Comparison of Tibiotalocalcaneal Arthrodeses Using a Sustained Dynamic Compression Nail Versus Nondynamized Nails

Authors: John R. Steele, MD, Beau J. Kildow, MD, Daniel J. Cunningham, MD, Travis J. Dekker, MD, James K. DeOrio, MD, Mark E. Easley, MD, James A. Nunley, MD, Selene G. Parekh, MD MBA, and Samuel B. Adams, MD

Affiliation: Department of Orthopaedic Surgery, Duke University Medical Center

Objective: Nondynamized (ND) nails fail to maintain compression post-operatively, which may contribute to nonunion. In contrast, the DynaNail® is an intramedullary (IM) nail with a pseudoelastic element that maintains compression in the face of bone resorption during bone healing. The purpose of this study was to evaluate the impact of patient risk factors, operative factors, and intramedullary nail design on the rates and times of radiographic fusion.

Methods: This was a retrospective, comparative study of all patients undergoing tibiotalocalcaneal arthrodesis (TTCA) with IM nails between November 2013 and July 2017 at a single institution with at least 1 year of clinical follow-up. Patients who received the DynaNail were placed in the SDC group while patients who received nondynamized or “static” IM nails3 were placed in the ND group. Radiographic evidence of fusion, including CT scans, were analyzed alongside secondary outcomes including infections, wound healing complications, hardware failure, and revisions. Comorbidities were also tracked.

Results: Fifty patients were included in the SDC group with 36 patients in the ND group. Patients in the SDC group had significantly more risk factors for nonunion including history of smoking, diabetes, Charcot, infection, bulk boney defects, and prior ankle surgery. Despite these factors, the SDC group had a significantly faster time to union by 3.9 months (Table 1). The SDC group also had a higher fusion rate (78%) than the ND nail cohort (75%), while utilizing significantly less supplemental hardware. There were no significant differences in secondary complications between groups.

Discussion: Results indicated that the SDC nail had a higher fusion rate and a significantly faster time to union than other TTCA nails despite being used in a population with significantly higher risk factors for nonunion. The SDC nail provides a viable option with proven acceptable fusion rates for TTCA even in challenging patient populations.

Significance of Results to the DynaNail

- This study represents the first long-term comparative clinical study between the DynaNail and nondynamized/static nails.
- Study was performed without selection bias at a single institution with the same group of performing surgeons, reducing variability and further legitimizing the study results.
- Largest study to date validating the clinical benefits of DynaNail’s internal NiTiNOL Element and its ability to maintain post-operative compression and provide immediate dynamization, especially in challenging patient populations.

Table 1: Unadjusted Rates of Radiographic Union

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Nondynamized</th>
<th>Sustained Dynamic Compression</th>
<th>PValue</th>
</tr>
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<tbody>
<tr>
<td>Radiographic union</td>
<td>27/36 (75%)</td>
<td>39/50 (78%)</td>
<td>.75</td>
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<tr>
<td>Months to union</td>
<td>10.8 (10.9)</td>
<td>6.9 (4.1)</td>
<td>.049</td>
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</tbody>
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The SDC nail [DynaNail] has been shown to achieve successful arthrodesis in a population at high risk for nonunion, using less hardware, and at a faster rate than ND nails.

3. IM nails included the A3 Fusion Nail (Stryker), Panta Nail (Integra LifeSciences), Trigen (Smith & Nephew), Phoenix (Zimmer Biomet), Valor (Wright Medical Group), and ACN (Orthofix).