

50 Vets in 50 States

 VIEW RAY® | VISIBLY BETTER®

MRIdian SMART for Prostate Cancer

Rodney J. Ellis, M.D.

Radiation Oncologist

Co-Chairman NCI Renal Task Force

Member NRG GU Steering Committee

Medical Director MR Linac Technology

GenesisCare USA

Fort Myers, Florida

June 27th 2023

Navigating prostate cancer treatment options

1 in 8
Men will be diagnosed with prostate cancer

Short Course (1-2 weeks)

Long course (7-9 weeks)

WATCHFUL WAITING

Also known as active surveillance, prostate cancer is monitored closely. Prostate cancer can grow very slowly and may never need treatment depending on other health factors of the patient. This is the preferred treatment for those whose cancer is contained within the prostate and who are not experiencing any symptoms.

SURGERY

Most commonly radical retropubic prostatectomy. The prostate gland is removed and may include biopsies of nearby lymph nodes. **Procedure time:** three to four hours, usually requiring general anesthesia and a three-day hospital stay. Recovery at home usually lasts a few weeks.

BRACHYTHERAPY

Small radioactive seeds are implanted within the prostate gland. Over the course of several months, the seeds give off radiation to the immediate surrounding area, killing the prostate cancer cells. Although patients remain in the hospital for several hours following the procedure, most usually go home the same day.

STEREOTACTIC BODY RADIATION THERAPY

Delivers targeted radiation beams to the prostate without incision or sedation using CyberKnife® technology. Compensates for normal patient movements, minimizing damage to surrounding healthy tissue. Patients are treated in five or fewer outpatient sessions over the course of one to two weeks.

PROTON THERAPY

Involves using a focused ray of proton particles to destroy prostate cancer cells. Beams of protons are delivered to the tumor using a particle accelerator. These charged particles damage the DNA of cells, ultimately causing their death or interfering with their ability to proliferate. Treatment is usually delivered five days a week for approximately eight weeks.

EXTERNAL-BEAM RADIATION THERAPY

Also known as intensity-modulated radiation therapy or IMRT, radiation beams are delivered from an external source. Lacks the ability to correct for movement of the prostate during treatment, resulting in possible damage to healthy surrounding tissue. Treatments are outpatient procedures that usually run five days a week for seven to eight weeks.



U.S. Statistics

- 288,300 new cases of prostate cancer are expected to be diagnosed in 2023
- A man is diagnosed with prostate cancer every 2 minutes
- 1 in 8 men will be diagnosed with prostate cancer during his lifetime
- Prostate cancer is the second leading cause of cancer death in men
- 34,700 men are expected to die from prostate cancer in 2023
- A man dies from prostate cancer every 15 minutes
- Today, there are more than 3.1 million prostate cancer survivors

Radiation treatment (prostate)

External Beam RT (long course)							
	SUN	MON	TUE	WED	THR	FRI	SAT
Week 1		X	X	X	X	X	
Week 2		X	X	X	X	X	
Week 3		X	X	X	X	X	
Week 4		X	X	X	X	X	
Week 5		X	X	X	X	X	
Week 6		X	X	X	X	X	
Week 7		X	X	X	X	X	
Week 8		X	X	X	X	X	
Week 9		X	X	X	X	X	

> 90%

U.S. men offered long course treatment

Radiation therapy treatment (prostate)

	Conventional RT (long course)						
	SUN	MON	TUE	WED	THR	FRI	SAT
Week 1		X	X	X	X	X	
Week 2		X	X	X	X	X	
Week 3		X	X	X	X	X	
Week 4		X	X	X	X	X	
Week 5		X	X	X	X	X	
Week 6		X	X	X	X	X	
Week 7		X	X	X	X	X	
Week 8		X	X	X	X	X	
Week 9		X	X	X	X	X	

	SBRT (short course) = ~5 visits						
	SUN	MON	TUE	WED	THR	FRI	SAT
		✓	✓	✓	✓	✓	

< 10%

U.S. men offered SBRT short course treatment Despite clinical evidence showing safe and effective treatment

Radiation therapy treatment (prostate)

	Conventional RT (long course)						
	SUN	MON	TUE	WED	THR	FRI	SAT
Week 1		X	X	X	X	X	
Week 2		X	X	X	X	X	
Week 3		X	X	X	X	X	
Week 4		X	X	X	X	X	
Week 5		X	X	X	X	X	
Week 6		X	X	X	X	X	
Week 7		X	X	X	X	X	
Week 8		X	X	X	X	X	
Week 9		X	X	X	X	X	

MRIdian SMART (short course)						
SUN	MON	TUE	WED	THR	FRI	SAT
	✓	✓	✓	✓	✓	

~85%

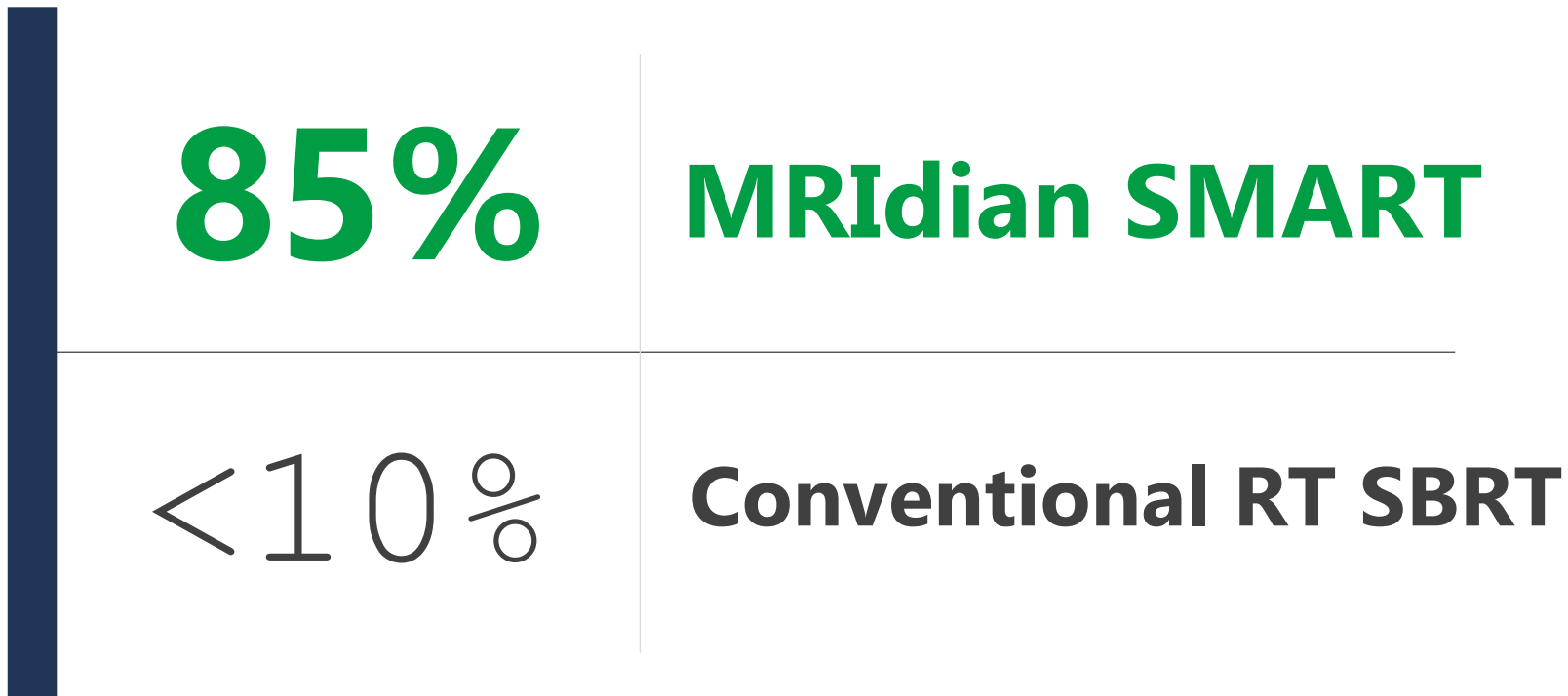
Men offered short course MRIdian SMART at MRIdian Treatment Centers

Men get back to what matters..

