Società Italiana di Radiobiologia
XXVI CONGRESSO NAZIONALE AIRO
XXX CONGRESSO NAZIONALE AIRB
IX CONGRESSO NAZIONALE AIRO GIOVANI

S.C. Radioterapia ASST – Lecco
Carlo Pietro Soatti
Alessandra Vola, Romerai D'Amico,
Giuseppe De Nobili, Federica Gherardi

Brachiterapia come modalità di somministrazione del boost nel carcinoma della prostata localmente avanzato

Ringraziamento speciale a Cristina Frigerio, Alessandro Colombo

DICHIARAZIONE

Relatore: CARLO PIETRO SOATTI

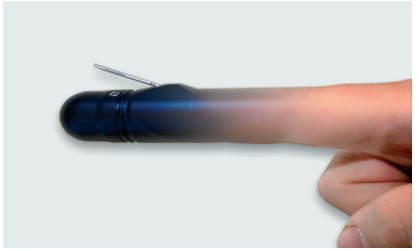
Come da nuova regolamentazione della Commissione Nazionale per la Formazione Continua del Ministero della Salute, è richiesta la trasparenza delle fonti di finanziamento e dei rapporti con soggetti portatori di interessi commerciali in campo sanitario.

- Posizione di dipendente in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE /**
- Consulenza ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Fondi per la ricerca da aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazione ad Advisory Board **(NIENTE DA DICHIARARE)**
- Titolarietà di brevetti in compartecipazione ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazioni azionarie in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Altro **(NIENTE DA DICHIARARE)**

Classi di rischio (MSKCC)

rischio	stadio		iPSA		Gleason		prelievi +		PSAD
molto basso	T1c	e	< 10 ng/ml	e	≤ 6	e	≤ 2 (≤ 50%)	e	<0,15 ng/ml
basso	T1-T2a	e	< 10 ng/ml	e	≤ 6		-		-
intermedio	T2b-T2c	o	10-20 ng/ml	o	7		-		-
alto	T3a	o	>20	o	>7		(o 2 fattori di rischio intermedio)		
molto alto	T3b-T4		-		-		-		-

Lo stadio di malattia è definito dalla DRE



Prostata rischio intermedio alto

- Con radioterapia per aumentare il controllo di malattia occorre incrementare la dose oltre 70 Gy
- Problemi di tossicità degli organi limitrofi

INDICAZIONI

BRT

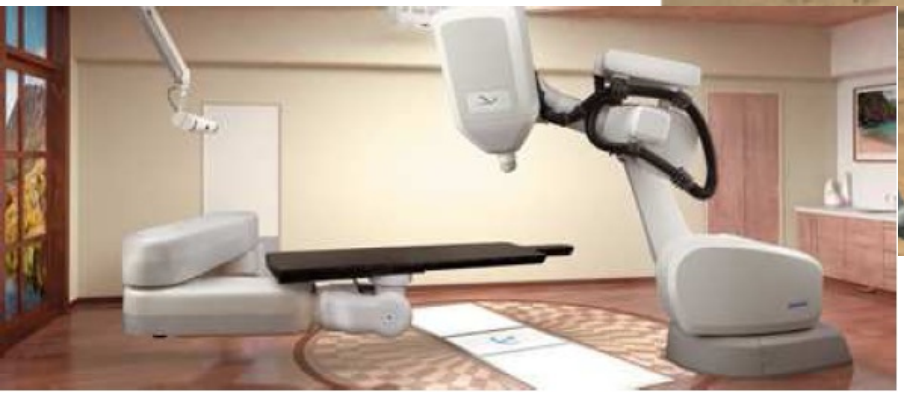
monoterapia (BRT)

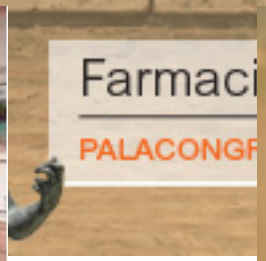
terapia combinata (EBR + BRT)

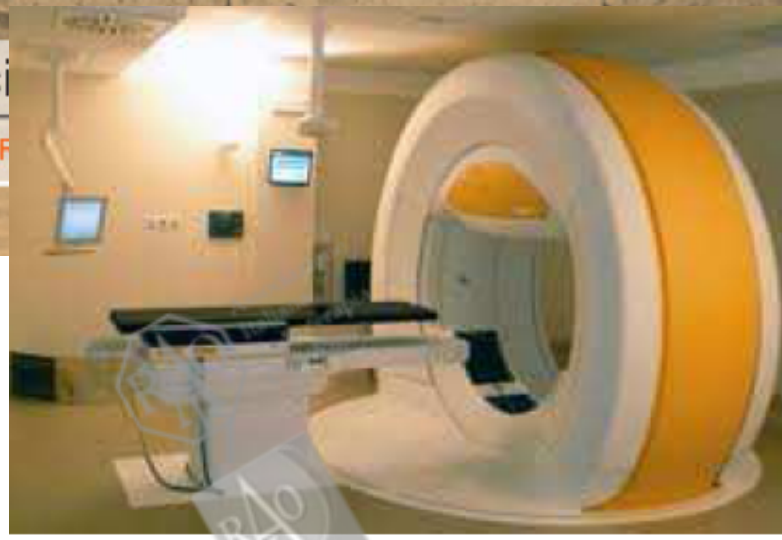
basso rischio
PSA < 10 **e**
GPS ≤ 6 **e**
Stadio ≤ T2b

rischio intermedio
PSA > 10 < 20 o
GPS = 7 o
Stadio T2c

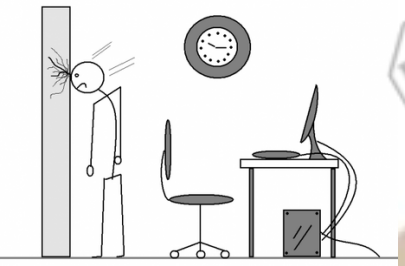
rischio alto
PSA > 20 o
GPS ≥ 7 o
Stadio ≥ T3a







Con queste meraviglie perché stiamo qui a pensare alla BRT?



