

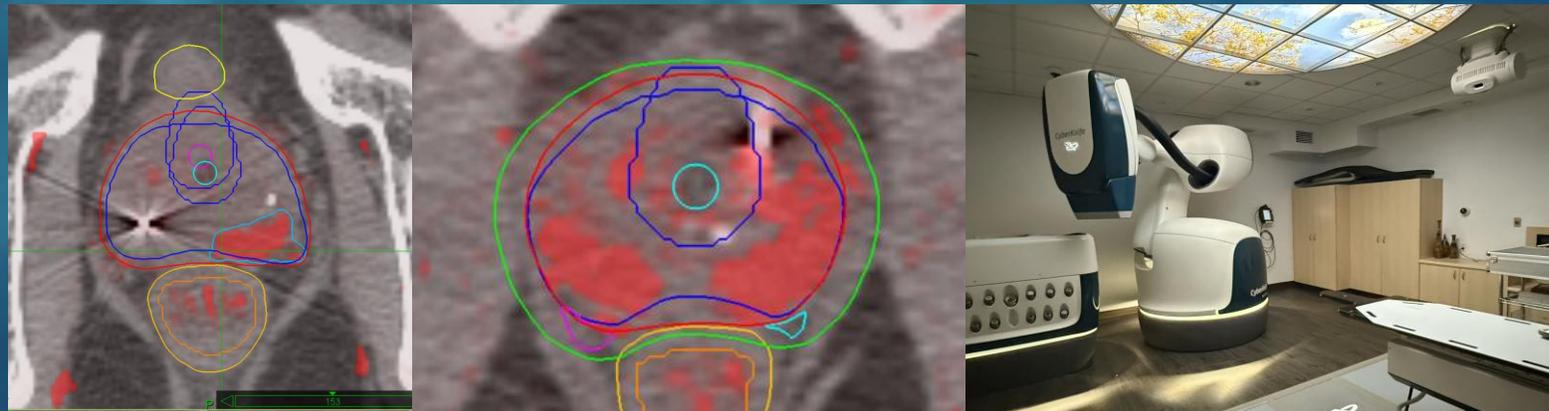
# CyberKnife SBRT as a Salvage Option for Recurrent Prostate Cancer

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SAN DIEGO



# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ▶ History of the problem

### ▶ NON-SBRT “potentially curative” options . .

▶ Salvage RP- Medicare-based SEER series of 18,317 radical prostatectomy cases reported that 0.5% of these were done for post-RT salvage (= n ~ 90)

▶ They had > double the mean . .

- ▶ Hospital stay length
- ▶ 30 day readmission rate
- ▶ 6 month medical expenditure rate

▶ They had 27 times the . .

- ▶ Death rate!!

Prasad SM, Gu X, Kowalczyk KJ, Lipsitz SR, Nguyen PL, Hu JC. Morbidity and costs of salvage vs. primary radical prostatectomy in older men. Urol Oncol. 2013 Nov;31 (8):1477-82

# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ▶ History of the problem

### ▶ NON-SBRT “potentially curative” options . . .

▶ LDR and HDR Brachytherapy - 45-78% 5 yr bDFS (similar w both modalities)

▶ General sense that HDR salvage has lower toxicity than LDR salvage . . .

▶ At least one LDR series has a 30% grade 3 or higher toxicity rate (1)

▶ Different LDR series described 33% rate of acute catheter dependence  $\geq$  2 weeks (2)

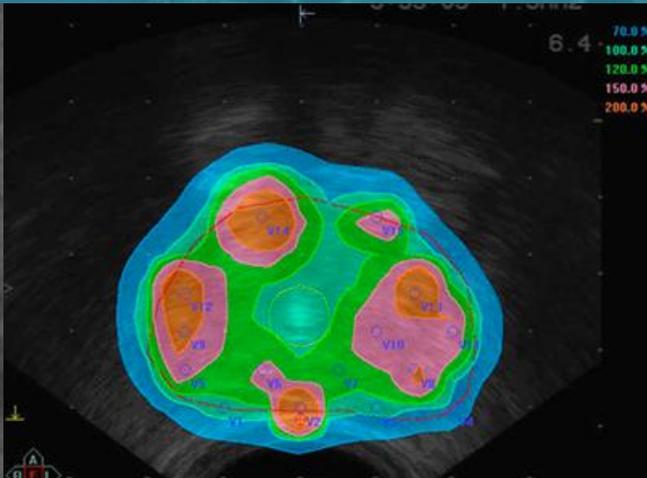
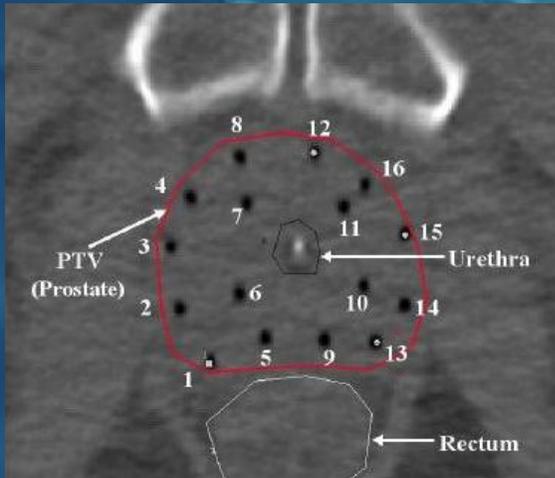
1. Nguyen PL, Chen MH, D'Amico AV, *et al.* Magnetic resonance image-guided salvage brachytherapy after radiation in select men who initially presented with favorable-risk prostate cancer: a prospective phase 2 study. *Cancer* 2007;110:1485-1492
2. Rose JN, Crook JM, Pickles T, Keyes M, Morris WJ. [Salvage low-dose-rate permanent seed brachytherapy for locally recurrent prostate cancer: Association between dose and late toxicity. \*Brachytherapy\*. 2015 May-Jun;14\(3\):342-9](#)
3. Kollmeier MA, McBride S, Taggar A, Anderson E, Lin M, Pei X, Weiji S, Voros L, Cohen G, Yamada Y, Zelefsky MJ. [Salvage brachytherapy for recurrent prostate cancer after definitive radiation therapy: A comparison of low-dose-rate and high-dose-rate brachytherapy and the importance of prostate-specific antigen doubling time. \*Brachytherapy\*. 2017 Nov - Dec;16\(6\):1091-1098](#)

# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ▶ History of the problem

▶ HDR Brachytherapy Local Salvage (HDR = The model after which we still practice SBRT)

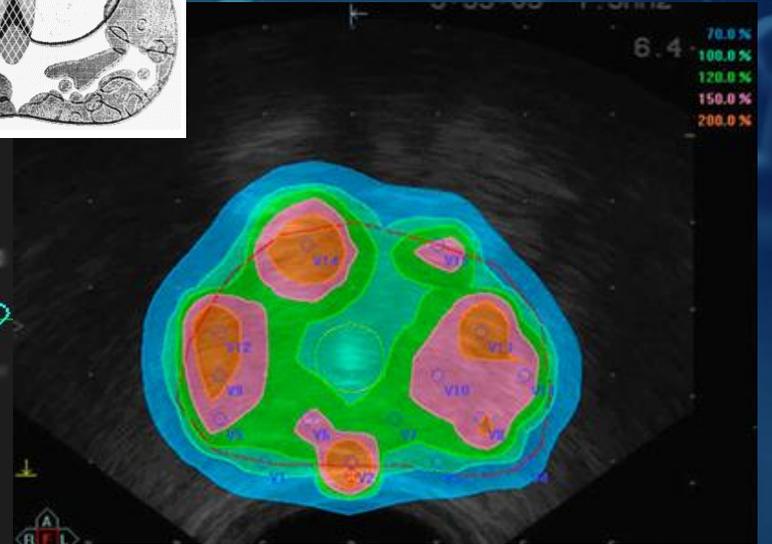
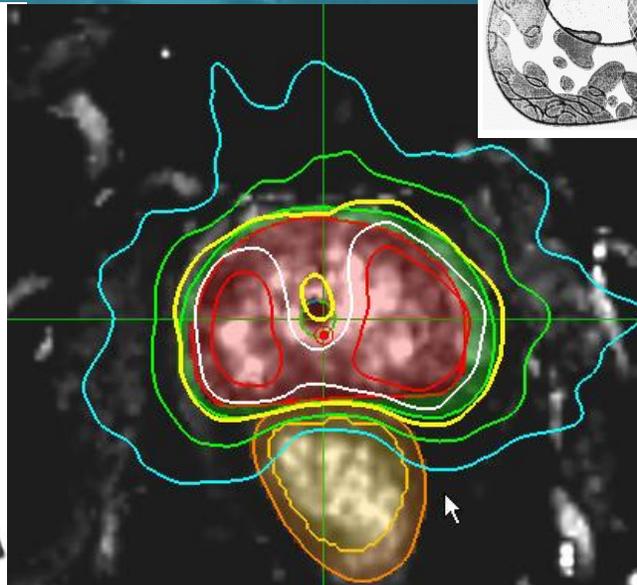
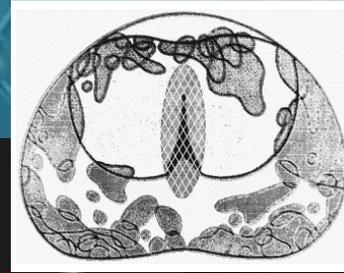
▶ UCSF Series – 36 Gy/6 fx – The model upon which we based our SALVAGE SBRT protocol



Lee B, Shinohara K, Weinberg V, et al. Feasibility of high-dose-rate brachytherapy salvage for local prostate recurrence after radiotherapy: the University of California-San Francisco experience. Int J Radiat Oncol Biol Phys. 2007 Mar 15;67 (4): 1106-12

# SBRT as a Salvage Option for Recurrent Prostate Cancer

- ▶ History of the problem
- ▶ SBRT Local Salvage



Fuller DB, Naitoh J, Lee, et al. Virtual HDR CyberKnife Treatment for Localized Prostatic Carcinoma: Dosimetry Comparison with HDR Brachytherapy and Preliminary Clinical Observations. Int J Radiat Oncol Biol Phys. 2008 Apr 1;70 (5): 1588-97

# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ▶ Protocol Description

### ▶ Eligibility Requirements

- ▶ > 2 years since their original RT course
- ▶ Biopsy proof of recurrence is mandated in the protocol
  - ▶ 2022 NOTE: Imaging is far better now vs. 2007, when this protocol was initially written
- ▶ Radiologically NED beyond the prostate
- ▶ No complications > grade 1 from their prior RT course

### ▶ IRB Approved – n = 50

- ▶ We achieved “n = 50” in 2018

# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ▶ Protocol Description

### ▶ SBRT Method

#### ▶ CyberKnife SBRT - "HDR-like"

##### ▶ Fiducial based

##### ▶ CT/MRI co-registered treatment planning

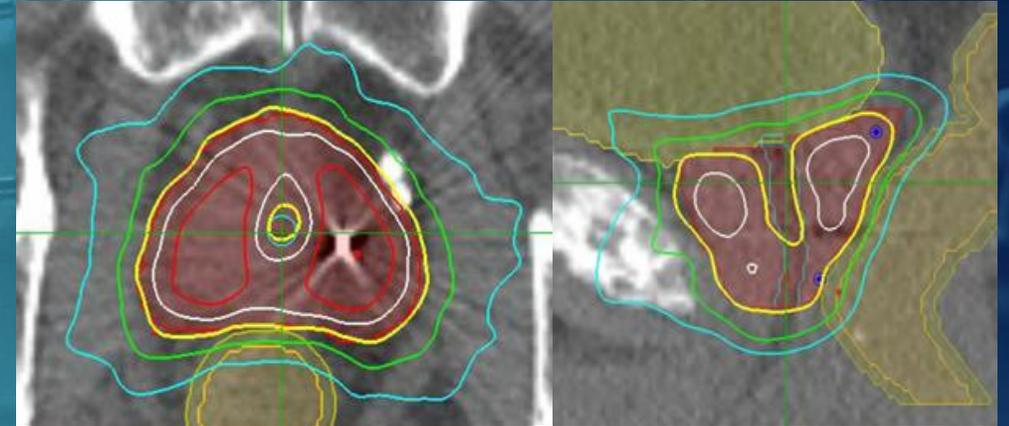
#### ▶ Treatment volume – Prostate (+) ECE (+) 0

#### ▶ 3,400cGy/5 fx

#### ▶ Lower total dose and smaller margins versus most of our de novo prostate SBRT experience – Designed to resemble USCF 3,600 cGy/6 fx regimen

##### ▶ The majority of our "de novo" SBRT pts have received 3,800 cGy/4 fx

#### ▶ These pts clearly have higher risk - "First do no harm" . .



# SBRT as a Salvage Option for Recurrent Prostate Cancer

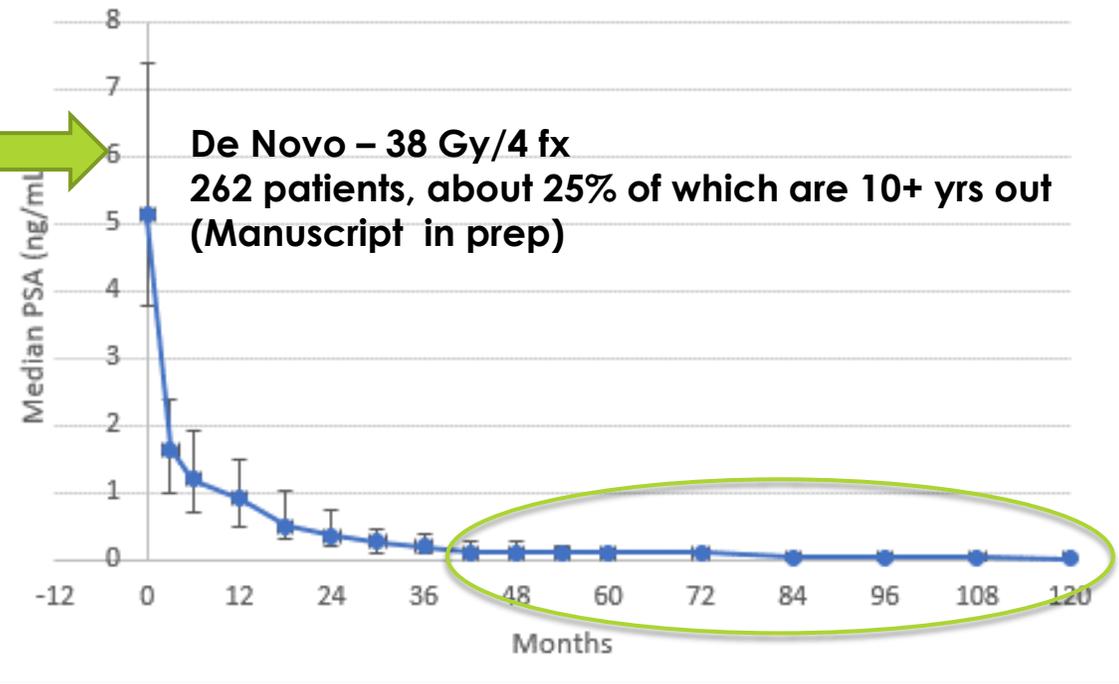
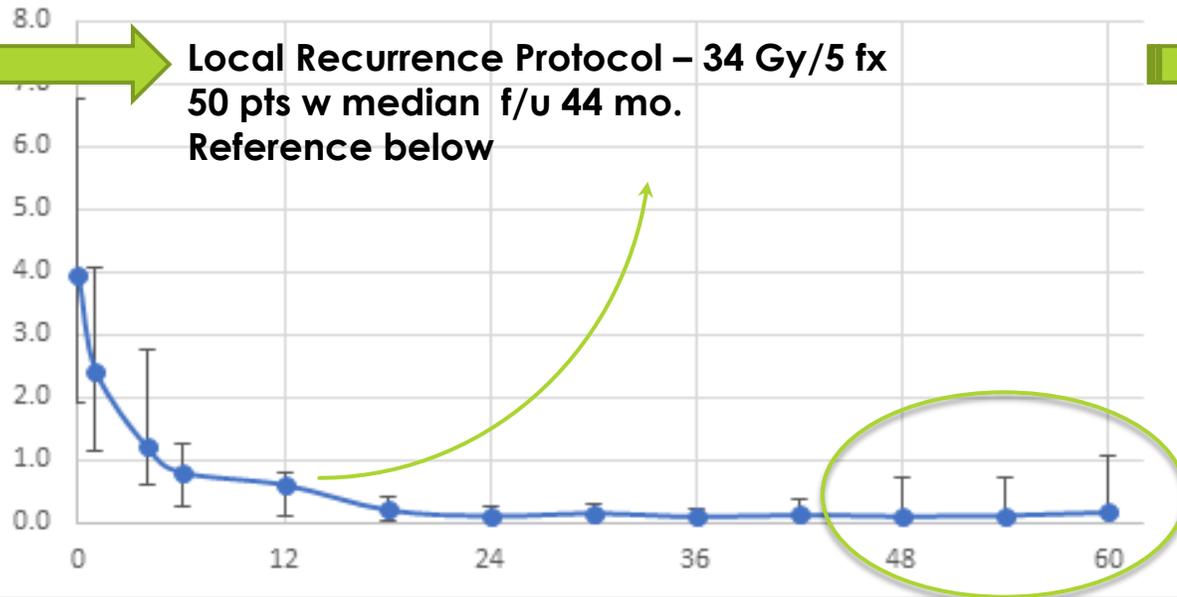
## ▶ Patient Characteristics:

