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The effects of myofascial release and remedial exercise on iliotibial overuse syndrome

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Abstract

Iliotibial overuse syndrome (ITOS) is chronic inflammation and recurring pain of the iliotibial band and often the tensor fascia lata (TFL) associated with cumulative trauma. This study investigated the potential outcome of myofascial release combined with a remedial exercise program for a patient exhibiting ITOS. Myofascial release was used in five treatments over a three and a half week period. Pain measured at varying degrees throughout the study period. There was an increase in hip and knee flexibility post treatment however these gains did not last until the next treatment. Strength gains occurred in TFL, gluteus medius, and gluteus minimus. The patient noticed the ability to sit longer pain free, a decrease in the amount of warm up needed prior to sports, an awareness of increased hip flexor flexibility, and recognition that stretching decreased the pain felt after sports. It appears that myofascial release may assist in normalizing tight tissue short-term and could be used as parallel therapy in ITOS rehabilitation, however additional research is needed. A recommended study using a control group to explore the effects of myofascial release combined with remedial exercise versus remedial exercise alone would be beneficial.

Key words: massage, iliotibial band friction syndrome, functional leg length discrepancy, sports injury, treatment

Table of Contents

Summary

Iliotibial overuse syndrome (ITOS) is associated with cumulative trauma causing chronic inflammation and pain anywhere along the iliotibial band (ITB).

The ITB is a thickening of the fascia lata overlying the vastus lateralis. It connects the anterior and posterior pelvis with the lateral hip and knee (Cael, 2011). It serves as an attachment for the gluteus maximus and TFL muscle and inserts into Gerdy's tubercle and the lateral knee (Puniello, 1993).

The fascia lata is a fascial system enveloping the thigh and gluteal muscles. Fascia is an abundant substance that separates and surrounds structures, provides passageways for vessels and nerves, contains sensory receptors, stabilizes the body during postural balance and movement, and plays a major role in the inflammatory process (Hertling & Kessler, 2009).

TFL originates on the iliac crest and inserts into the proximal ITB (Muscolino, 2005). It flexes, medially rotates and abducts the hip joint, tenses the fascia lata and assists in knee extension via the ITB (Kendall, McCreary, Provance, Rodgers, & Romani, 2009).

Gluteus maximus originates on the sacrum, iliac crest, and coccyx and inserts into the proximal femur and ITB (Muscolino, 2005). It mainly extends and laterally rotates the hip and stabilizes the knee in extension via the ITB (Kendall et al., 2009). This muscle provides powerful hip extension during strenuous activities and assists in maintaining erect posture (Travell, 1993).

There are a variety of causes of ITOS including muscle imbalances surrounding the hip, chronic overload, structural and postural abnormalities, and decreased fascial mobility.

According to Hertling and Kessler (2009) and Travell (1993), structural abnormalities include medial rotation of the femur, genu valgum, lateral tibial torsion, pes planus, hallux valgus, and Morton foot structure. Postural abnormalities include anterior pelvic tilt, flat back or handedness posture (Hertling & Kessler, 2009).

Muscle imbalances in the TFL, gluteus medius, and less commonly the gluteus maximus are another cause of ITOS. Broer & Houtz (1967) measured TFL to be strongly active during jumping activities, especially upon landing. Repetitive walking or running on sloped surfaces contributes to TFL dysfunction because the slant increases genu varus in one knee and genu valgus in the other (Travell, 1993). TFL is also aggravated by prolonged sitting or sleeping in the fetal position. A tightened TFL or gluteus maximus can contribute to a tight ITB due to their direct insertion (Kendall et. al, 2009). Early firing and over activation of the TFL due to hip abductor weakness has been mentioned by several sources, including Kisner & Colby (2007) and Janda (1983). Fredericson et. al. (2000) found a correlation between weak hip abduction strength and ITB dysfunction in runners, although this has been disputed in a study by Grau, Krauss, Maiwald, Best, and Horstmann (2008). Most literature investigated seems to support weak hip abductors being a factor in ITOS.

Kendall et. al. (2009) state that significant tightness of the ITB usually presents unilaterally. ITB dysfunction can create low back tension and may be felt when walking, running, ascending and descending stairs, and sitting (Cael, 2011). ITB tightness can cause frictioning on the greater trochanter or lateral femoral condyle and can injure the band or underyling bursae (Cael, 2011). The peroneal nerve can also be irritated over the proximal fibula by the ITB and cause neurological symptoms that are often misdiagnosed (Kendall et. al., 2009).

