Learning Objectives

- Explain the meaning of the term: CAVE
- Describe the Ponseti method of casting for clubfeet

Level of evidence for research

Wright et al: JBJS 85A Jan 03
- Level I Randomized, controlled
- Level II Prospective cohort
- Level III Case control
- Level IV Case series
- Level V Expert opinion

Cashin et al: JPO Sept 2011
2007-2008 JPO, JCO
- Level I 3% Randomized, controlled
- Level II 5% Prospective cohort
- Level III 24% Case control
- Level IV 58% Case series
- Level V Excluded Expert opinion

Clubfoot
- Definition
- Epidemiology
- Diagnosis
- Radiology
- Classification
- Treatment: Kite/Lovell vs Ponseti Technique
**Latin Terminology**

“TEV”

- Talipes: Foot
- Equino: Horse
- Varus: Turning inward

**Definition**

4 components: CAVE

- Cavus—high arch
- Adduction forefoot
- Varus: heel
- Equinus: Plantar flexion

**Anatomy**

- Displacement of navicular, calcaneus, and cuboid bones around the talus

**Clubfoot**

**Epidemiology**

- 1 in 1000 live births
- 65% males
- 30% bilateral
- Etiology multifactorial
- Genetics

**Etiologic Factors**

- Intraterine forces
- Abnormal fetal development
- Fibrosis
- Abn muscle/tendons
- Abn rotation of talus
- Germ plasm defect

**Associated Syndromes**

- PFFD
- Amniotic Band
- Pierre Robin
- Larsen’s
- Spina Bifida
- Arthrogryposis
- Diastrophic Dwarf
**Genetics**
- If one child has clubfoot: risk is 4% to future siblings
- If one parent had clubfoot: risk is 25% to future children

**Diagnosis**
- Physical Exam
- Rule out Neuromuscular Disease or syndromes

**Radiographs**
- Not required for diagnosis
  - Talus and Calcaneus
  - “Kites Angle” AP view
  - < 20 degrees = varus
  - Parallel Talus and Calcaneus on lateral view
  - No correlation: radiographs and function
    - Cooper, Dietz JBJS 1995

**Classification**
- Postural
- Congenital
- Syndromic

**Dimeglio Grading System:** 20 points

- 4 points for each parameter
  - Equinus: sagittal plane
  - Varus: frontal plane
  - Adduction forefoot: horizontal plane
  - Calc-pedal derotation: horizontal plane

- 1 point for each parameter
  - Posterior crease, medial crease, cavus, absence of voluntary dorsiflexion

**Catteral/Pirani Scale**

- Each of 6 criteria graded on a 0, .5, or 1 point scale
  - Normal 0 pts
  - Most abnormal 6 pts

- Posterior crease
- Empty heel
- Rigid equinus
- Curved lateral border
- Medial crease
- Prominent lateral head of talus
Untreated Clubfoot

• Severe disability
• Child unable to wear shoes
• Unable to participate in sports
• Grotesque cosmetic appearance
• Smaller foot and leg

Treatment

Treatment Goals

• Obtain a functional, straight, painless, plantigrade, mobile foot without calluses and without a need for special shoes

Historical Notes

Hippocrates 400 BC
• Begin as early as possible
• Serial manipulations
• Bandages to maintain correction

Post Hippocrates
• Paré, 1575; Andry 1743: manipulation, bandaging & splinting
• Lorenz 1784, Sartorius 1806, Delpech 1816, Stromeyer 1831: Achilles tenotomy
• Denis Browne 1930: splinting

Kite and Lovell Method

1964
• Stretching
• Traction
• Use index finger to push navicular onto head of talus
• Forefoot abducted on the hindfoot as short leg cast drys—pronated foot
• Cast extended to LLC with foot ext rotated
• Correct forefoot adduction and heel varus
• Leave equinus to last
• Wedging the cast
• 22 months of serial casting
• AFO brace until age 10
• > 90% success rate
• This method was very popular 1960’s to 1999

Ponseti Technique

Univ of Iowa 1940’s

First publication in 1960’s

• Pediatrics 2004
• Iowa Ortho Journal 2002
• J Pediatr Ortho 2000
• Ortho Nursing 1999
• Iowa Ortho Journal 2000
• International Ortho 1997
• J Ortho Sports Phy Therapy 1994
• JBJS 1992
• J Pediatr Ortho 1983
• Clin Orthop 1981
• JBJS 1988
• Acta Peds 1974

Ponseti Technique

• Weekly manipulation/cast 4-8 weeks
• Reduce cavus
• Abduct via head of talus
• Supinate the foot
**Treatment**

**Ponseti Technique**

- Can start immediately after birth
- Success rate depends on rigidity of clubfoot
- Experience and skill of orthopaedist/physician/NP

**Percutaneous Heel Cord Release:** 90%

**Indication:** can’t get > 10’ dorsiflexion

**Ponseti Technique**

- More Casting 4 weeks
- Bar and externally rotated shoes 70 degrees
- Full time for 3 months
- Night time for 3 years

**Foot Abduction Brace**

Dennis Brown Bar and Special Shoes:
70˚ angle
3mo full time 3 years part time
**Relapses**

- 7% if compliant with brace
- 78% if non-compliant with bracing
- Parent education level correlated with non-compliance

**Ponseti Results**

- Stronger, less painful feet that will function normally for a lifetime...

**Effect of Cultural factors on outcome of Ponseti treatment of clubfeet in rural America**

Schwend et al. JBJS 2009

- 138 clubfeet in New Mexico
- Ponseti method with 2 year follow up
- Discontinued use of brace related to recurrence of clubfoot *p*<0.0001
- Rural Native Americans had more compliance issues than urban Native Americans
- Culturally related

**Ponseti Technique**

- 1/3 of children need a TA transfer to 3rd cuneiform at 2.5-6 years old +/- TAL
- Correct dynamic supination of foot
- Due to failure to correct medial displacement of navicular
- TA transfer does not violate any joint, or cause stiffness, or weakness
Best Age for TA transfer + - TAL

Ponseti, Dietz
Pediatrics 2004
• Age 2.5 year
• Need ossification of the 3rd cuneiform to be present for transferred tendon to fuse to bone

Huang JBJS 81B 1999
• Age 6-12 months
• Cartilage
• No bone present in 3rd cuneiform
• No cases reported of pull out or growth disturbance

Full surgical release only needed in about 5 % of cases with Ponseti Technique

40 year follow up
Cooper, Dietz et al JBJS 1995
62% Excellent, 22% Good, 15% Poor

Summary
Ponseti Method
• Obtain a functional, straight, painless, plantigrade, mobile foot without calluses and without a need for special shoes

The Ponseti method of clubfoot treatment involves which of the following concepts?
• 1. Short leg casts for 6 to 8 weeks, followed by percutaneous heel cord tenotomy
• 2. Comprehensive posterior, medial, and lateral subtalar release performed at age 3 months
• 3. Supination of the foot during initial cast correction
• 4. Abduction of the foot with counterpressure at the calcaneocuboid joint
• 5. Correction of equinus prior to correction of supination

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Which of the following components of the clubfoot deformity should be addressed last when using the Ponseti method?

- 1. cavus
- 2. equinus
- 3. pronation
- 4. hindfoot alignment
- 5. metatarsal alignment

Thank You
Questions?