Retrospective Analysis of Timing of Syndesmotic Screw Removal and Their Outcomes

Joshua Hunt1, DPM and Zeeshan S. Husain2, DPM FACFAS FAPS

1 PGY-3 Resident, Podiatric Medicine and Surgery Residency, Detroit Medical Center, Detroit, MI
2 Attending Physician, Department of Orthopedics, Podiatry Section, Detroit Medical Center, Detroit, MI

Abstract
This is a retrospective analysis performed at a single hospital (Sinai-Grace Hospital, Detroit, MI) where ankle fractures were surgically repaired by a single surgeon (ZSH) to evaluate timing of syndesmotic screw removal and patient outcomes. Ankle fractures comprise approximately 9% of all fractures in the general public (1). Of these ankle fractures, one in seven incur a syndesmotic injury (2). The current treatment practice and guidelines of these injuries have a lack of consensus in many areas including the type of construct, how much fixation to utilize, and timing of hardware removal (3). The successful management of ankle joint syndromic injuries require anatomic reduction to ensure proper repair of the syndesmotic ligament and reduction of the tibiofibular incus to optimize functional outcomes (4-5). It is unknown how much time is needed for the syndesmotic ligament to heal. As such, there is no agreement on when to remove syndesmotic fixation (4).

Methodology
From 2003 to 2013, 335 ankle fracture cases were identified to have undergone syndesmotic fixation by a senior author (ZSH). Of these cases, 47 cases (14.0%) involved syndromic injuries that were surgically repaired with metallic screws. These charts were reviewed to record date of injury, date of surgery, if they were diabetic, date of birth, syndesmotic screws used (type, size, number, and number of cortices captured), time to weight bearing, final date of follow-up, and date of screw removal. All radiographs were reviewed (16) to determine Dansis-Weber and Lauung-Hansen classification fracture patterns. Patients completed the SF-12 questionnaire at their final post-operative visit. Table 1 includes descriptive statistics for timing of screw removal.

Syndesmotic Screw Placement
Once the malleoli have been reduced, the drill is oriented parallel to ankle joint and approximately 30-45° posterior to coronal plane. Finally, screw is placed without hardware removal.

Discussion
This study includes 47 syndromic injuries associated with ankle fractures over 10 years. The incidence of syndromic injury from our study is 17.0% compared to the literature (2). Patients only underwent hardware removal if the syndromic screws became symptomatic due to stiffness or pain with range of motion and/or limitation. The number of screws and number of cortices were comparable in the removal and retained groups (1.5 screws per 5.9 cortices and 2.0 screws per 6.2 cortices respectively). The time to WB was comparable in both the removed and retained groups (40 days and 38 days respectively). Our preliminary data demonstrate comparable parameters and SF-12 scores in the syndromic screw removal and retained groups. However, the authors are working on a prospective study to better determine if the timing of syndromic screw removal has any correlation to outcomes following syndromic ligament injury.

Results
From 2003 to 2013, 335 ankle fracture cases were treated by the senior author (ZSH). 47 cases (14.0%) met inclusion criteria with post-operative follow-up. Overall, 31 (66.0%) were female and 16 (34%) were male. Patient age ranged from 14 to 70 years of age (38.7±14.2y). Average time to surgery was 12.0±13.8 days. On average, 1.6±0.7 screws were used in each case. On average, 6.2±2.3 cortices were captured per case. Patients began partial WB at 39.9±17.4 days post-operatively. Patients had their syndromic screws removed at 106.3±37.6 days post-operatively. In the study, a follow-up time of 349.1±406.9 days. The SF-12 patient questionnaire was performed on 13 (27.3%) patients via phone interview. The patients were converted into numerical score with a maximum score of 48. The SF-12 score was 35.4±8.5 in the syndromic screw removal group and 42.5±4.9 in the syndromic screw retained group.

Introduction
Current literature lacks consensus in type of construct (number of screws, type of screws, and number of cortices purchased) and timing of hardware removal (6). The majority (83.6%) removed the syndesmotic screws, type of screws, and number of cortices purchased (6). The United Kingdom (63.5% responded) demonstrated a range of time to weight bearing, final date of follow-up, and date of screw removal. All radiographs were reviewed (16) to determine Dansis-Weber and Lauung-Hansen classification fracture patterns. Patients completed the SF-12 questionnaire at their final post-operative visit.

Table 1: Descriptive statistics for timing of syndromic screw removal

<table>
<thead>
<tr>
<th>Date Range</th>
<th>Screw Removed</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 days</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>31-60 days</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>61-90 days</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>91-120 days</td>
<td>13</td>
<td>27.3%</td>
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<tr>
<td>121-180 days</td>
<td>10</td>
<td>21.3%</td>
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<tr>
<td>181-240 days</td>
<td>11</td>
<td>23.4%</td>
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<tr>
<td>241-300 days</td>
<td>13</td>
<td>27.3%</td>
</tr>
<tr>
<td>&gt;300 days</td>
<td>7</td>
<td>14.9%</td>
</tr>
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References