Dynamic Chiropractic

SPORTS / EXERCISE / FITNESS

Foot Inversion and Eversion Matter: Assessing Movement Patterns to Reveal Dysfunction

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Patients typically receive treatment and therapy while lying on a table – an environment that requires little to no stabilization because they are lying down. Gravity and load are off the table (pun intended). What happens when they stand up? Everything changes when their feet hit the ground! The body now has to control the force of gravity and function as an integrated kinetic chain to prevent falling. Now make it even more unstable by walking, where we spend 80 percent of our time on one foot. So, it's probably a good idea to assess the ability of the foot to control inversion and eversion effectively during foot strike and propulsion.

Stability rules the movement road. Stability is force control and the ability to pattern movement, otherwise known as motor control. Foot and ankle stability impact how fast and how well someone responds to adjustments and therapy. Stability is essential in order to maintain mobility, and up to 40 percent of muscle force transmission is due to fascia. Let's take a closer look at the muscular and fascial structures that impact foot inversion and eversion, and some ways to assess function.

Inversion / Eversion Anatomy

Inversion Muscles of Foot

- Tibialis anterior
- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus

Eversion Muscles of Foot

- Peroneus (fibularis) longus
- Peroneus (fibularis) brevis / tertius
- Extensor digitorum longus

The muscles of eversion and inversion are part of several full-body myofascial lines used for stabilization and force production. Thomas Myers' *Anatomy Trains* references several myofascial connections that are involved: deep front line, spiral line, lateral line, superficial front line and superficial back line.

Myofascial Connections and Motor Control Patterns

The myofascia of the deep front line (DFL) is strongly associated with support of the medial longitudinal arch and the midtarsal joints. The tendons of the flexor hallucis longus, flexor digitorum longus and tibialis posterior pull the foot into supination. These tendons load the foot for push-off (propulsion) and are an accessory part of the windlass mechanism.

The fascia in the deep compartment of the foot connects to the adductor complex in the thigh, which then merges into the iliacus, psoas, pectineus, quadratus lumborum and diaphragm. You can see how the foot intricately connects to the deep stabilization system of the body (DFL). One must have proximal stability for optimal distal mobility. If the motor control pattern of these muscles are dysfunctional, movement becomes restricted.

The tibialis posterior is a powerhouse supporter from the lower leg to the foot. Its tendon attaches to all of the middle metatarsals, navicular, all three cuneiforms and the cuboid. The tibialis posterior adds stability to the entire kinetic chain.

The tibialis anterior and the fibularis form a sling around the foot (fascial stirrup). This fascial boot is part of the spiral line of the fascia, and helps to control foot inversion and eversion. This stirrup impacts tranverse-plane rotational motion of the torso. Even though they are antagonistic to one another, they work together in moving the first metatarsal into the medial arch.

What you often discover in people who have inhibition in the primary muscles of inversion (tibialis posterior / anterior) and/or eversion (fibularis) is an over-recruitment of the toe flexors and extensors. Seeking the missing foundational stability, they recruit farther up the fascial chain and use more centralized muscles mentioned above (adductors, psoas, quadratus lumborum, etc.). This can lead to overuse, with musculoskeletal pain and discomfort in these areas. As Ida Rolf is famous for saying, "Where you think it is, it ain't."

Assessing Inversion / Eversion & Dysfunctional Stability Patterns

How can we assess these relationships? By observing movement. Martha Graham said, "Movement never lies. Nothing is more revealing than movement." Oh, how true that statement is in the pain game.

1. Observe the patient while they are standing with shoes off. Notice foot flare; weight distribution; foot arch. Follow posture all the way to the head and note compensation patterns.
2. Instruct the patient to perform single-leg stance and observe foot stability as they do so. Is the downward foot searching for stability? Check inversion, eversion patterns. Do the toes claw the ground for stability? This indicates the toes are overworking for larger muscles (glute max and hip stabilizers). The patient should be able to hold a single-leg stance for at least 30-40 seconds. Next, have them perform it with their eyes closed. They should be able to maintain the position for 20 seconds. If they cannot, there is proprioceptive dysfunction from the joints feeding back into the nervous system.
3. Instruct the patient to perform a double-stance calf raise slowly, taking 4 seconds to perform the movement. Observe the difference from one foot compared to the other. Can they supinate / invert at the top of the movement and control descent back to the floor? Next, have them perform the movement one foot at a time, taking 4 seconds to do the calf raise per side. Can they even perform it? Now you will see a difference in their ability to supinate from one side to the other. Inability to do this movement indicates inhibition in the tibias posterior and/or anterior.
4. Muscle test the tibialis anterior / posterior and fibularis. You often find inhibition in one or both of these muscles in relationship to the eversion muscles (fibularis). Inhibition leads to instability in the ankle complex and overcompensation higher up the movement chain, via fascial tensioning and joint fixations.

Correction Strategy

1. Soft-tissue release the tibialis posterior / anterior and fibularis.
2. Adjust subluxated joints in the foot and ankle complex.
3. Use kinesiology tape on the tibialis anterior and posterior. Tape adds proprioceptive feedback via stimulation to mechanoreceptors of the skin, giving the brain a better sense of environmental position.
4. Use a variable resistance band to strengthen inversion and eversion patterns of the foot before standing.
5. Load the foot with the patient standing.

There is no break in the continuity of living matter. Everything is connected. Take the necessary time in the beginning of the assessment process to see what foundation your patients are walking on when they leave the office. Integrating full-body movement into the evaluation and examination process can help guide you to the end result faster.

Resources

- Boyle M. *Advances in Functional Training: Training Techniques for Coaches, Personal Trainers and Athletes*. Santa Cruz, CA: On Target Publications, 2010.
- Cook G. *Movement: Functional Movement Systems: Screening, Assessment, & Corrective Strategies*. Aptos, CA: On Target Publications, 2010.
- Earls J. *Born to Walk: Myofascial Efficiency and the Body in Movement*. Berkeley, CA: North Atlantic Books, 2014.
- Myers TW. *Anatomy Trains: Myofascial Meridians for Manual and Movement Therapists.* Edinburgh, U.K.: Churchill Livingstone, 2001.
- Weinstock D. *NeuroKinetic Therapy: An Innovative Approach to Manual Muscle Testing*. Berkeley, CA: North Atlantic Books, 2010.

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