Hallux Rigidus and Alternatives to Fusion

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Disclosure

• BESPA Medical – Consultant
• Integra/Derma Sciences - Speaker

Anatomy of the First Metatarsophalangeal Joint

• 1st Met, Prox Phalans, Tibial and Fibular sesamoids
• FHL and FHB
• Plantar plate
• Extensor hood, EHL, EHB
• Articular surfaces
  • MT-Phalanx
  • MT-Sesamoids
Cheilectomy

- Removal of the dorsal bone spur from the first MPTJ
- Often considered first line surgical option for early HR

Roukis, JFAS 2010
Systematic Review (Level 1)
23 studies, 706 cheilectomies
Low incidence of revision surgery and should be considered a first-line surgical treatment for HR

Nicolosi, JFAS 2015
Retrospective (Level 3)
Follow up 7.14 yrs, mean age 55.7
51/58 had no limitation in activity, 88% “success”, 3% fusion
Cheilectomy offers long term satisfaction for HR patients

Phalangeal Osteotomy

- Increases joint space by decompression, reduce intrinsic muscle pull, preserving joint ROM
- Cylindrical Akin, Regnault enclavement, Moberg

Outcomes after Cheilectomy with Phalangeal Osteotomy: Roukis, JFAS 2010
- Systematic review (Level 2)
- 11 studies, 374 procedures
- 89% pain relieved/improved, 77% satisfied/very satisfied, 5% needed revision
- C with PO should be considered a first line surgical treatment for HR

Double V Osteotomy

- Valero, Medicine 2017
  - Prospective, multicenter trial
  - Cheilectomy v Double V ost + Chei
  - 33 in each group, > 30 mo F/U
  - 13 degrees DF and 2 degrees PF more in Double V group
  - Significant improvement AOFAS score
  - Technically easy, low complications
  - Better clinical/functional results than Cheilectomy alone
Metatarsal Osteotomy

- Roukis, JFAS 2010
  - Systematic Review (Level 1)
  - 4 studies, 93 osteotomies
  - Peak DF increased 10.4 degrees
  - 26.7% dissatisfied, 22% revision rate
  - “Use with caution or not at all”

- Cullen et al, JFAS 2017
  - Retrospective, comparative (3)
  - 423 subjects, 80% C, 20% DO
  - Revision rate 8% C, 15 DO
  - Technically difficult, more risks, WB injuries but...
  - DO lower rate of revision than C

Soft Tissue Interposition Arthroplasty

- Keller
  - Resect base of proximal phalanx with interposition of capsular tissue
  - Lost favor secondary to altered biomechanics, long-term complications, limited salvage

- Schneider et al, FAI, 2011
  - Retrospective review: 87 cases, 27 years, avg 90 yrs
  - 5% revised, 99% would have procedure again
  - Keller had high patient satisfaction, low complication rate compared to competing methods

- Aynardi et al, AOFAS Annual Mtg 2016
  - Retrospective review: 292 procedures, avg 6.9 yrs follow-up
  - Failure = subsequent surgery on the hallux
  - 1.7% failure rate (2 revisions, 3 fusions)
  - 88.7% rated the procedure “excellent” or “good”
  - Excellent long-term survivorship and high patient satisfaction

Total Joint Implant Arthroplasty

- Silicone bone 1967, double stemmed in 1974
- Improve stability of the Keller arthroplasty
Total Joint Implant Arthroplasty

- Morgan et al., Int Ortho, 2012
  - Retrospective, mid-term, 5-8.5 yr f/u
  - No difference between ceramic, metallic total, metallic hemi
  - SIA f/u ti f HR ith ti f t

- No difference between ceramic, metallic total, metallic hemi, silastic total

- Lower satisfaction with silastic hemi

SIA = effective for HR with satisfactory functional outcomes, high patient satisfaction