Radiotherapy and Oncology 84 (2007) 114–120
www.thegreenjournal.com

Phase III randomised trial

High dose rate brachytherapy in combination with external beam radiotherapy in the radical treatment of prostate cancer: initial results of a randomised phase three trial

Peter J. Hoskin*, Kate Motohashi, Peter Bownes, Linda Bryant, Peter Ostler

Mount Vernon Cancer Centre, Northwood, UK

- 55 Gy in 20 fx. vs
- 35,75 in 13 fx+ 8,5 Gy in 2 fx in 24 ore 220 pazienti

Table 2
Biologically equivalent doses of external beam and combined external beam and HDR brachytherapy schedules

	α/β 1.5	α/β 3.5	α/β 10
External beam			
74 Gy/40 f	165.2	113.1	87.7
55 Gy/20 f	155.8	98.2	70.1
Combined external beam and HDR boost			
35.7 Gy/13 f			
+ 17 Gy/2 f HDR	214.5	122.0	77.0

Radiotherapy and Oncology 84 (2007) 114–120
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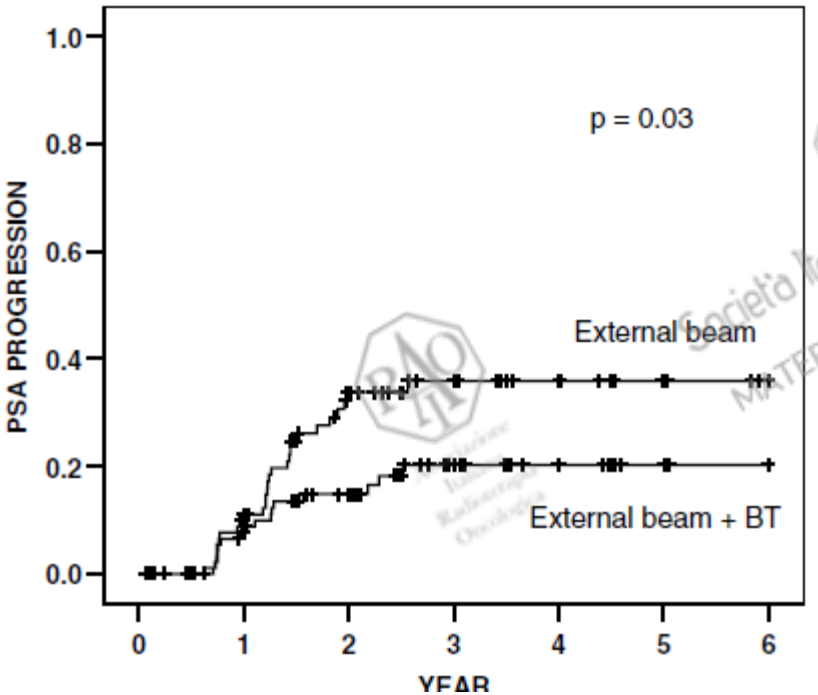

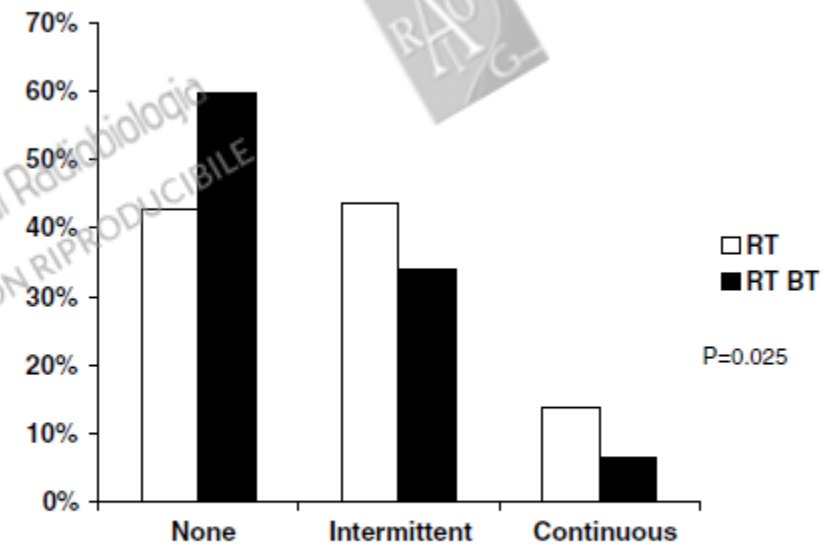

Fig. 4. Acute rectal discharge defined by maximal RTOG score at any time during first 12 weeks.

