

The Inclined Posture (Tip): A New Clinical Entity

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Received: March 31, 2016; **Published:** July 20, 2016

The medical literature points to the fact that humans are not symmetrical. In over 60% of the population the two feet are not the same length and width and the muscle mass of almost any region on the left side, is different than that of the right [1-3]. The majority of our population exhibits some amount of variation when it comes to the lengths of our limbs, while functioning and The Inclined Posture [4], a previously unrecognized entity, deserves early recognition and treatment due to the fact that our population is living longer lives and extending its quality of life.

Clinically, The Inclined Posture (TIP) exists when there are differences in the length, strength and/or structure of a person's limbs but unless the difference in limbs is greater than 1.5 centimeters (i.e. a limb length discrepancy or LLD), it is difficult to determine its origin and impossible to accurately measure its existence [5]. This means that The Inclined Posture is a clinical entity diagnosed by confirming the existence of specific compensatory signs and symptoms that develop in affected subjects as they try to maintain center of gravity and balanced posture over a lifetime.

The inclined posture compensates at specific locations of the postural chain when performing specific activities [6]. For example, when standing still, the pelvis tilts downward to the short side and when walking, the short side supinates at the subtalar joint as the long side pronates. It is important to note that if closed chain asymmetry is present in subjects without taxing the posture, the signs and symptoms of TIP do not develop and by definition The Inclined Posture does not exist. On the other hand, when the signs and symptoms of the inclined posture are present in subjects they reflect the existence of pathology in the postural chain and therefore, by definition, TIP exists (Figure 1).

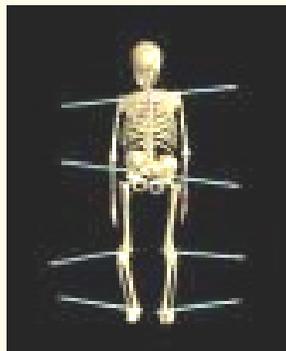


Figure 1: *The Inclined Posture.*

The effects of The Inclined Posture are progressive and degenerative and since it affects a majority of people, TIP plays an important role as a component of many overuse syndromes, postural degenerations, deformities, and performance issues.

The Functional Equinovarus of the Joints of the Ankle or The FEJA Test and TIP Confirmatory Tests, Signs and Symptoms.

Diagnostic Test for The Inclined Posture: The Functional Equinovarus of the Joints of the Ankle Test (FEJA Test, for short) [7]

The FEJA Test is based upon the fact that functionally, if TIP exists, the long side is compensating to shorten and the short side is compensating to lengthen. Eventually there are soft tissue and adaptive osseous changes, in specific locations, that can be used diagnostically.

In the functional lower extremity biomechanics (FLEB) literature, Mann and Inman call the ankle joint and the subtalar joint “the joints of the ankle” and located them as the primary compensators of the lower extremities [8]. These two joints, as a unit, become the first line of compensation and the first areas where fixed changes occur in reaction to the inclined posture. When comparing a pair of limbs, The Inclined Posture exists if there is a relative Equinus deformity between Ankle Joints and a relative Varus deformity between Subtalar Joints, until proven otherwise. This diagnostic test for The Inclined Posture is called The Functional Equinovarus of the Joints of the Ankle or FEJA Test for short.

The Inclined Posture compensates in the sagittal plane of the long side ankle joint by dorsiflexing in order to shorten its limb. On the other hand, the short side ankle joint compensates by plantarflexing in order to lengthen its limb. This balances the incline on the sagittal plane seen in TIP. In time, soft tissue contractures create a relative difference in dorsi-plantar flexion of both ankles with the short side being plantar flexed (in relative equinus).

The Functional Equinus portion of The FEJA Test is performed by forcibly dorsiflexing the ankle joint of both limbs and noting any difference when measured (Figure 2).

If the inclined posture and its concomitant factors are enough to cause internal compensation, the side with a relative plantarflexion (equinus) in relation to its mate is the short side until proven otherwise.



Figure 2: The Functional Equinus portion of The FEJA Test.

The Inclined Posture compensates in the frontal Figure 1 plane of the long side subtalar joint by pronating (inverting) in order to shorten its limb. On the other hand, the short side subtalar joint compensates by supinating (everting) in order to lengthen its limb. In time, soft tissue contractures create a relative difference in inversion/eversion of both subtalar joints with the short side being inverted (in relative varus).

The Functional Varus portion of The FEJA Test is performed by forcibly inverting the subtalar joint of both feet and noting any difference when measured the comparative difference (Figure 3).

If the inclined posture and its concomitant factors are enough to cause internal compensation, the side with a relative varus position in relation to its mate is the short side until proven otherwise.



Figure 3: The Functional Varus portion of The FEJA Test.

In summary, a positive FEJA Test exists when one limb (the short side until proven otherwise) has both a relative plantarflexion (reduced dorsiflexion) when comparing the ankle joints and a relative varus (increased inversion) when comparing the subtalar joints.