Tightening of the fascia lata prevents an individual muscle from overworking to the extent of risking safety of other joints (Todd, 1979). However, decreased elasticity can irritate surrounding joints and contribute to ITB contracture (Hertling & Kessler, 2009).

Kisner and Colby (2007) explain that when tissue is repetitively injured, the inflammatory process is perpetuated and new, immature collagen dominates. This has a weakening effect on tissue. Later, collagen fibers develop cross-links and adhere together resulting in a loss of mobility, interfering with the body's normal biomechanics (Hertling & Kessler, 2009).

Initial ITOS treatment includes activity modification, rest, non-steroidal anti-inflammatory medication or corticosteroid injection, iontophoresis, and cold hydrotherapy (Hertling & Kessler, 2009). Eliminating myofascial restrictions and correcting structural deficiencies should precede strengthening and muscle re-education (Fredericson & Wolf, 2005). Mennel (1947) advocates a combination of swedish massage and myofascial release to the ITB complex. Hertling and Kessler (2009) also suggest friction massage in adhered areas. Stretching is recommended once acute inflammation is controlled (Fredericson & Wolf, 2005). Falvey et. al. (2010) demonstrated that lengthening the muscular components of the ITB complex was more effective than stretching the ITB itself. Strengthening should emphasize eccentric contractions, triplanar motions and integrated movement patterns (Fredericson & Wolf, 2005). Fredericson et. al. (2000) showed that hip abductor strengthening resulted in improvement. In severe cases, surgery is performed to lengthen or release the ITB (Fredericson & Wolf, 2005).

Case History

The patient is a 32-year old male who complained of unilateral chronic aching pain in the area of the right greater trochanter radiating to the lateral thigh. Pain initially started from playing competitive volleyball four years ago and began with similar symptoms on the left limb but included numbness and tingling down the left lateral thigh to the lateral leg. This completely resolved when he stopped activity for two weeks. He then modified his hitting approach and symptoms began on the right limb and have persisted for three years. Pain begins at the start of volleyball, decreases during activity, and increases after activity, lasting several hours or overnight. At times the patient could not sleep on the affected side. During volleyball, pain became sharp during squatting, such as landing from a jump. He played volleyball 6 to 9 hours weekly and ascending stairs also aggravated the pain.

On initial assessment, he measured at 2 out of 10 on a visual analog pain scale (VAS) (0 no pain, 10 worst pain).

The patient is a pilot and paramedic. He flies 6 to 13 hours daily and averages four days weekly. During this time he remains seated and cannot sit for prolonged periods without pain.

The patient had previously seen a variety of healthcare professionals regarding his symptoms which included chiropractics, acupuncture, physiotherapy, and massage therapy. None seemed to permanently relieve the pain.

Physical Examination

The patient's right ilium was moderately depressed in comparison with the left. He pointed to an area of marked tenderness over the right greater trochanter. The ipsilateral TFL was also very tender and hypertrophied in comparison with the left. The hip flexors were hypertoned bilaterally. The ITB was tender near the greater trochanter. Superficial thigh fascia demonstrated decreased mobility, especially laterally. TFL trigger points referring locally were found.

Performing a jump squat reproduced pain during landing and was felt most intensely in the finish position at 90 degree hip and knee flexion. A onelegged squat resulted in shaking on the stance leg and medial movement of the knee more evident on the affected side. The squat was held minimally for two seconds.

The patient's volleyball hitting approach was assessed and found that upon landing, the right lower limb assumed a unilateral stance shortly before the left foot contacted the ground. As a result, greater stabilization is required on the right limb and could be a factor in the patient's pain.

Snapping hip syndrome was ruled out and testing for trochanteric bursitis produced slight discomfort but did not recreate the patient's symptoms.

Dermatomes were assessed over the affected thigh and found to be normal.

Hip abduction muscle control test (Kessler & Hertling, 2006) caused cramping in the affected side, felt "weaker" to the patient, and showed an abnormal firing pattern, as TFL fired first causing hip flexion and internal rotation, followed by gluteus medius.

It became apparent that obtaining a consistent, reliable reading using the Ober's test would be difficult. Thomas test and Kendall test was positive bilaterally for shortened hip flexors, particularly on the right. This was measured regularly and was a more reliable baseline. Trendelenburg's sign and Noble's compression test was negative bilaterally. The supine to sit test revealed a possible ilium rotation or a leg length discrepancy on the affected side. According to Travell (1993), TFL tightness can produce the appearance of a shorter limb on the affected side when the patient is examined supine or prone.

Manual muscle tests showed moderate weakness of the TFL, gluteus medius and gluteus minimus on the affected side. Other hip related muscles performed strongly or with minimal weakness bilaterally.

