SECTION 2 – CLINICALLY SIGNIFICANT FOOT TYPES

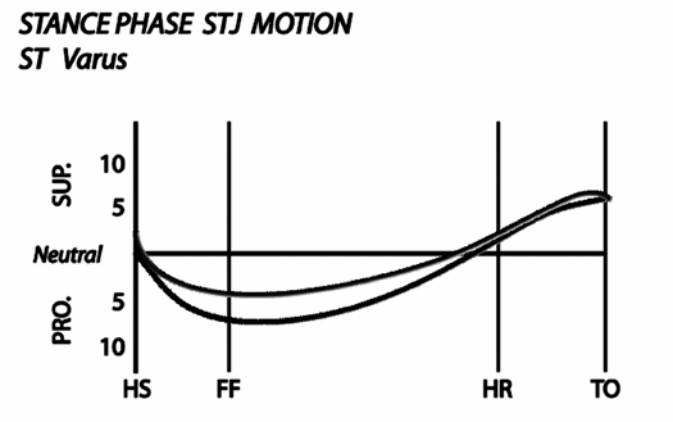
SUBTALAR VARUS

Osseous Deformity of calcaneus

Inverted position of calcaneus to lower leg (STJN, MTJP).

Function

First goal of the foot is get the condyles of the calcaneus to the ground. When there is a subtalar or calcaneal varus deformity and the subtalar joint has enough motion to compensate, the subtalar joint pronates (calcaneus everts) to a vertical position allowing the condyles to get to the ground. This causes the foot to remain partially or fully pronated until heel off resulting in an inability for the STJ to become supinated during propulsion. Hypermobility of the midtarsal joint and a functionally "unstable" first ray are present. This early contact phase pronation occurs at a faster velocity and a greater amount depending on the size of the deformity. A medial heel whip may be seen during early propulsion in an effort to resupinate the STJ.



Pathology

Associated with subtalar joint varus - early contact phase excessive or prolonged pronation.

"Shin Splints"
Achilles Tendinitis
Tarsal Tunnel
"Pump Bump"
Plantar Fasciitis
Patellofemoral Disorders

Intervention

RF control, Post extrinsic RF varus, Shell DHS, Skive, think more rigid

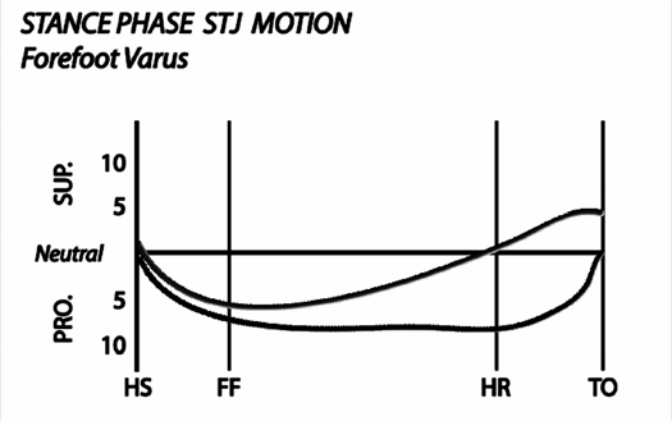
COMPENSATED FOREFOOT VARUS

STJ HAS MOBILITY

Osseous deformity of the forefoot

Inverted position of the forefoot relative to the calcaneal bisection, with STJN & OMJA fully pronated.

The foot with a compensated forefoot varus requires STJ pronation to get the metatarsal heads to the ground. The calcaneus therefore, everts beyond vertical and the STJ is maintained in a fully pronated position throughout propulsion. The foot is hypermobile during the latter part of midstance and through propulsion.



Pathology

Associated with forefoot varus – compensated

Metatarsalgia	Achilles Tendinitis
2nd Metatarsal Fracture	Patellofemoral Disorders
H.A.V.	ACL Injury
Plantar Fasciitis	Medial Knee/Ankle Pain
Peroneus Longus Tendinitis	Lumbar spine
Tarsal Tunnel	SI Joint Dysfunction
Neuroma	Trochanteric Bursitis
Bursitis	

Intervention

FF control, post FF varus extrinsic up to 8°, Shell intrinsic posting up to 6°, flanges