The FEJA Test is reported as a positive test for the short side of The Inclined Posture (i.e. FEJA +, Left). Since the amount of Equinus and Varus are relative, exact measurements are not necessary for a positive FEJA Test and depending on planal dominance; the equinus or varus component of the FEJA Test differs for each patient with one or the other dominating.

TIP Confirmatory Tests, Signs and Symptoms

Weighing Scales

Observe the patient marching in angle and base of gait for 10 seconds and then ask the patient to freeze. The separation of the feet and the angle which they sit determine the angle and base of gait. Trace the patient's footprints, and in those footprints, put two weigh scales. Then ask the patient to step on the scales. Since TIP causes a person to shift weight to the short side in stance, if the scales do not read the same, the greater of the two readings will be on the short side.

Gait Pattern Confirmatories

TIP shows predictable changes in gait that reflect the asymmetry in the feet and posture. There is a longer stride length on the long side with a longer foot plant. There is a relative external rotation of the hip and limb on the short side with a greater arm swing when comparing the short side to the long side. There is a relative flatter arch (pronation) when comparing the long side to the short (or a relative higher arch on the short side (supination)).

A Unilateral Postural Complaint, or a bilateral complaint that develops from a one sided complaint. I.e. unilateral Bunion, heel spur, plantar fasciitis, ankle, knee and hip arthritis and pain syndromes. Unilateral nerve problems such as sciatica

The increased work accepted by the longer side with every active step and movement, in subjects with TIP, places greater stress upon the joints, muscles, tendons, and ligaments of the long side. Overuse syndromes and progressive degenerative syndromes attack overstressed locations in the posture with the most force and early. This results in additional compensation in these locations in the posture with early pathology and symptoms [11].

Unequal Shoe Wear Pattern

With the increased inversion noted at the subtalar joint of the short side, bony adaptation in addition to contractures of the associated musculature, capsular, tendon and ligament soft tissue structures fix the subtalar joint in more varus than its mate. During the heel contact phase of the gait cycle the short sided heel is contacting the ground more supinated and this leads to additional lateral wear of the shoe.

The additional weight and time that the long side spends in active function in subjects with TIP leads to increased total shoe wear on the long side.

Excess Lateral Column Callus on the short side

The increased weight on the lateral column as a result of the varus loading on the short sided heel, in gait, results in the existence of a unilateral or a more extensive 5th metatarsal callus on the short side. In The Flexible Functional Foot Types, this can also lead to increased callus under the 2nd metatarsal.

Low Back Pain or one side dominated sciatica, A Pelvic Tilt in angle and base of gait, to the short side and/or A Shoulder Girdle Tilt in angle and base of gait, to the long side [12]

In TIP, at the level of the pelvis, one limb is functionally (or structurally) longer than its mate. This fact causes a downward tilt in the pelvic girdle from the vertical lopsided towards the short side (Figure 4)

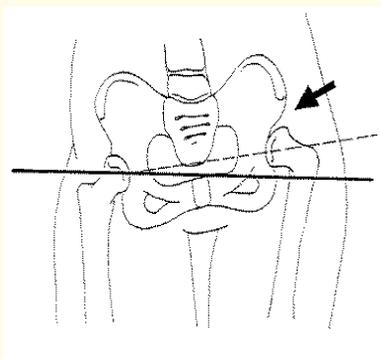


Figure 4: The Pelvic Tilt Angle.

Note the downward tilt to the short right side.

This can be measured or “eyeballed” by placing markers on both anterior superior iliac spines (ASIS’s) and noting the presence of the incline (i.e. The Leaning Tower of Pisa). This incline of the pelvic girdle with the short side lower causes L-5/S-1 and L-4/L-5 degeneration and low back pain and radiculopathy. In order to maintain the center of gravity and erect posture, the lumbar vertebrae shift towards the long side and form a concavity. This compresses the lumbar nerves on the long side and leads to compression and eventual sciatica on the long side. The curvature in the spine tapers and becomes less exaggerated as it extends all the way to the shoulder girdle. At the shoulder girdle, the compensatory need to keep the center of gravity causes a tilt with the long side lower.

The Long Sided Foot is Larger, longer and/or wider and reveals an Increase in Pronation when compared to the short side in angle and base of gait.

The long sided foot accepts a dominant role in stance and in function and performs more work than its mate. Over a lifetime, this is reflected with greater muscle mass, bone density, supportive tissue as well as a widening of the longer foot. This translates into the fact that the long sided foot, in TIP, is larger than its mate both in length and girth.

Larger Mass on the Long Sided Limb (i.e. calf, thigh)

Since, functionally, the long side dominants in subjects with TIP, the compensatory increase in muscle mass, bone density and connective tissue strength leads to the long sided limb developing larger than its mate.

Walking Down Stairs

Observe the subject walking down a flight of stairs. Due to the compensatory abduction of the short sided hip, the angle of gait will appear windswept to the short side if TIP is present. If it is not present the angle of gait will appear relatively straight.

