Supramalleolar Osteotomy for Coronal Deformity of the Ankle

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Disclosures

- Smith & Nephew – Consultant, Design Surgeon, Royalties
- DJO Global – Consultant
- These osteotomies are probably under utilized

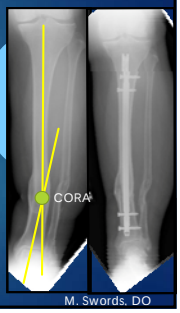
Goals

- **To understand:**
  - The deformity and how to measure it
  - The indications for Supramalleolar osteotomy
  - Introduce the concepts – planfondplasty, mortiseplasty
  - The operative Technique
  - The Outcomes

Why Do We Care About Tibial Deformity?

- Deformity affects the Mechanical axis
  - It affects the way that load is transferred
  - This ***may lead*** to premature arthritic degeneration
- **indications for operative correction of tibial shaft deformity:**
  - Valgus >10-12 deg
  - varus > 6-10 deg
  - Ext. rotation >15-20 deg
  - int. rotation >10-15 deg
  - shortening > 2 cm;

Wheeless' Textbook of Orthopaedics



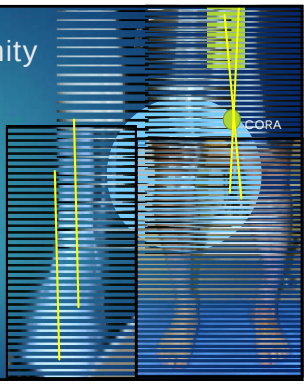
Does Malalignment Matter?

- **Maybe**
- **Long term data is limited**

- Milner SA· et. Al., JBJS Am, 2002
  - 164 pts, 30 to 43 yrs after injury
  - (29%) - coronal ang > or = 5 degrees.
  - **No significant associations with osteoarthritis.**
- Puno RM· et. Al. JOT, 1991
  - 28 tibial fractures
  - **Greater degrees of ankle malalignment produce poorer clinical results (p = 0.001)**

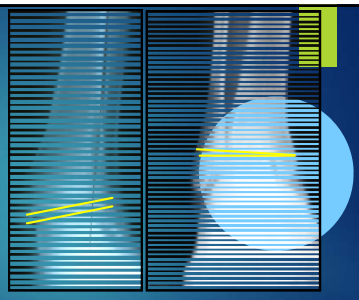
Understand the deformity

- The tibial deformity is in only 1 "true" plane (oblique)
  - Varus/valgus
  - Apex anterior or posterior
  - Rotation
  - Translation
  - Shortening
- Deformity may exist at multiple levels (Tibia) (Ankle and foot)



Understand the Deformity

- Congruent –
  - Less than or equal to 4 degrees of talar tilt in the mortise
- Non-congruent –
  - Greater than 4 degrees



Measuring The Deformity

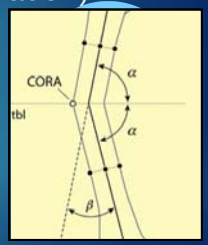
- You need:
  - Full length (If multiple levels deformity)
  - Contralateral side - "normal"
  - Scanograms – length determination
  - Saltzman View – axial alignment at multiple levels
- Draw:
  - The mechanical and anatomic axis
- Measure:
  - MAD – 10mm medial to the center of the knee
  - mLDTA approx. 90 degrees (88-95 degrees)
  - The CORA
  - Talar tilt angle
  - Tibia medial mal angle

Kobayashi, H, et Al. JFAS 2016

The CORA (Center of rotation of angulation)

- Intersection of anatomic axes
  - The apex of the deformity
- The transverse bisector line
  - osteotomy along the bisector – No translation
- Traumatic deformities - CORA may not be at the level of the deformity (i.e translation may exist)

RA Fawdington, et. Al. Orthopaedics and Trauma 28:1 Elsevier 2013



Operative Technique -The Concept

- Knupp et. Al.
  - In varus deformity – medial overload
  - In valgus deformity – lateral overload
  - Check sagittal alignment

