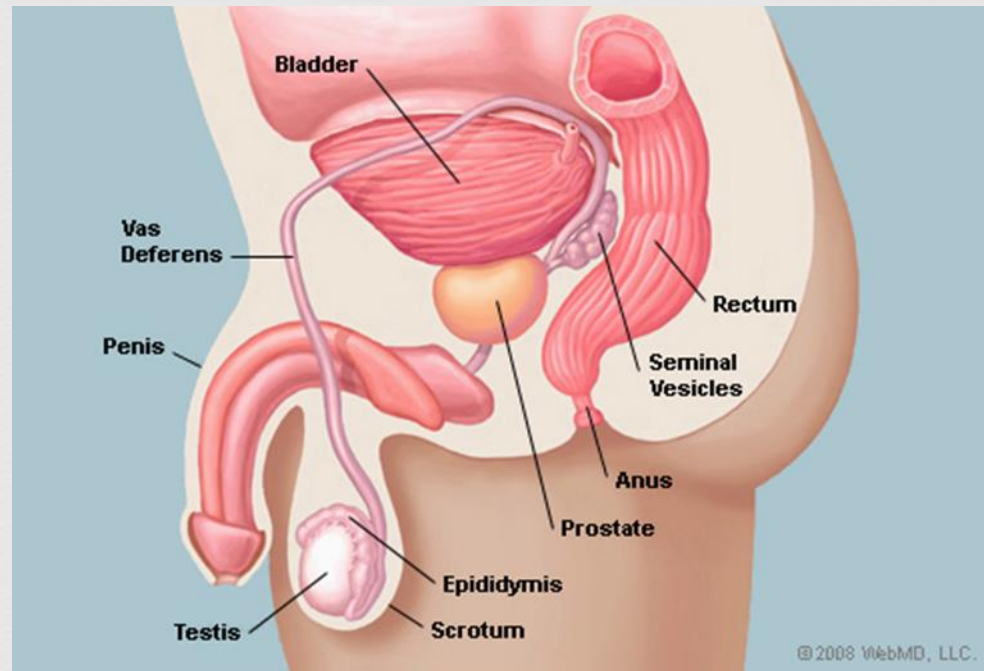


PROSTATE CANCER - 2014



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DIRECTOR OF RADIATION ONCOLOGY AND CYBERKNIFE
STAMFORD HOSPITAL

MALE ANATOMY



FUNCTION OF THE PROSTATE GLAND



- ❧ Secretion of a slightly alkaline fluid which carries sperm produced by the testicles to form semen
- ❧ During orgasm the muscular glands of the prostate contract and propel the semen into the urethra and penis

AMERICAN CANCER SOCIETY-2014



- ❧ 233,000 new prostate cancer cases diagnosed
- ❧ 29,480 prostate cancer deaths
- ❧ Most common cancer in American men aside from skin
- ❧ After lung cancer, most common cause of cancer related death
- ❧ More than 2.5 million American men who have had prostate cancer at some point are alive today

DETECTION



- ❧ Prostate specific antigen (PSA)- controversies and recommendations
- ❧ Digital rectal exam (DRE)
- ❧ Transrectal ultrasound and biopsy

PSA SCREENING



- ❧ U. S. Preventative Services Task Force (USPSTF) has concluded to recommend against universal screening for men in the U.S.A.
- ❧ Basis is the risk of greater harms associated with treatment over possible benefit
- ❧ American Urologic Society (AUA) recommends risk guided screening after individual discussion with one's health provider

BIOPSY



- ❧ **Transrectal needle biopsies**
- ❧ **Usually 12 cores**
- ❧ **Complications from biopsy: fever, blood in urine, pain, transient urinary difficulties**