Confirmatory Signs	Long Side	Short Side
Scales	Decreased Weight	Increased Weight
Gait Pattern	Long Foot Plant	External Rotation of the Hip
Foot Pathology	Increased	If Present not as Significant as Long Side
Shoe Wear	Increased Total Shoe Wear	Increased Lateral Shoe Wear
Callus Formation	Focused Around Pathology	Lateral Callus Formation
Pelvic Tilt	Higher	Lower
Shoulder Tilt	Lower	Higher
Back Pain/ Sciatica	Present	Absent/Reduced
Foot Positioning	STJ Pronation, Normal Ankle ROM	Inversion, Reduced Ankle ROM
Stair Walking	Normal	Windswept to Short Side
Musculature	Increased	Normal

Table 1: Confirmatory Signs of TIP (Approved).

The Diagnosis of the Inclined Posture

The inclined posture exists in a subject when there is a positive FEJA Test and the existence of two or more of the confirmatory tests and signs, until proven otherwise.

Treatment for the Inclined Posture (TIP)

TIP and Functional Foot Typing [10] Pads (Foot Centering Pad)

Initially, The Inclined Posture can be compensated by placing a heel pad of one eighth to one quarter of an inch thick in the heel of the shoe on the side showing a positive FEJA Test. Materials can vary but adhesive felt is a readily available option. There should be an immediate improvement of most of the signs of TIP and the pad can be adhered to the shoe or moved from shoe to shoe daily. Simultaneously, rear foot, medial arch and forefoot pads can be adhered to a shoe to decompensate the subjects Functional Foot Type, if pathologic.

Foot Centering Orthotics (Foot Centrings®)

Custom Foot Orthotics called foot centering orthotics are used to treat The Inclined Posture as the previous generation is only treating limb length discrepancies 10-12% of the time at the four largest orthotic labs in the USA [9]. They are fabricated in pairs and have three basic components, a semi rigid thermoplastic shell created from a non weightbearing Optimal Functional Position cast corrected for each foot, asymmetric rearfoot posting and a heel lift on the limb having the positive FEJA test.

The semi rigid thermoplastic shell should be fabricated from a non weightbearing FFT-specific or cast corrected plaster cast in order to capture the Functional Foot Type of the subject and the anatomical differences in the two feet.

The asymmetric rearfoot posts should be fabricated in shock absorbing crepe or a similar material and should reflect the functional difference of the subtalar joint of each foot since the short side (+FEJA) will have a neutral position in greater varus than the long side. The thicker rear foot posting on the short side will add lift to the short side as it compensates for the additional varus deformity on the frontal plane.

A heel lift fabricated in shock absorbing crepe or a similar material can be added to the rearfoot of the short side (+ FEJA) if the amount of TIP deformity needing compensation is greater than the asymmetric rear foot posts can accomplish.

Sole Heel Lifts or a Sole Platform Raising the Short Side Shoe

If the inclined posture is excessive (i.e. A diagnosed Limb Length Discrepancy) and cannot be compensated in the inside of a shoe than a heel lift tapered to the heads of the metatarsals or a platform lift of appropriate thickness can be added to the Outer Sole of the shoe on the short side.

Bibliography

1. Subotnick SI. "The Short Leg Syndrome". *Journal of the American Podiatric Medical Association* 66 (1976): 720-723.
2. Blustein S D Amico J. "Limb Length Discrepancy Identification: *Clinical Significance, and Management*"; *JAPMA* 75.4 (1985): 200-206.
3. Wernick J and Volpe R. "Lower Extremity Function and Mechanics Chapter 1 in *Clinical Biomechanics of the Lower Extremities*". Valmassey, Mosby Publishing, San Francisco (1996).
4. Shavelson D and Lubell K. "The Unequal Limb, Sports Medicine 80". *Futura Publishing Company*, Mt Kisco, NY (1980).
5. Burke G. "Leg Length Discrepancy". *Gait and Posture* 15 (2002): 196-206.
6. Lawrence D. "Chiropractic Concepts of the Short leg". *A Critical Review Journal of Manipulative and Physiological Therapeutics* 8.3 (1985): 157-161.
7. Shavelson D. "The Diabetic Foot in Principles of Diabetes Mellitus". Edited by Poretzsky, L Kluwer Academic Publishers Boston (2002).
8. Mann RA, Inman VT. *The joints of the ankle*. Baltimore: Williams & Wilkins, 1976.
9. Informal poll taken of orthotic laboratories by corresponding author (2004).
10. Shavelson D. "Neoteric Biomechanics". *Podiatry Today* 3 (2007): 66-70.
11. Friberg. "Ora Leg Length Discrepancy in Stress Fractures" *Journal of Sports Medicine* 22 (1982): 485-489.
12. Friberg. "Ora Clinical Symptoms and Biomechanics of Lumbar Spine and Hip Joint in Limb Length Inequality". *Spine Journal* 8.6 (1983): 643-651.

Volume 3 Issue 4 July 2016

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