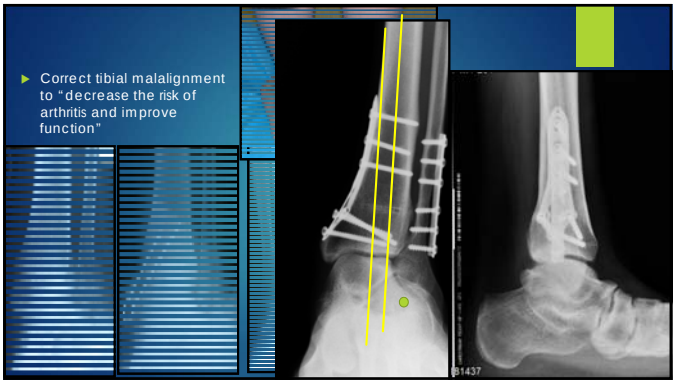
Closing Wedge

Opening Wedge

Dome

Indications for Supramalleolar Osteotomy

- Correct tibial malalignment to "decrease the risk of arthritis and improve function"



Treating Ankle Arthritis

Things to Consider

- Must have at least 50% of the cartilage preserved
- Goal – center the talus under the tibia in all planes
- Deformities >15 degs – dome osteotomy

Takakura Classification

Varus Deformity

- Fluroscopic stress
- Goal 2 – 4 degrees of valgus
- Fibular osteotomy >10 degs varus
- Congruent deformity or poor soft tissues medially –
  - Lateral closing wedge osteotomy
- Tarsal tunnel release – may be necessary

Valgus Deformity

- Medial Closing Wedge Osteotomy
- Lateral opening wedge
- Goal – 2 – 4 degrees of varus
- Fibular osteotomy is often required

- To treat ankle arthritis (delaying the need for fusion or replacement)

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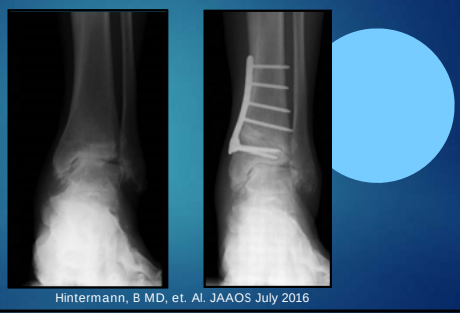
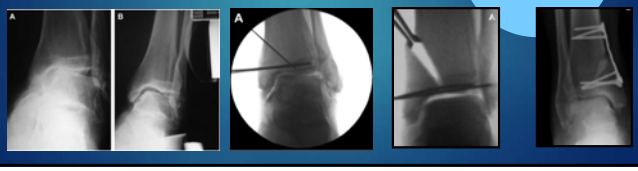
(delaying the need for fusion or replacement)



Hintermann, B MD, et. Al. JAAOS July 2016

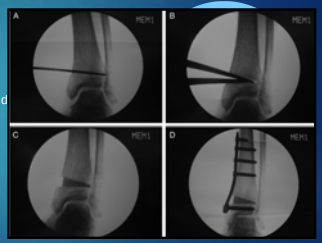
Plafond-plasty

- Mann HA., et. Al. FAI 2012
  - AOFAS - 46 to 78,
  - 2 Fusions, 2 TAR
  - 15 – Satisfied or very satisfied



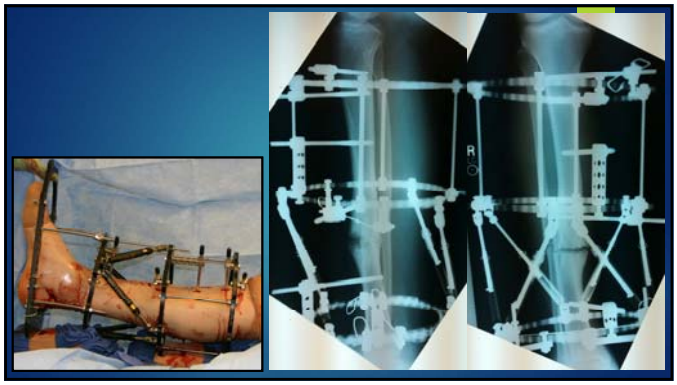
Mortiseplasty

- JFAS 2016 Kobayashi, H., et. Al.
  - 27 cases, varus with instability
  - F/U – 27 mos.
  - Signif decrease in pain and improved function
  - Deformity improved
  - No fusions or TAR
  - No ligament repair



To treat ankle arthritis (delaying the need for fusion or replacement)

- 40 y.o man
- Open tibia fracture in 1980
- Pain at the medial ankle and medial knee
- Significant arthritis of the ankle with limited dorsiflexion
- Significant varus deformity on standing
- Options?



