How Does Radiobiology Guide Treatment Options

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How Do Trade-offs Guide Treatment Options

Low and Intermediate Prostate Cancer

Efficacy

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Disclosures

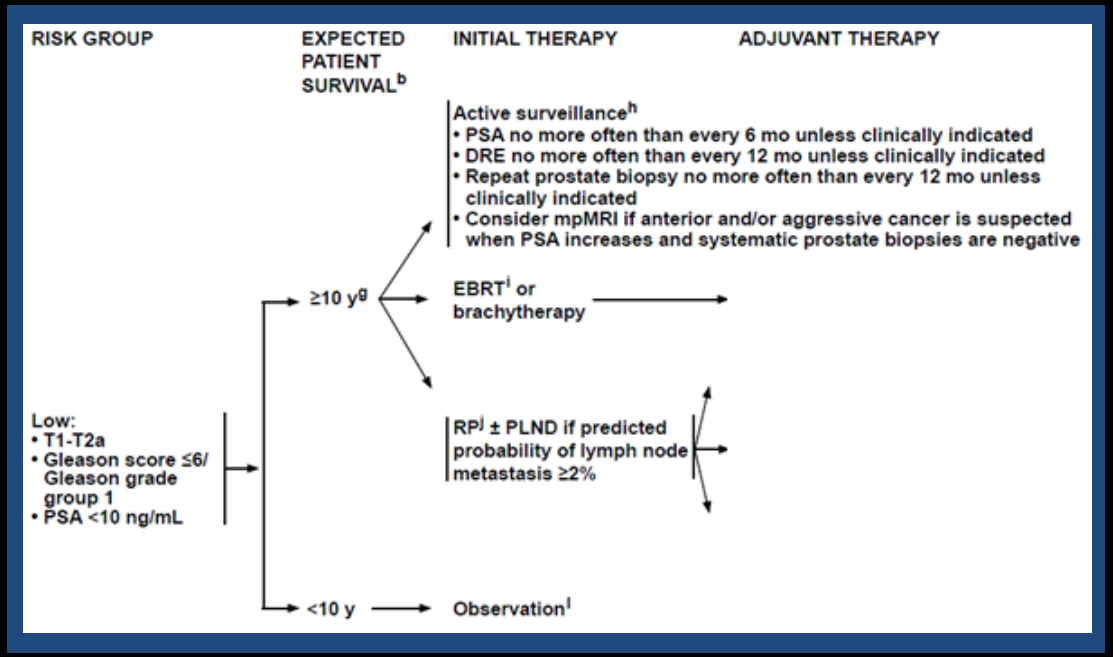
Accuray, Advisory Board

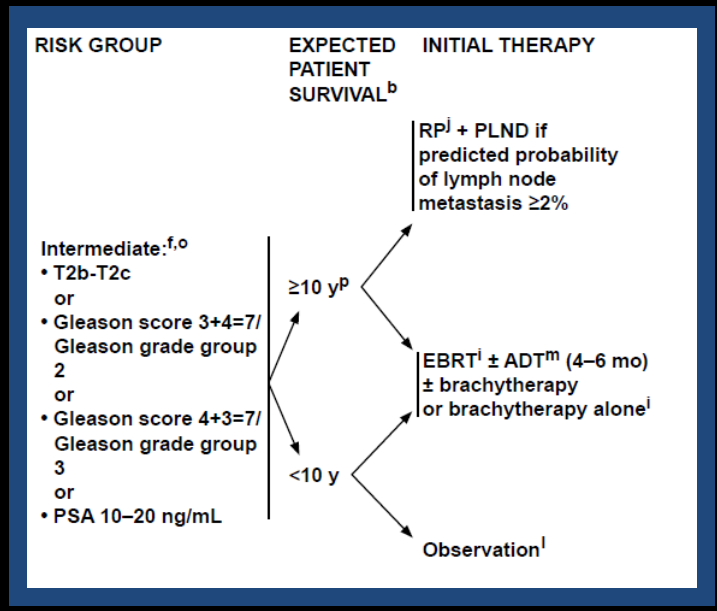
Agenda

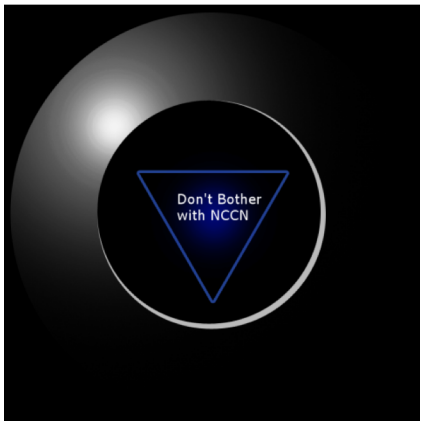
- Macro Level Trends and Tx Comparisons
  - PIVOT
  - ProtecT
- Tx Options
  - IMRT
  - Brachy
  - Hypofx
  - SBRT
    - Is SBRT Data Mature?
- Physician and Patient Selection
  - SBRT less operator dependent
  - One Size Doesn’t Fit All

National Comprehensive Cancer Network®

NCCN Guidelines Version 2.2017
Prostate Cancer



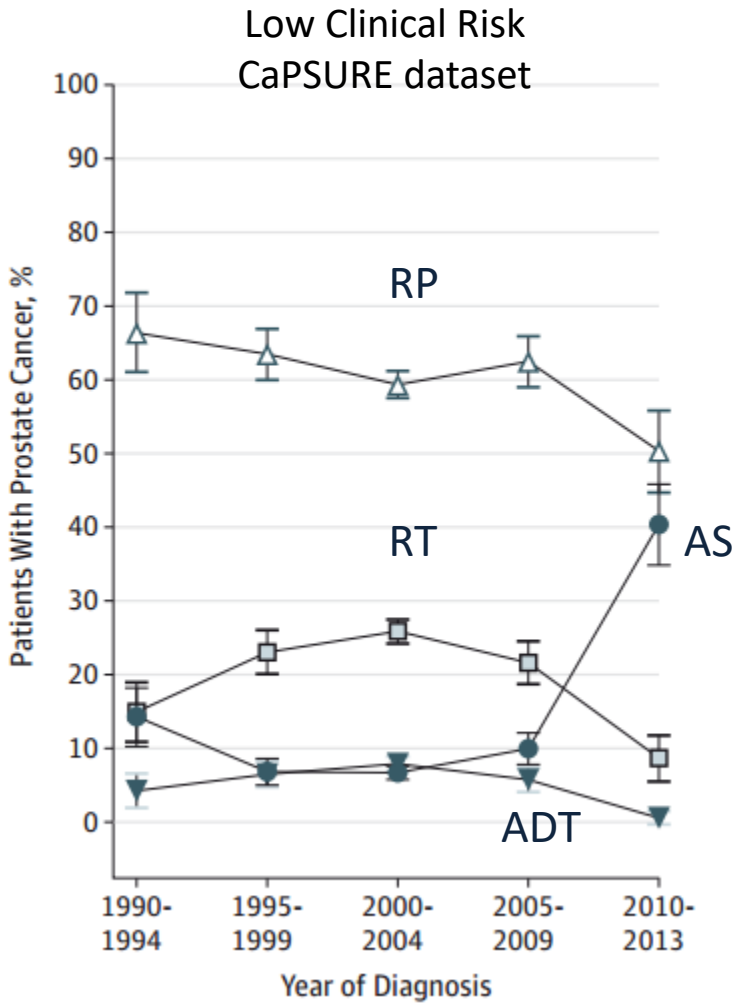




- Reflect Tx Heterogeneity
- All [perhaps not equally, depending on scenario] good options

Active Surveillance

- *Updated trends*: increasing utilization of AS as initial management strategy
- From nearly 10% in 2009 to currently near 40%



Cooperberg et al, JAMA 2015;314(1):80-82

Cooperberg MR and Carroll PR. JAMA. 2015 Jul 7;314(1):80-2.

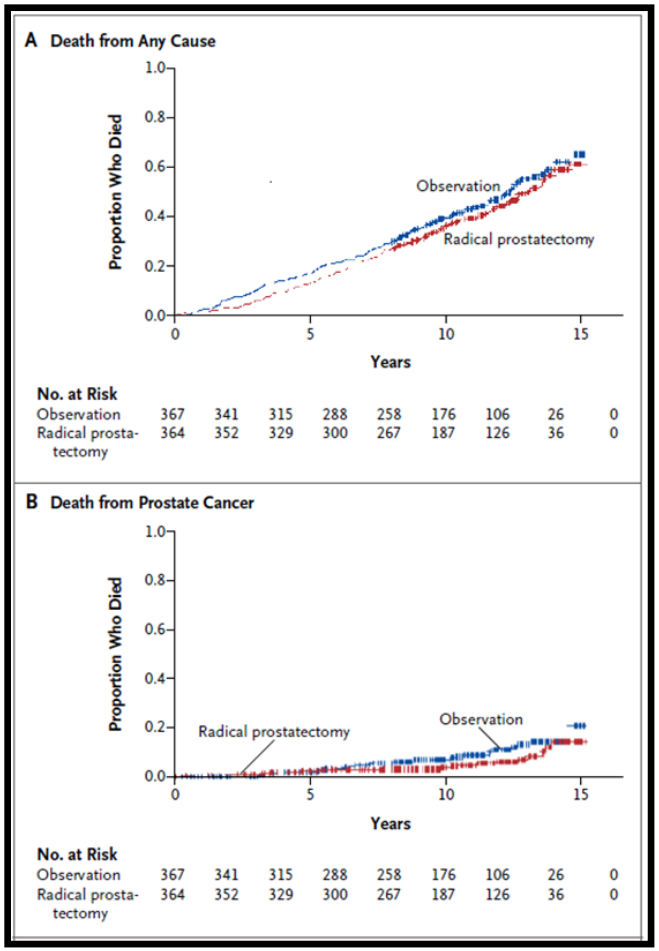
- 731 men w prostate cancer randomized to observation vs. surgery

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JULY 19, 2012 VOL. 367 NO. 3

Radical Prostatectomy versus Observation for Localized Prostate Cancer

Timothy J. Wilt, M.D., M.P.H., Michael K. Brawer, M.D., Karen M. Jones, M.S., Michael J. Barry, M.D., William J. Aronson, M.D., Steven Fox, M.D., M.P.H., Jeffrey R. Gingrich, M.D., John T. Wei, M.D., Patricia Gilhooly, M.D., B. Mayer Grob, M.D., Imad Nsouli, M.D., Padmini Iyer, M.D., Ruben Cartagena, M.D., Glenn Snider, M.D., Claus Roehrborn, M.D., Ph.D., Roohollah Sharifi, M.D., William Blank, M.D., Parikshit Pandya, M.D., Gerald L. Andriole, M.D., Daniel Culkin, M.D., and Thomas Wheeler, M.D., for the Prostate Cancer Intervention versus Observation Trial (PIVOT) Study Group



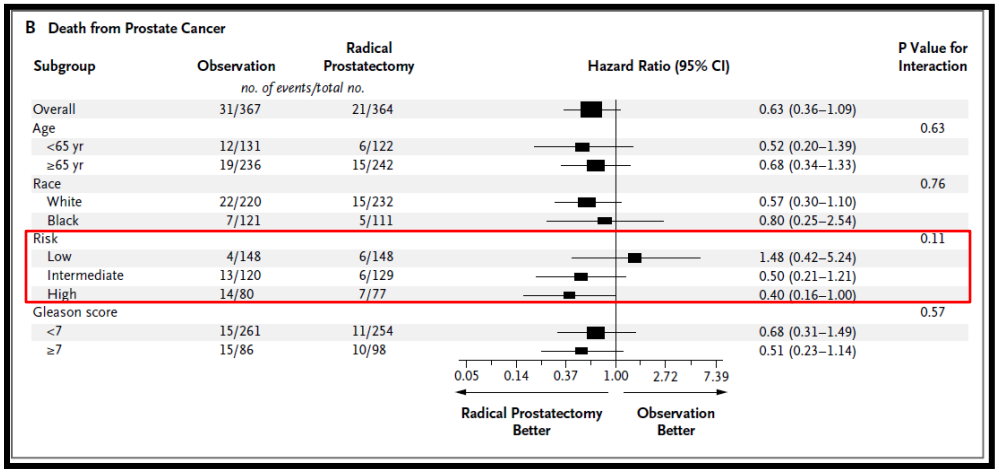


Table 2. Patient-Reported Urinary, Erectile, and Bowel Dysfunction at 2 Years, According to Study Group.*

Dysfunction	Radical Prostatectomy	Observation	P Value
	no./total no. (%)		
Urinary incontinence†	49/287 (17.1)	18/284 (6.3)	<0.001
Erectile dysfunction‡	231/285 (81.1)	124/281 (44.1)	<0.001
Bowel dysfunction§	35/286 (12.2)	32/282 (11.3)	0.74

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 13, 2016 VOL. 375 NO. 15

10-Year Outcomes after Monitoring, Surgery, or Radiotherapy for Localized Prostate Cancer

F.C. Hamdy, J.L. Donovan, J.A. Lane, M. Mason, C. Metcalfe, P. Holding, M. Davis, T.J. Peters, E.L. Turner, R.M. Martin, J. Oxley, M. Robinson, J. Staffurth, E. Walsh, P. Bollina, J. Catto, A. Doble, A. Doherty, D. Gillatt, R. Kockelbergh, H. Kynaston, A. Paul, P. Powell, S. Prescott, D.J. Rosario, E. Rowe, for the ProtecT Study Group*

- 1643 **European** men Randomized
  - Active surveillance v. Surgery v. Radiation
- 10-year Prostate Cancer-Specific Mortality
  - No Difference between groups (and low)
- Active surveillance
  - By 3 years, 25% patients received Surgery/Radiation
    - By 10 years, over half
  - Metastatic disease rate 2-3x's higher
    - but still low
- Critiques:
  - 10 years→ not enough time
    - met dz may translate to decreased OS
  - ONLY 1% patients with African/Caribbean ancestry

