Carbon Fiber Implants for Spinal Tumors: Outcomes and Complications

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INTRODUCTION: Advances in cancer detection and treatment have increased life expectancy for cancer patients. There is a shift toward less invasive approaches for metastatic spine disease. Carbon fiber implants offer better post-operative visualization for radiation therapy planning and surveillance imaging.

METHODS: A retrospective review of spinal tumor patients managed from 12/2020 - 12/2024 was conducted. Inclusion criteria were patients with primary or metastatic spine tumors undergoing carbon fiber instrumentation. Data collected included patient demographics (age, sex, race/ethnicity), tumor histology, surgery levels, implant types (open pedicle screws, percutaneous pedicle screws), hybrid constructs (titanium screws with carbon fiber implants), and complications. Surgical outcomes, follow-up, and survival were also reviewed.

RESULTS: 30 patients underwent 31 procedures (14 percutaneous and 17 open), utilizing 159 carbon fiber screws and one carbon fiber corpectomy cage. Demographics: average age 60.2 years (15-83), 12 females, 18 males, 13 White, 14 Black, 3 Hispanic. Tumor types included Multiple Myeloma (4), Colon (4), Breast (4), Lung (4), Thyroid (3), and others. Tumor locations were lumbar (14), thoracic (13), and sacral (3). The average estimated blood loss (EBL) was 530.5 ml, with less blood loss in the percutaneous group compared to the open group (442.5 ml vs. 602.9 ml. Most patients (23) had carbon fiber-only constructs, while 7 had hybrid constructs. One intraoperative complication occurred. Postoperatively, one patient required revision surgery, and three patients developed surgical site infections. Nine patients died by the latest follow-up, with 21 alive, and follow-up ranged from 1 to 32 months (average 8 months).

DISCUSSION AND CONCLUSION: Carbon fiber implants for spinal tumors appear to perform similarly to titanium implants, with only one revision required. Multi-center studies are needed to assess long-term effectiveness and justify the cost of these implants.