Objectives
1) To learn the terminology commonly used by podiatrists and foot & ankle surgeons when describing flatfoot.
2) To understand the causes of flatfoot, and to simplify these into three primary causes.
3) To discuss the staging and treatment of posterior tibial tendon dysfunction.
4) To know at least as much about flatfoot as a podiatrist.
Flatfoot: Definitions

pes planus L “foot” “flat, even, level” aka “weak foot”, “fallen arches”
- Loss of medial longitudinal arch

Diagnosed: Visual Exam
- WHEN STANDING

Flatfoot: Definitions

Rigid Flatfoot
- Arch is stiff and always flat
- Whether standing or not

Flexible Flatfoot
- Arch is flat when standing
- Suspended foot regains normal arch

Regarding the flexible flatfoot:
A. it is uncommon in toddlers
B. it is commonly symptomatic
C. it is treated with orthotics
D. when standing on toes, the arch reappears
E. when standing on toes, the calcaneus everts

Flexible Flatfoot

Infants are born with flat feet
Toddlers typically have flat arch

Usually asymptomatic
- Requires no treatment
- Orthotics tend to cause discomfort
- >15% Adults

Flexible Flatfoot

Passively Correctable

Flatfoot with weight-bearing
Flatfoot: Terminology, Treatment, & Importance of Cobey View

Flattfoot: Visual Exam
- Arch with & without weight-bearing
  - Rigid vs Flexible
- Heel from behind
  - Normal
  - Heel neutral
  - Achilles straight
  - Flatfoot
  - Heel everts
  - Achilles curved medial
  - "Helbing sign"

References:
Lee, J. Foot & Ankle Surg, '05, v44 p80
Normal
Lee, J. Foot & Ankle Surg, '05, v44 p81
Flatfoot

Regarding the flexible flatfoot:
A. It is uncommon in toddlers
B. It is commonly asymptomatic
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D. When standing on toes, the arch reappears
E. When standing on toes, the calcaneus everts

Coughlin & Mann, Surgery of the Foot and Ankle, 7th Ed, p734

Flatfoot: Heel Valgus (pronation)
- Normal
- Flatfoot
- Standing:
  - Bilateral flatfeet
  - Heel valgus (mild)
- Standing on toes:
  - Arch reconstitutes
  - Heels go into varus

Flatfoot: Several Deformities
- Loss of plantar arch
  - Observe: Medial, Standing Foot
- Hindfoot valgus
  - Observe: Posterior, Standing Feet
  - Measure: Cobey view

Cobey view: PA view
- Posterior Roentgenogram of the Foot
  - James C. Cobey, M.D., M.P.H.
  - Yale Orthopedics Department

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Flatfoot: Terminology, Treatment, & Importance of Cobey View

**Cobey view: PA view**

- Displayed: As if looking at patient from behind (like the way scoliosis radiographs are displayed)
- Measure angle between 2 lines:
  1) Tibial shaft
  2) Center talar dome to Center calcaneal curve

- 0º (normal)

**S,G 42yoM**

- 20º valgus

- related to patient's right flatfoot deformity

**T,J 63yoM**

- 20º varus

- related to patient's left ankle OA deformity

**Flatfoot: Several Deformities**

- Loss of plantar arch
  - Observe: Medial, Standing Foot

- Hindfoot valgus
  - Observe: Posterior, Standing Feet
  - Measure: Cobey view

- Observe: Posterior, Standing Feet “too many toes” sign

- The “too many toes” sign indicates:
  - A. Forefoot abduction
  - B. Posterior tibial tendon dysfunction
  - C. Flatfoot deformity
  - D. Tarsal coalition
  - E. Parents were related

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Flatfoot: Terminology, Treatment, & Importance of Cobey View

Too Many Toes Sign: not this…

Too Many Toes Sign: Cobey view

Too Many Toes Sign
= Forefoot Abduction

Too Many Toes Sign: Cobey view
= Forefoot Abduction

Flatfoot: Several Deformities

Loss of plantar arch
➤ Observe: Medial, Standing Foot

Hindfoot valgus
➤ Observe: Posterior, Standing Feet
➤ Measure: Cobey view

Forefoot abduction
➤ Observe: Posterior, Standing Feet “too many toes” sign

Peritalar subluxation
The most common cause of rigid flatfeet in children is:
A. Tarsal coalition
B. Congenital vertical talus
C. Neuromuscular foot
D. Skew-foot

Objectives: Simplify Flatfoot

Causes
Child (congenital)
- Flexible
- Normal variant
- Rigid

Adult (acquired)
The most common cause of adult acquired flatfoot is:

A. neuropathic
B. neuromuscular
C. post traumatic
D. tarsal coalition
E. posterior tibial tendon dysfunction

The most common cause of adult acquired flatfoot is: E. posterior tibial tendon dysfunction.

