



Advanced imaging for more precise prostate cancer treatment

Tyler M. Seibert, MD, PhD
Associate Professor
Radiation Medicine | Radiology | Urology | Bioengineering
Center for Multimodal Imaging and Genetics
Center for Precision Radiation Medicine
University of California San Diego



SeibertLab.com



1

Disclosures

- Academic affiliations
 - University of California San Diego
 - VA San Diego
 - University of Oslo
- Industry relationships
 - GE Healthcare
 - Cortechs.ai
 - Varian
 - Janssen
 - WebMD
 - Quibim
 - Veracyte
 - MJH Life Sciences
 - Blue Earth Diagnostics
 - Lantheus

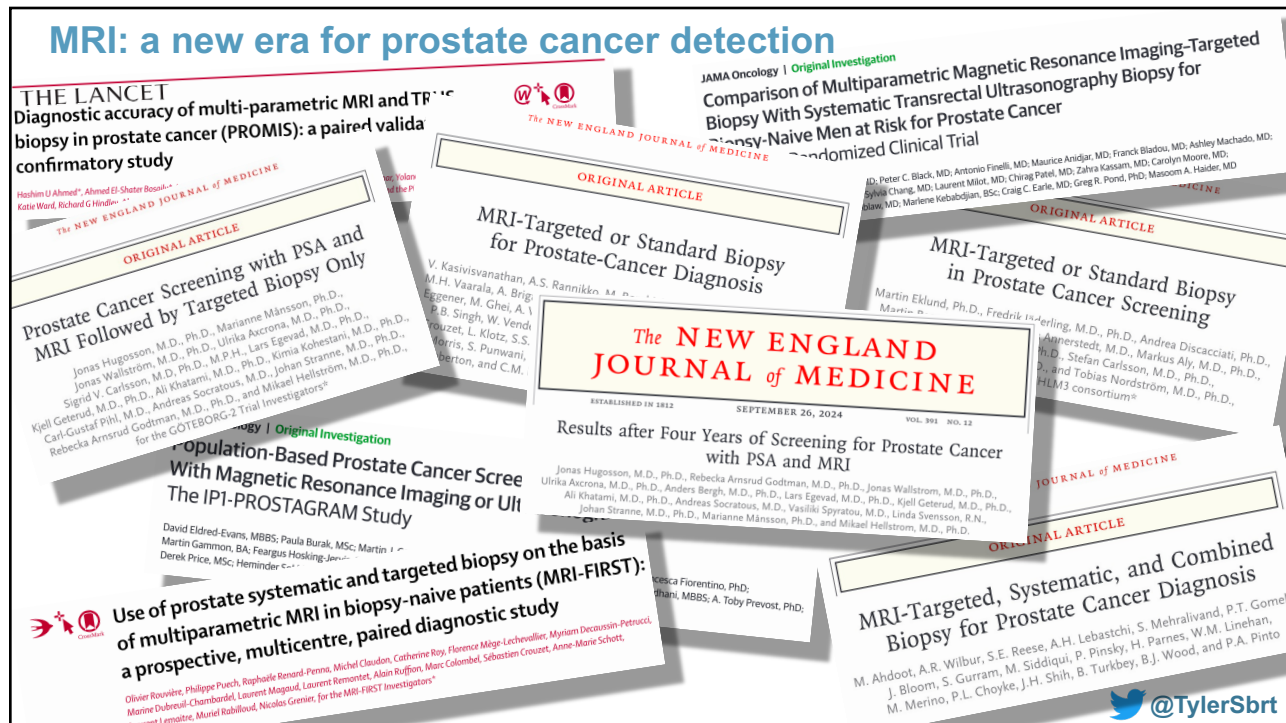


UC San Diego



@TylerSbrt

2



3

original reports

Focal Boost to the Intraprostatic Tumor in External Beam Radiotherapy for Patients With Localized Prostate Cancer: Results From the FLAME Randomized Phase III Trial