Ripresa PSA

Tox Rettale

Radiotherapy and Oncology 84 (2007) 114–120
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Phase III randomised trial

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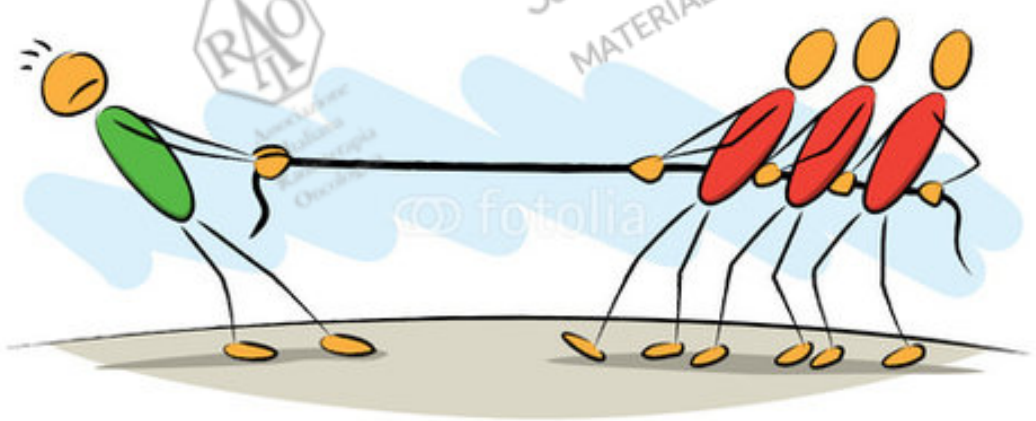
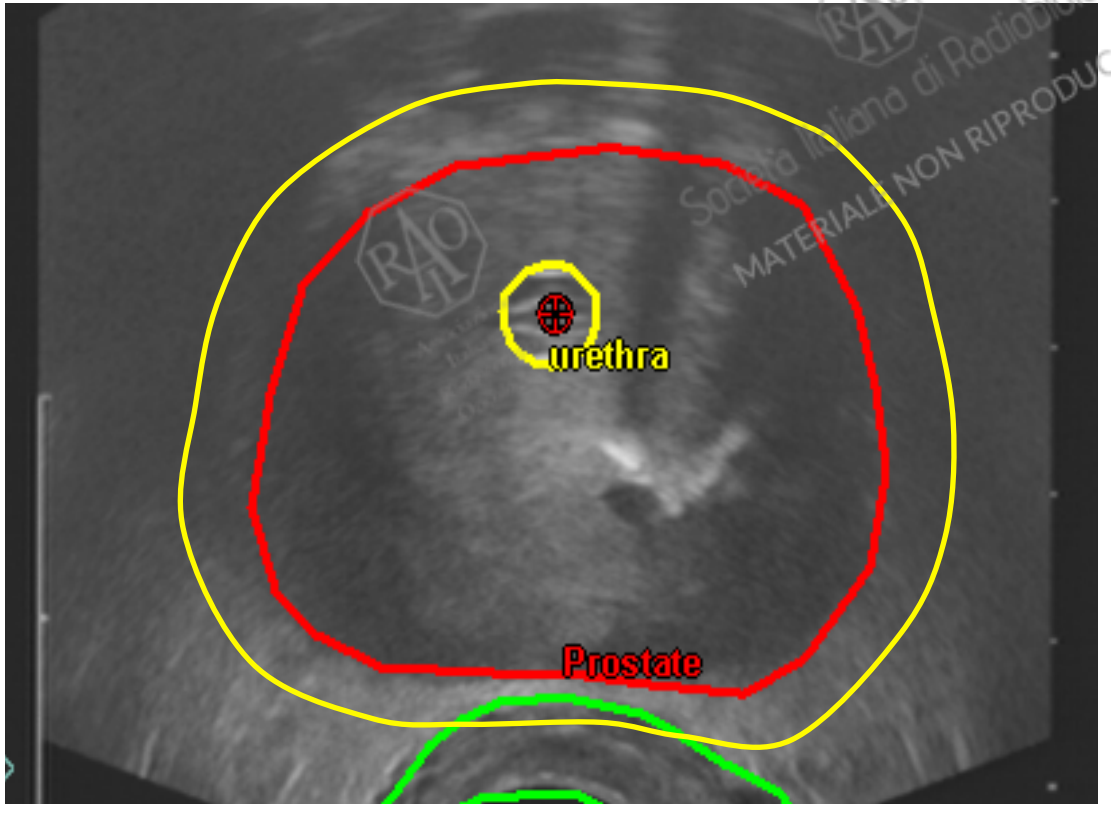
BRT O EBRT



