Correction of Hallux Valgus with Osteotomies

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Disclosures

• None

Hallux Valgus Radiographic Angles

• Hallux Valgus Angle (HVA)
  – Normal < 15°

• Intermetatarsal Angle (IMA)
  – Normal < 9-10°
#### Hallux Valgus Deformity

<table>
<thead>
<tr>
<th></th>
<th>HV Angle</th>
<th>IM Angle</th>
<th>Sesamoid Subluxation</th>
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</thead>
<tbody>
<tr>
<td>MILD</td>
<td>&lt;30°</td>
<td>&lt;12°</td>
<td>&lt;50%</td>
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<tr>
<td>MODERATE</td>
<td>30°-40°</td>
<td>12-15°</td>
<td>&lt;75%</td>
</tr>
<tr>
<td>SEVERE</td>
<td>&gt;40°</td>
<td>&gt;15°</td>
<td>&gt;75%</td>
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#### Distal Metatarsal Articular Angle

- **Definition:**
  - Angle between the longitudinal axis of the metatarsal (≤10 degrees)
  - May be difficult to measure accurately
  - Poor inter/intra observer reliability
  - Think younger HV pts

#### Congruent vs Incongruent
Indications

• Pain over medial eminence
• Transfer lesions
• 2nd toe impingement
• Inability to wear reasonable shoes

Surgical Goals

• Correct Hallux valgus
• Correct IM angle
• Restore or Maintain joint congruencey
• Maintain 1st metatarsal length

Hallux Valgus Surgery

> 130 Surgical Procedures
• Exostectomy
• Soft Tissue Procedures
• Distal Metatarsal Osteotomy
• Proximal Metatarsal Osteotomy
• Proximal Phalangeal Osteotomy
• 1st TMTJ Arthrodesis
• 1st MTP Joint Resection Arthroplasty
• 1st MTPJ Arthrodesis

Multiple osteotomies described
When is an osteotomy **not** indicated?

1st TMT instability

Failure to recognize TMT instability
Arthritis

Osteotomies: How to choose which one?

- Degree of correction needed
- Consistency of correction
- Ease of performing the surgery
- Stability/early weightbearing
- Surgeon’s comfort level with technique

Distal Osteotomies

- Step cut (Mitchell): shortening and dorsal malunion
- Oblique (Wilson): avg 8.5mm shortening
- Distal > type (Chevron/Austin)
- Z type (SCARF)
Distal osteotomies/ Distal Chevron Osteotomy

- **Indications (mild/moderate)**
  - HVA < 30-35°
  - IMA < 13-15°

- **Contraindications**
  - HV Pronation > 15°
  - Severe deformities (> 40°)

Distal Chevron most common osteotomy among ortho surgeons in USA

### Technique

- **Incision**
  - Center over medial eminence

- **Pitfalls**
  - Avoid dorsal and plantar nerves

- Drill apex hole in center of MT head
• V shaped osteotomy in center of head
  60 degree angles

Technique

Avoid lateral blade penetration

• Shift fragment laterally 3 – 5 millimeters

Technique
Technique

- Fixation
  - K-wire
  - Screw
  - Biodegradable pin or screw

K wire vs Screw

Absorbable
No evidence to support one type of fixation over another

Technique

- Medial capsular reefing

Technique

- Check intraoperative xray or fluoroscopy after medial closure
- Simulate WB
Distal Chevron Osteotomy
• Results
  – 80-94% patients satisfied
  – Average correction
    • HVA 12-15°
    • IMA 4-7°
  – Shortening of 1st MT avg. 2-3 mm
  – Limited correction of sesamoid subluxation or hallux pronation
  – Higher satisfaction rate with IMA < 15°
  – Limited lateral release: No effect on outcomes

Hallux Valgus dressing

Technique

Post OP
• Post Op, shoe or boot for 6 weeks
• Heel walking 4 weeks
• Change dressing week 1,3
• Toe spacer
• ROM at 4 weeks
• Toe spacer 8 weeks
**Distal Chevron Osteotomy**

- **Complications**
  - Recurrence
    - 10-14%
  - Transfer metatarsalgia
    - Secondary to shortening
  - Osteonecrosis of MT head
    - 0-20% incidence
    - Respect safe zones
    - Avoid excessive dorsal and lateral saw blade penetration

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**Recurrent HV after Chevron**

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**Limitations**

- 1 degree/mm angular correction
- 3 degrees/5mm
  - Graves et al, F&A, 1993
Limitations

• Average MT neck width is about 12-14mm
• Can only shift distal fragment 4-6mm and maintain adequate boney contact

Limitations

• Goal IMA <10 degrees
• 5 mm shift at most 5 degrees correction
• Pre-op IMA <14

Chevron Modifications

• Biplanar Chevron
  – Removes medial wedge
  – Allows medial rotation of capital fragment
  – Useful in cases of high DMAA (15 degrees)
Modifications

• Biplanar Chevron
  – Removes medial wedge from metatarsal cut
  – Allows rotation of the capital fragment

Double Osteotomy

• Post op
  – Biplanar Chevron
  – Akin osteotomy

Distal Closing Wedge
Proximal Metatarsal Osteotomy (High DMAA)

Controversies
- Lateral Release/adductor tenotomy
- Is there sufficient evidence to support increased risk of AVN?

