**Pediatric Distal Third Tibial Shaft Fractures: A Comparison of Surgical Fixation Methods and Incidence of Concomitant Physeal Fractures**

***Jessica McGraw, MD****; Ekene U. Ezeokoli, BS; Parker Mitchell, BS; Rachel Sanislo Silverstein, MD; Brian G. Smith, MD*
*Texas Children's Hospital, Houston, Texas, UNITED STATES*

**Purpose:** The purpose of this study was to compare treatment outcomes of operatively treated pediatric distal third tibial shaft fractures (AO Pediatric 42-D fractures) fixed with elastic nailing or open reduction and plate fixation and to evaluate the incidence of concurrent distal tibial physeal fractures in these patients.

**Methods:** Retrospective chart review was performed to identify skeletally immature pediatric patients who underwent operative fixation of distal third tibial shaft fractures at a large, Level I children's hospital between 2010 and 2020. Patient and fracture characteristics were recorded. Analysis of treatment outcomes was performed and rates of concurrent ipsilateral distal tibial physeal fractures were evaluated.

**Results:** Our study cohort had 214 tibial shaft fractures treated surgically at our institution; 43 were distal third tibial shaft fractures. An ipsilateral non-contiguous distal tibial physeal fracture (AO Pediatric 43-E fracture) was present in 32.6% of these patients. Associated physeal injuries were significantly associated with a spiral distal third tibial shaft fracture pattern. The presence of an associated physeal fracture did not affect patient treatment outcomes. Comparison of treatment outcomes between distal third fractures undergoing fixation with elastic nailing versus open reduction and plating revealed no difference with time to fracture union, time of postoperative immobilization, or time to full weightbearing. While elastic nailing was associated with increased coronal angulation, translation, and shortening of fractures on initial postoperative imaging, there was no difference in rates of malunion at final follow-up.

**Conclusion:** In our series, there were no statistically significant differences in treatment outcomes of distal third tibial shaft fractures based on fixation method at final follow-up. Our cohort of operatively treated distal third tibial shaft fractures had a higher rate of associated non-contiguous distal tibial physeal fractures than previously published in the pediatric orthopaedic literature. We recommend careful evaluation of the ankle for concurrent physeal injuries in patients with distal third tibial shaft fractures requiring operative treatment.