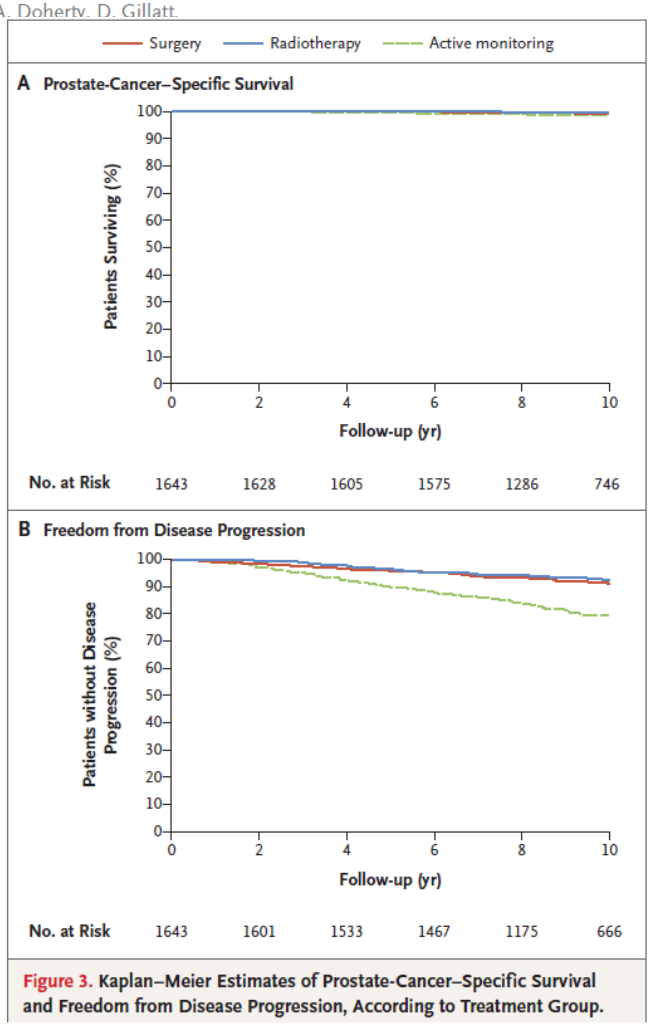


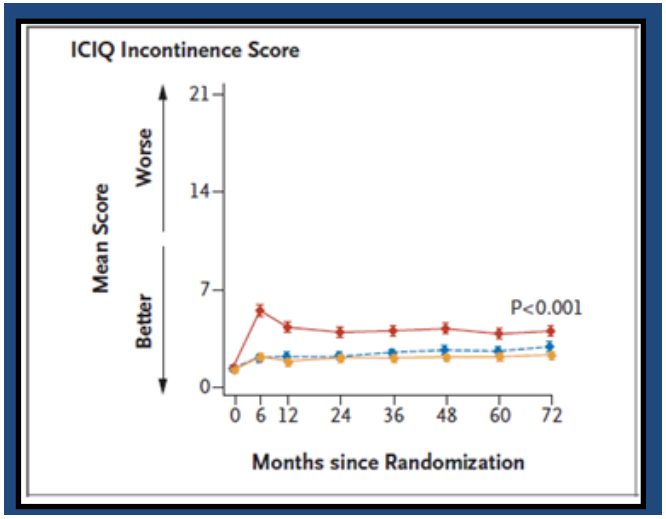
Figure 3. Kaplan–Meier Estimates of Prostate-Cancer–Specific Survival and Freedom from Disease Progression, According to Treatment Group.

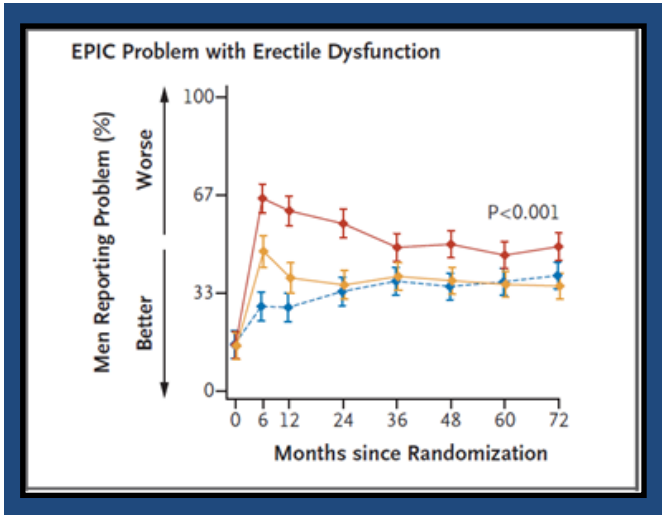
The NEW ENGLAND JOURNAL of MEDICINE

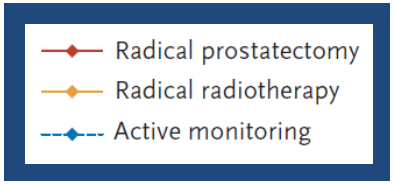
ORIGINAL ARTICLE

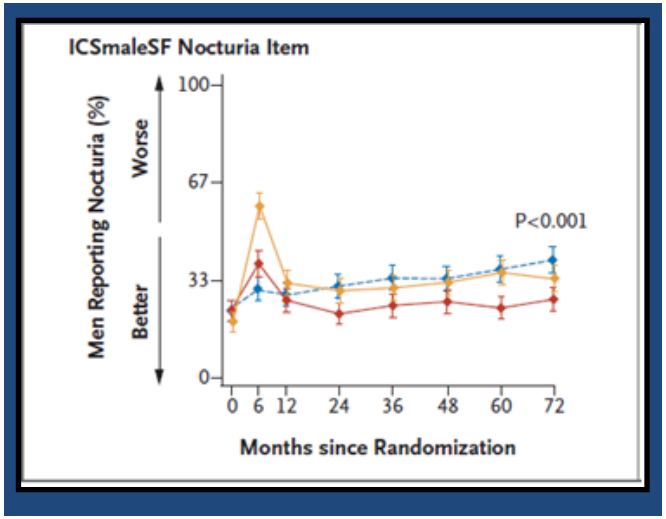
Patient-Reported Outcomes after Monitoring, Surgery, or Radiotherapy for Prostate Cancer

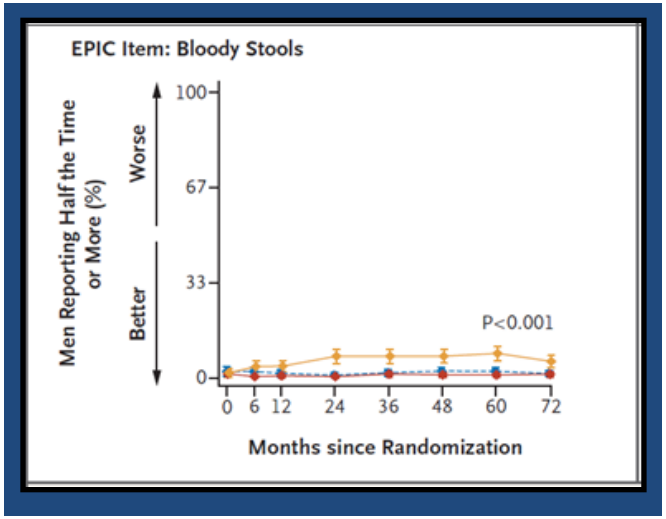
J.L. Donovan, F.C. Hamdy, J.A. Lane, M. Mason, C. Metcalfe, E. Walsh, J.M. Blazeby, T.J. Peters, P. Holding, S. Bonnington, T. Lennon, L. Bradshaw, D. Cooper, P. Herbert, J. Howson, A. Jones, N. Lyons, E. Salter, P. Thompson, S. Tidball, J. Blaikie, C. Gray, P. Bollina, J. Catto, A. Doble, A. Doherty, D. Gillatt, R. Kockelbergh, H. Kynaston, A. Paul, P. Powell, S. Prescott, D.J. Rosario, E. Rowe, M. Davis, E.L. Turner, R.M. Martin, and D.E. Neal, for the ProtecT Study Group*











Agenda

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  - Hypofx
  - SBRT
    - Is SBRT Data Mature?

- Physician and Patient Selection
  - SBRT less operator dependent
  - One Size Doesn’t Fit All

Isotope
I-125
Pd-103
Cs-131

Int. J. Radiation Oncology Biol. Phys., Vol. 73, No. 2, pp. 341–346, 2009

0360-3016/09/$–see front matter

ELSEVIER

doi:10.1016/j.ijrobp.2008.04.038

CLINICAL INVESTIGATION **Prostate**

MULTICENTER ANALYSIS OF EFFECT OF HIGH BIOLOGIC EFFECTIVE DOSE ON BIOCHEMICAL FAILURE AND SURVIVAL OUTCOMES IN PATIENTS WITH GLEASON SCORE 7–10 PROSTATE CANCER TREATED WITH PERMANENT PROSTATE BRACHYTHERAPY

NELSON N. STONE, M.D.,* LOUIS POTTERS, M.D.,† BRIAN J. DAVIS, M.D., PH.D.,‡ JAY P. CIEZKI, M.D.,§ MICHAEL J. ZELEFSKY, M.D.,¶ MACK ROACH, M.D.,‖ KATSUTO SHINOHARA, M.D.,‖ PAUL A. FEARN, B.A.,¶ MICHAEL W. KATTAN, PH.D.,§ AND RICHARD G. STOCK, M.D.*

*Mount Sinai School of Medicine, New York, NY; †North Shore Long Island Jewish Health System, New Hyde Park, NY; ‡Mayo Clinic, Rochester, MN; §Cleveland Clinic, Cleveland, OH; ¶Memorial Sloan-Kettering Cancer Center, New York, NY; and ‖University of California, San Francisco, San Francisco, CA

Table 2. Five-year biochemical freedom from failure*

Variable	bFFF (%)	*p*
PSA		
≤10	86	
10.1–20	78	
>20	55.5	<0.001
Stage		
T1c-T2a	82.1	
T2b	78	
T2c	77	
T3	58.6	0.140
Gleason score		
7	83.7	
8–10	68.6	<0.001
BED (Gy)		
<200	76.4	
200–220	83.5	
>220	88.3	<0.001

Abbreviations: bFFF = biochemical freedom from failure; other abbreviations as in Table 1.
* Five-year bFFF for entire cohort was 80%.

Table 3. Five-year biochemical freedom from failure for high-grade disease by biologic equivalent dose in patients with PSA >20 ng/mL

Gleason score	BED dose (Gy)	*n*	bFFF (%)	*p*
7–10	<200	56	44.1	
	200–220	32	60	
	>220	31	82	0.017
7–10	≤220	88	48.8	
	>220	31	82.0	0.007
7	<200	32	56.1	
	200–220	21	52.9	
	>220	23	80.6	0.187
7	≤220	53	54.3	
	>220	23	80.6	0.073
8–10	<200	24	26.7	
	200–220	11	71.6	
	>220	8	85.7	0.027
8–10	≤220	35	48.8	
	>220	8	85.7	0.050

Int. J. Radiation Oncology Biol. Phys., Vol. 76, No. 4, pp. 1061–1065, 2010

0360-3016/10/$–see front matter

ELSEVIER

doi:10.1016/j.ijrobp.2009.03.031

CLINICAL INVESTIGATION **Prostate**

POSTOPERATIVE NOMOGRAM PREDICTING THE 9-YEAR PROBABILITY OF PROSTATE CANCER RECURRENCE AFTER PERMANENT PROSTATE BRACHYTHERAPY USING RADIATION DOSE AS A PROGNOSTIC VARIABLE

LOUIS POTTERS, M.D.,* MACK ROACH, III, M.D.,† BRIAN J. DAVIS, M.D., PH.D.,‡ RICHARD G. STOCK, M.D.,§ JAY P. CIEZKI, M.D.,‖ MICHAEL J. ZELEFSKY, M.D.,¶ NELSON N. STONE, M.D.,# PAUL A. FEARN, B.A.,** CHANGHONG YU, M.S.,†† KATSUTO SHINOHARA, M.D.,† AND MICHAEL W. KATTAN, PH.D.††

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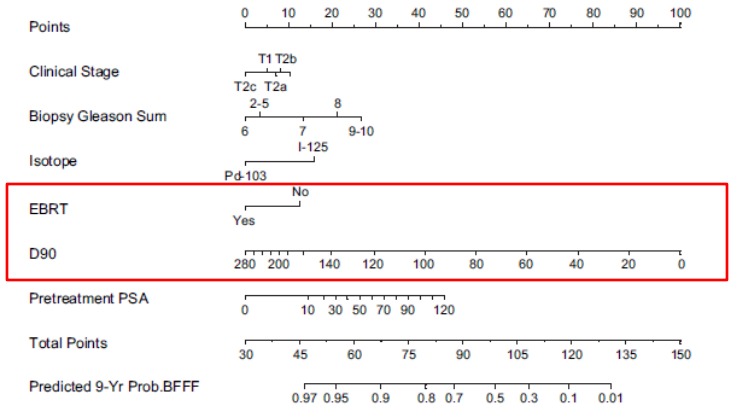

Fig. 3. Nomogram for biochemical freedom from failure (BFFF). EBRT = external beam radiotherapy; D90 = minimum dose to 90% of the prostate volume.

