MALIGNMENT OF THE HINDEFOOT

VALGUS

VARUS
- Supple painfree PPV (idiopathic)
- Rigid painful PPV (synostosis)
- Acquired PPV
  - malunion after calcaneum fracture
  - tibialis posterior insuffisency
PES PLANO VALGUS

Calcaneum
Subtalar joint
Talus
T-N and N-C
Midtarsal joints

valgus
valgus tilted medially
medially and down
subluxation
Abduction

valgus hindfoot

Achilles tendon = evertor
Line of weight-bearing transmitted through the talus = medial to the calcaneus
CALCANEAL OSTEOTOMY FOR FLAT FOOT

- **Medial closing wedge**
  (1893 Gleich)

- **Lateral opening wedge**
  (1923 Lord; 1967 Silver)
CALCANEAL OSTEOTOMY FOR FLAT FOOT

- 1971: medial translation of the posterior fragment (Koutsogiannnis, JBJS, febr 1971)
Surgical technique Koutsogiannis osteotomy

- Lateral incision *(parallel and behind peroneal tendon)*
- sural nerve!
Surgical technique Koutsogiannis osteotomy

- Incision periostum parallel to the incision
Surgical technique Koutsogiannis osteotomy

- MEDIAL TRANSLATION POSTERIOR PART CALCANEUM (1/3 to 1/2 of the width of the calcaneus, 1 cm)
Surgical technique Koutsogiannis osteotomy
Surgical technique Koutsogiannis osteotomy
Postoperative care Koutsogiannis osteotomy

- Cast bellow-knee
  - non weight-bearing: 4 w
  - weight-bearing: 4 w
Results Koutsogiannis osteotomy

- Correction of the valgus and the eversion force of the Achilles tendon
- Medial arch + forefoot abduction: deformation corrected only if no severe flatfoot

Koutsogiannis alone not enough!
What to do more?

- Valgus hindfoot?
- Forefoot abduction?
- Deltoid Ligament?
- Spring ligament?
- Tibialis posterior?
STAGES PPV
tibialis posterior dysfunction

<table>
<thead>
<tr>
<th></th>
<th>stage 1</th>
<th>stage 2</th>
<th>stage 3</th>
<th>stage 4</th>
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<td>retromalleolar pain</td>
<td>+</td>
<td>++</td>
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<tr>
<td>hindfoot valgus</td>
<td>+/-</td>
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<tr>
<td>arch flattening</td>
<td>+/-</td>
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<td>forefoot supination</td>
<td>+/-</td>
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<td>forefoot abduction</td>
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<td>Ankle pain</td>
<td>-</td>
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Supple pes plano valgus

- elongation
- (partial) rupture
Posterior Tibial Tendon Dysfunction
Stage 3

- Rigid pes plano valgus

rupture
Posterior Tibial Tendon Dysfunction
Stage 4

- Rigid pes plano valgus
- Lateral ankle pain

- rupture
- ankle arthrosis
Posterior Tibial Tendon Dysfunction Treatment

Stage 1

- conservative
  - physiotherapy
  - shoe corrections
  - medial support
Posterior Tibial Tendon Dysfunction

Treatment

- Stage 2 = surgical
  - Calcaneal osteotomy
    (Koutsogiannis)
Posterior Tibial Tendon Dysfunction

Treatment

Stage 2 = surgical

- Calcaneal osteotomy
  (Koutsogiannis)
- Lateral column lengthening
  (Evans)
- Tendon reconstruction
  (suture, plasty, transfert FHL or FDC, Cobb)
- Ligament reconstruction

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EVANS Osteotomy

picture from: Th Leemrijse, B Valtin, Pathologie du Pied et de la cheville, 2009
Lateral column lengthening calcaneal osteotomy

Hintermann B: Techniques in Orthopaedics and Traumatology 2000
Calcaneal osteotomies
lateral column lengthening
Tendon reconstruction: suture
Tendon reconstruction: plasty
Tendon reconstruction: FHL or FDC transfert
Tendon reconstruction:
Transfert Tibialis anterior (Cobb)

Figure 42.17: Diagram of the Cobb technique illustrates its use of the...
ligament reconstruction
spring ligament suture
Posterior Tibial Tendon Dysfunction

Treatment

- Stage 3
- Surgical
  - triple arthrodesis
Posterior Tibial Tendon Dysfunction

Treatment

- Stage 4

- Surgical

  - Panarthrodesis
  - (TAR)
Posterior Tibial Tendon Dysfunction

Prognosis

- early diagnosis
- early treatment

→ better prognosis
CAVO VARUS DEFOMITIES
Dorsiflexion pitch of calcaneus
CLINICAL evaluation

REDUCIBILITY?

