THE PAINFUL FLATFOOT

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WHAT TO DO?
ETIOLOGIES

INTRINSIC > EXTRINSIC

- Repetitive microtrauma combined with inflammation (age dependent)
- Degeneration (shift of collagen I to III)
- Inflammatory disease (younger patients)
- Vascular causes (obesity, hypertension, diabetes, steroid use)
- Constriction through synovial enlargement
- Accessory navicular

Multifactorial causes involved in failure of posterior tibial tendon
PATHOPHYSIOLOGY

PTT insufficiency
- reduction of inversion power
- arch stabilized by static restraints
- unopposed pull of evertors
- valgus deformity
- medial pressure at talonavicular joint

Spring ligament stressed
- transverse tarsal joint unlocked
- rigid lever of toe-off
- spring ligament stressed

Flatfoot deformity

altered pull of Achilles tendon

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THE PROBLEM

STAGE I (Tenosynovitis without deformity)
A: Inflammatory disease
B: Partial PTT tear with normal hindfoot anatomy
C: Partial PTT tear with hindfoot valgus

STAGE II (PTT rupture and flexible flatfoot)
A: Hindfoot valgus
B: Flexible forefoot supination
C: Fixed forefoot supination
D: Forefoot abduction
E: Medial ray instability

STAGE III (PTT rupture and rigid flatfoot)
A: Hindfoot valgus
B: Forefoot abduction

STAGE IV (Ankle valgus)
A: Flexible ankle valgus
B: Rigid ankle valgus

Johnson KA and Strom DE, CORR 239: 196-206, 1989
CLINICAL PRESENTATION

- Hindfoot valgus
- Derotated subtalar joint
- Pain along PTT
- Swelling along PTT
- Too many toes sign
- Loss of strength
- Positive single heel rise test

Lapidus, CORR; 16:119-135, 1959
DIAGNOSTICS

- Clinical examination
- Radiology
  - Conventional x-rays
  - Ultrasound
  - Magnetic resonance imaging (not routinely)
CONSERVATIVE TREATMENT

Rest (4-6 weeks)

- Rigid stirrup brace
- Lace-up sport brace
- CAM (controlled-ankle-motion) walker boot
- Below-knee cast
- Orthotic or brace (semi-rigid +/- medial heel wedge/med. column post)
- Total contact rigid orthotic (stage 2)
- Accommodative braces required for stage 3
CONSERVATIVE TREATMENT

Antiinflammatory medication
- Used simultaneously with resting measures
- Complete 2-week course
- Do not prescribe oral/injectable steroids

Physical therapy
- Iontophoresis
- Cryotherapy
- Ultrasound or pulsed ultrasound
- Isolated strengthening of the posterior tibial tendon
PRINCIPLES OF SURGERY

- Preserving integrity and movement of joints has become important
- In the hindfoot subtalar joint plays central role in walking dynamics
- Hindfoot adapts to ground by way of calcaneal tuberosity positioning
- Alterations of tuberosity support influence hindfoot and forefoot

Malerba F and De Marchi F. Foot Ankle Clin N Am; 10: 523-40, 2005
Espinosa N and Rothenfluh E. In preparation
THE POWER OF THE SUBTALAR JOINT

Eversion compensation

Inversion compensation

LDTA = 105°

LDTA = 60°
Static correction
- Calcaneal osteotomy
- Cuneiform Osteotomy
- TMT-I-fusions
- Spring-ligament repair

Dynamic correction
- FDL-Transfer

MEDIALIZING CALCANEAL OSTEOTOMY (MCOT) + FLEXOR DIGITORUM LONGUS TENDON TRANSFER
SURGICAL TREATMENT
STAGE I

Tenosynovectomy
- Subjective and objective improvement
- Good to excellent results in 84%-88%
- Patients with seronegative disorders require earlier surgical debridement when failure of conservative measures.

Complications
- Infection
- Nerve damage
- Incisional wound necrosis
- Progression of deformity and tendon disease
- Deep venous thrombosis.
STAGE II
SURGICAL INDICATIONS

- Symptoms cannot be controlled by nonoperative means acceptable to the patient
- Absence of hindfoot arthritis
- Excessive hindfoot valgus >30°
CLASSIC MEDIALIZING OSTEOTOMY CONCEPT HAS NOT MUCH CHANGED

- To correct deformities in the frontal plane
- Effective for patients with marked hindfoot valgus but without significant forefoot abduction

Gleich A. Arch Klein Chir; 46: 358-362, 1893
Koutsogiannis E. J Boint Surg-B; 53.:96-100,1971
ASPECTS OF MEDIALIZING CALCANEAL OSTEOTOMY

- Technically simple
- Structured but flexible deformity
- In conjunction with other procedures
- Absence of arthritic changes at subtalar joint is prerequisite
WHAT IS THE GOAL OF CALCANEAL OSTEOTOMY?

Abnormal pulling vector of Achilles = Deforming force

Malerba F and De Marchi F. Foot Ankle Clin N Am; 10: 523-40, 2005
WHAT IS THE GOAL OF SURGERY?
MEDIALIZING CALCANEAL OSTEOTOMY
MEDIALIZING CALCANEAL OSTEOTOMY
EFFECTS OF MEDIALIZING CALCANEAL OSTEOTOMY

- Radiographic height and alignment 🆙
- Outer appearance not altered
  - Difference in 50%
  - Significant only in 4%
- Medialization of Achilles tendon
  - Medialization to subtalar axis = valgus moment removed → abduction force exerted by peroneal tendons reduced but plantar moment of PL increased → medial arch height increased
- Stress on spring ligament = Reduced
- Role on ankle remains unclear

Otis JC et al. Foot Ankle Int; 20: 222-226, 1999
Z-SHAPED MEDIALIZING CALCANEAL OSTEOTOMY
MEDIAL DISPLACEMENT CALCANEAL OSTEOTOMY
PITFALLS

- Avoid placing osteotomy into origin of plantar fascia
- Displacement is only achievable if tuberosity is adequately distracted
- Check screw placement with fluoroscopy
- Injury to the medial structures due to medial saw penetration
- Lateral pain due to prominent rim
- Sural nerve injuries on lateral side
- Undercorrection
FDL TRANSFER

1. PTT
2. FDL
3. Henry-Knot
FDL-TRANSFER
THE CLASSIC WAY
FDL-TRANSFER ALTERNATIVE WAY