ILIOTIBIAL BAND SYNDROME INJURED RUNNERS INCREASE FLEXIBILITY USING SOFT TISSUE MOBILIZATION AND INCREASE FUNCTIONAL STRENGTH USING A HEAT PACK-IMPLICATIONS FOR FASTER RECOVERY

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The purpose of this study was to quantify the effects of two independent treatments, soft tissue mobilization and a localized heat pack, upon iliotibial band syndrome injured runner. Iliotibial band injured runners (n=5) who were actively seeking soft tissue mobilization as a treatment were recruited. These runners received one of three randomized treatments during three consecutive visits - (1) soft tissue mobilization (2) an iliotibial band isolating heat pack (3) rest. Iliotibial band flexibility and functional abductor strength measures were taken before and after each treatment. Flexibility was quantified by determining the hip and knee abduction moments generated during the iliotibial band stretch. Each active treatment resulted in significant changes when compared to the treatment of rest. Soft tissue mobilization increased flexibility at the hip (<0.05) and knee ($p<0.05$) while the heat pack increased functional abductor strength ($p<0.005$).

KEY WORDS: running injuries, iliotibial band, soft tissue mobilization, heat treatment, iliotibial band syndrome

INTRODUCTION: Iliotibial band syndrome (ITBS) injuries comprise as much as 22% of knee injuries (Ballas, Tytko & Cookson, 1997). Rehabilitation may take as much as six weeks (Clancy, 1989). Termination of running, rest and ice are the more prevalent conservative treatments for this injury (Ballas, Tytko & Cookson, 1997). With respect to recovery from ITB syndrome, there are two quantifiable measures that are hypothesized to correlate with ITBS recovery: Iliotibial band flexibility and increased hip abductor strength (Fredericson, Dowdel, & Oestreicher, 1997).

Research has shown that an active program of gluteus medius strength improvement correlates with ITBS recovery (Fredericson, M., Guillet, M., DeBenedictis, L, 2000). It is assumed that functional strength, and potential strength, a function of muscular cross section, do not necessarily correlate in injured subjects. It is assumed that protective neuromuscular feedback guards injuries and thus reduces functional strength. An individual's functional strength can be quantified during an isometric contractions.

One local site of inflammation associated with ITBS is the lateral femoral epicondyle. The ITB traverses this region during 20-30° of knee flexion. Relaxation of the muscle-tendon complex may reduce the pressure between the ITB and the epicondyle by increasing flexibility. Since increased force development increases muscle-tendon relaxation, a stretch that increases the forces in the ITB will induce greater relaxation (Taylor, Brook & Ryan, 1997). In light of this, adduction moments at the hip and the knee are used to quantify the potential increased forces in the ITB.

Soft tissue mobilization treatments address tightness, trigger points and adhesions of muscle, tendons and fascia. Adhesions of the ITB layers can result in decreased flexibility and travel in the distal ITB. Given the multiple attachments of the distal ITB to the femur, there is ample fascia in the lateral distal femur to stimulate (Lobenhoffer, 1987).

Two hypotheses were investigated. Hypothesis I - Soft tissue mobilization significantly increases the flexibility of the ITB complex over a treatment of rest. Hypothesis II – A treatment of an ITB isolating heat pack increases functional abductor strength over a treatment of rest. These treatments may decrease recovery time for ITBS injured runners.

METHODS: The runners (N=5) had actively sought soft tissue mobilization treatment of ITBS. Inclusion in the study was based on the following criteria:

1. Present Injury - ITBS presenting with pain at the lateral aspect of the knee
2. Major Injuries - no lower limb surgeries or significant soft-tissue injuries

3. Mileage before injury - >20 mi./wk

Runners who matched the criteria were invited to the Biomotion Lab for 3 visits. The runners performed two independent measures before and after each treatment day.

Measure 1 - Runners were asked to perform the standing ITB stretch 4 times (Figure 1). Each stretch was held for 30 sec. (data collected over last 5 sec.) followed by a rest period (<1min.). Kinematics and kinetics of the stretch were analyzed using 7 retro-reflective markers, a four-camera system, and a force plate. Inverse dynamics were applied to determine abduction moments at the hip and knee during the stretch and then averaged over the 5 sec. trial.