Linda G. W. Kerkmeijer, MD, PhD^{1,2}; Veerle H. Groen, MD¹; Floris J. Pos, MD, PhD³; Karin Haustermans, MD, PhD⁴; Evelyn M. Monninkhof, PhD⁵; Robert Jan Smeenk, MD, PhD²; Martina Kunze-Busch, PhD²; Johannes C. J. de Boer, PhD¹; Jochem van der Voort van Zijp, MD, PhD¹; Marco van Vulpen, MD, PhD⁶; Cédric Draulans, MD, PhD⁴; Laura van den Bergh, MD, PhD⁷; Sofie Isebaert, PhD⁴; and Uulke A. van der Heide, PhD³

- Focal Lesion Ablative Microboost in Prostate Cancer (FLAME) trial.
- N=571 men with intermediate- or high-risk PCa undergoing radiotherapy
- Randomized trial with superiority design for biochemical DFS
 - 1. 77 Gy in 35 fractions (2.2 Gy/fx)
 - 2. As above, with focal boost up to 95 Gy (2.7 Gy/fx)
 - [Biologically, ~42% increase in dose]

Kerkmeijer et al. *JCO* 2020

UC San Diego @TylerSbrt

4

Focal radiation boost for prostate cancer

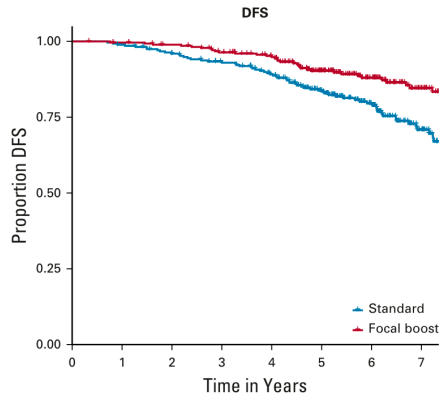


Table 2 – Cox per-protocol regression analysis for local failure and regional + distant metastatic failure

	Adjusted HR (95% CI) ^a	p value
Local failure	0.33 (0.14–0.80)	0.01
Regional + distant metastatic failure	0.56 (0.34–0.91)	0.02

CI = confidence interval; HR = hazard ratio.

^a Adjusted for center, age (in years), hormonal treatment duration (in months), timing of hormonal treatment (neoadjuvant vs adjuvant), T stage, initial prostate-specific antigen (in ng/ml), and Gleason score.

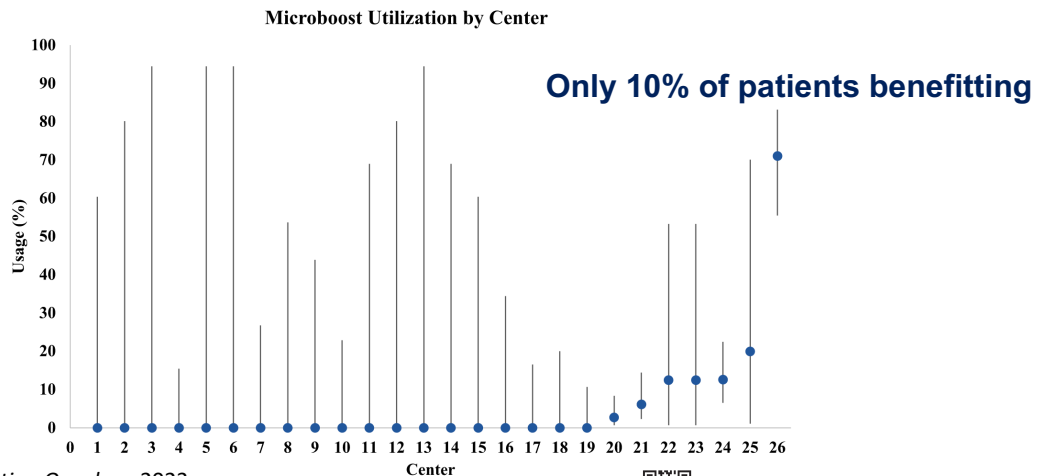
- Focal boost group had:
 - 67% lower local recurrence**
 - 44% less regional or distant metastatic disease**
 - No increase in toxicity** (only boosted as could be safely achieved)