- back to health
- back to life
- back to family
- back to work

MRIdian enables short-course therapy

MRIdian vs. market (prostate cancer)



Prostate cancer recurrence (2020)

20-50%

Of prostate cancer patients undergoing radical prostatectomy or definitive radiation therapy will experience disease recurrence.¹

High-Risk Prostate Cancer Diagnosis (~214,972 patients) ²	
Risk	High-Risk Cancer (%)
2004	11.8%
2016	20.4%

Biochemical Recurrence Predictors at Predictors at time of diagnosis ³	
Risk	Recurrence Probability (5 years)
Low	33%
Medium	50%
High	85%

1. https://ascopubs.org/doi/abs/10.1200/JCO.2020.38.15_suppl.3577

2. <https://pubmed.ncbi.nlm.nih.gov/32865572/>

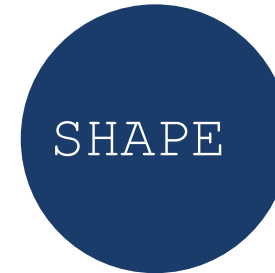
3. <https://www.health.harvard.edu/blog/how-to-handle-a-relapse-after-treatment-for-prostate-cancer-2009031122>

“MRIdian SBRT may be an option for salvage treatment after failure from surgery and salvage radiation or after progressing following prior IMRT using PET PSMA images and MRI planning for 5 fraction salvage with or without concurrent hormonal therapy as clinically indicated”

Dr. Rodney Ellis, M.D.

MRIdian SMART

Stereotactic MR-guided Adaptive Radiotherapy



High-value MRI

On-table adaptive re-planning

Real-time, 3D tissue tracking and automated beam control

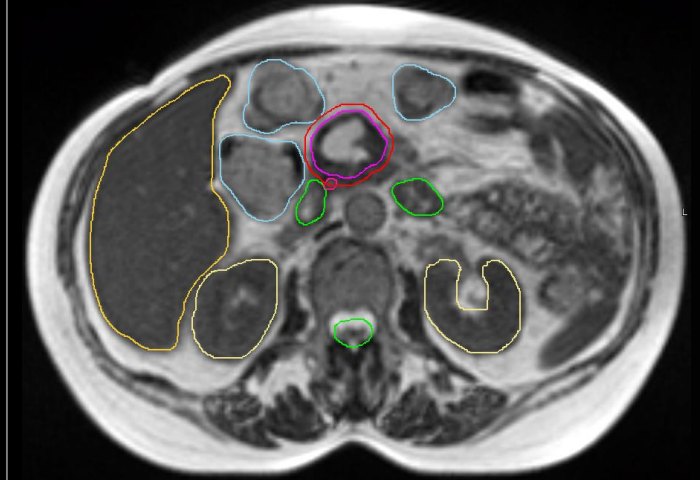
Diagnostic-quality MR imaging

Optimal imaging of target
and organs at risk prior to
RT

SEE
MRIdian[®]



Ref: [sciencedirect.com/science/article/abs/pii/S1055320721000491](https://www.sciencedirect.com/science/article/abs/pii/S1055320721000491)