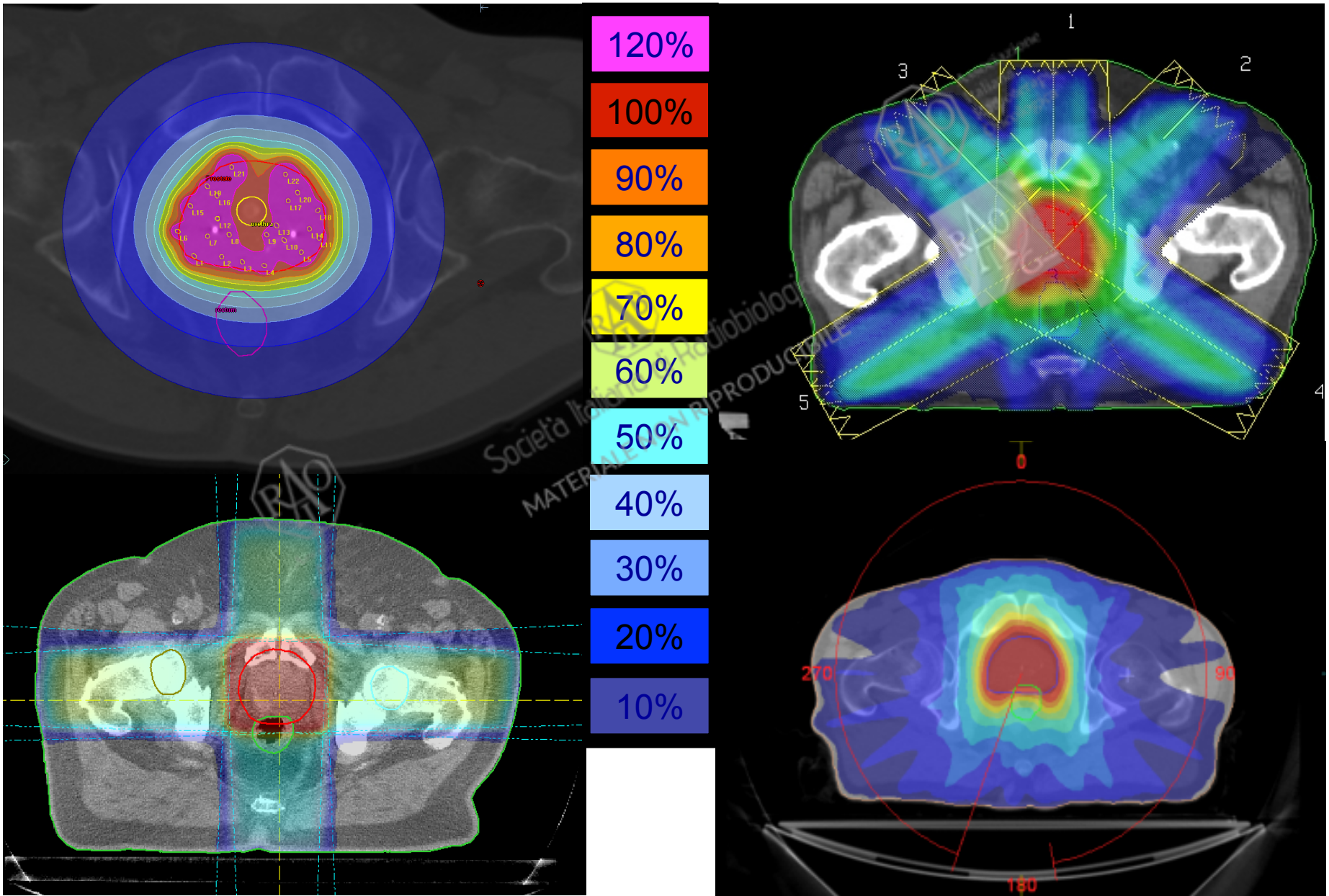
BRT vs EBRT: VOLUMI



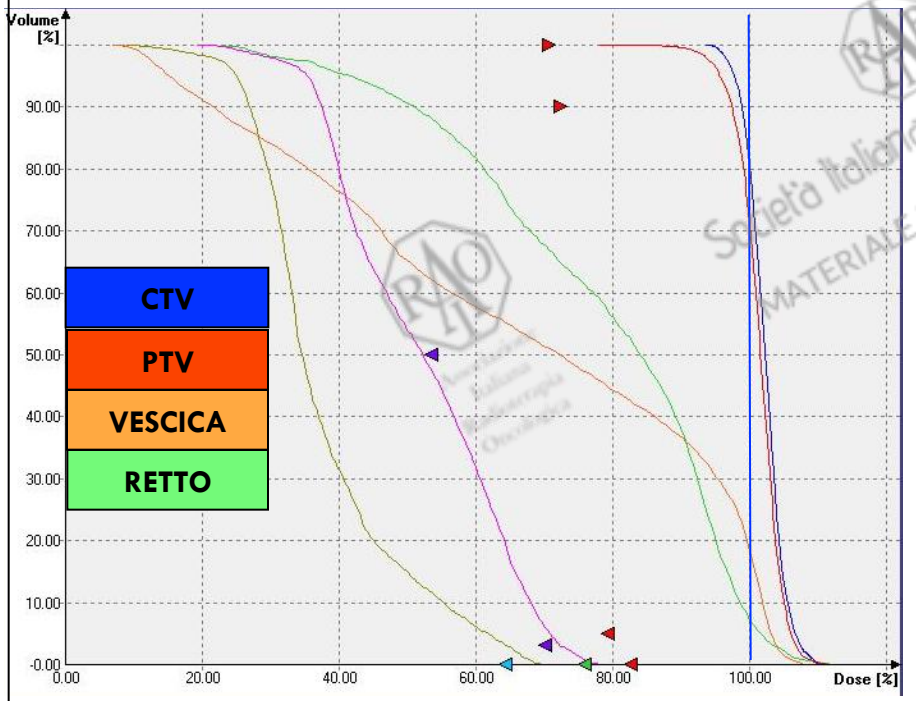
- BRT: PTV = CTV
- RTE: PTV = CTV + esp

BRT vs EBRT

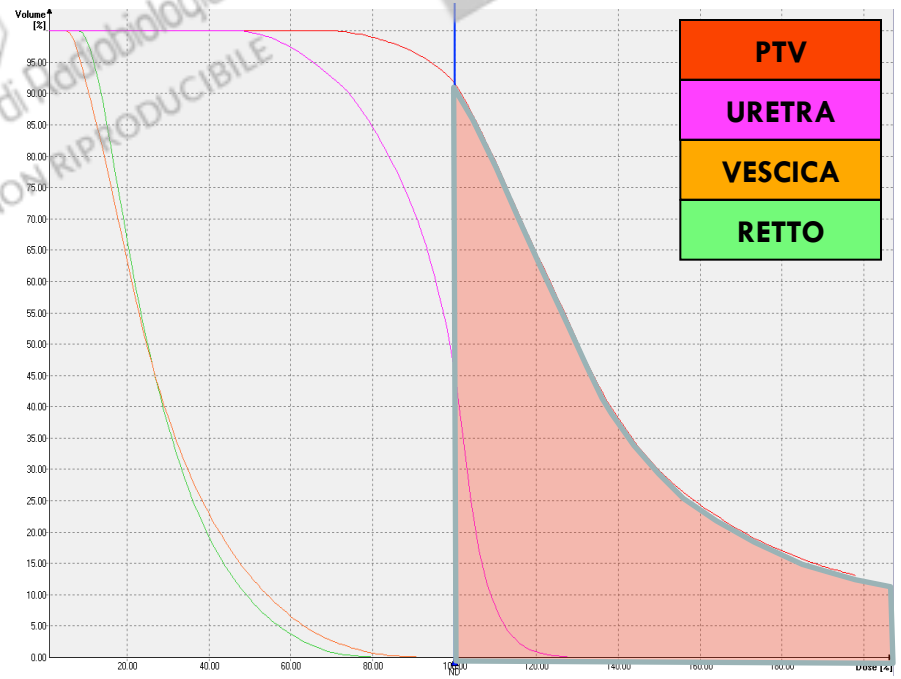
(oltre al target cosa si irradia…)



