Tensor Fascia Latae and Iliotibial Band

Functional Evaluation

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The tensor fascia latae (TFL) acts through the iliotibial tract by pulling it superiorly and anteriorly. It assists in flexing, medial rotation and abduction of the hip and extension of the knee joint. The TFL arises from the anterior part of the outer lip of the iliac crest, the lateral aspect of the anterior superior iliac spine and the upper part of the anterior border of the iliac wing. Keep in mind that in addition to arising from the iliac crest, the iliotibial band (ITB) attaches into the posterior gluteus maximus muscle in the back. When the TFL and gluteal muscles contract, they increase tension on the band. Often, one muscle dominates the movement pattern causing an imbalance to occur, which may lead to injury. When a muscle imbalance exists, some muscles are short (overactive) and others are long (underactive).1-7

Muscle length imbalance (or muscle weakness) is a common occurrence that occurs in the synergistic muscles in the hip:

*Flexors:* The TFL becomes short and the iliopsoas becomes a long and/or weak muscle.

*Hip abductors:* The TFL becomes short; the posterior gluteus medius becomes long (and/or weak).

The difference in the length of two synergistic muscles contributes to compensatory joint motion and the development of movement impairment. The weak muscle (iliopsoas or posterior gluteus medius) usually is associated with pain in the muscle belly, which is noted upon contraction or with palpation. The long muscle (iliopsoas or posterior gluteus medius) synergist will cause the pain to usually occur during hip-joint motion because the pain generator is the faulty control of the head of the femur in the acetabulum. The gluteus medius is the primary frontal-plane stabilizer of the hip. When it’s underactive, the TFL, adductor and the opposite quadratus lumborum (QL) become overactive.1

Shortened muscles over time can become structurally short and mechanically incapable of lengthening to an appropriate level.1-7 Long muscles can become structurally long and incapable of shortening to an appropriate level.5,6 When muscles are incapable of firing correctly, compensation occurs, and this will
alter joint motion from its normal path.

If you have been performing the overhead squat maneuver (described in previous articles), you will notice that the knees can drift inward or outward on the descent. The TFL is implicated as being overactive in both the knee moving inward and outward, which may seem to be a contradicting statement. The movement at the knee depends if the foot is in the open or closed chain. In the open chain, the TFL is a major abductor of the femur and is noted as being overactive when the gluteus medius and/or maximus are underactive.\textsuperscript{1,13,14} The gluteus medius and/or maximus have been shown to be prone to underactivity when the lack of activity leads to synergistic dominance or overactivity of other muscles.\textsuperscript{1,9,14} Overactivity (synergistic dominance) of the TFL, piriformis and biceps femoris can all stem from or lead to underactivity of the gluteus medius/maximus because they are each a functional synergists to the gluteal complex.\textsuperscript{1,9,14}

In the closed chain, the knee could move inward if the TFL is overactive doing the squat evaluation. The TFL (and the soleus, lateral gastrocnemius, biceps femoris) attaches to the lower leg and has the ability to produce external rotation of the lower leg.\textsuperscript{13,14} The TFL (and the adductor complex, biceps femoris [short head], and lateral gastrocnemius) affects either the femur and/or the lower leg. When overactive, these muscles can cause altered knee position.\textsuperscript{14} In conjunction, the medial hamstrings (particularly at the knee), gracilis, popliteus, medial gastrocnemius, and the gluteus medius and/or maximus are muscles which, when underactive, will allow the femur to adduct (internally rotate) and/or the lower leg to abduct (externally rotate).\textsuperscript{14}

The TFL (and biceps femoris [short head] and lateral gastrocnemius) crosses the knee joint (tibiofemoral joint) laterally. When overactive, as compared to the medial structures, it laterally pulls the femur and lower leg closer together in the frontal and transverse planes.\textsuperscript{14} Without adequate medial support, the knee is virtually pushed inward, resulting in the "knee-inward" compensation during the squat assessment.

The TFL, biceps femoris (long head), piriformis, gluteus minimus and medius all have an effect on the femur and when overactive can cause the knees to move outward during the overhead squat assessment.\textsuperscript{14}

\textbf{Common Stresses}

Intrinsic Factors/Causes of TFL-ITBS
1. Tightness in the TFL-ITBS. This is detected by performing the modified Ober’s test. The client is positioned in side-lying, with the unaffected side down. The pelvis and spine in neutral alignment and the bottom leg flexed for support. The uppermost leg is extended (although the leg may be flexed as much as 10 to 15 degrees, and the test still will be valid) and needs to be above the horizontal. The hip is laterally rotated and extended, as far as no lumbar extension occurs. Tell the client to actively flatten the waist towards the floor and actively hold the leg in slight abduction and lateral rotation. The knee is not locked and the foot is relaxed. The client is then instructed to slowly lower the leg towards the floor until the iliotibial band hangs on the greater trochanter and cannot lower any further. The key to an accurate test is not letting the pelvis move, either into lateral tilt, anterior tilt or rotation. As the leg lowers, the hip should not flex or medially rotate. It’s essential to maintain the laterally rotated position of the hip. Ideally, the leg should lower into at least 10 to 15 degrees adduction (approximately two to three inches above the floor for females and one to two inches above the floor for males) without loss of proximal control of the pelvis or hip. The iliotibial band lacks extensibility if the leg does not adduct sufficiently.