Table 2. Cox regression for 9-year bNED outcome using D90 and treatment intent (monotherapy implant vs. combined external beam and implant)

Factor	χ^2	df	*p*
Clinical stage	5.29	4	0.259
Biopsy Gleason score	60.93	4	<0.001
Isotope	43.71	1	<0.001
Radiotherapy	20.11	1	<0.001
D90	177.02	2	<0.001
Pretreatment PSA level	32.14	2	<0.001
Year of treatment	15.56	2	0.0004

Clinical Investigation

High-Dose-Rate Monotherapy for Localized Prostate Cancer: 10-Year Results

Henrik Hauswald, MD, Mitchell R. Kamrava, MD, Julia M. Fallon, BA, Pin-Chieh Wang, PhD, Sang-June Park, PhD, Thanh Van, BS, Lalaine Borja, PA-C, Michael L. Steinberg, MD, and D. Jeffrey Demanes, MD

California Endocurietherapy at UCLA, Department of Radiation Oncology, University of California, Los Angeles, David Geffen School of Medicine, Los Angeles, California

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International Journal of Radiation Oncology biology • physics

288 Low Risk
160 Int Risk, 9% ADT
7.25Gy x 6, 6.5yr F/u

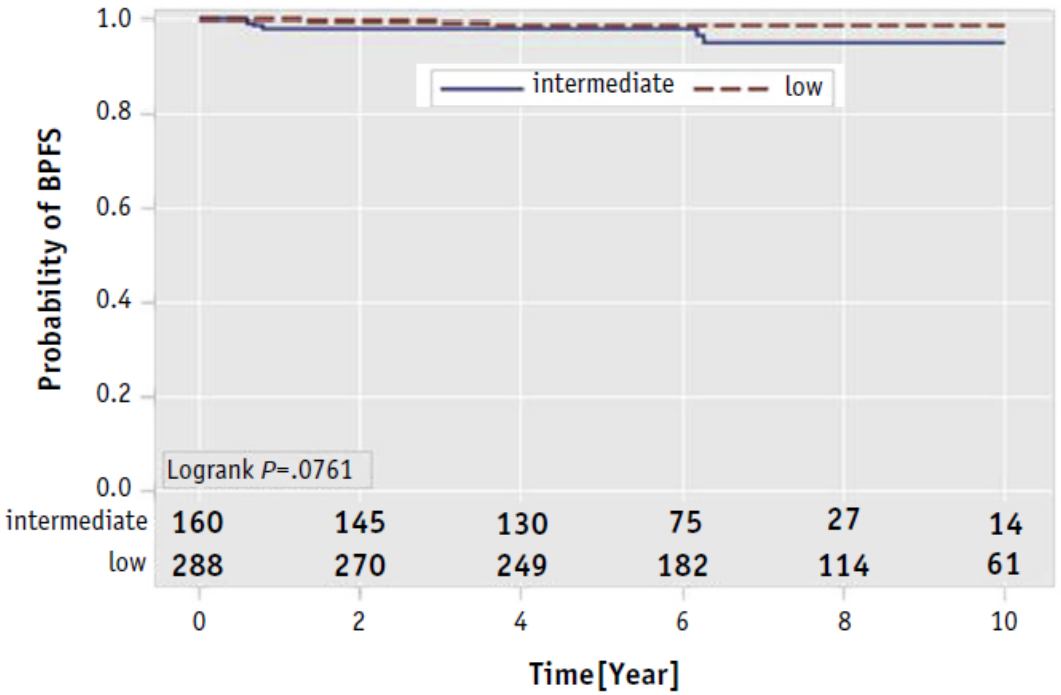

Table 3 Late grade 3 or 4 CTCAEs

Adverse event	Patients (n)
Total patients	22 (4.9)
Rectal grade 3 or 4	0 (0)
Urinary grade 3	
Urgency	1 (0.2)
Pelvic pain	1 (0.2)
Incontinence	3 (0.6)
Outflow impairment	
BPH	4*,† (1.2)
Bladder neck contracture	5* (1.2)
Bulbomembranous stricture	4* (0.8)
Unspecified	3* (0.6)
Urinary grade 4	
Fistula after multiple TUR procedures	1* (0.2)

Table 1. Late rectal toxicity rates in published reports of low dose-rate and high dose-rate prostate brachytherapy

Low dose rate

	Study	No. of patients	Isotope and dose	EBRT dose (Gy)	% EBRT	Median follow-up (months)	Rectal toxicity			Toxicity criteria
							Grade 2 (%)	Grade 3 (%)	Grade 4 (%)	
1998–2006	Phan *et al.*[26]	263	I-125 (150 Gy)		0	68	3.7	0.4	0	RTOG
1998–2002	Zelefsky *et al.*[37]	367	I-125 (150 Gy)		0	63	7	1	0	CTCAE
1999–2005	Gomez-Iturriaga Pina *et al.*[27]	94	I-125 (160 Gy)		0	63	2.2	0	0	CTCAE
1998–2003	Keyes *et al.*[28]	1006	I-125 (150 Gy)		0	60.7	7.3	0.9	0.1	RTOG
1989–1996	Zelefsky *et al.*[22]	248	I-125 (150 Gy)		0	48	9	0	0.4	RTOG
1996–2001	Shah and Ennis[31]	135	I-125 (145 Gy)		0	41	4	0	0	CTCAE
1998–2004	Zelefsky *et al.*[38]	562	I-125 (150 Gy)		0	40	6	1	NR	CTCAE
1997–1999	Waterman and Dicker[35]	98	I-125 (150 Gy)		0	32	9.8	< 1	0	RTOG
1995–1998	Snyder *et al.*[16]	212	I-125 (160 Gy)		0	28	10.4	0	0	RTOG
1998–2002	Herstein *et al.*[21]	352	I-125 (144 Gy) or Pd-103 (125 Gy)		0	24min	9	NR	NR	RTOG
2000–2001	Lawton *et al.*[25]	131	I-125 (108 Gy)	45	100	98	NR	3.1	0	RTOG
1990–2007	Price *et al.*[23]	2752	I-125[a]; Pd-103[a]; or Pd-103 (86–100 Gy) or I-125 (110 Gy)+EBRT	45	38	70	6.4	0.3	NR	RTOG
1992–1998	Gelblum and Potters[19]	825	I-125 (144 Gy) or Pd-103 (120 Gy) or I-125 (100 Gy) or Pd-103 (90 Gy)+EBRT	41.4–45	17	48	6.6	0.5	NR	RTOG
2003–2007	Shiraishi *et al.*[29]	458	I-125 (100 Gy)+EBRT	45	100	45	9.7	0.4	0	RTOG
2004–2008	Tanaka *et al.*[30]	218	I-125 (145–160 Gy) or I-125 (110 Gy)+EBRT	45	28	42	2.8	0	0	CTCAE
1997–2006	Kalakota *et al.*[32]	110	I-125 (144 Gy) or I-125 (108 Gy)+EBRT	45	43	41	10	4.5	0.9	RTOG
1998–2003	Sheretz *et al.*[33]	161	Pd-103 (90–115 Gy)+EBRT	20–44	100	36	7.5	0.6	0	RTOG
1997–2002	Albert *et al.*[34]	201	I-125 (150 Gy) or I-125 (100 Gy)+EBRT	45	33	34	18	8	NR	RTOG
1998–2001	Tran *et al.*[24]	503	I-125[a] or Pd-103[a]	20–44	42	24	8.7	0.4	0	RTOG

Schutzer ME, et al, Prostate Cancer Prostatic Dis. 2015 Jun;18(2):96-103

South Texas Urology and Urologic Oncology, and Cancer Therapy and Research Center, San Antonio, Texas.

TABLE 4
Invasive Procedures for Complications (%)

Procedure	Overall (n = 158)	Brachy (n = 97)	Combination (n = 61)	P value[a]
TURP	14 (8.9)	5 (5.2)	9 (14.8)	0.029
Colonoscopy ± fulguration	37 (23.4)	15 (15.5)	22 (36.0)	0.002
Fecal diversion	4 (2.6)	0	4 (6.6)	0.021
Urinary diversion	2 (1.3)	0	2 (3.3)	0.148
CIC	3 (1.9)	0	3 (4.9)	0.055
Patients requiring one or more of the above procedures	47 (29.7)	20 (20.6)	27 (44.2)	0.001

Brachy: brachytherapy; TURP: transurethral resection of the prostate; CIC: clean intermittent self-catheterization.
[a] Determined by the Fisher exact test.

Sarosdy MF, et al, Cancer. 2004 Aug 15;101(4):754-60.

NRG ONCOLOGY (12/17/14)

RTOG 0232

A PHASE III STUDY COMPARING COMBINED EXTERNAL BEAM RADIATION AND TRANSPERINEAL INTERSTITIAL PERMANENT BRACHYTHERAPY WITH BRACHYTHERAPY ALONE FOR SELECTED PATIENTS WITH INTERMEDIATE RISK PROSTATIC CARCINOMA

Pathology
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Radiation Oncology
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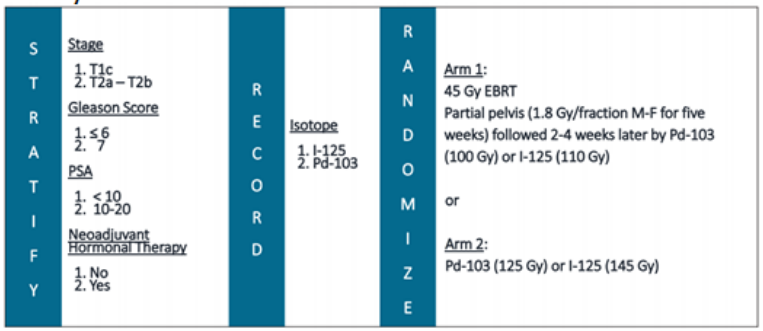
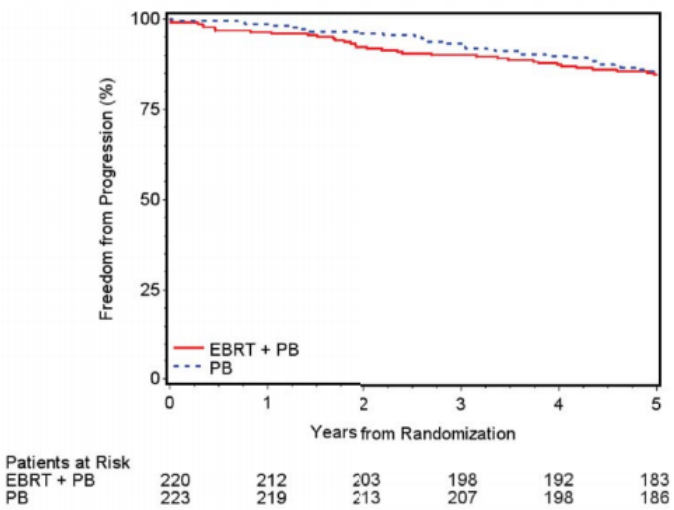
Study Schema



5yr Freedom from Progression



85% combined
86% brachy mono

RTOG 0232 had benefit of Central Review

grade 3 toxicity	Brachy + EBRT	Brachy monotherapy
GU	7%	3%
GI	3%	2%
Overall	12%	7%

p=.039

BJUI SUPPLEMENTS

Comparative analysis of prostate-specific antigen free survival outcomes for patients with low, intermediate and high risk prostate cancer treatment by radical therapy. Results from the Prostate Cancer Results Study Group

Peter Grimm[1], Ignace Billiet[2], David Bostwick[3], Adam P. Dicker[4], Steven Frank[5], Jos Immerzeel[6], Mira Keyes[7], Patrick Kupelian[8], W. Robert Lee[9], Stefan Machtens[10], Jyoti Mayadev[11], Brian J. Moran[12], Gregory Merrick[13], Jeremy Millar[14], Mack Roach[15], Richard Stock[16], Katsuto Shinohara[15], Mark Scholz[17], Ed Weber[18], Anthony Zietman[19], Michael Zelefsky[20], Jason Wong[21], Stacy Wentworth[22], Robyn Vera[23] and Stephen Langley[24]

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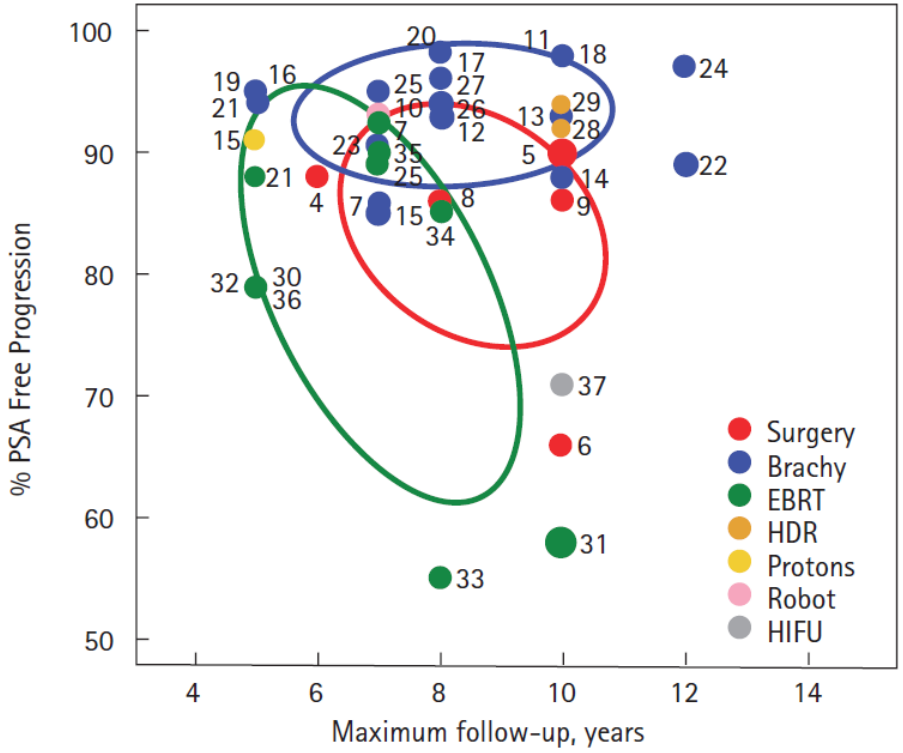
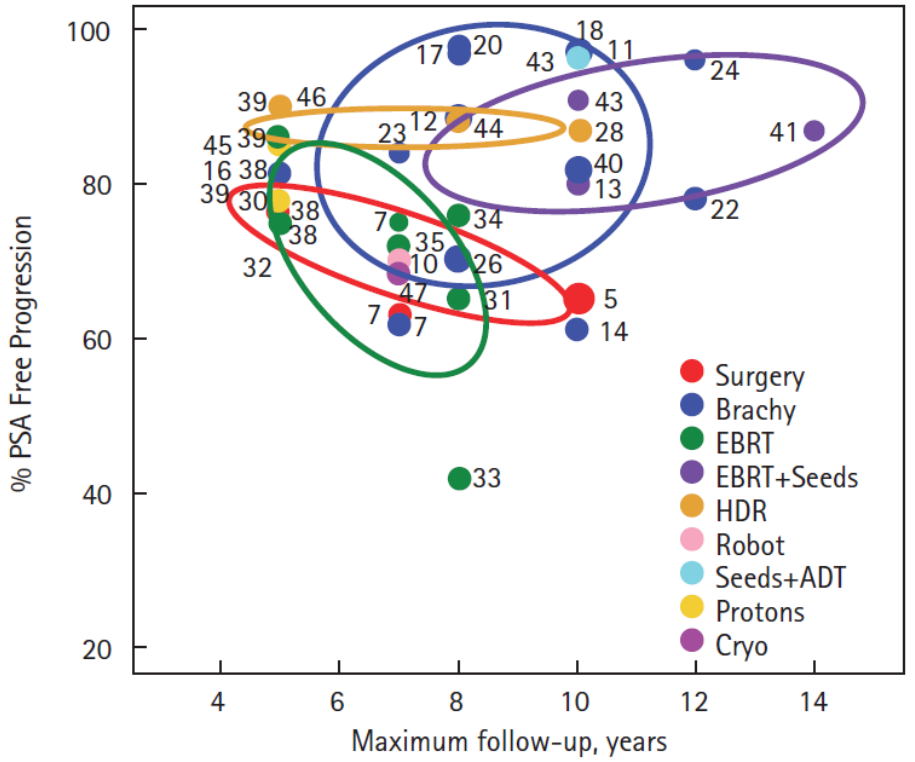
Low Risk Dz



