RADIOTERAPEUCI
RADIOTERAPEUTOM
MÓWIĄ O RADIOTERAPII

Obniżenie dawek w promieniowrażliwych narządach krytycznych poprzez łączenie teleradioterapii i brachyterapii w raku gruczołu krokowego. Praktyczne aspekty planowania skojarzonej radioterapii .

Lek. Artur Chyrek

Zakład Brachyterapii

Wielkopolskie Centrum Onkologii

Warszawa 17.11.2018

wielkopolskie centrum onkologii

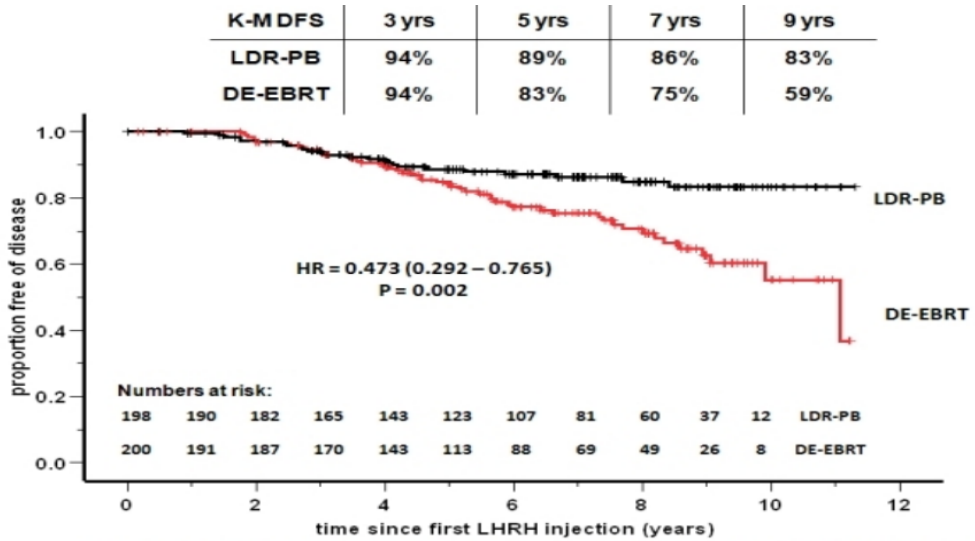
ASCENDE-RT:

Androgen Suppression Combined with Elective Nodal and Dose Escalated Radiation Therapy is an NCI registered trial (NCT00175396)

- 398 pts (High i Inter PCa)
- ADT przez 12 msc
- Po 8 msc – EBRT do 46 Gy

Dose Escalation
n= 200 pts
32 Gy 16 fx
TD = 78 Gy

LDR –PB n=198
I125 BTh = 115Gy



K-M disease free survival using the nadir+2 ng/mL threshold for biochemical failure

Conclusions: In multi-centre randomized setting, an LDR-PB boost demonstrated a large advantage over a DE-EBRT boost in relation to the primary endpoint (DFS). To date, OS and prostate cancer-specific survival do not appear to differ between arms. However, existing trends favour LDR-PB, suggesting differences in these survival endpoints may well emerge with longer FU.

W. Morris1 , S. Tyldesley1 , S. Rodda1 , R. Halperin2 , H. Pai3 , M. McKenzie1 , J. HammOC-0485 3rd ESTRO forum

ELSEVIER

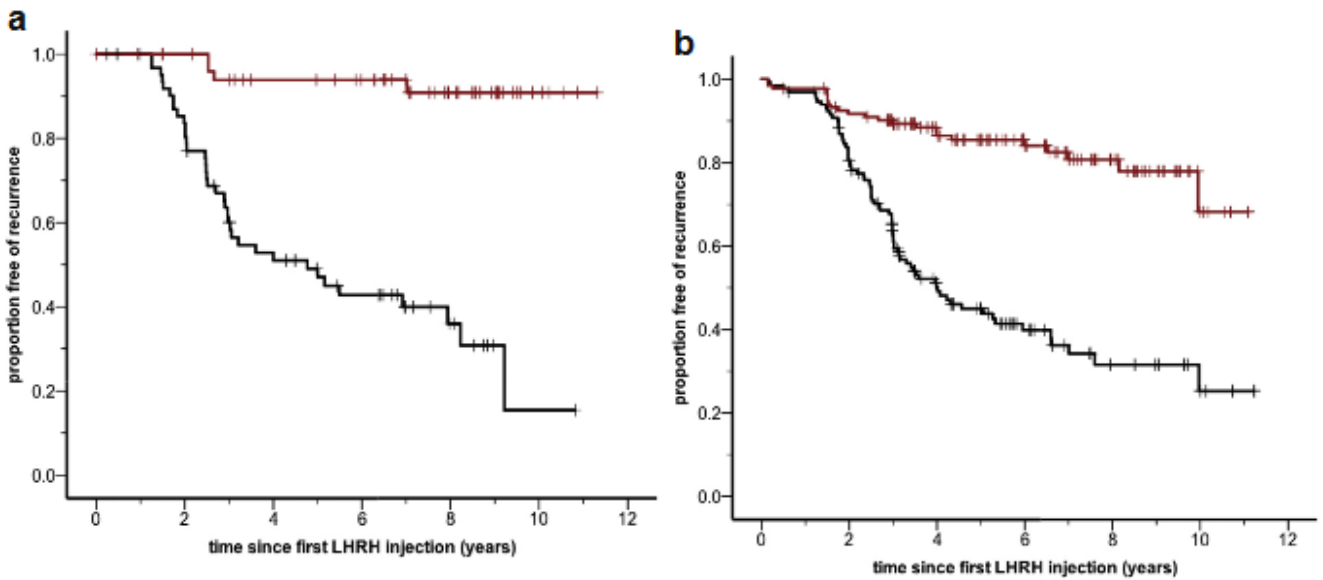
Brachytherapy ■ (2018) ■

BRACHYTHERAPY

Using a surgical prostate-specific antigen threshold of >0.2 ng/mL to define biochemical failure for intermediate- and high-risk prostate cancer patients treated with definitive radiation therapy in the ASCENDE-RT† randomized control trial

W. James Morris*, Tom Pickles[1], Mira Keyes[1]

Clinical Professor, Department of Surgery, University of British Columbia, Vancouver, British Columbia, Canada
Radiation Oncologist, Vancouver Cancer Centre, Vancouver, British Columbia, Canada



Time (yrs)	0	2	4	6	8	10
LDR-PB	54	50	41	37	22	4
DE-EBRT	64	50	28	20	8	-

Time (yrs)	0	2	4	6	8	10
LDR-PB	131	120	87	58	31	6
DE-EBRT	134	101	48	26	10	3

Fig. 3. (a) Intermediate-risk subgroup: Kaplan-Meier plots comparing b-PFS for LDR-PB boost (upper [red] line) with DE-EBRT boost (lower [black] line) using a surgical definition of biochemical failure of >0.2 ng/mL. (log rank $p < 0.001$). (b) High-risk subgroup: Kaplan-Meier plots comparing b-PFS for LDR-PB boost (upper [red] line) with DE-EBRT boost (lower [black] line) using a surgical definition of biochemical failure of >0.2 ng/ml (log rank $p < 0.001$). b-PFS = biochemical progression free survival; LDR-PB = low-dose-rate prostate brachytherapy boost; DE-EBRT = dose-escalated external beam radiation therapy.

CME ASTRO

International Journal of Radiation Oncology biology • physics

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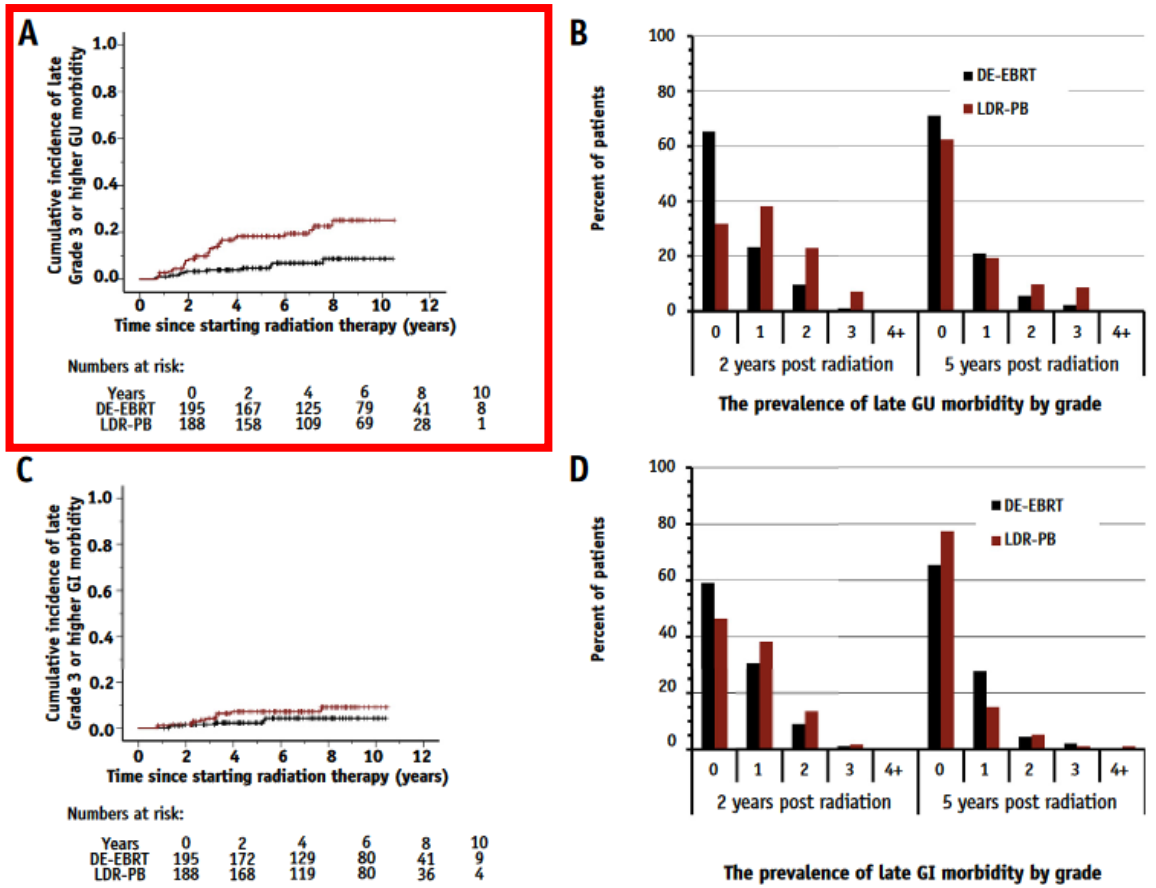
Clinical Investigation

