

Early Weight-Bearing After Tibial Intramedullary Nailing: Recent Evidence for Clinical Decision Making

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Abstract

Introduction: Intramedullary nailing (IMN) is a standard treatment in tibial fractures and evidence is guiding certain patients toward early weight bearing (EWB) in hopes to improve recovery compared to delayed weight bearing (DWB). This review will accumulate evidence for determining who may safely benefit from EWB status.

Methods: A literature search included 8 studies published between 2020-2025. Studies were categorized by weight bearing initiation: EWB consisting of ≤ 4 weeks post-operative and DWB > 4 weeks post-operative. Findings were qualitatively synthesized, focusing on evidence trends related to EWB status.

Results: 8 studies showed comparable alignments post-operative. 6 studies showed no rise in complication rates, 1 study showed fewer complications, and 1 study showed lower nonunion rates compared to DWB. 5 studies showed no difference in time to union and 3 studies showed decreased time to union (range 2.41 to 5.6 weeks faster).

Conclusion: Current evidence suggests that EWB can be a safe option for facilitating recovery, however there are factors to be considered when applying EWB status to patients after a tibial IMN. The major factor for EWB is stability of the fracture pattern and bone quality. The studies supported EWB for simple and minimally comminuted fractures and stable surrounding soft tissues. Patients with good bone quality are possible candidates for EWB given their ability to handle the increased stress on the fracture area. Higher-risk patients should receive more precaution when considering EWB status as they are less stable and may not respond well to the increased stress of EWB. Ultimately, if the patient has a stable fracture with good fixation, then they would be a good candidate for EWB. If the patient has poor reduction, poor bone quality, or unstable fracture pattern and surrounding tissues, then EWB may not provide any additional benefits.

Introduction

Intramedullary nails (IMN) are one of the most popular implants of choice for tibial fractures located in the midshaft as well as the proximal and distal epiphyseal portions of the bone. These nails are indicated for a multitude of fracture types because it creates strong stabilization within the tibia. Surgical treatment for tibial fractures aim to create union, alignment, and proper rotation of the fracture segments.¹ Compared to femoral nailing, tibial IMNs have reduced risk of systemic effects such as pulmonary embolism, coagulation disorders, immunologic, or inflammatory response, making it a common choice of fixation.² Recent advancements in IMN have led to better outcomes regarding stability, union, and rotation, which has led to changes in postoperative rehabilitation.¹

Traditional postoperative protocol for tibial IMN is delayed weight bearing (DWB) to avoid complications. However, as better outcomes arise from better IMNs, these traditional postoperative protocols change to favor earlier weight bearing (EWB). Studies have started trending toward EWB showing no increase in complications and nonunion rates compared to DWB groups.^{3,4} Although the data is moving toward incorporating EWB in rehab protocols, there has not been sufficient evidence comparing EWB to the traditional DWB designed to show outcomes and give standards to who qualifies for EWB.

A standardized approach for clinical decision making would act as a guide for surgeons to get their patients to desired outcomes like union as soon and safely as possible.

Methodology

A narrative literature review was conducted using PubMed and Google Scholar to identify English-language studies published between 2020 and 2025 evaluating postoperative weight bearing after tibial shaft intramedullary nailing. Search terms included “tibia,” “tibial,” “intramedullary nail,” “IM nail,” “weight-bearing,” and “early weight-bearing,” “early mobilization” “tibial IM nail”. Studies were included if they reported a protocol for post-op weight bearing (early or delayed) after tibial IMN and reported outcomes related to union, alignment/implant failure, reoperation, function, or complications. Exclusion criteria included non-operative management, external fixation-only cases, pediatric populations, and review articles without original data.

Inclusion Criteria

Patients ≥ 18 years old with tibial shaft fractures that are treated with IMN (OTA 42A including proximal, midshaft, and distal shaft, open and closed fractures)

Study is a randomized control trial, prospective cohort study, retrospective cohort study, or direct comparative study reporting weight bearing and outcomes.

Studies reporting postop EWB protocol after IMN as ≤ 4 weeks and DWB as > 4 weeks.

Reports outcome of union (rate of union, time to union)

Reports outcomes including alignment/malalignment, implant failure, complications, reoperation.

