Tibiotalocalcaneal Arthodesis via a Nitinol Containing Intramedullary Nail: A Case Series

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Disclosure

NO CONFLICT TO DISCLOSE

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Our disclosures in the Final AOFAS Mobile App.
Dr. Jason Bariteau serves as a consultant for Medshape.
Tibiotalocalcaneal (TTC) Arthrodesis

- Versatile procedure used in management of several foot and ankle pathologies
- Several techniques – plate/screw construct, crossing screws, nail/screw construct

TTC via a hindfoot nail provides rigid fixation and beneficial in many complex scenarios

- Poor bone quality – charcot, osteopenia
- Compromised bone stock – failed ankle arthroplasty, avascular necrosis of the talus, traumatic tibial bone loss
- Complex deformities
Outcomes after TTC

No difference in patient reported outcomes, satisfaction and return to work between AA and TTC

Higher union rates with nail compared to cannulated screw construct

However, TTC also has associated risks and complications

Increased risk of amputation and nonunions especially in high risk patients
Bone resorption risk

- Adequate compression at the arthrodesis site is vital to successful fusion
- Unfortunately, many patients who undergo TTC fusion have poor vascular, immune, and nutritional status which can lead to bone resorption increasing the nonunion risk

- Bone resorption of just 1 mm can lead to a 90% reduction in load for intramedullary nails commonly used for TTC arthrodesis
The Dynanail

The recently designed DynaNail (MedShape, Inc, Atlanta GA) is a hindfoot nail with a built in nickel titanium alloy (nitinol) that has pseudoelastic properties and to maintains compression across joint surfaces in the setting of bone resorption.

The authors present a case series of patients who underwent tibiotalocalcaneal (TTC) arthrodesis with this DynaNail hindfoot nail system.
Methods

- Patients treated by one board certified foot and ankle surgeon using the Dynanail hindfoot nailing system
- Retrospectively reviewed over a two-year span
- Collected variables:
  - Demographics
  - Preoperative diagnosis
  - Postoperative functional outcomes and complications

Compression achieved:
Proximal migration of the distal interlocking screw on the lateral radiograph was measured at two, six, and twelve weeks to objectively assess compression through the nitinol system.

A) Immediate post op
B) 6 weeks post op
There is proximal migration of the distal interlock within the screw hole.
## Results

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Preoperative diagnosis</th>
<th>Complications</th>
<th>Functional Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46</td>
<td>nonunion of previous ankle arthrodesis</td>
<td>wound dehiscence requiring I&amp;D and closure at 1 month</td>
<td>full weight bearing, cleared for all activities</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>posttraumatic arthritis</td>
<td>none</td>
<td>full weight bearing, cleared for all activities</td>
</tr>
<tr>
<td>3</td>
<td>58</td>
<td>nonunion of previous subtalar arthrodesis</td>
<td>none</td>
<td>full weight bearing, cleared for all activities</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>posttraumatic arthritis</td>
<td>none</td>
<td>Weightbearing in boot due to continued pain</td>
</tr>
<tr>
<td>5</td>
<td>67</td>
<td>nonunion of previous ankle arthrodesis</td>
<td>none</td>
<td>full weight bearing, cleared for all activities</td>
</tr>
<tr>
<td>6</td>
<td>71</td>
<td>posttraumatic arthritis</td>
<td>none</td>
<td>full weight bearing, cleared for all activities</td>
</tr>
<tr>
<td>7</td>
<td>72</td>
<td>Charcot arthropathy</td>
<td>none</td>
<td>full weight bearing, cleared for all activities</td>
</tr>
<tr>
<td>8</td>
<td>73</td>
<td>posttraumatic arthritis</td>
<td>none</td>
<td>full weight bearing, cleared for all activities</td>
</tr>
</tbody>
</table>

**8 patients**

Average follow up time: 7 months

Most common diagnosis: posttraumatic arthritis

One complication: wound dehiscence requiring I&D/closure (this patient went on to heal without problems)

Only one patient continued to ambulate in boot at time of most recent follow up due to pain
Compression

<table>
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<tr>
<th>Average Compression obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 weeks</td>
</tr>
<tr>
<td>2.9 mm</td>
</tr>
</tbody>
</table>

All patients demonstrated some additional compression at each subsequent follow up through the nitinol system. When averaged, there was a clear trend of increased compression obtained from post-op to twelve weeks.
Conclusions

- Tibiotalocalcaneal arthrodesis can be an excellent procedure that provides significant pain relief and restores function.

- There was only one postoperative complication, which resolved by six months follow up.

- All patients had returned to full weight bearing and all activities except one which required a boot for ambulation.

- Furthermore, patients all demonstrated increased compression at each follow up radiographs which demonstrates the sustained compression obtained at the arthrodesis site through the Dynanail system.

Further prospective work with a larger patient cohort is warranted to determine if this nailing system is superior to other TTC hindfoot nails.
References


Images
https://plasticsurgerykey.com/tibiotalocalcaneal-and-pan-talar-arthrodesis/
http://www.podiatrytoday.com/pertinent-insights-posterior-approach-hindfoot-arthrodesis
https://www.researchgate.net/figure/232114572_fig7 FIGURE-7-Lateral-and-anteroposterior-radiographs-6-weeks-after-tibiotalocalcaneal