ASCENDE-RT: An Analysis of Treatment-Related Morbidity for a Randomized Trial Comparing a Low-Dose-Rate Brachytherapy Boost with a Dose-Escalated External Beam Boost for High- and Intermediate-Risk Prostate Cancer

Sree Rodda, MBBS, MRCP, FRCR,* Scott Tyldesley, MD, FRCPC,*,† W. James Morris, MD, FRCPC,*,† Mira Keyes, MD, FRCPC,*,† 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*,**



Contents lists available at SciVerse ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Phase III randomised trial

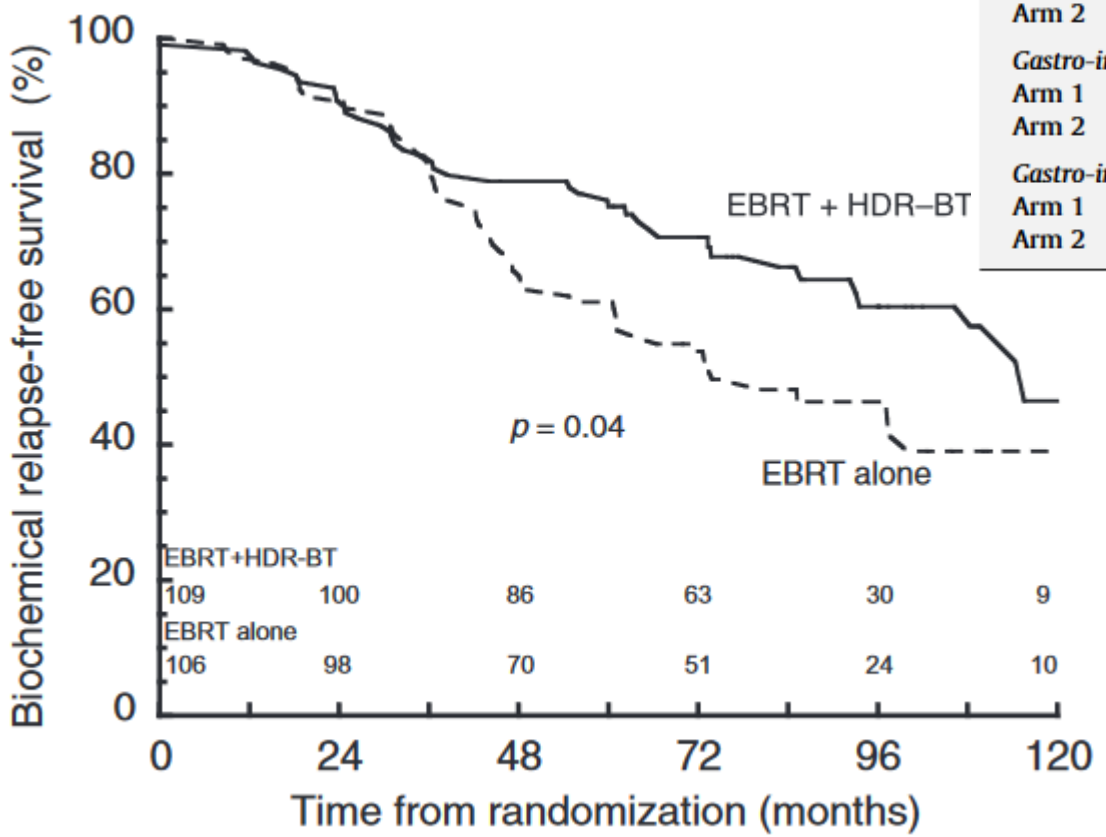
Randomised trial of external beam radiotherapy alone or combined with high-dose-rate brachytherapy boost for localised prostate cancer

Peter J. Hoskin [a], Ana M. Rojas [a,*], Peter J. Bownes [b], Gerry J. Lowe [a], Peter J. Ostler [a], Linda Bryant [a]

[a] Cancer Centre, Mount Vernon Hospital, Northwood, UK; [b] St. James's Institute of Oncology, St. James's University Hospital, Leeds, UK

- RCT III -218 pts,
  cT1-3,
  iPSA < 50 ng/ml
- EBRT – 55 Gy/20 fx
  vs
- EBRT 37,5 Gy + HDR 2 x 8,5 Gy
- OS - ns

Toksyczność n.s.



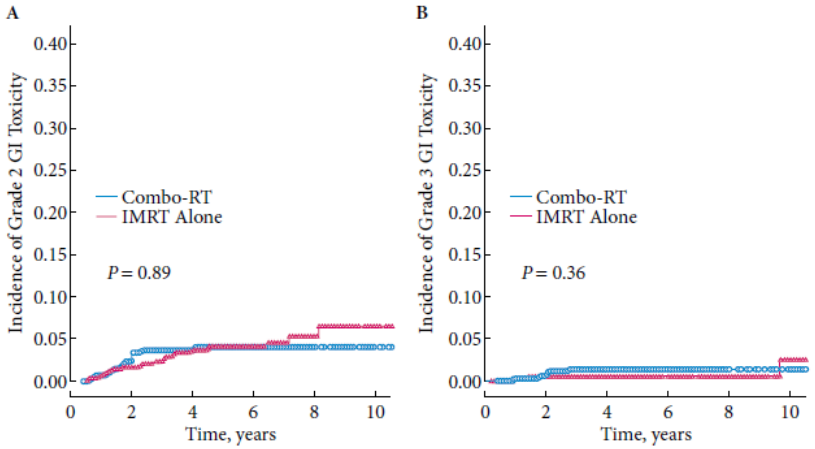
Endpoint	Analytical procedure	At 5 years	At 7 years	*p* value
bRFS				
Arm 1	K–M	61%	48%	0.04
Arm 2		75%	66%	
OS				
Arm 1	K–M	89%	88%	0.2
Arm 2		88%	81%	
Genito-urinary				
Arm 1	K–M	26%	30%	0.5
Arm 2		26%	31%	
Genito-urinary				
Arm 1	Prevalence	9%	4%	5 year: 1.0
Arm 2		8%	11%	7 year: 0.4
Urethral strictures				
Arm 1	K–M	2%	2%	0.1
Arm 2		6%	8%	
Gastro-intestinal				
Arm 1	K–M	6%	6%	0.8
Arm 2		7%	7%	
Gastro-intestinal				
Arm 1	Prevalence	0%	2%	7 year: 1
Arm 2		0%	0%	

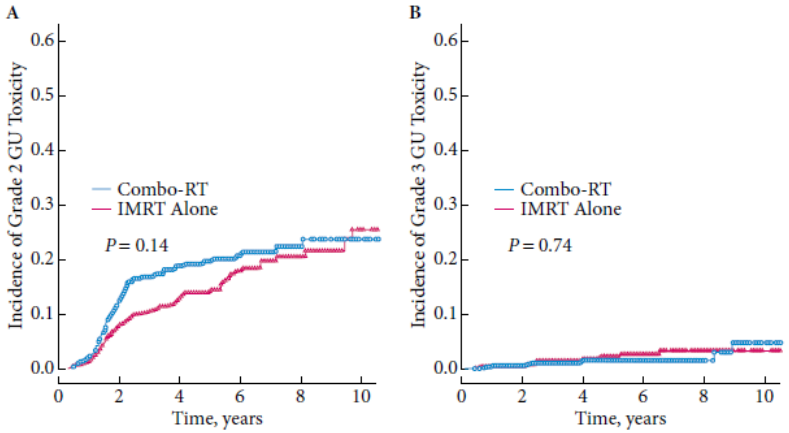
BJUI
BJU International

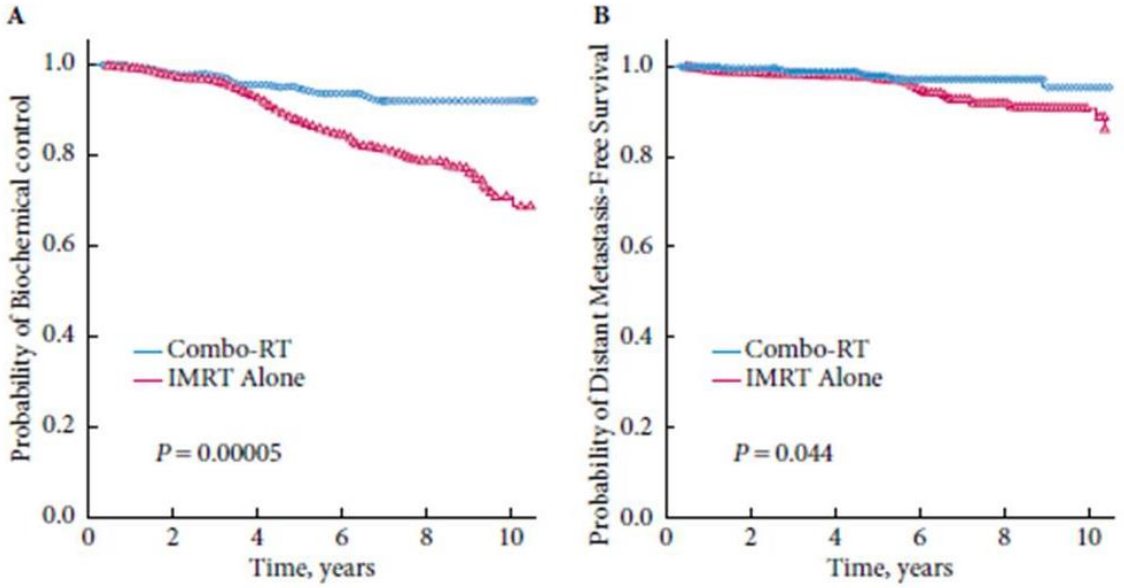
Comparison of high-dose (86.4 Gy) IMRT vs combined brachytherapy plus IMRT for intermediate-risk prostate cancer

Daniel E. Spratt, Zachary S. Zumsteg, Pirus Ghadjar, Marisa A. Kollmeier, Xin Pei, Gilad Cohen*, William Polkinghorn, Yoshiya Yamada and Michael J. Zelefsky

