Orthotic Postural Stabilization

Dr. Lee S Cohen
Podiatric Consultant to:
✓ The Philadelphia Eagles
✓ The Philadelphia 76ers
✓ The Philadelphia Wings
Basic Foot Biomechanics

✓ Mobile Adaptor
✓ Rigid Lever
The Three Phases of Gait

- Contact Phase
- Mid-Stance Phase
- Propulsive Phase
How the Foot Works As an Adaptor/Lever

- Heel strike to 25% of the gait cycle, foot pronates to adapt to terrain
- 25% of gait mid-stance on foot begins to supinate to prepare rigid lever for propulsion
Pathomechanics of the Adaptor/Lever

✓ Failure to or delay in sequence of event from pronation supination

✓ Here in lies the basis for 95% of the mechanical symptoms that occur in the foot and leg

- Contracted Toes
- Heel Spurs
- Shin Splints
- Low Back Discomfort
- Fatigue
Biomechanical Criteria for Normalcy

- Distal one third of the leg is vertical
- The knee, ankle, and subtalar joints lie in the transverse plan closely parallel to the supporting surface
- STJ rest in its neutral position
- The bisection of the posterior surface of the calcaneus is vertical
- Mid foot locked in against rearfoot in stance
- Forefoot parallel to rear foot all metatarsals are the same plane
Abnormal  Normal  Abnormal

Inverted  Everted  Everted

Inverted  Everted

10°
Abnormal

Normal

Abnormal

Understanding

Normal
Subtalar Varus (calcaneal varus)

Mechanism of compensation

Appearance of neutral position
Appearance of compensated subtalar varus

Compensation by pronation of the subtalar joint until the medial side of the rearfoot and forefoot contact the weight bearing surface.

Clinical observations

Dorsal
- Dorso-medial bunion, HD- 5th toe, Hammer toes, Tailor’s bunion.

Plantar
- Plantar callosus - most common under 2 but also 3 & 4 with possible nucleus.

Posterior
- Haglund’s deformity

Symptoms
- Leg fatigue and nocturnal leg cramp
- Low back pain or fatigue
- Lateral ankle sprains
Forefoot Varus (Supinatus)

**Mechanism of compensation**
- Appearance of neutral position (Subtalar joint neutral, forefoot inverted).
- Appearance of compensated forefoot varus (Heel everted, forefoot on ground).
- Compensation by pronation of the subtalar joint until the medial side of the foot reaches the ground.

**Clinical observations**
- **Dorsal**
  - Hallux abducto valgus.
  - Hallux limitus/rigidus.
  - 5th toe H.D. Overlapping toes, especially 2nd.

- **Plantar**
  - Plantar Callous most common, under 2 but also 3 and 4 with possible nucleus.

- **Frontal**
  - Genu valgum.

- **X Ray**
  - Calcaneal spur.
  - Genu valgum.

**Symptoms**
- Hallux bursa
- Metatarsalgia
- Chronic low back pain
- Inferior calcaneal bursitis
  
- Plantar fascitis
- Severe fatigue
- Sciatica
Forefoot Valgus and Plantarflexed 1st Ray (rigid)

Appearance of neutral position
(Compensates by supination of subtalar joint and dorsiflexion of the ankle)

Forefoot Valgus or Rigid Plantarflexed 1st Ray
Compensated Position
Either foot type compensates by subtalar joint supination. When compensation is in the mid tarsal joint and first ray, joint motion is not available.

Symptoms
(May have)
Tendency for:
Chronic lateral ankle sprain, Haglund’s deformity, unstable gait, sesamoiditis, Morton’s neuralgia, leg and thigh fatigue/strain, sciatica, stress fracture and lateral knee pain.
Plantarflexed 1st Ray (flexible)
Plantarflexed 1st Ray (flexible cont.)
Mechanism of Compensation

Mechanism of Compensation

Compensates by dorsiflexing the 1st ray and subtalar joint pronation.

Figure B
Perpendicular to the heel with no forefoot deformity

Figure C

Compensates by subtalar joint pronation, midtarsal joint supination and dorsiflexion of 1st ray.

Figure D
Inverted to the heel as in a forefoot with varus deformity

Figure E
Change in Architecture of the Foot
Treatment Objective
Inverted Calcaneus is seen in the following clinical situations:

- Uncompensated rearfoot varus
- Partially compensated rearfoot varus
- Rigid forefoot valgus
- Also normal for rigid cavus foot type or rigid plantar flexed 1st ray
- A unilateral inverted calcaneus as a compensated for a short limb
Vertical Calcaneus is seen in the following clinical situations:

- Considered a normal position for the calcaneus in static stance
- May be present in compensated rearfoot varus
- Uncompensated forefoot varus
- Flexible forefoot valgus
Everted Calcaneus is seen in the following clinical situations:

- Partially compensated or compensated forefoot varus
- Forefoot Supination
- Compensated congenital gastrocnemius equinus
- Compensated transverse plane pronation condition
- Ankle valgus, calcaneal valgus, ankle valgus, congenital convex pes valgus (rigid vertical talus), and a peroneal spastic flatfoot
- Unilateral everted calcaneus may demonstrate a compensation for long limb
Posterior Tibial Shin Splints
Anterior Shin Splint

Diagram of the anterior shin splint area, showing the Tibialis Anterior muscle, Area of Pain, and Extensor digitorum longus muscle.
Orthotic Prescription

1. Type of Material

✓ Rigid
✓ Semi-rigid
✓ Soft

Selection process must include:
- Amount of deformity/type of deformity
- Type of activity
- Type of problem (symptom complex)
- Athlete/patient weight
- What do you hope to accomplish
Orthotic Prescription (cont.)

2. Material Thickness
   • Pain of patient
   • Weight of patient
   • Patient Activity

3. Forefoot Correction
   • Amount of correction
   • How correction accomplished

4. Rearfoot Correction
   • Amount of correction
   • How correction accomplished

5. Top Cover

6. Temporary Measures
Thank you for your attention on this beautiful day!