DIAGNOSIS



❧ Stage I-IV

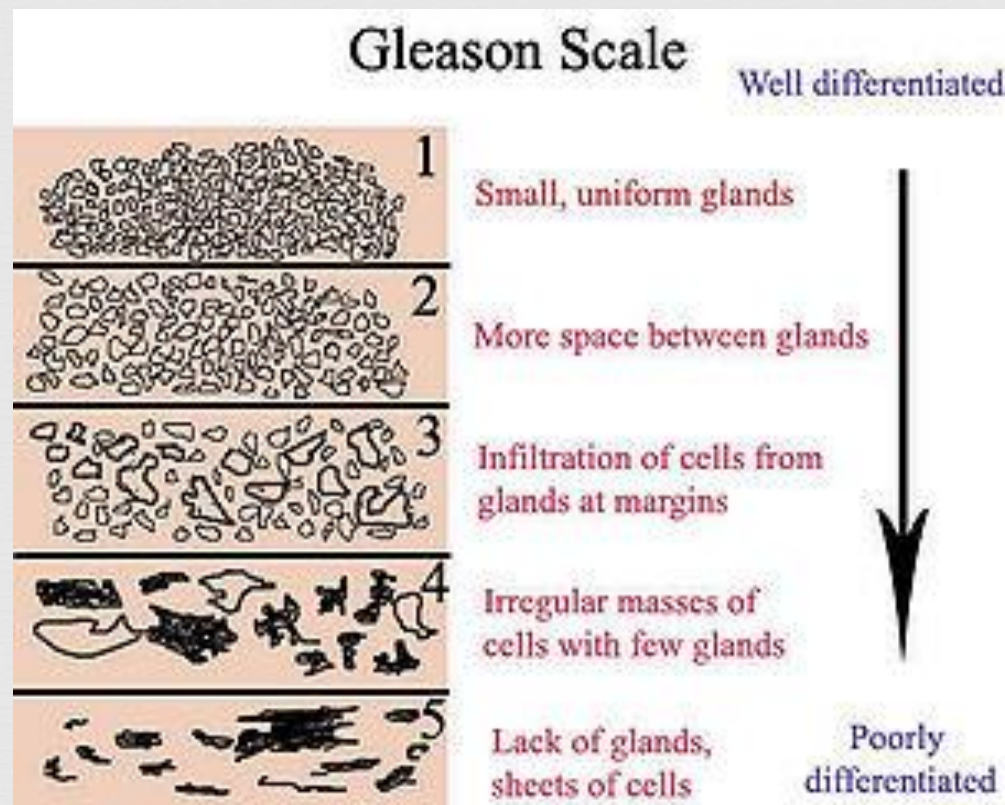
❧ Gleason Score 2-10 / 10

STAGES



Group	T	N	M	PSA	Gleason Score
I	T1a-c/T2a	N0	M0	<10	</=6
IIA	T1a-c	N0	M0	<20	7
IIA	T1a-c	N0	M0	10-20	</=6
IIA	T2a-b	N0	M0	<20	</=7
IIB	T2c	N0	M0	any	any
IIB	T1-2	N0	M0	>/=20	any
IIB	T1-2	N0	M0	any	>/=8
III	T3a-b	N0	M0	any	any
IV	T4	N0	M0	any	any
IV	any	N1	M0	any	any
IV	any	any	M1	any	any

GLEASON SCORE



TREATMENT OPTIONS



- ❧ Active Surveillance
- ❧ Radical Prostatectomy
- ❧ Brachytherapy (seed implantation)
- ❧ External beam radiation therapy
IMRT/IGRT
- ❧ Cyberknife
- ❧ Combination therapy with hormones

ROBOTIC RADICAL PROSTATECTOMY

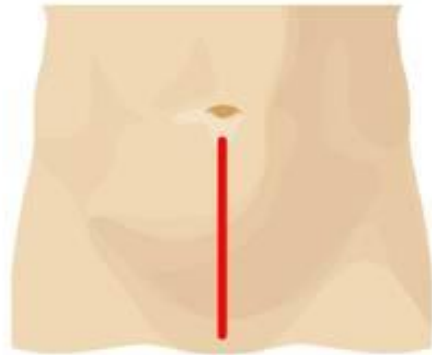


- ⌘ In experienced hands 2-3 hour procedure
- ⌘ Overnight stay in hospital
- ⌘ In dwelling foley catheter for approximately 2 weeks
- ⌘ Recovery time usually 4-6 weeks

