Syndesmosis: How and When to Reduce

Boston Medical Center

Disclosures!

- Publications:
  - Rockwood and Green, Tornetta and Einhorn; Subspecialty series, Court-Brown, Tornetta, Ingersoll, AAOS; OSU Trauma, ICL Trauma L2, Tornetta; Sp Tectin in Ortho Surg, OTA Slide project.
  - Journals: JOT; Deputy editor, CORR, JAAOS, JBJS; Reviewer

- Research:
  - OTA, FOT, AICD, DOR

- Consultant / Designer
  - Smith and Nephew, Exploramed

The Syndesmosis

- Indications
  - Subluxation
  - Instability

- Technique
  - Fluoroscopic
  - Open
Does Perfection Matter?

The Functional Consequence of Syndesmotic Joint Malreduction at a Minimum 2-Year Follow-Up

H. Claude Sagl, MD, Atij R. Shah, MD, and Roy W. Sander, MD

- 78 Patients
- CT scan at 2 yrs
- Functional outcomes

- 2 / 13 (15%) Open
- 24 / 55 (44%) Closed

TABLE 2. Outcome Scores as a Function of Quality of Reduction of Syndesmosis

<table>
<thead>
<tr>
<th>Anatomic Reduction</th>
<th>Malreduction</th>
<th>Significance</th>
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<tr>
<td>SMFA (functional)</td>
<td>12.0</td>
<td>27.0</td>
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<tr>
<td>SMFA (brotherzone)</td>
<td>19.3</td>
<td>30.8</td>
</tr>
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<td>SMFA (emotional)</td>
<td>19.7</td>
<td>32.8</td>
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<tr>
<td>Olerud/Molander</td>
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SMFA, Short Form Musculoskeletal Assessment; NS, nonsignificant.
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Syndesmosis

• Anterior TF
• Posterior TF
• Interosseous
  • Location varies
  • Snedden 2000
• Anterior inferior

Indirect Injuries

• Rotation
  • PE
  • SE
• Abduction
  • PA
• Level of fracture
  • At or above the syndesmosis
23 year old man

Syndesmotic Instability

Marginal Impaction
19 year old woman

Posterior Syndesmosis

Treatment
Healed

Instability
• Weber B injuries
  • Incidence
  • Indications for fixation
• Weber C injuries
  • Almost all
  • Posterior malleolus?

Weber B, SE Pattern
• General Criteria
• Instability after bony fixation
  • Bimalleolar
    • Type of medial fracture
    • Cotton test
  • Lateral malleolar
  • Stress test
**Boden**

- Recommendations
  - Height of fibula above joint
  - Medial injury
    - Malleolar fracture
    - Deltoid injury
  - Design flaws
  - Clinical failures
  - Time to healing

**Stress Examination**

- Syndesmotic instability
- 104 / 291 (36%) ankles
- Bimalleolar fractures
  - 30%
- Lateral malleolar fractures
  - 40%

**Stress (+) SE4**

- 41% Syndesmotic Injury

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<tr>
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<th>Presentation MCS (mm)</th>
<th>Stress MCS (mm)</th>
<th>United MCS (mm)</th>
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<tbody>
<tr>
<td>Casted (43)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ORIF fibula (32)</td>
<td>2.66±.4</td>
<td>6.09±.9</td>
<td>2.41±.3</td>
</tr>
<tr>
<td>ORIF fibula + syndesmosis (24)</td>
<td>2.80±.4</td>
<td>7.51±2</td>
<td>2.50±.3</td>
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Weber B Injuries

- Associated with syndesmotic instability
- General criteria abandoned
- Individual evaluation of all cases intraoperatively

Does it Matter?

- Must we fix them?
- What happens if we don’t?
My Take

• Surprised
  ▶ Have done many revisions when injuries are missed
  ▶ No difference found if screws used
  ▶ Why take the risk…
• But… VERY interesting study
Weber

- Type “C”
- Above the syndesmosis
- Assumes tib - fib dissociation
Operative Indications

- Instability after bony fixation
  - Bimalleolar
    - Type of medial fracture
    - Cotton test
  - Lateral malleolar
    - Stress test
- In lieu of fibular fixation
  - Stabilizes fibula as well

Fixation

- After fixation
  
  - Instead of fibular fixation

Fixation

- After fixation
  
  - Instead of fibular fixation
**Syndesmotic Injury**

- Instability is NOT just posterior
- Rest ankle, not heel on bolster
  - Avoids anterior subluxation
- Don’t forget the lateral radiograph

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**Syndesmotic Instability**

Weber C

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**Syndesmotic Instability**
Reconstruction