- Median interval since prior RT – 98 months (32-241)
- Median f/u – 44 months (3-108)
- Prior modality
  - EBRT – 43 (Median prior EBRT dose – 75.6 Gy )
  - Other – 7 (brachy, SBRT, RP + EBRT)
- 7/50 had ADT (4 “neoadjuvant” and 3 w localized CRPC still on ADT)
- So primarily, a straight SBRT salvage series (ADT was “discouraged” but not prohibited)

# SBRT as a Salvage Option for Recurrent Prostate Cancer

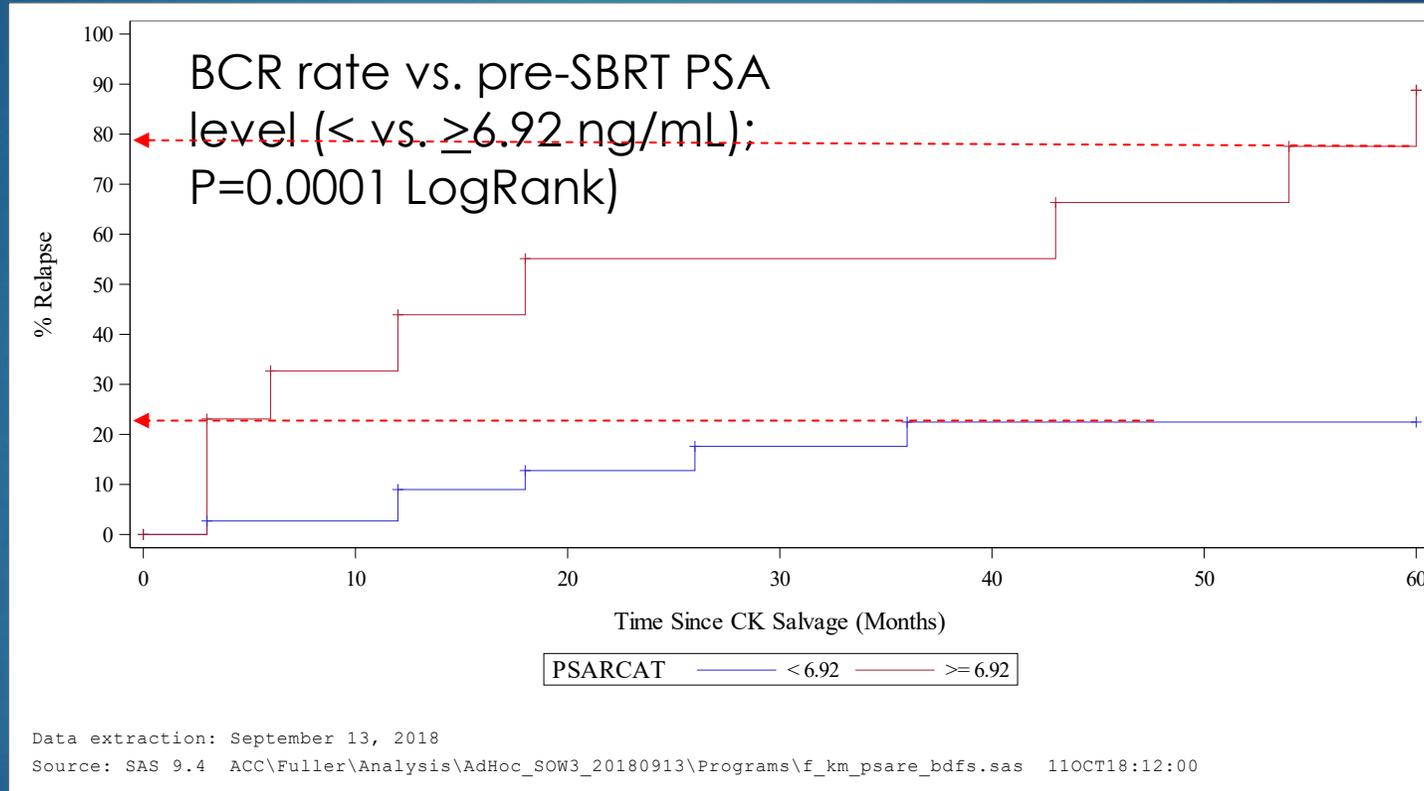
## ▶ RESULTS:

