

Hundreds of small beams create a very tight radiation dose-wrap (semitransparent orange) around the prostate (illustrated by this 3-dimensional MRI reconstruction within the orange radiation volume)

Early stage disease

Robotic Stereotactic Radiosurgery, delivered by the CyberKnife® device, is a new technique that shows great promise in the treatment of early stage prostate cancer.

Due to its unique dose molding and tumor tracking capability, the CyberKnife device has sub-millimeter accuracy and a much sharper dose fall-off beyond the prostate compared with other external radiation methods, effectively rendering the high dose radiation margin more “scalpel-like.” This tight margin coverage around the prostate enables the use of a short ablative radiation dosing schedule within the prostate, allowing the entire course of treatment to be delivered in less than one week. Because of the sharp margin, CyberKnife monotherapy is only appropriate for early stage patients.

Locally advanced or unfavorable disease

The combination of external beam radiotherapy (EBRT) plus a CyberKnife prostate boost is a viable approach for more advanced patients, drawing upon the complimentary strengths of these modalities. Using this approach, CyberKnife provides the central prostate tumor ablation mechanism, while EBRT provides wider coverage of potential cancer cell spread pathways beyond the prostate.

As with monotherapy, CyberKnife radiosurgery in the form of a prostate boost delivers the benefit of HDR brachytherapy dosimetry, without the hospitalization and without the indwelling transperineal plastic catheters.

CyberKnife® Prostate Radiosurgery Comparison With Other Modalities

CyberKnife® Advantage

Radical Prostatectomy

- Non-invasive outpatient treatment with rapid recovery
- There is no hospital admission
- No post-operative recovery
- A patient may rapidly resume normal activity
- Advanced age or coexisting medical conditions do not impede the ability to receive CyberKnife treatment

External Beam Radiotherapy

- Compared with external beam radiotherapy, which takes approximately two months to complete, CyberKnife radiosurgery takes one week to complete
- The CyberKnife therapeutic margin is more “surgical” compared than any other form of external radiotherapy, reducing the radiation dose to surrounding tissues, and enabling more biologically powerful radiation dosing within the prostate

Permanent Seed Prostate Brachytherapy

- The CyberKnife approach is a non-invasive treatment
- Leaves no radioactive foreign bodies in the prostate
- The CyberKnife urologic recovery appears more rapid
- There is less potential for long-term urinary obstruction

HDR Prostate Brachytherapy

- The CyberKnife® approach is a non-invasive treatment
- No hospital admission
- No painful plastic tubes
- CyberKnife is capable of closely recapitulating HDR radiation dose sculpting noninvasively

CyberKnife® Drawback

- Radical prostatectomy has long-term data indicating a high cure rate for localized prostate cancer
- Radical prostatectomy is the only local treatment method proven to increase overall survival in early stage prostate cancer patients
- The long-term curative potential of CyberKnife radiosurgery remains to be defined

- External beam radiotherapy methods, such as IMRT or proton beam therapy, have substantial data suggesting curative potential
- The long-term curative potential of CyberKnife radiosurgery remains to be defined
- In more advanced cases, the CyberKnife margin could be “too surgical” and miss cancer cells that have spread beyond the prostate

- Permanent source prostate brachytherapy has a large body of long-term data indicating a high cure rate for localized prostate cancer
- The long-term curative potential of CyberKnife® radiosurgery remains to be defined

- HDR prostate brachytherapy has data indicating a high cure rate for localized prostate cancer
- The curative potential of CyberKnife® radiosurgery remains to be defined
- Even if CyberKnife appears capable of recapitulating HDR radiation dose sculpting, the actual effectiveness and safety requires confirmation through properly designed clinical studies

CYBERKNIFE PROSTATE CANCER



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“Because Every Day Counts”



PROSTATE CANCER

Prostate cancer has a highly variable natural history, presenting a bewildering variety of treatment management options to the clinician and patient alike:

Radical Prostatectomy

Anatomic
Robotic

Radiotherapy

IMRT/IGRT/Proton beam
Brachytherapy (Seeds or HDR)

Thermal Measures

Cryosurgery (Freezing)
Thermotherapy (Heating)

Medical Therapy

Androgen Suppression/chemotherapy

Watchful Waiting

Active treatment deferred



CLINICAL TRIAL:

PROSPECTIVE EVALUATION OF CYBERKNIFE STEREOTACTIC RADIOSURGERY FOR LOW AND INTERMEDIATE RISK PATIENTS

We are honored to be the primary investigator for a multi-center evaluation, sponsored by Accuray (manufacturer of the CyberKnife device), to thoroughly assess CyberKnife effectiveness and quality of life outcome for selected early stage prostate cancer patients. Our method employs an already published effective radiation dose, previously delivered by a technique known as High Dose Rate (HDR) prostate brachytherapy, yet does this without the indwelling plastic tubes required to deliver the HDR treatment.

How it works: Briefly, CyberKnife radiosurgery is a noninvasive, automated, "artificial-intelligence-like" form of radiation treatment delivery, which delivers hundreds of precisely targeted beams through the target volume, with amazing accuracy created by a method known as "tracking," which constantly updates the position of the prostate throughout each treatment. Using many more beams and targeting angles than traditional radiation systems, combined with the continuously updated target tracking feature, means that CyberKnife may wrap very high doses of radiation, very tightly within and around the prostate.

Because of the novelty of this technique, our center is offering this approved clinical trial to eligible (early stage) patients to confirm the effectiveness, evaluate the side effects, compare the result with other prostate cancer treatment methods, and share the findings through publication of results in peer-reviewed medical literature.



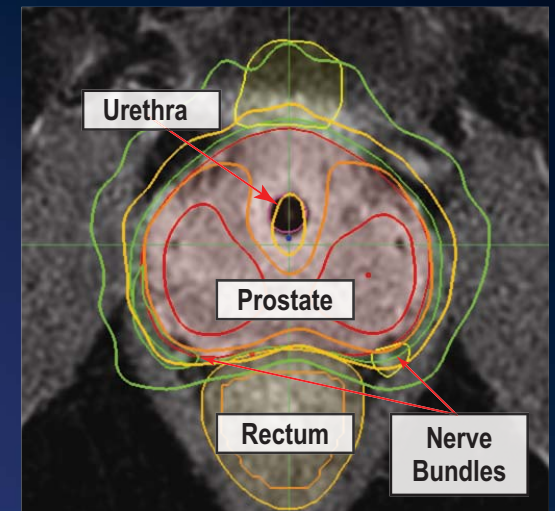
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CyberKnife prescription radiation dose (yellow line) wraps tightly around the prostate planning target volume (inner green line), while sparing the rectum, urethra, and outer aspects of the nerve bundles from the high dose region

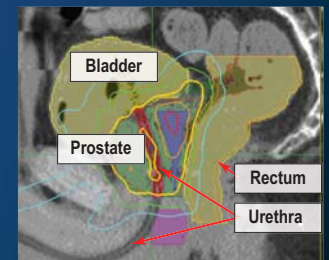
Conclusion

A one week course of CyberKnife® radiosurgery represents an extremely attractive therapeutic option for early stage prostate cancer patients:

- Surgical precision but without the hospitalization
- Far less investment of time compared with EBRT.
- Sharp therapeutic margin dictates careful patient selection when used as monotherapy

CyberKnife® radiosurgery is also a useful boost technique in advanced cases, in combination with external radiotherapy, creating dosimetry coverage similar to HDR brachytherapy boosting, but without the indwelling transperineal catheters.

Pending further investigation, CyberKnife® radiosurgery may also evolve to a useful option for patients with locally recurrent disease following external beam radiotherapy, who have previously had limited further safe and effective treatment available.



Sagittal (side) view of CyberKnife prostate coverage illustrates highly conformal radiation dose coverage (yellow line) around the prostate (red line) with central urethral sparing