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

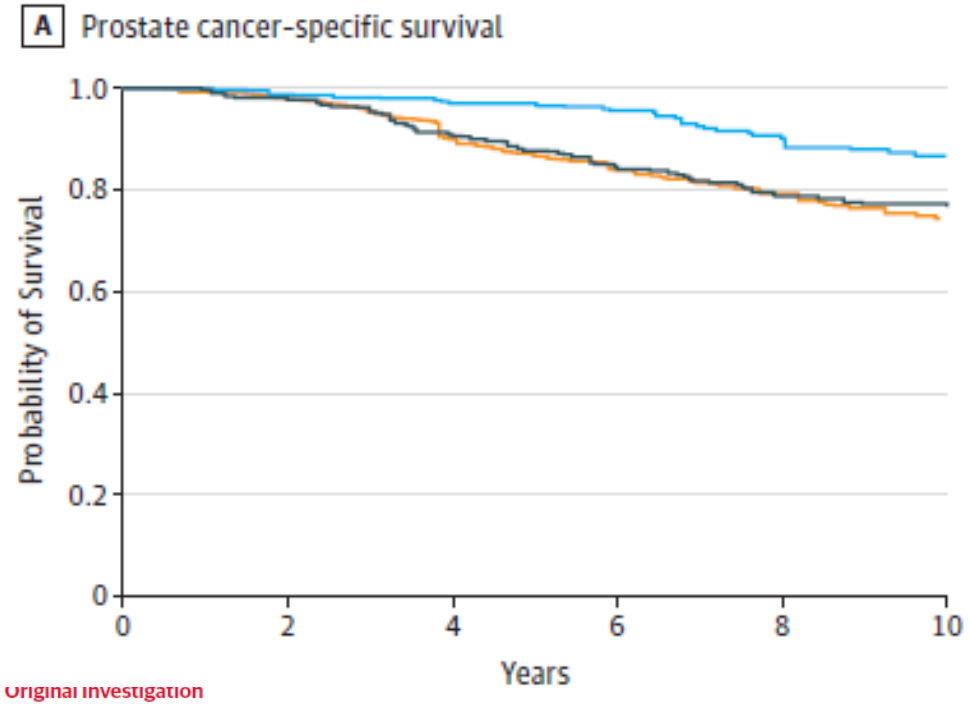


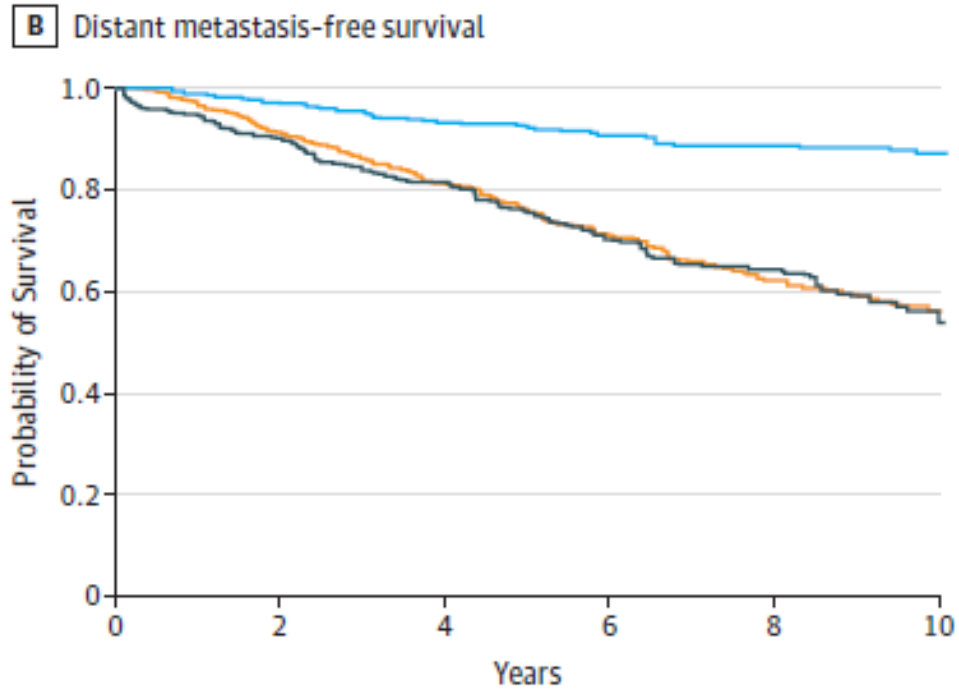




- Between 1997 and 2010, **870 patients** with **intermediate-risk prostate**
- **86.4/48fx Gy of IMRT** alone (*n* = 470) bez LN
- combo-RT consisting of brachytherapy HDR/LDR combined with 50.4 Gy of IMRT (*n* = 400).
- The **median (range) follow-up** for the entire cohort was **5.3** (1–14) years.

Toksyczność n.s.





JAMA | Original Investigation

Radical Prostatectomy, External Beam Radiotherapy, or External Beam Radiotherapy With Brachytherapy Boost and Disease Progression and Mortality in Patients With Gleason Score 9-10 Prostate Cancer

Amar U. Kishan, MD; Ryan R. Cook, MSPH; Jay P. Ciezki, MD; Ashley E. Ross, MD, PhD; Mark M. Pomerantz, MD; Paul L. Nguyen, MD; Talha Shaikh, MD; Phuoc T. Tran, MD, PhD; Kiri A. Sandler, MD; Richard G. Stock, MD; Gregory S. Merrick, MD; D. Jeffrey Demanes, MD; Daniel E. Spratt, MD; Eyad I. Abu-Isa, MD; Trude B. Wedde, MD; Wolfgang Lilleby, MD, PhD; Daniel J. Krauss, MD; Grace K. Shaw, BA; Ridwan Alam, MPH; Chandana A. Reddy, MS; Andrew J. Stephenson, MD; Eric A. Klein, MD; Daniel Y. Song, MD; Jeffrey J. Tosoian, MD; John V. Hegde, MD; Sun Mi Yoo, MD, MPH; Ryan Fiano, MPH; Anthony V. D'Amico, MD, PhD; Nicholas G. Nickols, MD, PhD; William J. Aronson, MD; Ahmad Sadeghi, MD; Stephen Greco, MD; Curtiland Deville, MD; Todd McNutt, PhD; Theodore L. DeWeese, MD; Robert E. Reiter, MD; Johnathan W. Said, MD; Michael L. Steinberg, MD; Eric M. Horwitz, MD; Patrick A. Kupelian, MD; Christopher R. King, MD, PhD

- Retrospective cohort study with 1809 patients treated between 2000 and 2013
- 639 underwent RP, 734 EBRT, and 436 EBRT+BT.
- median FU was 4.2, 5.1, and 6.3 years

Toksyczność brachyterapii HDR

Grade 3 late GU complications

Author	*N*	Followup (mo)	Dose	Type of treatment	Comments
Astrom (60)	214	48	10Gyx2	Boost	13 patients experienced urethral strictures
Demanes (17)	209	86	5.5 Gy−6.0Gyx4	Boost	6.7% late Grade 3 and 1% Grade 4 GU toxicity (TUR related)
Hsu (7)	112	30	9.5Gyx2	Boost	Less than 3% Grade 3 toxicity at 18 mo
Phan (49)	309	59	6Gyx4	Boost	4% late Grade 3 GU
Deger (50)	442	60	9−10 Gyx2	Boost	9% late Grade 3 GU toxicity
Martinez (77)	207	66	5.5−11Gyx2	Boost	8% late Grade 3 GU toxicity
Sullivan (52)	425	41	4−5Gyx46.5 Gyx3	Boost	8% late Grade 3 GU toxicity
Zwahlen (73)	587	66	5Gyx4−6Gyx3	Boost	7% late Grade 3 GU toxicity
Demanes (57)	298	62	7Gyx6 9.5Gyx4	Mono	3% late Grade 3 GU toxicity
Ghilizan (51)	173	17	12−13.5Gyx2	Mono	1% late GU Grade 3 toxicity
Hoskin (78)	197	37	8.5Gyx4 9Gyx4 10.5Gyx3 13Gyx2	Mono	3−7% strictures

GU = genitourinary; TUR = transurethral resection.

Y. Yamada et al. / Brachytherapy 11 (2012) 20−32

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Radiotherapy and Oncology

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Original article

What is the ideal radiotherapy dose to treat prostate cancer? A meta-analysis of biologically equivalent dose escalation

Nicholas G. Zaorsky [a,b,*], Joshua D. Palmer [b], Mark D. Hurwitz [b], Scott W. Keith [c], Adam P. Dicker [b], Robert B. Den [b]

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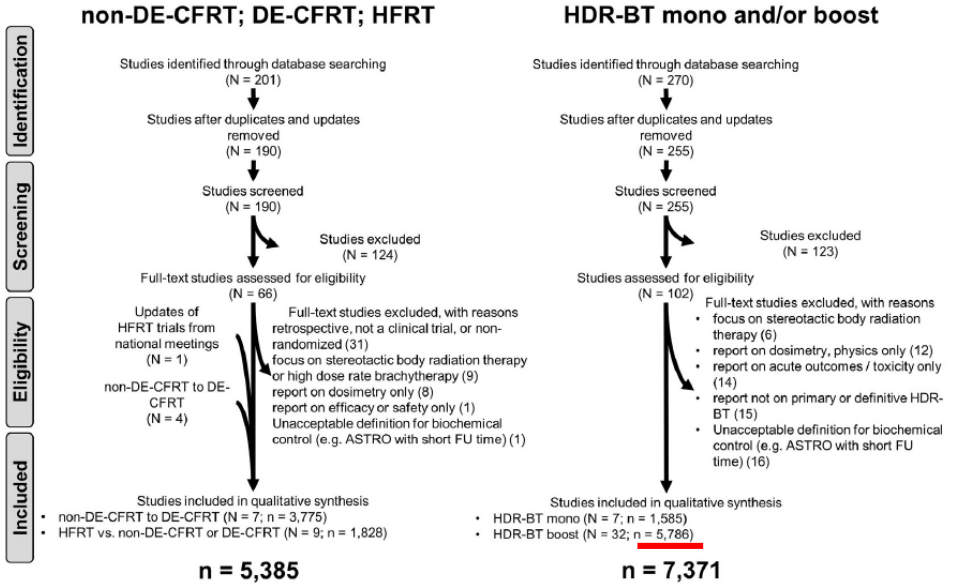
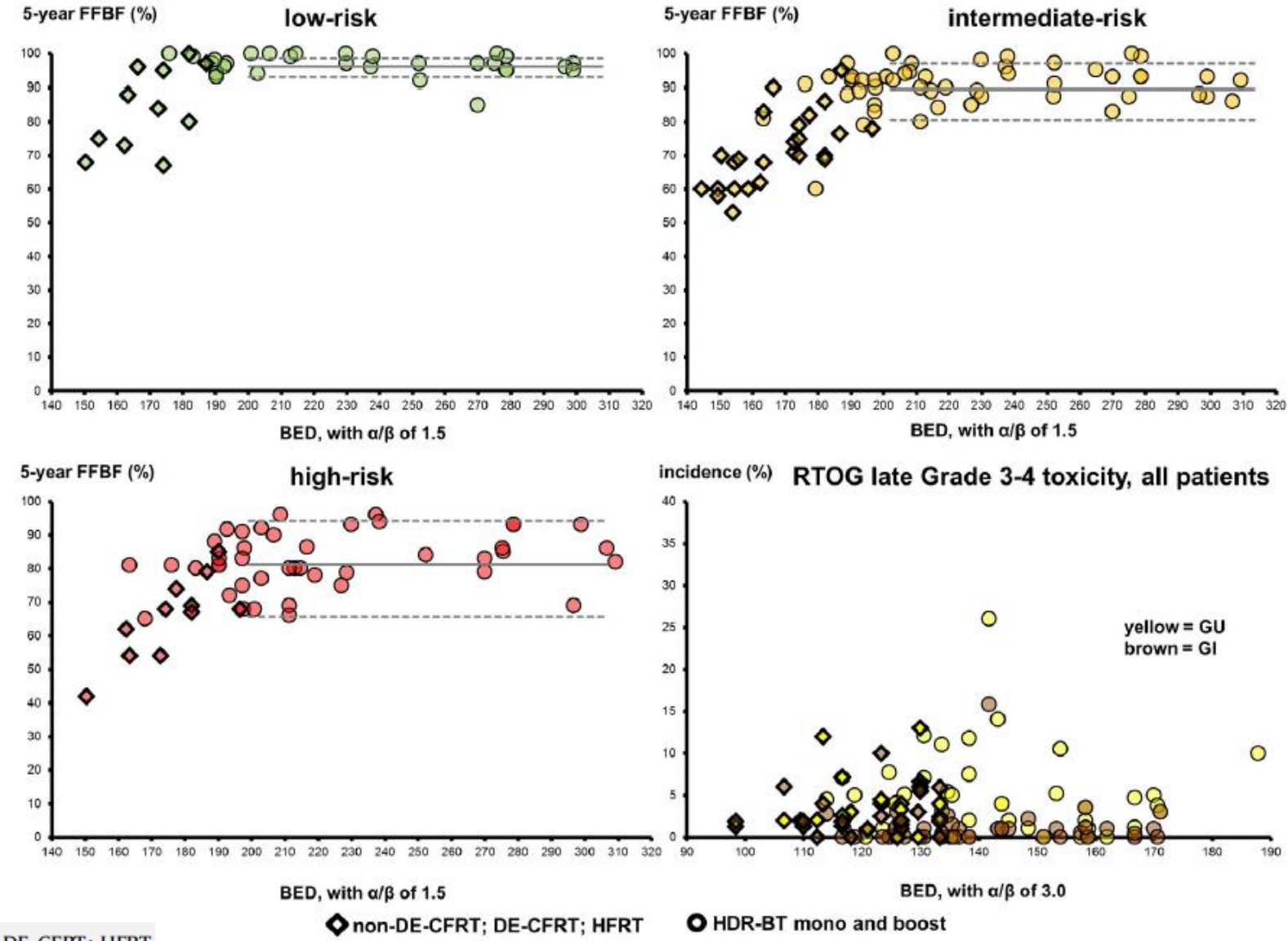


