PROSTATE CANCER TREATMENT

INFORMATION GUIDE

Several effective treatment options exist today for men diagnosed with prostate cancer. Each man's particular cancer, overall health, age, and lifestyle will play an important role in determining which option seems most appropriate.

This guide provides information about the **CyberKnife® System**.

CyberKnife®

ACCURAY®

Quick facts about **The CyberKnife® System**

- The FDA provided clearance for the CyberKnife® System in 2001 for tumors anywhere in the body, including prostate
- More than 20,000 patients with prostate cancer have been treated to date with the CyberKnife System[1]
- The CyberKnife System delivers stereotactic radiation, providing high doses of radiation with precise sub-millimeter accuracy
- The CyberKnife System's unique design and advanced planning software allows physicians to avoid healthy tissue and minimize side effects on urinary, bowel, and sexual function that can reduce a patient's quality of life
- Compared to surgery, the CyberKnife System is a nonsurgical and outpatient procedure that does not require general anesthesia, hospitalization, or a long recovery time
- Compared to brachytherapy, the CyberKnife System is a non-invasive procedure and avoids the inconvenience and risk associated with seed or catheter implants, local anesthesia, potential infection, hospitalization, and long recovery time
- The entire CyberKnife treatment for prostate cancer can be completed within four to five sessions, compared to conventional radiation therapy which typically takes 30 to 40 sessions

Overview of Radiation

What is Radiation Therapy?

Radiation therapy is a treatment that uses high energy x-rays (photons) to kill, shrink, or control the growth of tumors. Radiation therapy works by damaging cells, disabling them from growing and dividing. The goal of any radiation treatment is to destroy cancer cells while minimizing the side effects on healthy tissue. As imaging technologies have improved over the last several decades, radiation therapy has integrated those improvements to enhance dose delivery and minimize side effects.

Radiation may be recommended as an alternative to surgery or in addition to other therapies. There are several kinds of radiation therapy. The CyberKnife® System delivers a type of radiation therapy known as stereotactic body radiation therapy (SBRT).

What is SBRT?

Stereotactic Body Radiation Therapy (SBRT) couples a high degree of targeting accuracy with very high doses of extremely precise, externally delivered radiation, thereby maximizing the cell-killing effect on the tumor(s) while minimizing radiation-related injury in adjacent normal tissues.

What are the advantages of SBRT?

1. SBRT takes into account the interaction between prostate cancer cells and radiation

Studies have indicated that prostate cancer cells have a high sensitivity to the amount of radiation delivered in each treatment session. This sensitivity suggests that a larger radiation dose delivered in a smaller number of sessions may result in better long-term control of the disease..[2]

2. SBRT reduces treatment time

Compared to conventional radiation therapy that requires approximately 30 to 40 sessions over several weeks, prostate SBRT can be completed in four to five sessions over one to two weeks.[3,4]

How does my doctor typically determine if I am a candidate for CyberKnife® treatment?

Following a prostate cancer diagnosis, men are faced with numerous options including: active surveillance, radical prostatectomy, and radiation therapy. Each man should consult his physician regarding his own specific case. Among the considerations that a physician will factor into a treatment recommendation is the patient's health, age, lifestyle, and particular cancer aggressiveness, often referred to as "risk" profile.

The American Urological Association (AUA), the American Society for Radiation Oncology (ASTRO), and the Society for Urologic Oncology (SUO) support SBRT (such as the CyberKnife System) for select low- and intermediate-risk prostate cancer.[5]

More on Risk Stratification

Risk stratification assesses the possibility of recurrence by a combination of PSA, Gleason score, and clinical stage from biopsy.

