

*Institute for Orthopaedics and Sports Medicine*

## Revision Total Ankle Replacement

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NYU Hospital for Joint Diseases  
January 27, 2017



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## Disclosures

- Consultant, speaker bureau
  - Wright Medical
  - Integra



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## 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



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### 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



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### Complications of TAR

High Grade Complications Associated with High Failure Rates

<ul style="list-style-type: none"> <li>• Wound healing problems (2-18%)</li> <li>• Nerve/tendon injury (2-10%)</li> <li>• Intra-/postoperative fracture (10-38%)</li> </ul>	} Low
<ul style="list-style-type: none"> <li>• Technical error           <ul style="list-style-type: none"> <li>– Malalignment (Varus, valgus)</li> </ul> </li> <li>• Subsidence (9-11%)</li> </ul>	} Medium
<ul style="list-style-type: none"> <li>• Aseptic loosening (9-11%)</li> <li>• Deep infection (2-3%)</li> <li>• Implant failure</li> </ul>	} High

Glazebrook et al, FAI '09

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### 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%)
- *Soochoo et al, JBJS Am '07, re-op 1995-2004*
  - TAR: ↑risk device-related infection, major revision
  - Revision: TAR 23% 5 yr, fusion 11% 5yr

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### Reoperation ≠ Revision

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



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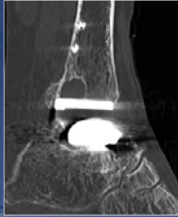
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### Reoperation ≠ Revision

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



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### Reoperation ≠ Revision

- Extra-articular secondary surgery
  - Adjacent joint arthrodesis
  - Adjacent peri-articular osteotomy
  - Ligament reconstruction/release
  - Achilles/gastrocnemius lengthening
  - Tendon lengthening/transfer



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### Reasons for Medium-Long Term Failure of TAR

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



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### 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



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### 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

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### 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



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### 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!*



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### 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!



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### 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



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### 58 yo woman post-traumatic arthritis



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### 58 yo woman post-traumatic arthritis



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**58 yo woman post-traumatic arthritis**

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



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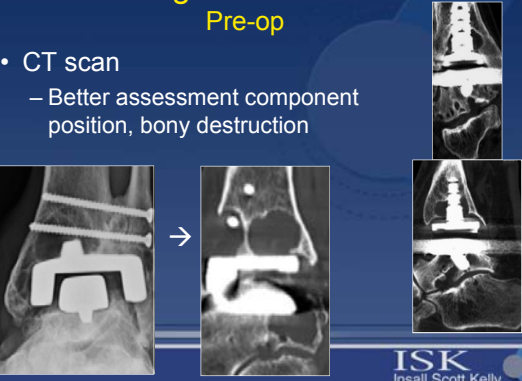
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**Planning a Revision TAR**  
Pre-op

- CT scan
  - Better assessment component position, bony destruction



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### TAR with Deformity

Patient-Specific Total Ankle Arthroplasty



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### 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 flouro time (12 min)

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### 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



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### 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



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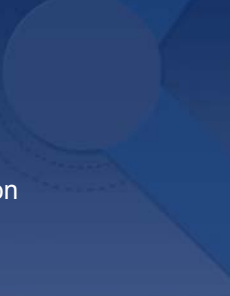
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### TAR Revision

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



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### 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



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### 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



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### 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



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### 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



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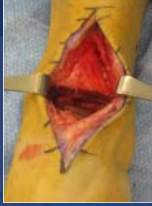
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### TAR Revision

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



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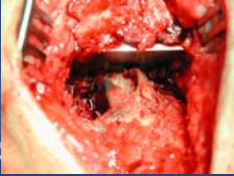


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### TAR Revision

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



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### TAR Revision

- 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



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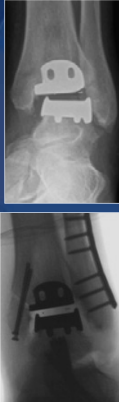
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### TAR Revision

#### 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



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### 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



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### 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



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### HD

(courtesy Hodges Davis, MD)



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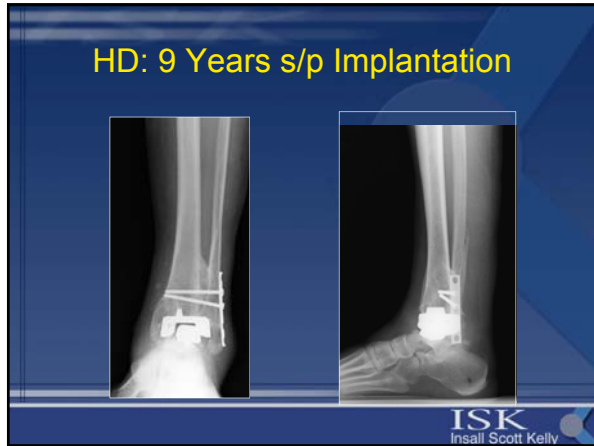
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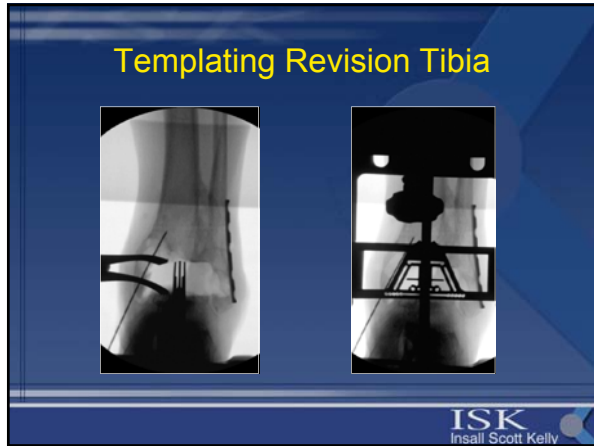
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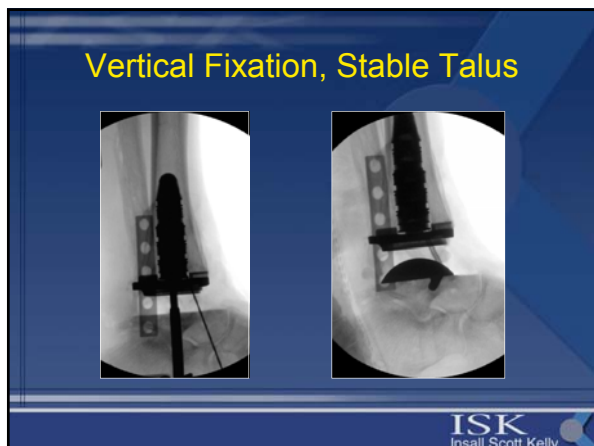
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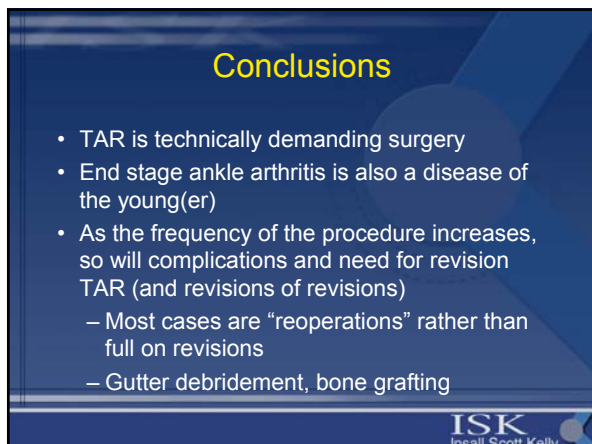
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**Conclusions**

- 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

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**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

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**THANK YOU!!!**



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