- Coleman block test

  Bringing the first metatarsal head down

  Test - : varus remains fixed

  (despite discharge of forefoot)
MEDIAL OPENING WEDGE OSTEOTOMY (DWYER 1936)

picture from: Th Leemrijse, B Valtin, Pathologie du Pied et de la cheville, 2009
LATERAL CLOSING WEDGE OSTEOTOMY (DWYER 1958)

- Shifting posterior fragment laterally

>< varus hindfoot
LATERAL CLOSING WEDGE OSTEOTOMY (Dwyer 1958)

- Translation of the calcaneal tuberosity cephalad
  - Increased calcaneal pitch
DWYER OSTEOTOMY
surgical technique

- Skin incision *(from posterior of the tip of the fibula to plantar of the C-C joint)*
- Sural nerve!
DWYER OSTEOTOMY surgical technique

- **Osteotomy**
  - **First cut** starting 1 cm post of the subtalar joint ending 1 cm proximal to the C-C joint
  - **Second cut** parallel and plantar dependent upon the degree of the deformity (4 to 8 mm)
DWYER OSTEOTOMY
surgical technique

- Stabilisation (screws, staple, pins)
DWYER OSTEOTOMY
Postoperative care

- Bellow-knee cast
  - 4 weeks without weight-bearing
  - 4 weeks with weight-bearing
LATERAL CLOSING WEDGE OSTEOTOMY

- 1985: L osteotomy (Pisani)
- 1986: great oblique osteotomy (Garelli)

pictures from: Th Leemrijse, B Valtin, Pathologie du Pied et de la cheville, 2009
LATERAL CLOSING WEDGE OSTEOTOMY

- 1995: Z osteotomy (Mori)
- 2005: more easy Z osteotomy (Malerba)

pictures from: Th Leemrijse, B Valtin, Pathologie du Pied et de la cheville, 2009
MALERBA OSTEOTOMY (2005)
Lateral closing wedge osteotomy

pictures from: Th Leemrijse, B Valtin, Pathologie du Pied et de la cheville, 2009
MALERBA OSTEOTOMY
Lateral closing wedge osteotomy

Picture from: Th Leemrijse, B Valtin, Pathologie du Pied et de la cheville, 2009
MALERBA OSTEOTOMY
Lateral *opening* wedge osteotomy

*picture from: Th Leemrijse, B Valtin, Pathologie du Pied et de la cheville, 2009*
Cavo-varus deformities
goal of surgical management

Produce plantigrade and stable foot

- **Supple:**
  - soft tissue procedure *(fascia plantaris release; tendon transfer)*

- **Supple + deformity that prevents plantigrade/foot** *(plantar flexed 1st ray, excessive dorsiflexion calcaneus, varus calcaneus):*
  - soft tissue procedure *(fascia plantaris release; tendon transfer)*
  - Osteotomy *(calcaneus, 1st MT, midtarsal)*

- **Rigid:**
  - arthrodesis
VARUS + ARTHRITIS

• subtalar or triple arthrodesis
CONCLUSION

Pes plano valgus

Koutsogiannis osteotomy = Hindfoot valgus correction

Pes cavo varus

Dwyer/ Malerba osteotomy = Hindfoot varus correction

Osteotomy alone not enough!
Cavo-varus deformities

Treatment

- Calcaneus osteotomies to correct
  - varus hindfoot
  - increased calcaneal pitch
- Tarso / metatarsal osteotomy to correct
  - Cavus deformity
- Plantar fascia release
- Tendon transfer
CALCANEAL OSTEOTOMY FOR FLAT FOOT

- 1893: posterior fragment forwards, medially and downwards (Gleich)
CALCANEAL OSTEOTOMY FOR FLAT FOOT

- 1923: 13 cases of calcaneal osteotomy for severe flat foot (Lord)

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Pes plano valgus stage 2

Posterior Tibial Tendon Dysfunction

- Calcaneal osteotomies
  (Koutsogiannis)
  (lateral column lengthening)

- Ligament reconstruction
  (LLI, spring ligament)

- Tendon reconstruction
  (suture, plasty, transfert FHL or FDL, Cobb)
What to do if tibialis posterior tendon rupture?

- Suture
- Z lengthening
- FHL/FDC transfer
- TA transfer
Koutsogiannis osteotomy
KOUTSOGIANNIS OSTEOTOMY (medial shift)