Kerkmeijer et al. *JCO* 2020; Groen et al. *European Urology* 2021

5

Fewer metastases / recurrences without increased toxicity

- Every patient should get this, right?
- Are radiation oncologists routinely using focal boost for their patients?



Zhong et al. *Radiation Oncology* 2023

Regan et al. *Adv. Rad. Onc.* 2024

● % Receiving Microboost with 95% Confidence Intervals

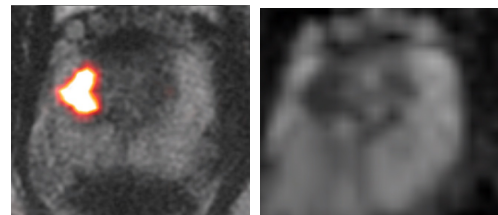
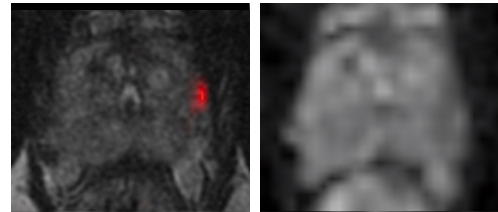


UC San Diego @TylerSbrt

6

Fewer metastases / recurrences without increased toxicity

- Why not offer this?
 - Several contributing factors, but one seems most critical...
- You can't aim at what you can't see
 - What if we made it easier?



Lui et al. *Red Journal* 2023
Dornisch et al. *WJU* 2024



UC San Diego @TylerSbrt

7

Diffusion MRI → ADC

- We can “weight” MRI scans to measure how water molecules are moving
- This gives us a **non-invasive peek into microscopic tissue** structure



ADC: *Apparent* Diffusion Coefficient:
How fast are the molecules diffusing?

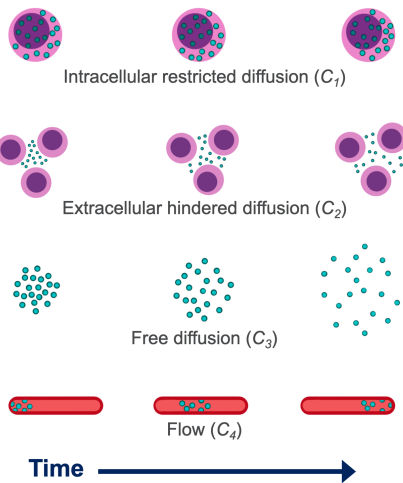


UC San Diego @TylerSbrt

8

Restriction Spectrum Imaging (RSI) – RSI restriction score (RSIrs)

Diffusion compartments



2-3 minutes on a standard clinical scanner



UC San Diego @TylerSbrt

9

ReIGNITE RT Boost:

A prospective, international study of radiation oncologists' accuracy in contouring prostate tumors for focal radiotherapy boost on conventional MRI alone or with assistance of restriction spectrum imaging (RSI)

- Prospective study with 44 radiation oncologist participants
 - They were given prostate MR images
 - They were told where the tumor was (in words)
 - They attempted to circle the tumor for focal RT boost
- In 50% of cases, they were only given conventional MRI
 - In the others, they were also given RSIrs maps



Asona Lui

Lui et al. *Red Journal* 2023

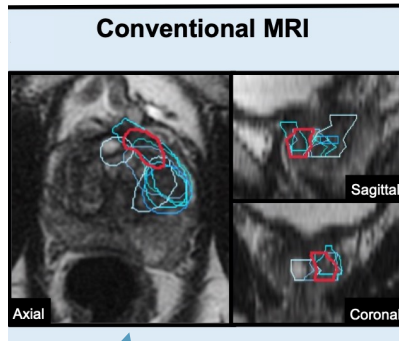


UC San Diego Seibert Lab

10

Example Case #1:

