INTRODUCTION
Davies: Initial Description (1949)
– pressure over lateral condyle 5th metatarsal head
  • bursa irritation
Tailor’s Bunion
– cross-legged sitting creates irritation

DEFORMITY
Recognize the specific anatomic variation to select appropriate surgical procedure
– Structural causes
  • Abnormal transverse metatarsal ligament insertion
  • Lateral bowing 5th metatarsal shaft
  • Primary hypertrophy of 5th metatarsal head
  • Malposition of hindfoot surgery with residual forefoot varus
  • Brachymetatarsia for the 4th metatarsal
  • Symptomatic inflammatory arthropathies
    • Rheumatoid nodules, bursa inflammation

RADIOGRAPHIC ASSESSMENT
Weight bearing Radiographs are Critical
– Metatarsal–5th toe angle
  • Normally ≤16 degrees
– 4th–5th Inter-metatarsal angle
  • Normally 7 to 8 degrees
  • Symptomatic at 10 degrees
– Lateral deviation angle
  • Measures lateral bowing of 5th diaphysis
  • Bisect neck of 5th metatarsal at articular surface
    • 2nd line adjacent and parallel to medial proximal surface of metatarsal
  • Average value <3 degrees
  • Symptomatic at 8 degrees (Coughlin FA, 1991)

CLASSIFICATION
Type 1
– Enlarged 5th metatarsal head
  • true hypertrophy
  • exostosis
  • pronation rotating plantar lateral condyle laterally
Type 2
– Bowing of the diaphysis laterally
  • congenital
Type 3
– Widened 4th—5th intermetatarsal angle

INCIDENCE
Kitaoka (FA, 1991)
– Type 1 and Type 2
  • Less than 10% cases
Coughlin (FA, 1991)
– Type 1: 27%
– Type 2: 23%
– Type 3: 50%

SURGICAL MANAGEMENT
Type 1 Deformity
– Davies: Shave 5th metatarsal head
– Isolated prominence of 5th mt head WITHOUT structural deformity
Type 1 Deformity: Metatarsal Head Shaving
– Advantages
  • Technical ease
  • Immediate weightbearing
  • Rapid recovery and return to footwear
– Disadvantages
  • Destabilization of the lateral 5th mtp joint
    • Resultant medial drift and recurrence
    • Excessive valgus deviation of the 5th toe
SURGICAL MANAGEMENT
Type 1 Deformity: Metatarsal Head Shaving
- Results
  - Kitaoka (CORR, 1991)
    - 21 Feet
    - 71% satisfied
    - No correlation between amount of correction and patient satisfaction
    - Contraindicated in isolated plantar keratotic lesion
    - Must repair lateral capsule and abductor tendon

Type 1: Salvage
- Metatarsal head excision
  - Joint destructive procedure
  - McKeever (CORR, 1959) advocated as primary procedure
  - Now best employed in inflammatory conditions, ulceration, and post-surgical arthritis
- Problems
  - Retraction of the 5th toe
  - Transfer lesion under 4th metatarsal head
  - Flail 5th toe

Kitaoka (FA, 1991)
- 82% Fair or Poor results at 8 years
- 64% complications
  - Severe shortening (36%)
  - Transfer lesions to 4th (75%)
  - Stiffness (25%)
  - Persistent pain (27%)
- Increase in 4th-5th intermetatarsal angle 4.5 degrees

SURGICAL MANAGEMENT
Metatarsal Osteotomy: Distal Procedures
- Advocated for Type 1 and Type 3 deformity
  - Greater effect than condylectomy alone
  - No significant correction of the 4th—5th IM angle
  - Technical ease
  - Consistent results
- First described by Hohmann (1951)
  - Transverse osteotomy of the fifth metatarsal neck

Metatarsal Osteotomy: Distal Procedures
- Distal Oblique Osteotomy
  - Addresses 2 planes of deformity
  - Sponsel (Orthop Clin, 1976)
    - No fixation used—metatarsal allowed to float to appropriate position
    - 11% delayed union rate
  - Keating (J Foot Surg, 1982)
    - 75% transfer lesions
    - 12% recurrence rate
    - 56% success rate
- Distal Oblique Osteotomy
  - Kitaoka and Leventen (CORR, 1988)
    - Modified technique—impaled head upon medial spike of bone
    - Correction of 4th-5th intermetatarsal angle 5 degrees
    - Forefoot width decreased 4mm
    - 87% satisfaction rate
    - 1 nonunion