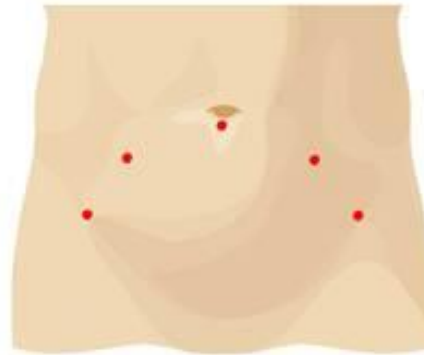
daVINCI ROBOTIC SYSTEM



INCISIONS



Open Surgical Incision



da Vinci® Surgical Incisions

INSTRUMENTS



SURGEON'S VIEW

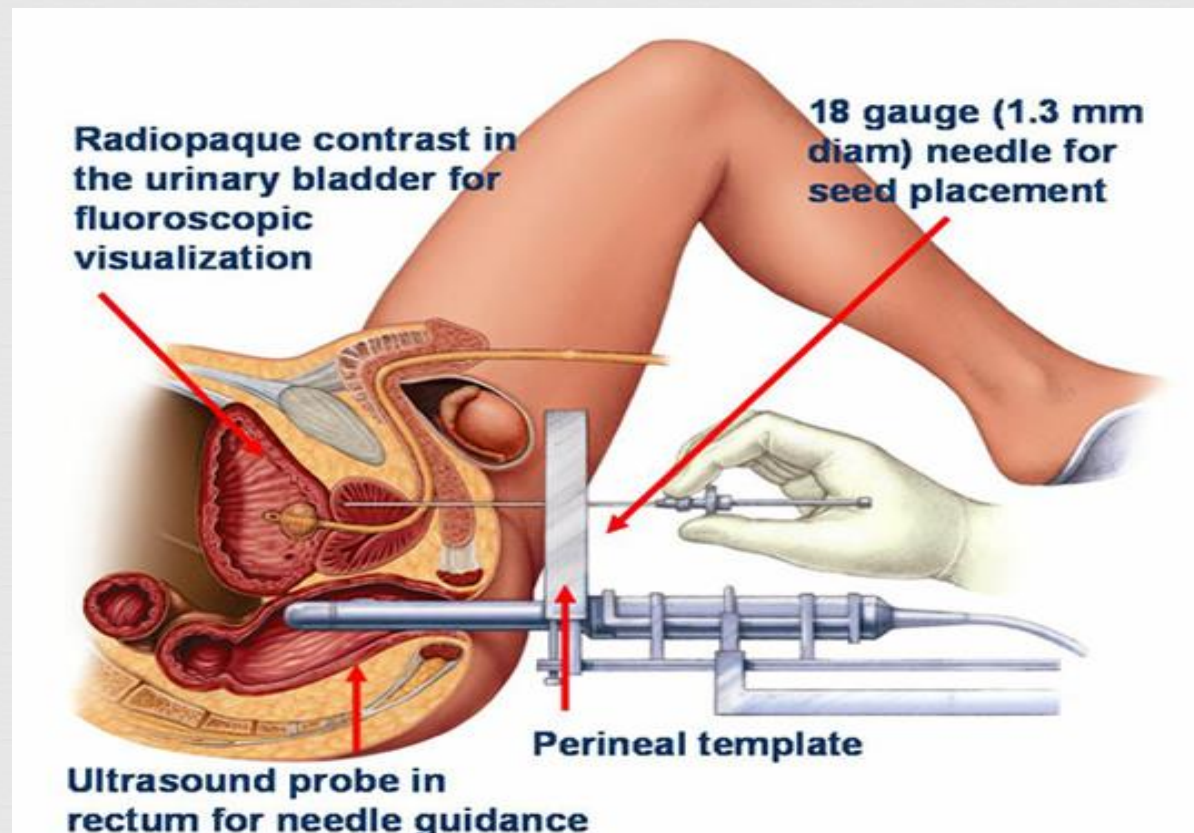


SIDE EFFECTS-SURGERY



- ∞ Incontinence first two months-40%
 - ∞ 3 months-20%
 - ∞ 6 months-10%
 - ∞ 1 year-2-5%
-
- ∞ Impotence if low risk and full nerve sparing
 - ∞ 1 year-30%
 - ∞ 2 years-10%