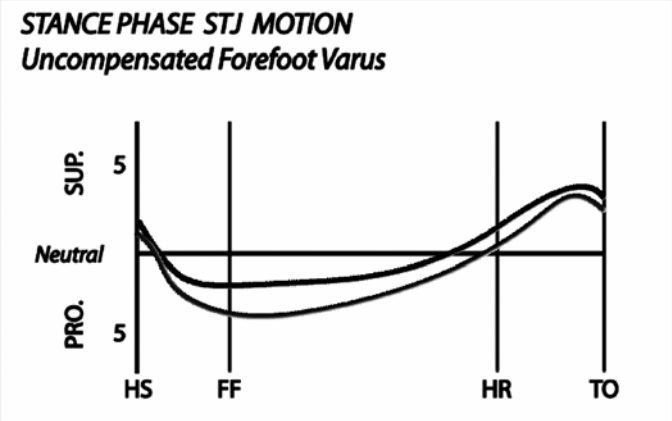
UNCOMPENSATED FOREFOOT VARUS

STJ LACKS MOBILITY OR MEDIAL SIDE IS PAINFUL

Osseous deformity of the forefoot

Inverted position of the forefoot relative to the calcaneal bisection (STJN, MTJP).

With an uncompensated forefoot varus the STJ is unable to fully evert for the forefoot varus deformity. The calcaneus does not evert past vertical and the medial column of the foot is not stabilized. This foot is unable to absorb shock, limb rotation and adapt to uneven surfaces.



Pathology

Associated with ***uncompensated*** forefoot varus

- Stress Fracture 5th
- Stress Fracture Fibula
- Lateral Ankle Sprains
- STJ & TCJ Capsular pain -dorsum of the foot

Intervention

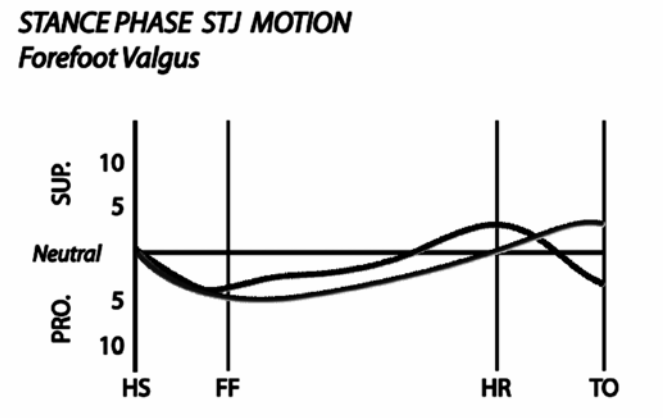
- FF control
- RF mobilization
- Post - soft FF varus extrinsic max 4°
- Shell – think more flexible, avoid intrinsic post

FOREFOOT VALGUS FIXED OSSEOUS

Osseous Deformity of the Forefoot

Everted position of the forefoot relative to the calcaneal bisection (STJN, MTJP).

As the foot is loaded the medial column loads prematurely. When the forefoot valgus is significant there will be a limitation of forefoot inversion on the rearfoot. Supinatory compensation of the STJ occurs during the midstance period resulting in a decreased amount of shock absorption and lateral instability just prior to heel off. In order to overcome this instability the subtalar joint undergoes a sudden pronation at heel off resulting in hypermobility.



Pathology

Associated with ***Rigid*** Forefoot Valgus:

- Stress Fracture 5th
- Stress Fracture Fibula
- Lateral Ankle Sprains
- Lateral Hip Pain
- Sesamoiditis
- Metatarsalgia
- HAV
- Lateral Knee Pain - popliteus, ITB
- Medial Knee Pain – Hamstring

Intervention

- FF control
- Post FF valgus, extrinsic max 4”
- Shell – think more flexible

INFLUENCE OF THE 1ST RAY ON THE FOREFOOT TO REARFOOT ALIGNMENT

The position of the 1st ray can influence the appearance of the non weight-bearing forefoot to rearfoot alignment examination. Once an altered position of the 1st ray (not central or neutral) is established. The position of metatarsals 2-5 should be evaluated.

Plantarflexed 1st: Neutral 2-5

Will present as a forefoot valgus relationship.

If flexible will function as a normal foot.

Pathology - if prolonged pronation is noted. The 1st ray is not the cause.

Reevaluate the rearfoot to lower leg alignment and any extrinsic factors (tight gastrocnemius/soleus). Pathology could be similar to that of rearfoot varus.

Intervention – RF control, shell extrinsic,1st cut out.

If rigid will function with compensatory supination at the level of rigidity of 1st. Ray.

