Syndesmosis: How to Reduce and How Perfect?

Boston Medical Center

The Syndesmosis

• Indications
  • Subluxation
  • Instability

• Technique
  • Fluoroscopic
  • Open

I (and/or my co-authors) have something to disclose.

Detailed disclosure information is available via:

“My Academy” app;

Printed Final Program; or

AAOS Orthopaedic Disclosure Program on the AAOS website at
http://www.aaos.org/disclosure
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

Stress Examination
- Syndesmotic instability
- 104 / 291 (36%) ankles
- Bimalleolar fractures
  - 30%
- Lateral malleolar fractures
  - 40%
Stress (+) SE4

- 41% Syndesmotic Injury

<table>
<thead>
<tr>
<th></th>
<th>Presentation MCS (mm)</th>
<th>Stress MCS (mm)</th>
<th>United MCS (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casted (43)</td>
<td>2.51 ± .3</td>
<td>5.01 ± .6</td>
<td>2.55 ± .4</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>
</tr>
</tbody>
</table>

32 Year Old Woman
S/P ORIF
Post-op

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

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Does Syndesmatic Injury Have a Negative Effect on Functional Outcome? A Multicenter Prospective Evaluation

July Lovett, MD,* David Soper, MD,* Paul Terrett II, MD,* Laura Pfeiffer, MD,*
Clifford R. Jones, MD,** Brian H. McIlveen, MD,† Kenneth Epgel, MD,‡ Cory Collins, MD,§
Ross K. Leighman, MD,** William Evl, MD,** William M. Rovic, MD,** David Troncale, MD,**
and James P. Enli, MD

TABLE 3. SMFA—Mixed Linear Regression

<table>
<thead>
<tr>
<th>Syndesmotic Injury</th>
<th>Adjusted Mean</th>
<th>P</th>
</tr>
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<tbody>
<tr>
<td>Week 6</td>
<td>Yes</td>
<td>26.49</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>28.86</td>
</tr>
<tr>
<td>Week 12</td>
<td>Yes</td>
<td>28.83</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22.88</td>
</tr>
<tr>
<td>Week 26</td>
<td>Yes</td>
<td>15.66</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>14.79</td>
</tr>
<tr>
<td>Week 52</td>
<td>Yes</td>
<td>15.51</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>19.96</td>
</tr>
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</table>

Adjusting for:

<table>
<thead>
<tr>
<th>Gender</th>
<th>SMFA</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>19.95</td>
<td>0.33</td>
</tr>
<tr>
<td>Female</td>
<td>28.77</td>
<td>0.012</td>
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</tbody>
</table>

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<table>
<thead>
<tr>
<th>Group</th>
<th>SMFA</th>
<th>Bother</th>
<th>AOFAS</th>
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<tbody>
<tr>
<td>Syndesmatic Injury</td>
<td>17.19</td>
<td>19.36</td>
<td>80.58</td>
</tr>
<tr>
<td>No Syndesmatic Injury</td>
<td>11.60</td>
<td>12.06</td>
<td>85.89</td>
</tr>
<tr>
<td>P Value</td>
<td>0.04</td>
<td>0.05</td>
<td>0.21</td>
</tr>
</tbody>
</table>

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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

Weber C

Anterior Instability
S/P ORIF

Fibula Anterior

S/P ORIF

Anterior Displacement

Reduction Techniques

• Fluoroscopic

• 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

Fluoroscopic Method

Syndesmotic Injury
Syndesmotic Injury

Reduction is Paramount

How Do We Do

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

<table>
<thead>
<tr>
<th></th>
<th>Reduced</th>
<th>Anterior</th>
<th>Posterior</th>
<th>2.5 mm displaced</th>
<th>5.0 mm displaced</th>
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<tbody>
<tr>
<td>PPV</td>
<td>75%</td>
<td>90%</td>
<td>75%</td>
<td>74%</td>
<td>82%</td>
</tr>
<tr>
<td>NPV</td>
<td>90%</td>
<td>83%</td>
<td>77%</td>
<td>76%</td>
<td>83%</td>
</tr>
</tbody>
</table>

Bimalleolar Weber C
CT Confirmation

If Not Sure...OPEN!
- Where do you look?
- Incisura?
- Shapes vary
  - Very curved
  - Very flat
- Joint!!!

Joint Reduction
Incisura

Where to Look?
• 10 cadaveric ankles
• AP depth
  • At Joint
  • 1cm above Joint

Answer...
• At joint corner vs incisura
• Joint better $p = 0.0001$
  • $0.7 \pm 0.7$
• Fibula to incisura diff
  • 2mm at joint
  • 6mm at 1 cm
Laterals

“Flexible Fixation”

- Not as strong
- Forsythe, et al ‘08
  - More displacement at all loads
- Clanton, et al ‘16
  - More rotational displacement

“Flexible Fixation”

- Allows for error
  - Westerman, et al ‘14
“Flexible Fixation”

- Comparisons
  - Laflamme ‘16
  - Andersen ‘18
- If you reduce ... no difference
- Residents should not operate alone

Technical Issues

Have Seen Failures
**Does Perfection Matter?**
The Functional Consequence of Syndesmotic Joint Malreduction at a Minimum 2-Year Follow-Up

H. Claude Sugi, MD, Anjum R. Shah, MD, and Roy W. Sanders, MD

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

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

<table>
<thead>
<tr>
<th>Anatomic Red</th>
<th>Malreduction</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMFA (functional)</td>
<td>12.0</td>
<td>27.0</td>
</tr>
<tr>
<td>SMFA (bothersome)</td>
<td>18.3</td>
<td>30.8</td>
</tr>
<tr>
<td>SMFA (eroticional)</td>
<td>19.7</td>
<td>32.0</td>
</tr>
<tr>
<td>Olerud/Molander</td>
<td>46.3</td>
<td>72.7</td>
</tr>
</tbody>
</table>

SMFA, Short Form Musculoskeletal Assessment; NS, nonsignificant.
The Functional Consequence of Syndesmotic Joint Malreduction at a Minimum 2-Year Follow-Up

H. Claude Sagi, MD, Anjan R. Shah, MD, and Roy W. Sanders, MD

The Measurement and Clinical Importance of Syndesmotic Reduction After Operative Fixation of Rotational Ankle Fractures

Stephen J. Weiner, MD, MS, Peter H. Pollock, MD, MPH, Matthew R. Swann, MD, Patrick C. Subwohl, MD, David L. Hackett, MS, and Dean C. Lynch, MD

Functional Outcomes of Syndesmotic Injuries Based on Objective Reduction Accuracy at a Minimum 1-Year Follow-Up

Steven M. Chernoy, MD, Christopher T. Cragg, MD, Amanda G. Spragg, Hughes, MA, Christopher M. McAuley, MD, William M. Rest, MD, and Michael J. Gardner, MD.

• 48 Patients at 1 year
• Olerud, SMFA, Bother
• No difference at:
  • 1-3 mm translation
  • 10° - 15° Rotation
  • Power very low (5%, 10%, 45%, 71%)
Summary
• Reduce the syndesmosis
  • Avoid clamps
  • Open if need to!
  • Level of the joint
• Fluoroscopy
  • Beware posterior malleolus
• 2-3mm off is likely fine

Boston Medical Center
Thank You
Reducing is Paramount