D'Amico Prostate Cancer Risk Stratification[6]

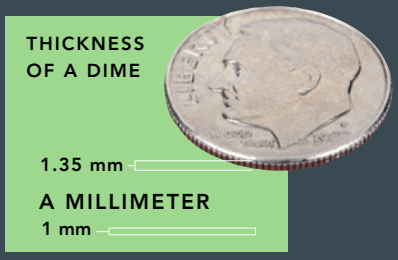
	PSA	GLEASON	CLINICAL STAGE
LOW-RISK	≤10	≤6	T1-2a
INTERMEDIATE-RISK	10-20	7	T2b
HIGH-RISK	>20	≥8	T2c-3a

For more information on Risk Stratification, check the National Cancer Institute website: http://www.ncbi.nlm.nih.gov.

Also, please be aware that there are other classification approaches that your doctor may use in evaluating your cancer and assessing your best treatment option.

What are the advantages of CyberKnife® prostate treatment?

It is the precision of the CyberKnife System, delivered by its robotic arm, and continual tracking and automatic correction of the beam in real-time throughout treatment, that makes such a difference for patients. In fact, CyberKnife accuracy is sub-millimeter, meaning its pinpoint precision is within the thickness of a dime.



CyberKnife Advanced Robotics

Accuray, the manufacturer of the CyberKnife System, has been recognized in the Top 10 on *Fast Company's* list of most innovative robotic companies.[7] Its CyberKnife System is an image-guided linear accelerator mounted to a robotic arm that is specifically designed to deliver beams of stereotactic radiation from multiple angles.

The robotic arm is not fixed; it moves in multiple directions to precisely target the prostate. With this robotic range of motion, the CyberKnife System can avoid healthy tissue and deliver a highly individualized treatment for the prostate that conforms to the shape of the patient's prostate (see Figures 1 and 2).

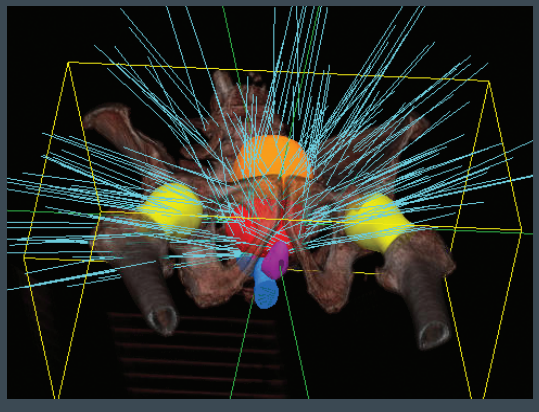


Fig. 1 The CyberKnife System can deliver beams from multiples of unique angles around the patient.

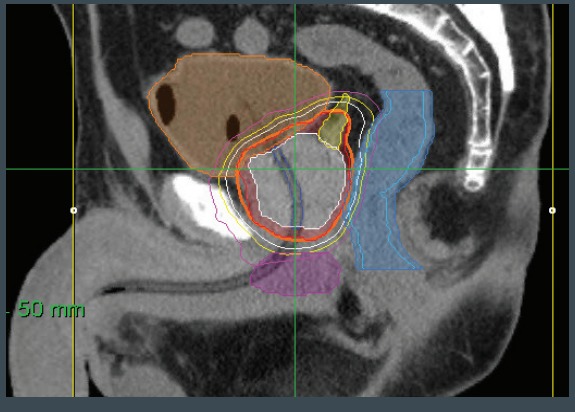


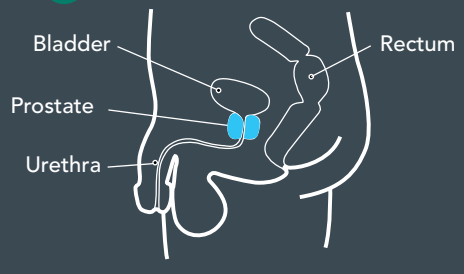
Fig. 2 A 3-D CT image of a CyberKnife System treatment plan shows that the highest concentration of radiation is directed to the prostate.