Late RTOG grade 3–4 toxicity at BED range with α/β of 3.0

GU % range	Slope‡	GI % range	Slope‡	
0–7	0.63	0–13	0.81	Non-DE-CFRT; DE-CFRT; HFRT
0–12	0.01	0–4	0.13	HDR-BT mono or boost



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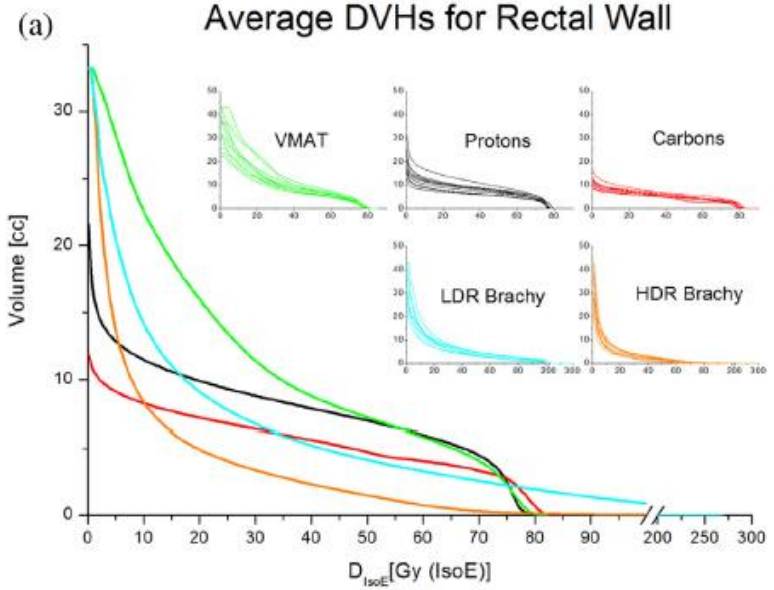

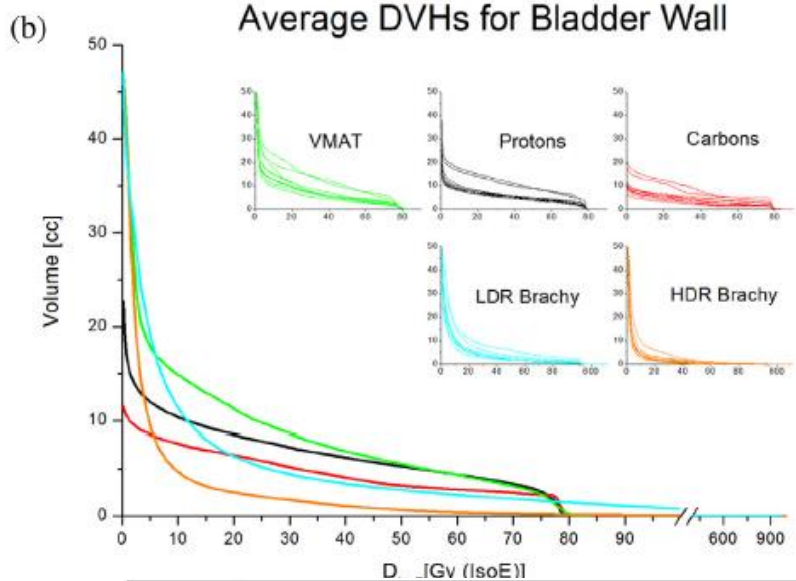

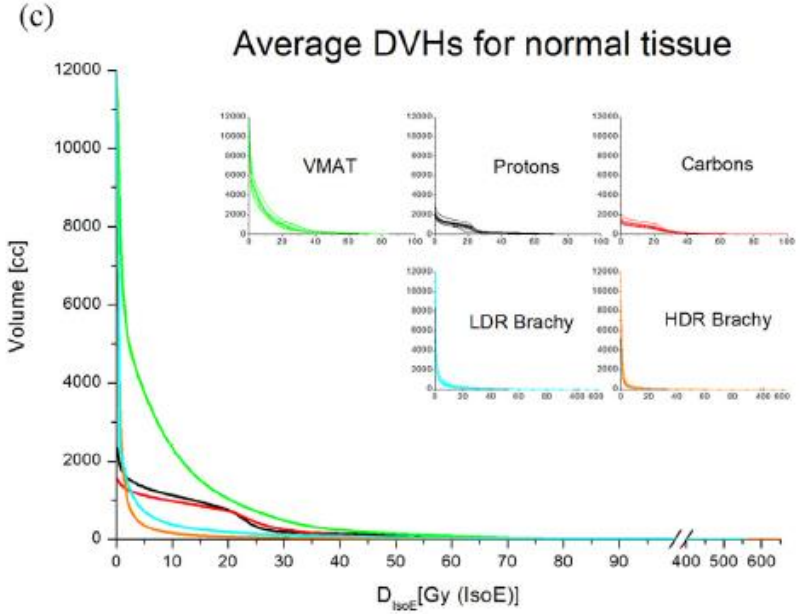

Physics Contribution

Dosimetric Considerations to Determine the Optimal Technique for Localized Prostate Cancer Among External Photon, Proton, or Carbon-Ion Therapy and High-Dose-Rate or Low-Dose-Rate Brachytherapy

Dietmar Georg, PhD,*,† Johannes Hopfgartner, MSc,*,† Joanna Gòra, MSc,* Peter Kuess, MSc,*,† Gabriele Kragl, PhD,* Daniel Berger, MSc,*,† Neamat Hegazy, MD,* Gregor Goldner, MD, PhD,*,† and Petra Georg, MD, PhD*,†