median PSA excluding relapses at call



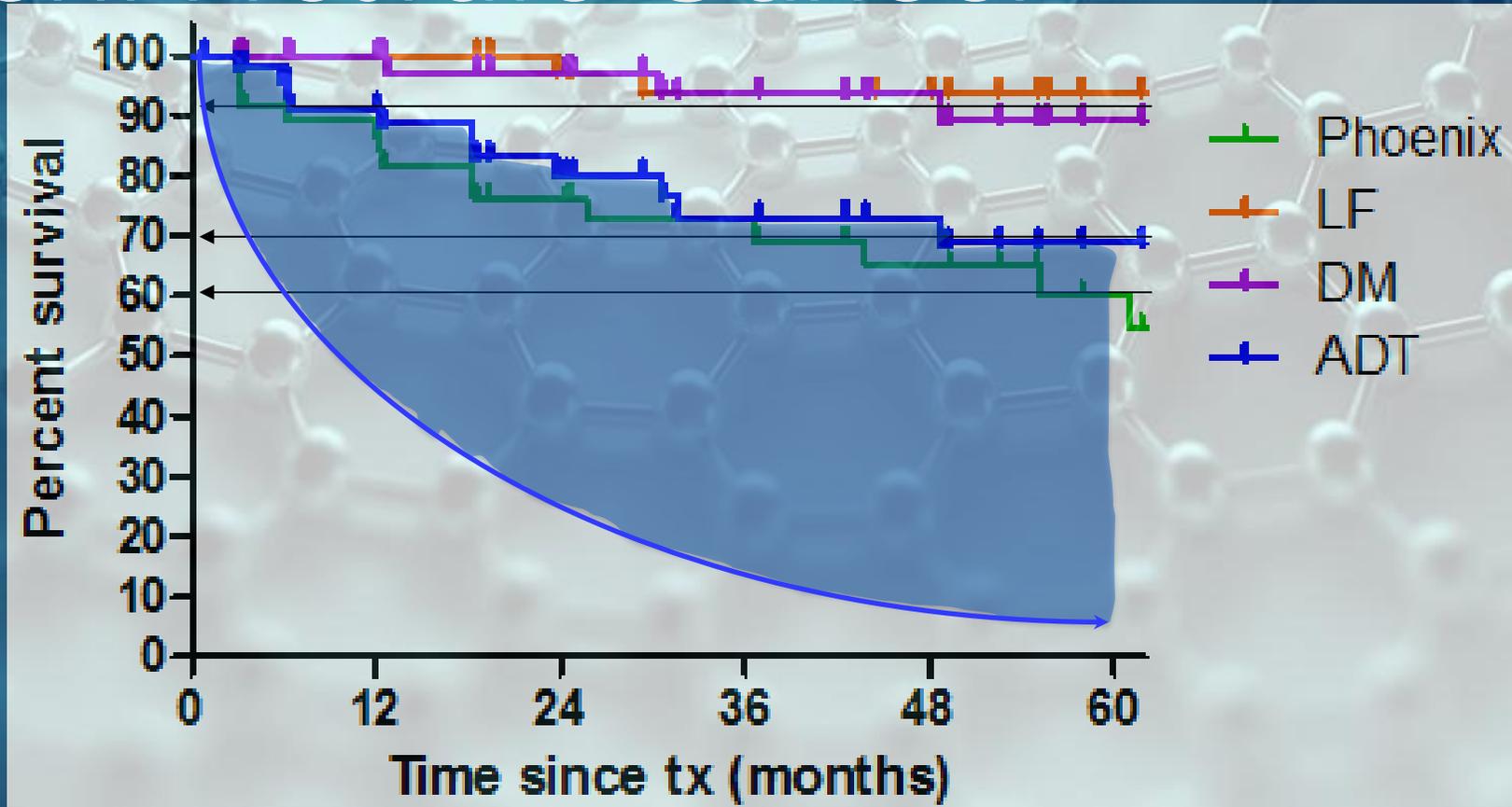
# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ► RESULTS:



# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ▶ RESULTS:



Fuller D (1), Wurzer J (2), Shirazi R, Bridge S, Law J, Crabtree T, Mardirossian G. Retreatment for Local Recurrence of Prostatic Carcinoma After Prior Therapeutic Irradiation: Efficacy and Toxicity of HDR-like SBRT [International Journal of Radiation Oncology Biology Physics](#), 106(2), 291-299, Feb 1, 2020

(1) Genesis Healthcare Partners – San Diego; (2) Atlanticare - New Jersey

# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ► Complications

► Grade 3+ GU, whole series - **8%**

► Grade 3+ GU, limited to post-standard EBRT relapse cases – **3%**

► This rate is actually similar to primary RT

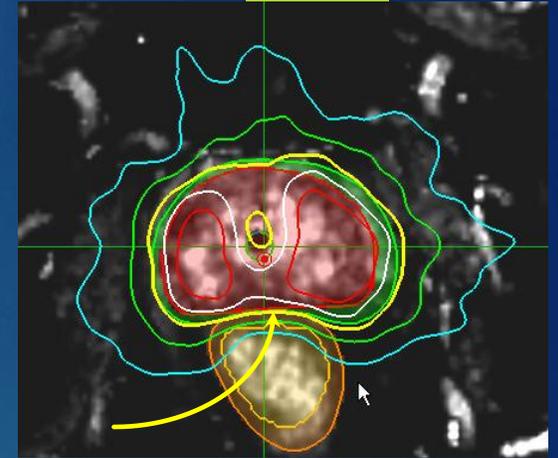
► Higher complication rate post-brachy, post combined RP/RT – **40%**

► Grade 2+ GI – **0%**; all cases

► All cases enrolled PRE-SpaceOAR

► NOTE: Grade 3 GU toxicity post-salvage radical prostatectomy – **35%**

► (City of Hope salvage RP series)



Yuh B, Ruel N, Muldrew S, Mejia R, Novara G, Kawachi M, Wilson T. Complications and outcomes of salvage robot-assisted radical prostatectomy: a single-institution experience. BJU Int. 2014 May;113(5):769-76

# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ▶ Complications

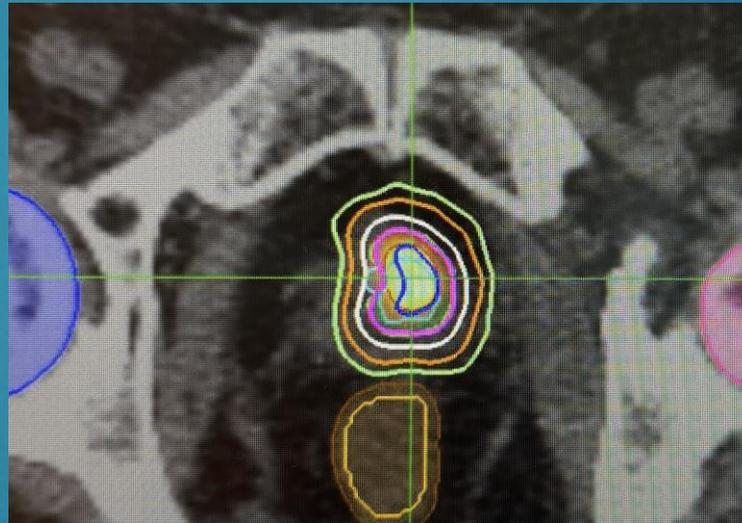
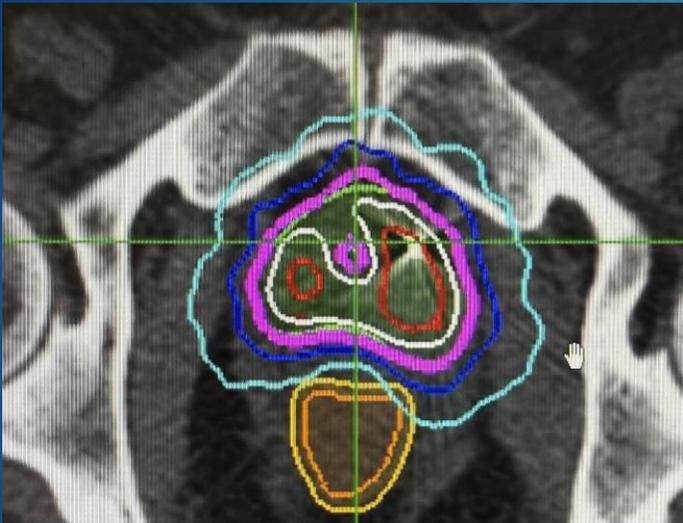
- ▶ From a toxicity point, zero mm margin expansion is the correct answer
- ▶ This outcome virtually completely negates 2 of the most “fingernails on the blackboard” statements in human history:
  - ▶ “We can’t radiate a radiation failure” . . .
  - ▶ “If you have radiotherapy, you can’t have RP afterward” . .

## ▶ CyberKnife wins this space:

- ▶ non-invasive and much lower rate of retention vs. brachytherapy. .
- ▶ Smaller margins and hotter in the target volume, vs. other LINACs . . .

