Tibial Shaft Fractures Treated with Reduction and Fixation with Carbon Fiber-Reinforced Polymer Nail

Gilbert Ralph Ortega, MD
HonorHealth Osborn Trauma Center, Scottsdale, AZ, United States

Purpose: We reviewed outcomes and complications of tibial shaft fractures treated with reduction and fixation using a carbon fiber-reinforced polyetheretherketone (CFR-PEEK) tibial nail.

Methods: This was a retrospective review of tibial shaft fractures treated with reduction and CFR-PEEK tibial nail from 2016-2018 by a single surgeon at a Level-I trauma center. Patients were identified by CPT code 27759, and fractures were classified according to the OTA Compendium. Imaging was reviewed by a fellowship-trained orthopaedic traumatologist. Patients were treated by a single surgeon using a semi-extended technique while using the same standardized postoperative protocol including allowing patients to be weight-bearing as tolerated and range of motion as tolerated.

Results: 37 patients with 38 tibial shaft fractures treated with reduction and fixation using a CFR-PEEK tibial nail were included. One patient had bilateral tibial fractures. 4/38 (11%) fractures were located at the tibia proximal third, 27/38 (71%) were located at the tibia middle third, and 7/38 (18%) were located at the tibia distal third. 8/38 (21%) were open fractures, and 30/38 (79%) were closed fractures. The patients treated were of an average age of 42 years (range, 17 to 81 years). 10/37 (27%) were female and 27/37 were male (73%). Patients were observed for an average of 28 weeks postoperatively (range, 4 weeks to 18 months). Six patients were lost to follow-up secondary to moving back to their original state. Two patients had an open fracture with a known bony defect that required a planned delayed bone grafting between 3 and 4 months. Of the 31 patients who have had follow-up, union was observed in 28/28 (100%) of the fractures. The average time to union was 10 weeks (range, 6 to 18 weeks) when including both closed and open fractures. Three of 38 tibia fractures are still in early phase of healing, under 6 weeks, and are not included in calculation of union rate. There were no intraoperative complications in any patients. Early postoperative complications included an infection of a free- flap tissue surgery that was not directly related to a bone infection. This soft-tissue infection occurred in 1 patient and was treated by his plastic surgeon with resolve. Late postoperative complications included 3 patients with hardware impingement from a prominent proximal screw. Two of these 3 patients required a secondary surgery to have 1 screw removed (2/31, 6%), which allowed resolution of their pain. In 1 of the 3 patients, pain resolved between 6 to 12 months and did not require further treatment.

Conclusion: CFR-PEEK tibial nails are an effective treatment in both open and closed tibia fractures with evidence of very low complication rates, high union rates, and early healing. Our data suggest that a CFR-PEEK tibial nail may be a working alternative to other methods of fixation with a low complication rate, high union rate, and earlier healing when compared to other methods of metal fixation.

See the meeting app for complete listing of authors' disclosure information.