- Expert radiologists outlined the **tumor** in **red**
- Radiation oncologists' **attempts** to outline the tumor are shown in **shades of blue**



With only conventional MRI, many oncologists struggled to find the tumor

With RSIs maps, these same oncologists each correctly outlined the tumor target

Lui et al. *Red Journal* 2023

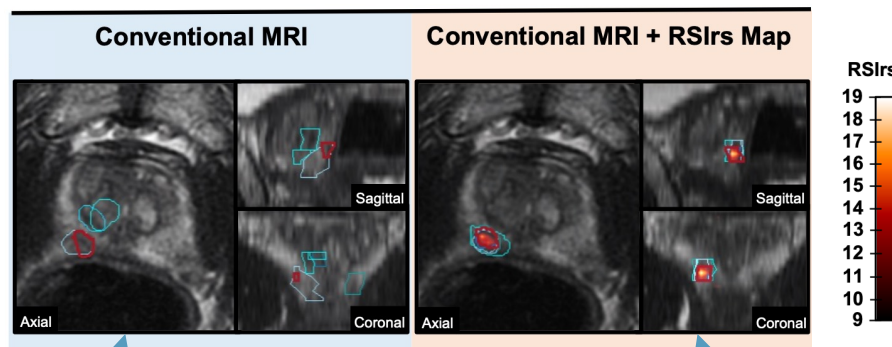


UC San Diego @TylerSbrt

11

Example Case #2:

- Expert radiologists outlined the **tumor** in **red**
- Radiation oncologists' **attempts** to outline the tumor are shown in **shades of blue**



With only conventional MRI, many oncologists struggled to find the tumor

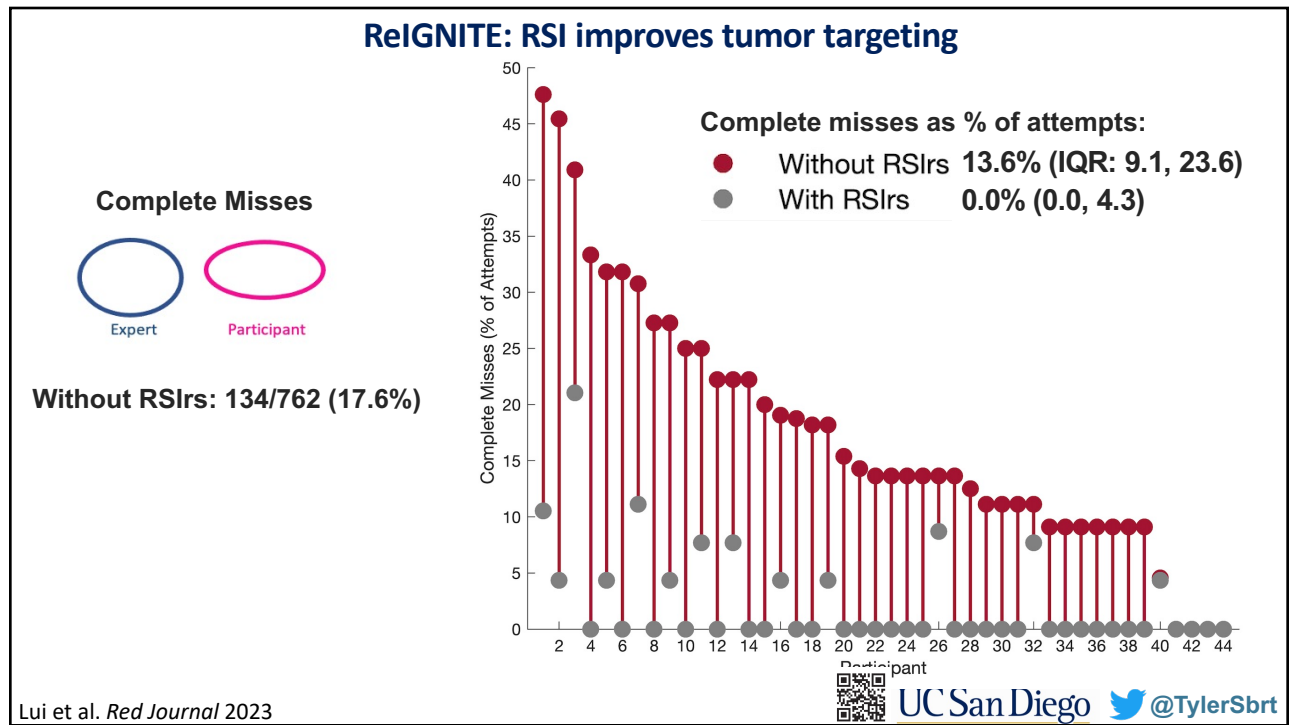
With RSIs maps, these same oncologists each correctly outlined the tumor target

