Revision Total Ankle Replacement

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Disclosures

• Consultant, speaker bureau
  – Wright Medical
  – Integra

Total Ankle Replacement 2017

• Rapid growth in number of cases
  – Increase 10-12%/year, est. 7000 for 2017
  – AOFAS: 51% 2004; 63.5% 2012
  – Increased understanding biomechanics
  – Improved prosthesis design
  – Increasing surgeon training, experience
  – Increasing availability
  – Improved outcomes, pain, function, patient satisfaction
Complications of TAR

- Wound healing problems (2-18%)
- Nerve/tendon injury (2-10%)
- Intra-/postoperative fracture (10-38%)
- Technical error
  - Malalignment (Varus, valgus)
- Subsidence (9-11%)
- Aseptic loosening (9-11%)
- Deep infection (2-3%)
- Implant failure

Complications of TAR
High Grade Complications Associated with High Failure Rates

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Glazebrook et al, FAI ’09

Total Ankle Replacement 2017
Longevity Is Still Limited

- Glazebrook et al, FAI ’09
  - TAR 12.4% mean failure at 64 mos

- Haddad et al, JBJS ’07
  - Implant survival: 5 yr 78%, 10 yr 77%
  - TAR revision 7% (loose/subsidence 28%)
  - Arthrodesis revision 9% (nonunion 65%)

- Soohoo et al, JBJS Am ’07, re-op 1995-2004
  - TAR: Risk device-related infection, major revision
  - Revision: TAR 23% 5 yr; fusion 11% 5yr
Reoperation ≠ Revision

- **Wound treatment**
- **Gutter debridement**
  - Debride osseous impingement, hypertrophied synovial and scar tissue
  - Start lateral, 30°/70° scope

Reoperation ≠ Revision

- **Bone grafting of contained peri-prosthetic cysts with stable implants**
  - CT scan
  - Open vs scope
  - Intra-op flouro
  - Check implant stability

Reoperation ≠ Revision

- **Extra-articular secondary surgery**
  - Adjacent joint arthrodesis
  - Adjacent peri-articular osteotomy
  - Ligament reconstruction/release
  - Achilles/gastrocnemius lengthening
  - Tendon lengthening/transfer
Reasons for Medium-Long Term Failure of TAR

- Stiffness
- Impingement
- Malalignment
- Prosthetic instability
- Aseptic loosening, implant subsidence
- Infection

Revision TAR 2017
What Options Do We Have?

- Gold standard still conversion to fusion
- Concerns about hindfoot function
  - Peritalar overload, subsequent arthritis
  - Subtalar, midtarsal
- Prefer to be able to exchange the implant
  - Preserve ankle ROM
  - Function, gait, protect adjacent joints

Revision TAR 2017
What Tools Do We Have?

- Unlike knee, hip, shoulder
  - Literature, reports still very limited
  - No “standard principles”
  - We have to use primary systems for revisions
- Options limited
- Potential need to revise previous revisions
Revision TAR 2017
Can Newer Designs Make Revision “Easier”

• Anatomic design
• Less extensive bone resection
• Multiple implant sizes
• Reduction of body wear
• Increased support to protect against subsidence
  – Broad cortical rim
  – Fixation stems

Planning a Revision TAR

• Establish the etiology of TAR failure
• State of the ankle
  – Bone stock, stability, alignment
• Demands of the patient
  – Pain
  – Function
  – Co-morbidities, life expectancy
  – Appropriate expectations—high-risk surgery with strong potential for complications!

Planning a Revision TAR
Pre-op

• Check alignment, standing, gait
• Evaluate for equinus contracture
• Note deformity and flexibility
  – Ankle, hindfoot, midfoot, forefoot
• Soft tissue status
  – Previous scars
• Neurovascular status
• Locate main area of pain!
Planning a Revision TAR
Pre-op
• XR ankle, foot +/- hindfoot alignment view
  – Evaluate component position
  – Check prosthetic migration
  – Check for causes of impingement
  – Assess deformity (intra/extrarticular)
  – Check for adjacent arthritis, instability

58 yo woman post-traumatic arthritis

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- Staged Flatfoot reconstruction
- TAR
- WB at PO week 6
- Persistent pain
- Progressive recurrence of valgus
- Deformity
- Developed Talus AVN

Planning a Revision TAR

Pre-op

- CT scan
  - Better assessment component position, bony destruction
TAR with Deformity
Patient-Specific Total Ankle Arthroplasty

• Goal is to restore mechanical, kinematic joint axes
• Improved implant alignment
  – Neutral coronal and sagittal alignments obtained for all TAR cases regardless of preoperative deformity (Hsu et al, FAI 2015)
• Improved accuracy, reproducibility
• Decreased surgical time
• Decreased fluoroscopy time (12 min)

