

**Efficacy of Carbon Fiber-Reinforced PEEK Femoral Nails: Preliminary Results**

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**Purpose:** Carbon fiber has been used in several applications due to its mechanical properties but its use has been limited due to both cost and acceptance. Recently, carbon fiber (CF)-reinforced polyetheretherketone (PEEK) implants have become available at a price point commensurate with traditional metal implants. The CF implants have a modulus of elasticity between titanium and human bone and fatigue properties that are superior to metallic implants, thus they may provide better biologic and biomechanical characteristic for fracture treatment. The implant is approved by the US Food and Drug Administration and has been used for several years but with little literature surrounding its use. The current report focuses on the initial results of a CF femoral nail.

**Methods:** An IRB-approved, retrospective review of cases performed by the authors was undertaken. Inclusion criteria were diaphyseal femur fractures amenable to either antegrade or retrograde femoral nailing. Exclusion criteria were pathologic fractures, inadequate follow-up, and fractures with extension into the periarticular region. Routine demographic data were recorded as were any complications related to the surgery or implant. Outcome variables were percent healing at 2, 6, 12, and 18 weeks, infection, failure, or other complication. Since the goal was safety and efficacy, functional outcomes were not reported but patient questioning included any pain related to hardware.

**Results:** A total of 50 patients were reviewed, with an average age of 45 years. Of the 50 patients, 38 had follow-up until healing. Of the 38 patients, 66% demonstrated healing by 6 weeks, and 96% demonstrated healing by 12 weeks. The 1 fracture that did not heal “autodynamized (broken proximal interlocking screws)” and the patient was lost to follow-up. There were no infections or hardware failures, and patients did not complain of hardware-related pain or barometric pain.

**Conclusion:** The healing rate of a CF femoral nail is similar to reported rates of 96%, but unlike metallic nails, we noted a greater percent of cases healed at the 6-week time period. We also noted the lack of barometric or hardware-related complaints. We attribute these findings to the lower modulus of elasticity, which may promote faster healing. The lack of any hardware-related patient complaints may be due to the lower modulus. While the fatigue properties of CF are superior to metal, we could not make any conclusions about the longevity of the implant. In summary, the CF femoral nail appears safe and effective with the appearance of faster callus and healing. Further study is warranted.