Treatment Plan

Treatment goals included increasing hip flexor flexibility, strengthening hip abductors, and decreasing pain post-treatment and post-volleyball.

Because the ITB and fascia lata are connective tissue structures, myofascial release was the selected modality. It is hypothesized that increasing fascial mobility would allow muscles to work more efficiently and increase the glide of muscles over one another (Hertling & Kessler, 2009). Five treatments were performed over three and a half weeks and each technique was held for 90 seconds. Treatment only addressed the affected side and lasted approximately 35 minutes.

In prone, a cross-hand technique was used to shear the gluteus maximus away from the gluteus medius followed by picking up and bowing of the gluteus maximus. A bear claw technique sheared the gluteal attachments at the greater trochanter.

In left side lying, the top arm rested in full abduction to increase the space between the iliac crest and twelfth rib. Here a cross hand technique was used, targeting the quadratus lumborum and abdominal obliques. The TFL was then bowed followed by a cross hand technique longitudinally on the ITB, working segmentally proximal to distal along the ITB. The vastus lateralis and biceps femoris were sheared away from the ITB. Finally, the ITB was picked up and bowed segmentally as the patient alternated between active knee flexion and extension.

In supine, cross hands was used over the inguinal ligament area with one hand over the abdomen and the other on the ipsilateral thigh. TFL was again bowed followed by rectus femoris, working segmentally again proximal to distal. The affected thigh was positioned to hang off the table's longitudinal edge. A one hand shear was directed caudally over the TFL, rectus femoris, and sartorius near the anterior superior iliac spine as the thigh was passively lowered into hip extension. The patient then actively flexed and extended the knee as the shear was held. Lastly, the origin of each of the aforementioned muscles was targeted directly and sheared caudally as the thigh was repeatedly passively lowered into extension.

Remedial exercise included strengthening the weak hip abductors and stretching the tight hip flexors. Hip abductors were targeted bilaterally with an open chain exercise progressing to a closed chain exercise. The patient was instructed to strengthen twice weekly with several days between each session for recovery. Stretching focused on TFL, the vastii group, rectus femoris, iliopsoas and hip adductors. These were held 30 to 60 seconds and performed three to five times weekly, especially after volleyball. It was theorized that this would restore normal biomechanics and that ITB symptoms were secondary to this.

The patient was instructed to ice the region of the greater trochanter during acute symptoms, such as after volleyball, for 10 minutes on and 10 minutes off, repeating three times.

He was educated on aggravating factors, such as prolonged sitting, which puts TFL in the shortened position, and volleyball which vigorously loads the TFL and the ITB. Reducing these factors is thought to aid healing, as this would decrease the breakdown of mature collagen and allow maturation of existing collagen (Kisner and Colby, 2007).

Immediate Outcomes

In regards to pain, the VAS recorded before, during, and after volleyball including pre and post treatment measured at varying degrees throughout the study period. The Thomas test used to measure hip flexor length, primarily iliopsoas, resulted in a consistent increase in hip extension post treatment. Values [median(range)] measured at [10(4-16)°] pre treatment and [2(0-5)°] post treatment. However, these gains did not last until the next treatment. The Kendall test showed that rectus femoris flexibility at the knee did not increase consistently throughout the study period. On the affected side, a strength gain of 20% occurred in TFL (4/5 to 5/5), a 10% increase in gluteus medius (4/5 to 4.5/5), and a 20% (4/5 to 5/5) gain in gluteus minimus.

Over the course of the study, the patient stated improvements in four ways: (1) the ability to sit for a longer period pain free, (2) a decreased amount of warm up needed prior to volleyball, (3) awareness of increased hip flexor flexibility, and (4) recognition that stretching decreased the pain after volleyball.

Lessons Learned

The outcome of this study could have been influenced by several factors. The patient continued to play volleyball throughout the study and consequently, there was not sufficient time for healing, therefore perpetuating the injury and possibly reversing gains achieved in treatment. Hydrotherapy instructions were not followed as prescribed. The patient’s occupation as a pilot was a major aggravating factor as it required prolonged periods of sitting and elevated stress. For this study, assessment focused primarily at the hip and pelvis. A future study should assess and correct abnormal biomechanics in distal joints as this could also contribute to ITOS. Additionally, more specific measurements related to the ITB length should be included in future studies that were inaccessible due to limited resources. Improvements could be made to future range of motion assessment. Hip range of motion was assessed, however ranges such as adduction combined flexion, and therefore wasn’t a pure measurement. Careful monitoring to eliminate combined movements, such as extension combined with external rotation, must occur to obtain consistent, accurate readings. Unfortunately, this was not achieved consistently throughout the study. Although a goniometer was used, measurements were still objective and prone to human error. To improve this, at least three consecutive measurements of each range should be recorded and the average used to ensure consistency. In this study, only one measurement was taken pre and post treatment. Some of the myofascial techniques used combined active range of motion and passive stretching. A prospective study using only myofascial release may help to clarify if resulting gains in range of motion can be attributed to the modality being tested versus movement of the joint or passive tissue stretch. It is also possible that simply reducing the pain or normalizing tight soft tissues led to increased facilitation of the hip abductors and TFL rather than strengthening itself.

