Turf Toe and Midfoot Sprains

Financial Disclosure

• Dr. Mark Casillas has no relevant financial relationships with commercial interests to disclose.

1st MTPJ

An important component of the healthy lower extremity

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Anatomy

- Diarthroidal joint
- Supplemented by a substantial plantar capsuloligamentous complex and two sesamoids

Biomechanics

1st MTPJ joint is designed for the transmission of tremendous power to the great toe and multiples of body weight through the foot.

Turf Toe

- Sprain of the plantar capsuloligamentous complex
- The profound athletic disability poignantly illustrates the great toe’s relevance to the lower extremity
Mechanism of Injury

- Hyper-dorsiflexion
- Also:
  - Varus
  - Valgus
  - Plantarflexion

Bowers and Martin, 1976

- Forced dorsiflexion mechanism of injury in football players
- Related to the use of flexible soccer style shoes on hard artificial turf
- Established “shoe-surface relationship”

History

- Acute injuries
- Continued forward motion over a planted forefoot
- Cumulative injuries have also been described
Physical Exam

- Circumferential swelling
- Bruising
- Tenderness centered on the first MTPJ
- Passive extension is painful and guarded
- Resisted plantar flexion may be weak
- Instability may be present

Imaging

- Standard radiographs
- Consider comparison views
- MR

Imaging- Radiographs

- No fracture with STS at the 1st MTPJ
- Subtle avulsion fractures
  - Base of the proximal phalanx
  - Metatarsal head
- Compression fracture
  - Dorsal aspect of the 1st MT head
- Overt fracture sesamoid(s)
  - With or without proximal migration
Imaging - MR

- Dedicated extremity coil
- Plantar plate edema with partial or complete rupture
- Sesamoid edema or fracture
- Dorsal impaction fracture at the 1st MT head

Classification

- Clanton classified turf toe injuries based on the degree of capsular injury.
- Treatment and time for return to sport were also described for each grade of injury but remain variable.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury</th>
<th>Treatment</th>
<th>Return to Sport</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capsular stretch without tear</td>
<td>Symptomatic</td>
<td>Immediate</td>
</tr>
<tr>
<td>2</td>
<td>Partial capsular tear</td>
<td>Brief restricted weight bearing</td>
<td>1-24 days</td>
</tr>
<tr>
<td>3</td>
<td>Complete capsular tear with possible dorsal impaction fracture of the first MTPJ</td>
<td>Long-term restricted weight bearing</td>
<td>3-12 weeks</td>
</tr>
</tbody>
</table>

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Initial Treatment

• RICE
• Non-weight bearing pending formal evaluation
• Subsequent treatment is dictated by the grade of injury

Grade 1

• Weight bearing as tolerated
• Post-op shoe or stiff shoe supplemented by a carbon fiber plate

Grade 1- Physical Therapy

• Pain and swelling management
• Maintenance of ROM
• Resistive strengthening
• Return to sport phase as soon as tolerated
Grade 1 - Patient education

• Stiff-sole shoe
• Carbon fiber plate
• Taping program to resist DF at 1st MTPJ
Grade 2
• Non-weight bearing (3-7 days)
• Splint
• Cold therapy
• Cast boot
  – Weight bearing to tolerance

Grade 2- Physical Therapy
• Pain and swelling management
• Recover ROM
• Once the tenderness remits
  – Convert to a post-op shoe or a stiff shoe
  – Carbon fiber plate
  – Resistive strengthening
• Return to sport phase
  – 1 to 2 weeks after injury

Grade 2- Patient education
• Stiff-sole shoe
• Carbon fiber plate
• Taping program to resist DF at 1st MTPJ
Grade 3 - Initial Treatment

- Non-weight bearing splint
- Cold therapy
- The vast majority of cases are treated non-surgically