Intermediate Risk Dz



Clinical Investigation

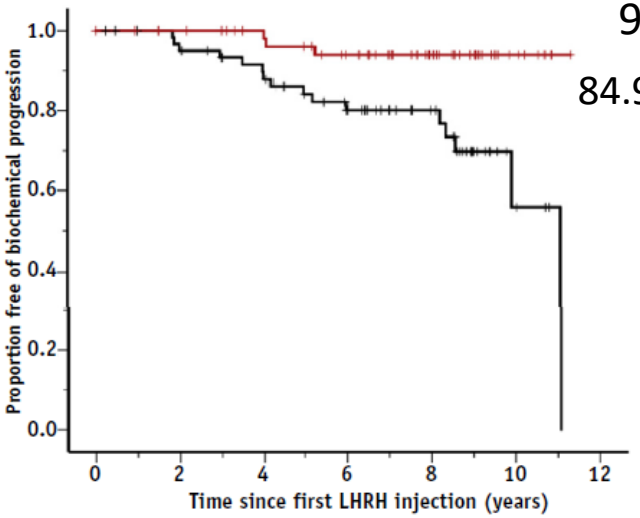
Androgen Suppression Combined with Elective Nodal and Dose Escalated Radiation Therapy (the ASCENDE-RT Trial): An Analysis of Survival Endpoints for a Randomized Trial Comparing a Low-Dose-Rate Brachytherapy Boost to a Dose-Escalated External Beam Boost for High- and Intermediate-risk Prostate Cancer

W. James Morris, MD, FRCPC,*,† Scott Tyldesley, MD, FRCPC,*,† Sree Rodda, MBBS, MRCP, FRCR,* Ross Halperin, MD, FRCPC,*,‡ Howard Pai, MD, FRCPC,*,§ Michael McKenzie, MD, FRCPC,*,† Graeme Duncan, MB, ChB, FRCPC,*,† Gerard Morton, MB, MRCPI, FRCPC, FFRRCSI,‖ Jeremy Hamm, MSC,¶ and Nevin Murray, MD, FRCPC†,#

*Departments of *Surgery, and #Medicine, University of British Columbia; †BC Cancer Agency—Vancouver Centre; ‡BC Cancer Agency—Centre for the Southern Interior; §BC Cancer Agency—Vancouver Island Centre; ¶Department of Population Oncology, BC Cancer Agency, Vancouver, British Columbia; and ‖Department of Radiation Oncology, University of Toronto, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada*

Int J Radiation Oncol Biol Phys, Vol. 98, No. 2, pp. 275–285, 2017

Intermediate Risk Dz

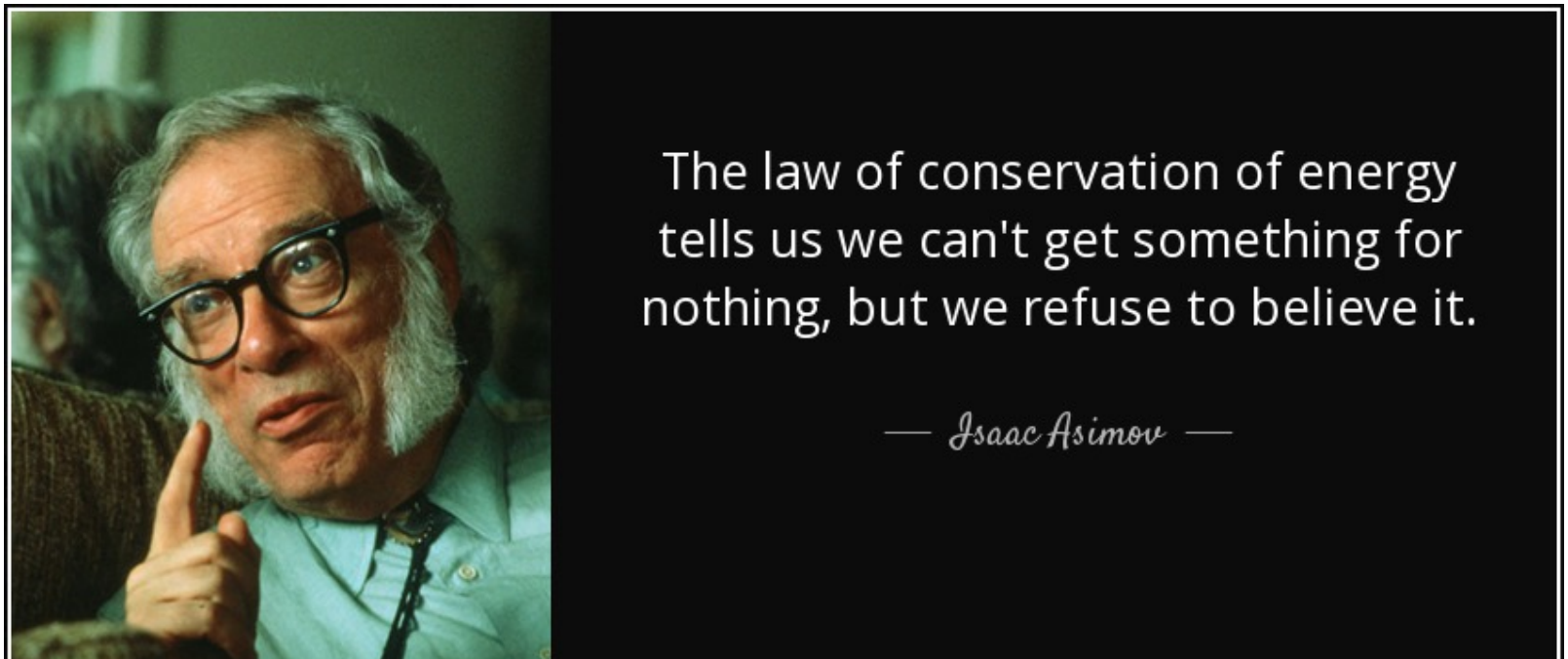


9yr bPFS

84.9% vs. 65.0%

p=.003

No diff in OS, at this time



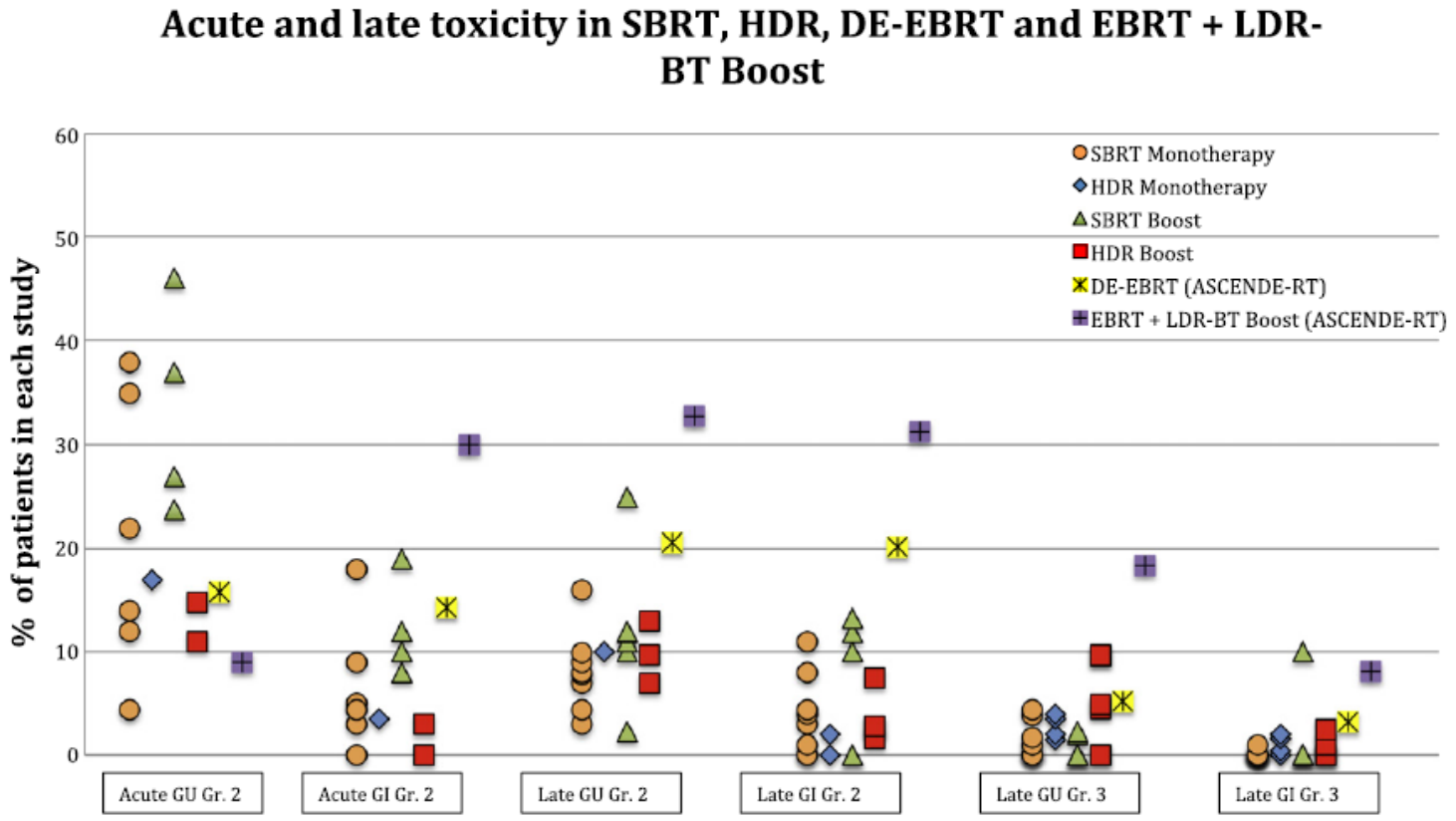


Figure 4 Acute and late toxicity reported in stereotactic body radiation therapy (SBRT), high-dose-rate (HDR), dose-escalated external beam radiation therapy (DE-EBRT), and dose rate prostate brachytherapy (LDR BT) studies. Not all SBRT and HDR studies reported toxicity data. Three scales were used in the studies: the common terminology criteria for adverse events (CTCAE), the Radiation Therapy Oncology Group (RTOG) scale, and the LENT-SOMA (late effects normal tissue task force-subjective, objective, management and analytic) scale; however, they were plotted together in the figure.

- M Roach et al, Literature Review of 20 studies
  - comparing Biochemical Effectiveness and Toxicity

RTOG 0232 had benefit of Central Review

grade 3 toxicity	Brachy + EBRT	Brachy monotherapy
GU	7%	3%
GI	3%	2%
Overall	12%	7%

p=.039

Pract Radiat Oncol. 2017 Dec 2. pii: S1879-8500(17)30341-7.

VOLUME 33 · NUMBER 9 · MARCH 20 2015

JOURNAL OF CLINICAL ONCOLOGY

COMMENTS AND CONTROVERSIES

Brachytherapy: Where Has It Gone?