Fibula Repositioned Posteriorly

Syndesmotic Reduction

- Periarticular clamp

Reduction Techniques

- Ankle position
- Fluoroscopy
- Open methods
Reduction

- Position of ankle
  - Dorsiflexion ➔ lateral subluxation
  - Can cause malunion

Ankle Position

- Dorsiflexion ➔ malreduction
- Dorsiflexion not necessary
- Position of the foot irrelevant
- **Make sure syndesmosis is anatomic**

Cadaveric Study

Before Fixation

43°

After Fixation

42°
Syndesmotic Injury

Reduction is Paramount

How Do We Do

- Lateral radiograph
- 90% NPV for unreduced
- 4 Traumatologists
- Varied (best was 100%)

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<th></th>
<th>Red</th>
<th>Anterior</th>
<th>Posterior</th>
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Weber C

Short!
Maintain Length

Still Short!

Normal Side

Postop & F/U
Bimalleolar Weber C

S/P ORIF

Perfect Laterals!
Postop

CT Confirmation

Long-Term Outcome of Pronation-External Rotation Ankle Fractures Treated with Syndesmotic Screws Only

- 50 Patients
- Average F/U = 21 yrs!
- OA in 49%
  - 2 Fused
- 92% G/E AOFAS scores
  - Pain explained variation
My Take

• One evaluator “not anatomic”
  • No strict criteria for measurement
• No fracture types (B vs. C)
• No method of closed reduction
• Fellows….
• Stresses need for reduction!

How Do We Do

• Lateral radiograph
• 90% NPV for unreduced
• 4 Traumatologists
• Varied (best was 100%)

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If Not Sure…OPEN!

• Where do you look?
• Incisura?
• Shapes very
  • Very curved
  • Very flat
• Joint!!!
Joint Reduction

Incisura

Why is the Joint Better?

- 10 cadaveric ankles
- AP depth
  - At Joint
  - 1 cm above Joint
Answer...
• At joint corner vs incisura
• Joint better p = 0.0001
  • 0.7 ± 0.7
• Fibula to incisura difference
  • 2mm at joint
  • 6mm at 1 cm

Case

Clinical View
Articular Surface Reduction
The Radiographic Fate of the Syndesmosis after Trans-syndesmotic Screw Removal in Displaced Ankle Fractures

Thomas H. Jordan, DPM \(^1\), Ross H. Talanico, DPM \(^2\), John M. Schubert, DPM \(^3\)

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Laterals

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11/21/2016
Fate Over Time

Koenig, Tornetta, et al

• 166 Patients
  • 35% Removed (patient choice)
  • 84% Remaining loose or broken
  • Did NOT lose reduction at all!
  • 0.5mm difference if removed

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<th>Tibia-Fibula OL</th>
<th>Tibia-Talar MCS</th>
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<tr>
<td></td>
<td>Preop</td>
<td>Postop</td>
</tr>
<tr>
<td></td>
<td>4.78</td>
<td>6.89</td>
</tr>
<tr>
<td></td>
<td>-0.41</td>
<td>3.29</td>
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Song, et al AAOS ‘12

• 15 Patients
• CT of syndesmosis
  • Postop and 30D after removal
• 6 (40%) malaligned
  •  5/6 (83%) too posterior
•  5/6 (83%) Aligned at 30 days
•  Self center!!

My Take

• Initial reduction is not final
• Fibula settles without ankle subluxation
• Minimal translation probably ok
• Screw removal?
  • Two studies with different criteria
Screw Removal?
- Sanders, et al
  - Broken, loose or removed > intact
- Egol, et al
  - Syndesmotic fixation = worse outcome
- Wikeroy, et al
  - 3 vs 4 Corticies not different
    - Obese, PM worse
- Miller, et al
  - Removing increased ROM + outcome

Syndesmotic Screws
- Leave in a long time
  - Minimum 12 wks
- Removal?

“Flexible Fixation”
- Not as strong
- Forsythe, et al ’08
  - More displacement at all loads
- Multiple trials
  - Seemingly good results
Technical Issues

Have Seen Failures

• Only one screw or Tightrope
• Even for high type C (n?)
  • No way to maintain length!
• No relevant difference at any time point
• Reduction? Radiographic?
Summary
• Fix for subluxation, instability
• Reduce the talus
  • Avoid clamps
• Fluoroscopy
  • Beware posterior malleolus
• If any question, open the joint

Controversies
• Remove screws?
• Flexible fixation?
• Timing of weightbearing?
• Weber B SE pattern mild instability
  • Fix or not?

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