Conclusion

It appears that myofascial release may assist in normalizing tight tissue short-term and could be used as parallel therapy in ITOS rehabilitation. This study did not determine whether stretching or strengthening had a greater effect on ITOS although it seems that a combination of this program could help to alleviate some symptoms. Future studies investigating the effects of myofascial release on ITOS should rule out all variables influencing the condition as this study was not carried out in a controlled setting. A recommended future study using a control group to explore the effects of myofascial release combined with remedial exercise versus remedial exercise alone would be beneficial.

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Appendix 1: Pre and Post Treatment Measurements

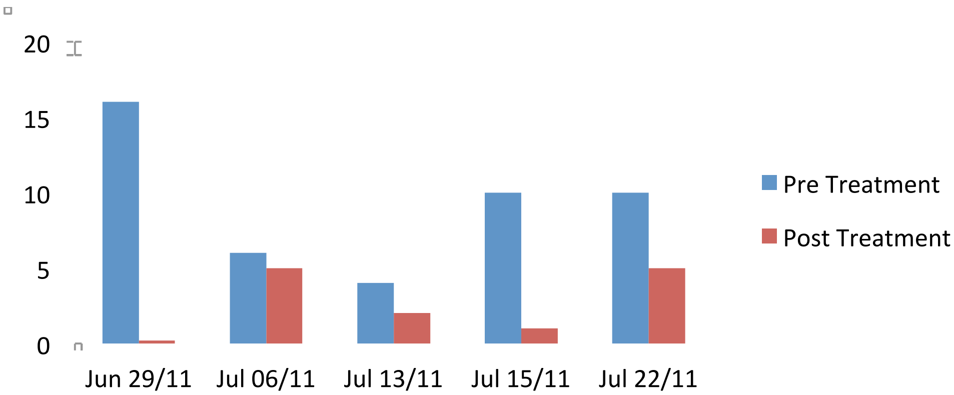

Figure 2. A comparison of hip flexion before and after treatment using the Thomas Test.

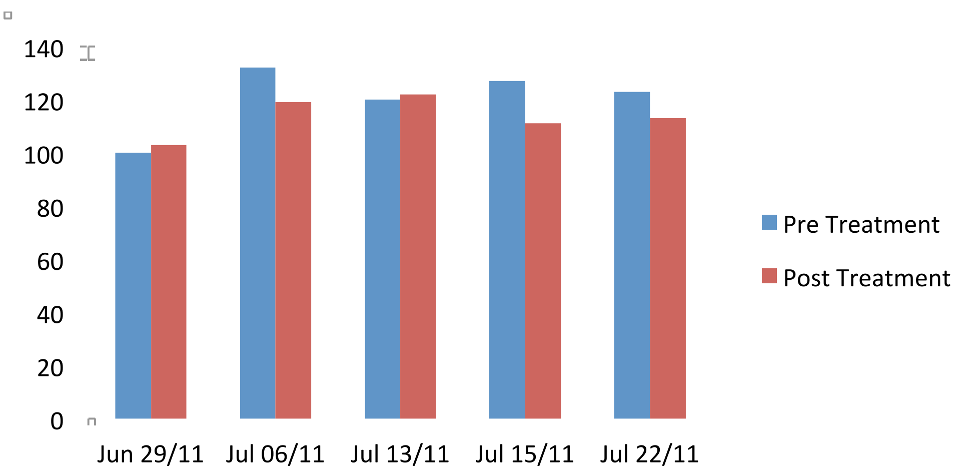

Figure 3. A comparison of knee flexion before and after treatment using the Kendall Test.

Appendix 2: Pre and Post Treatment Photographs

Figure 4a. Pre treatment #2

Figure 4b. Post treatment #2

Figure 5a. Pre treatment #4

Figure 5b. Post treatment #4

Figure 6a. Pre treatment #5

Figure 6b. Post treatment #5