Medial Displacement Calcaneal Osteotomy

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Disclosures

MTF: Consultant

Talar Capital Partners: Director; Financial Investment
ADULT ACQUIRED FLATFOOT

Adult Acquired Flatfoot

- Fixed HF valgus
- Degenerative changes
  - Arthrodesis
- Reducible HF valgus
  - Absence of DJD
  - Reconstruction
Stage 1
- Chronic Tenosynovitis
- No Deformity

Stage 2
- Muscle-Tendon Imbalance
- Reducible Flatfoot Deformity

Stage 3
- Hindfoot Arthritis
- Fixed Flatfoot deformity

Stage 4
- Ankle Valgus
- Deltoid Insufficiency
Muscle-Tendon Imbalance leads to foot and ankle dysfunction and subsequent deformity

Deformity is supple and passively correctable

- PTT
  - Attenuated
  - Functionally incompetent
  - Degenerative PT tendinosis
- Achilles tendon contracture
- Peroneal tendons
  - Contracture
  - Functional advantage
ADULT ACQUIRED FLATFOOT

This Is A Triplanar Deformity!
ADULT ACQUIRED FLATFOOT

Surgical Goals

- Restore the Tripod
- Maintain Hindfoot ROM
- Correct the Tendon/Muscle Imbalance
104 foot and ankle orthopedists surveyed
- 88% would use preserve the STJ and TNJ
- 73% medializing calcaneal osteotomy
- 41% lateral column lengthening
- 15% medial column procedure
- 12% would perform an arthrodesis
- 94% would augment the PTT
- 54% repair the spring ligament
- 70% address the equinus with posterior lengthening

Conclusions: there is a wide variety of approaches to the stage 2 flatfoot

(Hiller, Pinney. Foot Ankle, 2003)
CLINICAL EVALUATION

STJ in neutral

Attempt to lock MTJ

Acceptable    Unacceptable

Posterior    Anterior
CALCANEAL OSTEOTOMIES

Reconstructive Options

Moderate valgus HF
Stable MTJ
Medial symptoms
TFMA-low

- MDCO

Severe valgus HF
Absence of MTJ locking
Lateral symptoms
TFMA-high

- Evans, CCJ fusion, Double osteotomy
Posterior Calcaneal Osteotomy
Medialize insertion of Achilles tendon
- Decreases deforming pronatory forces
- Creates supinatory STJ moment

Decreases PB antagonistic forces on a relatively weak FDL transfer

Decreases distance between the heel-floor contact point and the long axis of the leg
Cadaver study to define contribution of Achilles tendon contracture to flatfoot deformity and effect of MDCO

Loading of the achilles tendon increases flatfoot deformity

MDCO significantly decreases the arch-flattening effect of the achilles tendon and eliminates the potential increase in the deformity.

Nyska, Parks, Chu, Myerson; FAI, 22:278, 2001
MDCO RATIONALE

- Restores proper gastro-soleus function as a heel invertor
- Medializes the posterior tuber, increasing supinatory GRF
- Maintains STJ ROM
INDICATIONS

- Reducible hindfoot valgus
- Stable Midtarsal joint
- Functional Tritarsal Joints
- Minimal forefoot varus
Medial Displacement Calcaneal Osteotomy

TENDON TRANSFER COMBINED WITH CALCANEAL OSTEOTOMY FOR TREATMENT OF POSTERIOR TIBIAL TENDON INSUFFICIENCY

- 18 patients (12-26 m = average follow-up)
- Mean improvement of TFMA = 12.5 degrees
- Mean improvement of TNJ coverage angle = 13 degrees
- Mean improvement of distance of MC to floor = 7 mm
- Will offset the inherent weakness of FDL transfer by reducing the antagonist deforming force of heel valgus

Myerson et al, FAI; Vol. 16, No. 11, 1995
Medial Displacement Calcaneal Osteotomy

TREATMENT OF STAGE II POSTERIOR TIBIAL TENDON DEFICIENCY WITH FLEXOR DIGITORUM LONGUS TENDON TRANSFER AND CALCANEAL OSTEOTOMY

- 129 patients (5.2 yr = average follow-up)
- Mean improvement of AP TFMA = 21 degrees
- Mean improvement of AP TN coverage angle = 21 degrees
- Mean improvement of lat TFMA = 12 degrees
- Mean improvement of distance of MC to floor = 12 mm
- Subjectively high patient satisfaction

Myerson et al, FAI 25(7), 2004
INCISIONAL APPROACH

- Parallels peroneals
- Superior border of calcaneus to inferior border
- Avoid sural nerve
- Direct to periosteum
- Parallels peroneals
- Superior border of calcaneus to inferior border
- Avoid sural nerve
- Direct to periosteum
Subperiosteal

Elevate superiorly and inferiorly

Gentle retraction
OSTEOTOMY

- Anterior to Achilles and plantar tubercle
- Transcortical
- Proceed with **CAUTION** medially
- Configuration
  - Oblique
  - L
  - Z
**Anatomic Study of Medial NV Structures in Relation to MDCO**

- 22 fresh-frozen cadavers
- Average of 4 NVS crossed each osteotomy site
- Branches of the LPN and MPA may be at risk when performing MDCO (lateral approach)
- Risk of pain, numbness and hematoma
- Osteotomy thru medial cortex must be performed in a carefully controlled manner

Greene et al., FAI: 22:569-571, 2001
Lamina spreader
- "Periosteal Stretching"

Plantarflex the ankle

Medial displacement
- 10mm
Large caliber cannulated screws
- 6.5, 7.3, 8.0
- Headless???

Posterior to anterior

Fluoroscopy
- Lateral
- Axial view
MDCO Complication
MDCO “Z” Technique
MDCO “Z” Technique
MDCO "Z" Technique
1 cm medializing osteotomy moves the center of pressure of the ankle joint 1.58 mm medially


In vitro studies have shown that a 1 cm medializing MDCO decreases strain on the spring Ligament


...And Deltoid Ligament

- Resnick et al, FAI, 16:14-20, 1995
Evans combined with MDCO

Late stage 2 PTTD

 Reported success for PTTD in adults

 Less severe displacements at both sites
Double Osteotomy + Tendon Transfer for Stage II PTTD

- 28 cases with mean follow-up of 5 years
- MDCO, Evans, FDL transfer and TAL
- 14%(4 pts) displayed radiographic signs of CC joint arthritis at 5 year follow-up
- One required arthrodesis
- Radiographic measurements demonstrate maintenance of correction of the adult acquired flatfoot
- Rebalances mechanical forces with “less severe displacements” at both sites
- High patient satisfaction

Moseir-LaClair, Pomeroy, Manoli; FAI, #22:283-291, 2001
Double Calcaneal Osteotomy
Effective in *late* stage II PTTD

Preserves hindfoot motion

*CCJ arthrodesis has higher morbidity, increased number of complications and extended convalescence relative to the Evans osteotomy.*
SUMMARY

STAGE II PTTD

TRIPLANAL CORRECTION

RESTORE TRIPOD

MAINTAIN HINDFOOT MOTION

CALCANEAL OSTEOTOMIES:
  - MTJ LOCKED: MDCO
  - MTJ UNLOCKED: EVANS
  - SEVERE: DOUBLE

BALANCE MUSCLE IMBALANCE