VMAT vs BRT: DOSE AL BERSAGLIO

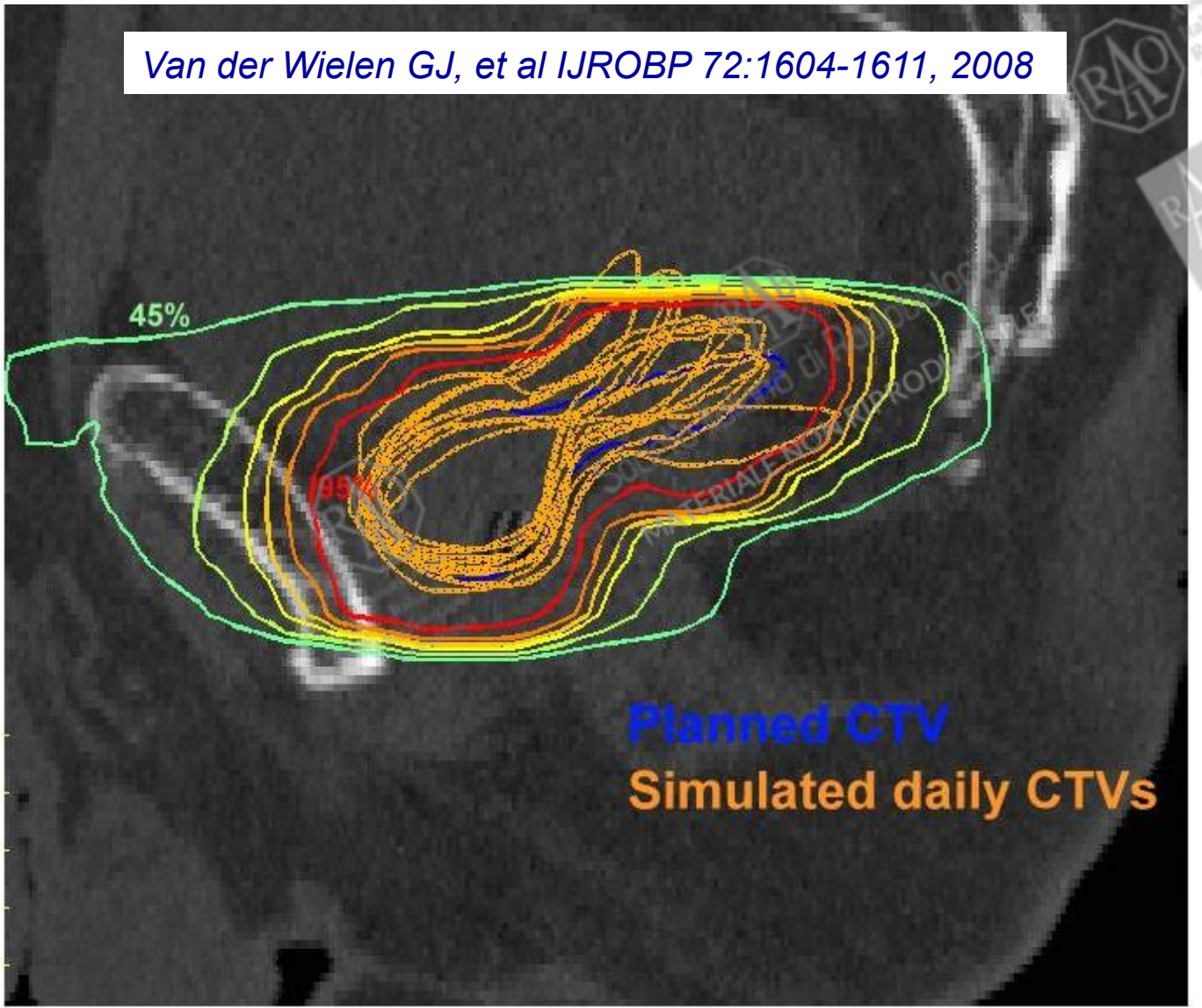


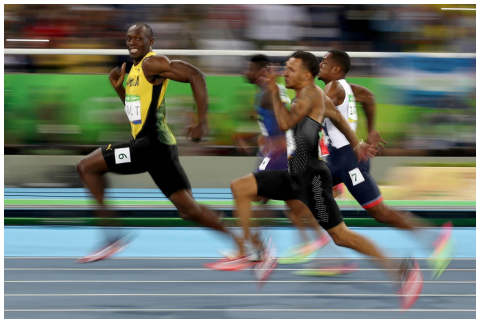
VMAT



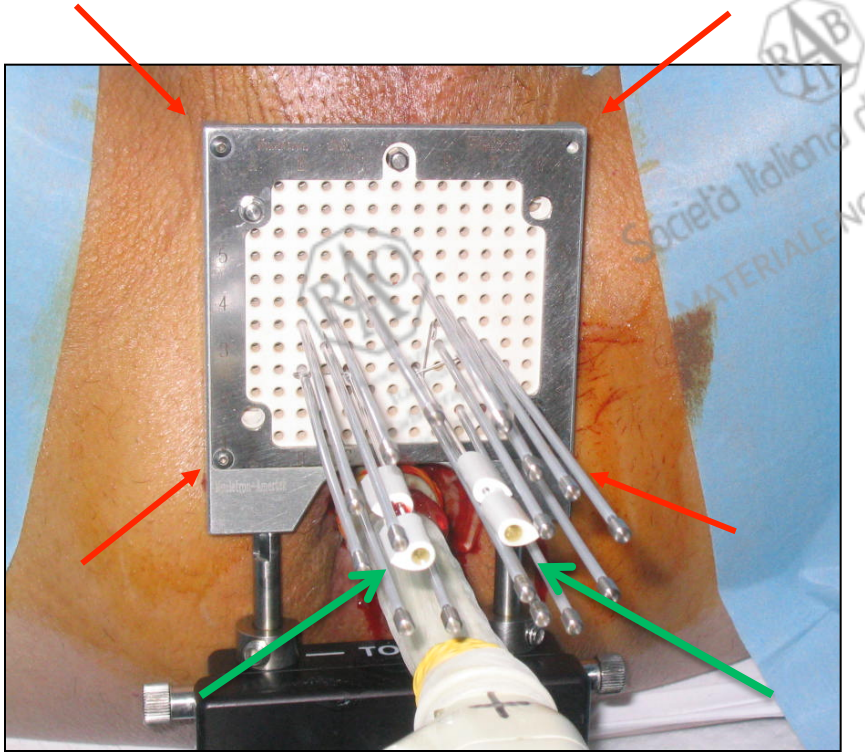
BRT

Van der Wielen GJ, et al IJROBP 72:1604-1611, 2008

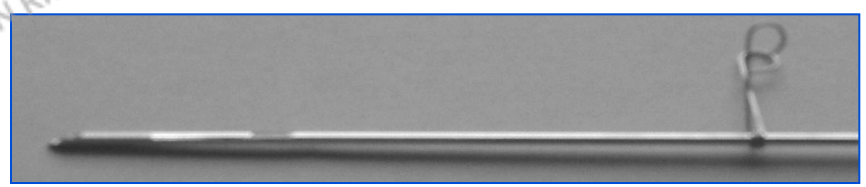


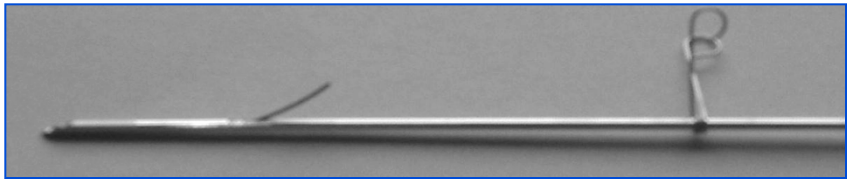


BT - setup: ancoraggio



Aghi di ancoraggio