Cook et al., JFAS, 2009
- Meta-analysis of 1st MTPJ IAP (Level 1)
  - 47 articles, 3049 procedures
  - Overall pt satisfaction = 85.7% (94.5%)
  - Provides supportive evidence to the clinical benefit of 1st MTPJ IAP

Implants vs Arthrodesis

- Stone et al., FAS, 2016
  - Randomized, controlled trial (Level 1)
  - Follow-up to a 2005 study, VAS at 24 mos.
  - No loss of motion, VAS pain, survivorship
  - AD outperformed AP in the long term

- Kim et al., JAS, 2012
  - Multicenter, retrospective (Level 3)
  - 158 procedures: AD, AP, or hemi, 5.3 yr f/u
  - ACFAS 1st MPJ/AOFAS 1st MPJ scales
  - No difference in subject outcomes of the 3

- AD outperformed AP in the long term

Metatarsal Head Resurfacing Implant Arthroplasty

- Hilario et al, JFAS 2017
  - Retrospective, 10 yr f/u
  - Treatment of late stage HR with metatarsal resurfacing allows for low risk and excellent outcomes
Arthrodiastasis

- Joint distraction with external fixation
- Prevents mechanical bone contact
- Changes the hydrostatic pressure, increased proteoglycan synthesis
- Removes stress on subchondral bone, decreasing subchondral sclerosis

Abraham, JFAS 2012
10 distractions, avg age 41 yrs
Grade II or III
Avg duration period 16.4 weeks
Avg pain scale 8.2 → 0.83
No add'l surgery in 2.2 yr follow up
Arthrodiastasis a reliable option for Grade II or III HR in the short term

What's new in 2018?
Polyvinyl Alcohol (PVA) Implant

- CARTIVA SCI
- Organic polymer-based material consisting of 40% polyvinyl alcohol (PVA) and saline (0.9%)
- Elastic and mechanical properties similar to surrounding cartilage
- Synthetic: (no disease transmission)
- Biocompatible: (no systemic irritation)
- Biostable: (no degradation)
- Durable: (can withstand repetitive loads)
- Slippery: (low friction coefficient)

Baumhauer et al, FAI 2016
Prospective, randomized, Level 1 study
12 centers in Canada & UK
PVA implant vs Arthrodesis
24 month f/u
VAS pain decreased in BOTH
FAAM sports/ADL increased in BOTH

Goldberg et al, FAI 2017
Randomized trial, Level 2 study
Good alternative for pts wanting to maintain motion

PVA implant appropriate in HR grade 2-4
Results with HV <20 or substantial preoperative stiffness equivalent to fusion.
Irrespective of gender, age, BMI, HR grade, preop pain or symptom duration
Daniels et al, FAI 2016
- Prospective case series, Level 4 study
- 5 year outcomes of PVA arthroplasty
- 27 patients
- Average age 56.1

- Pain VAS, SF-36, FAAM ADL and Sports all had statistically significant improvements
- Radiographically no changes in implant position, loosening, subsidence or implant wear

"Substantial and clinically meaningful" reduction in pain at every follow up visit
93% reduction in pain from baseline to 2 years

108% functional improvement at 2 years
PVA (Cartiva) Pearls and Pitfalls

- Check for plantar sesamoid pain
- Positioning device flush and center with the metatarsal head
- Minimal cheilectomy
- At least 2mm bone around the implant
- Can combine with a phalangeal osteotomy

What I’m telling my active, severe HR patients...

- Fusion vs Cartiva SCI
- Similar pain relief and functional improvement
- Cartiva maintains motion
- 1/10 still have pain, may need to be removed/converted
- Can still fuse later if necessary

Summary

- Cheilectomy w/wo phalangeal osteotomy = 1st line surgical option early HR
- Isolated decompressional 1st metatarsal osteotomies = use with caution “or not at all”
- Resection arthroplasty ideal for the sedentary patient with HR +/- HV
- Implant arthroplasty has strong supporting evidence
- PVA implant (Cartiva) has promising data for grades 2-4 HR and preserves future options.

Thank You

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