Evaluation of Pediatric Foot Radiographs

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I have no commercial disclosures.
Left foot  Right foot

Feet  Feet  Feet

How many, many feet you meet.
Ossification Centers

Newborn:
- Metatarsals and phalanges
  - (fetal 8-12 wks)
- Calcaneus
  - (fetal 23 wks)
- Talus
  - (fetal 25 wks)
- Cuboid
  - (at birth)
Navicular bone:
- 2-5 years
- eccentric ossification
Terminology

• *Talipes*: (Latin *talus* = ankle, *pes* = foot) congenital foot and ankle deformity

• *Pes*: (Latin: foot) “acquired” foot deformity
Terminology

- **Hindfoot:**
  - talus and calcaneus

- **Midfoot:** navicular, cuneiforms, cuboid

- **Forefoot:**
  - metatarsals, phalanges
Valgus
(eversion, pronation)

Varus
(inversion, supination)
Radiologic Evaluation

• AP and lateral **weight-bearing** or simulated weight-bearing

• Additional:
  – flexion (dorsal or plantar)
  – tangential (Harris-Beath)
  – 45 degree medial oblique views
Normal Anatomy
Lateral View (weight-bearing)
Normal Anatomy
Lateral View (weight-bearing)
Normal Anatomy
Lateral View (weight-bearing)

- Tibial-calcaneal angle = 70 - 90°
Equinus

- Fixed calcaneal plantarflexion
- Tibial-calcaneal angle $> 90^\circ$
Calcaneus
Calcaneus

- Fixed calcaneal dorsiflexion
- Tibial-calcaneal angle < 60°
Normal Anatomy
Lateral View (weight-bearing)
Normal Anatomy
Lateral View (weight-bearing)

- Talo-calcaneal angle = 30° - 45°
Normal Anatomy
AP View (weight-bearing)
• Talo-calcaneal angle = 30° - 45° (decreases with age)
Everything revolves around the talus
Hindfoot valgus
Hindfoot valgus
Hindfoot varus
Hindfoot varus
Hindfoot Valgus

- Axis of talus is medial to 1\textsuperscript{st} MT
- Talo-calcaneal angle $> 45^\circ$
Hindfoot Valgus
Hindfoot Valgus

- Increased talo-calcaneal angle > 45°
Hindfoot Varus

- Axis of talus is lateral to 1st MT
- Talo-calcaneal angle < 30°
Hindfoot Varus
Hindfoot Varus

- Talo-calcaneal angle $< 30^\circ$
Hindfoot Alignment

Valgus

Normal

Varus

midline
Here come more and more ......... and more feet!
Metatarsus Adductus

• 10x’s more common than clubfoot
• “Intrauterine packing”
• 1-10% incidence of developmental dysplasia of the hip (DDH)
• Radiographs: rigidity, other deformities
Metatarsus Adductus

- Normal talo-calcaneal angle
- Adducted forefoot
Clubfoot (talipes equinovarus)

- 1-4:1000 live births
- Boys > girls
- Unilateral > bilateral
- Multifactorial inheritance modified by intrauterine and environmental factors
- Equinus
- Hindfoot varus
Clubfoot

• Hindfoot varus
Clubfoot

- Hindfoot varus
- Forefoot varus
Flexible Flatfoot  
*(pes planus, flattened longitudinal arch)*

- Standard in infants, common in children
- Radiographs for rigidity, loss of subtalar motion
- Treatment for pain, severe progression
- Longitudinal arch reconstitutes
Flexible Flatfoot

- Normal heel
- Hindfoot valgus
- “Relaxed talus”
- Talonavicular association on lateral view maintained
Hindfoot Valgus

• Hindfoot valgus
Congenital Vertical Talus

(congenital rigid rocker-bottom foot, congenital flatfoot with talonavicular dissociation)

- Most severe form of congenital rigid flatfoot
- Plantar surface of foot is convex (rocker-bottom)
- Associated with neuromuscular imbalance
- Contracted soft tissues; all eventually need surgery
Congenital Vertical Talus

- Equinus heel
- Extremely plantarflexed talus
- Hindfoot valgus
- Talonavicular dissocation
No change in alignment with plantarflexion (vs pes planus) or dorsiflexion.
Flat Foot

**Flexible Flatfoot**
(pes planus)

- Hindfoot valgus
- Normal heel
- Talonavicular association
- Reconstituted arch

**Congenital Rigid**
(congenital vertical talus)

- Hindfoot valgus
- Equinus heel
- Talonavicular dissociation
- No change with flexion
Skewfoot
(Z-foot, S-foot)

• Rigid
• Hindfoot valgus: resembles flatfoot
• Forefoot varus: resembles clubfoot
Skewfoot (Z-foot, S-foot)

- Hindfoot valgus,
- Rigid forefoot varus
YOUR TURN:

In the house, and on the street,
how many, many feet you meet.
QUESTION #1:
This foot alignment is:

1. Rigid flatfoot
2. Hindfoot varus
3. Normal
4. Metatarsus adductus
QUESTION #2: This foot alignment is:

a) Hindfoot valgus and forefoot adductus
b) Equinus and hindfoot varus
c) Equinus and hindfoot valgus
d) Due to a post-operative complication
QUESTION #2:
QUESTION #2:

This foot alignment is:

a) Hindfoot valgus and forefoot adductus
b) Equinus and hindfoot varus
c) Equinus and hindfoot valgus
d) Due to a post-operative complication
Thank you!