BRACHYTHERAPY



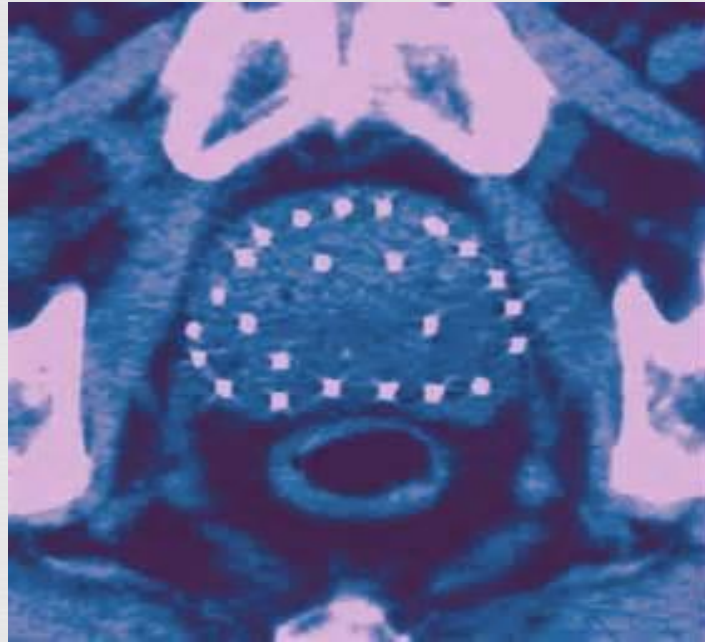
O.R. SETUP



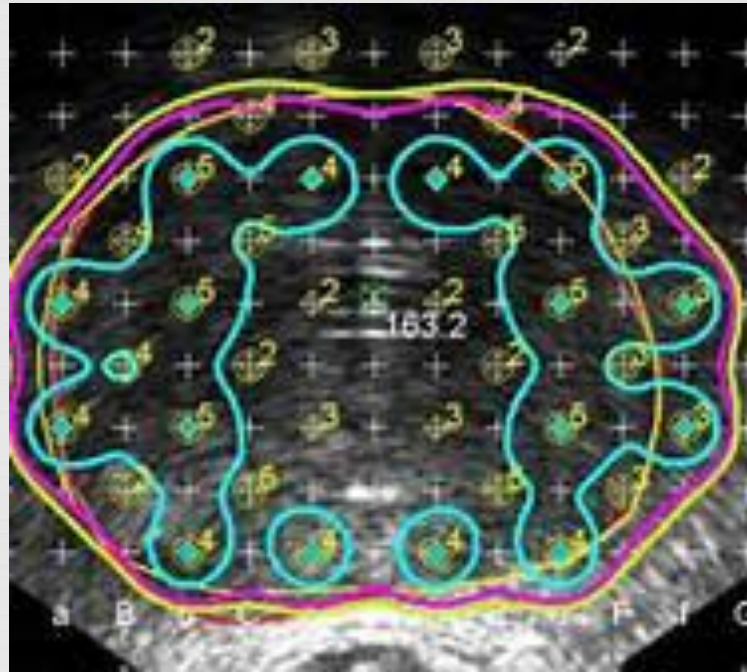
SEEDS



SEED DISTRIBUTION



DOSIMETRY



EARLY X-RAY UNIT

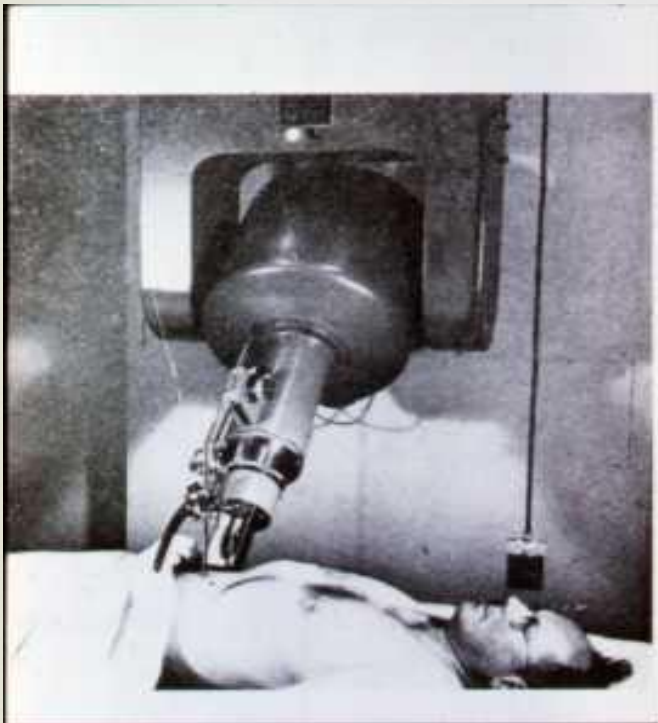
∞ Superficial X-ray machine



COBALT UNIT



First Cobalt Unit
in 1951



First cobalt-60 radiation therapy unit (1951).



