

Long-Term Functional Outcomes and Survival Following Intramedullary Nailing of Pathological Diaphyseal Tibial Fractures

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Significance & Hypothesis/Techniques: Pathologic fractures of the tibia are rare, representing only 3-7% of all pathologic long bone fractures, and are associated with a limited life expectancy. While intramedullary nailing (IMN) has become the preferred fixation strategy, existing data specific to tibial lesions is mostly derived from very small cohorts and focuses primarily on implant failure or survival rather than functional recovery. The goal of this study was to assess overall survival, reoperation rates, longitudinal postoperative pain, and ambulatory outcomes in patients undergoing IMN for pathologic diaphyseal tibial fractures.

Innovation: This study provides the largest known cohort evaluation specifically focused on comprehensive clinical and patient-reported functional outcomes for pathologic tibial shaft fractures treated with IMN. It addresses a significant gap in the literature by defining recovery timelines for independent ambulation and pain resolution, which are critical for shared decision-making in palliative orthopedic oncology.

Approach (Materials & Methods): A retrospective review was conducted of 30 patients who underwent IMN for pathologic diaphyseal tibial fractures (metastatic lesions, multiple myeloma, or primary bone lymphoma) at two tertiary care centers between 2000 and 2024. Longitudinal outcomes were assessed at multiple timepoints up to 2 years postoperatively. Primary readouts included overall survival, reoperation rates, pain Visual Analogue Scale (VAS) scores, weight-bearing status, Eastern Cooperative Oncology Group (ECOG) performance status, and the Combined Pain and Ambulatory Function (CPAF) Index.

Results: The cohort comprised 30 patients with a median age of 70 years and a female predominance (67%). The most common primary malignancies were lung cancer (37%), renal cell carcinoma (17%), and multiple myeloma (13%). Overall survival was 48.7% at 1 year and 38.3% at 2 years, with a median survival of 8.9 months. Three patients (10%) required reoperation at a median of 13 months. Of these, one underwent implant removal due to local disease progression, and two (7%) required implant revision due to deep infection and persistent infection with non-union, respectively. Regarding functional outcomes, median pain VAS scores decreased significantly from 38 preoperatively to 6 at 1 month ($p=0.005$), with sustained improvement at all subsequent timepoints. Median CPAF scores similarly improved from 6 points preoperatively to 7 points at 1-month postoperatively ($p=0.02$). The proportion of patients achieving full weight-bearing increased from 29% preoperatively to 73% at 3 months postoperatively. Furthermore, patients demonstrating good functional status (ECOG 0 or 1) increased from 40% preoperatively to 75% at 6 months, and 100% at 2 years.

Discussion & Impact: IMN for pathologic tibial fractures provides durable pain relief, a low complication rate, and rapid functional recovery. These findings offer crucial benchmark data for expected postoperative outcomes, demonstrating that substantial mobility improvements occur within weeks. This validates IMN as an effective palliative intervention that helps maintain patient autonomy and significantly enhances quality of life despite the progression of metastatic disease.