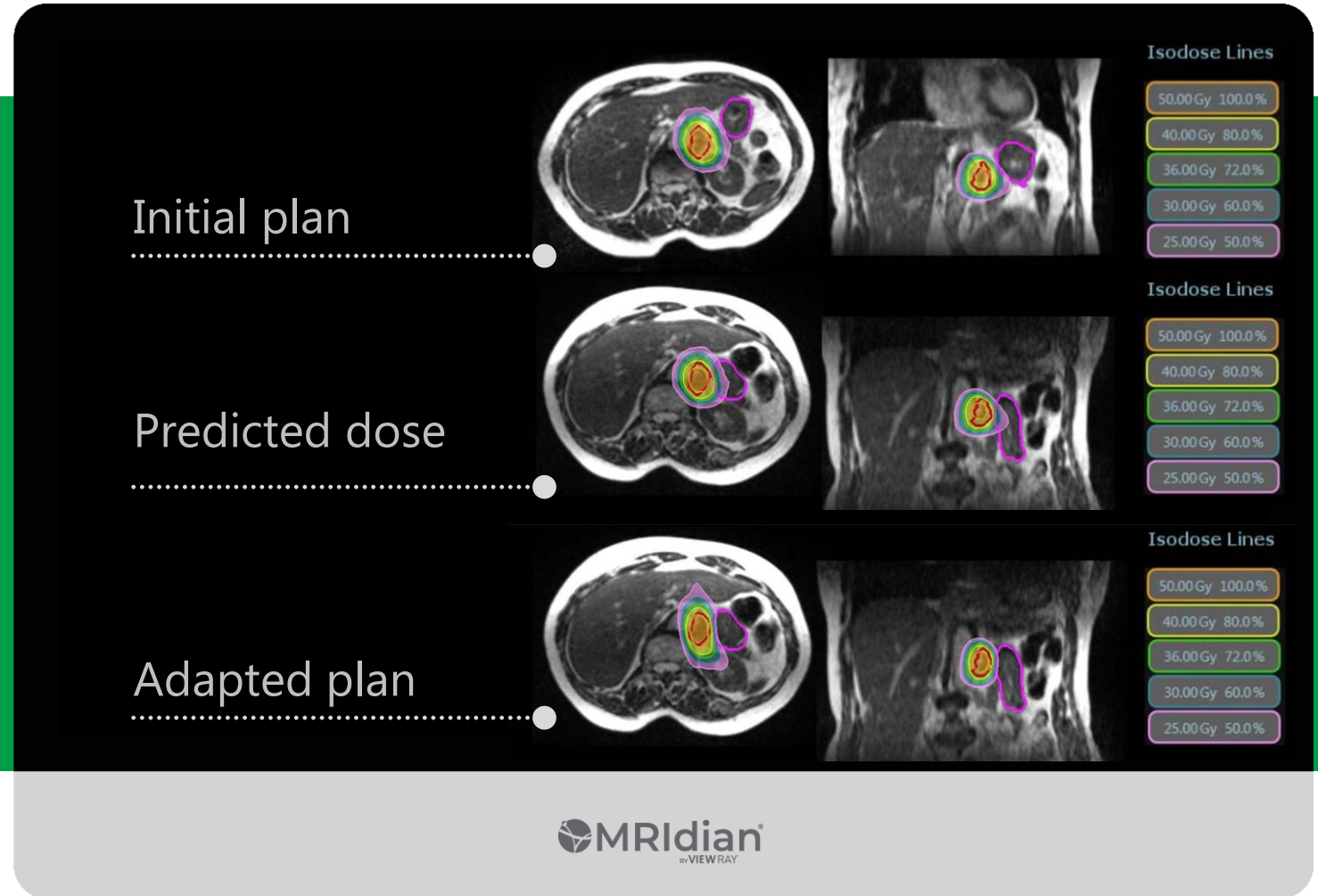


MRIdian
by VIEW RAY

Precise and personalized

Adaptation of original treatment plan when medically necessary

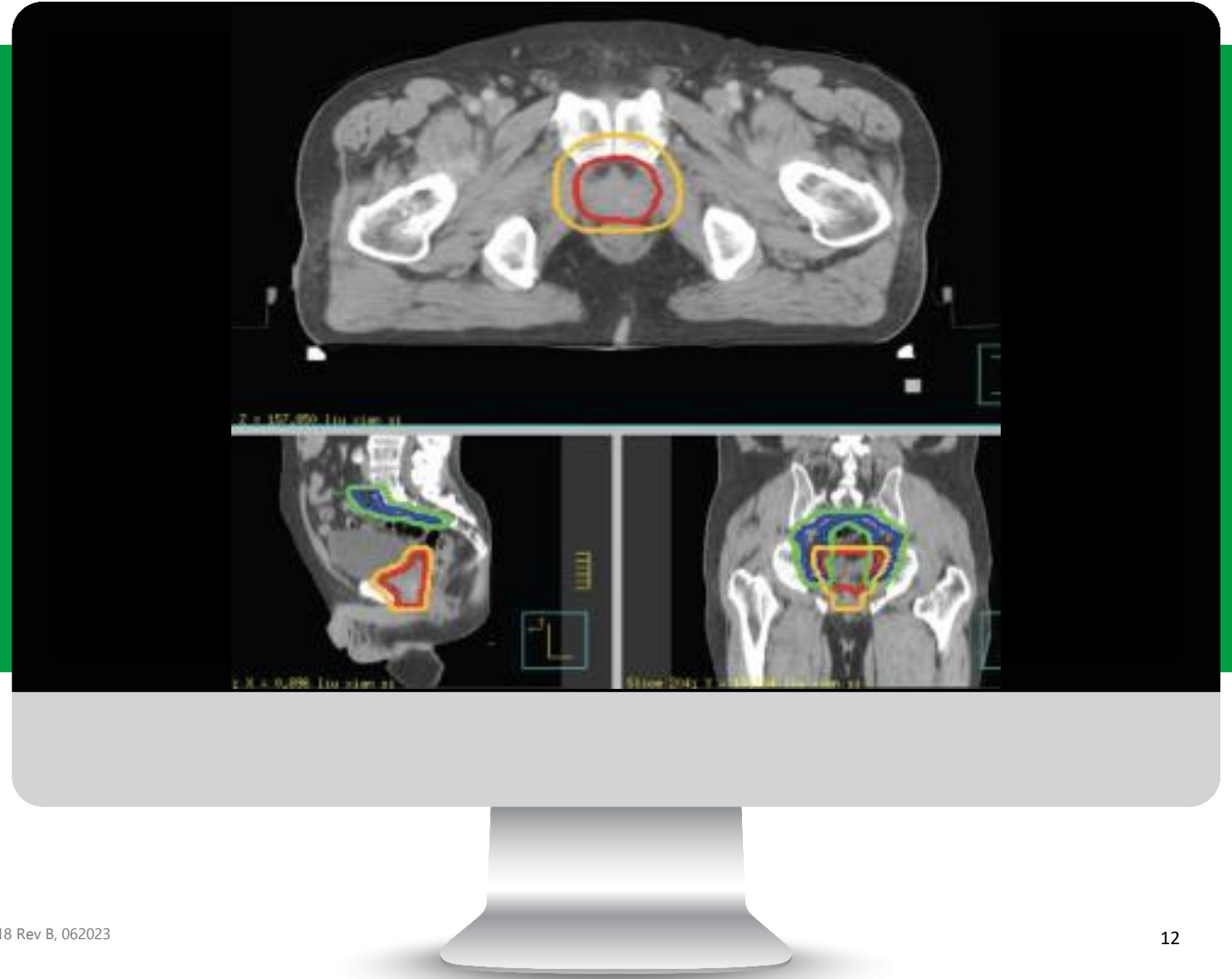
SHAPE
MRIdian®



MRIdian
by VIEW RAY

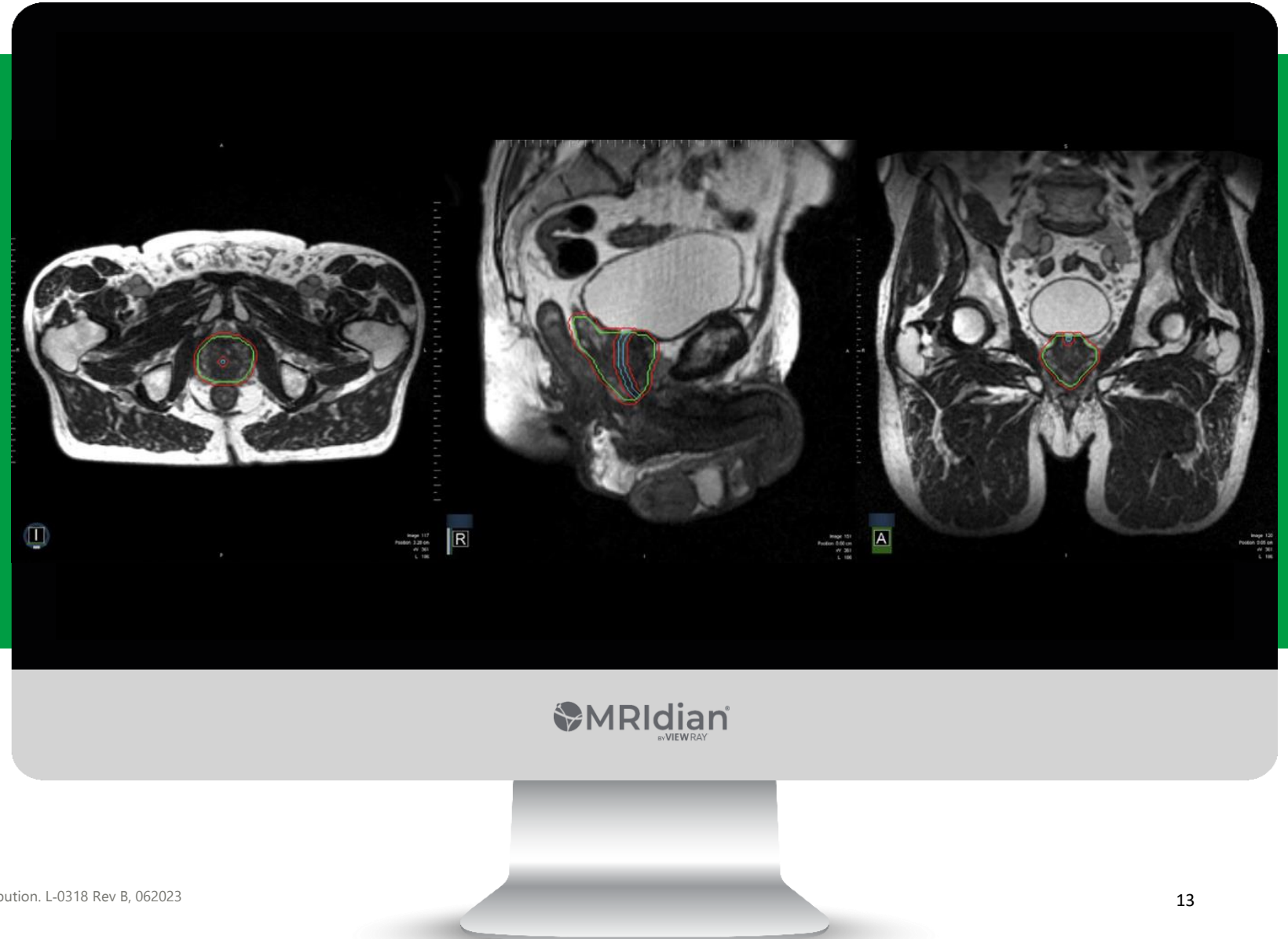
Conventional treatment margins

- 7-10mm expansion if prophylactic lymph node irradiation
- 5mm if daily image guidance used, with 3mm at posterior