LINEAR ACCELERATORS



Patient

Digital Display

Patient Alignment Lasers



Linac Then



On Board
Imager

Linac Today

MLC

Couch

IMRT -INTENSITY MODULATED RADIATION THERAPY



- ❧ 3D shaping of treatment fields
- ❧ Higher doses of radiation directly to tumors
- ❧ Surrounding organs & tissues protected
- ❧ IMRT targets the tumor and not the entire body



IGRT-IMAGE GUIDED RADIATION THERAPY



- ❧ High-resolution, 3-D images pinpoint tumor site
- ❧ Accounts for tumor motion
 - ❧ Adjusts patient positioning when necessary
- ❧ Fluoroscopic & cone-beam CT
- ❧ Complete a treatment in standard treatment time slot





OBI, Service ID: OBI-SVC

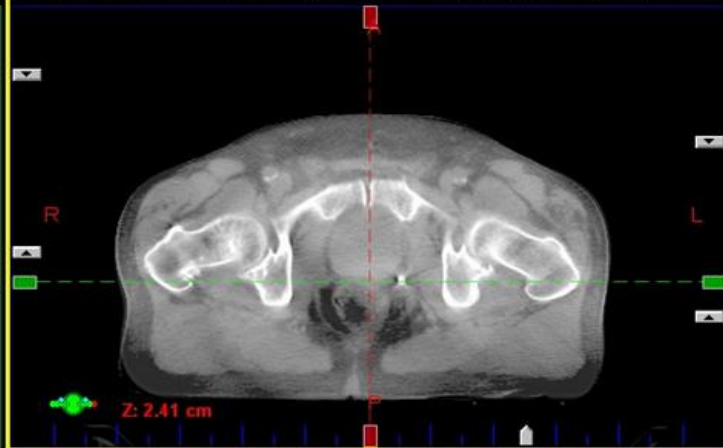
3D / 3D Match

Frontal - CBCT 3/20/2008 11:34:14 PM - CBCT 3/20/2008 11:34:42 PM - <?>



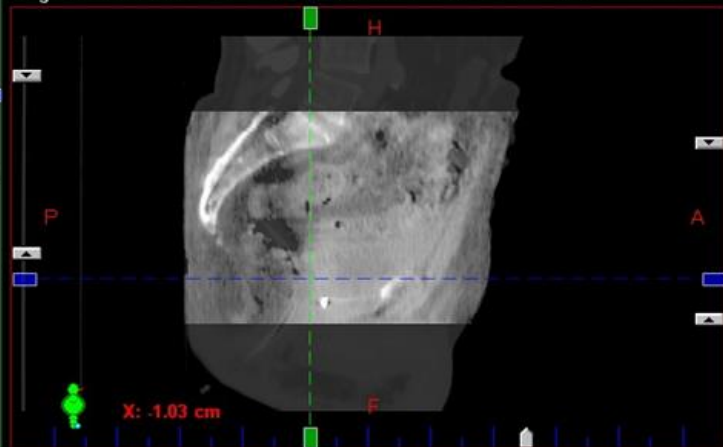
Head First-Supine
Y: 2.08 cm

Transversal - CBCT 3/20/2008 11:34:14 PM - CBCT 3/20/2008 11:34:42 P...



Z: 2.41 cm

Sagittal - CBCT 3/20/2008 11:34:14 PM - CBCT 3/20/2008 11:34:42 PM ...



X: -1.03 cm

Couch Position (VAR_IEC Scale) and Shift

	TARGET	ACTUAL	SHIFT		TARGET	ACTUAL	SHIFT	
Couch Vrt	9.3	9.2	0.1	<input checked="" type="checkbox"/> Include	Couch Lat	999.4	0.0	-0.6 <input checked="" type="checkbox"/> Include
Couch Lng	120.2	120.0	0.2	<input checked="" type="checkbox"/> Include	Couch Rtn	359.9	0.0	-0.1 <input checked="" type="checkbox"/> Include