Lui et al. *Red Journal* 2023

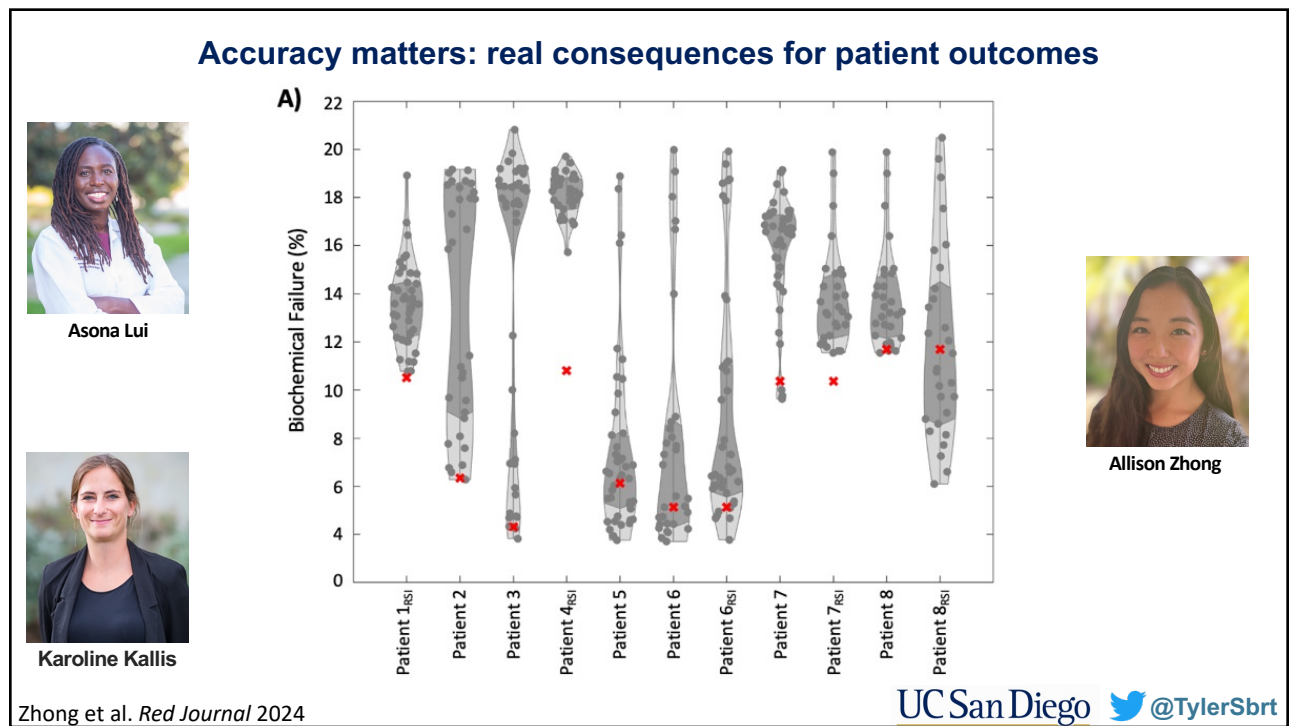


UC San Diego @TylerSbrt

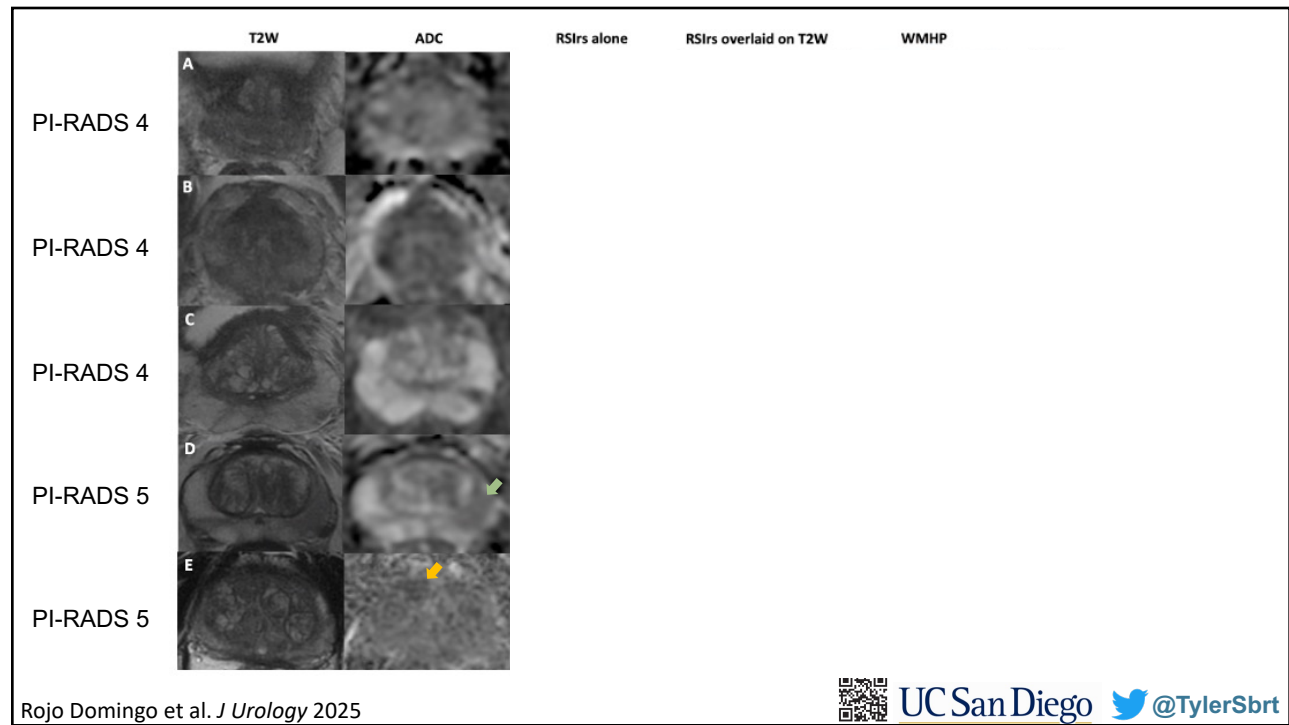
12



13

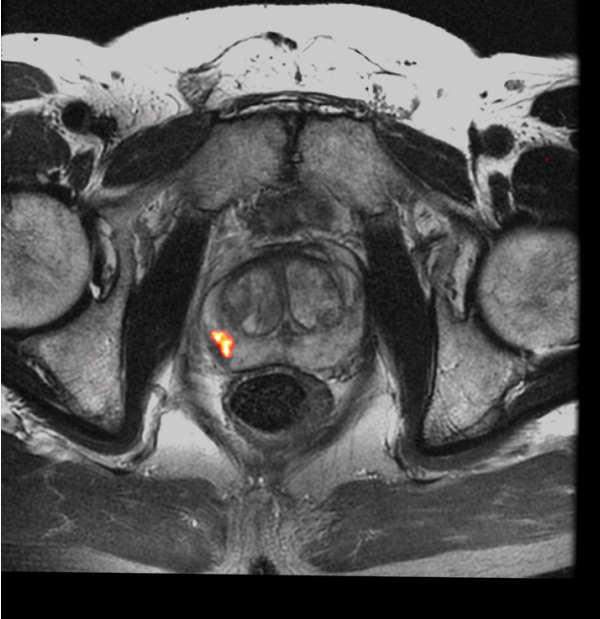


14



15

What does this mean for patients today?



- Safe, effective, precise therapy
- Fewer men with cancer recurrence
