

Spine Radiosurgery

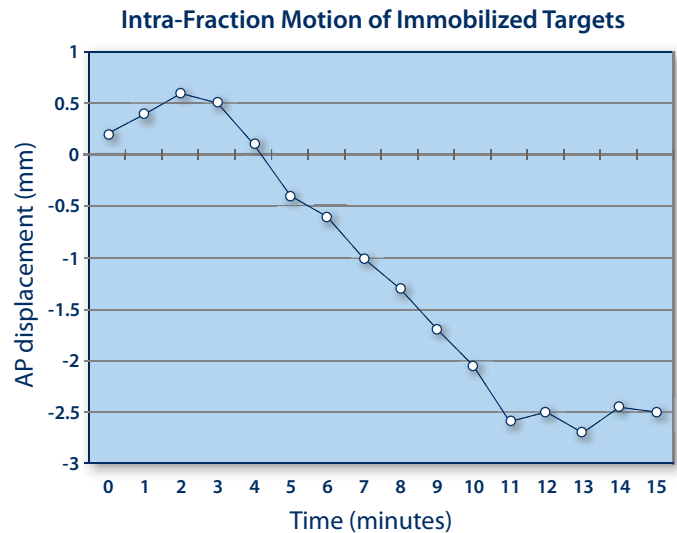
Delivering unrivaled dose conformity with non-coplanar, non-isocentric treatment delivery

In the United States, spinal metastases affect more than 150,000 individuals per year.¹ Benign spinal tumors and vascular malformations constitute more than 4,000 cases per year.² While surgery, chemotherapy, and radiation therapy have historically been the standard of care, the CyberKnife® Robotic Radiosurgery System has emerged as a revolutionary treatment for delivering spine radiosurgery – rapidly delivering proven tumor control and durable pain relief.³

Unprecedented Targeting Accuracy

Spinal tumors, even when immobilized, can shift nearly 4 millimeters over just a 15-minute treatment period (see graph). Where conventional technologies such as IGRT and cone beam CT often provide image guidance for pre-treatment set-up, target movements during the treatment remain unrecognized, which may result in an increased risk of toxicity to sensitive structures.

Using advanced robotic technology, the CyberKnife is the only system to utilize continual image guidance to automatically track, detect, and correct for intra-fraction target movements. With the CyberKnife System, radiosurgical accuracy is maintained throughout the treatment – from the first beam to the last. With these unique capabilities, the CyberKnife System has demonstrated an unprecedented 0.53 mm targeting accuracy treating spinal lesions in independent, peer-reviewed studies.⁴



Hoogeman, Mischa, ErasmusMC, Daniel den Hoed Cancer Center, Rotterdam, The Netherlands

Unrivaled Dose Conformality

For more than 30 years, radiosurgery technical research and clinical studies have demonstrated that a large array of uniquely angled beams enhances dose conformity while reducing the risks of dose toxicity. Unconstrained by the clockwise / counter-clockwise gantry rotations of conventional radiation therapy equipment, the robotic mobility of the CyberKnife System extends these proven benefits by delivering diverse non-coplanar treatments routinely in daily clinical practice. Unlike the 7 to 9 beam plans commonplace with gantry-based systems, a typical CyberKnife System treatment includes more than 100 uniquely angled, highly focused beams per fraction.

Where isocentric treatment delivery is common for treating large radiotherapy fields and spherical targets, this technique is often not optimal for treating targets of complex shapes – especially with radiosurgical doses and when radiosensitive structures are in close proximity. As the only system capable of delivering both isocentric and non-isocentric treatments, the CyberKnife System has an unparalleled ability to precisely sculpt delivered dose around sensitive critical structures.

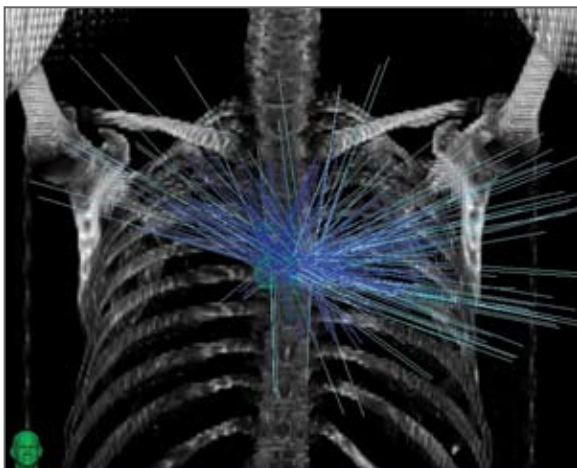


Image courtesy of the University of Pittsburgh Medical Center

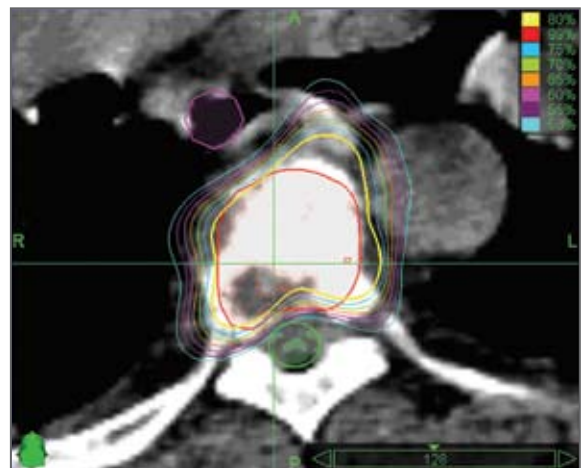


Image courtesy of the University of Pittsburgh Medical Center

Unlimited Spinal Reach

With unhindered robotic mobility, the CyberKnife® System extends spinal radiosurgery to all levels of the spine – cervical through sacral. This ability to treat anywhere along the spine truly expands clinical capabilities, significantly increasing eligible spine patient caseloads by nearly 600 percent when compared to the capabilities of the latest generation of cobalt-based radiosurgery systems.⁵

Completely Non-Invasive Tumor Tracking

The CyberKnife System has rendered implanted fiducials and external markers unnecessary. Advanced image-enhancement and image-registration technology allow spinal tumors to be targeted and tracked based entirely on information provided by the surrounding bony anatomy. Rather than treating the spine as a rigid body, the CyberKnife System tracks the complex motion of individual spinal segments to ensure radiosurgical accuracy throughout the treatment. Furthermore, this completely non-invasive capability applies to nearly 100 percent of spine cases at all levels of the spine.

Proven Capabilities - Proven Results

As the pioneer of spinal radiosurgery, the CyberKnife System is now recognized as the premier solution for safe and effective treatment delivery. The non-coplanar, non-isocentric approach only available with the CyberKnife System has been clinically proven to provide significant and durable pain relief. In fact, a recent study of 500 cases from the University of Pittsburgh Medical Center demonstrated 88 percent effective tumor control and 86 percent long term pain improvement with single fraction treatments using the CyberKnife System – all without a single neurological complication.⁵

With a large body of academic support, the CyberKnife System has now treated more than 50,000 patients and has been installed as the radiosurgery system of choice by more than 140 institutions globally – including many of the most prestigious cancer centers in the world.



“With careful contouring, margin allowances for microscopic disease, and aggressive dosing, spinal cancers can now be successfully treated using the CyberKnife System. Even chordomas have shown an ablative response to high dose regimens using the CyberKnife – resulting in a sea change for the treatment of neoplasms.”

Fraser C. Henderson, M.D.
Director of the Spine Tumor Center &
Co-Director of Radiosurgery,
Georgetown University Hospital
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References:

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