Measure 2 - Normalized isometric abductor strength measures were acquired using a test stand mounted dynamometer contacting the runner just proximal to the lateral malleolus. The test stand was adjusted to 20° of abduction (Figure 1). Runners performed the test 4 consecutive times. 3 sec. of isometric force development, followed by 20 sec. of rest. The runners were not coached during the tests. A moment arm length, the greater trochanter to lateral malleolus distance, was multiplied by the forces to get hip abduction moments and then normalized (%BW*HT) (Eq. 1).

$$\text{Moment}\,(\%BW * HT) = \left(\frac{\text{Force}(N) * \text{Moment Arm}(m)}{\text{Body Weight}(N) * \text{Height}(m)} * 100\%\right) \qquad (1)$$

It is assumed that increased adduction moments resulted in higher ITB forces.

Figure 1 - Standing stretch of the right iliotibial band with the right foot upon the force plate.

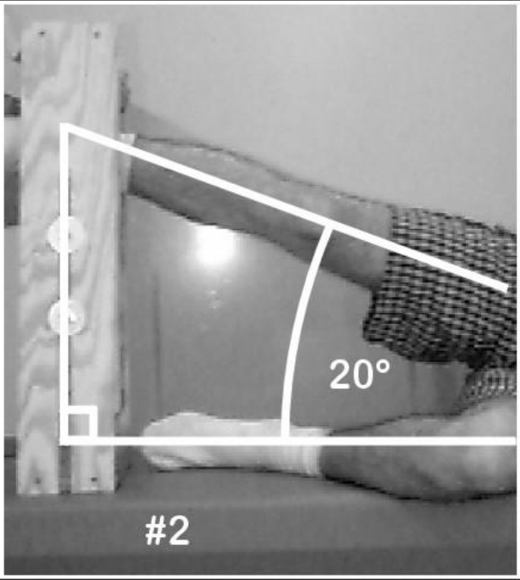

Figure 2 - Isometric strength measure at 20° of abduction.

The three prescribed treatments were rest, a custom shaped heat pack, and soft-tissue mobilization. Both the STM treatment and the heat pack isolated the lateral femur distal to the greater trochanter and proximal to the lateral epicondyle. The heat treatment involved a microwable heat pack with a taper shape (approx. 6" x 3") to isolate the ITB. The treatment order was randomized.

Analysis methods. The statistical analysis is based on before and after measures from each treatment. For each set of 3 trials, the trial with the peak hip adduction moment was chosen as representative. One-sided pair-wise t-tests were used to test for significance ($p<0.05$) between treatments and rest(Fig. 3).

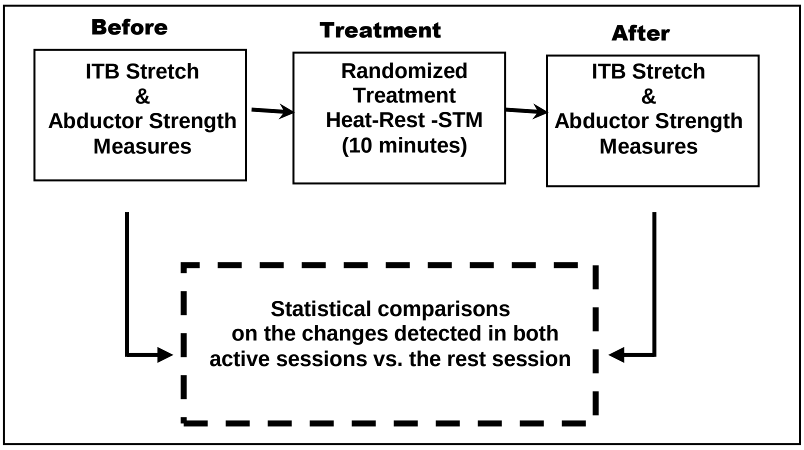

Figure 3 - Experimental design to investigate statistical significance in changes from active treatments to changes resulting from rest.