Exclusion Criteria

Patients < 18 years of age

Fractures reported are not limited to the tibial shaft (including tibial plateau fractures, pilon ankle fractures, primary tibial tubercle fractures, etc.)

Case reports, biomechanical studies, or studies not reporting original data

Studies where the tibial IMN is not the primary form of fixation (external fixation only, plate fixation only, mixed fixation including IMN, etc.)

Studies that do not report outcomes related to union

Studies where the fractures addressed were pathological fractures (tumors, periprosthetic fractures, patients with metabolic bone disease, etc.)

All patients in the included studies were categorized as follows:

EWB: ≤ 4 weeks postoperative

DWB: > 4 weeks postoperative

From each group factors such as sample size, fracture pattern, fixation, and outcomes were summarized descriptively. Evidence trends and relevant patient factors associated with safe WB were qualitatively synthesized and analyzed using descriptive statistical analysis.

Results

The 8 studies addressing EWB after a tibial IMN each reported different outcomes related to weight bearing status. The studies showed EWB had similar alignment with no increase in complication rates and similar, if not quicker, time to union compared to DWB status.⁵⁻¹² Four studies showed maintenance of postoperative alignment with minimal change in coronal and sagittal parameters, and no increased loss of reduction or malalignment that required revision.^{7,9, 10, 12} Most studies showed no rise in complication rates, however one study showed fewer complications, and one study showed lower nonunion rates compared to DWB.^{5,7} The outcomes measured and the subsequent mobilization preferred is seen in Table 1.

Table 1. Clinical Outcomes and Corresponding Favored Mobilization

Study	Union Outcomes	Complications	Alignment
Bhanushali et. al	X	X	X
Uemi et. al	X	X	X
Weng et. al	X	X	X
Apostolides et. al	X	X	X
Force et. al	X	X	X
Telgheder et. al	X	X	X
Elsenosy et. al	X	X	X
Deliberato et. al	X	X	X

Key: X = EWB, X = No Difference, X = DWB

Regarding time to union, 5 studies showed no difference and 3 studies demonstrated a significant reduction ranging from 2.4 weeks ($p < 0.05$), 2–4 weeks ($p < 0.05$), and up to 6 weeks ($p = 0.023$) compared to DWB.⁵⁻¹² The study by Apostolides et al. showed a trend of faster union that overall favored EWB, but no significance was found between the EWB and DWB groups.⁹ Three of the studies noted DWB status was assigned to patients with higher-risk fracture patterns as a precaution (e.g., distal-third tibial fractures).⁵⁻⁷ Across multiple studies, EWB was associated with either no difference or decreased time to union, with some reporting accelerated healing without compromising stability.^{5-7, 11} No study demonstrated a statistically significant increase in adverse outcomes such as malunion, implant failure, or reoperation due to the EWB designation.

