


Institute for Orthopaedics and Sports Medicine

Arthroscopic Ankle Arthrodesis

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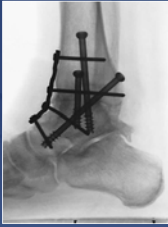
Disclosures

- Consultant
 - Wright Medical
 - Integra




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 dorsi/plantarflexion
 - 5 degrees of valgus
 - 5 degrees externally rotated
 - Anterior aspect of talar dome slightly posterior to anterior aspect of tibia



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Tibiotalar Arthritis: 1° Post-traumatic


- Bone defects
- Axial deformities
- Previous open fractures
- Previous scars
- Talar avascular necrosis



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Disadvantages of Open Arthrodesis

- Extensive soft tissue dissection
- Wound healing problems
- Delayed weightbearing
- Slow rehabilitation
- Nonunion (5-40%)
- Infection



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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



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Trends over last 20 years

- Improved peri-, post-op pain management
- Trend towards shorter hospital stays
- Increase in outpatient procedures
- Lower rate of complications
- Improved speed and reliability of overall recovery
- Decrease overall cost of care



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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

Peterson KS et al, J Ft Ankle Surg, 2010; Nielsen et al, Foot Ankle Surg, 2008

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Arthroscopic Ankle Arthrodesis

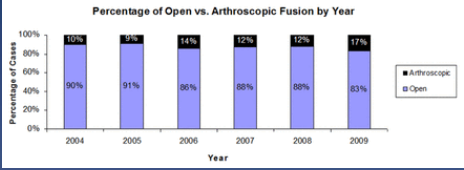
- Increase in arthroscopic vs open fusion (2004-09)
- Improved instrumentation, experience
 - Reduced postoperative pain, shorter hospital stays, faster time to union, earlier return to mobilization, decreased complications

Terrell et al, FAI 34(11)'13




Arthroscopic Ankle Arthrodesis

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



Year	Arthroscopic (%)	Open (%)
2004	10%	90%
2005	9%	91%
2006	14%	86%
2007	12%	88%
2008	12%	88%
2009	17%	83%

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 flouroscopy



Gougoulias et al, FAI'07; Behrend et al, Tech Ft Ankle '12



Indications for Arthroscopic Fusion

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



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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

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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!



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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



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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



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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



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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



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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



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Ankle Arthroscopic Arthrodesis: Joint Preparation

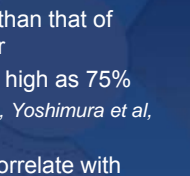
- Debride medial malleolus and medial gutter
 - Consider smaller burr (2.3mm)
- Shave lateral gutter to allow apposition
 - Significant lateral tibiotalar pain
 - Preexisting lateral compression
 - Debride phytes esp w/varus deformity



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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



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Arthroscopic Ankle Arthrodesis: Joint Preparation


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



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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



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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



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Ankle Arthroscopic Arthrodesis: Fixation

- 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



Yoshimura et al, Arthr 2012

Goetzmann et al, Ortho Traumatol 2016; Oglivie-Harris et al, JBJS 1993; Alonso-Vazquez et al, Clin Biomech 2004; Yoshimura et al, Arthr 2012

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Ankle Arthroscopic Arthrodesis: My Fixation Preference

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



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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



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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

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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

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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



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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**

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**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

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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



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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

deLeeuw et al, Knee Surg Sports Traum 2016

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Posterior Ankle Arthroscopic Arthrodesis

- Limited trans-Achilles approach for screw insertion
 - 2 parallel 6.5 partially threaded screws PL→AM
- *deLeeuw et al, Knee Surg Sports Traum 2016*
 - 100% fusion at 3 mos
 - Access to 96% of surface area of entire joint



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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

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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

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