coincide with contralateral limb flexion (50 Hz, 5 seconds on, 5 seconds off, 3-second ramp). As the limb in motion reached a predetermined degree of hip flexion, the ramp of the neuromuscular electric stimulation on the support foot reached peak intensity. Restoration of acceptable first ray

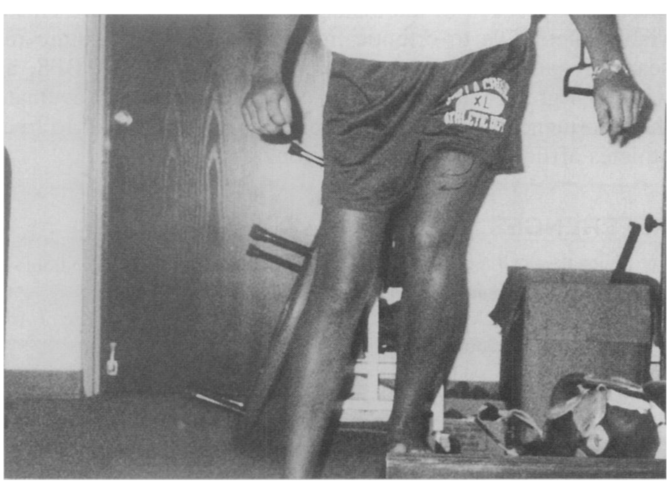

Figure 1. Performance on the step-up test.

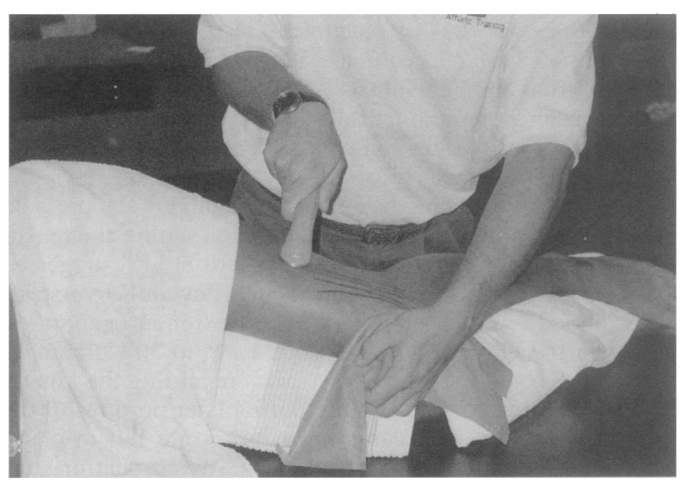

Figure 2. Soft tissue mobilization: medial patellar mobilizations against the resistance of electrically induced contractions in the lateral musculature.

Figure 3. Single-leg terminal extension. A slant board is added for difficulty.

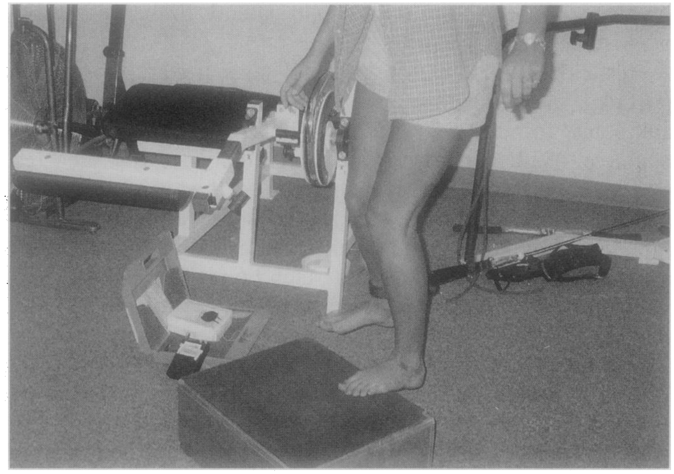

Figure 5. Standing hip-flexion exercise. The emphasis is on maintenance of pelvic stability.

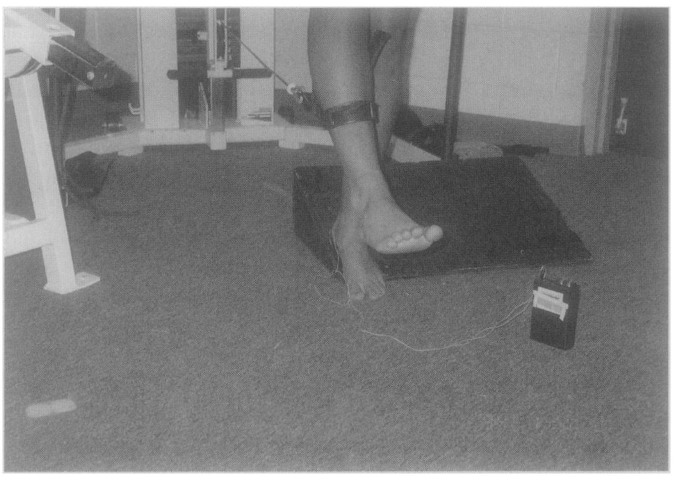

Figure 4. Re-education of the flexor hallucis longus with neuromuscular electric stimulation in the standing hip-flexion exercise.

neuromuscular control during the stance phase of the athlete's walking gait required 6 treatments.

DISCUSSION

Several mechanisms of functional ITB friction during running have been established in the literature. Early in the stance phase of running, individuals striking the ground with an inverted heel position kinetically impart varus stresses to the knee, thereby increasing compression and friction of the ITB over the lateral femoral epicondyle.[3,12] Overstriding, as in the case of downhill running, can also heighten ITB compression over the epicondyle by increasing tension within the tensor fascia lata.[9] Along similar lines, Orchard et al[10] suggested that the increased time associated with downhill overstriding, coupled with the degree of knee flexion at heel strike, results in the ITB remaining within a 20° to 30° "impingement zone" longer. Controversy exists regarding the kinetic factors of increased ITB friction during later portions of the stance phase. Whereas varus knee forces are felt to occur with underpronation during heel strike, overpronation during midstance or toe-off may be linked with heightened tensile forces on the ITB by way of excessive medial tibial rotation.[9] Currently, no studies have explored the interaction of altered first ray neuromuscular control with either of these factors for ITB tightening.

The best course of treatment to circumvent the distal kinetic influences of ITBFS will fall short if altered proximal neuromuscular factors are not addressed within a protocol. During running, the abductor magnus, tensor fascia lata, gluteus maximus, and gluteus medius collectively function to stabilize the pelvis and help counteract impact forces.[13,14] Inadequate functioning or fatigue of these pelvic stabilizers results in superior pelvic listing and excessive lateral pelvic displacement, pulling the runner's center of gravity sideways from the desired linear path. This not only dampens running performance but also increases tension within the ITB.[13] A combination of the stretching and weightbearing proprioception exercises used in our protocol represented a potential means of correcting and preventing these influences.

Although selecting proper athletic footwear is crucial in preventing chronic running injuries affecting the knee,[12] our case report demonstrates the importance of avoiding casual daily footwear, such as sandals, that lacks appropriate support as well. After a 10-week period of reduced training, this athlete returned to activity and completed an entire season of indoor track and field free of symptoms. While we cannot make claims as to what extent any single treatment contributed to this athlete's recovery, we can conclude that a corrective neuromuscular approach in the management of ITBFS represents a viable alternative to orthotic intervention. Clearly, future research regarding the neuromuscular influences of ITBFS, as well as a greater understanding of how to clinically evaluate these influences, will better enable the athletic trainer to treat athletes afflicted with this condition.

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