# SBRT as a Salvage Option for Localized Recurrent Prostate Cancer

► Contemporary Case Hx # 1 . . . CK Prostate 2019, w delayed relapse . .



2019 -----> 2024

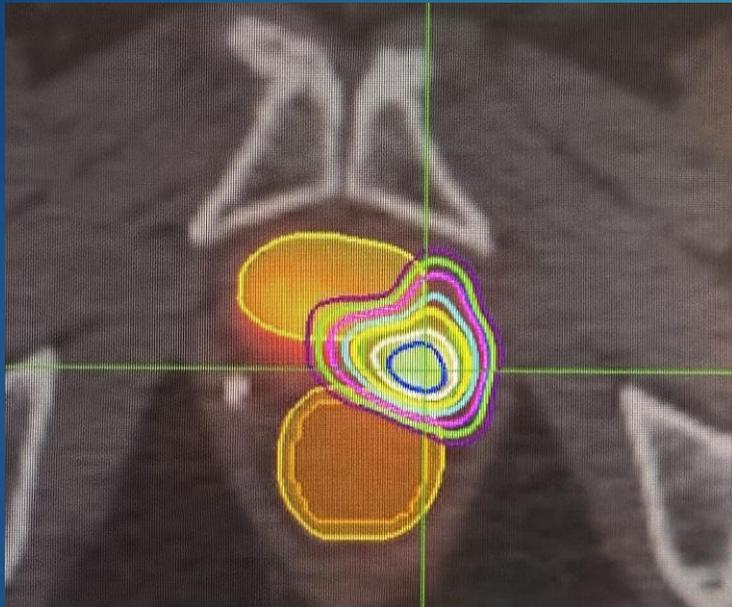
“If you do radiotherapy first you can’t have a radical prostatectomy later”  
Quack quack . . .

**Diagnostic Studies History** (Donald B. Fuller, MD; 10/27/2025)

<b>Labs - PSA</b>	9/14/2018 - 5.61 ng/mL
	4/12/2019 - CK SBRT
	7/05/2019 - 6.03 ng/mL
	10/14/2019 - 2.93 ng/mL
	4/14/2020 - 1.3 ng/mL
	10/5/2020 - 1.02 ng/mL
	4/6/2021 - 0.91 ng/mL
	4/27/2022 - 0.7 ng/mL
	4/12/2023 - 2.48 ng/mL
	7/15/2023 - 2.21 ng/mL
	10/25/2023 - 2.5 ng/mL
	1/8/2024 - 3.33 ng/mL
	3/22/2024 - Focal CK SBRT retreatment, partial prostate
	9/4/2024 - 0.74 ng/mL
	3/14/2025 - 0.09 ng/mL
	9/23/2025 - 0.07 ng/mL
<b>Labs - Testosterone</b>	7/5/2019 - 154.36 ng/dL
	10/14/2019 - 285.86 ng/dL
	4/14/2020 - 297.01 ng/dL
	10/5/2020 - 403.84 ng/dL
	4/6/2021 - 390.45 ng/dL
	4/12/2023 - 346.26 ng/dL
	7/15/2023 - 309.99 ng/dL
	10/25/2023 - 381.54 ng/dL
	1/12/2024 - 358.66 ng/dL
	9/4/2024 - 316.14 ng/dL
	3/14/2025 - 215.86 ng/dL
	9/23/2025 - 173.34 ng/dL

# SBRT as a Salvage Option for Localized Recurrent Prostate Cancer

- ▶ Contemporary Case Hx # 2 . . R P 2003 (Chicago), pelvic RT 2004 . . w delayed relapse . .



<b>Labs - Testosterone</b>	8/2/2024 - 220 ng/dL
	11/21/2024 - 146 ng/dL
	5/23/2025 - 190 ng/dL
	11/5/2025 - 149 ng/dL
<b>Labs - PSA</b>	2003 - Radical Prostatectomy (Chicago)
	1/15/2021 - 1.1 ng/mL
	1/31/2023 - 1.3 ng/mL
	8/3/2023 - 1.7 ng/dL
	2/6/2024 - 1.8 ng/mL
	5/3/2024 - Focal RP bed CyberKnife SBRT
	8/2/2024 - 0.4 ng/mL
	11/21/2024 - 0.2 ng/mL
	5/23/2025 - 0.077 ng/mL
	11/5/2025 - <0.1 ng/mL

→ Prostate Bed RT 2004

“Can’t radiate a radiation failure”  
Quack quack . . .

Toxicity (2025) is “Grade 0”  
Key to that outcome . . Keep it FOCAL

# SBRT as a Salvage Option for Recurrent Prostate Cancer

- ▶ Current thinking based on nearly 20 years of experience:
- ▶ Whole prostate “HDR-like” SBRT salvage of std post-3DCRT/IMRT local relapse is effective.
  - ▶ Appears particularly effective if used > 5 yrs post-initial RT and PSA < 7 ng/mL at salvage
  - ▶ Has performed similarly versus the UCSF HDR salvage series, upon which it was based

# SBRT as a Salvage Option for Recurrent Prostate Cancer

## ▶ Current thinking based on nearly 20 years of experience:

- ▶ What have I learned since (2020) publication?
  - ▶ GU toxicity may continue to “evolve” well beyond 5 years
    - ▶ At least some of our pts that were good at 5 years . . are incontinent at 10 years
  - ▶ GI toxicity does not “evolve” – what you see at 2 years is what you get . .
  - ▶ ED . . ~ 10% maintain good potency after “double radiated” prostate . .