Pathology - same as fixed osseous valgus deformity

Intervention - Forefoot control, Shell – think flexible,1st ray cut out – Post 1/8" bar 2-5.

Plantarflexed 1st: 2-5 Valgus

Will present as a forefoot valgus relationship**.**

If flexible or rigid will function with compensatory supination. Rigid will compensate more.

Pathology - same as forefoot valgus fixed osseous deformity

Intervention - FF control rigid 1st, shell cut out; flexible FF control 2-5 valgus post 1st cut out

INFLUENCE OF THE 1ST RAY ON THE FOREFOOT TO REARFOOT ALIGNMENT

Plantarflexed 1st: 2-5 Varus: can present as…

a valgus (mild 2-5 varus) forefoot relationship,

a neutral (moderate 2-5 varus) forefoot relationship,

a varus (severe 2-5 varus) forefoot relationship.

If flexible will excessively pronate to the level of the 2-5 varus deformity.

Pathology - same as forefoot varus

Intervention - FF control, post FF varus extrinsic, shell – think more rigid, 1st cut out

If rigid will function like the 1-5 relationship.

Pathology – same as previous forefoot types

Intervention – depends upon function

VALGUS – TREAT AS PF RIGID 1ST

Neutral – cut out 1st

Varus – cut out 1st, 2-5 varus post

MIDTARSAL JOINT HYPERMOBILITY

Forefoot to rearfoot alignment is perpendicular.

A fully supinated STJ results in an "unlocked" MTJ. Can be seen as: Oblique Axis Compensation - hypermobility or laxity of the oblique axis results in an inability of the foot to resupinate and is characterized by an abductory moment during the propulsive phase of gait. The STJ does not evert past vertical but a collapse of the midfoot is noted.

Pathology

Metatarsalgia
HAV
2nd met fracture
Plantar fasciitis
Tarsal tunnel
Neuroma
Achillies tendinitis/bursitis
Lumbar spine strain
SI joint dysfunction
Trochanteric Bursitis

Intervention

Midfoot control, forefoot wedge to sulcus;
Shell – think semi flexible, ICA, flanges, MAP

FIRST RAY INSTABILITY

Forefoot to rearfoot alignment is perpendicular.

When the foot is abnormally pronated in midstance or propulsion the base of the first ray approaches the plantar aspect of the cuboid. This change in position results in peroneus longus loosing its vertical vector in favor of an increased horizontal vector. This results in the inability of peroneus to stabilize the first ray against ground reaction force resulting in an “UNSTABLE” first ray. This results in loss of hallux extension and a decreased stride length (functional Hallux Limitus, fHL) and an inefficient windlass mechanism.

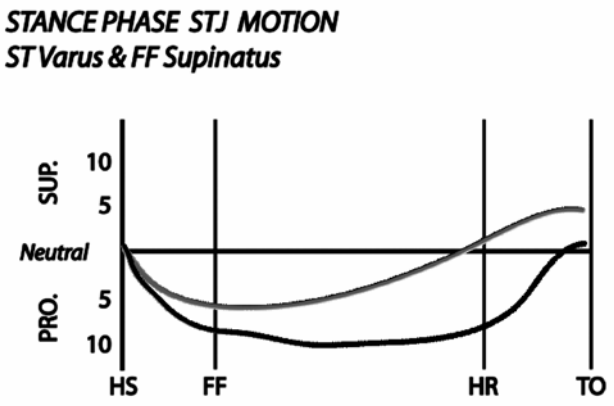
Pathology - Low back pain

Intervention - evaluate RF including extrinsic factors. Treat RF varus post, DHS. Shell think more rigid, 1st cut out

FOREFOOT SUPINATUS

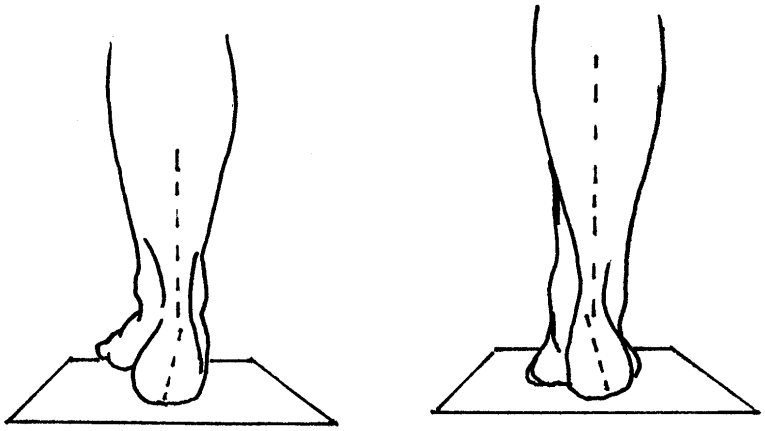
Soft tissue deformity in the mid-foot results in forefoot frontal plane mal-alignment. The plane of the forefoot is inverted to the calcaneal bisection. Looks like a forefoot varus but feels different.

