Lisfranc Injuries
Midfoot Injuries

Resident Comprehensive Fracture Course

Introduction

- Uncommon Injuries
- Frequently missed
  - Up to 20%
- Highly Variable Injuries
  - Sports
  - Trauma

Osseous Anatomy

- Trapezoidal configuration
- "Recessed 2nd TMT serves as the "keystone""
- Individual joints are "flat on flat"
- Little inherent stability


Ligamentous Anatomy

- Transverse Intermetatarsal M2-M5
- "Interosseous C1-M2 ligament = Lisfranc ligament"
- Plantar ligaments stronger than dorsal ligaments

Panchbhavi et al. Three-dimensional, digital, and gross anatomy of the Lisfranc ligament. Foot Ankle Int. 2013

Functional Anatomy

- Column Theory
  - Medial column
    - 1st TMT and NC joints
    - Limited mobility
  - Intermediate column
    - 2nd-3rd TMT joints and NC joints
    - Rigid
  - Lateral Column
    - 4th and 5th TMT joints
    - Mobile
- Medial and Intermediate Columns function as a rigid lever for propulsion
- Lateral column mobile for shock absorption

Reid JJ, Early JS. Osseous anatomy of the midfoot. In: Bucholz et al., editors. Rockwood and Green's fractures in adults. 7th ed.
Significance of Lisfranc Injuries

- Soft tissue injury
- Minimal bony displacement may understate ligamentous injury
- Diagnosis is missed or delayed in up to 20% of cases
- LISFRANC UNTIL PROVEN OTHERWISE

Normal X-rays

- AP
  - Up to 3 mm normal between 1st and 2nd metatarsal bases
  - Lateral base 1st MT in-line with lateral aspect of medial cuneiform
  - Medial base 2nd MT in-line with medial aspect of middle cuneiform

Normal x-rays

- 30 degree oblique
  - Medial base 3rd MT in-line with medial aspect of lateral cuneiform
  - Medial base 4th MT in-line with medial aspect of cuboid

Imaging of Lisfranc Injuries

- Dynamic Joints
  - Weight bearing radiographs crucial

“Fleck” sign
Imaging of Lisfranc Injuries

- Contralateral views

Advanced Imaging

- CT scan
  - Articular comminution
  - Non displaced fracture lines
  - Helpful for preop planning
  - NOT DYNAMIC

- MRI
  - Ligamentous injury
  - "Plantar Oblique Ligament"
  - C1-M2-M3
  - Disruption predictive of intraoperative instability
  - Raikin et al, JBJS 2009
  - Not dynamic

Initial Management

- Urgent if tenting the skin
- Can be blocked by tendons, ligaments, bone
- External Fixation?
  - High energy patterns
  - Temporize until soft tissue appropriate
Management

- Nonoperative
  - Rule out occult instability
  - Negative weight bearing or stress imaging
  - EUA if necessary
- Operative
  - Multiple base fractures
  - Articular involvement
  - Instability (>2 mm)

Definitive Management

- ORIF
  - Do not eliminate a motion segment of the foot
  - Hard to make the multiple fractures and a fusion heal
  - Traditional treatment with reasonable outcomes
- Primary Arthrodesis
  - Medial column of the midfoot functions rigidly during gait for stability
  - "Non-essential joints"
  - Lateral column (4th, 5th TMT) is the mobile midfoot segment
  - One operation, one recovery period
  - Fusion after ORIF is technically more difficult
  - With worse outcomes

Fixation

- What to use?
  - Screws
    - 3.5mm or 4.0mm cortical
    - Cannulated screws
  - Spanning Plates
    - comminution

Operative Technique

- Incisions

Operative Technique

- Reduction/Temporary Fixation

- Where to start?
  - Medial to lateral?
  - Lateral to medial?
  - Proximal to distal?
Inter-cuneiform instability

Operative Technique

Pin 4th and 5th if unstable

Post-Op
- Remove K wires at 4-6 weeks
- NWB Short leg cast X 8-12 weeks
- Gradual WB over next 2-4 weeks +/- arch support
- PT

Implant Removal?
- Indications?
- When?

Results of ORIF
- Amtz et al, JBJS 1988
  - 41 injuries - 3.4 yr followup
    - 33 of 35 who had "good to excellent result" -> anatomic reduction
    - 6 had fair/poor result
    - 5 open injuries/1 malreduction
- Kuo et al, JBJS 2000
  - 48 patients – 55 mo followup
    - Avg AOFAS score 77
    - 12 post-traumatic OA (6 fusion)
    - 6 of 15 with ligamentous injury
    - Better results with anatomic reduction
Alternatives to ORIF?

WHY Primary Arthrodesis?
- Kuo et al JBJS am 2000
  - Worse outcomes in primarily ligamentous injuries
- Komenda et al JBJS am 1996
  - Significant improvement after midfoot arthrodesis for PTOA
- Sangeorzan et al FAI 1990
  - Improved results with early fusion for PTOA midfoot

Primary Arthrodesis (PA) vs ORIF

Treatment of Primarily Ligamentous Lisfranc Joint Injuries: Primary Arthrodesis Compared with Open Reduction and Internal Fixation
A Prospective, Randomized Study
By Brian V. M., MD, and Lisa Cohen-Garty, MD, FRSC

PA vs ORIF
- Level I, 41 patients (21 ORIF, 20 PA)
- 2 year followup
- All results in favor of PA
  - AOFAS Midfoot score in favor of PA
  - 15 of 21 ORIF with radiographic arthritis
  - 5 of 21 converted to arthrodesis
  - 16 of 21 with second surgery for screw removal

Summary
- Complex injuries
- Wide range of injury from subtle athletic to high energy crush
- DO NOT MISS THE SUBTLE LISFRANC
- Goal of fixation → Stable painless plantigrade foot
- Fuse vs. ORIF – still controversial

Case 1
- 17 yo female rugby player with r foot sprain 4 weeks ago
Case 1

- Next step?

- What now?
- Timing?

Case 1
Case 1

- 50 yo male who jumped from motel roof presents to ED with R foot pain as only complaint
- PMHx: Substance abuse, Hepatitis C, Bipolar disorder, smoker
- PE: Foot swollen, ecchymosis. Pulses intact sensation intact

Case 2
Case 2

27 year old male
MVC
Isolated left foot injury
NV intact

Case 3

What now?
Initial Management?
Definitive Management?
ORIF? Arthrodesis?
Case 3

Case 3: 2 year follow up

Thank You