The CyberKnife® System uniquely compensates for prostate movement

The prostate gland can move unpredictably throughout the course of treatment, making the ability to track, detect and correct for motion critically important. In fact, the prostate has been documented to move as much as 10 mm in as little as 30 seconds due to normal patient bodily functions – such as filling of the bladder, gas in the bowel, or even slight patient movement during the procedure.[8]

Unlike any other radiation treatment, the CyberKnife System continually tracks and automatically corrects the beam for movement of the prostate in real-time throughout the entire treatment session. With this automatic motion tracking and adjustment, the CyberKnife System enhances the doctor's ability to treat with unparalleled preservation of healthy tissue.

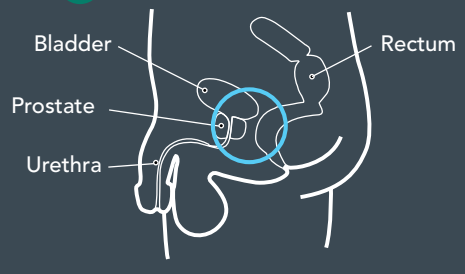
1



Original Position of Prostate during treatment planning

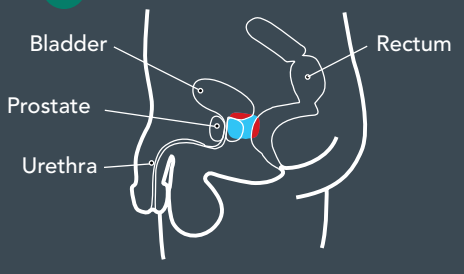
Planned treatment area

2



Movement of anatomy during treatment

3

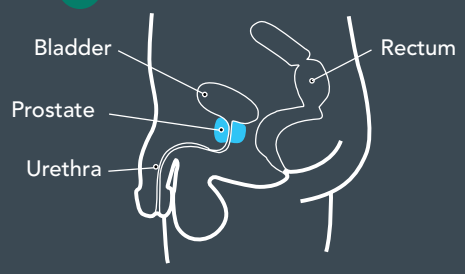


Without tracking prostate movement, there can be unwanted radiation to healthy tissue

Planned treatment area

Unwanted radiation to rectum and bladder

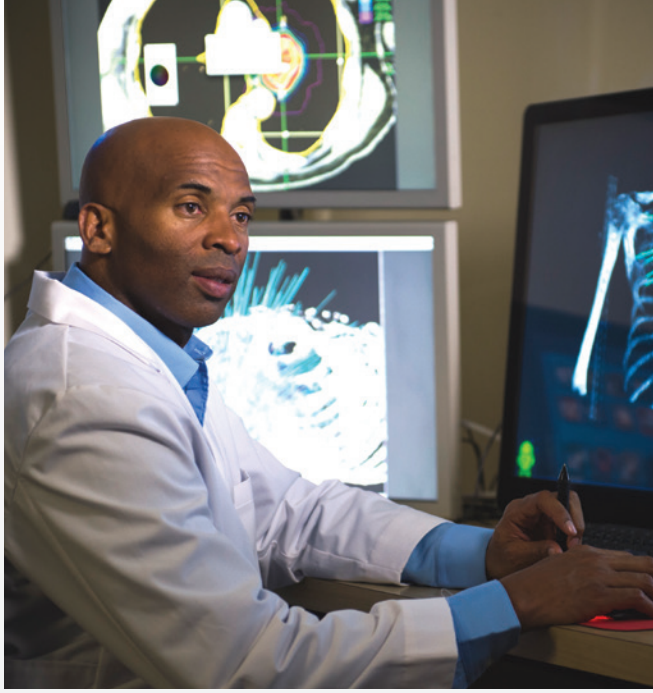
4



The CyberKnife System adjusts to movement of the anatomy, keeping the radiation only on the intended target

Adjusted treatment area

Clinically Proven



The two largest prospective multi-institutional studies conducted to date included only patients treated with the CyberKnife® System. These two studies provide robust clinical data supporting the safety and efficacy of the System for 568 patients with low- and intermediate-risk prostate cancer.[3,4] Additionally, a single institution follow-up study[9] supports the use of the System for 230 low-risk patients.