Benefits of Ex-Fix

- Complex deformities
- Poor soft tissue envelope
- Concomitant shortening can be corrected
- Total residual correction
  - If you mess up you can keep correcting the program

- Horn DM, et. Al. , FAI 2011
  - TSF
  - 52 pts. AOFAS 40 to 71
  - 3 ankle fusions

Greater than 5 years out and still no fusion or replacement

In addition

- Must assess the alignment of the foot
  - May require arthrodesis or osteotomies below the ankle
    - Calcaneal osteotomies
    - Medial column osteotomies
- Must assess ligament balance of the ankle
  - In varus deformity – may require lateral ligament repair / reconstruction as well as a superficial deltoid release
  - In valgus deformity – may require deltoid ligament reconstruction

Bottom Line "SMO" For The Treatment of Arthritis

- Improved functional scores
- Decreased pain
- Improved alignment
- Improved arthritis grade
- Slows progression of arthritis

References

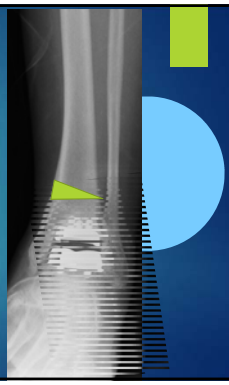
- Krähenbühl N., et. Al. FAI 2016
  - 294 pts., 298 ankles
  - 5-year survival rate was 88%.
  - 13% Fusion or TAR
  - Takakura 3B - worse
  - Young – Better
- Kim YS., et. Al., AJSM 2014
  - **SMO With Bone Marrow Stimulation**
  - second-look arthroscopies - progression of degenerative arthritis in 42%
- Colin F., et. Al., Orthop Traumatol Surg Res. 2014
  - Both varus and valgus arthritis
  - Positive side walk sign is good
- Harstall R., et. Al. FAI 2007
  - Lateral supramalleolar closing wedge
- Emmanouil D. Stamatis, et. Al., FAI 2003
  - 12 patients, AOFAS - 53.8 to 87
  - Pain decreased
  - Deformity and alignment improved
  - No progression of arthritis
- Nüesch C., et. Al., FAI 2015
  - Different gait biomechanics
  - Quality of life - comparable to controls
- Ahn TK, et. Al., JBJS Am., 2015

Post – op Protocol

- Immobilization depends on fixation stability and additional procedures
- Early ankle and foot motion if possible

To improve the alignment for a total ankle replacement or fusion

To improve the alignment for a total ankle replacement or fusion



Summary

- Supramalleolar osteotomies can be used to:
  - Prevent ankle arthritis
  - Treat ankle arthritis
  - Improve alignment for a fusion or replacement
- May need to combine with:
  - Other osseous realignment below the ankle
  - Soft tissue balancing
- Make the osteotomy as close to the CORA as possible
- Varus – Opening Wedge or Dome
- Valgus – Closing Wedge or Dome
- Can Use Internal or external fixation
- Thank you

Do We Need To Do A Fibular Osteotomy? – Maybe

- JFAS 2017Choi GW., Et. AL.
  - Fibular osteotomy might be necessary to minimize the increase in pressure in the talofibular joint, especially when the osteotomy gap is large.
- Hongmou Z, et. Al., FAI 2016
  - Varus arthritis - No significant difference – functional outcomes, better radiographic results with osteotomy

- Nha KW., et. Al., FAI 2016
  - According to the present findings, lateral cortical fracture was less likely to occur when open-wedge SMO was at the plane of the proximal one-third of the intrasyndesmosis