Chevron + DSTR
Complications

• AVN
  – Lateral release
  – Lateral blade penetration

• Under Correction/Recurrence
  – Pushing the indications

Proximal Metatarsal Osteotomies (PMTO)

• Indicated for moderate to severe deformities
  – HVA > 30 degrees
  – IMA > 12-13 degrees

Distal Soft Tissue Procedure

“Modified McBride” (1990)

• Adjunct to bony procedure
  – Medial capsulotomy and plication
  – Lateral capsule release (multiple perforations)
  – Adductor hallucis release (not always necessary)
  – Deep transverse metatarsal ligament release (not always necessary)
  – Varus stress
  – Fibular sesamoid no longer excised
Proximal Metatarsal Osteotomy

- Proximal Metatarsal Osteotomies (PMTO)
  - Crescentic
  - Proximal chevron
  - Oblique (Ludloff and Mau)
  - SCARF
  - Medial opening wedge

**How to decide?**

Osteotomies: How to choose which one?

- Degree of correction needed
- Consistency of correction
- Ease of performing the surgery
- Stability/early weightbearing
- Surgeon’s comfort level with technique

Proximal Osteotomies

- Complications
  - Recurrence
  - Hallux Varus
  - Arthrofibrosis
  - Transfer metatarsalgia
    - Secondary to malunion, shortening, or 1st MT dorsiflexion
  - Delayed or nonunion
  - Incomplete correction
Intrinsic Stability

PMTO Biomechanics

- No consensus on most stable PMTO
  - Scarf and Mau osteotomy strongest in recent biomechanical study  Unal et al  AOFT 2010

- Plates > screws > K-wires
Proximal Crescentic Osteotomy

- Rotational osteotomy
- 90-95% patient satisfaction
- Reliable correction
- Zettl et al 2000 AOTS
- Thordarson 1992 FA
- Dreeban, Mann 1996 FAI

Proximal Crescentic Osteotomy

- Dorsiflexion malunions
- Nonunion
- Challenging to perform
- Difficulty w/fixation
  - Plates may help

Proximal Chevron Osteotomy

- Translational and Angular correction
- Outcomes similar to Cresentic but more stable
  - Easley et al FAI 1996
  - Markbreiter/Thompson FAI 1997
  - Sammarco et al FAI 1998
Proximal Chevron Osteotomy

- Although better stability to prevent DF
- More tendency for loss of reduction
- Plate fixation may be required
  • Deorio & Deorio, Tech in Ortho Surg 2011

Proximal Opening Wedge Osteotomy (POWO)

POWO
POWO

- Fairly reproducible
- Good results reported
  - Nery FA 2013
  - Smith FASpec 2009
  - Shurnas FAI 2009
  - Wukich Oper Tech 2006

POWO

- Nonunion/delayed union
- Hardware removal
- Intraarticular hardware

Proximal Metatarsal Oblique Osteotomies

- Ludloff
- Mau
- SCARF
Ludloff Osteotomy

Ludloff osteotomy

- Fairly easy procedure
- Good clinical results
  - Chiodo FAI 2004
  - Trinka JBJS 2008

- Stability
- Shortening
- Loss of correction
- Intraoperative fracture
SCARF

- Widely used
- Translational
- Excellent stability
- Ease of internal fixation
- Mild to severe deformities
- Good reported clinical results
  - Choi FAI 2013
  - Adam CORR 2011
  - Robinson 2009 FAI
  - Weil 2000 FA clinic

SCARF

- Troughing
- IO fracture
- Wound healing
- Delayed union
- Learning Curve

Modified MAU
Modified Mau

- Translational & Rotational
- Excellent stability
- Ease of internal fixation
- Moderate to severe deformities

59 y/o female painful bunion

MAU Osteotomy
Distal soft tissue release

Draw out osteotomy

Mau Osteotomy
POST OP

- Splint x 7 days
- Fracture boot x 5 wks
- Heel WB

COMPLICATIONS

N=65

- Hallux Varus: 9%
- Metatarsal Fracture: 4.6%
- Loss of Correction: 4.6%
- Dorsiflexion Malunion/Transfer Lesion: 0%
- Nonunion: 0%

LEARNING CURVE

Other procedures
Proximal Phalangeal Osteotomy

**Akin Procedure (1925)**
- Hallux valgus interphalangeus
- HV w/ increased DMAA
- Typically adjunctive to more comprehensive HV correction (double osteotomy)

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**Akin Osteotomy**
- Extend incision distally to expose metaphyseal/diaphyseal junction
- 3-7 mm wedge removed
- Leave lateral cortex intact

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**Akin Osteotomy**
- O-nonabsorbable suture thru drill holes
- K-wires
- Wire
- Staples
- Screws
Distal biplanar Chevron and Akin Osteotomies

Akin + Mau

Thank You