

Commentary



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See the article "Carbon Fiber-Reinforced Polyetheretherketone Spinal Implants for Treatment of Spinal Tumors: Perceived Advantages and Limitations" via <https://doi.org/10.14245/ns.2244920.460>.



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Commentary on “Carbon Fiber-Reinforced Polyetheretherketone Spinal Implants for Treatment of Spinal Tumors: Perceived Advantages and Limitations”

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Spinal reconstruction with instrumentation has become an important part in the treatment plan for spinal oncology patients, especially since 2005 where surgery was shown to confer benefit over radiation alone in patients with epidural malignant cord compression.¹ (Lancet, 2005). Maximizing decompression while reconstructing spinal stability allows for patients to preserve neurologic and functional status during the treatment course for cancer. Titanium alloy implants are routinely employed in achieving spinal reconstruction however imaging artifact from metallic implants are not ideal for follow-up and can interfere with targeted radiation plans. Nonmetallic options exist but are uncommon with very limited experiences reported.

This is a single center retrospective study of 69 consecutive patients treated with carbon fiber-reinforced peak (CFRP) spinal implants for a total of 491 implant screws.² Patient with metastatic tumors comprised 60% of the group, while 32% of patients had primary spinal tumors. Average follow-up was 54 months.

Hardware complications were overall low at 7%, or 5 cases. They included difficulty with implantation of the screws due to stripping and/or fracturing. Additionally, hybrid constructs were required in 13 patients where titanium rods were used due to contouring limits of the carbon fiber-reinforced rods.

The authors are commended for taking a bold step forward using a unique material for use on complicated patients, but with progress should come caution. First, the lack of ability to contour peek implants may make it difficult for widespread use and likely has a steep learning curve with regards to placing screws appropriately to fit precontoured rods. Improper alignment and excessive stress on the implants may result in higher rates of implant or construct failure. Using a hybrid construct with titanium may be a good solution to this issue however this contradicts some of the benefit of using such nonmetallic materials to begin with. Second, the true benefit of enhanced imaging characteristics to detect early recurrence and make a clinical impact for such patients is still to be determined. Though visualization around the spinal construct is certainly better with nonmetallic implants, much higher numbers and longer follow-up are needed to show this potential effect. In the end, the effect may be so small or the difference inconsequential to make a meaningful impact

for patients. Currently, not placing pedicle screws at the primary/index site of surgery/disease, where it is most likely to recur, allows for acceptable visualization with current magnetic resonance imaging (MRI) hardware suppression protocols to visualize adjacent areas in most patients. Additionally, the future of treatment for patients with metastatic cancer will be progress in immunotherapy and targeted single transduction therapies that are now becoming more prevalent for specific cancers. Even if recurrence is detected, does it change what options the patient has? Many patients have already maximized radiation dose and are not fit for further surgery. Finally, the authors did not touch on the cost of such implants. Costs can certainly vary based on market and contracting agreements, but in general nonmetallic spinal implants come at a high markup over regular metallic implants. The cost-benefit ratio which needs to be carefully considered especially given the ongoing strained environment of the healthcare economy.

A subset of spinal oncology patients, however, may have the most to benefit from CFRP's and similar implants. Patients with malignant primary spinal tumors have limited systemic treatment options and therefore depend more readily on surgical excision and monitoring for progression free survival. The utility of such implants may be higher in these cases where there is

lack of effective targeted therapies and surveillance is paramount. In this setting, the cost-benefit ratio may be in favor of CFRP's in early detection of residual or recurrence and in obviating the need for further invasive imaging tests such as computed tomography myelograms or repeated MRI's. Overall, the authors have indeed demonstrated overall safety with using such implants in this paper, and I will be interested to see how overall clinical outcomes can be impacted by such innovations in the future.

- **Conflict of Interest:** The author has nothing to disclose.

REFERENCES

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