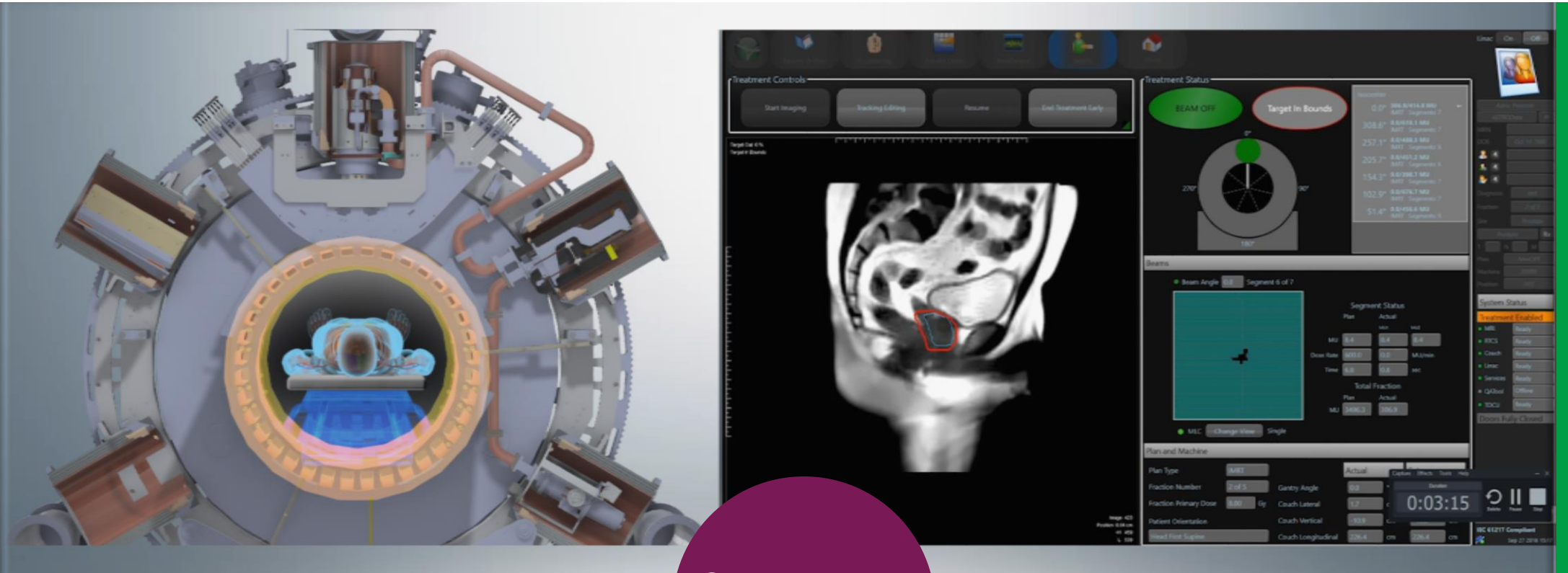


MRIdian treatment margins

3mm margins in every direction



Real-time, Tissue Tracking and Automated Beam Control



STRIKE
MRIdian®

The MRI controls the beam

Real-time, 3D tissue tracking and automated beam control

STRIKE
MRIdian®

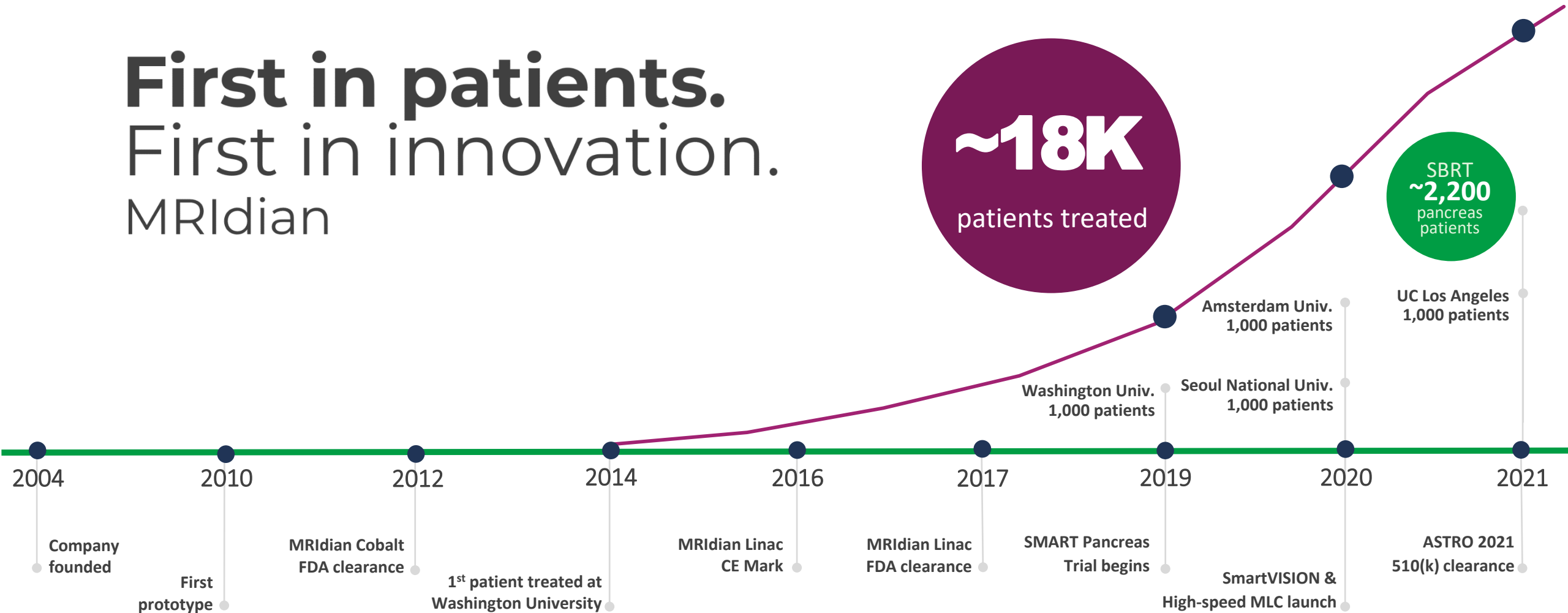


MRIdian Clinical Evidence

First in patients. First in innovation. MRIdian

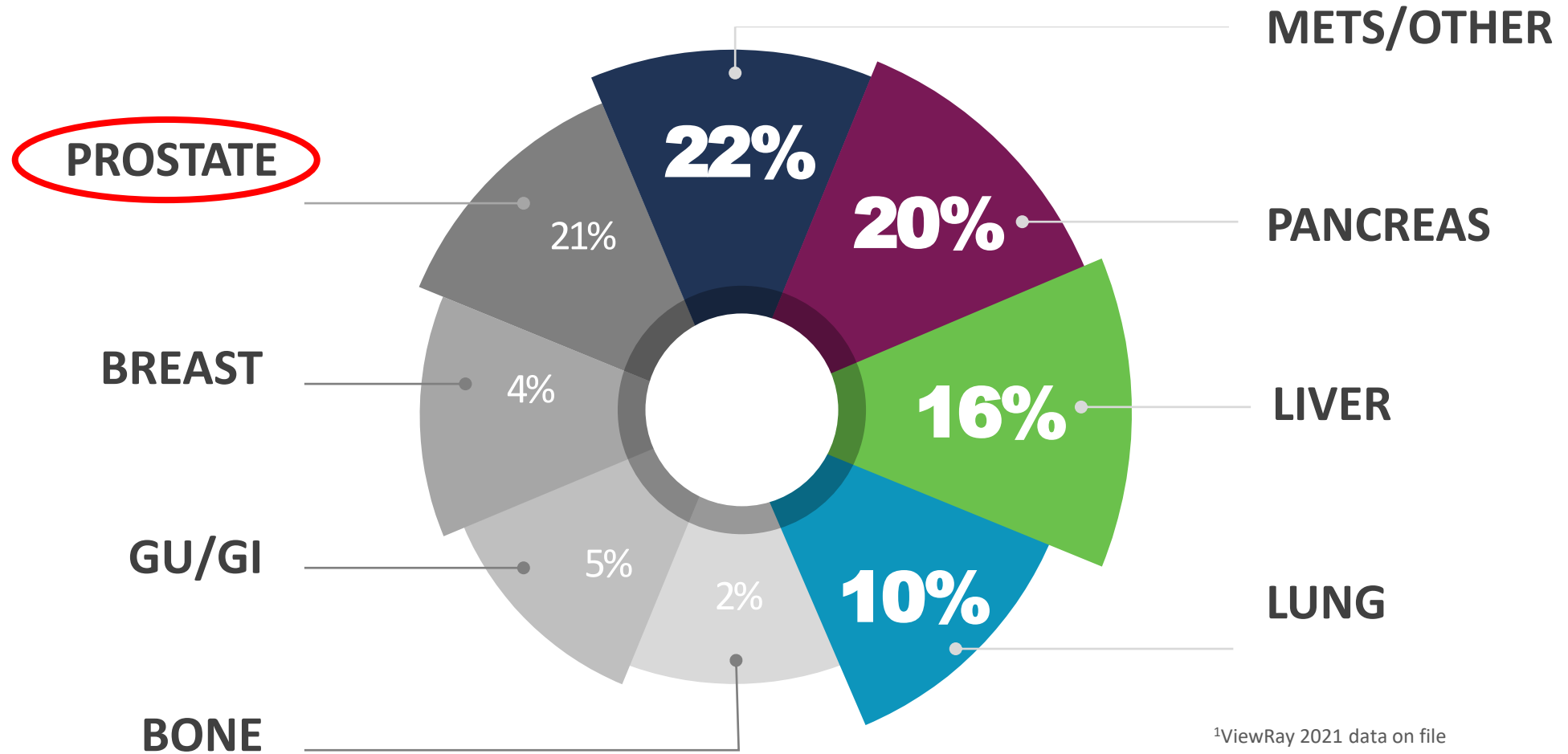
~18K
patients treated

SBRT
~2,200
pancreas
patients



MRIdian Treats Complex Tumors Types

Distribution in the US, 2021¹



¹ViewRay 2021 data on file

NRG-GU005 NCT03367702

Phase III IGRT and SBRT vs IGRT and Hypofractionated IMRT for Localized Intermediate Risk Prostate Cancer n=633 closed 6/2022

Principal Investigator **Rodney J. Ellis, M.D.**

Co-Chairman NCI Renal Task Force

Member NRG GU Steering Committee

GU-005 is the First National Trial Written for Prostate Cancer to Allow Use of MR Linac

opened on 12/11/2017

**Opened at 293 sites
in 6 countries:
USA, Canada, Ireland,
Sweden, Hong Kong,
and India**



S T R A T I F Y	<u>Risk Group</u>	R A N D O M I Z E	<u>Arm 1: IMRT</u> 70 Gy in 28 fractions of 2.5 Gy or 60 Gy in 20 fractions of 3 Gy to the prostate +/- proximal 1cm of seminal vesicles
	<u>Use of Rectal Manipulation</u>		<u>Arm 2: SBRT</u> 36.25 Gy in 5 fractions of 7.25 Gy to the prostate +/- proximal 1 cm of seminal vesicles
	1. Gleason score 7(3+4) with PSA <10 ng/mL		Minimal Margins: 8 mm uniform in expansion, 5 mm posteriorly
	2. Gleason score 7(3+4) with 10 ng/mL <= PSA < 20 ng/mL		Minimal Margins: 5 mm superior inferior & laterally, 3 mm anterior & posterior
	3. Gleason score 6(3+3) with 10 ng/mL < PSA < 20 ng/mL		
	1. No		
	2. Rectal balloon		
	3. SpaceOAR		
	4. SpaceOAR and rectal balloon		

NRG-GU005

PRIMARY OBJECTIVE

- To determine whether SBRT can be shown to be **superior** to hypofractionated IMRT in terms of GU toxicity by having fewer patients that experience a minimal important decline (MID) in urinary irritation/obstructive and bowel HRQOL as measured by EPIC-26 at 24 months post completion of therapy.
 - Results available for analysis **June 2024**
- To determine if SBRT (5 fractions of 7.25 Gy) is **superior** to hypofractionated IMRT as measured by Disease Free Survival (DFS)
 - Results available for analysis **June 2027**

**If Either or Both primary endpoints are proven
then the Standard of Care for most men with Prostate Cancer
Will become SBRT**

Treating PROSTATE with MRIdian



Conventional trial

- **PACE-B Phase III Trial**
(similar to GU-005)
 - Cyberknife SBRT vs Linac IMRT 78 Gy (no MR Linac)
 - **Late Toxicity** reported Lancet Oncology Sept 2022
 - GU Toxicity **2% vs 3%**
 - GI 3 Toxicity **3% vs 2%**
- Conclusion: SBRT equal to IMRT for GI and GU toxicity**



MRIdian trials

- AUMC paper
- MIRAGE
- SCIMITAR
- Future: SHORTER
- Future: FORT



Key messages