A limitation of longitudinal axis eversion is noted with a soft tissue end-feel. This foot type functions like a forefoot varus. Etiology: a large rearfoot varus + extrinsic factors forces the forefoot into an inverted and traps it against the ground as the proximal segment moves over the distal segment.



Pathology - same as both forefoot and rearfoot varus combined

Intervention - mobilize LAMTJ, aggressive rearfoot post, rehab if use an orthotic wedge it don't post it.



FF EQUINUS INFLUENCE ON THE OMJA AND STJ

Forefoot to Rearfoot Alignment is Deviated in the Sagital Plane

The foot presents with a forefoot that is plantarflexed relative to the rearfoot, tansitioning at calcaneocuboid joint. This deviation is the result of congenital plantarflexed alignment of the midtarsal and/or tarsometatarsal joints. This mal-alignment is assessed along the lateral column, sagital plane in off weight bearing (STJ neutral position, OMJA fully pronated).

FULLY COMPENSATED, OMJA HAS MOBILITY

A fully loaded OMJA in stance or gait results in FF Abduction/Dorsiflexion and "unlocked" MTJ. This can be seen as: Oblique Axis Compensation - hypermobility or instability. It results in an inability of the foot to resupinate and is characterized by an abductory moment of the forefoot during mid-stance or propulsive phases of gait. The STJ does not necessarily evert past vertical. but is likely to remain pronated through late mid-stance.

Pathology

Metatarsalgia
HAV
2^{nd} met fracture
Plantar fascitis
Tarsal tunnel
Neuroma
Achillies tendonitis/bursitis
Lumbar spine strain
SI joint dysfunction
Trochanteric Bursitis

Intervention

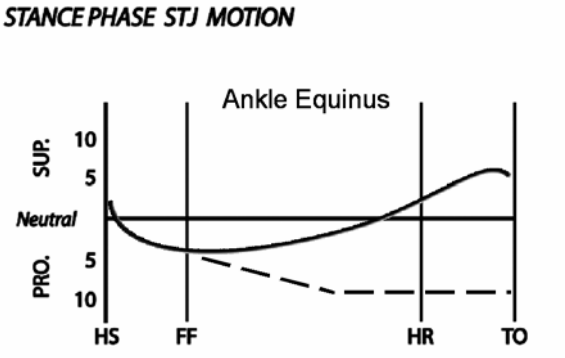
Deep Heel Seat; Heel Lifts; Lift on Heel of Shoe
Shell – Semi-Rigid, M.A.P.

ANKLE EQUINUS INFLUENCE ON THE OMJA AND STJ

Ankle RO.M. (Dorsiflexion) is Restricted in the Sagital Plane

The ankle presents with passive dorsiflexion that is limited to less than 10º dorsiflexion, past a 90º angle between the fibula and lateral margin of the calcaneus. This deviation is the result of congenital plantarflexed alignment at the ankle, or more commonly tight/short gastroc, soleus or other posterior muscles that restrict passive ankle dorsiflexion.

Premature tension at the posterior calcaneus pulls up on the bone, rocking it into plantarflexion. The STJ, having dorsiflexion as a component motion, can pronate to compensate. The OMJ in late mid-stance, having significant available dorsiflexion, often pronates to compensate. It results in an inability of the foot to resupinate and is characterized by pronatory moments at the rearfoot and mid-foot during contact and mid-stance phases of gait. The STJ does not necessarily evert past vertical, but often remains pronated into late mid-stance.



Pathology

Metatarsalgia
HAV
2nd met fracture
Plantar fasciitis
Achillies tendinitis/bursitis
SI joint dysfunction
Trochanteric Bursitis

Intervention

Deep Heel Seat; Heel Lifts; Lift on Heel of Shoe
Shell – Semi-Rigid or softer, M.A.P., **LOWER LA**.