### **History of Present Illness** (Donald B. Fuller MD; 10/20/2025 3:31 PM)

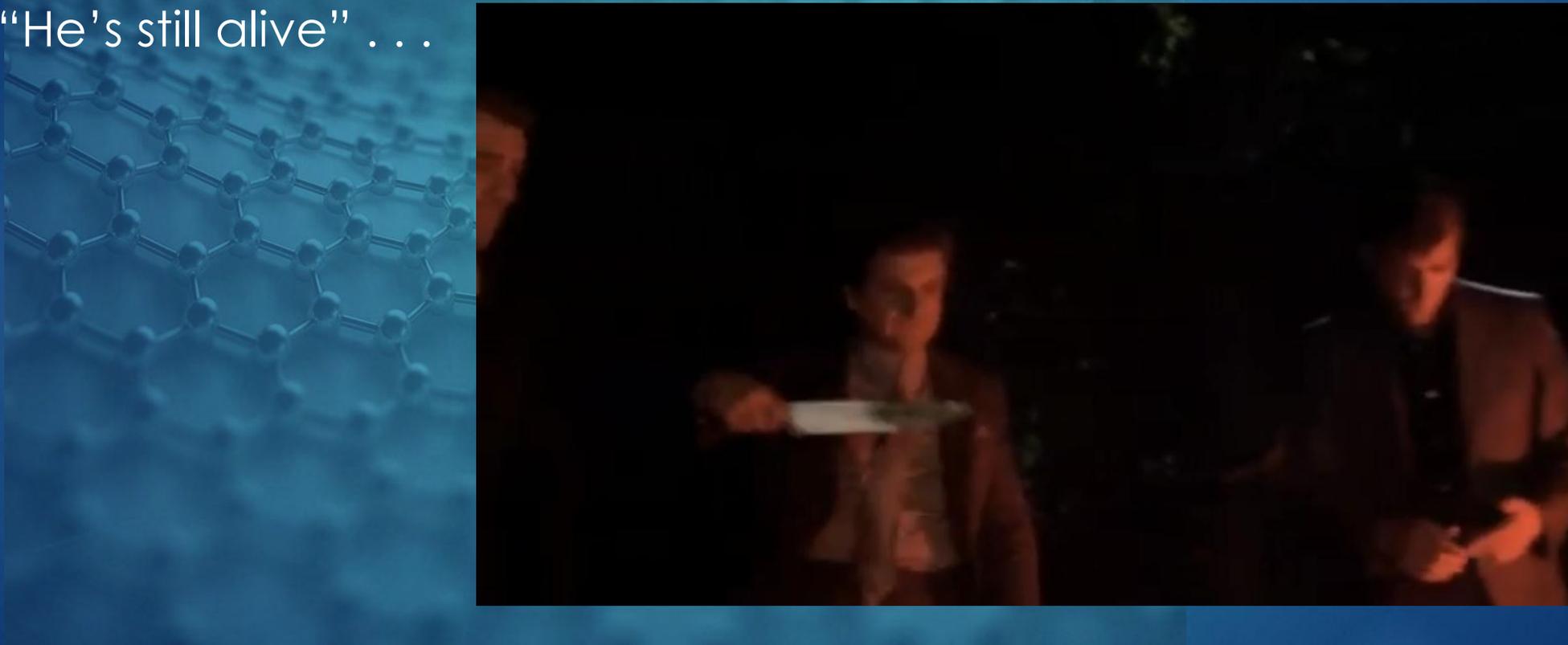
The patient is a 82 year old male who presents today for a phone follow up. The patient completed radiation to the prostate (CyberKnife SBRT prostate local recurrence protocol) on 9/29/2017 and received 3,400 cGy in 5 fractions. Patient's SHIM Score is 2 /25. Patient's AUA Symptom Score is 25 /35 (w severe incontinence; 5-6 PPD). Symptoms since the last visit have included ever worsening urinary incontinence now - up to 5-6 pads/day, unfortunately. Note for "Radiation Oncology follow up visit": He will soon be seeing a new urologist at his local academic center; little benefit from recent std community urologic evaluations to date, unfortunately - in fact he says he thinks he got worse, after his last cystoscopy procedure

# SBRT as a Salvage Option for Recurrent Prostate Cancer

- ▶ Current thinking based on nearly 20 years of experience:
- ▶ What is different versus the period of our published result? IMAGING!!
  - ▶ Restriction Spectrum Imaging (RSI) MRI; PSMA PET/CT . .
  - ▶ Typical current approach
    - ▶ SBRT salvage limited to Image fusion-defined relapse only, w 2 mm margin – 40 Gy/5 fx
      - ▶ “Whole prostate” SBRT salvage is now rare, in our own practice, even though that’s what we published
- ▶ I would no longer consider biopsy proof of local recurrence mandatory, if contemporary imaging makes a compelling case for “prostate only” relapse

# SBRT as a Salvage Option for Recurrent Prostate Cancer

- ▶ Current thinking based on nearly 20 years of experience:
- ▶ “He’s still alive” ...



Thank You!