Revision of Septic TAR

• Early joint infection (<4 wks s/p TAR), good soft tissues, stable implants
  – Debride, retain implants, poly change
• >3 mos s/p TAR, acute infection (<2 wks sx)
  – Open arthrotomy, debride, poly removal
  – PMMA antibiotic cement spacer
  – 6 wks IV antibiotics
Revision of Septic TAR

- Otherwise 2 stage exchange
  - For infections < 3mos or chronic infections > 3mos s/p TKR
  - Components removed, joint debrided
  - Antibiotic-loaded cement spacer
  - IV antibiotics 6-8 weeks
  - D/c antibiotics then check aspiration
  - Then revise TAR or TTC fusion

TAR Revision

- Regional anesthesia
- Supine position
- Thigh tourniquet
- Large C arm
- Antibiotic loaded irrigation

TAR Revision

- Same anterior approach as primary
  - Wound complications 2-20.9%
- Careful handling of soft tissues
- Tag the extensor retinaculum for later repair to prevent bowstringing
- Remove fibrotic scarring and HO to visualize components, poly
  - Identify host bone—poly interface
TAR Revision
Component Removal

• Visualize implant M→L, proximal→distal
  – Thin sagittal saw
  – Thin straight, curved osteotomes
  – Minimize bone resection
• Prophylactic pinning or screws into malleoli before implant extraction

TAR Revision
Component Removal

• Order is implant dependent
  – Usually poly → tibia → talus
  – Poly → talus → tibia for Inbone
• Osteotomes, drill bits to aid in removal of poly
• Use probes, Freer to assess stability of components
• Remove granulation tissue

TAR Revision
Tibial Component Removal

• Exposure tibial implant—bone interface
  – Thin sagittal saw, osteotomes
  – Minimize bone resection
  – Protect anterior distal tibial cortex
  – Avoid flexion of tibial component
    • Allograft bone graft
    • Vertical fixation with tibial stems
• With tibial stems
  – Create anterior tibial cortical window
TAR Revision

- Remove talar component
- Assess remaining bone
- Debride cysts to subchondral bone
  - Impaction bone grafting
- Debride medial and lateral gutters
- Resect posterior capsule, granulation tissue
TAR Revision

- Remove additional hardware
- Recreate cuts tibia, talus
- Soft tissue balancing
- Appropriate component sizing

Bypass defects with stems
- Bone graft tibial defects once final tibial component position is accepted
- Talus is positioned after grafting of defects
- BG: auto, allo, BMA, vanco, +/- cement

Test trial components and stability
Restore joint line
- Reference malleoli

Additional Concurrent Surgeries

- Osteotomy for deformity correction
  - Tibia, supramalleolar, calcaneal, fibular
- Soft tissue releases
  - Deltoid, posterior tibial tendon, TN capsule
- Soft tissue reconstruction
  - Lateral ligaments, deltoid, PL→PB
- Arthrodesis for adjacent arthritis
TAR Revision

Inbone II is Right Now My Implant Of Choice For Revision TAR

• Modularity
  – Tibia, talus, poly, length/size of IM stems
• Stems allow for vertical fixation
  – Bypass poor quality, missing bone on tibia
  – No violation of anterior cortex
  – Load sharing
  – Improved fixation on talus

TAR Revision

Inbone II is Right Now My Implant Of Choice For Revision TAR

• Improved stability with poly-talus sulcus

• The implantation jig reference landmarks outside of the compromised joint to allow for consistent implantation

HD

(courtesy Hodges Davis, MD)
HD: 9 Years s/p Implantation

Preop CT: loosening

Implant Loosening
Templating Revision Tibia

Reaming Tibia for Stem Placement
Templating Cuts, Prophylactic Malleolar Fixation

Vertical Fixation, Stable Talus
Conclusions

• TAR is an established alternative to ankle fusion for the treatment of end-stage arthritis
• 3rd generation implants have superior outcomes with regards to pain, function, patient satisfaction, survival
• Surgeon training and experience is increasing and is crucial

Conclusions

• TAR is technically demanding surgery
• End stage ankle arthritis is also a disease of the young(er)
• As the frequency of the procedure increases, so will complications and need for revision TAR (and revisions of revisions)
  – Most cases are “reoperations” rather than full on revisions
  – Gutter debridement, bone grafting
Conclusions

- Failure of TAR is a challenge for both patients and surgeons
- Appropriate patient expectations!
  - Risk of complications— intra op and post op—remains high
- Need to know the cause for revision!!!
- Rule out infection
- Handle soft tissues, bone with great care

Conclusions

- Literature is sparse
- Results are very dependent on TAR prosthesis system used
- New revision systems will assist with cortical bone coverage, implant stability, increased implant survival

THANK YOU!!!