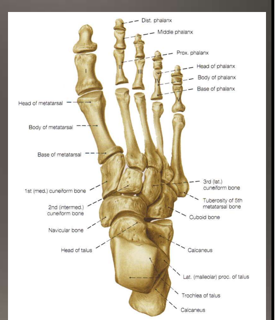
Techniques of Midfoot Arthrodesis: Comparing Screw Fixation vs. Locked Plating

James Head, MD
Arthur Walling, MD
Michael Clare, MD
Kyle Parker, MS

Introduction

- Midfoot joints transfer forces during weight bearing from the hindfoot to forefoot
  - Metatarsal cuneiform
    - Tarso-metatarsal



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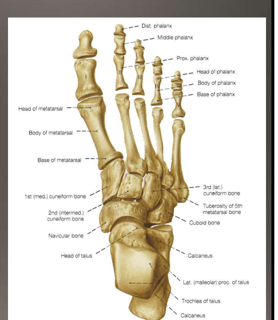
- Pathology affecting these joints can cause major pain and dysfunction



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  - Cortisone injections
  - Anti-inflammatory medications
  - Orthotics
  - Shoe modifications
  - Physiotherapy
  - Activity modification

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  - Physiotherapy
  - Activity modification
- Operative treatment
  - Arthrodesis of affected joints

Introduction

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  - Trauma
    - Lisfranc fracture/dislocations

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  - Trauma
    - Lisfranc fracture/dislocations
  - Deformity
    - Pes planus, cavus, hallux valgus
  - Arthritis
    - Post traumatic, primary, inflammatory

Hypothesis

- Large joint fusions (hindfoot) approach 95% fusion rates with modern techniques
  - Flemister et al noted 96% fusion rate in series of 86 subtalar fusions
  - Chen et al reported 94% union rate for isolated talonavicular fusions

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- Hypothesis 1:
  - Small joint fusions (midfoot) do not approach this level of success

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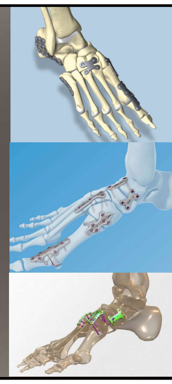
- Hypothesis 2:
  - Multiple small joint fusions, which are more typical for midfoot disorders, also have lower fusion rates than isolated small joints

Hypothesis

- Trend in orthopedics toward locked plates
  - Devries et al reported higher union rates with locked plating vs crossed screws for 1 MTC arthrodesis (Lapidus)
  - Anderson et al reported a higher union rates with non-locked vs locked plating for 1 MTP arthrodesis



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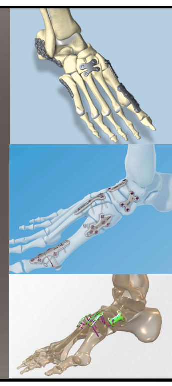
- Hypothesis 3:
  - Locked plating will improve union rates over compression screws for midfoot fusions



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- Retrospective chart review of consecutive patients treated by 2 surgeons (Walling, Clare) from January 2002-December 2014 with arthrodesis of 1,2,3 metatarsal cuneiform joints.

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  - Diagnosis
  - Type of fixation
  - **Union rates**
  - Adjunctive procedures
  - Time to weight bearing
  - Reoperation/hardware removal
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- Exclusion Criteria
  - Charcot arthropathy
  - Minimum 3 months follow up


Methods

- Radiographs and clinical notes reviewed
- Nonunion defined by no radiographic union at 6 months
  - Hardware failure
  - Loss of correction
  - Continued pain

Methods

- Patients divided into multiple comparison groups
  - Diagnosis
    - Hypermobile 1st tarsometatarsal joint/Hallux Valgus
    - Cavus
    - Flatfoot
    - Arthritis
    - Acute trauma

Methods

- Comparison groups (cont.)
  - Type of fixation
    - Locked plating
    - Non-locked plating
    - Screws only
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  - Isolated vs Multiple joints fused
    - Isolated TMT
    - Multiple TMT
    - TMT plus additional fusion (i.e. TN)

Results

- 245 patients met inclusion criteria
- Mean age 58 years
- Mean follow up 17 months
- Mean weight 189 lbs.
- Mean time to weight bearing 10 weeks
- 27 patients developed a nonunion (11%)

Results

Lag Screws	Total Joints	Nonunions	% Union
1 TMT	169	15	91
2 TMT	72	2	97
3 TMT	57	2	96
Total	**298**	**19**	**94**

Results

Locked Plates	Total Joints	Nonunions	% Union
1 TMT	20	3	85
2 TMT	19	1	95
3 TMT	5	0	100
Total	**44**	**4**	**91**

Results

Joints	Total Joints	Nonunions	% Union
Isolated TMT	88	9	90
Multiple TMT	119	15	87
TMT plus hind-foot	14	2	86

Results

Diagnosis	Total Patients	Nonunions	% Union
Acute Trauma	24	0	100
Arthritis	101	14	86
Flatfoot	55	9	84
Cavus	3	1	67
Hypermobile 1st Ray	55	4	93
Revision Arthrodesis	13	3	77

Results

- Hardware Removal
  - Lag Screws
    - 19/186
    - **10%**
  - Locked Plates
    - 2/25
    - **8%**

Results

- Cost Comparison (FOISC)
  - Synthes 3.5 Cortical Screw
    - $40 per screw
  - Synthes 2.4/2.7 Variable Angle Midfoot Fusion Plate
    - $1200-1800 per plate
    - $201 per screw

Conclusions

- Primary fusion for acute trauma to midfoot (Lisfranc injuries) had 100% union rate.
  - Supports this treatment technique
- Fusing multiple midfoot joints or midfoot combined with hindfoot joints trends toward increase in nonunion rate
- Union rate not affected by type of fixation
  - lag screw (94%) vs locked plate (91%)
- Hardware removal not affected by type of fixation
  - Lag screw (10%) vs locked plate (8%)
- Cost of lag screws significantly less than locked plate
  - 2 lag screws: $80
  - 1 plate/4 locking screws: $2,004

Limitations

- Retrospective chart review (Level IV)
- Unable to reliably assess union without CT scan
- No outcome scores
- More compression screws than locked plates