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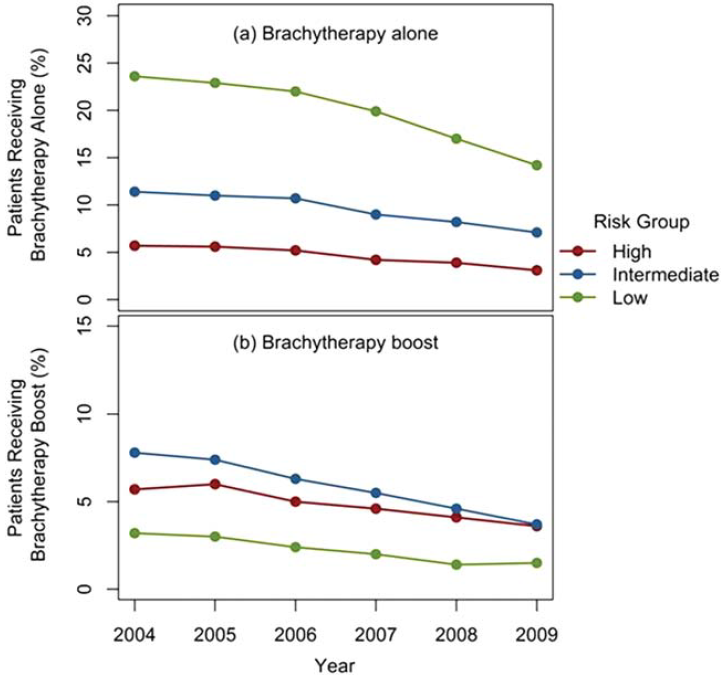
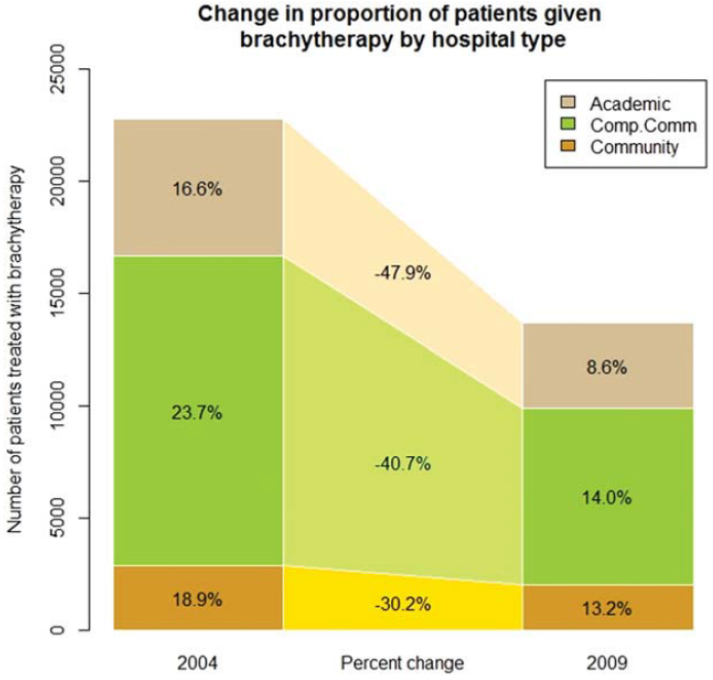
Steven J. Frank, *University of Texas MD Anderson Cancer Center, Houston, TX*
Akila N. Viswanathan, *Brigham and Women's Hospital and Dana-Farber Cancer Institute, Harvard Medical School, Boston, MA*
Beth Erickson, *Medical College of Wisconsin, Milwaukee, WI*
Patricia Eifel, *University of Texas MD Anderson Cancer Center, Houston, TX*
Paul L. Nguyen, *Brigham and Women's Hospital and Dana-Farber Cancer Institute, Harvard Medical School, Boston, MA*
David E. Wazer, *Tufts Medical Center, Tufts University School of Medicine, Boston, MA, and Rhode Island Hospital, The Alpert Medical School of Brown University, Providence, RI*

NCDB 1,547,941
pt tx's





Martin JM, et al, Cancer. 2014 Jul 15;120(14):2114-21

Brachytherapy:
Extremely Operator Dependent

The New York Times

Graham Roberts/The New York Times Sources: Dr. Adam P. Dicker and Dr. Yan Yu, Jefferson Medical College of Thomas Jefferson University; The Nuclear Regulatory Commission

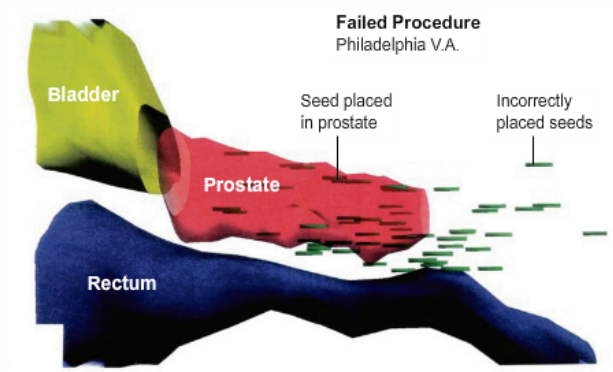
June 20, 2009

Failed Prostate Procedures at the Philadelphia V.A.

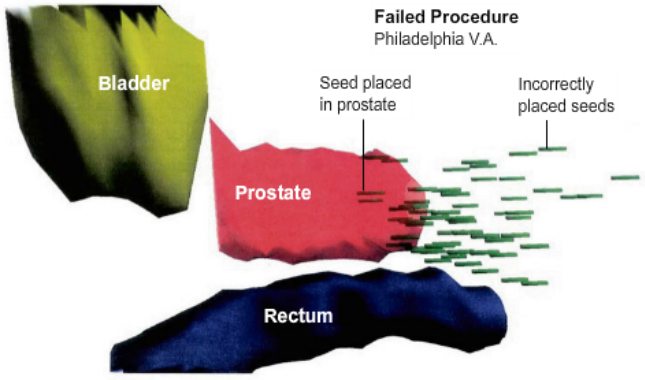
Investigators from the Nuclear Regulatory Commission have found that from 2002 to 2008, a cancer unit at the Philadelphia V.A. botched 92 of 116 brachytherapy procedures. A look at how the procedure is commonly performed.

What went wrong at the Philadelphia V.A.

These computer-generated images, part of a presentation produced by the Nuclear Regulatory Commission, show two specific patients who received the treatment. The images show the major organs, with the surrounding tissue rendered as white. Seeds that are implanted in or near the bladder or rectum can cause undue damage to otherwise healthy organs.



Here some of the radioactive seeds were implanted near the patient's rectum, potentially causing damage to that organ. In addition, the patient's prostate received only 43 gray of the 160 prescribed by the doctor.



In this case, nearly all of the seeds have been placed outside of the prostate, in the perineum. Of the prescribed dose of 160 gray, the prostate received only 24. This means that the patient's prostate cancer was only minimally treated by the procedure.

Brachytherapy: Extremely Operator Dependent

Int. J. Radiation Oncology Biol. Phys., Vol. 73, No. 2, pp. 341–346, 2009

0360-3016/09/$–see front matter

ELSEVIER

doi:10.1016/j.ijrobp.2008.04.038

CLINICAL INVESTIGATION **Prostate**

MULTICENTER ANALYSIS OF EFFECT OF HIGH BIOLOGIC EFFECTIVE DOSE ON BIOCHEMICAL FAILURE AND SURVIVAL OUTCOMES IN PATIENTS WITH GLEASON SCORE 7–10 PROSTATE CANCER TREATED WITH PERMANENT PROSTATE BRACHYTHERAPY

NELSON N. STONE, M.D.,* LOUIS POTTERS, M.D.,† BRIAN J. DAVIS, M.D., PH.D.,‡ JAY P. CIEZKI, M.D.,§ MICHAEL J. ZELEFSKY, M.D.,¶ MACK ROACH, M.D.,‖ KATSUTO SHINOHARA, M.D.,‖ PAUL A. FEARN, B.A.,¶ MICHAEL W. KATTAN, PH.D.,§ AND RICHARD G. STOCK, M.D.*

*Mount Sinai School of Medicine, New York, NY; †North Shore Long Island Jewish Health System, New Hyde Park, NY; ‡Mayo Clinic, Rochester, MN; §Cleveland Clinic, Cleveland, OH; ¶Memorial Sloan-Kettering Cancer Center, New York, NY; and ‖University of California, San Francisco, San Francisco, CA

Int. J. Radiation Oncology Biol. Phys., Vol. 76, No. 4, pp. 1061–1065, 2010

0360-3016/10/$–see front matter

ELSEVIER

doi:10.1016/j.ijrobp.2009.03.031

CLINICAL INVESTIGATION **Prostate**

POSTOPERATIVE NOMOGRAM PREDICTING THE 9-YEAR PROBABILITY OF PROSTATE CANCER RECURRENCE AFTER PERMANENT PROSTATE BRACHYTHERAPY USING RADIATION DOSE AS A PROGNOSTIC VARIABLE

LOUIS POTTERS, M.D.,* MACK ROACH, III, M.D.,† BRIAN J. DAVIS, M.D., PH.D.,‡ RICHARD G. STOCK, M.D.,§ JAY P. CIEZKI, M.D.,‖ MICHAEL J. ZELEFSKY, M.D.,¶ NELSON N. STONE, M.D.,# PAUL A. FEARN, B.A.,** CHANGHONG YU, M.S.,†† KATSUTO SHINOHARA, M.D.,† AND MICHAEL W. KATTAN, PH.D.††

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- Masters who have perfected their craft
  - Must perform ~~hundreds~~ (more?) of cases before “this good?”

Brachytherapy 4 (2005) 241–251

Variability of prostate brachytherapy preimplant dosimetry: A multi-institutional analysis

Gregory S. Merrick[1,*], Wayne M. Butler[1], Kent E. Wallner[2], John C. Blasko[3], Jeff Michalski[4], Jesse Aronowitz[5], Peter Grimm[3], Brian J. Moran[6], Patrick W. McLaughlin[7], Jacqueline Usher[1], Jonathan H. Lief[1], Zachariah A. Allen[1]

[1]*Schiffler Cancer Center and Wheeling Jesuit University, Wheeling, WV*
[2]*Puget Sound Healthcare Corporation, University of Washington, Seattle, WA*
[3]*Seattle Prostate Institute, Seattle, WA*
[4]*Department of Radiation Oncology, Mallinckrodt Institute of Radiology, Washington University, St. Louis, MO*
[5]*Department of Radiation Oncology, University of Massachusetts Memorial Hospital, Worcester, MA*
[6]*Chicago Prostate Cancer Center, Chicago, IL*
[7]*Department of Radiation Oncology, University of Michigan, Ann Arbor, MI*

- 8 **experienced** brachytherapists submitted Pd-103 and I-125 monotherapy pre-implant dosimetry plans for central review
- Substantial variability despite uniform Rx
  - target volume
  - dose homogeneity
  - tx margins
  - extracapsular seed placement

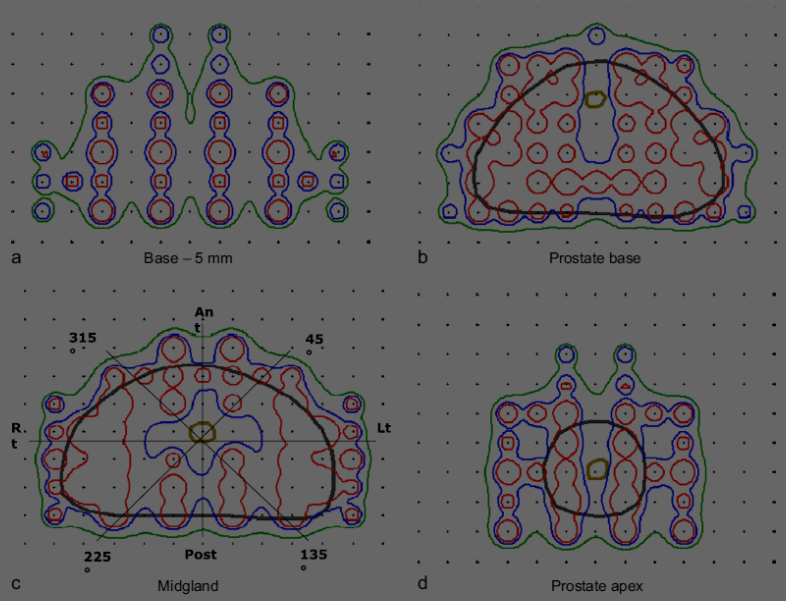

Fig. 3. Composite Pd-103 monotherapy isodose plan incorporated all seeds from each brachytherapist weighted by 1/8, which resulted in 375 unique seed positions and a maximum redundancy of five seeds on one coordinate. The isodose lines from outermost to innermost are 100%, 150%, and 200% of prescription dose. (a) Superior to the base by 5 mm, (b) prostate base, (c) midgland, and (d) prostate apex. Diagonal lines on the midgland image show the eight rays along which the dosimetric margins were measured on every slice.

Provider Case Volume and Outcomes Following Prostate Brachytherapy

Aileen B. Chen, Anthony V. D'Amico, Bridget A. Neville, Ewout W. Steyerberg and Craig C. Earle

From the Department of Radiation Oncology, Dana-Farber Cancer Institute and Brigham and Women's Hospital (ABC, AVDA) and Center for Outcomes and Policy Research, Dana-Farber Cancer Institute (BAN, CCE), Boston, Massachusetts, and Center for Medical Decision Making, Department of Public Health, Erasmus Medical Center (EWS), Rotterdam, The Netherlands

THE JOURNAL OF UROLOGY Vol. 181, 113-118, January 2009

- Linked SEER registries to Medicare claims data
- 6,747pts underwent brachy
  - By 251 MD's @154 hospitals

Table 3. *Physician and hospital volume, and risk of recurrence and death*

Model	HR/100 Pts (95% CI)	p Value
Physician vol:		
Recurrence	0.89 (0.81–0.98)	0.01
Prostate Ca death	0.80 (0.66–0.98)	0.03
All deaths	0.95 (0.90–1.00)	0.05
Hospital vol:		
Recurrence	0.99 (0.96–1.02)	0.66
Prostate Ca death	1.07 (0.98–1.17)	0.14
All deaths	0.99 (0.96–1.02)	0.48

Dose Escalation, 4 RCT + 5 Retrospective

- Improved bDFS→ *cancer control*
- Slight Increase in toxicity
  - Managed w better treatment delivery (3DCRT→ IMRT) and targeting (IMRT→ IGRT)

Table 1. Summary of the data extracted from 9 included studies

Study	Randomized	No. of patients	Dose (Gy) Low (median)	Int. (median)	High (median)	Follow-up Median (y)	Failure rate reported (y)	Method of analysis*	bNED (%) Risk group	Low dose	Int. dose	High dose	bNED definition†
Zelefsky 1998	—	530	70.2		75.6	3	5	KM	Low	84		95	ASTRO
								KM	Int.	55		79	
								KM	High	19		53	
Hanks 2000‡	—	618	70 (<10 f)		73 (<10 f)	4.4	5	KM	<10 f	77		89	ASTRO
									<10 unf	70		92	
									10–19.9 f	72		86	
			73 (rest)		78 (rest)				10–19.9	51		82	
									≥20 f	23		63	
									≥20 unf	29		26	
Pollack 2000	—	1127	66	70	78	4.3	4	KM	Low	73	85	84	ASTRO
									Int.-high	31	51	68	
Lyons 2000	—	738	68.4		74	3.4	5	HR	Low	81		98	ASTRO
								KM	Int.-high	41		75	
Zietman 2005	+	393	70.2		79.2	5	5	KM	Low	60		81	ASTRO
									Int.-high	63		80	
Kupelian 2005	—	1325	68.4		75.6	5.8	5	KM point	Low	75		79	ASTRO
								KM	Int.	63		72	
								KM point	High	38		46	
Peeters 2006	+	664	68		78	4.2	5	HR	Low	88		84	ASTRO
									Int.	64		79	
									High	48		66	
Dearnaley 2007	+	843	64		74	5	5	HR	Low	79		85	PSA >2
									Int.	70		79	And PSA
									High	43		57	>nadir + 50%
Kuban 2008	+	301	70		78	8.7	8	KM	Low	63		88	Phoenix
									Int.	76		86	
									High	26		63	