- Fewer men with metastatic cancer

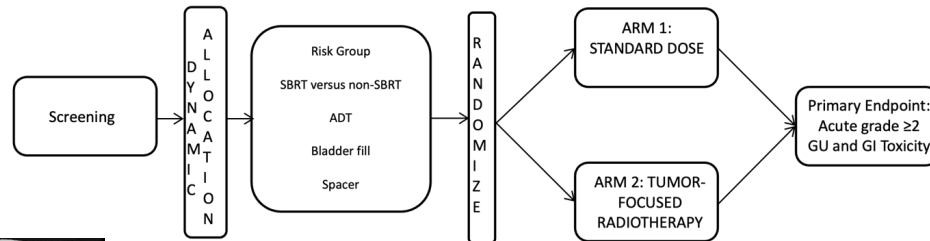
UC San Diego @TylerSbrt

16

RadTARGET trial: Radiation Dose Tailoring Guided by Enhanced Targeting



Enrolling at UCSD



Anna Dornisch



UC San Diego @TylerSbrt

17

FLAME trial analysis of local recurrences

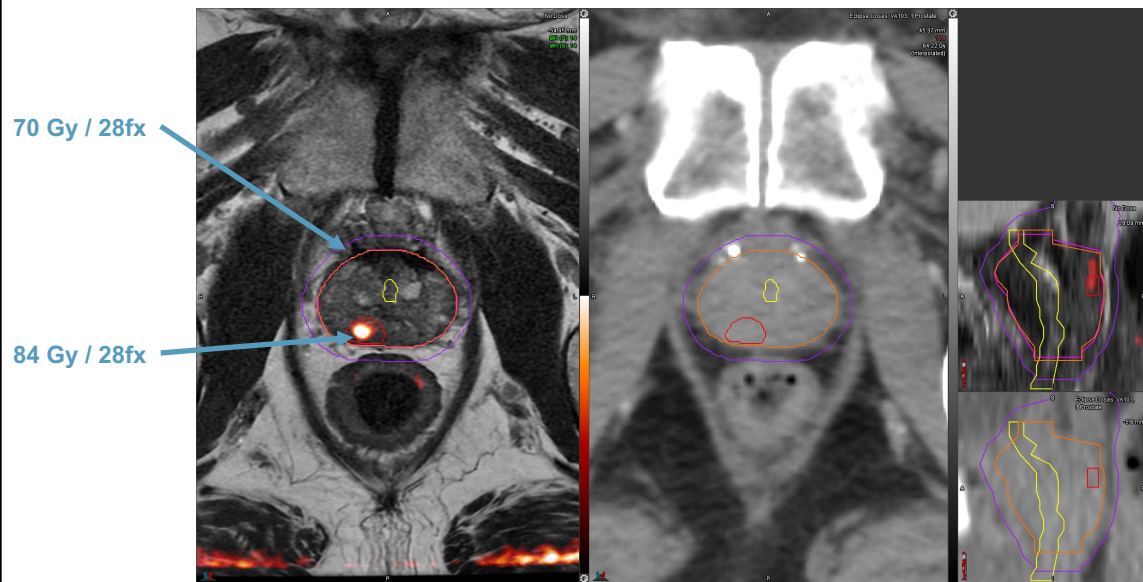
- Of 571 participants in both arms, 28 had intra-prostatic recurrence
 - 4.9% overall
 - 7.7% in standard arm
 - 2.7% in focal boost arm
- Imaging available to determine location of recurrence in 24 of the 28
 - 23 of 24 had recurrence in the GTV
 - Only 1 of 571 patients found to have recurred only in the non-GTV prostate