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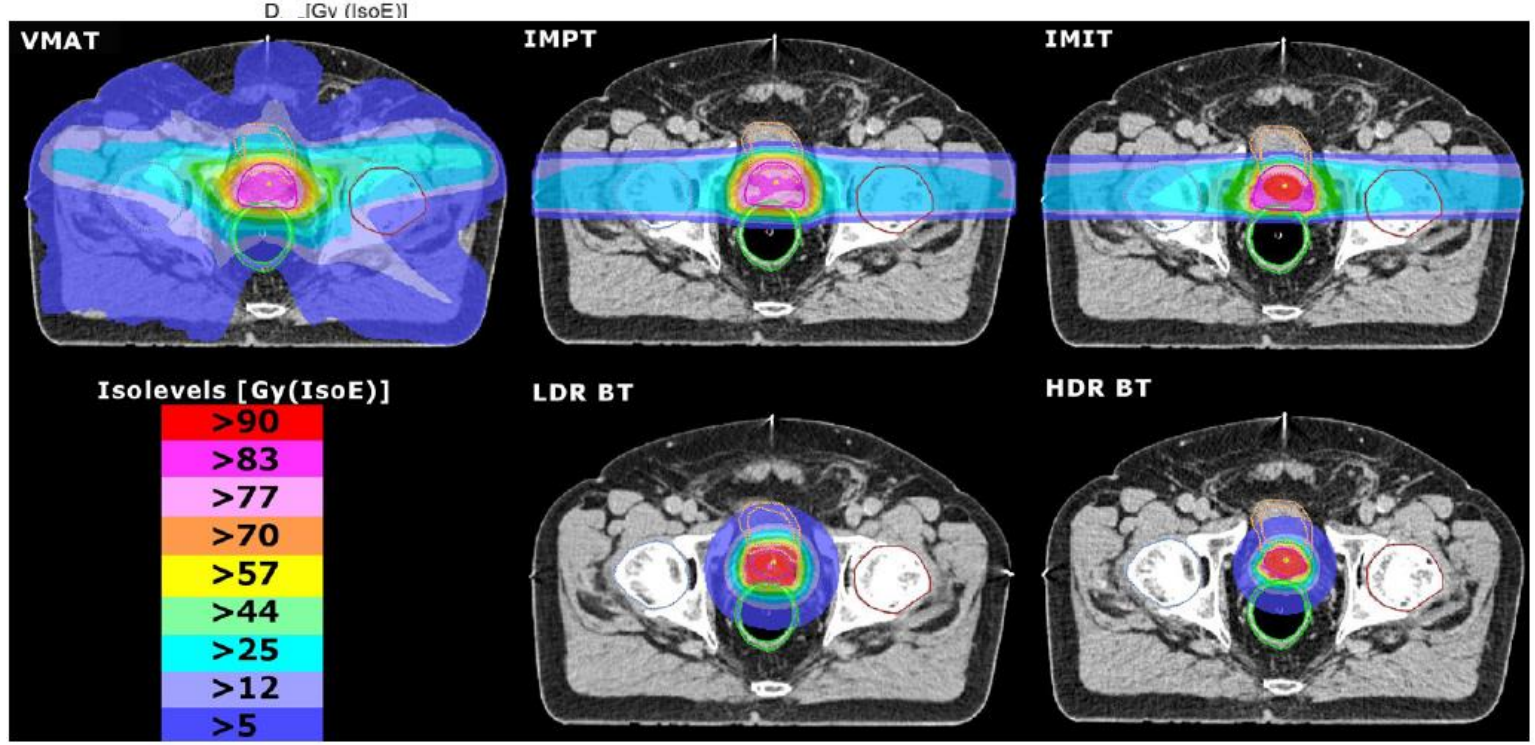
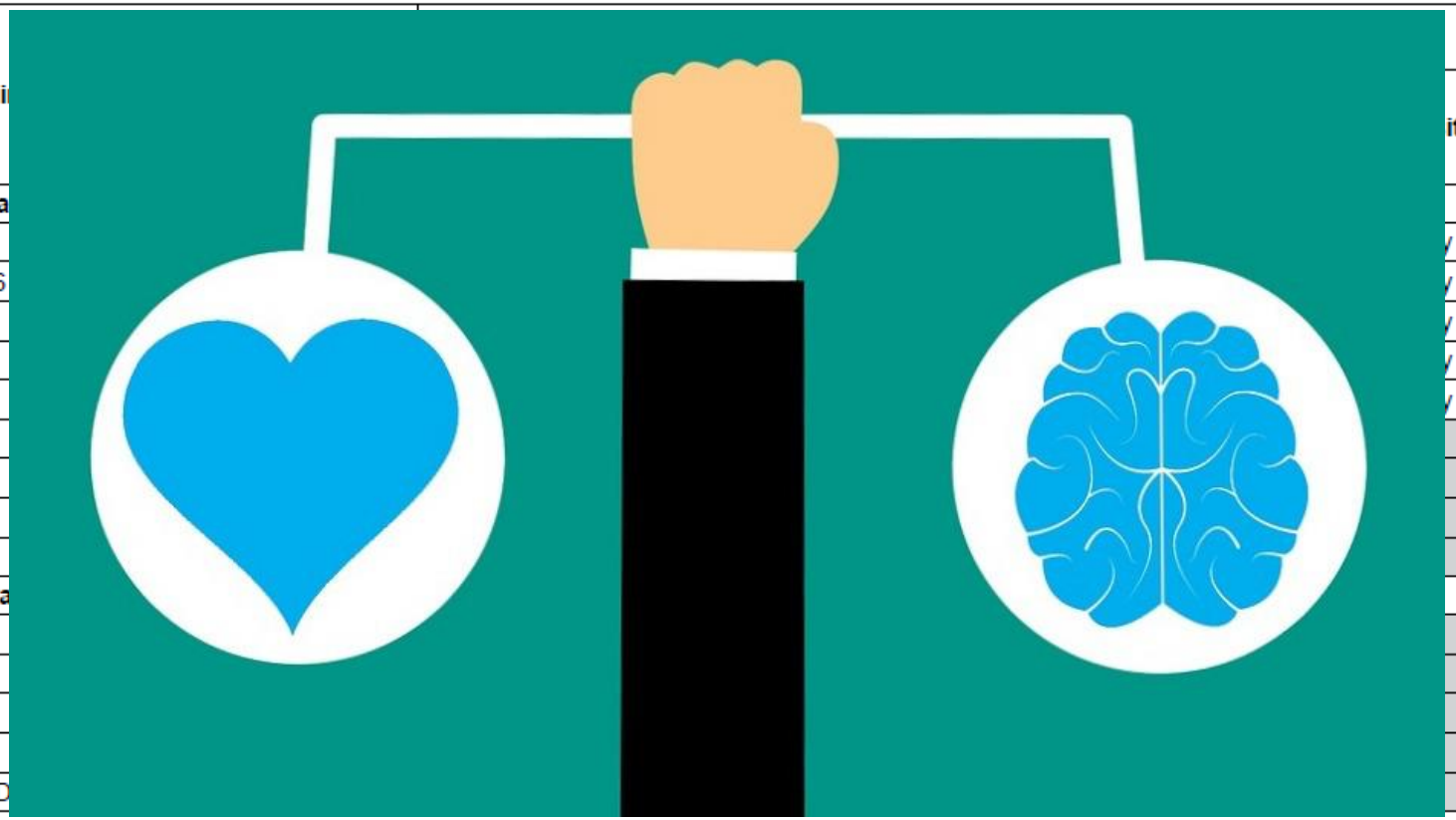


PRINCIPLES OF RADIATION THERAPY

Table 1: Regimens that have shown acceptable efficacy and toxicity. The optimal regimen for an individual patient warrants evaluation of comorbid conditions, voiding symptoms, and toxicity of therapy. Additional fractionation schemes may be used as long as sound oncologic principles and appropriate estimate of BED are considered.



Regi				itive
Beam Thera				
				y ADT
75.6				y ADT
				y ADT
				y ADT
				y ADT
Brachythera				
HD				
Combined EBRT and Brachytherapy (EBRT 45–50.4 Gy at 1.8–2.0 Gy/fx, unless otherwise noted)				
Iodine 125 implant at 110-115 Gy				✓ ± 4 mo ADT ✓ with 1-3 y ADT ✓ with 1-3 y ADT
Palladium 103 implant at 90-100 Gy				✓ ± 4 mo ADT ✓ with 1-3 y ADT ✓ with 1-3 y ADT
Cesium implant at 85 Gy				✓ ± 4 mo ADT ✓ with 1-3 y ADT ✓ with 1-3 y ADT
HDR 21.5 Gy at 10.75 Gy x 2				✓ ± 4 mo ADT ✓ with 1-3 y ADT ✓ with 1-3 y ADT
EBRT 37.5 Gy at 2.5 Gy + 12-15 Gy single HDR				✓ ± 4 mo ADT ✓ with 1-3 y ADT ✓ with 1-3 y ADT

Standard leczenia raka prostaty pośredniej (niekorzystnej) i wysokiej grupy ryzyka w WCO

- 50 Gy (2Gy/fr) + BT HDR 1x15 Gy +/- HT

α/β [Gy]	1,5		Zakład Brachyterapii Wielkopolskiego Centrum Onkologii	
Dawka na guz	Prostata		**Pacjent:**	

EBRT 1		BED [$Gy_{\alpha/\beta}$]	EQD_2 [Gy]
liczba frakcji n	25		
dawka / frakcja d [Gy]	2	4,7	2,0
TOTAL	50,0	116,7	**50,0**

EBRT 2		BED [$Gy_{\alpha/\beta}$]	EQD_2 [Gy]
liczba frakcji n			
dawka / frakcja d [Gy]		0,0	0,0
Dawka całkowita	0,0	0,0	**0,0**

Dawka całkowita EBRT	BED [$Gy_{\alpha/\beta}$]	EQD_2 [Gy]
EBRT 1+2	116,7	**50,0**

HDR	D [Gy]	BED [$Gy_{\alpha/\beta}$]	EQD_2 [Gy]
dawka frakcyjna 1 D_1	15	165,0	**70,7**
dawka frakcyjna 2 D_2		0,0	**0,0**
dawka frakcyjna 3 D_3		0,0	**0,0**
dawka frakcyjna 4 D_4		0,0	**0,0**
dawka frakcyjna 5 D_5		0,0	**0,0**
dawka frakcyjna 6 D_6		0,0	**0,0**
Dawka całkowita		165,0	**70,7**

ZAKŁAD BRACHYTERAPII
WIELKOPOLSKIE CENTRUM ONKOLOGII

Dawka całkowita EBRT + HDR	BED [$Gy_{\alpha/\beta}$]	EQD_2 [Gy]
EBRT + HDR	281,7	**120,7**

Przeciwwskazania do BT

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BRACHYTHERAPY

Brachytherapy 11 (2012) 20–32

American Brachytherapy Society consensus guidelines for high-dose-rate prostate brachytherapy

Yoshiya Yamada[1,*], Leland Rogers[2], D. Jeffrey Demanes[3], Gerard Morton[4], Bradley R. Prestidge[5], Jean Pouliot[6], Gil'ad N. Cohen[7], Marco Zaider[7], Mihai Ghilezan[8], I-Chow Hsu[6]

[1]*Department of Radiation Oncology, Memorial Sloan Kettering Cancer Center, New York, NY*
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[3]*Department of Radiation Oncology, California Endocurietherapy Cancer Center, University of California Los Angeles, Los Angeles, CA*
[4]*Department of Radiation Oncology, University of Toronto, Sunnybrook Health Sciences Centre, Toronto, Ontario*
[5]*South Texas Radiation Therapy Associates, Memorial Hermann – Southwest Hospital, Houston, TX*
[6]*Department of Radiation Oncology, Helen Diller Family Comprehensive Cancer Center, San Francisco, CA*
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Absolute contraindications

Absolute contraindications for HDR brachytherapy include the following conditions:

1. Preexisting rectal fistula,
2. Medically unsuited for anesthesia, and
3. No proof of malignancy.

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journal homepage: www.thegreenjournal.com

GEC/ESTRO recommendations

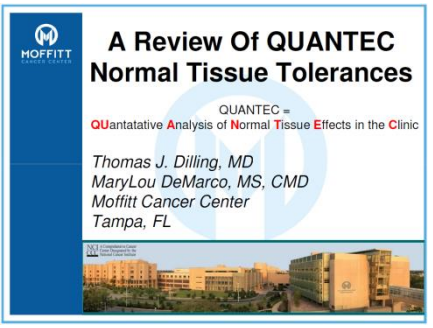
GEC/ESTRO recommendations on high dose rate afterloading brachytherapy for localised prostate cancer: An update

Peter J. Hoskin[a,*,1], Alessandro Colombo[b,1], Ann Henry[c,1], Peter Niehoff[d,1], Taran Paulsen Hellebust[e,1], Frank-Andre Siebert[f,1], Gyorgy Kovacs[g,1]

[a] *Mount Vernon Cancer Centre, Northwood, UK;* [b] *Department of Radiotherapy, Manzoni Hospital, Lecco, Italy;* [c] *St. James Institute for Oncology, Leeds, UK;* [d] *Department of Radiotherapy, City Hospital Cologne, Germany;* [e] *DNR Norwegian Radium Hospital, Oslo, Norway;* [f] *Universitätsklinikum Schleswig-Holstein, Kiel; and* [g] *University Hospital Schleswig-Holstein Campus Lübeck, Germany*

Table 2
Patient selection criteria for a curative combined HDRBT and external beam treatment.