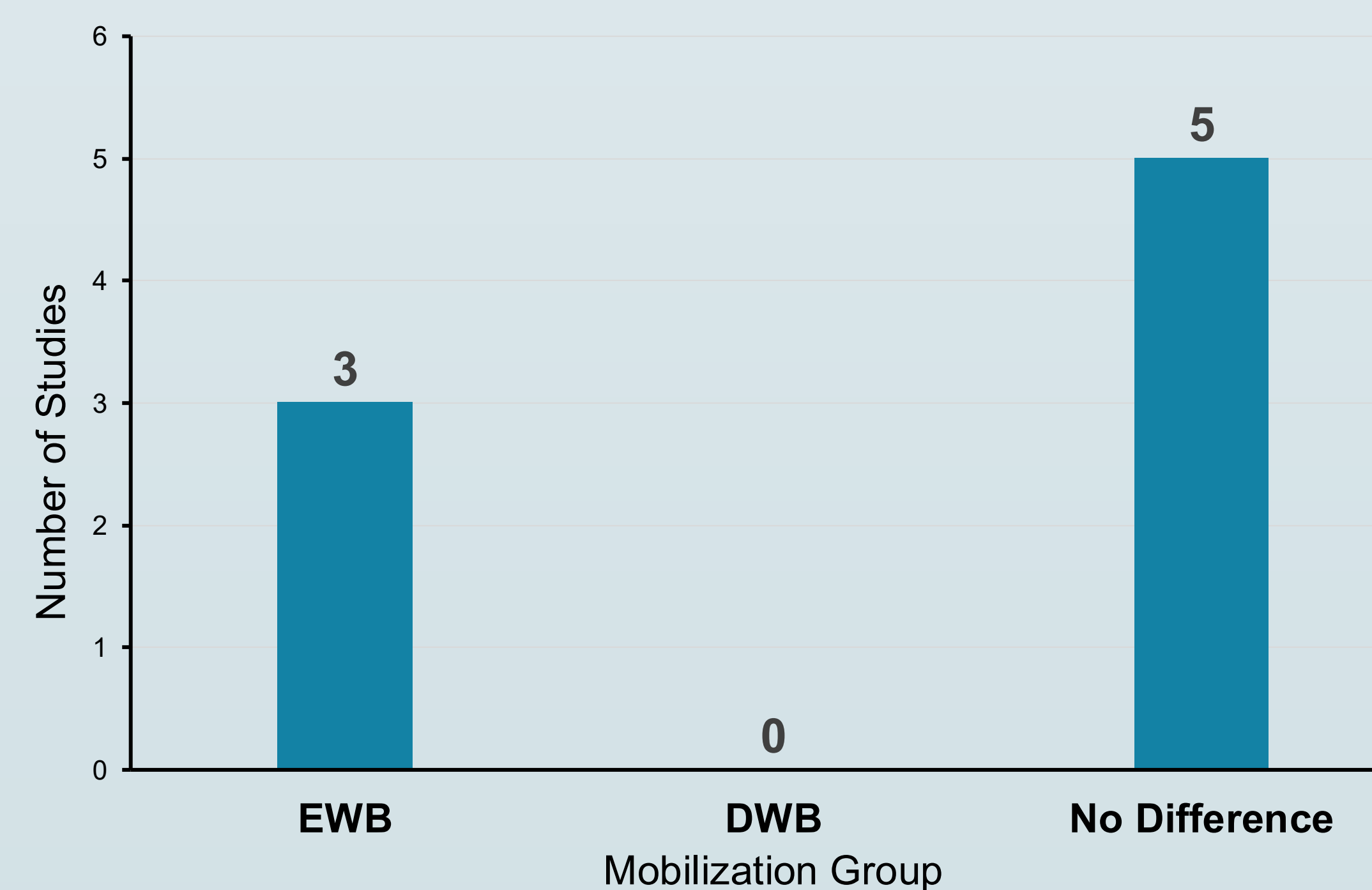


Figure 1. Union Outcomes by Weight-Bearing Status After Tibial IMN

This graph represents the number of studies favoring EWB, DWB, or no difference regarding union outcomes.

Discussion

The current evidence shows that EWB can be a safe option for facilitating recovery, however there are factors to be considered when applying EWB status to patients after a tibial IMN. The major factor that needs to be considered for EWB is stability. Stability of the fracture pattern and bone quality are the driving factors to a successful recovery. The studies supported EWB for simple and minimally comminuted fractures (42-A/B) and stable surrounding soft tissues. Patients with good bone quality are possible candidates for EWB given their ability to handle the increased stress on the fracture area. These patients could have accelerated healing and faster return to daily activities on an EWB regimen. Patients that should receive more caution when considering weight bearing status are higher-risk patients with distal third or segmental fractures (42-C) and older patients who are at risk for osteoporosis. These patients are less stable and may not respond well to increased stress of weight bearing soon after their tibial IMN. Ultimately, the evidence supports consideration for EWB. If the patient has a stable fracture with good fixation, then they would be a good candidate for EWB. If the patient has poor reduction, poor bone quality, or unstable fracture pattern and surrounding tissues, then EWB may not provide any additional benefits.

EWB after tibial IMN is shown to be a non-inferior option compared to DWB protocols, with no increase in malalignment or complications. It is associated with comparable or improved union outcomes that support EWB as a useful option in rehabilitation protocols for patients that show early stability. This method of EWB may lead to better recovery outcomes, but more studies should further evaluate the effects of EWB to consider which patients, given their patient characteristics and fracture type, are the best candidates for this intervention.

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