UC San Diego @TylerSbrt

18

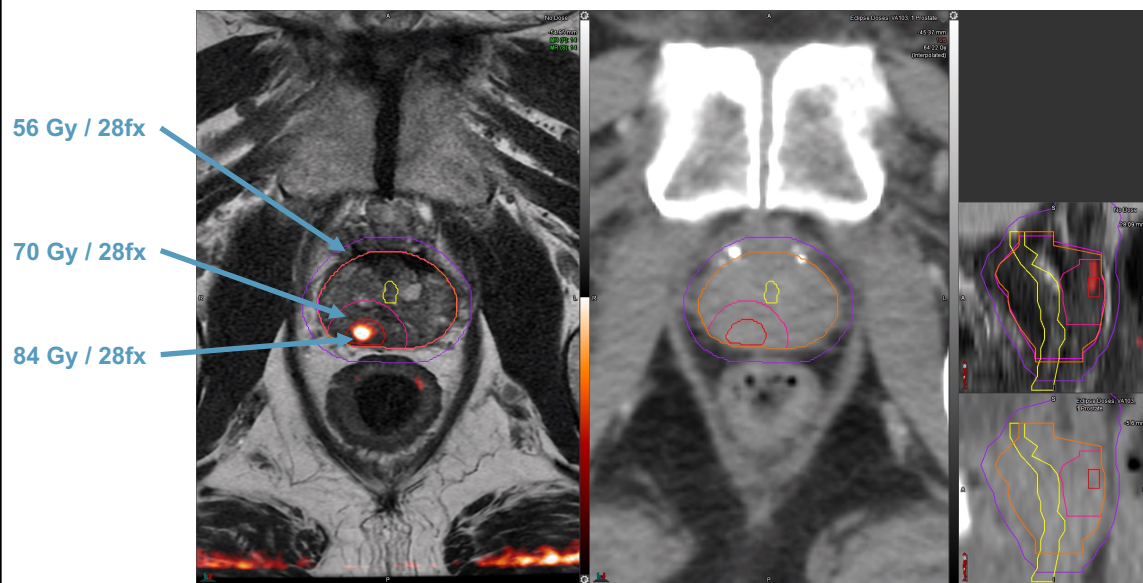
RadTARGET: standard radiotherapy



UC San Diego @TylerSbrt

19

RadTARGET: tumor-focused radiotherapy



UC San Diego @TylerSbrt

20

RadTARGET: tumor-focused radiotherapy



UC San Diego @TylerSbrt

21

Conclusions



- Advanced imaging → precise radiation therapy
- Reduce metastasis
- Reduce side effects



UC San Diego @TylerSbrt

22

Acknowledgements

Numerous brilliant collaborators

Generous fundors and donors

Study participants!



Prostate Cancer
Foundation
Curing Together.



CUREBOUND



U.S. Department of Defense



GE HealthCare



UNIVERSITY OF CALIFORNIA
RESEARCH INITIATIVES
Cancer Research Coordinating Committee



UC San Diego  @TylerSbrt