Low-Profile Knotless Suture and Button Fixation Device for Ankle Syndesmosis Repair: A Study of Creep

Christopher F. Hyer, DPM, MS
Gregory C. Berlet, MD
Kyle S. Peterson, DPM
W. Drew Chapman, DPM
Jeffrey E. McAlister, DPM

Advanced Orthopedic Foot and Ankle Fellowship
Orthopedic Foot and Ankle Center, Westerville, Ohio

Orthopedic Foot & Ankle Center
OhioHealth
Low-Profile Knotless Suture and Button Fixation Device for Ankle Syndesmosis Repair

Our disclosures are in the Final AOFAS Mobile App. There are no potential conflicts with this presentation.
Syndesmotic Injuries

- Annual incidence of 15 per 100,000 people\textsuperscript{1, 2}
- Occurs in 10\% of patients with ankle fractures\textsuperscript{1, 2}
- Without anatomic reduction of syndesmosis, instability and arthritis can occur\textsuperscript{3}
Treatment of Syndesmotic Injuries\(^4\)\(^-\)\(^7\)

- Kirschner Wires
- AO Screw fixation
- Bioabsorbable implants
- Suture button fixation devices
  - Studies showing good radiographic and clinical outcomes with TightRope\(^\text{TM}\) fixation device\(^5\)\(^-\)\(^8\)
  - No studies evaluating radiographic outcomes with ZipTight\(^\text{TM}\) fixation device (Biomet, Warsaw, IN)
Hypothesis

• Ankle syndesmotic repair with ZipTight™ fixation system will maintain radiographic anatomic alignment throughout short-term follow-up.

• Creep within the suture button device does occur post-operatively
Retrospective Study

- IRB-approved
- ORIF syndesmosis (CPT 27829)
- January 2010-June 2013
- Inclusion
  - Syndesmosis instability/rupture
  - Concomitant ankle fracture with syndesmosis rupture
  - ZipTight™ fixation
- Exclusion
  - Diabetes and/or charcot neuroarthropathy, and/or peripheral neuropathy
  - Use of concomitant syndesmotic lag screw with ZipTight™

- Radiographic measurements (AP view)
  - Medial clear space (MCS)
  - Tibiofibular Overlap (TFO)
  - Tibiofibular Clear Space (TFCS)
  - Distance between both buttons (BD)
- Pre-operative, first post-op, and final post-op measurements compared using paired t-tests (p<0.05)
Clinical Results

- 59 patients
- 3 patients excluded due to incomplete radiographic follow up
- Average follow-up 169.9 days (5.29 months)

Table 1. Demographic and Clinical Characteristics of Patients whom Underwent Ankle Syndesmotic Repair with the ZipTight™ Fixation System (N=56)

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male, n (%)</td>
<td>26 (46.4%)</td>
</tr>
<tr>
<td>Age at surgery in years, mean (SD)</td>
<td>34.6 (16.0)</td>
</tr>
<tr>
<td>Height at surgery in inches, mean (SD)</td>
<td>67.1 (4.0)</td>
</tr>
<tr>
<td>Weight at surgery in pounds, mean (SD)</td>
<td>186.0 (37.7)</td>
</tr>
<tr>
<td>Body mass index (BMI), mean (SD)</td>
<td>29.1 (6.1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Procedure Surgical Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ZipTight™ fixation systems used</td>
<td></td>
</tr>
<tr>
<td>1, n (%)</td>
<td>33 (58.9%)</td>
</tr>
<tr>
<td>2, n (%)</td>
<td>23 (41.1%)</td>
</tr>
<tr>
<td>Fibular plate used, n (%)</td>
<td>49 (87.5%)</td>
</tr>
<tr>
<td>Had fibula fracture, n (%)</td>
<td>18 (32.1%)</td>
</tr>
<tr>
<td>Had medial malleolar fracture, n (%)</td>
<td>3 (5.4%)</td>
</tr>
<tr>
<td>Had posterior malleolar fracture, n (%)</td>
<td>2 (3.6%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surgical Complications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection, n (%)</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>ZipTight™ hardware removal, n (%)</td>
<td>3 (5.4%)</td>
</tr>
<tr>
<td>Revision, n (%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>
Radiographic Results

Pre-op to 1st Post-op (Table 2)

• Mean MCS decreased from 3.77 mm to 3.47 mm
  – p=0.061
• Mean TFCS decreased from 5.20 mm to 3.84 mm
  – p<0.001
• Mean TFO increased from 6.90 mm to 8.68 mm
  – p<0.001

Table 2. Mean Radiographic Angles in Millimeters among Patients whom Underwent Ankle Syndesmotic Repair with the ZipTight™ Fixation System, Pre-Operatively, At First Post-Operative Follow-Up, and Final Post-Operative Follow-Up

<table>
<thead>
<tr>
<th>Radiographic Angles Measured in Millimeters</th>
<th>Pre-Operatively</th>
<th>First Post-Operative Follow-Up</th>
<th>Final Post-Operative Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medial Clear Space (MCS), mean (SD)</td>
<td>3.77 (1.41)</td>
<td>3.47 (0.85)</td>
<td>3.10 (0.65)</td>
</tr>
<tr>
<td>Tibiofibular Overlap (TFO), mean (SD)</td>
<td>6.90 (2.86)</td>
<td>8.68 (2.60)</td>
<td>7.44 (2.55)</td>
</tr>
<tr>
<td>Tibiofibular Clear Space (TFCS), mean (SD)</td>
<td>5.20 (1.80)</td>
<td>3.84 (1.21)</td>
<td>4.29 (1.42)</td>
</tr>
</tbody>
</table>
Radiographic Results

1st Post-op to Final Post-op (Table 2)

- Mean MCS decreased from 3.45 mm to 3.10 mm
  - $p<0.001$

- Mean TFCS increased from 3.84 mm to 4.29 mm
  - $p=0.001$

- Mean TFO decreased from 8.68 mm to 7.44 mm
  - $p<0.001$

- Distance between all buttons (n=74), increased from 51.94 mm to 53.03 mm
  - $p<0.001$
Discussion

• First study evaluating creep with suture button syndesmotic fixation devices
• TFCS and TFO measurements
  – significantly reduced from pre- to 1\textsuperscript{st} post-op
  – significantly increased from 1\textsuperscript{st} post-op to final post-op
• Creep between buttons
  – Occurred from 1\textsuperscript{st} post-op to final post-op
    • Avg of 1.09 mm
• Although TFCS, TFO, and button distance increased from 1\textsuperscript{st} post-op to final post-op
  – Demonstrates dynamic stabilization with suture button fixation
• Low complication rate and no surgical revisions
Conclusion

• Syndesmotic stabilization with ZipTight™ fixation adequately improves radiographic parameters of syndesmosis disruptions
• Creep does occur post-operatively, which demonstrates dynamic stabilization occurs with these devices
References

Thank You