Reset Shift

Save Match

Apply Shift

All units in cm and degrees

Perform the anatomy match

CT received

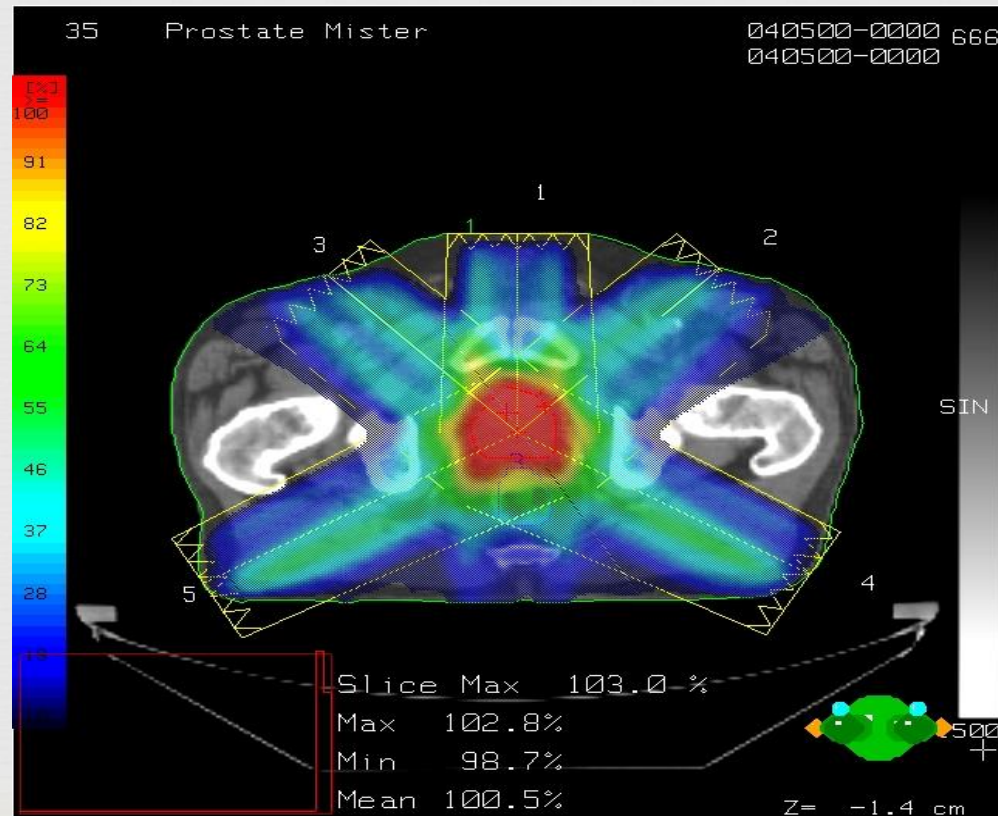
1. Acquire 2. Analyze Cancel

IMRT/IGRT PROSTATE



IMRT allows radiation to be delivered to minimize exposure of:

- Bladder
- Rectum
- Bowel



PATIENT BENEFITS-IMRT/IGRT



- ❧ Precise targeting of beam means dosage levels can be increased
 - ❧ Higher doses have been shown to enhance treatment effectiveness
- ❧ Increasing treatment accuracy
- ❧ Target volumes can be reduced
- ❧ Increasing patient comfort
 - ❧ Natural breathing during treatment sessions