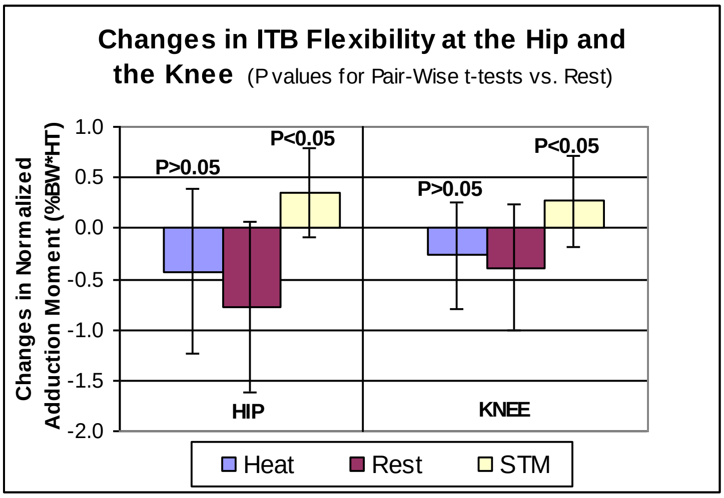

Figure 4 - ITB flexibility changes - hip and knee ITB flexibility measured by the normalized adduction (N=5).

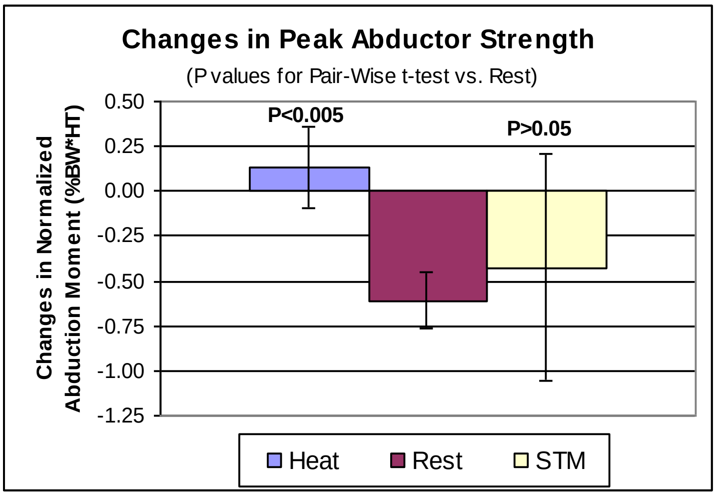

Figure 5 - Strength changes - peak hip abductor strength measured by normalized abduction moment (N=5).

RESULTS: When tested against a treatment of rest, soft tissue mobilization of the ITB, increased flexibility significantly at both the hip and the knee ($p<0.05$) (Fig. 4). When tested against a treatment of rest, a heat treatment of the ITB, increased peak abductor strength significantly ($p<0.005$) (Fig. 5).

The protocol reduced runner strength, 0.62 (%BW*HT), and reduced flexibility, hip and knee moments were reduced by 0.98 (%BW*HT) and 0.53 (%BW*HT), respectively.

DISCUSSION: The results support both hypotheses. The implications are that either of these two active treatments, a heat pack isolating the distal ITB and soft tissue mobilization, will aid in reducing recoery time for ITBS injured runners. The treatment of heat is envisioned to add functional strength that has been shown to correlated with ITB recovery. Soft tissue mobilization may reduce recovery time by increasing flexibility and muscle-tendon relaxation. The ability to generate greater moments allows greater potential force generation in the ITB complex. This will reduce lateral epicondyle pressure. This pressure is the presenting injury symptom.

Some physiologically limiting mechanism was overcome in response to these treatments. Either Injury induced tightness, trigger points or soft tissue adhesions may be the cause. Taylor et al. hypothesized that viscous elements of the connective tissue will also be affected.

The major shortcoming of this effort is the influence of the protocol upon the runners. Also, normal soft tissue mobilization treatments are longer in duration (30–60 min) than this 10 min. session, and they address the entire lower limb not just the distal ITB.

The resulting increased strength and flexibility are both beneficial to the ITBS injured runners.

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