ANKLE ARTHRITIS, ARTHRODESIS, & ARTHROPLASTY

Prevalence

- 5% of adults >70 yo have full thickness defects in the ankle
- Medial compartment > than lateral
- Knee OA 12x > than ankle OA
- TKA 25x > TAA & ankle fusion combined
Prevalence
Primary OA is rare
Post-traumatic is most common
RA is second most common

Post-Traumatic

Rheumatoid Arthritis of Ankle
• Less common than other joints (9%)
• Prevalence is related to duration of illness
• Higher involvement of ankle in JRA
Physical Exam

- Short strided antalgic gait
- Weakness
- Swelling
- Varus or Valgus
- Generalized tenderness over ankle joint
- Distinguish from subtalar pain

Radiographs

- AP/Lateral/Mortise
- Weight bearing is critical
- AP view distinguishes varus/valgus from ankle vs subtalar joint
- Radiographs don’t correlate with clinical function
Advanced Studies

- Bone Scan of limited use
- CT scan to evaluate subtalar joint involvement
- MRI to evaluate extent of AVN

Surgical Options

- Arthroscopic Debridement
- Arthrodiastasis
- Realignment Osteotomies
- Allografts
- Ankle Arthrodesis
- Total Ankle Arthroplasty
Most Common Treatments

- Ankle Fusion
- Total Ankle Replacement (TAR)

Advantages of Ankle Fusion

- Gold standard
  - First described in 1882 by Eduard Albert
- Good pain relief
- Good patient satisfaction
- If successful initially → no further operations

Disadvantages of Ankle Fusion

- Long period of immobilization
- ~10% nonunion rate
- Malunion
- Functional impairment
  - Difficulty with uneven ground, inclines, driving
- Premature arthritis in adjacent joints
  - Increased motion and stress
Advantages of TAR

- Retained motion
- Shorter period of immobilization
  - Soft tissue healing only
- Better restores function and ROM
  - May decrease adjacent joint DJD
  - Theoretical

Disadvantages of TAR

- Wound breakdown
  - Anterior approach
- Finite longevity of implants
- Less long term follow-up on newer generation implants
- Many surgeons have limited experience
- Failure may be catastrophic (BKA)
- Cost

Arthritis of the Ankle

Surgical Treatment
Arthrodesis
- "Gold Standard"
- Indications - pain, deformity, loss of ROM, failed arthrodesis, failed arthroplasty
Ankle Arthrodesis

- Neutral Dorsiflexion
- 5 degrees valgus
- 10 degrees external rotation
- Talus posterior to the tibia

Internal Fixation

- Provides rigid stabilization
- Lower incidence of complications
- Better mobility
- Easier for patient

Techniques

- Open
- Arthroscopic
- Mini-arthotomy
- Fibular onlay
- Fibular sparing—possible future TAR
Ankle Fusion—"Kitchen Sink" technique

- Fixation
  - Screws
  - External Fixation
  - Plates
  - Combo
**Surgical Technique**

- Intra-op fluroscopic views
- Avoid subtalar joint - check motion
- Bone graft from resected lateral malleolus
Ankle Arthrodesis: Complications

• malunion
• pseudarthrosis (0 - 30%)
• infection (0 - 27%)
• neurovascular complications resulting in amputation (0 - 13%)
• persistent pain
Why a Total Ankle Arthroplasty?

- The Need for Other Surgical Options:
  - patients with large bone loss
  - subtalar and/or midtarsal arthrosis
  - bilateral involvement
- Other Advantages
  - provides pain relief
  - preserves joint motion & stability

Who is the Ideal Candidate for a Total Ankle Arthroplasty?

- The older the better (>65)
- No significant comorbidities
- No significant angular deformity (varus/valgus)
- Systemic disease with bilateral or multiple joint involvement

TAA: What went wrong?

Tibial Component is Loose
Conaxial ankle replacement medial malleolus fracture
# Longer Term Follow-up: Cemented Total Ankle Arthroplasty

<table>
<thead>
<tr>
<th>Author</th>
<th>Prosthesis</th>
<th>Diagnosis#</th>
<th>AvgFU</th>
<th>Survival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jensen/Kroner</td>
<td>TPR</td>
<td>OA(21)/OA(2)</td>
<td>4.9 yrs</td>
<td>48%</td>
</tr>
<tr>
<td>Kitakata, et al</td>
<td>Mayo</td>
<td>RA(125)/SA(65)/OA(14)</td>
<td>5 yrs</td>
<td>79%</td>
</tr>
<tr>
<td>Kitakata/Patz</td>
<td>Mayo</td>
<td>RA(66)/SA(8)/OA(64)</td>
<td>9 yrs</td>
<td>64%</td>
</tr>
<tr>
<td>Wynn, et al</td>
<td>Beck-Steffee</td>
<td>RA(18)/SA(12)</td>
<td>2 yrs</td>
<td>73%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 yrs</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 yrs</td>
<td>10%</td>
</tr>
</tbody>
</table>

## TAA: History / Development

- **Second Generation Ankle Replacements**
  - preserve bone stock
  - respect rotational axis
  - respect tibiopedal alignment
  - semiconstrained
  - biological fixation
TAA: History / Development

- Second Generation Designs
  - S.T.A.R (Stryker)
  - Salto- Talaris (Integra Life Sciences now)
  - Agility (Depuy)- unavailable now
  - InBone/ Infinity- Prophecy Technology(Wright Medical Technology)
  - Trabecular Metal (Zimmer)

Agility : 2nd Generation Designs

- Agility prosthesis (Depuy, Warsaw, Indiana)
  - uncemented 3-component
  - incorporates tibiofibular arthrodesis
  - circumferential cortical loading
STAR : 2nd Generation Designs

• S.T.A.R prosthesis (Sbi now Stryker))
  – 3-component design
  – free-gliding polyethylene meniscus
  – rotation/gliding between tibia and meniscus
  – flexion/extension between talar component
STAR : 2nd Generation Designs

S.T.A.R prosthesis

Sagittal plane

Frontal plane

Salto Talaris Anatomic Ankle
(Integra Life Sciences)

- Italian
  - *Salto* – ‘jump’
  - *Talaria* – ‘winged sandals’
- FDA approval 11/06
- Design based on Salto Total Ankle Prosthesis (Tornier)
  - Used in Europe
  - Mobile-bearing
**Salto Talaris Anatomic Ankle – Talus Component**

- Anatomic talus design
  - Medial radius of curvature smaller
- Only lateral facet of talus replaced
- Groove in top of talar component that articulates with PE
  - Forces the foot in external rotation with dorsiflexion
- Ti plasma spray

**Salto Talaris Anatomic Ankle (Tornier) – Tibia Component**

- Thin with a tibial keel
  - Tapered pedestal on a thin shaft
  - Inserted via anterior cortical window
- Ti plasma spray

**InBone**
(Wright Medical)
Zimmer Trabecular Metal Total Ankle System

Trabecular Metal Implant by Zimmer

Cut surfaces off of center axis with router: one radius for talus and longer one for the tibia
Cut surfaces off of center axis with router: one radius for talus and longer one for the tibia

Final Fluoroscopy

Conclusions

Indications:
– rheumatoid arthritic patients & patients with low demands

Contraindications:
– talar AVN, Charcot Joint, neurologically compromised foot, chronic infection

Relative Contraindication:
– youthful, active individuals
Conclusions

- Pts. With symptomatic ankle arthritis have many options for treatment
- Present Total Ankle Arthroplasties address some of the earlier design problems
- Short term results are promising