Is Immediate Weight Bearing Safe for Tibial Shaft Fractures Treated with IM Nails?

Results of randomized clinical trial show no increase in adverse events or complications

**OTA Orthopaedic Trauma Association 2013 Annual Meeting**

**Is Immediate Weight Bearing Safe for Tibial Shaft Fractures Treated with IM Nails?**

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Tibial shaft fractures that require surgery are typically treated with intramedullary (IM) nails, yet no standard postoperative rehabilitation protocol currently exists.

“As a general principle, mechanical loading of injured bone is conducive to its healing,” according to Steven C. Gross, MD. “However, clinical decision making must balance the advantages of weight bearing on fracture healing against the risks of placing excessive loads across the fixation construct.”

To assess differences in outcomes between immediate weight bearing as tolerated and non–weight-bearing status in patients treated with IM nails for tibial shaft fractures, Dr. Gross and his colleagues conducted a prospective, randomized clinical trial at the four hospitals within their large academic medical center. They presented their results at the 2013 annual meeting of the Orthopaedic Trauma Association.

Using the need for revision as the primary outcome measure, and time to union, loss of reduction, and functional outcome scores as secondary measures, they hypothesized that early weight-bearing status would have no effect on outcomes.

**Study design**

Over a 2.5-year period, researchers prospectively identified 60 adult tibial shaft fractures indicated for surgical treatment. Prior to surgery, consent was obtained from eligible patients, who were then randomized into two groups: immediate weight bearing as tolerated (WBAT) or non–weight bearing for the first 6 weeks following surgery (NWB). To eliminate treatment bias, surgeons were blinded to the patients’ postoperative weight-bearing status.

Patients older than 18 years with a closed or open fracture of the tibial diaphysis (AO Type 42) and any amount of fracture comminution, including segmental fracture, without gross bone loss were included. Exclusion criteria were the following:

- Inability to place an IM nail
- Gross bone loss
- Metabolic bone disease
- Associated injuries or pre-existing comorbidities that would prevent postoperative weight-bearing
- Neurovascular deficits
- Pathologic fracture
- Surgical delay greater than 24 hours for open fractures
- Surgical delay greater than 3 weeks for closed fractures
- Pregnancy

All patients were surgically treated with reamed/locked tibial IM nails, with a minimum of two proximal and two distal 5-mm locking bolts.

Immediately following surgery, patients in both groups were placed in a splint and transitioned to a fracture boot after wound check (between 48 and 72 hours postoperative). Open fracture patients were transitioned to a fracture boot on a case-by-case basis, determined by the condition of the soft-tissue envelope.

Physical therapy in both groups was guided by the patient’s assigned treatment arm (WBAT or NWB) and included range-of-motion exercises for the knee and ankle. Six weeks after surgery, all patients were allowed to bear weight as tolerated.

Both groups were followed until union or treatment failure/revision surgery. In all, 47 patients with 49 tibial shaft fractures (WBAT = 25, NWB = 24) had complete follow-up to union. The authors noted no significant differences among the patients with respect to age, sex, open fractures, AO fracture, or injury severity score.

Anteroposterior and lateral radiographs were taken immediately following surgery and at each follow-up visit to measure coronal/sagittal plane angulation at the fracture site and overall bone length. In addition, all patients completed Short Musculoskeletal Function Assessment (SMFA) questionnaires at 6 weeks, 3 months, and 6 months postoperative.

**No differences in outcomes**

Analysis of the primary outcome of the study—indication for a revision procedure—revealed no significant differences between the groups. Two nonunions were recorded, both in the NWB group. No episodes of hardware failure were found. The incidence of other complications was also similar between groups.

Time to union and changes in measured bone length were also similar between the two groups (Table 1). SMFA outcome scores were nearly identical at 6 weeks and at union in both groups.

Although three delayed unions (WBAT = 1, NWB = 2) and seven malunions (WBAT = 4, NWB = 3) were recorded, no instances of loss of reduction leading to malunion were found. Loss of reduction was defined as deviation of greater than 5 degrees from the initial postoperative alignment in the coronal or sagittal plane, or shortening of bone length greater than 15 mm.

The authors acknowledge several limitations to their study. For example, several patients in the NWB group admitted to bearing some weight on their legs, even though they were specifically instructed not to do so. Similarly, some patients in the WBAT group limited their weight-bearing due to pain.

Rather than seeing noncompliance as a confounding element, however, “we believe that the noncompliance in our patient population increases the applicability of the results to the typical trauma practice,” they said.

“Our data complement other studies, such as those on femoral shaft fractures, that show that early weight bearing is appropriate and safe,” said Dr. Gross. “We believe that our data shows immediate weight bearing is not associated with an increase in adverse events or complications. Patients should be allowed to bear weight as tolerated immediately following IM nailing of tibial shaft fractures, provided that there are no other complications.”

> See Weight Bearing on page 17

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**TABLE 1: TIME TO UNION AND CHANGES IN BONE LENGTH**

<table>
<thead>
<tr>
<th></th>
<th>Time to union (weeks)</th>
<th>Final alignment (deg)</th>
<th>Change in alignment (deg)</th>
<th>Change in length (cm)</th>
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<tr>
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<td>WBAT</td>
<td>NWB</td>
<td>Coronal</td>
<td>Sagittal</td>
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<tr>
<td></td>
<td>23.4 ± 12.2</td>
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<td>1.6 ± 1.6</td>
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**Bottom Line**

- IM nailing is the standard of care for tibial shaft fractures that require surgery.
- Currently, no consensus exists regarding the appropriate postoperative weight-bearing protocol for tibial shaft fractures treated with IM nails.
- In this prospective randomized clinical trial, immediate weight-bearing status was found safe for tibial shaft fractures treated with IM nails.
- Based on their results, the researchers recommend that patients be allowed to bear weight as tolerated following surgery.