Punti di sutura





Radiotherapy and Oncology 110 (2014) 110–113

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Phase III randomised trial

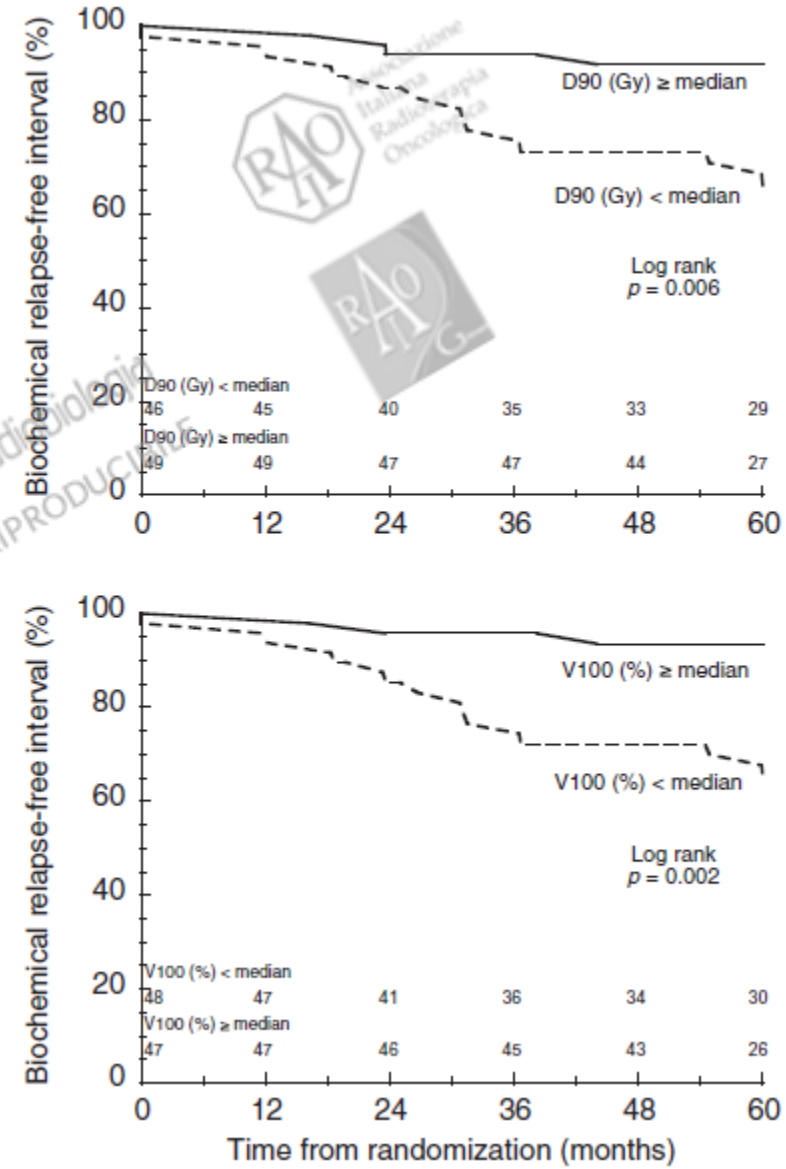
Dosimetric predictors of biochemical control of prostate cancer in patients randomised to external beam radiotherapy with a boost of high dose rate brachytherapy