- **Smaller margins**
- **Reduced toxicity/ fewer side effects**
- **No fiducials needed for MR Linac on MRIdian**

Prostate: prospective trial

AUMC study - early signal

01

Study design

Phase II, prospective, single-center, **n=101**

02

Treatment method

The low incidence of early GI toxicity, despite inclusion of the base of (or entire) seminal vesicles in 96% of patients, is likely to result from benefits of MRgRT, in particular the use of only 3 mm CTV to PTV margins, made possible by online CTV monitoring and daily plan re-optimization.

03

Key points

Majority of patients had high risk disease, but results are comparable with those typically observed in lower-risk patients, pointing to the potential benefits of MR-guided SBRT in high-risk patients.

*International Journal of Radiation Oncology*Biography*Physics, 105(5), 1086–1094*

A prospective single-arm phase 2 study of stereotactic magnetic resonance guided adaptive radiation therapy for prostate cancer: early toxicity results
Bruynzeel, A. M. E., Tetar, S. U., Oei, S. S., Senan, S., Haasbeek, C. J. A., Spoelstra, F. O. B., et al. (2019).

Results

	GU	GI
Early Grade 2 cumulative toxicity	23.8%	5%

	Low	Medium	High
Patient risk classification	4%	36.6%	59.4%

Prostate: prospective trial

MIRAGE – intact prostate Dr. Amar Kishan MD UCLA Principal Investigator

01

Study design

Phase III, randomized, single-center, **n=154**

02

Treatment method

Superiority MR-guided SBRT vs. CBCT-guided

03

Endpoints

Primary: Early 90-day grade 2 or higher **GU** toxicity

Secondary: Early 90-day grade 2 or higher **GI** toxicity, biochemical control (PSA control), OS, QOL

JAMA Oncology January 2023

Magnetic resonance imaging-guided versus computed tomography-guided stereotactic body radiotherapy for prostate cancer: MIRAGE Phase III Randomized Clinical Trial

Amar U. Kishan, MD; Ting Martin Ma, MD, PhD; James M. Lamb, PhD; Maria Casado, BS; Holly Wilhalme, MSc; Daniel A. Low, PhD; Ke Sheng, PhD; Sahil Sharma, BS; Nicholas G. Nickols, MD PhD; Jonathan Pham, PhD; Yingli Yang, PhD; Yu Gao, PhD; John Neylon, PhD; Vincent Basehart, BS; Minsong Cao, PhD; Michael L. Steinberg, MD

<https://clinicaltrials.gov/ct2/show/NCT04384770>

Results

- 60% reduced odds of grade 2+ GU toxicity (multi-variable analysis)
- Elimination of grade 2+ GI toxicity

Conclusions

MRI-guidance leads to a significant reduction in acute physician-scored GU & GI toxicity


Prostate cancer **MIRAGE** Phase III RCT*

60% reduction in
odds of GU toxicity
(multivariate analysis)

**NO GI
toxicity**

10.5% CT compared to 0% MRIdian

Majority of
patients were
intermediate to
high-risk



“Potential explanations for the magnitude of these [MIRAGE] results can be attributed to the **real-time tissue tracking** of actual anatomy and **automatic gating of beam delivery**, which thereby allows for tighter contours and treatment of smaller volumes.”