Grade 3 - Non-Surgical Treatment

- Non-weight bearing for up to 8 weeks
- Physical therapy
  - Active ROM
  - Coordinated activity
    - Towel scrunches
    - Toe pick-ups

Grade 3 - Non-Surgical Treatment

- Physical therapy
  - Joint mobilization
Grade 3- Non-Surgical Treatment

• Physical therapy
  – Modalities
    • US
• Cross-training
  – Exercise bike
  – Water
  – Aerobic fitness

Grade 3- Non-Surgical Treatment

• Once tenderness remits
  – Convert to a post-op shoe or stiff shoe
  – Carbon fiber plate
  – Weight bearing as tolerated
  – Resistive strengthening
  – Closed chain exercises

Grade 3- Non-Surgical Treatment

• Return to sport phase
  – 3 to 12 weeks after injury
  – Plyometrics
  – Sport-specific drills
  – Appropriate shoe wear and taping
Grade 3 - Surgical Treatment

- Healthy and athletic individuals
- Unstable joint
- Intra-articular loose bodies
- Retracted sesamoids

Grade 3 - Surgical Treatment

- Medial approach
  - Extensile
  - Plantar to the midline
- Plantar approach
  - Extensile
  - “L”
- Remove loose bodies

Surgical Treatment

- Plantar plate repair
  - 2-0 braided, non-absorbable sutures
  - Suture anchors base of the P1
  - Repair or partial excision sesamoid fractures
  - Repair of MCL
Grade 3- Physical Therapy

- Once the tenderness remits (after 8 weeks)
  - Weight bearing to tolerance
  - Post-op shoe or a stiff shoe
  - Carbon fiber plate
- Return to sport phase begins 12 to 16 weeks after surgery

Grade 3- Patient education

- Stiff-sole shoe
- Carbon fiber plate
- Taping program to resist DF

Complications

- Intrinsic minus toe- cock-up
- Loss of push-off power
- Stiffness
- Pain
- Hallux valgus
- Hallux rigidus
- Osteoarthritis
Take Home Tips

Promote stiff shoes

Use carbon fiber plates

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Midfoot Sprains

- The function of the midfoot is to anchor the metatarsals.
- The stable metatarsals act as levers for force transmission between the foot and the ground.

Midfoot Sprains

- Even subtle midfoot sprains prevent athletic activity and can require weeks or months of recovery before being returned to play.
- Missed diagnosis or failed treatment can lead to OA.
Anatomy

- Roman Arch
- 2 MT keystone
- Intermetatarsal ligaments
  - MT2-MT3
  - MT3-MT4
  - MT4-MT5
- Lisfranc ligament
  - Med. cuneiform-MT2
Tarsometatarsal Injuries

• Mechanism of injury
  – Direct force
    • MVA
    • Fall from height
  – Indirect force
    • Continued motion over fixed forefoot
    • Football

Diagnosis

• History
  – MOI
  – Acute midfoot pain
  – Inability to bear weight or continue play
• Exam
  – Tender and swollen midfoot
  – Unstable midfoot

Imaging

• X-ray
  – AP (MT2 and Mid. Cuneiform)
  – Oblique (MT4 and Cuboid)
  – Lateral (Dorsal subluxation)
  – Alignment
  – Fractures
  – WB
  – Comparison
Imaging

- BS
  - Increased uptake
- CT
  - Alignment
  - Avulsion fractures
- MR
  - Ligament injury
  - Subtle fractures
Treatment

• Stable injury
  – Non-WB for up to 6 weeks
  – Protected WB for 6-8 weeks
  – Early ROM, cross-training
  – Stiff shoes
  – Custom inserts

• Unstable injury
  – CR PP
  – ORIF
    • Screw fixation to 1, 2, 3 rays
    • Pin fixation at 4, 5 rays
    • NWB 6-8 weeks
    • Screw removal 12-16 weeks
  – Post-op
    • NWB for 12 weeks
    • Early ROM, cross-training
    • Custom inserts with stiff shoes