Disclosures

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Ankle Arthritis: Ankle Arthrodesis

• Gold standard for end-stage arthritis
• 85 - 100% union rate
• Rigid internal fixation
• Multiplanar fixation
• Simultaneous deformity correction
Ankle Arthritis: Ankle Arthrodesis
- Eliminate pain, deformity
- Obtain plantigrade foot
- Position:
  - Neutral dors/plantarflexion
  - 5 degrees of valgus
  - 5 degrees externally rotated
  - Anterior aspect of talar dome slightly posterior to anterior aspect of tibia

Tibiotalar Arthritis: 1° Post-traumatic
- Bone defects
- Axial deformities
- Previous open fractures
- Previous scars
- Talar avascular necrosis

Disadvantages of Open Arthrodesis
- Extensive soft tissue dissection
- Wound healing problems
- Delayed weightbearing
- Slow rehabilitation
- Nonunion (5-40%)
- Infection
Trends over last 20 years

- Minimally invasive surgery
- Preservation of surrounding soft tissues
  - Percutaneous fracture plating
- Reliable arthroscopic techniques in the shoulder, hip, knee and ankle

Advantages of Arthroscopic Fusion

- Minimize soft tissue concerns
  - Enhanced peri-articular blood supply
- Reduced blood loss
- More rapid rehab and mobilization
  - Increase ROM at surrounding joints
- Quicker time to union
- Decreased nonunion rates

Arthroscopic Ankle Arthrodesis

- Increase in arthroscopic vs open fusion (2004-09)
- Improved instrumentation, experience
  - Reduced postoperative pain, shorter hospital stays, faster time to union, earlier return to mobilization, decreased complications

Terrell et al, FAI 34(11)'13

Arthroscopic Ankle Arthrodesis

- Majority of fusions still done open
- Especially for more severe deformities

Terrell et al, FAI 34(11)'13

Indications for Arthroscopic Fusion

- Mechanical pain with all WB activities
- Fail ≥6 mos conservative treatment
- No active infections
- Minimal preoperative bone defects
- Minimal/mild correctable deformity in coronal plane
- Moderate deformities correctable to neutral under stress fluoroscopy

Gougoulas et al, FAI’07; Behrend et al, Tech Fr Ankle ’12
**Indications for Arthroscopic Fusion**

- Wound healing concerns
  - Post-traumatic arthritis
  - Multiple scars
  - Inflammatory arthritis
  - Elderly

**Contraindications for Arthroscopic Fusion**

- Irreducible, significant deformity
- Significant bone loss
- Previous attempt at fusion
- Active infection
- ?Broad-based AVN (relative)
- ?Painful adjacent joint arthritis
- ?Smoking

**Arthroscopic Ankle Arthrodesis: Pre-op Evaluation**

- Post-traumatic axial deformities
- Bone defects
- Bone quality
- Skin condition, previous incisions
- Underlying infection
- Evaluate adjacent joints
  - Knee, subtalar, tarsal
  - Confirm pain is coming from the ankle!
Ankle Arthroscopic Arthrodesis: Set up

- Patient supine
  - Bumps under thigh, knee and ankle
- Spinal or regional anesthesia
  - Incr pt satisfaction, decr pain/narcotics, decr LOS

Ankle Arthroscopic Arthrodesis: Set up

- Pump 50-60 mm Hg
- 1ml epi (1:100) per 3L volume of irrigation
- ?Noninvasive distraction
  - ? thigh holder

Ankle Arthroscopic Arthrodesis: Set up

- 4.0-mm 30° and 70° arthroscopes
  - Initially may use 2.7 or 1.9 mm scope if tight
- Fluoroscopy necessary for guide pin and HW positioning
- Angulated, small joint instruments, shavers, burrs, curettes for removal of articular cartilage
- Large cannulated screws for internal fixation
- ?Bone graft
Ankle Arthroscopic Arthrodesis:
Set up
• Mark out neurovascular structures
• Standard AM, AL, +/- PL portals used
• Insufflate joint, distend
• Insert 18G needle into AL portal
  – Should be able to swing along ankle joint and into lateral gutter facing directly forward

Ankle Arthroscopic Arthrodesis:
Joint Preparation
• Systematic removal of all remaining cartilage
  – Aggressive shavers
    • 3.5, 4.5-mm full radius resector
    • Larger shavers useful b/c clog less often
• Work anterior → posterior first on talus
  – Ring, angled curettes good to remove posterior

Ankle Arthroscopic Arthrodesis:
Joint Preparation
• Then work posterior → anterior on plafond
• Important to clear the anterior lip
  – Remove anterior tibial/talar osteophytes
    • 4.0/5.5mm burr
    • Avoid equinus
    • Allow improved access to joint
Ankle Arthroscopic Arthrodesis:
Joint Preparation

- Debride medial malleolus and medial gutter
  - Consider smaller burr (2.3mm)

- Shave lateral gutter to allow apposition
  - Significant lateral tibiotalar pain
  - Preexisting lateral compression
  - Debride phytes esp w/varus deformity