Amar Kishan, MD.

Associate Professor and Chief of the
Genitourinary Oncology Service
UCLA



Only on
MRIdian

Prostate: prospective trial

SCIMITAR – post-prostatectomy Dr. Amar Kishan Principal Investigator

01

Study design

Phase II, prospective, single-center, **n=100**

02

Treatment method

Compared to CTgRT, MRgRT had a **30.5% reduction** in any grade **acute GI toxicity** and a **32% reduction** in any grade cumulative **GI toxicity up to 6 months**.

03

Results

Toxicities	CTgRT	MRIdian
GU grade	Acute / Late	Acute / Late
1	45% / 43.5%	38.7% / 32.3%
2	8.7% / 8.7%	9.7% / 9.7%
3	1.4% / 1.4%	0% / 0%
GI grade	Acute / Late	Acute / Late
1	63.9% / 36.3%	41.9% / 29%
2	7.2% / 0%	0% / 0%
3	1.4% / 1.4%	0% / 0%

International Journal of Radiation Oncology**Biology*Physics* (2022)

Quality-of-Life Outcomes and Toxicity Profile Among Patients with Localized Prostate Cancer After Radical Prostatectomy Treated With Stereotactic Body Radiation: The SCIMITAR Multi-Center Phase 2 Trial

Ma T, Ballas L, Wilhalme H, Sachdeva A, Chong N, Sharma S, Yang T, Basehart V, Reiter R, Saigal C, Chamie K, Litwin M, Rettig M, Nickols N, Yoon S, Smith L, Gao Y, Steinberg M, Cao M, Kishan A

Prostate cancer recurrence

SCIMITAR

phase II study*

evaluating the feasibility of salvage SBRT for post-operative prostate cancer recurrence

32% reduction in any grade cumulative GI toxicity up to 6 months

No patients treated with MRgRT experienced a grade 3 GU toxicity nor a grade ≥ 2 GI toxicity

*Martin Ma, Ting, et. al. Quality-of-Life Outcomes and Toxicity Profile Among Patients with Localized Prostate Cancer After Radical Prostatectomy Treated With Stereotactic Body Radiation.
[https://www.redjournal.org/article/S0360-3016\(22\)03160-1/fulltext](https://www.redjournal.org/article/S0360-3016(22)03160-1/fulltext)



Tracking Confidence: 83.3%
Fraction Outside: 0.00%
Target In

S

FOV: 35.0 x 35.0 x 0.70 cm
Res: 0.24 x 0.24 cm (144 x 144)



P

A

Gating: ON

Image 1862,

Only on
MRI^{dian}

Prostate: accruing trial

FORT – intact prostate Weil Cornell NYC Dr. Nagar Principal Investigator

01

Study design

Phase II, randomized controlled trial, multi-center (NYP & UCLA), n=136, recruiting now

02

Treatment method

Non-inferiority of Five (37.5Gy) vs Two (25Gy) MRI-Guided Adaptive Radiotherapy Treatments for Prostate Cancer

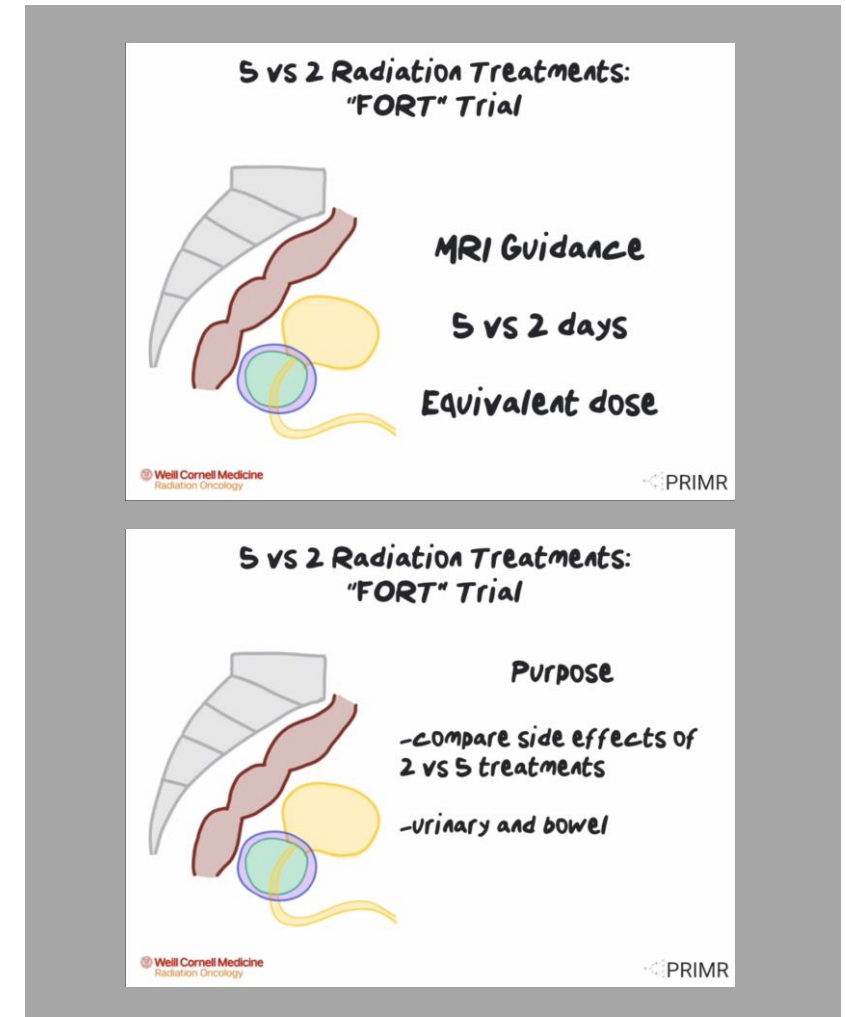
03

Endpoints

Primary: 2-year GU & GI symptoms for 5fx vs 2fx

Secondary: TTP, OS, ED

<https://clinicaltrials.gov/ct2/show/NCT04984343>



5 vs 2 Radiation Treatments: "FORT" Trial

MRI Guidance

5 vs 2 days

Equivalent dose

5 vs 2 Radiation Treatments: "FORT" Trial

Purpose

- compare side effects of 2 vs 5 treatments
- urinary and bowel

Prostate: accruing trial

SHORTER – post prostatectomy Weil Cornell NYC Dr. Nagar Principle Investigator

01

Study design

Phase II, Randomized controlled trial, single center, n=134, recruiting now

02

Treatment method

Non-inferiority trial for 20fx (55Gy) vs 5fx (32.5Gy) for post-op prostate

03

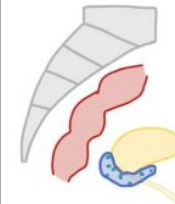
Endpoints

Primary 2-year GU & GI symptoms for 20fx vs 5fx

Secondary: TTP, OS

<https://clinicaltrials.gov/ct2/show/NCT04422132>

5 days vs 4 Weeks Radiation: SHORTER Trial



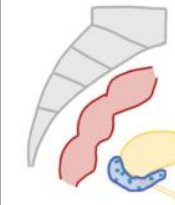
Overview

- Real time MRI guidance
- 4 weeks vs 5 days
- Equivalent dose

Weill Cornell Medicine
Radiation Oncology

PRIMR

5 days vs 4 Weeks Radiation: SHORTER Trial



Eligibility

- post-prostatectomy
- Elevated PSA

Weill Cornell Medicine
Radiation Oncology

PRIMR

The MRIdian 5

Why does this matter for PROSTATE?