Inclusion criteria
Stages T1b–T3b
Any Gleason score
Any PSA level
Exclusion criteria
TURP within 3–6 months
Maximum urinary flow rate (Qmax) <10 ml/s
IPSS > 20
Pubic arch interference
Lithotomy position or anaesthesia not possible
Rectal fistula



Ograniczenia dawek w OARs dla EBRT

- Rectum
- V50 < 50%, V60 <35%, V65 < 25%,
- V70 < 20%, V75< 15%

- Pęcherz
- V80 <15%, V75 <25%,
- V70 < 35%, V65 < 50%

- Opuszka prącia
- D70 < 70 Gy D90 <50 Gy
- mean dose to 95% of volume to <50 Gy

- głowy kk. udowych
- Dmax < 50 Gy
- V50 < 5%

TABLE 5. Constraints in Use

	RTOG	UTHSCSA	Univ. Miami	Cedars Sinai	MSKCC	DFCI/BWH
Volume	Prostate only	Same for prostate with or without pelvis	Prostate + proximal SVs	Same for prostate with or without pelvis	Prostate + proximal half of SV	Same for prostate with or without pelvis
IMRT method	Any	Tomo, Varian or Rapid Arc	Rapid Arc	Rapid Arc or 7 field IMRT	In house	Sliding window (Varian Eclipse)
Total prescribed dose	73.8 Gy	77 Gy	80 Gy	77.7 Gy for int. risk at 1.85/d	86.4 Gy	75.6 Gy
How prescribed	Minimum dose (100%)	95% isodose	>95% PTV	100%	100% isodose-does not cover rectum/ prostate overlap	99% of PTV receives 100% of prescribed dose
Allowable PTV inhomogeneity	+7%	±5%	Nominally 10% (up to 15%)	7%	110%	Max dose in PTV less than 110% of prescribed
How rectum defined (see key)	1	2	3	4	5	6
Rectum constraints						
85 Gy	—	—	—	—	85.5 max	83 Gy max
80 Gy	—	—	—	—	—	—
75 Gy	15%	5%	—	—	30% (V75.6)	—
70 Gy	25%	20%	—	25%	—	<10 mL
65 Gy	35%	—	17%–22%	—	—	—
60 Gy	50%	—	—	—	—	—
55 Gy	—	30%	—	—	—	—
50 Gy	—	—	—	50%	—	—
45 Gy	—	—	—	—	53% (V47)	<53% (V47)
40 Gy	—	50%	35%–40%	—	—	—
How bladder defined	Whole bladder	Whole bladder	Whole bladder	Whole bladder	Whole bladder	Whole bladder
85 Gy	—	—	—	as low as	—	—
80 Gy	15%	—	—	reason-able	—	—
75 Gy	25%	—	—		—	—
70 Gy	35%	25%	—		—	—
65 Gy	50%	—	25%		—	—
60 Gy	—	—	—	—	—	—
55 Gy	—	—	—	—	—	—
50 Gy	—	—	—	—	—	—
45 Gy	—	—	—	—	53% (V47)	53% (V47)
40 Gy	—	—	50%	—	—	—

The investigators emphasized that these are not absolute and represent goals and final determination is based on careful evaluation of the isodose pans and dose-volume histograms. If a range is given, the lower number is the target with allowance up to the higher. Rectal volume definitions are defined in the Appendix.

Ograniczenia dawek w OARs dla EBRT 50Gy podczas leczenia skojarzonego stosowanego w WCO

- Rectum i pęcherz V50 < 50%
- głowy kk. udowych Dmax < 50 Gy
- Opuszka prącia Dmean<35 Gy

Ograniczenia dawek w OARs dla BT HDR 15 Gy podczas leczenia skojarzonego stosowanego w WCO

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GEC/ESTRO recommendations

GEC/ESTRO recommendations on high dose rate afterloading brachytherapy for localised prostate cancer: An update

Peter J. Hoskin [a,*,1], Alessandro Colombo [b,1], Ann Henry [c,1], Peter Niehoff [d,1], Taran Paulsen Hellebust [e,1], Frank-Andre Siebert [f,1], Gyorgy Kovacs [g,1]

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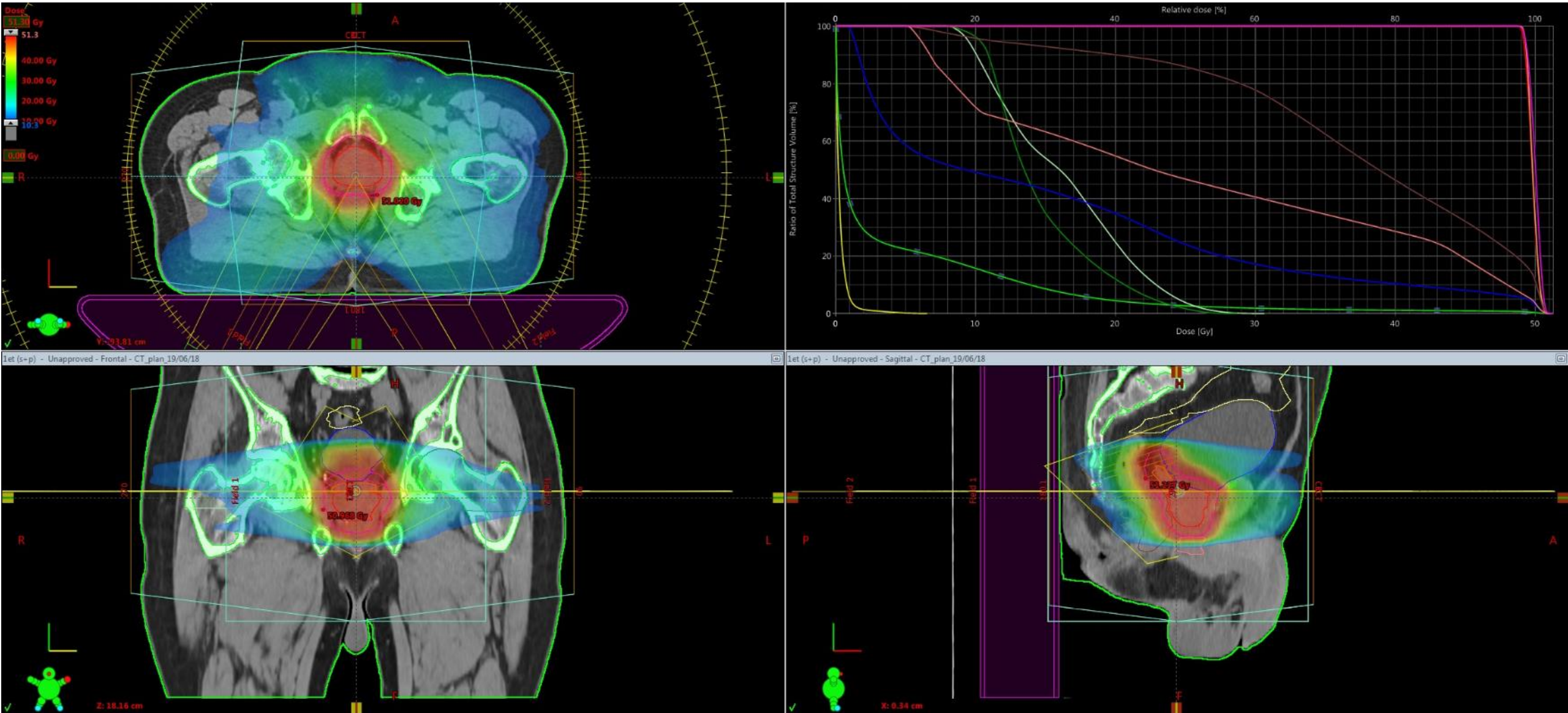
- Rectum: D2 cc $\leqslant$ 75 Gy EQD_2
- Urethra:
  - D0.1 cc = $\leqslant$120 Gy EQD_2
  - D10 $\leqslant$ 120 Gy EQD_2
  - D30 $\leqslant$ 105 Gy EQD_2

- Rectum (α/β=3)
- D2cc ≤ 65%
- D10 <75%
- Dmax < 100%

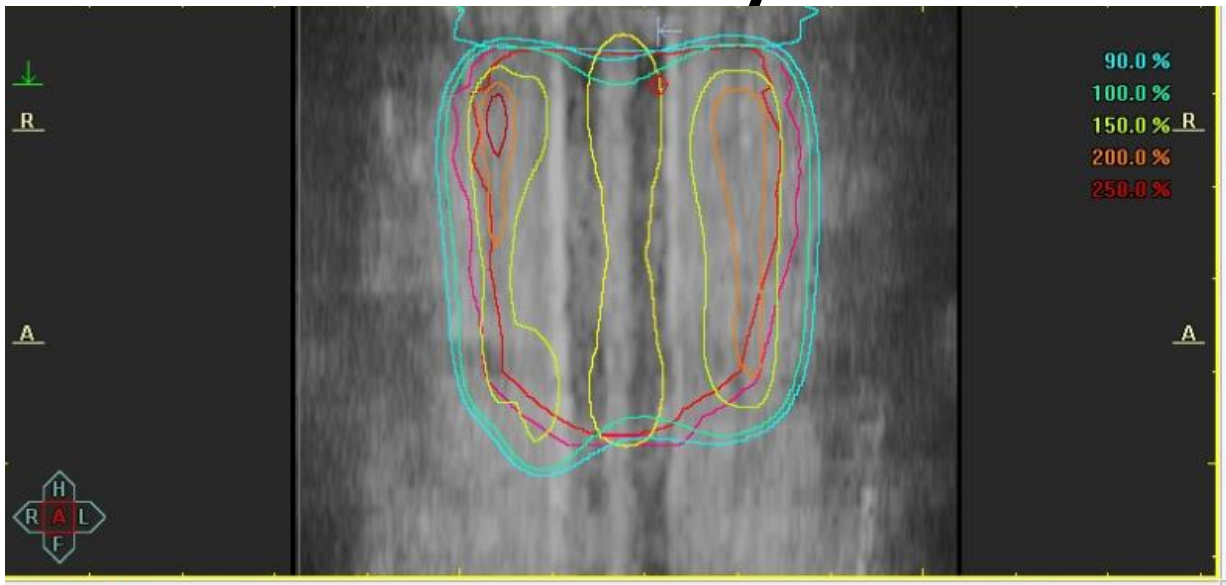
- Urethra (α/β=5)
- D0.1cc i D10 ≤ 130%
- D30 ≤ 115%