2. Myofascial restrictions in the hip and thigh musculature, which will increase tension on the band. The iliotibial band is not sensitive to mechanical stretch. The iliotibial band only becomes sensitive to mechanical stretch in the presence of inflammatory pathology. The client will describe fascial inflammation as "burning outer-thigh pain." Manual palpation can detect tension in the band. Visual postural analysis reveals a deep groove along the iliotibial band when it’s tight. With the client in the Modified Thomas test position, the tensor fascia latae is tested by adducting the horizontal thigh until the pelvis moves. This should be 15 to 20 degrees. Iliotibial band tightness is confirmed by restricted passive extension/adduction of the thigh with the knee flexed to 90 degrees.

3. Weakness in hip abductors (common in distance runners).

4. Weakness or poor control of knee muscles.

5. Dominance of anterior hip muscles, (TFL) over posterior hip muscles (gluts). Tight hip flexors cause the pelvis to rotate while walking. This leads to one side of the abdominals and one side of the gluteus medius shutting down.

6. Excessively flat feet or high arches. Poor instep strength is a cause of Achilles tendon inflammation and chronic knee pain from the iliotibial band attachment at the knee.

7. Bow legs or knock-knees.

8. Leg-length inequality.
9. Limited ankle ROM. During the overhead squat if the feet/toes externally rotate, this is usually associated with decreased ankle dorsiflexion and lateral gastrocnemius muscle tightness. During the overhead squat, when you observe the feet turn out, you likely may observe knee valgus (inward knee movement) due to increased hip adduction muscle activity. This must be resolved through mobilization, inhibition and muscle-lengthening procedures before moving up the kinetic chain. The biceps femoris (short head) and TFL also can cause the lower leg to abduct which can perpetuate eversion of the foot/ankle.\(^{14}\)

Extrinsic Factors/Causes of TFL-ITBS

1. Training errors (e.g. excessive mileage, sudden increase in mileage, sudden increase in intensity of training, too much hill work, running on crowned roads).
2. Worn-out running shoes. Top runners replace their running shoes every 250 to 300 miles. I’ll see clients who wear shoes up to 500-plus miles.
3. Overstriding.
4. Failing to warm up or cool down.

**Functional Testing of the TFL**

Have the client stand two to three inches from a wall with their feet together, with the sacrum and thoracic spine on the wall. The client should be able to contract the abdominal and gluteal muscles to flatten the lumbar spine onto the wall and hold it there. This test reveals the ability to self-correct a lumbar lordosis. If the client can’t posterior tilt the pelvis to flatten back on the wall, then the tensor fascia latae (TFL) and iliotibial band could be the cause. Have the client repeat the test with their feet shoulder-width apart. This unloads the TFL and IT band and enables the client to posterior tilt the pelvis to flatten back on to the wall. To correct this dysfunction, have the client repeat the test procedure with their feet shoulder-width apart, actively posterior tilting the pelvis and holding this position for 20 to 30 seconds and repeat the stretch three to five times. Over time, gradually bring the feet closer together. When the client can do it with their feet together have them rotate the hips out while actively posterior tilting the pelvis. A unilateral shortness of the TFL muscle can contribute to sacroiliac joint problems and restrict external hip rotation and extension. In terms of performance, it affects the swing phase of the leg during sprinting, because it causes the foot to swing out at toe-off and the foot to go medial and pronate at touchdown. This can be the cause of shin splints because of the rapid deceleration.
Treatment and Rehabilitation of TFL-ITB Syndrome:

Acute Phase

1. Ice.
2. Anti-inflammatory diet and supplements to reduce inflammation.
3. Activity modification. Stop the perpetuating factors that caused the irritation.
4. Sleep with a pillow between the knees to decrease tension on the ITB.

Subacute Phase

1. Massage, myofascial release techniques.
2. Address tight areas and trigger points. A foam roll is best for this.
3. Stretch the TFL-ITBS. The Modified Thomas maneuver is one way to manually stretch the TFL-ITBS. I prefer teaching clients the "standing self-stretch" method. For the right TFL-ITBS, stand in a split-leg stance with the right leg behind the left in a full stride stance. Externally rotate the right foot, leg and hip and maintain weight on the right foot. Raise the right arm straight overhead with the palm facing forward. Place the left hand on the left iliac crest and push with enough pressure from left to right to feel the stretch. Stand with a "tall spine" and slightly rotate the left shoulder anterior. You may need to slightly extend your torso to gain a greater stretch sensation. Hold this pose for 20-30 seconds and repeat this maneuver two to three times. Performing a gluteal bridge with the toes raised with adduction gets a stretch to the TFL as well.

Strength and Stability Phase

1. Bridging with single-leg raise. Repeat the movement up and down. Build up to one to two minutes of slow continuous movement.
2. Clam shell. The aim is to strengthen the gluteus medius. Lie on your side with your hips stacked one on top of the other and your legs together with the heels connected. Extend your lower arm, palm up, so that you can rest your head. Now angle your stacked thighs forward 30 to 45 degrees, without changing the position of your spine, which must be still in a straight line from your head to your tail. From this position, pre-contract the gluteus medius and lift the top leg. In the beginning, allow the heels to stay in contact. Do not let the pelvis rotate forward or backward. Lift the thigh up from the hip to its maximum height. Hold it up for 10 seconds and slowly bring it back down. Repeat this 10 times.
3. Standing with an elastic band around the knees, perform a single-leg/thigh abduction (one at a time) in a semi-squat position. Keep the big toe down on the ground. Build up to one to two minutes of continuous movement.

4. Step downs. Step down from a 2" to 6" stable step very slowly.

References


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