SURGICAL MANAGEMENT
Metatarsal Osteotomy: Distal Procedures
- Chevron osteotomy (Throckmorton and Bradlee, J Foot Surg, 1978)
  - Predominantly for lateral keratoses
  - Confers stability while minimizing sagittal plane displacement
  - Transposed 33 to 40% of the width of the metatarsal
    - 1mm shift reduces 4th—5th IM angle by 1 degree
    - Usual displacement 3 to 4mm
    - Limitation imposed by width of metatarsal neck
- Chevron osteotomy (Kitaoka, FA, 1991)
  - 19 feet
  - 7.1 year follow-up
  - 89% good results, 11% fair results
  - Correction of 4th-5th IM angle 2.6 degrees
    - 11.8 degrees preop to 9.2 degrees postop
  - Correction of 5th toe—metatarsal angle 7.9 degrees
    - 20.7 degrees preop to 12.8 degrees postop
  - Average forefoot width decreased 3mm

SURGICAL MANAGEMENT
Metatarsal Osteotomy: Midshaft Osteotomy
- Addresses both Type 2 and Type 3 deformity
- May be uniplanar or biplanar
  - Adds advantage of correcting plantar AND lateral keratoses
  - Medial capsule release may be added to improve correction of 5th toe
- Oblique diaphyseal 5th metatarsal osteotomy described by Mann (1986)

METATARSAL OSTEOTOMY: MIDSHAFT OSTEOTOMY
Procedure
1) Lateral incision
   a. Carefully avoid sural nerve
2) Expose 5th metatarsal head with longitudinal incision
3) Ostectomy 5th metatarsal head
   a. Do NOT resect too much head, the power of correction is great with this procedure
4) Extend incision along 5th metatarsal shaft
   a. Expose shaft to base
5) Mark site of osteotomy
6) Begin saw cut
   a. DO NOT violate the medial cortex (except at central portion of osteotomy)
7) Drill for first compression screw
   a. 2.7mm screw system
   b. Overdrill dorsal cortex with 2.7mm drill bit
   c. Countersink head carefully
   d. Plantar cortex with 2.0mm bit
8) Place screw across osteotomy, but DO NOT compress
9) Finish osteotomy proximally and distally
10) Rotate shaft around the screw
    a. Tighten screw securely following rotation
11) Check position under Fluoro
12) Place second 2.7mm screw
   a. Not necessary to compress, this screw prevents rotation
13) Resect exposed “tails” of bone proximally and distally with saw
14) Repair longitudinal capsular incision after excising redundancy
15) Add vertical capsulotomy with repair if necessary

Metatarsal Osteotomy: Midshaft Osteotomy

- Complications
  - Malunion with elevatus
  - Nonunion (mostly cortical bone)
  - Injury to branches of the sural nerve
  - MP stiffness
  - Painful hardware

- Results: Coughlin (FA, 1991)
  - 30 feet
  - All patients united the osteotomy
  - Correction of 4\textsuperscript{th}-5\textsuperscript{th} IM angle 9.8 degrees
    - 10.6 degrees preop to 0.8 degrees postop
  - Correction of 5\textsuperscript{th} toe—metatarsal shaft angle 15.5 degrees
  - 16 degrees preop to 0.5 degrees postop
  - 93% satisfaction rate
  - Average foot width decreased by 6mm
  - Shortening 0.5mm
  - Demographics
    - 70% with lateral keratotic lesion
    - 10% with plantar keratotic lesion
    - 20% combined lesions
    - 87% of patients underwent removal of hardware

Surgical Management

Metatarsal Osteotomy: Proximal Osteotomy

- High intermetatarsal angles
- Severe bowing a contraindication
  - Not providing correction at apex of deformity
  - Consider potential for disruption of blood supply
  - Shereff (FA, 1991)
    - Extraosseous blood supply
    - Interosseus supply has nutrient artery penetrating medially
    - Both aspects easily disrupted with proximal osteotomies within 2 cm of the proximal extent of the bone
  - Risks avoided through mid-shaft osteotomies