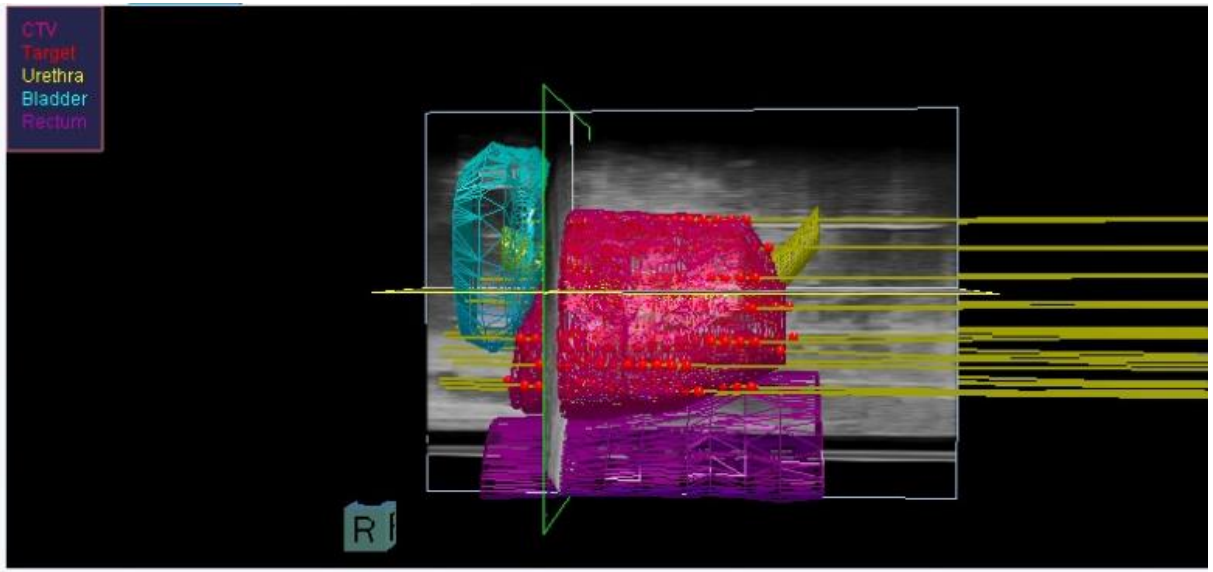
- Pęcherz (α/β=5)
- idealnie Dmax < 100%
- D10 <75%

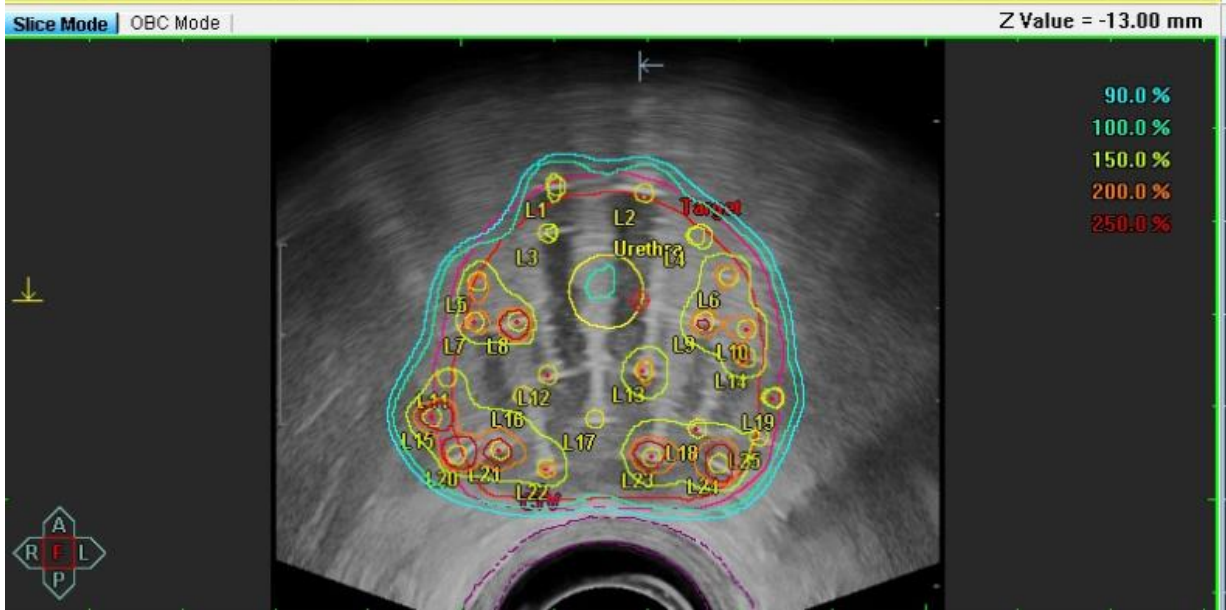
RA 50 Gy


Relative dose [%]
Ratio of Total Structure Volume [%]
Dose [Gy]
1et (s+p) - Unapproved - Frontal - CT_plan_19/06/18
1et (s+p) - Unapproved - Sagittal - CT_plan_19/06/18

BT HDR 15 Gy – Real time







RA 50 Gy + 15 Gy BT HDR (120,7 Gy EQD2)

- **Rectum**
- EBRT

V50 = **11,2%**

- EBRT + BT

D2cc = 75Gy EQD2

Dmax = 98 Gy EQD2 (worst scenario)

- **Pęcherz**
- EBRT

V50 = **3,6%**

- EBRT + BT

D10 (D1,69cc)= 76,1 Gy EQD2

Dmax = 94,4 Gy EQD2 (worst scenario)

Urethra

D0.1cc = 111,3 Gy EQD2

D10 = 108,6 Gy EQD2

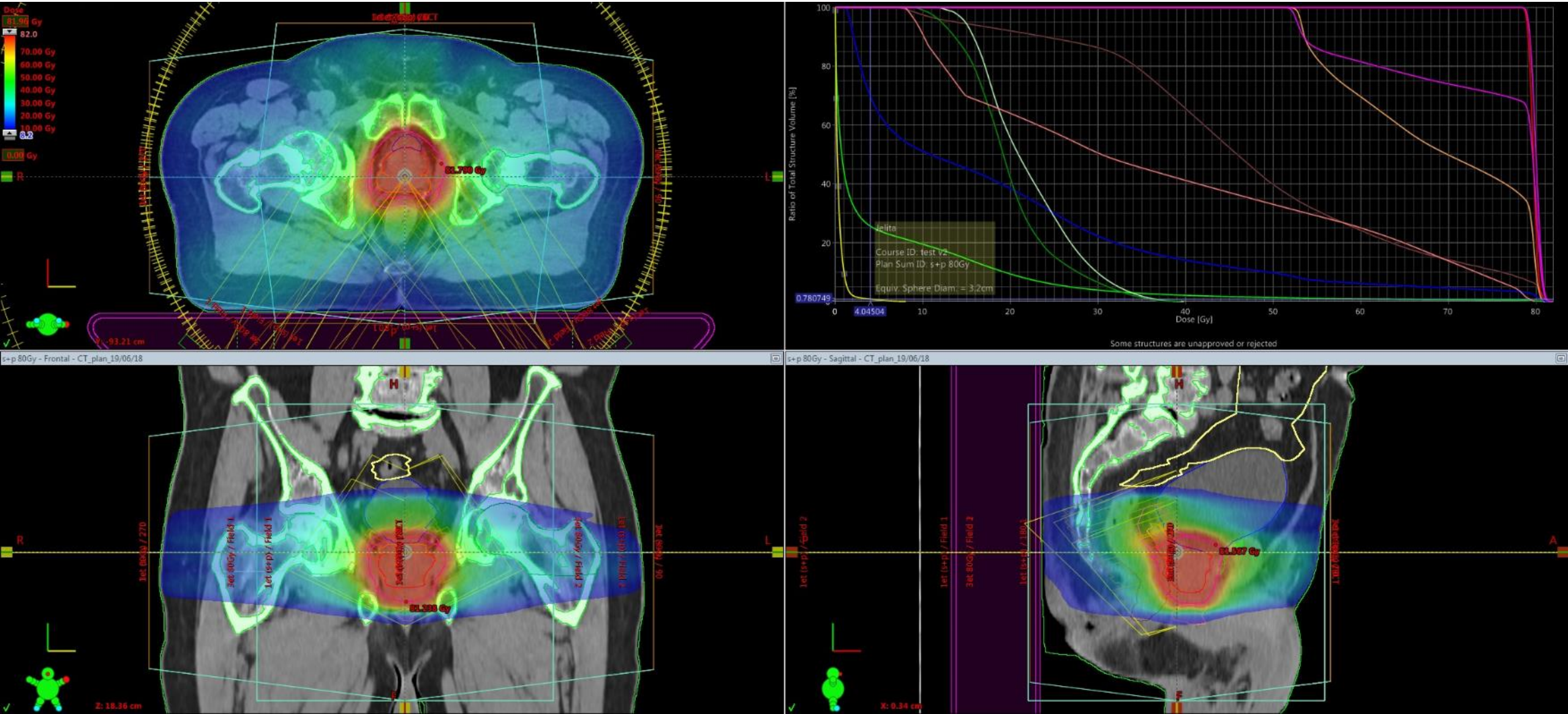
D30 = 104,6 Gy EQD2

- **Opuszka prącia** (EBRT)

  Dmean= 25,6 Gy
- **Gł. Kk. Udowych** (EBRT)

  Dmax Pr = 30,7 Gy; Dmax L = 28,7 Gy

RA 80 Gy


Dose
81.96 Gy
82.0
70.00 Gy
60.00 Gy
50.00 Gy
40.00 Gy
30.00 Gy
20.00 Gy
10.00 Gy
8.2
0.00 Gy
81.790 Gy
Ratio of Total Structure Volume [%]
Jelita
Course ID: test v2
Plan Sum ID: s+p 80Gy
Equiv. Sphere Diam.: = 3.2cm
0.780749
4.04504
Dose [Gy]
Some structures are unapproved or rejected
s+p 80Gy - Frontal - CT_plan_19/06/18
s+p 80Gy - Sagittal - CT_plan_19/06/18
81.327 Gy

RA 80 Gy

- **Rectum**

V50 = **39,7%**, V60 = 24%,
V65 = 18,3%, V70 = 14,2%,
V75 = 10,7%
D2cc = **80,5 Gy**
Dmax = 81,7 Gy