KEY FINDINGS

EXCELLENT SURVIVAL RATES

At five years following CyberKnife prostate SBRT, the disease free survival (DFS) rates were:

- 97% - 100% for low-risk patients, superior to the 92% - 94% from conventional radiation therapy historic data[10, 11, 12] and equivalent to low dose rate (LDR) brachytherapy[13, 14] and high dose rate (HDR) brachytherapy[15] without the inconvenience and risk associated with invasive seed and catheter implants.
- 88% - 97% for intermediate-risk patients, equal to or higher than the 85% - 90% reported with conventional radiation therapy[16, 17] without the inconvenience of daily visits over several weeks.

At 10 years following CyberKnife prostate SBRT, the DFS rates were:

- 93% for low-risk patients, superior to the 81% - 85%[18,19] from conventional radiation therapy historical data and similar to HDR at 92%[20].

MINIMAL SIDE EFFECTS

Serious side effects were uncommon and similar to other radiation therapy procedures without the need for invasive rectal balloons or spacers to spare the rectal wall.

REPEATABLE RESULTS

These multi-institutional studies, conducted at community and academic hospitals, provide reassurance for men with localized prostate cancer that these results are achievable in their community setting.

What do prostate cancer patients have to say about their CyberKnife® System experience?

The CyberKnife Coalition, a not-for-profit advocacy organization, conducted a survey with 304 participants who were asked about their satisfaction with their CyberKnife SBRT treatment. Here is what they said:[21]

- 99% of patients indicated that they would again choose to be treated with the CyberKnife System
- 93% of patients indicated that SBRT did not interrupt their normal life routine
- 98% of patients indicated they would recommend SBRT treatment to others

What is a typical CyberKnife® System treatment process?

- The CyberKnife® System treatment process begins with a consultation with a radiation oncologist who will provide perspective on this as a treatment option specific to the patient's condition. The physician will review the patient's PSA, Gleason score, biopsy results, imaging, and other medical conditions.

- Should the patient and doctor agree to proceed with CyberKnife treatment, gold pellets (fiducials) will be implanted in the prostate. These fiducials are used in many SBRT procedures as imaging reference points so that the tumor can be tracked. These three to four gold pellets are implanted about two weeks before the actual treatment sessions in an outpatient procedure, like a prostate biopsy, under conscious sedation.

- About one week after the fiducials are implanted, the patient will return for imaging that then allows the radiation team to develop an individualized treatment based on the patient's unique anatomy.

- Approximately one week later the treatment sessions will begin. There are usually four to five sessions of short duration over one to two weeks. The patient lies on the table, and the CyberKnife System tumor tracking software adjusts the radiation beam for any slight patient movement.

- Treatment sessions are non-invasive outpatient procedures, and no anesthesia is required.

*Actual treatment plans and timelines may vary and are as advised by a physician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What are the side-effects of treatment?

Despite the higher dose rate associated with SBRT, multiple studies have validated that there are no worse side effects with CyberKnife® SBRT than with traditional radiation.[22] The ability to deliver precise doses of radiation enables clinicians to decrease exposure to surrounding healthy tissue and minimize negative side-effects on urinary, bowel, and sexual function that can reduce a patient's quality of life. Most patients resume normal activity immediately after treatment sessions. Nonetheless, urinary incontinence, bowel issues, and erectile dysfunction are all possible complications with any treatment option, and should be discussed with your physician. Please see back page for Important Safety Information.

What if I am not a candidate for the CyberKnife® System?

Not every patient's prostate cancer is effectively treated with SBRT. Talk to your physician about your best options and come to a joint decision. If whole-bed pelvic radiation – radiation for disease outside the prostate – is required, Accuray's Radixact™ or TomoTherapy® System may be a good option: Radixact and the TomoTherapy Systems leverage CT-image guidance to ensure highly conformal dose delivery to the tumor with each treatment.