Diez et al, IJROBP 2010

ELSEVIER

Int. J. Radiation Oncology Biol. Phys., Vol. 70, No. 4, pp. 1124–1129, 2008

0360-3016/08/$–see front matter

doi:10.1016/j.ijrobp.2007.11.044

ASTRO Online CME

CLINICAL INVESTIGATION Prostate

INCIDENCE OF LATE RECTAL AND URINARY TOXICITIES AFTER THREE-DIMENSIONAL CONFORMAL RADIOTHERAPY AND INTENSITY-MODULATED RADIOTHERAPY FOR LOCALIZED PROSTATE CANCER

MICHAEL J. ZELEFSKY, M.D.,* EMILY J. LEVIN, B.A.,* MARGIE HUNT, M.S.,† YOSHIYA YAMADA, M.D.,* ALISON M. SHIPPY, B.A.,* ANDREW JACKSON, PH.D.,† AND HOWARD I. AMOLS, PH.D.†

Departments of *Radiation Oncology and †Medical Physics, Memorial Sloan-Kettering Cancer Center, New York, NY

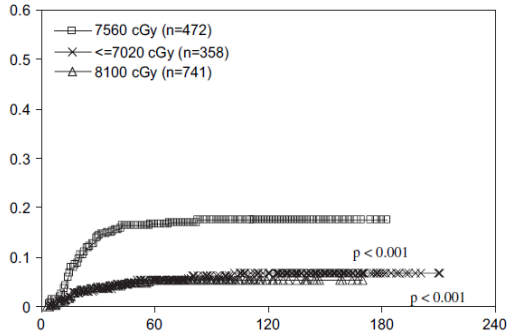

Fig. 1. The incidence of late Grade ≥2 rectal toxicities by prescription dose.

Table 2. Multivariable predictors for the incidence of late Grade ≥2 GI toxicities

Predictor	*p*	Hazard ratio
Dose (<81 Gy vs. 81 Gy)	<0.001	0.44
Hormones (no vs. yes)	NS	NS
Acute toxicity (Grade 0, 1 vs. Grade 2–4)	<0.001	6.95
T stage (T1, T2 vs. T3)	NS	NS
Year of treatment (<1999 vs. ≥1999)	NS	NS

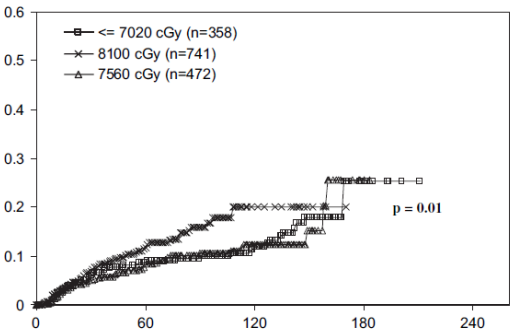

Fig. 3. The incidence of late Grade ≥2 urinary toxicities by prescription dose. A significant increase in Grade 2 toxicities was observed for patients treated to 81 Gy compared with lower doses ($p = 0.01$).

Table 3. Multivariable predictors for the incidence of late Grade ≥2 GU toxicities

Predictor	*p*	Hazard ratio
Dose (<81 Gy vs. 81 Gy)	0.027	1.50
Hormones (no vs. yes)	NS	NS
Acute toxicity (Grade 0, 1 vs. Grade 2–4)	<0.001	3.22
T stage (T1, T2 vs. T3)	NS	NS
Year of treatment (<1999 vs. ≥1999)	NS	NS

86.4Gy IMRT

International Journal of Radiation Oncology biology • physics

Clinical Investigation: Genitourinary Cancer

Long-term Survival and Toxicity in Patients Treated With High-Dose Intensity Modulated Radiation Therapy for Localized Prostate Cancer

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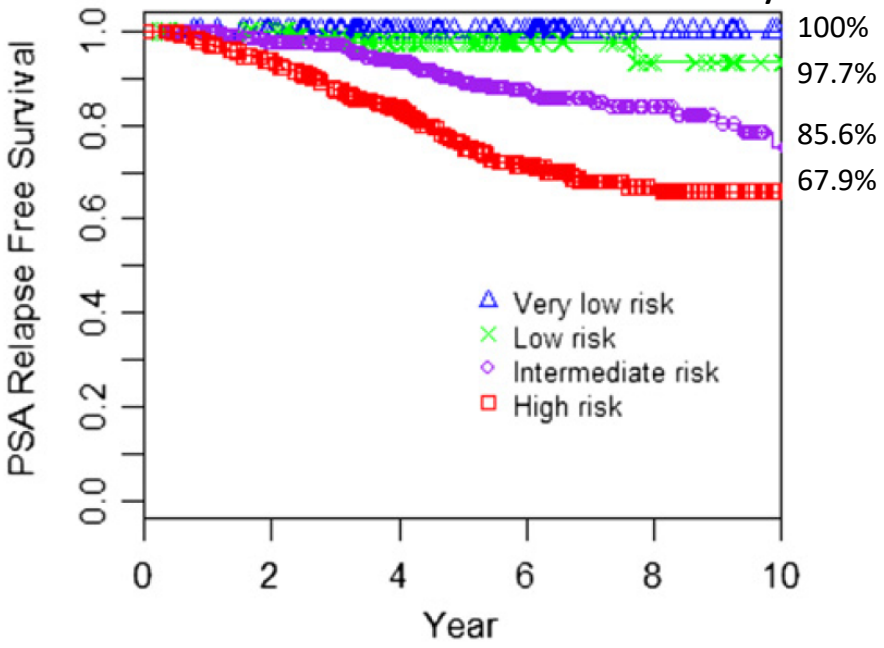
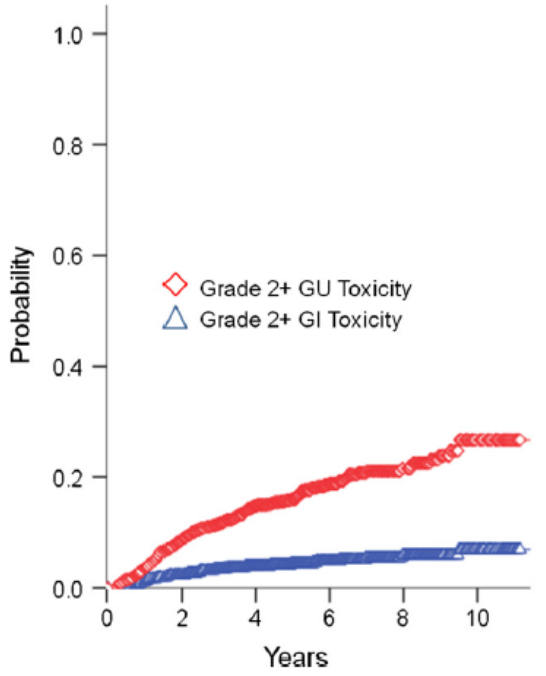
Department of Radiation Oncology, Memorial Sloan-Kettering Cancer Center, New York, New York

Int J Radiation Oncol Biol Phys, Vol. 85, No. 3, pp. 686–692, 2013

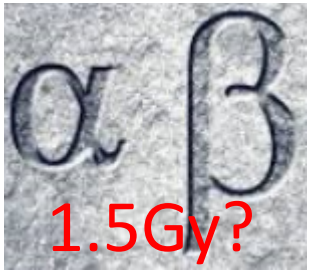
7yr bRFS





Late grade ≥2 GI and GU toxicity actuarial outcomes.

Prospective, non Randomized HypoFx Trials



Study	Median FU, mo	Risk, GS, or NCCN	Technique	Regimen	BED, Gy	n	Outcome	Toxicity
Lukka et al. [15]	68	60% GS ≤6 31% GS 7 9% GS 8–10	3DCRT No IGRT	52.5 Gy/20 fx	62	466	5 yr FFBF 40% (NS)	Gr ≥3 2% (NS)
				66 Gy/33 fx	66	470	5 yr FFBF 43%	Gr ≥3 1%
Yeoh et al. [17]	90	n.s.	2D/3DCRT No IGRT	55 Gy/20 fx	66.8	108	7.5 yr FFBF 53% ($p < 0.05$)	Late GU; HR: 1.58 (95% CI, 1.01–2.47) favoring hypofractionation
				64 Gy/32 fx	64	109	7.5 yr FFBF 34%	
Dearnaley et al. [18]	51	n.s.	3D/IMRT No IGRT 3–6 mo ADT	57 Gy/19 fx	73.4	151	n.s.	Gr ≥2 GU 0% (NS) Gr ≥2 GI 1% (NS)
				60 Gy/20 fx	77	153		Gr ≥2 GU 2% Gr ≥2 GI 4%
				74 Gy/37 fx	74	153		Gr ≥2 GU 2% Gr ≥2 GI 4%
Kuban et al. [14]; Hoffman et al. [19]	60	28% low 71% intermediate 1% high	IMRT IGRT 21% ADT	72 Gy/30 fx	80.2	102	5 yr FFBF 96% (NS)	5 yr Gr ≥2 GU 16% (NS) 5 yr Gr ≥2 GI 10% (NS)
				75.6 Gy/42 fx	71.4	101	5 yr FFBF 92%	5 yr Gr ≥2 GU 17% 5 yr Gr ≥2 GI 5%
Arcangeli et al. [12,13]	70	26% GS ≤7 74% GS >7	3DCRT No IGRT 100% 9 mo ADT	62 Gy/20 fx	81.4	83	5 yr FFBF 85% ($p = 0.065$) *p ss for GS ≥4 + 3	3 yr Gr ≥2 GU 16% (NS) 3 yr Gr ≥2 GI 17% (NS)
				80 Gy/40 fx	80	85	5 yr FFBF 79%	3 yr Gr ≥2 GU 11% 3 yr Gr ≥2GI 14%
Pollack et al. [16]	68	34% GS ≤6 47% GS 7 19% GS 8–10	IMRT IGRT	70.2 Gy/26 fx	84	151	5 yr BCDF 23% (NS)	5 yr Gr ≥2 GU 13% ($p = 0.16$) 5 yr Gr ≥2 GI 9% (NS)
				78 Gy/36 fx	78	152	5 yr BCDF 21%	5 yr Gr ≥2 GU 13% 5 yr Gr ≥2 GI 9%

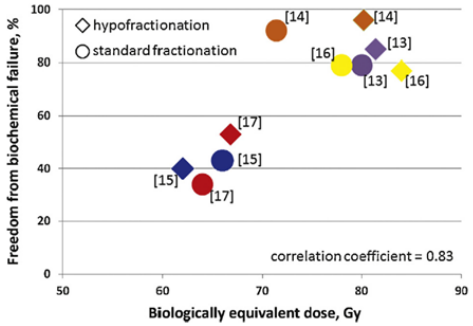


Fig. 2 – Relationship between biologically equivalent dose (calculated to be equivalent in 2-Gy fractions using an α/β of 1.5 Gy) and biochemical outcome for both arms of the six randomized phase 3 studies of moderate hypofractionation and standard fractionation.

- moderate hypofx→ predominantly low and int risk dz
- similar biochem control and late grade 2 + toxicities

Koontz et al, Eur Urol. 2015 Oct;68(4):683-91

RTOG 0415

A PHASE III RANDOMIZED STUDY OF HYPOFRACTIONATED 3D-CRT/IMRT VERSUS CONVENTIONALLY FRACTIONATED 3D-CRT/IMRT IN PATIENTS WITH FAVORABLE-RISK PROSTATE CANCER

SCHEMA

STRATIFY

Gleason Score
1. Gleason 2-4
2. Gleason 5-6

PSA
1. < 4 ng/mL
2. 4- < 10 ng/mL

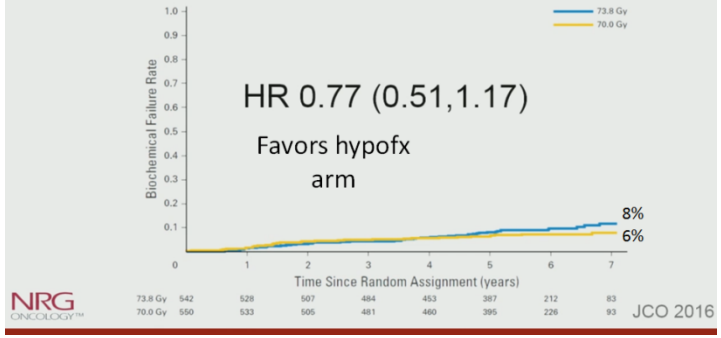
Radiation Modality
1. 3D-CRT
2. IMRT

RANDOMIZE

Arm 1 ***(Minimum PTV prescription)***
3D-CRT or IMRT: 73.8 Gy in 41 fractions

Arm 2 ***(Minimum PTV prescription)***
3D-CRT or IMRT: 70 Gy in 28 fractions

Biochemical Recurrence



2015 ASTRO Plenary session

2016 ASTRO update

Pooled 1100 patients

Contents lists available at ScienceDirect

Radiotherapy and Oncology

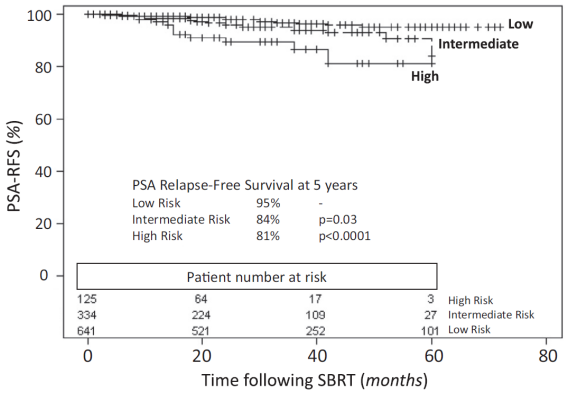
journal homepage: www.thegreenjournal.com