Ankle Arthroscopic Arthrodesis:
Lateral Talo-fibular Fusion

- Lateral gutter union rate lower than that of tibiotalar joint and medial gutter
- Lateral gutter nonunion rate as high as 75%
  - Goetzmann et al, Orth Traum ’16, Yoshimura et al, Arth ’12
- Lateral gutter union does not correlate with improved clinical outcomes without major talo-fibular lesions
  - Yoshimura et al, Arth ’12, Winson et al, JBJS Br 2005

Arthroscopic Ankle Arthrodesis:
Joint Preparation

- Proper preparation of bone surfaces
  - Removal of minimal subchondral bone to expose bleeding surfaces
  - Oval 4-mm burns
  - "Suction test" on talus
  - +/- Tourniquet down
  - Maintain joint contour
  - Curette cysts
Arthroscopic Ankle Arthrodesis:

Joint Preparation

- Fenestrate surfaces to be fused
  - Burr “spot welds” (Ferkel)
  - 2.0 mm drill thru sleeve
  - Microfracture awls
- Bone grafting with large defects
  - Allogeneic bone paste
  - Insert through cannula
  - +/- laminar spreader through portal

Ankle Arthroscopic Arthrodesis:

Fixation

- Reduce ankle into neutral position
  - Neutral DF
  - 0-5° HF valgus
  - 5-10° ER
- Place wires, check alignment, release traction, advance into talus, avoid penetration into ST joint
- If bone soft, use washer or additional screws

- 2 screws
  - Medial TT, lateral TT or FT
- 3 screws
  - Medial TT, lateral TT, FT
  - Increased union rate
  - Decreased time to union
  - Increased compression and torque resistance
  - Improved stability

Allograft Safety 2012
Ankle Arthroscopic Arthrodesis: My Fixation Preference

- Solid rigid internal fixation
- Large short-thread cannulated cancellous screws
- Compression
- Fluoroscopy

Ankle Arthroscopic Arthrodesis: My Fixation Preference

- Crossed transmalleolar fixation
  - Parallel compression screws (Europe)
- Tibiotalar +/- gutters
- Posterior “home run” tibiotalar screw
- Slight anterior angulation
  - Anterior compression
  - More bone for fixation and avoid subtalar joint

Ankle Arthroscopic Arthrodesis: Post-operative

- Same day discharge home
- NWB 3 weeks in SLC splint
- NWB boot with rocker sole x 3 wks
- Starting at 6 wks, progress to FWB in boot
- At 3 mos, with solid XR fusion, FWB, regular shoes, progressive activities as tolerated
- HWR not before 6 mos
Ankle Arthroscopic Arthrodesis: When is it fused?

• Union
  – Clinically stable ankle
  – Painless on manipulation and WB
  – Radiographic evidence of bridging trabeculae
  – No failure of internal fixation or change in position

Monroe et al, FAI 1999

Ankle Arthroscopic Arthrodesis: Results

• Ferkel et al, FAI ’05, 35 pts, f/u 72 mos
  – 97% union, fusion 11.8 wks
• Cannon et al, Ft Ankl Surg ’04
  – 100% union, fusion at 4 mos
• Winson et al, JBJS Br ’05
  – 92% union, fusion at 12 wks

Ankle Arthroscopic Arthrodesis: Arthroscopic Fusion With Increased Deformity

• Gougoulias et al, FAI ’07, f/u 21 mos
  – Coronal deformity 15-45°
  – Fusion 97.4% at 12.5 wks
• Dannawi et al, Foot Ankle Surg ’11
  – No significant difference in fusion rates
  – Time to union longer with greater deformity (12.7 wks vs 8.8 wks)
• Key is ability to place the forefoot square to the ground

Ankle Arthrodesis: Arthroscopic vs Open

- Townshend et al, JBJS ’13, f/u 2 yrs
  - Correction of deformity in both groups
  - Greater, more rapid improvements in pain, function in arthroscopic group
  - Arthroscopic better outcomes at 1 & 2 years

- Yasui et al, J Foot Ankle Surg 2016
  - Open group had 2x↑ rate subsequent adjacent joint arthrodesis

Posterior Ankle Arthroscopic Arthrodesis

- In most arthritic ankles the anterior joint
  - Has the least remaining cartilage
  - The worst soft tissues after prior surgeries
  - Higher chance of wound issues, infection

Posterior Ankle Arthroscopic Arthrodesis

- The posterior approach allows
  - Access to the posterior tibiotalar joint
  - Compression screws to pull talus in
- 2 portal hindfoot technique
- +/- AM portal for anterior rim of talus
- 5.5 shaver, curette, osteotome
Posterior Ankle Arthroscopic Arthrodesis

- Limited trans-Achilles approach for screw insertion
  - 2 parallel 6.5 partially threaded screws PL→AM
  - 100% fusion at 3 mos
  - Access to 96% of surface area of entire joint

Arthroscopic Ankle Arthrodesis

Conclusions

- More ankle arthritis patients as population is more active and lives longer
- Ankle arthrodesis still gold standard in young, active, high demand patients
- Trend toward minimally invasive procedures that protect soft tissues
- Improved arthroscopy instrumentation, experience

Arthroscopic Ankle Arthrodesis

Conclusions

- Compared to open surgery
  - Maintain periarticular blood supply
  - Reduced blood loss
  - Lower complication rate
  - More rapid rehab and mobilization
  - More rapid fusion rates
  - Decreased nonunion rates
  - Improved pain, function, long-term outcomes
Thank You For Your Attention