Is CyberKnife®/SBRT covered by private insurance and Medicare?

As of the publishing date of this information guide, SBRT treatment for prostate cancer is covered by Medicare in all 50 states and the District of Columbia. In addition, many private insurance payers cover SBRT treatment for prostate cancer. It is always best to check your insurance policy and if applicable, be sure to review your employee contract to determine if your insurance coverage benefits are limited. If you live outside of the United States, typically the CyberKnife Center that you would choose for treatment can answer coverage questions.

What other questions should I ask?

Many patients find it helpful to bring someone with them to their physician appointment to take notes. It can be difficult to focus during conversations about the diagnosis and treatment options, so having a caring partner in the room can be advantageous when later trying to recall the details.

SPECIFICALLY, TAKE THE TIME TO UNDERSTAND:

- What are my treatment options?
- What is my recommended treatment option and why?
- What are the side effects and risks of the procedure? Which side effects are short-term and which are long-term?
- How many of these procedures has the physician done and what are patients' results?
- What would the physician recommend for the physician's own brother or father?

Additional Resources

www.CyberKnife.com

Cancer Support Community
www.cancersupportcommunity.org

www.CyberKnifeforProstate.com

PCRI (Prostate Cancer Research Institute)
www.pcri.org

PHEN (Prostate Health Education Network)
www.prostatehealthed.org

Us TOO
www.ustoo.org

Veterans Prostate Cancer Awareness
www.vetsprostate.com

Zero - The End of Prostate Cancer
www.zerocancer.org

References and Bibliography

1 Accuray Incorporated, data on file 2016.

2 Fowler JF. The radiobiology of prostate cancer including new aspects of fractionated radiotherapy. Acta Oncol. 2005;44(3):265-76.

3 Meier R, et al. Five-Year Outcome From a Multicenter Trial of Stereotactic Body Radiation Therapy for Low- and Intermediate-Risk Prostate Cancer. Int J Radiat Oncol Biol Phys. 2016; 96(2): S33-S34.

4 Fuller DB, et. al. 5-year outcomes from a prospective multi-institutional trial of heterogeneous dosing stereotactic body radiotherapy (SBRT) for low- and intermediate-risk prostate cancer. J Clin Oncol. 2017; 35(6S).

5 Sanda MG, et. al. Clinical Localized Prostate Cancer: AUA/ASTRO/SUO Guideline. American Urological Association. 2017

6 D'Amico AV, Whittington R, Malkowicz SB, et al. Biochemical outcome after radical prostatectomy, external beam radiation therapy, or interstitial radiation therapy for clinically localized prostate cancer. JAMA. 1998;280:969–74.

7 "The World's Top 10 Most Innovative Companies in Robotics." Fast Company. March 2014.

8 Kupelian P, et al. Multi-Institutional Clinical Experience with the Calypso System in Localization and Continuous, Real-Time Monitoring of the Prostate Gland During External Radiotherapy. Int J Radiat Oncol Biol Phys. 2007; 67(4):1088–1098.

9 Katz A (September 09, 2017) Stereotactic Body Radiotherapy for Low-Risk Prostate Cancer: A Ten-Year Analysis. Cureus 9(9): e1668. doi:10.7759/cureus.1668

10 Zelefsky M.J., Chan H et al. Long-term outcome of high dose intensity modulated radiation therapy for patients with clinically localized prostate cancer. J Urol 2006; 176:1415-9.

11 Cheung R., Tucker S.L. et al. Dose-Response Characteristics of Low- and Intermediate-Risk Prostate Cancer Treated with External Beam Radiotherapy. Int J Radiat Oncol Biol Phys 2005; 61(4): 993-1002.

12 Thames HD, et al. Increasing external beam dose for T1-T2 prostate cancer: Effect on risk groups. Int J Radiat Oncol Biol Phys. 2006; 65(4): 975-81.

