

## PAPER 34

### **Clinical Outcomes of Patients Treated with Carbon-Fiber Nails for Oncologic Indications in Long-Bones: An International Multi-Institutional Study**

**Running head:** Carbon-Fiber Nails Oncologic Long-Bones

**Key words:** Carbon-fiber nails; oncologic indications; long-bone; clinical outcomes; endoprosthetic failure

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## **ABSTRACT**

**Background:** Intramedullary nail fixation is commonly used for the prophylactic stabilization of impending pathologic fractures and for fixation of complete pathological fractures of the long bones. However, metallic artifact complicates subsequent imaging for bone healing or tumor progression while also affecting post-operative radiation planning. Carbon-fiber implants have gained popularity as an alternative given their radiolucency and superior biomechanical properties in terms of axial bending. We evaluate the incidence of mechanical and non-mechanical complications and their predictors related to carbon-fiber nail use. We also compare these data to existing data on titanium femoral, tibial and humeral nails in the clinical setting of metastatic bone disease.

**Methods:** Between 2013 and 2020, 18-year-old and older patients with impending/actual pathologic long-bone fractures secondary to metastases and fixated with carbon-fiber nails at 13 centers were included. Incidence and risk factors for mechanical and non-mechanical complications were analyzed. Mechanical complications included: (1)screw aseptic loosening, (2)structural failures of the host bone, and (3)structural failures of the carbon fiber implant. Non-mechanical complications included: (4)deep infection and (5)tumor progression. Other complications such as superficial wound dehiscence and/or infection, and perioperative medical adverse events including deaths are also reported.

**Results:** 239 patients were included. The median-age was 68 years (IQR,59-75) with 47% males and 53% females. Most common tumors included breast cancer(19%), lung cancer(19%), multiple myeloma(18%), and sarcoma(13%). In total, 33(14%) patients had complications. Mechanical failures occurred in 4(1.7%) patients that were structural host-bone failures, 7(2.9%) had implant-structural failures, and 1(0.4%) patient had distal locking screws' aseptic loosening. Non-

mechanical failures included 8(3.3%) peri-implant infections and 15(6.3%) tumor progressions with contamination of the implant. The 90-day mortality was 28% (61/239) and 1-year mortality was 53% (53/102). Failure and mortality rates were comparable to patients treated with conventional titanium nails in the literature.

**Conclusions:** Carbon fiber implants are a promising alternative for the treatment of impending and sustained pathologic fractures secondary to metastatic bone disease. Their advantages and favorable complication profile warrant further comparative studies.

**Level of evidence:** Level III prognostic