Phase II trial

Stereotactic body radiotherapy for localized prostate cancer: Pooled analysis from a multi-institutional consortium of prospective phase II trials ☆,☆☆

Christopher R. King [a,*], Debra Freeman [b], Irving Kaplan [c], Donald Fuller [d], Giampaolo Bolzicco [e], Sean Collins [f], Robert Meier [g], Jason Wang [a], Patrick Kupelian [a], Michael Steinberg [a], Alan Katz [h]

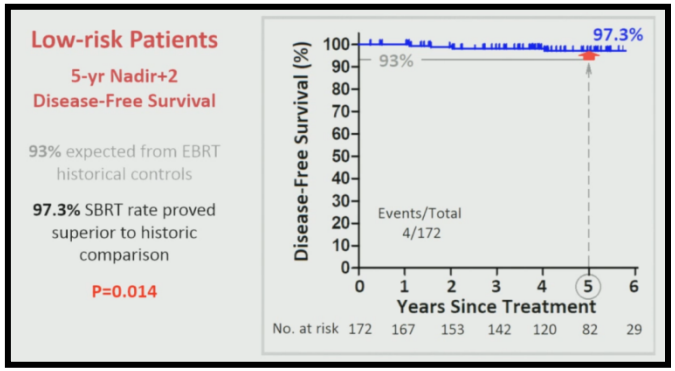
[a] Department of Radiation Oncology, UCLA, Los Angeles, CA; [b] Naples Radiation Oncology, Naples, Florida; [c] Department of Radiation Oncology, Beth Israel Deaconness, Boston, MA; [d] Radiosurgery Medical Group, San Diego, CA, United States; [e] Division of Radiation Oncology, San Bortolo Hospital, Vicenza, Italy; [f] Department of Radiation Oncology, Georgetown University, Washington DC; [g] Department of Radiation Oncology, Swedish Medical Center, Seattle, WA; and [h] Flushing Radiation Oncology, Flushing, NY, United States



Five-Year Outcomes from a Multi-Center Trial of Stereotactic Body Radiotherapy for Low- and Intermediate-Risk Prostate Cancer

R. Meier[1], A. Beckman[2], G. Henning[3], N. Mohideen[4], S. A. Woodhouse[5], C. Cotrutz[1], and I. D. Kaplan[6]

[1]Swedish Cancer Institute, Seattle, WA, [2]Central Baptist Hospital, Lexington, KY, [3]Huron River Radiation Oncology, Brighton, MI, [4]Northwest Community Hospital, Arlington Heights, IL, [5]Community Cancer Center, Normal, IL, [6]Beth Israel Deaconess Medical Center, Boston, MA



Cureus

Open Access Original Article

DOI: 10.7759/cureus.1668

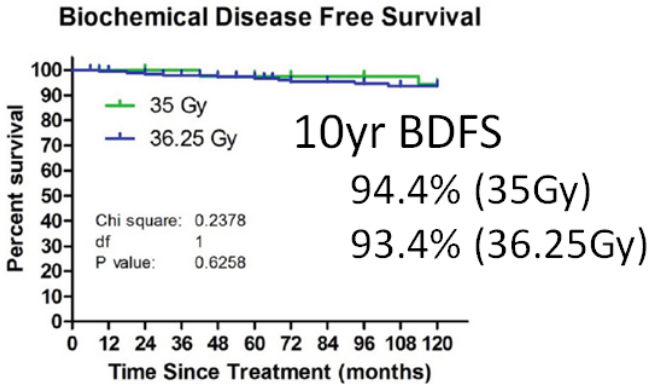
Stereotactic Body Radiotherapy for Low-Risk Prostate Cancer: A Ten-Year Analysis

Alan Katz [1]

1. Flushing radiation

Corresponding author: Alan Katz, akatzmd@msn.com

Disclosures can be found in Additional Information at the end of the article



BJUI SUPPLEMENTS

Comparative analysis of prostate-specific antigen free survival outcomes for patients with low, intermediate and high risk prostate cancer treatment by radical therapy. Results from the Prostate Cancer Results Study Group

Peter Grimm[1], Ignace Billiet[2], David Bostwick[3], Adam P. Dicker[4], Steven Frank[5], Jos Immerzeel[6], Mira Keyes[7], Patrick Kupelian[8], W. Robert Lee[9], Stefan Machtens[10], Jyoti Mayadev[11], Brian J. Moran[12], Gregory Merrick[13], Jeremy Millar[14], Mack Roach[15], Richard Stock[16], Katsuto Shinohara[15], Mark Scholz[17], Ed Weber[18], Anthony Zietman[19], Michael Zelefsky[20], Jason Wong[21], Stacy Wentworth[22], Robyn Vera[23] and Stephen Langley[24]

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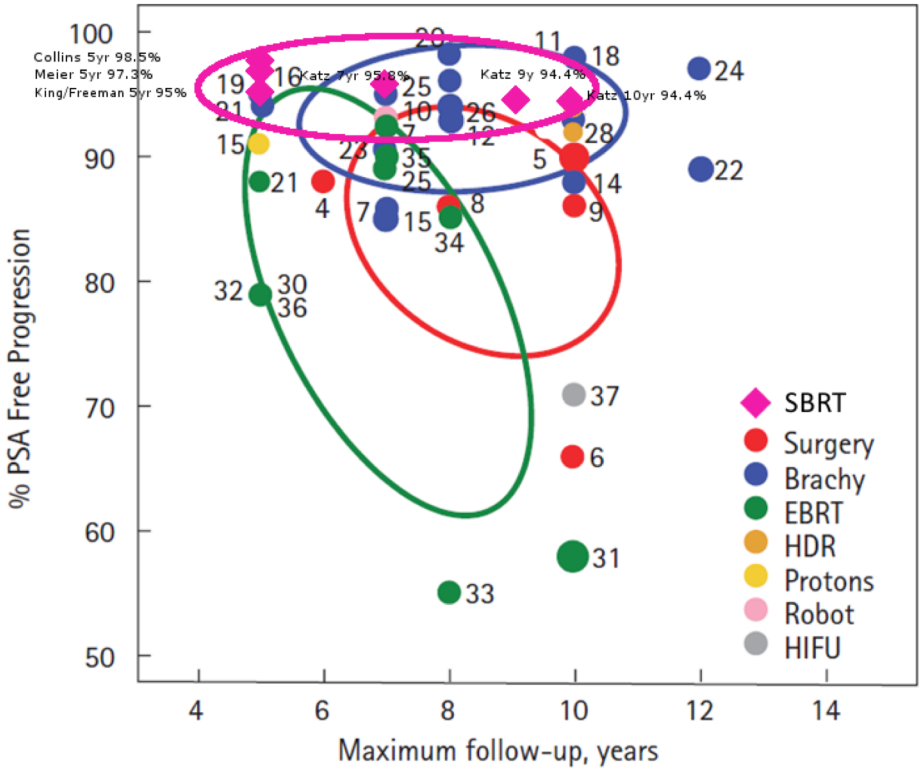
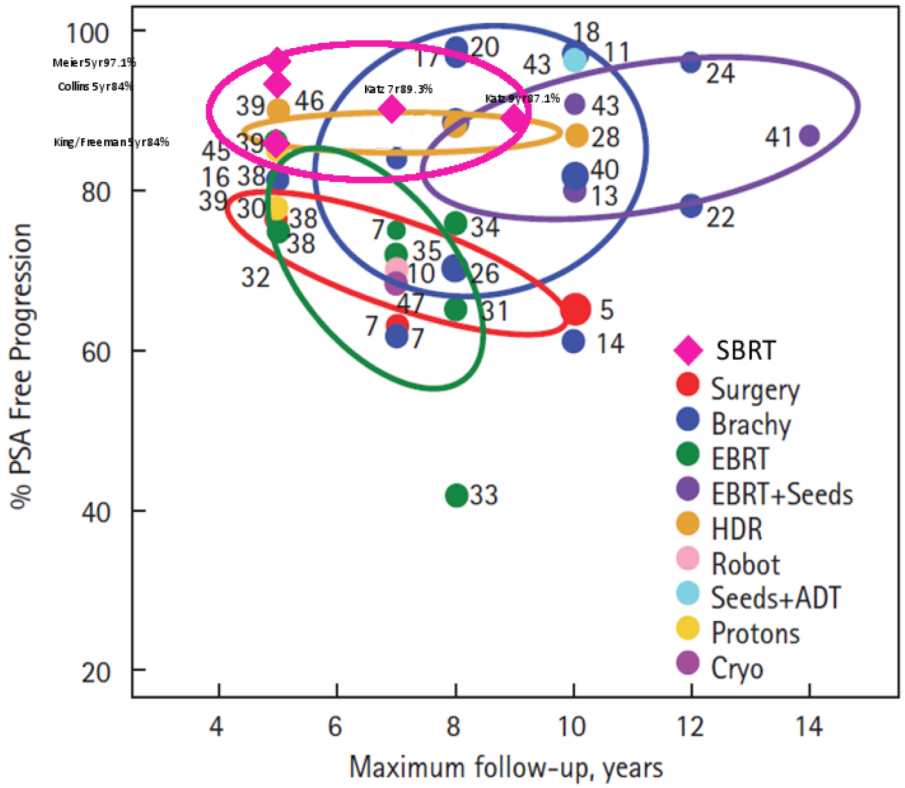
Low Risk Dz



Intermediate Risk Dz



History of SBRT Diffusion

- Unique: Academic hospitals as late(r) adopter?
  - At inception, some community hospital practices > Academic hospitals in output
  - High Impact Factor publications evolving

TABLE 2. Institutional Experience With SBRT for Localized Prostate Cancer

Reference	No. of Patients	Risk Group	Total Dose, Gy	No. of Fractions	Target Volume	Median Follow-up, y	bPFS, %	Late ≥G3 GU Toxicity	Late ≥G3 GI Toxicity
Bolzicco et al.,[30] 2013	100	Low–high	35	5	Prostate + proximal SV	3	94.4	1%	0%
Chen et al,[31] 2014	100	Low–high	35–36.25	5	Prostate + proximal SV	2.3	99.0	1%	0%
Freeman and King,[32] 2011	41	Low	35–36.25	5	Prostate + proximal SV	5	93	2%	0%
Friedland et al.,[33] 2009	100	Low–high	35–36	5	Prostate + proximal SV	2	98	0%	1%
Hannan et al.,[19] 2016	91	Low–intermediate	45–50	5	Prostate alone	4.5	98.6	5.5%	7%
Jabbari et al.,[34] 2012	38	Low–intermediate	38	4	Prostate +/− SV*	1.5	100	5%	0%
Kang et al.,[35] 2011	44	Low–high	32–36	4	Prostate +/− SV*	3.3	100, 100, 90.8†	0%	0%
Katz and Kang,[36] 2014	477	Low–intermediate	35–36.25	5	Prostate alone	6	95.6, 89.6‡	2%	0%
King et al.,[20] 2009	41	Low	36.25	5	Prostate alone	2.75	100	5%	0%
King et al.,[35] 2012	67	Low	36.25	5	Prostate alone	2.7	94.0	3%	0%
Mantz et al.,[38] 2010	54	Low	40	5	Prostate alone	2.2	100	0%	0%
McBride et al.,[39] 2012	45	Low	36.25–37.5	5	Prostate alone	3.7	97.7	2%	4%
Oliai et al.,[40] 2012	70	Low–high	35–37.5	5	Prostate +/− SV*	3.1	100, 95, 77.1†	3%	0%

Prostate RT Practice Changing Publications

- **ADT**
  - **Diff ADT studies**
    - D'Amico et al. JAMA. 2004 Aug 18;292(7):821-7
    - Denham JW, Lancet Oncol. 2011 May;12(5):451-9.
    - Jones CU, N Engl J Med. 2011 Jul 14;365(2):107-18
    - Roach M, J Clin Oncol 2008 Feb 1;26(4):585-91.
    - Bolla M, N Engl J Med. 1997 Jul 31;337(5):295-300.
- **Dose escalation**
  - **Prospective**
    - Zelefsky MJ, Int J Radiat Oncol Biol Phys. 1998 Jun 1;41(3):491-500
    - Hanks GE, Int J Radiat Oncol Biol Phys. 1997 Feb 1;37(3):543-50
  - **Randomized**
    - Vergis R, Int J Radiat Oncol Biol Phys. 2010 Jan 19.
    - Peeters ST, J Clin Oncol. 2006 May 1;24(13):1990-6.
    - Kuban DA, Int J Radiat Oncol Biol Phys. 2008 Jan 1;70(1):67-74
    - Gardner BG, J Urol. 2002 Jan;167(1):123-6.
- **IMRT techniques**
  - **Dosimetry/Safety**
    - Ashman J, Int J Radiat Oncol Biol Phys. 2005 Nov 1;63(3):765-71.
    - Kao J, Br J Radiol. 2004 Feb;77(914):129-36.
  - **Retrospective Long-term Outcomes**
    - Zelefsky M, Int J Radiat Oncol Biol Phys. 2002 Aug 1;53(5):1111-6.
    - Brabbins D, Int J Radiat Oncol Biol Phys. 2005 Feb 1;61(2):400-8.
    - Cahlon O, Int J Radiat Oncol Biol Phys. 2008 Jun 1;71(2):330-7.)