13 Lawton CA, DeSilvio M, Lee WR, et al. Results of a phase II trial of transrectal ultrasound-guided permanent radioactive implantation of the prostate for definitive management of localized adenocarcinoma of the prostate (radiation therapy oncology group 98-05). Int J Radiat Oncol Biol Phys 67:39-47, 2007.

14 Taira AV, Merrick GS, Galbreath RW, et al. Natural history of clinically staged low-and intermediate-risk prostate cancer treated with monotherapeutic permanent interstitial brachytherapy. Int J Radiat Oncol Biol Phys 76:349-54, 2010.

15 Demanes D. J. et al. High dose rate monotherapy: safe and effective brachytherapy for patients with localized prostate cancer. Int J Radiat Oncol Biol Phys 81(5): 1286-1292, 2011.

16 Michalski JM, Moughan J, Purdy J, et al. A randomized trial of 79.2 Gy versus 70.2 Gy radiation therapy (RT) for localized prostate cancer. J Clin Oncol 33(S7): abstr4, 2015.

17 Spratt DE, Pei X, Yamada J, et al. Long-term survival and toxicity in patients treated with high-dose intensity modulated radiation therapy for localized prostate cancer. Int J Radiat Oncol Biol Phys 85:686–92, 2013.

18 Alicikus, Z. A., Yamada, Y., Zhang, Z., Pei, X., Hunt, M., Kollmeier, M., Cox, B. and Zelefsky, M. J. (2011), Ten-year outcomes of high-dose, intensity-modulated radiotherapy for localized prostate cancer. Cancer, 117: 1429–1437. doi:10.1002/cncr.25467

19 Weller MA, Reddy CA, Kittel J, et al.: Comparison of Outcomes Between Brachytherapy and Intensity Modulated Radiation Therapy in High-Risk Prostate Cancer in American Society for Radiation Oncology 56th Annual Meeting. San Francisco, CA; 2014. http://www.redjournal.org/article/S0360-3016(14)01426-6/fulltext

20 Demanes DJ, Rodriguez RR, Schour L, et al.: High-dose-rate intensity-modulated brachytherapy with external beam radiotherapy for prostate cancer: California endocurietherapy's 10-year results. Int J Radiat Oncol Biol Phys. 2005, 61:1306–1316. http://www.redjournal.org/article/S0360-3016(04)02264-3/fulltext

21 CyberKnife Coalition patient survey: 304 patients that received SBRT to treat prostate cancer. 2010.

22 King CR, Freeman D, Kaplan I, et al. Stereotactic body radiotherapy for localized prostate cancer: pooled analysis from a multi-institutional consortium of prospective phase II trials. Radiother Oncol 2013; 109(2): 217-221.

www.CyberKnife.com

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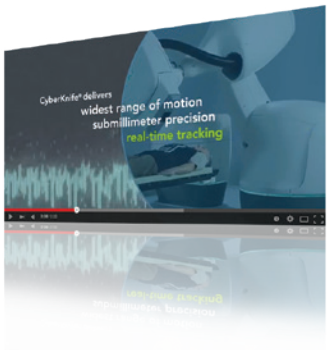

http://www.cyberknife.com/treatment/radiation-therapy/prostate

Important Safety Information:
Most side effects of radiotherapy, including radiotherapy delivered with Accuray systems, are mild and temporary, often involving fatigue, nausea, and skin irritation. Side effects can be severe, however, leading to pain, alterations in normal body functions (for example, urinary or salivary function), deterioration of quality of life, permanent injury, and even death. Side effects can occur during or shortly after radiation treatment or in the months and years following radiation. The nature and severity of side effects depend on many factors, including the size and location of the treated tumor, the treatment technique (for example, the radiation dose), and the patient's general medical condition, to name a few. For more details about the side effects of your radiation therapy, and to see if treatment with an Accuray product is right for you, ask your doctor.