TARGETING SYSTEM

X-ray sources

Synchrony[®]
camera

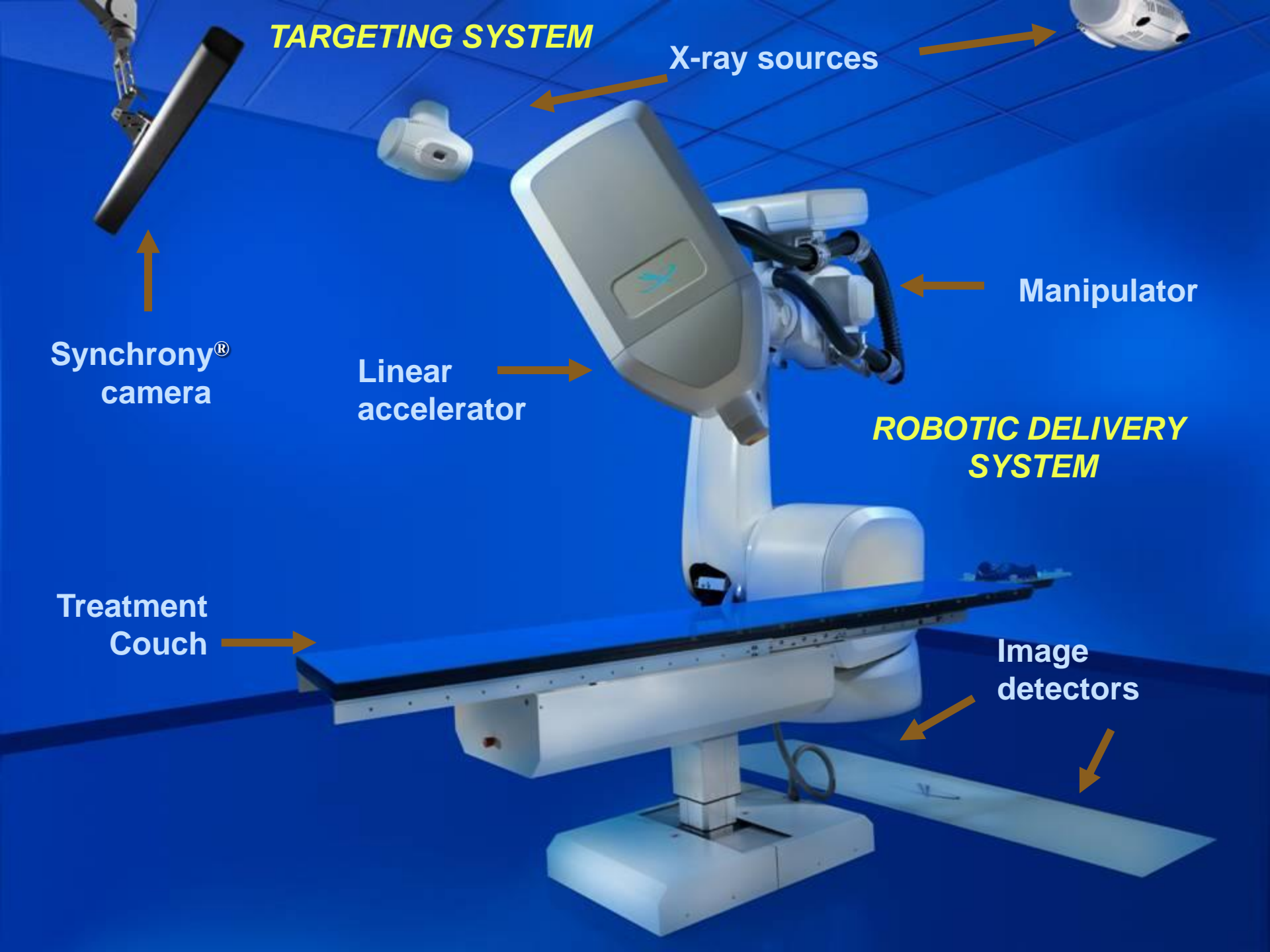
Linear
accelerator

Manipulator

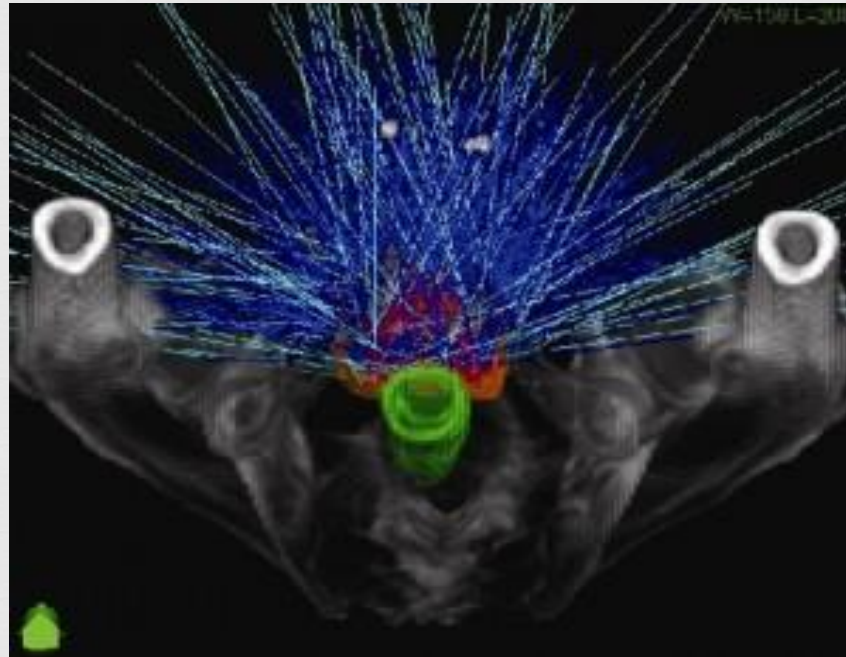
ROBOTIC DELIVERY SYSTEM

Treatment
Couch

Image
detectors



CYBERKNIFE BEAM DISTRIBUTION



DOSIMETRY-CYBERKNIFE AND IMRT

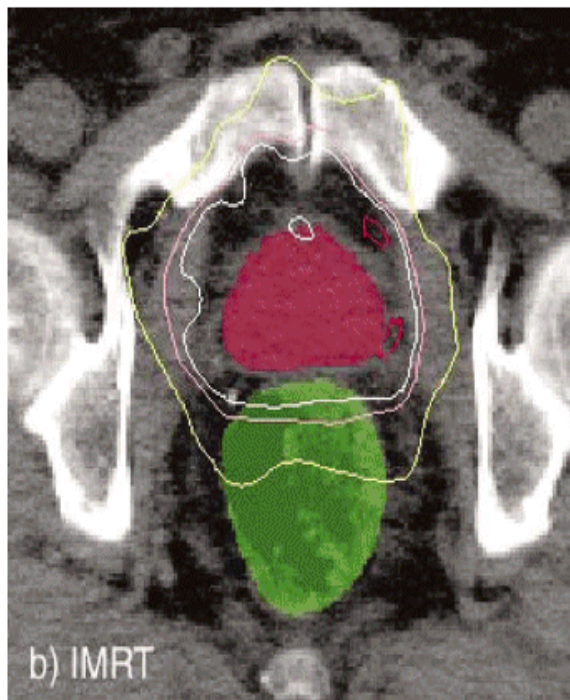


Figure 1: Isodose comparison between (a) CyberKnife and (b) IMRT plans in the same prostate mid-axial plane (small differences in the appearance between CT slices are artifacts due to differences between each system's graphic software). The isodoses shown are, from lowest to highest: 50Gy, 70Gy, 74Gy and 81Gy. Prostate and rectum are shown by the dot-solid lines for CyberKnife and color wash for the IMRT. Note that the 74Gy isodose (100% prescription) encompasses the prostate.

CYBERKNIFE AT STAMFORD HOSPITAL



SIDE EFFECTS-RADIATION THERAPY



- ⌘ Acute (during and shortly afterwards)-mild fatigue, urinary frequency and urgency, difficulty voiding, pain on urination, more frequent and looser BMs
- ⌘ Late (months to years)-incontinence (1%), impotence, cystitis (rare), proctitis causing rectal bleeding (2-5%), radiation induced malignancy (< 0.1%)

RESULTS



- ❧ For low risk patients outcomes are similar with control at 5 yrs. about 90-92%
- ❧ Results are maintained at 10 yrs.
- ❧ For intermediate and high risk patients with lower dose radiation therapy results were comparable to surgery
- ❧ With modern dose escalation (IMRT/IGRT & Cyberknife), radiation may be more efficacious