Ablative dose

Treat only the tumor, no need to limit dose because of movement into nearby OARs

Tight margins

Lower side effects reported in MIRAGE Phase III RCT attributed to real-time tissue tracking and automated beam control¹

No fiducials

MRI visualization eliminates need for implants, extra procedure and accelerates treatment completion

5 or fewer fractions

With conventional RT less than 15% of patients are offered SBRT, with MRIdian its over 80% U.S.²

No or low Grade 2 or 3 toxicity

MIRAGE: 60% reduce odds of Grade 2+ GU toxicity and 0% Grade 2+ GI toxicity¹

1. Kishan, M.D, et al. ASTRO 2022 Conference Abstract
2. ViewRay data on file

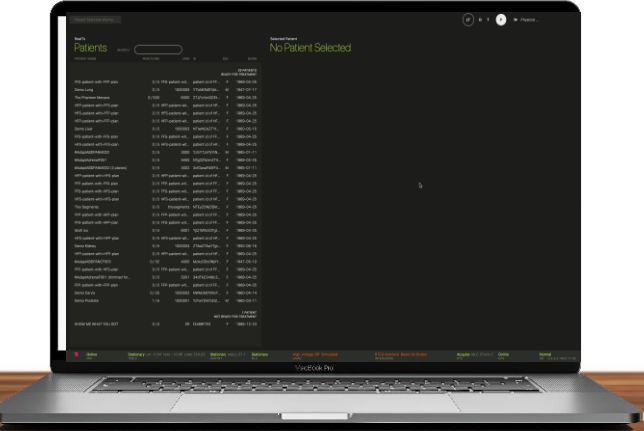
Remote, Collaborative, Parallel Clinician Workflow



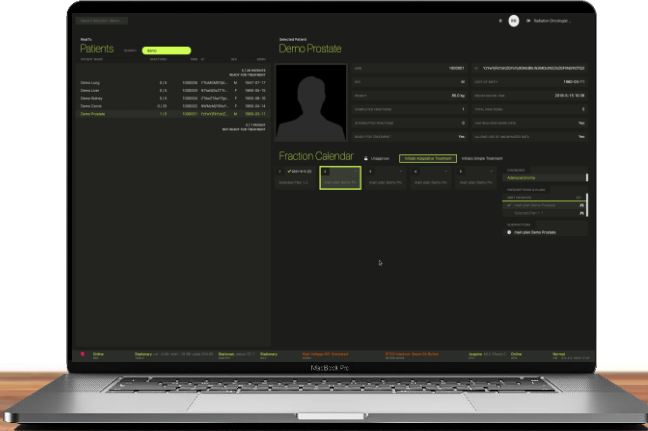
Radiation Therapist



Physicist

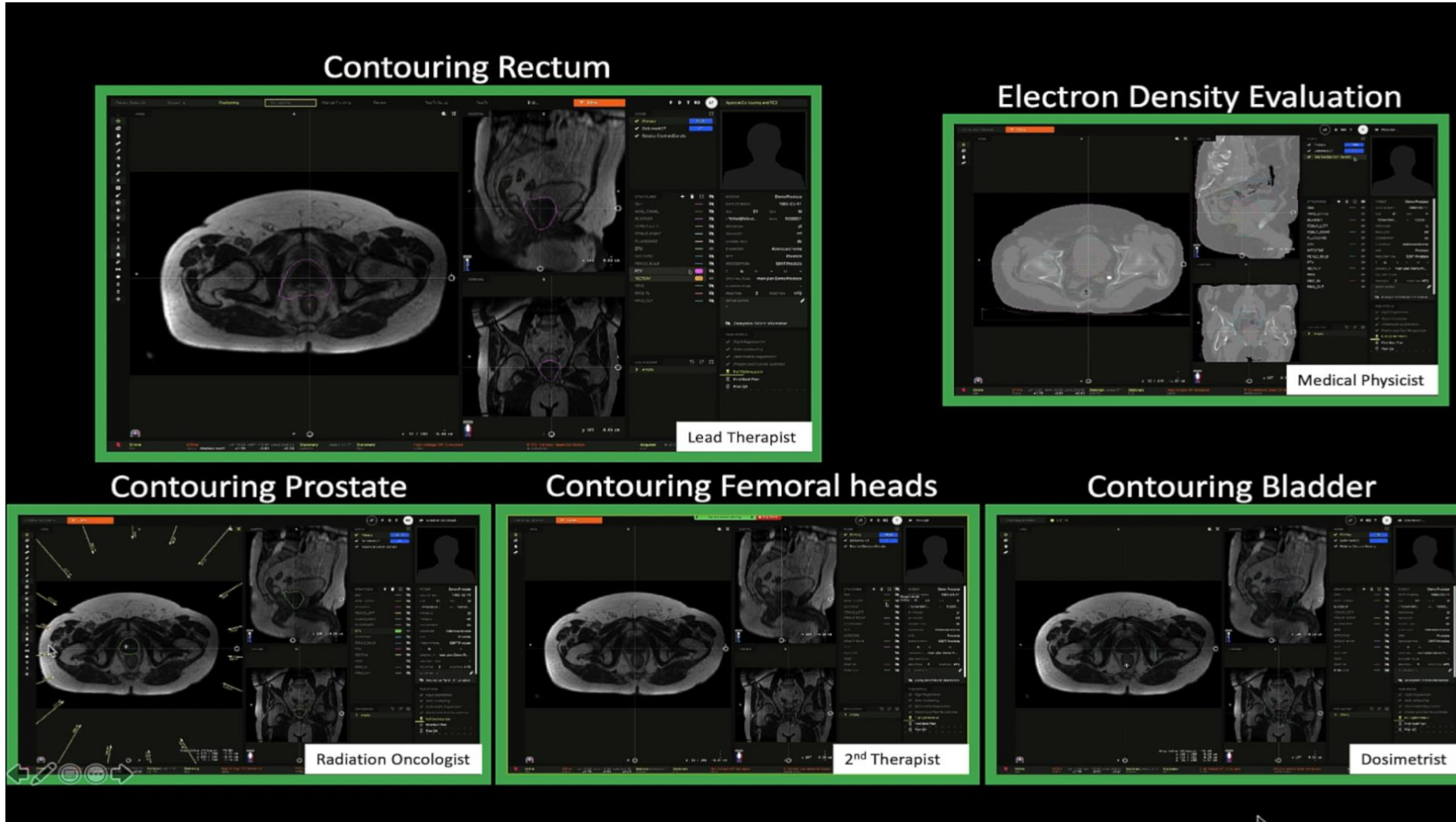


Radiation Oncologist



Note: Not available for sale outside the United States.