Peter J. Hoskin, Ana M. Rojas *, Peter J. Ostler, Robert Hughes, Linda Bryant, Gerry J. Lowe

Cancer Centre, Mount Vernon Hospital, Middlesex, UK

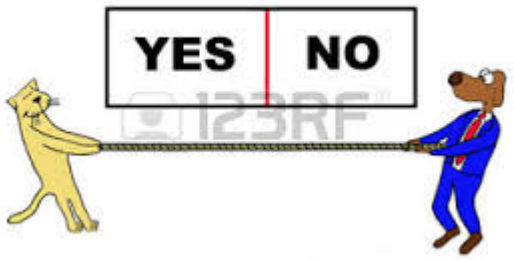
Radiotherapy

The techniques used have been described in detail previously [4,13]. Briefly, The external beam PTV was defined using CT planned volumes to cover the prostate gland with a 1 cm margin except posteriorly where the margin was reduced to 5-mm. The EBRT (using megavoltage 6–10 MV photons) delivered a dose of 35.75 Gy, prescribed to the intersection point in 13 fractions, treating daily Monday to Friday followed within no more than 6 days by the high dose rate (HDR) brachytherapy boost. The HDR-boost CTV was defined to cover the entire gland and the seminal vesicles if involved. The dose per fraction to the brachytherapy CTV was 8.5 Gy peripheral dose. The rectal dose



Tossicità non riportata

Se impianto ben fatto….



carcinoma della prostata: BRT vs EBRT

PRO BRT

- ↓ ↓
- ↑
- ↓
-
  del paziente
- no problemi di set-up
- protesi delle anche
- obesità

CONTRO

- limite volumetrico
- problemi anatomici
- sindromi ostruttive
- terapia invasiva
- anestesia
- *curva apprendimento*

Funziona ?

EBRT + BRT LDR vs BRT LDR

ELSEVIER

Radiotherapy and Oncology 57 (2000) 273–278

RADIOTHERAPY & ONCOLOGY
JOURNAL OF THE EUROPEAN SOCIETY FOR THERAPEUTIC RADIOLOGY AND ONCOLOGY

www.elsevier.com/locate/radonline

The role of external beam radiotherapy with I-125/Pd-103 brachytherapy for prostate carcinoma

John C. Blasko*, Peter D. Grimm, John E. Sylsvester, William Cavanagh

Seattle Prostate Institute, 1101 Madison Street, Suite 1101, Seattle, WA 98104, USA

n. pazienti
634

BRT (I:145 Gy – Pd:115 Gy)	403
EBRT (45 Gy) + BT (I:110 Gy-Pd:90 Gy)	231
FU mediano	58 mesi

EBRT + BRT LDR vs BRT LDR

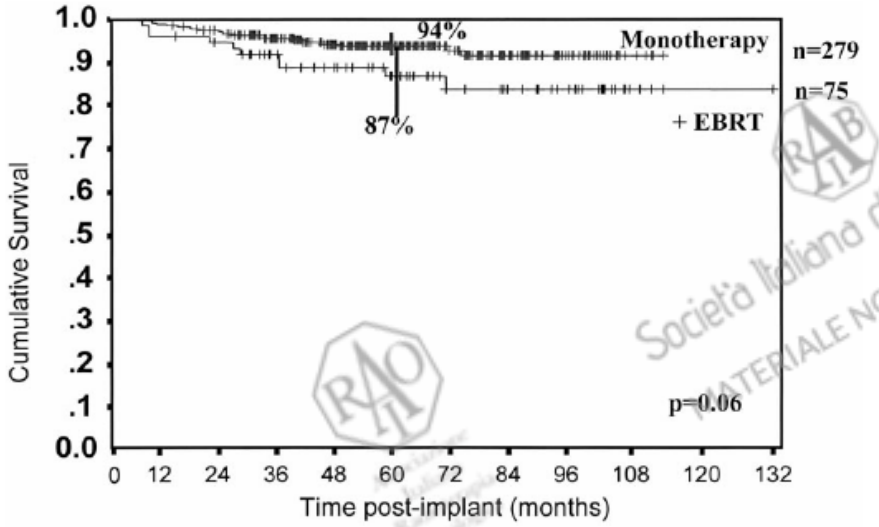


Fig. 3. Biochemical relapse-free survival: low risk group.

