

# Prostate Radiosurgery

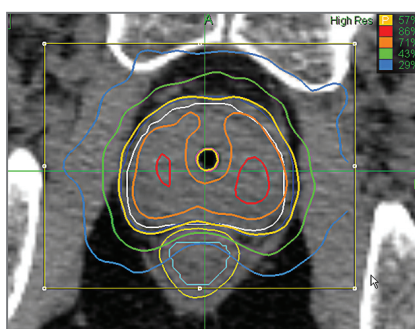
## The dose distribution of HDR brachytherapy delivered non-invasively in an outpatient setting

Hypofractionated, high-dose radiosurgery is emerging as a ground-breaking new treatment for early stage prostate cancers – allowing for potentially more effective tumor control and patient survival when compared to conventional radiotherapy.<sup>1</sup> However, safely delivering prostate radiosurgery presents considerable challenges given frequent and unpredictable target movement during treatment delivery. As the only radiosurgery system to utilize continual image guidance and the ability to automatically correct for intra-fraction target motion throughout the treatment, the CyberKnife® Robotic Radiosurgery System has revolutionized prostate radiosurgery, setting new standards for accuracy, conformality, and intra-fraction target motion tracking.

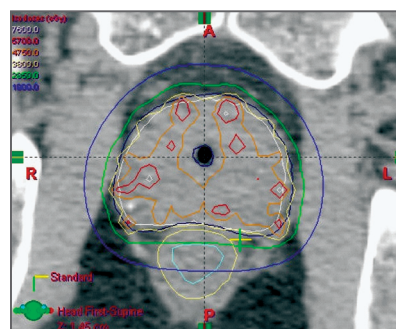
### Improved Tumor Control and Survival

The low  $\alpha/\beta$  ratio for prostate cancer suggests a favorable biological response to high-dose hypofractionated radiosurgery.<sup>2</sup> Supporting this theory, HDR brachytherapy has shown considerable success in controlling prostate cancer, yet the nature of the procedure has left both providers and patients looking for less invasive, more cost-effective alternatives.<sup>3</sup> While external beam radiotherapy such as IMRT has met some of these needs, the relatively imprecise targeting accuracy and resultant low dose delivery have demonstrated suboptimal tumor control.<sup>1</sup>

The CyberKnife System has revolutionized prostate radiosurgery as the only system capable of non-invasively delivering HDR equivalent dosing to the prostate with sub-millimeter targeting accuracy while precisely controlling exposure to the rectal wall and urethra. Used as either monotherapy or as a boost following treatment with other modalities, a typical CyberKnife treatment is delivered in just five or fewer outpatient visits.



**CyberKnife System Prostate Treatment Plan**  
Image Courtesy of Donald B. Fuller, M.D., CyberKnife Centers of San Diego

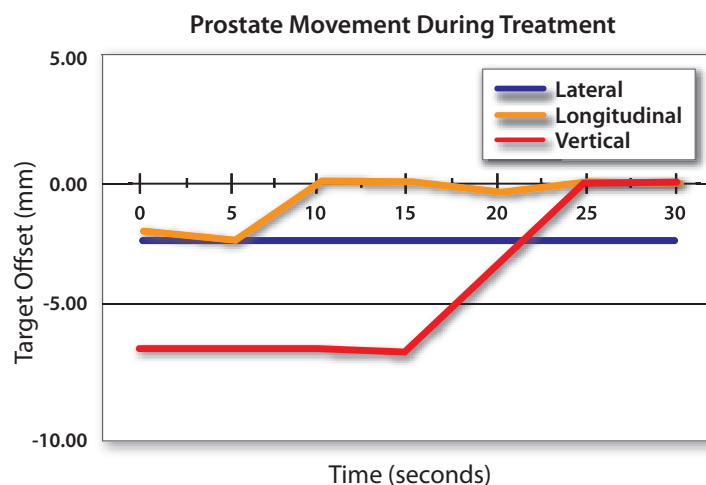


**HDR Brachytherapy Prostate Treatment Plan**  
Image Courtesy of Donald B. Fuller, M.D., CyberKnife Centers of San Diego

### Unprecedented Targeting Accuracy

Because the prostate can shift more than 5 millimeters in just a 30-second treatment period, the safe delivery of radiosurgery necessitates continuous tracking and correction of intra-fraction motion (see graph).<sup>4</sup> Where conventional technologies such as IGRT and cone-beam CT often provide image guidance for pre-treatment set-up, target movements during treatment delivery remain unrecognized, which may result in an increased risk of toxicity to surrounding sensitive structures or under-dosing of the prostate.

Using advanced robotic technology, the CyberKnife is the only system to utilize continual image guidance to automatically track, detect, and correct for intra-fraction prostate movements. With the CyberKnife System, radiosurgical accuracy is maintained throughout the treatment – from the first beam to the last. These unique capabilities enhance the CyberKnife System's ability to preserve surrounding nerves and healthy tissues with an unprecedented 0.7 mm targeting accuracy as proven in independent, peer-reviewed studies.<sup>5</sup>



## Unrivaled Dose Conformality

For more than 30 years, technical research and clinical studies of radiosurgery have demonstrated that a large array of uniquely angled beams enhances dose conformality 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 symmetrical targets, this technique is often not optimized 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 to the unique contours of the prostate while avoiding surrounding sensitive critical structures.

## Proven Capabilities – Proven Results

The CyberKnife System is recognized as the premier solution for safe and effective radiosurgery delivery. With a large body of academic support, the CyberKnife System has now treated more than 35,000 patients and been installed as the radiosurgery system of choice by more than 100 institutions globally – many of which include the most prestigious cancer centers in the world.



*“While other radiosurgery systems provide image guidance for patient set-up, only the CyberKnife has the imaging capabilities to manage prostate movement during the treatment. The result is a degree of targeting accuracy that gives us the confidence to deliver more effective escalated doses.”*

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## References:

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