- ❧ Biochemical failures after radiation seem to plateau after 5 yrs.

ALTERNATIVE LOCAL THERAPIES



❧ Proton beam therapy

❧ Cryotherapy

❧ High intensity focused ultrasound (HIFU)

METASTATIC PROSTATE CANCER



- ❧ Androgen Deprivation Therapy
- ❧ Abiraterone (Zytiga)
- ❧ Enzalutamide (Xtandi)
- ❧ Taxotere
- ❧ Provenge vaccine
- ❧ Samarium 153 (Quadramet)
- ❧ Radium 223 (Xofigo)

CONCLUSIONS



- ❧ Better biomarkers are needed to increase the rate of positive biopsies and minimize unnecessary biopsies
- ❧ Biomarkers are needed to stratify low from high risk tumors once a diagnosis is made
- ❧ Biomarkers on the horizon are: Prostate Health Index (PHI), proPSA, Prostate cancer gene 3 (PCA3), oncotype Dx (17 genes), Prolaris (46 genes), Decipher (22 genes)

CONCLUSIONS



- ❧ Most patients with prostate cancer do very well and live for many years
- ❧ Screening must be guided by risk and should be discussed with one's health care provider
- ❧ Prostate cancer is not a monolithic cancer but rather a spectrum of diseases
- ❧ Optimal treatment, including no treatment, must be individualized and patients should understand all appropriate options, expectations and risks
- ❧ When diagnosed, consult with appropriate specialists to understand all options including surveillance and ask questions

CARL & DOROTHY BENNETT CANCER CENTER



STAMFORD HOSPITAL
BENNETT CANCER CENTER
hope in motion
WALK, RUN & RIDE

STAMFORD HOSPITAL-2016 THANK YOU

