Introduction: While many pediatric tibial shaft fractures (TSFs) are managed nonoperatively, 25–40% require surgical fixation due to failed conservative treatment. Flexible nails (FN), rigid nails (RN), and plate-screw fixation (PSF) are common surgical options, but direct comparisons across all three are limited. This retrospective study compares clinical recovery and complication rates among these fixation methods in pediatric TSFs.

Methods: A retrospective review of 37 patients ≤17 treated for TSFs with FN, RN, and PSF was conducted at a single institution. Outcomes assessed included time to radiographic union, weight bearing, and removal and surgical wound complications. Given the non-parametric distribution of the data, Kruskal-Wallis tests were used to compare median values across the three fixation groups.

Results: Thirty-seven patients (27 males, 73%) with a mean age of 13.5 ± 1.8 years were included. Time to weight bearing was significantly shorter in RN (median 56 days) compared to FN (110 days; $P = 0.0005$) and PSF (89 days; $P = 0.013$). No significant difference was found between PSF and FN ($P = 0.16$). The three groups had no significant differences in time to radiographic union and time to implant removal. Implant removal was performed in 40% of patients, all without complications except one superficial infection in the FN group (n = 9).

Conclusion: All three fixation methods were effective for achieving radiographic union and timely implant removal, but RN may offer an advantage in earlier weight bearing compared to FN and PSF. Ultimately, the choice of fixation should be individualized based on fracture pattern, patient characteristics, and surgeon expertise.