

Prospective Study of the Biomechanical Factors Associated with Iliotibial Band Syndrome

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INTRODUCTION

Iliotibial Band syndrome (ITBS) is the leading cause of lateral knee pain in runners. The Iliotibial band (ITB) originates proximally from the facial attachments of the gluteus medius, gluteus maximus and the tensor fascia late. Distally, the ITB has attachments at the lateral femoral condyle, the lateral patella and at gerdy's tubercle on the lateral tibia. ITBS is thought to result from friction of the ITB sliding over the lateral femoral condyle. The mechanics that increase friction and exacerbate ITBS are not well understood, with few studies having been done to date.

It has been suggested that ITBS is related to a sagittal plane mechanism, whereby repetitive knee flexion causes friction between the ITB and the femoral condyle. However, Orchard et al. (1994) assessed knee flexion at initial contact, maximum knee flexion and time spent in knee flexion in runners with ITBS. They found no differences between the injured leg and uninjured leg in a group of runners.

It has also been suggested that a transverse plane mechanism may be at fault. Ferber et al. (2003) reported that runners with ITB exhibited a 7 deg increase in knee internal rotation compared with a control group. Increased knee internal rotation may be a result of increased ankle eversion due to the coupling between these joints. In fact, Messier et al. (1994) found that the runners with ITBS exhibited greater peak eversion as compared to controls. In addition, in a

prospective study, Ferber et al. (2003) found that runners who went on to develop ITBS had greater peak eversion, greater peak eversion velocity and excursion.

A hip mechanism for developing ITBS has been proposed as well. Weakness of the hip abductors has been associated with ITBS (Fredrikson 2000). Weakness of the hip abductors has been shown to be related to increased hip adduction in runners with patellofemoral pain syndrome (Dierks 2005). However, there are no studies of the role of increased hip adduction in ITBS. It is possible that increased hip adduction combined with knee internal rotation, increases ITB tension. This could increase contact of the ITB with the lateral femoral condyle and lead to irritation with repeated exposure

The purpose of this study was to prospectively compare running mechanics in a group of female runners who went on to develop ITBS compared to healthy controls. It was hypothesized that runners who go on to develop ITBS would exhibit greater hip adduction, knee internal rotation and rearfoot eversion.

METHODS

This is an ongoing study where, to date, 17 female runners have developed ITBS prospectively. All injuries were confirmed by a medical professional such as a physician, physical therapist or an athletic trainer. They were compared to a control group of 17 age and mileage matched

uninjured runners. In both groups all runners were free from any previous or current hip and knee pathology.

Subjects ran over ground along a 25m runway at 3.7m/s wearing standard laboratory shoes. Five running trials were collected during the stance phase of running. Kinematic data was captured using a 6-camera motion capture system at 120Hz (Vicon, Oxford metrics, UK) and kinetics were captured using a force platform (Bertec OH, USA). Kinematic and kinetics were calculated using visual3D software (Visual 3D, C motion, MD, USA). Variables of interest were compared between groups using an independent, one tailed t-test.

RESULTS AND DISCUSSION

Comparison of the variables of interest between groups is presented in Table 1. Hip adduction and knee internal rotation curves are presented in figures 1 and 2.

Table 1 Variables of Interest

	ITBS	CON	P
Peak EV (deg)	9.7	11.6	0.035
Peak Knee Int Rot	4.49	.021	0.001
Peak Hip Adduction	14.1	10.6	0.009

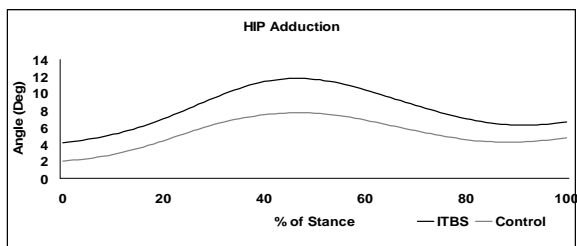


Figure 1. Comparison of hip adduction between groups

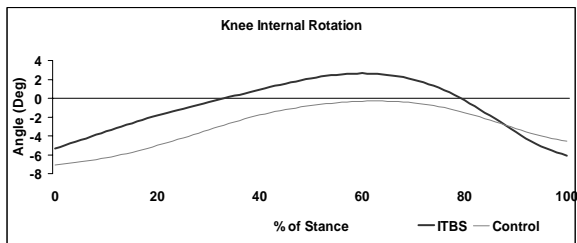


Figure 2. Comparison of knee internal rotation between groups

As hypothesized, hip adduction was greater in the ITBS group. This suggests that hip weakness noted previously in runners with ITBS may result in excessive hip adduction. This could increase the tension on the ITB and, with repeated exposure, lead to ITBS.

The ITBS group also exhibited a 4 deg. increase in knee internal rotation. These findings are in support of Ferber et.al. (2003). Increased knee internal rotation could further elongate the ITB as its attachment at gerdy's tubercle is moved anteriorly. Along with the hip adduction, this is likely to further increase ITB tension.

Unexpectedly, peak eversion was significantly lower in the ITBS group. This is contrast to Messier et al. (1995) and Ferber et al. (2003) who found greater peak eversion. However, it is possible that increased knee internal rotation noted was associated with increased talonavicular pronation, rather than subtalar pronation. Unfortunately, we were unable to measure talonavicular motion with our standard motion analysis techniques.

SUMMARY/CONCLUSIONS

Results from this prospective study suggest that individuals who go onto to develop ITBS exhibit greater hip adduction and knee internal rotation. These results suggest that interventions should be directed at controlling these motions.

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