Parallel Collaborative Workflow



Contouring Rectum
Lead Therapist

Electron Density Evaluation
Medical Physicist

Contouring Prostate
Radiation Oncologist

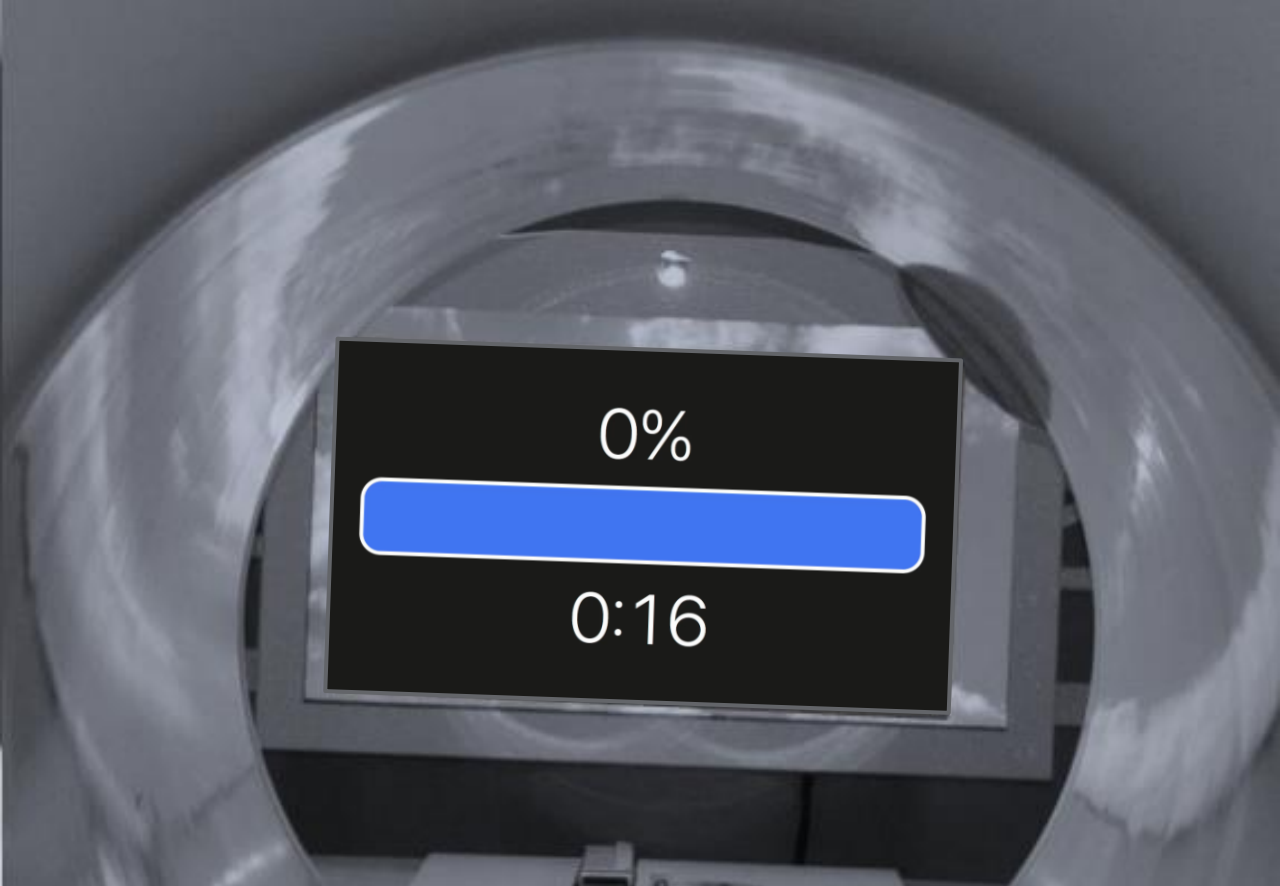
Contouring Femoral heads
2nd Therapist

Contouring Bladder
Dosimetrist

Integrated Patient Display



Mirrored patient glasses



In-room patient display

Multiplanar Beam Gating + Real-Time Display of Accumulated Dose

Real-time dose accumulation



The interface displays three cine planes (S, A, R) showing the prostate target and beam paths. Below the planes are real-time dose accumulation graphs for the prostate, showing % CONF and % OUT. A central beam diagram shows the beam's position and angle. A table on the right lists beams and segments with their respective MU and MU values.

BEAMS	# SEGS	MU	SEGMENTS	MU
21.2°	0/5	19.5/154.2	21.2° #1	19.5/33.9
0.0°	0/6	0.0/167.3	21.2° #2	0.0/38.1
338.8°	0/7	0.0/154.4	21.2° #3	0.0/27.6
317.6°	0/4	0.0/160.9	21.2° #4	0.0/21.8
296.5°	0/5	0.0/148.3	21.2° #5	0.0/32.8
275.3°	0/4	0.0/144.8		
254.1°	0/5	0.0/198.3		
211.8°	0/5	0.0/186.5		
190.6°	0/6	0.0/165.7		
169.4°	0/4	0.0/111.2		
148.2°	0/6	0.0/170.5		
105.9°	0/4	0.0/180.2		
84.7°	0/5	0.0/135.1		

PROSTATE % CONF
 82.40
% OUT
 0.00

PROSTATE % CONF
 81.66
% OUT
 0.00

PROSTATE % CONF
 86.75
% OUT
 0.00

SEGMENT TIME
 PLAN: 3.39 SEC
 CURRENT: 1.79
DOSE RATE
 PLAN: 600.00 MU/MIN
 CURRENT: 648.73
SEGMENT
 PLAN: 33.91 MU
 CURRENT: 19.52
FRACTION
 PLAN: 2358.64 MU
 CURRENT: 19.52

SYSTEM
 BEAM ON
 0°
 270°
 90°
 180°

PATIENT INFORMATION
 PATIENT: OV110, A3I_Demo_Prostate
 DATE OF BIRTH: 1945 February 2
 AGE: 76 SEX: M
 PHYSICIAN: A3I_Demo_O...
 PHYSICIST: -
 DOSIMETRIST: -
 DIAGNOSIS: SBRT
 SITE: Prostate
 PRESCRIPTION: SBRT
 ORIGINAL PLAN: SBRT
 DELIVERY PLAN: 1. Predicted
 FRACTION: 1 POSITION: HFS
 SETUP NOTES: -
 Anonymize Patient Information

BEAM STATUS
 Treatment Running ETA 11m 53s
 Pause Treatment
 Imaging
 Pause Imaging

SYSTEM STATUS
 Online MRI
 Offline TABLE
 Online GANTRY
 Online MLC
 High Voltage On Simulated LINAC
 Online RTC
 Normal DB

Note: Not available for sale outside the United States.

*ViewRay stock images and videos

Where can Veterans go to get MRIdian Treatment?

- **VA Louis Stokes (Cleveland Ohio) now treating patients in North Coast**
- **VA Ann Arbor Michigan, VA Houston Texas, VA Oklahoma**
 - purchased MRIdian systems (but **not treating yet**)
- Many hospitals offering MRIdian treatment for prostate cancer are enrolled in **VA Community Care Network**. Examples **UCLA West Coast** and **Weil Cornell Medical Center New York City East Coast**
- **Hospitals offering MRIdian treatment can be found at MRIdian locator page** and patients can contact hospitals to confirm they are part of Community Care Network
 - such as: **GenesisCare USA Southwest Florida Gulf Coast**
 - **Dr. Rodney Ellis MD**
 - **Phone (239)936-0382**
 - **Lee Health Regional Cancer Center**
 - **8931 Colonial Center Drive Suite 100 Fort Myers, Florida 33905**

Our locations > Fort Myers (Radiation oncology)



Fort Myers (Radiation oncology)

Nearby Hotels

- Holiday Inn Suites
- Candlewood Suites
- Hyatt Hotel



 8931 Colonial Center Drive, Suite 100
Fort Myers, Florida 33905

 239-936-0382

 239-936-1689

 Mon - Fri 8am - 5pm

 Webinquiries@usa.genescare.com

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[Refer a patient](#)

[Write a review](#)