

Foot Pain

"Pronatory Disorder"

ICD-9-CM: 734 Flat foot (pes planus-acquired)

Diagnostic Criteria

History: Aching in arch of foot - worse after prolonged weight bearing

Physical Exam: Excessive pronation at loading response and mid-stance (talonavicular joint) terminal stance (calcaneocuboid) joint
 Delayed or absent mid-tarsal or forefoot supination (normal = supination begins immediately following loading response)
 Inability to form rigid arch with lower external rotation when weight bearing or with full calcaneal inversion when non weight-bearing

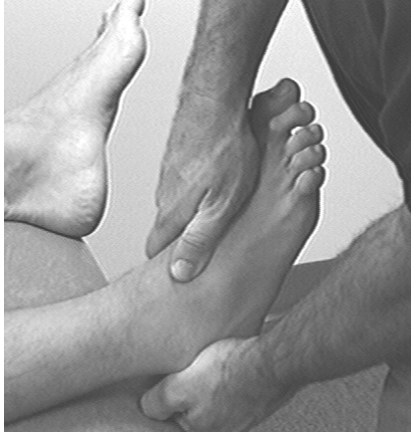


Tibial Internal Rotation Normal Foot Pronation

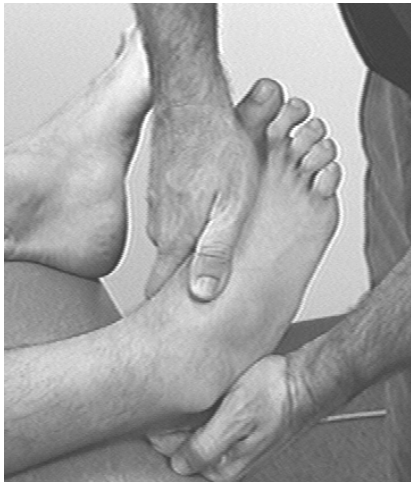


Tibial External Rotation Normal Foot Supination

Cues: Pronatory disorder - foot remains pronated with tibial external rotation



Longitudinal Mid Tarsal Joint Axis Mobile with Calcaneal Eversion



Longitudinal Mid Tarsal Joint Axis Rigid with Calcaneal Inversion

Cues: Grasp navicular and 1st cuneiform

Supinate and pronate wrist to provide inversion and eversion motion - compare mobility with full calcaneal eversion and full calcaneal inversion

Normal - LMTJ axis becomes relatively rigid with full calcaneal (subtalar) inversion



Oblique Mid Tarsal Joint Axis Mobile with Calcaneal Eversion



Oblique Mid Tarsal Joint Axis Rigid with Calcaneal Inversion

Cues: Grasp cuboid

Move cuboid parallel to the plantar surface of the foot to provide adduction and abduction motion - compare with full calcaneal eversion and full calcaneal inversion

Normal - OMTJ axis becomes relatively rigid with full calcaneal (subtalar) inversion

Pronatory Disorder

ICD-9: 734 flat foot (pes planus-acquired)

Description: Excessive pronation is defined as pronation that occurs for too long a time period or of too great an amount. The subtalar joint is the most common location of this excessive motion. The loss of a normal medial longitudinal arch will be evident and may result in a talonavicular subluxation throughout the stance phase of gait.

Etiology: A pronatory disorder may be caused by congenital, neurological, and/or acquired factors. The etiology of acquired factors will be discussed here, as the congenital and neurological causes are listed under a different ICD9 diagnosis.

Acquired factors resulting in excessive pronation can be divided into extrinsic and intrinsic causes. Extrinsic causes are a result of factors outside the foot/ankle complex such as the lower leg or knee. Gastrocnemius tightness, femoral anteversion, tibial internal rotation, and postural deformities are examples of extrinsic factors. Intrinsic causes of pronatory disorders are located within the foot and ankle region. These causes are usually fixed deformities of the subtalar joint, the midtarsal joints, and the first ray. It is common to see forefoot valgus (abduction), calcaneal eversion, a flattened medial longitudinal arch, midfoot ligament laxity, talar subluxation, posterior tibial tendon dysfunction, and plantar fascia rupture. A combination of extrinsic and intrinsic factors often results in excessive compensatory subtalar joint pronation. This compensatory motion may produce various soft tissue stresses resulting in pain, inflammation, and/or tissue deformity.

Physical Examination Findings (Key Impairments)

Acute Stage / Severe Condition

- Excessive pronation (navicular drop) at mid-stance and terminal stance
- Forefoot valgus, subtalar pronation, and calcaneal eversion deformities are common
- Limited ankle dorsiflexion and excessive calcaneal eversion are common.
- Weak ankle plantar flexors, ankle/foot inverters (tibialis posterior) and ankle/foot everters (peroneus longus - aka fibularis longus), and intrinsic pedal musculature (abductor hallucis) are common.
- Excessive midtarsal motions (hypermobile talonavicular, calcaneocuboid articulations, and excessive first ray dorsiflexion).
- Palpable tenderness of the peroneal tendons, tibialis posterior tendon, tarsal ligaments, and talonavicular and calcaneocuboid articulations
- Other dysfunctions in the lower kinematic chain (i.e. knee, hip) are commonly associated with excessive subtalar pronation.

Sub Acute Stage / Moderate Condition

- The above impairments may be present – however with less severe functional limitations.

Settled Stage / Mild Condition

- The above impairments may be present – however with less severe functional limitations.

Intervention Approaches / Strategies

Acute Stage / Severe Condition

Goal: Restore pain free performance of daily activities

- Physical Agents
 - Ultrasound
 - Phonophoresis
 - Electrical Stimulation
 - Ice
- Manual Therapy
 - Joint mobilization for restricted accessory movements associated with talocrural dorsiflexion and talocalcaneal eversion
 - Soft tissue mobilization for restricted posterior calf myofascia
- Therapeutic Exercises
 - Strengthening exercises for weak calf muscles and foot intrinsics
 - Stretching for tight calf muscles
 - Instruct in exercises and functional movements to maintain the improvements in mobility gained with joint and soft tissue manipulations
- External Devices (Taping/Splinting/Orthotics)
 - Anti-pronation type taping procedures
 - In-shoe orthotics to stabilize the hindfoot and medial longitudinal arch
- Re-injury Prevention Instruction
 - Proper footwear and/or inserts to limit pronation

Sub Acute Stage / Moderate Condition

Goals: Restore pain free performance of functional activities

Improve foot proprioception/afferent activity

Normalize ankle and foot mobility and strength

- Approaches / Strategies listed above
- Neuromuscular Re-education
 - Training for neutral foot position with daily activities – including single leg standing activities with/without unstable surfaces or visual cuing

Settled Stage / Mild Condition

Goal: Return patient to prior level of function or desired functional goals

- Approaches / Strategies listed above
- Therapeutic Exercises
Progress stretching and strengthening exercises – include exercises that address impairments of the pelvis, hip, and knee which may be associated with excessive pronation, such as weak hip abduction and external rotation
- Neuromuscular Re-education
Progress neutral foot position training
- External Devices (Taping/Splinting/Orthotics)
Consider foot orthotic prescription/fabrication

Intervention for High Performance / High Demand Functioning in Workers or Athletes

Goal: Return to desired work or sport specific activity levels

- Approaches / Strategies listed above
- Therapeutic Exercises
Progress stretching and strengthening exercises – include exercises/activities that challenge the patient with work related or sport specific demands addressing strength, flexibility, proprioception and endurance.

Selected References

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