ILLINOIS CYBERKNIFE®
AT ADVOCATE LUTHERAN GENERAL HOSPITAL

PROSTATE CANCER: CASE STUDY

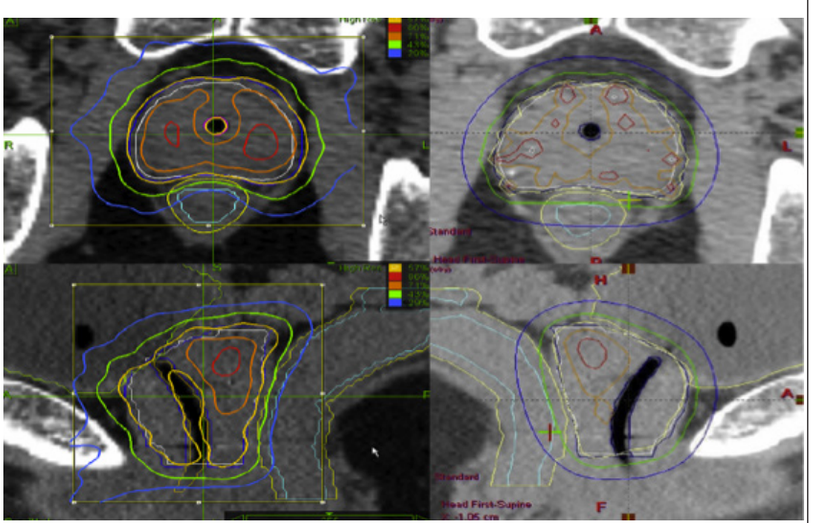
Patient Spotlight

66-year-old male presented with symptoms of dysuria and an elevated PSA of 5.03ng/mL. Physical examination demonstrated a non-enlarged prostate gland without palpable nodule. In further evaluation, transrectal ultrasound with biopsy was performed, revealing adenocarcinoma, Gleason score 3+3=6, involving the left base and left mid-lobe. CT abdomen and pelvis and bone scan were negative for metastasis.

Cyberknife Treatment Rationale

Several treatment options were discussed with the patient, including active surveillance, radical prostatectomy, external beam radiotherapy, and brachytherapy. The unique radiobiology of prostate cancer suggests particular sensitivity to large-dose-per-fraction (hypofractionated) radiation treatment regimens. In support of this, good biochemical disease control with few serious side effects has been reported for primary high-dose rate brachytherapy with Ir-192, prescribing 38Gy in 4 fractions (1). Robotic Cyberknife stereotactic body radiosurgery (SBRT) can achieve dose distributions similar to that of brachytherapy, and is ideally suited for delivery of large hypofractionated doses.

The CyberKnife employs the use of several hundred non-coplanar beams from a Linear accelerator supported by a robotic arm, achieving highly conformal dose plans with the ability to track prostate motion live. Fiducial markers are placed in the gland, to verify organ position in real time via a pair of orthogonal electronic x-ray imaging devices. The Cyberknife adjusts the beam trajectory per the movement of the prostate gland. The resultant dose-distributions create a “dose-painting”effect, with high-doses centered within the gland, sparing urethra, rectum and bladder.



Comparison of dose distributions:
Cyberknife (left)
HDR brachytherapy (right)

Following a consultation with a radiation oncologist, the patient decided on CyberKnife treatment. Five treatment sessions were necessary, each lasting about 45 minutes. No acute side effects were experienced following his treatment.

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Post-Treatment

At six months post-treatment, the patient's PSA was 2.1. Treatment was well tolerated and minimal side effects were reported, as the patient noted good urinary and bowel function following treatment. The patient also noted he was having normal erections without medication following treatment. At one year, the patient's PSA was 0.8. No urinary symptoms were reported during the follow-up period.

Cyberknife Prostate Cancer Treatment Outcomes

Over 10,000 prostate patients have been treated with Cyberknife SBRT. A few representative studies which report on outcome and toxicity for low and intermediate-risk prosate cancer are summarized in the table below:

Study	Dose (Gy)	N	FU (mo.)	bDFS (%)	Late Gr3 GU(%)	Late Gr3 GI (%)
King (2-3)	36.25 /5 fractions	67	32	97	3.5	None
Friedland (4)	35/5 fractions	112	24	98	<1	None
Katz (5-6)	35-36.25/5 fractions	304	60	97	2	None
Freeman (7)	35-36.25/5 fractions	41	60	93	<1	None
Jabbari (8)	38/4 fractions	38	18	100	None	None

CyberKnife Advantages

- *Patient had an excellent respone to Cyberknife with minimal side effects and toxicity*
- *Urinary function was spared using Cyberknife's unique tracking capabilities for treated a moving target*
- *Treatment is quick—only five fractions were necessary*
- *No recovery time was necessary after treatment*
- *Cyberknife continues to be a great alternative to surgery and other radiation therapy treatment options*

References:

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4. Friedland JL, Freeman DE, Masterson-McGary ME, et al. Stereotactic body radiotherapy: an emerging treatment approach for localized prostate cancer. Technol Cancer Res Treat 2009;8:387-392.
5. Katz AJ, Santoro M, Ashley R, et al. Stereotactic body radiotherapy for organ-confined prostate cancer. BMC Urol 2010;10:1.
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