Cast Treatment Leads to Similar Radiographic Outcomes and Decreased Surgical Morbidity Compared to Flexible Nailing for Isolated, Closed Pediatric Tibia Fractures

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INTRODUCTION:
Tibial shaft fractures are the third most common pediatric long bone fractures. Closed reduction and casting (CRC) is the gold standard in treatment with recent increase in utilization of elastic stable intramedullary nailing (ESIN). No studies have directly compared outcomes between patients treated with CRC and ESIN. The purpose of this study was to evaluate treatment outcomes between pediatric patients treated with CRC versus ESIN for isolated tibial shaft fractures.
METHODS:
Retrospective evaluation of patients with a tibial shaft fracture treated with an intramedullary nail (CPT 27759) or closed reduction and casting (CPT 27752) at a level 1 pediatric trauma center over a 15-year period was performed. Patients with pathologic or open fractures, treated with a reamed intramedullary rod, or sustaining polytrauma were excluded. Treatment was based on surgeon preference. Records were reviewed for demographics, injury and treatment characteristics, and radiation exposure. Radiographs were evaluated for fracture characteristics, alignment (malunion defined as angulation >5°), and time to radiographic union.
RESULTS:
Sixty-five patients treated with ESIN and 41 patients treated with CRC for isolated, closed tibial shaft fractures were identified. Patients in the ESIN cohort were older (12.1±1.9 vs. 9.3±3.7 years, $p<0.00001$), weighed more (54.8±16.2 vs. 44.6±24 kg, $p =0.01$), and had higher frequency of fibula fractures (51 vs. 21, $p=0.005$) than those treated with CRC. Length of hospital stay (LOS) was higher for ESIN patients (1.5 vs. 0.25 days, $p<0.00001$). There was no difference in time to union (116±64 ESIN vs. 105±48 days CRC, $p=0.65$) or time to partial weight bearing (50±16 ESIN vs. 45±17 days CRC). CRC patients were immobilized longer (43±36 ESIN vs. 67±18 days CRC). All patients went on to radiographic union. Twenty-eight (43.1%) ESIN patients and 15 (36.6%) CRC patients healed with malunion on final radiographs ($p=0.55$). ESIN patients were more likely to heal with malunion if their weight was ≥50 kg (26.9% vs. 53.8%, $p=0.04$). Patients undergoing ESIN had higher fluoroscopy exposure (155 vs. 28 images, $p<0.00001$) as well as plain film radiographic exposure (21 vs. 18 films, $p=0.02$). Sixty (92%) ESIN patients underwent a second surgery for nail removal.
DISCUSSION AND CONCLUSION:
Treatment with ESIN for closed, isolated tibial shaft fractures results in similar rate of malunion as CRC but results in increased radiation exposure, LOS, and secondary surgery. Patients with weight ≥50kg at time of treatment had higher rates of malunion when treated with ESIN. This study supports CRC as the gold standard for treatment of pediatric tibial shaft fractures.