Journal Name	Impact Factor	Total Cites				
CA-A CANCER JOURNAL FOR CLINICIANS	131.723	20,488				
* NEW ENGLAND JOURNAL OF MEDICINE	59.558	283,525				
* JAMA	37.684	129,909				
* LANCET ONCOLOGY	26.509	30,800				
* JOURNAL OF CLINICAL ONCOLOGY	20.982	141,362				
BMJ- BRITISH MEDICAL JOURNAL	19.697	93,118				
JNCI- JOURNAL OF THE NATIONAL CANCER INSTITUTE	11.37	37,074				
CANCER RESEARCH	8.556	139,464				
CANCER TREATMENT REVIEWS	7.983	6,110				
RADIOTHERAPY AND ONCOLOGY	4.817	14,095				
* UROLOGY	4.7	46,087				
* INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS	4.495	39,558				
SEMINARS IN ONCOLOGY	3.954	5,073				
ACTA ONCOLOGICA	3.73	5,709				
SEMINARS IN RADIATION ONCOLOGY	3.556	2,013				
RADIATION ONCOLOGY	2.466	3,624				
* BRITISH JOURNAL OF RADIOLOGY	1.84	7,226				
Cancer Radiotherapie	1.299	805				
FRONTIERS IN ONCOLOGY		3,297	Scimago Journal & Country Rank 2.133			

SBRT Select Seminal Publications

- Quality of Life
  - Medicare Claims, negative for SBRT
    - Yu J, J Clin Oncol. 2014 Apr 20;32(12):1195-201
  - Dose Escalation: negative for 50Gy/5
    - Kim D, Int J Radiat Oncol Biol Phys. 2014 Jul 1;89(3):509-17
  - Literature comparison in QOL between modalities
    - Meier R, Front Oncol. 2015 Apr 7;5:48. do
  - Favorable multi-institution QOL comparison between diff modalities
    - Evans J, Radiother Oncol. 2015 Aug;116(2):179-84.
- Single Institution Series
  - 4yr f/u
    - King C, Int J Radiat Oncol Biol Phys. 2012 Feb 1;82(2):877-82
  - 7r f/u; 9yr f/u abstract only
    - Katz A, Front Oncol. 2014 Oct 28;4:301
- Pooled Prospective, 1100 pts
  - 1100 pts:
    - King C, Radiother Oncol. 2013 Nov;109(2):217-21.
  - 2000 pts:
    - Freeman D, Front Oncol. 2015 Jan 22;4:369.

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A Word of Caution

"…considering the widespread increase in the use… throughout the United States, these data serve to heighten awareness to the possibility that this form of prostate cancer therapy may only be clinically efficacious in a select subgroup of patients and possibly inadequate in others."

-Anthony V. D'Amico, M.D., Ph.D.

Original Contributions

Biochemical Outcome After Radical Prostatectomy, External Beam Radiation Therapy, or Interstitial Radiation Therapy for Clinically Localized Prostate Cancer

Anthony V. D'Amico, MD, PhD; Richard Whittington, MD; S. Bruce Malkowicz, MD; Delray Schultz, PhD; Kenneth Blank, MD; Gregory A. Broderick, MD; John E. Tomaszewski, MD; Andrew A. Renshaw, MD; Irving Kaplan, MD; Clair J. Beard, MD; Alan Wein, MD

JAMA, September 16, 1998—Vol 280, No. 11

no post implant dosimetry or supplemental RT

Design.—Retrospective cohort study of outcome data compared using Cox regression multivariable analyses.

Setting and Patients.—A total of 1872 men treated between January 1989 and October 1997 with an RP (n = 888) or implant with or without neoadjuvant androgen deprivation therapy (n = 218) at the Hospital of the University of Pennsylvania, Philadelphia, or RT (n = 766) at the Joint Center for Radiation Therapy, Boston, Mass, were enrolled.

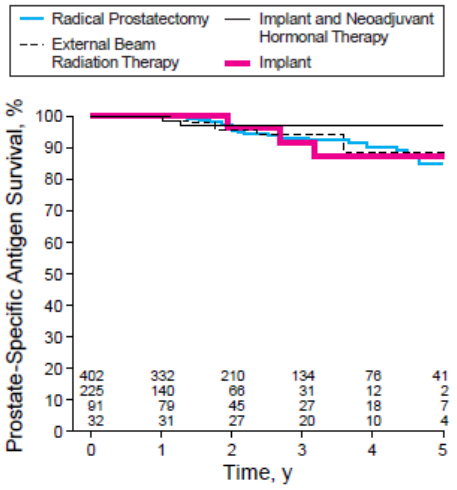


Figure 1.—Estimated prostate-specific antigen outcome for low-risk patients stratified by treatment modality. All pairwise *P* values are more than .25.

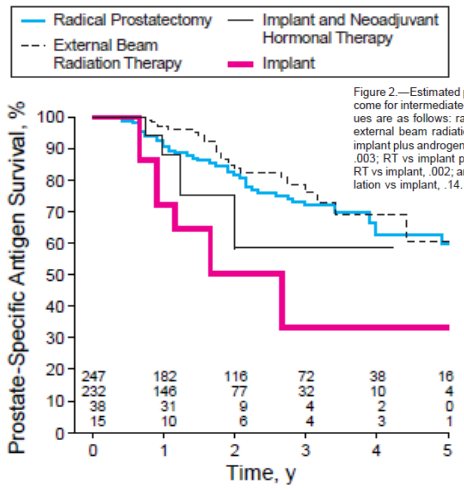


Figure 2.—Estimated prostate-specific antigen outcome for intermediate-risk patients. Pairwise *P* values are as follows: radical prostatectomy (RP) vs external beam radiation therapy (RT), .26; RP vs implant plus androgen ablation, .18; RP vs implant, .003; RT vs implant plus androgen ablation, .009; RT vs implant, .002; and implant plus androgen ablation vs implant, .14.

Nevertheless, considering the widespread increase in the use of implant therapy throughout the United States, these data serve to heighten awareness to the possibility that this form of prostate cancer therapy may only be clinically efficacious in a select subgroup of patients and possibly inadequate in others. While no definitive conclusions can be reached using nonrandomized retrospective data, these analyses can provide the basis on which to design prospective randomized clinical trials that could definitively compare PSA, cause-specific, and overall survival outcomes among treatment modalities.

Maturation

- Optimize
  - Patient Selection
  - Dose (Rx, normal structures)
  - Delivery
- Sequencing of Different Technologies
- High Impact Factor Publication
  - Rigorous Peer Review

Maturation

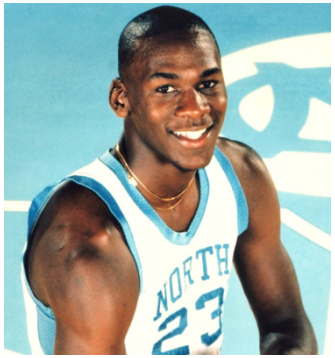
- Very Difficult to compare SBRT with more established Radiation Treatments

Radium
1905

Robotics
2000's

era

Proven,
Refined



Tested,
Promise

development

Maturation

Tx Delivery Frequency

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Original article

Once-weekly versus every-other-day stereotactic body radiotherapy in patients with prostate cancer (PATRIOT): A phase 2 randomized trial

Harvey C. Quon [a,*], Aldrich Ong [b], Patrick Cheung [c], William Chu [c], Hans T. Chung [c], Danny Vesprini [c], Amit Chowdhury [b], Dilip Panjwani [d], Geordi Pang [c], Renee Korol [c], Melanie Davidson [c], Ananth Ravi [c], Boyd McCurdy [b], Liying Zhang [c], Alexandre Mamedov [c], Andrea Deabreu [c], Andrew Loblaw [c]

[a] Tom Baker Cancer Centre, Calgary; [b] CancerCare Manitoba, Winnipeg; [c] Odette Cancer Centre, Sunnybrook Health Sciences Centre, Toronto; and [d] BC Cancer Agency, Abbotsford, Canada

Radiother Oncol. **2018 Mar 24**. pii: S0167-8140(18)30137-3.

Tx Dose

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Original article

Dose escalation for prostate stereotactic ablative radiotherapy (SABR): Late outcomes from two prospective clinical trials

Yasir Alayed [a,b], Patrick Cheung [a,b], Geordi Pang [a,b], Alexandre Mamedov [a], Laura D'Alimonte [a], Andrea Deabreu [a], Kristina Commisso [a], Angela Commisso [a], Liang Zhang [a], Harvey C. Quon [c], Hima Bindu Musunuru [d], Joelle Helou [e], D. Andrew Loblaw [a,b,f,*]

[a] Department of Radiation Oncology, Odette Cancer Centre, Sunnybrook Health Sciences Centre; [b] Department of Radiation Oncology, University of Toronto, Toronto, ON; [c] Tom Baker Cancer Institute, Calgary, AB, Canada; [d] Department of Human Oncology, University of Wisconsin, Madison, United States; [e] Radiation Medicine Program, Princess Margaret Cancer Centre, University Health Network; and [f] Institute of Health Policy, Measurement & Evaluation, University of Toronto, Toronto, ON, Canada

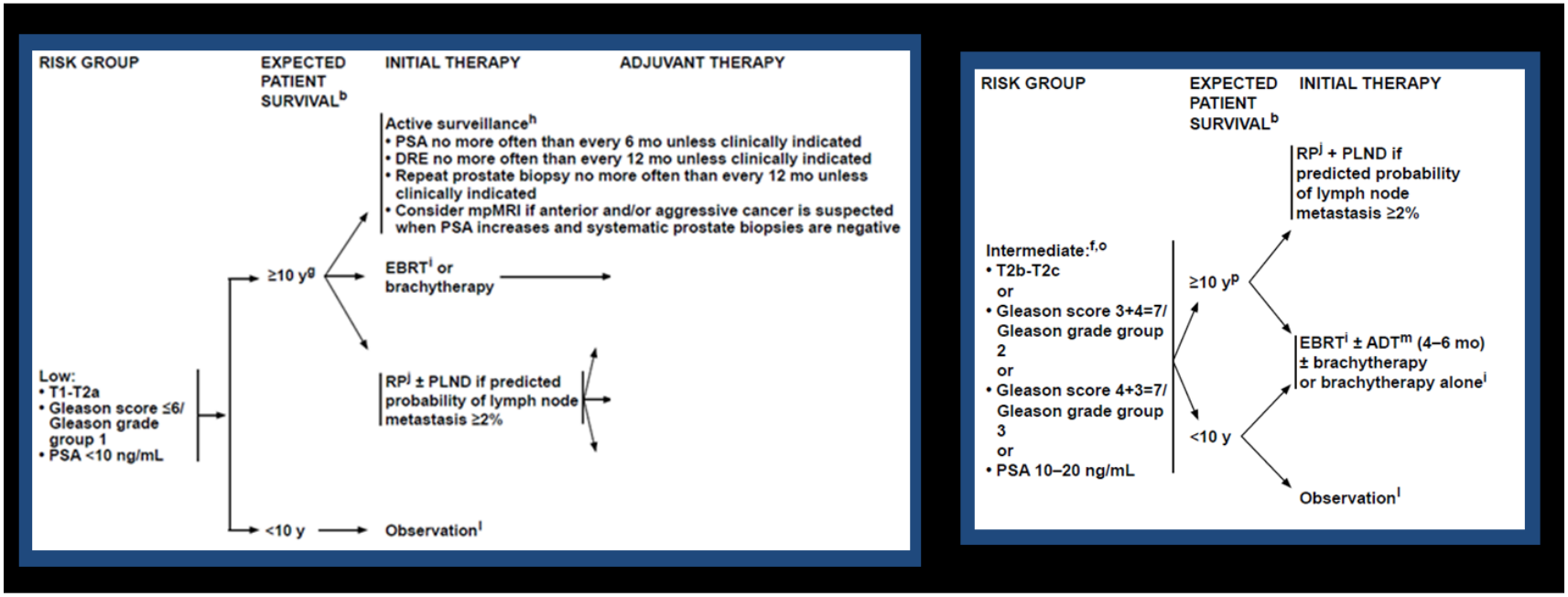
Radiother Oncol. **2018 Mar 24.** pii: S0167-8140(18)30137-3

Agenda

- Macro Level Trends and Tx Comparisons
  - PIVOT
  - ProtecT
- Tx Options
  - IMRT
  - Brachy
  - Hypofx
  - SBRT
    - Is SBRT Data Mature?
- Physician and Patient Selection
  - SBRT less operator dependent
  - One Size Doesn’t Fit All

National Comprehensive Cancer Network®

NCCN Guidelines Version 2.2017
Prostate Cancer



- Reflect Tx Heterogeneity
- All [perhaps not equally, depending on scenario] good options

Making d… …alized prostate c…

S.K. STEGINGA, … HEATHCOTE‡

School of Applied Psy… …Queensland, and Departments of Urology,

†Royal Brisbane Hos… …ternational (2002), 89: 255–260

What we say

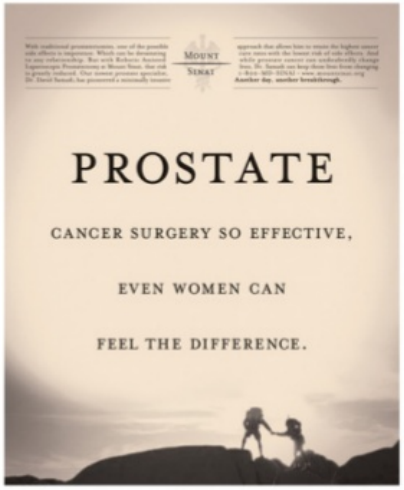
- Cure
- Salvag…
- Incont…
- Impot…
- Pain
- Social Disruption

What they fear

- …atment…
- …ctive
- …ms
- …treatment
- Getting “the Latest” technology

Toxicity

Efficacy



One size doesn’t fit all

- Patient Baseline Function
- Comorbidities
  - Prostate Size, previous TURP
- Disease Aggression
- Patient Preferences

Paradigm Change

- Cure ≥ Patient QOL
  - Reflects downstream uncertainties
    - Natural history of Tx'd/recurrent disease
    - Where upfront and tx'd disease is located and extent
    - Uncertainly regarding Salvage Options and morbidity

Light in a previous dark space

Light in a previous dark space

More Accurate Biopsy Data

- TRUS-bx w Eigen/Artemis and UroNav techniques
- 3D Mapping Biopsy

More Accurate Imaging

- Mp MRI
- Axumin/PSMA/NaF/Advanced Imaging

Better post-RT Salvage Techniques

- Partial gland Cryotherapy
- Partial gland HIFU
- Partial gland Brachytherapy

Thank you!