Objectives: Simplify Flatfoot

**Causes**

Child (congenital)
- Flexible
  - Normal variant ... none
- Rigid
  - Tarsal coalition ... resection

Adult (acquired)
- Posterior tibial ... depends upon tendon dysfunction the stage

**PTT Dysfunction: Stages**

1=Tenosynovitis, no deformity
   - Pain, Swelling along PTT

2=Reducible Flatfoot
   - Hindfoot valgus, forefoot abducted
   - Single heel raise with difficulty
   - Heel doesn’t undergo normal inversion

3=Fixed, non-reducible Flatfoot
   - Unable to perform single heel raise
   - Lateral symptoms predominate

4=Ankle valgus
   - Secondary OA at ankle joint
Significant History

• Middle Aged Female
• Unilateral Acquired Deformity
• No History of Trauma

PTT Dysfunction: Stages

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Medial Heel Pain, Tenderness</td>
</tr>
<tr>
<td>2A-2E</td>
<td>Increased Tenderness, Pain</td>
</tr>
<tr>
<td>3</td>
<td>Taut Plantar Fascia</td>
</tr>
<tr>
<td>4</td>
<td>Hindfoot Valgus, Arthritis</td>
</tr>
</tbody>
</table>

PTT Dysfunction: Treatment

Initial Treatment Options

- Patellar Tendon Balloon
- Orthotic Management
- Anti-Inflammatory Medications
- Physical Therapy
- Shoe Modifications

Reconstruction of the PTT alone does not correct hindfoot valgus.

Medial Sliding Calcaneal Osteotomy

Hindfoot valgus...corrected

Flexor Digitorum Longus (FDL) Transfer

FDL threaded up through hole drilled in Navicular Sutured to itself Side-to-Side PT-FDL Tenodesis

PTT Dysfunction: Terminology, Treatment, 
& Importance of Cobey View
Flatfoot: Terminology, Treatment, & Importance of Cobey View

Cobey view: Hindfoot valgus

Hindfoot valgus
R 20º

0º (normal)

20º valgus

...related to patient's right flatfoot deformity

Cobey view: Hindfoot valgus

Post Medial Sliding Calcaneal Osteotomy
R 20º valgus

PTT Dysfunction: Surgeries

Medial Sliding Calcaneal Osteotomy
- Gastrocnemius lengthening
- Lateral column lengthening

One month later...

FDL (FHL) transfer
Navicular arthrodesis
Talo-navicular
Navicular-cuneiform

PTT Dysfunction: Treatment

Stage 1
- Initial Treatment Options
  - Patient Education
  - Orthotic Management
  - Immobilization
  - Anti-inflammatory Medications
  - Physical Therapy
  - Shoe Modifications

Stage 1A - Early
- Surgical Options
  - Synovectomy
  - Tenectomy
  - Osteotomy
  - Arthroscopic Procedures

Stage 1B - Late
- Surgical Options
  - Tendon Transfer
  - Fusion

Stage 2A - Stage 2B
- Surgical Options
  - Synovectomy
  - Tenectomy
  - Osteotomy
  - Arthroscopic Procedures
  - Tendon Transfer
  - Fusion
  - Medial Column Fusion

Stage 3
- Surgical Options
  - Synovectomy
  - Tenectomy
  - Osteotomy
  - Arthroscopic Procedures
  - Tendon Transfer
  - Fusion

Stage 4
- Surgical Options
  - Synovectomy
  - Tenectomy
  - Osteotomy
  - Arthroscopic Procedures
  - Tendon Transfer
  - Fusion
  - Medial Column Fusion
  - Calcaneal Osteotomy

Consider Surgical Options
(Below)

Triple arthrodesis (STJ, TNJ, CCJ)

Footnote

James Cobey
- D.C. orthopedic surgeon
- 37 years of experience
- 1997 shared Nobel Peace Prize

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