- **Urethra**

Wszystkie parametry ~ 80 Gy

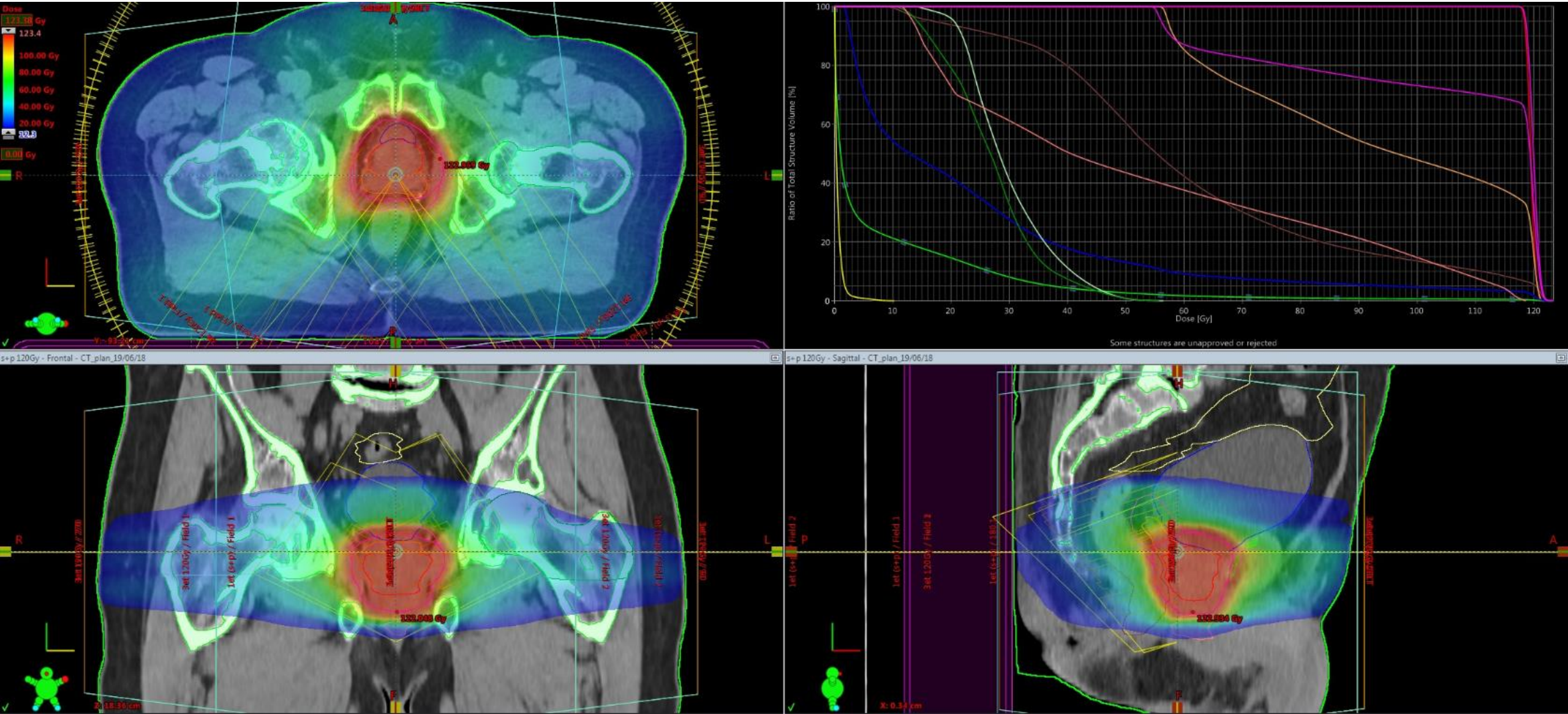
- **Pęcherz**
- V80 = 1,6%, V75 = 3,8%,
  V70 = 4,5%, V65 = 5,3%
  V50 = **9,7%**
  Dmax = **81,8 Gy**
  D1,69cc = 80,7 Gy

- **Opuszka prącia**

  Dmean= 34,9 Gy
- **Gł. Kk. Udowych**

  Dmax Pr = 39,8 Gy; Dmax L = 39,5 Gy

RA 120 Gy


Dose
123.4
100.00 Gy
80.00 Gy
60.00 Gy
40.00 Gy
20.00 Gy
0.00 Gy
Ratio of Total Structure Volume [%]
Dose [Gy]
Some structures are unapproved or rejected
s+p 120Gy - Frontal - CT_plan_19/06/18
s+p 120Gy - Sagittal - CT_plan_19/06/18

RA 120 Gy

- **Rectum**

V50 = **60,3%**, V60 = 42,1%,
V65 = 35,6%, V70 = 30,2%,
V75 = 25,8%
D2cc = **121 Gy**
Dmax = **123,1 Gy**

- **Urethra**

Wszystkie parametry ~ 120 Gy

- **Pęcherz**
- V80 = 6,8%, V75 = 7,6%,
  V70 = 8,4%, V65 = 9,3%
  V50 = **21,2%**
  Dmax = **122,9 Gy**
  D1,69cc = **121,1 Gy**

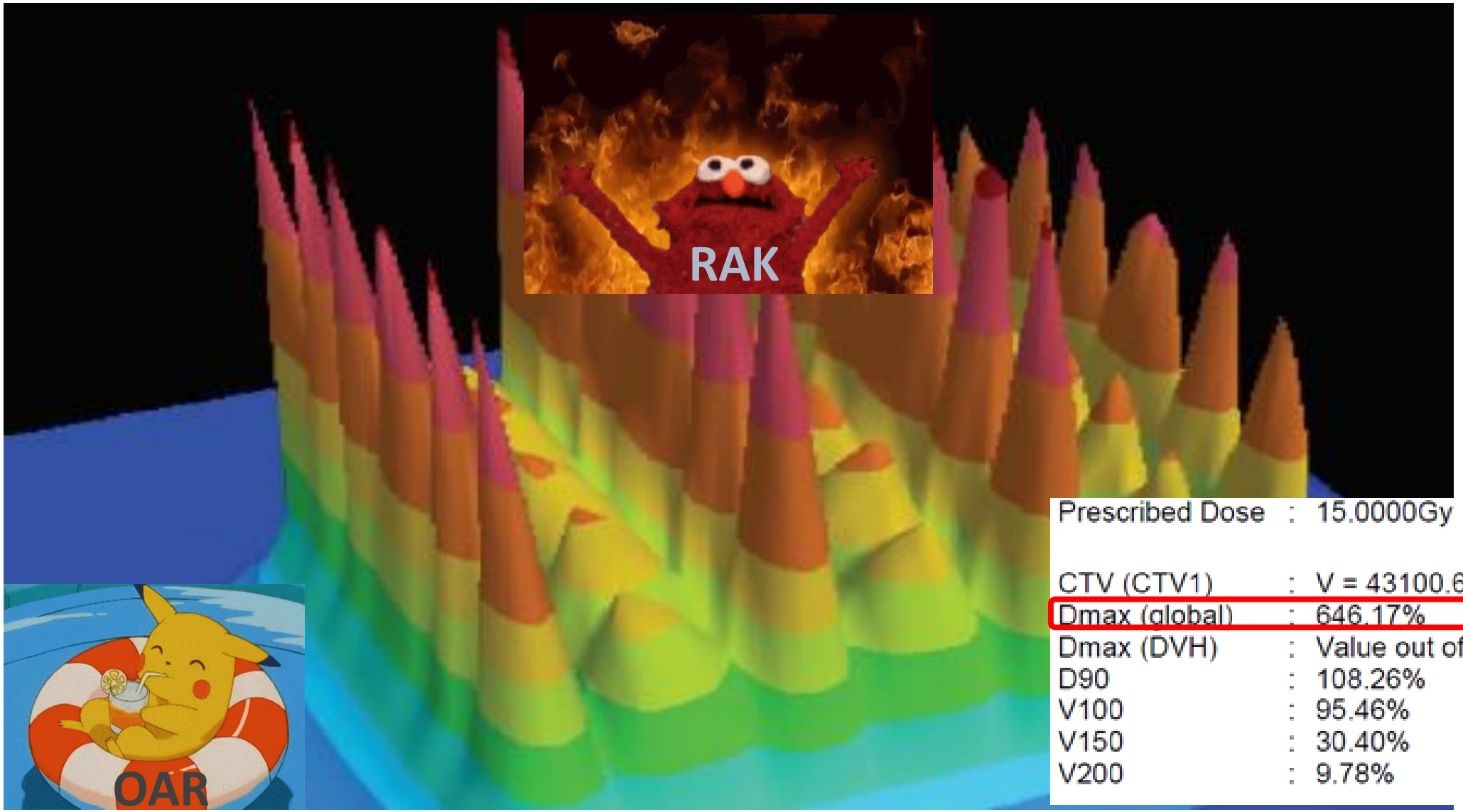
- **Opuszka prącia**

  Dmean= 53,4 Gy
- **Gł. Kk. Udowych**

  Dmax Pr = 67,9 Gy; Dmax L = 72,6 Gy
  V50 Pr = 8,9%; V50 L = 5,6%

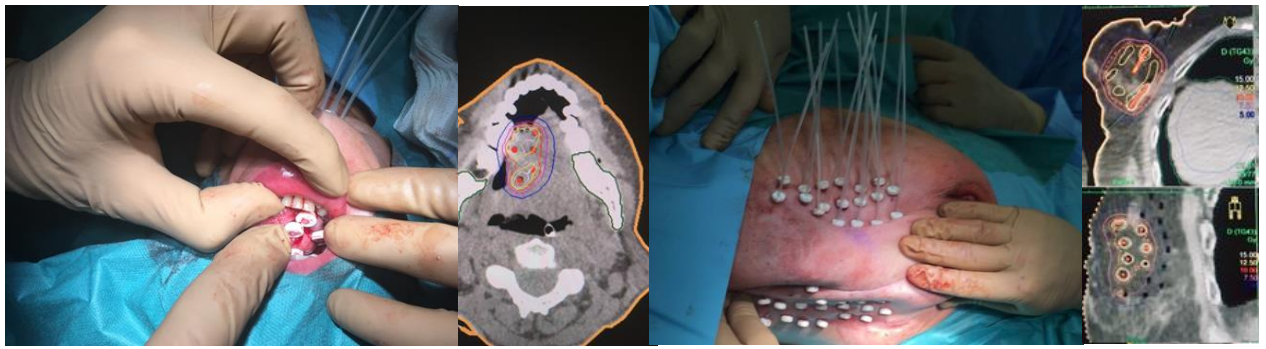

„Wszystkie modele są złe,
ale niektóre mogą być
przydatne”
David R. Wigg

Efekt niehomogennego rozkładu dawki



Brachyterapia HDR jako boost pozwala na:

- Podanie wyższej biologicznie dawki na z CTV dużo większą dokładnością niż za pomocą jakiejkolwiek techniki EBRT
- Dobrą ochronę cewki, pęcherza moczowego i rectum dzięki możliwości optymalizacji dawki w trakcie planowania
- Znaczne obniżenie dawki deponowanej w tkankach miękkich i kościach (szpik)
- Skrócenie czasu leczenia
- Odciążenie aparatów EBRT
- Zwiększenie przychodu szpitala



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MÓWIĄ O RADIOTERAPII

Dziękuję za uwagę!