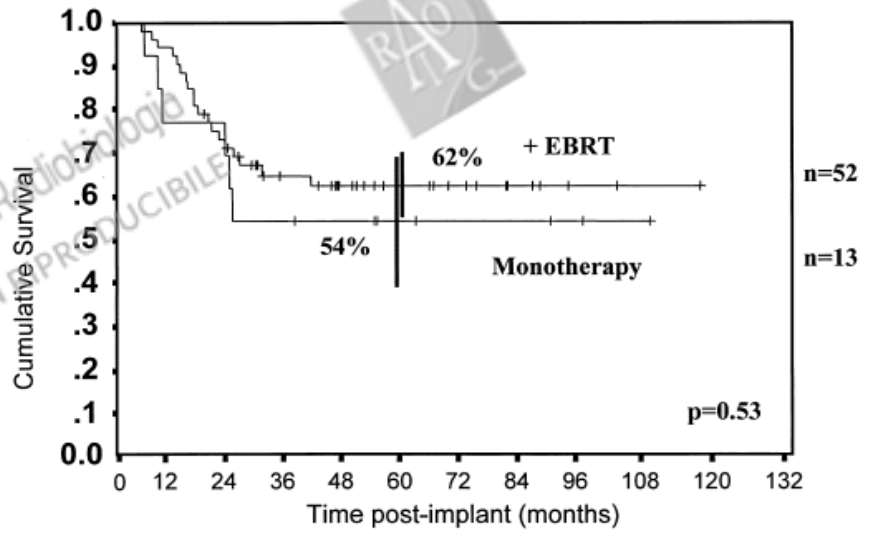


Fig. 5. Biochemical relapse-free survival: high risk group.

tossicità	BT	EBR+BT
RTOG G2	2%	6%
RTOG G3	-	2%
fistole U-R	-	1% (2 pz)

LONG-TERM OUTCOME BY RISK FACTORS USING CONFORMAL HIGH-DOSE-RATE BRACHYTHERAPY (HDR-BT) BOOST WITH OR WITHOUT NEOADJUVANT ANDROGEN SUPPRESSION FOR LOCALIZED PROSTATE CANCER

RAZVAN M. GALALAE, M.D.,* ALVARO MARTINEZ, M.D.,† TIM MATE, M.D.,‡ CHRISTINA MITCHELL, R.N.,† GREGORY EDMUNDSON, M.S.,† NILS NUERNBERG, M.D.,* STEPHEN EULAU, M.D.,‡ GARY GUSTAFSON, M.D.,† MICHAEL GRIBBLE, M.S.,‡ AND GYOERGY KOVÁCS, M.D.*

zionamento

, 1 - 2 ottobre 2016

EBRT + BRT HDR

- 611 pazienti
- T1a - T3c
- RT **pelvi** (45-50 Gy)
- boost BRT (16.5 - 18 Gy/2 - 3 fr)
- FU mediano 5 anni

Galalae RM IJROBP 58:1048-55, 2004

- 5 anni
  - BC 77%
  - DFS 67%
  - CSS 96%
- 10 anni
  - BC 73%
  - DFS 49%
  - CSS 92%

- BC: controllo biochimico
- DFS Disease free survival
- CSS: sopravvivenza cancro specifica

- BASSO RISCHIO
  - BC a 5 anni 96%
  - CSS a 5 anni 100%
- RISCHIO INTERMEDIO
  - BC a 5 anni 88%
  - CSS a 5 anni 99%
- ALTO RISCHIO
  - BC a 5 anni 69%
  - CSS a 5 anni 95%

Galalae RM IJROBP 58:1048-55, 2004

Radiotherapy and Oncology 115 (2015) 84–89

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Prostate cancer brachytherapy

High dose-rate brachytherapy boost for intermediate risk prostate cancer: Long-term outcomes of two different treatment schedules and early biochemical predictors of success

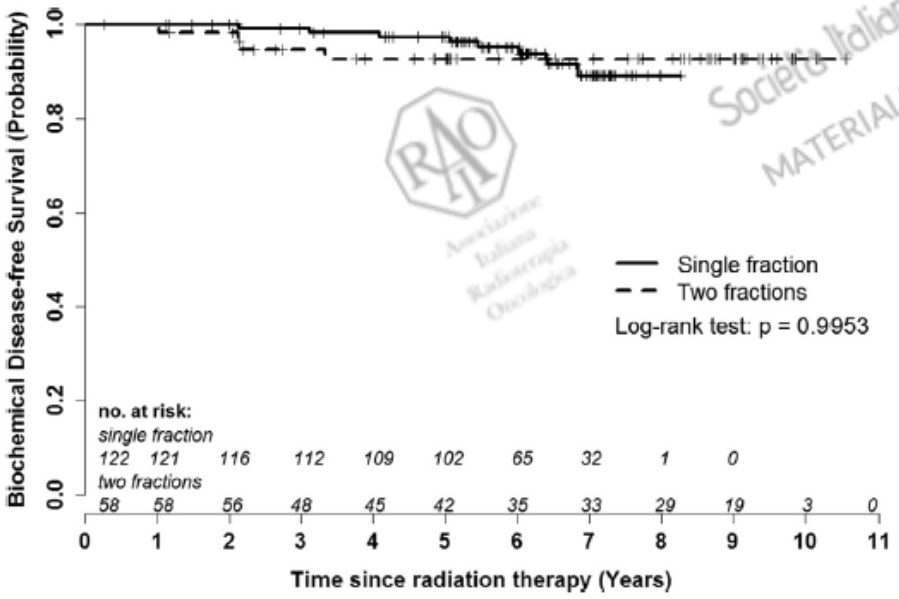
Joelle Helou [a,b], Laura D'Alimonte [a,b], Andrew Loblaw [a,b], Hans Chung [a,b], Patrick Cheung [a,b], Ewa Szumacher [a,b], Cyril Danjoux [a,b], Ananth Ravi [a,b], Andrea Deabreu [a], Liying Zhang [a], Gerard Morton [a,b,*]

[a] Sunnybrook Odette Cancer Centre; and [b] University of Toronto, Canada

- 45 Gy in 25 fx + 10 Gy HDR in 2 fx

37,5 Gy in 15 fz + 15 Gy HDR singola

Tossicità simile



BED	α/β 1,5	α/β 10
10 x 2	252,3	93,1
15	265	84,4

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The Role of High-Dose Rate Brachytherapy in Locally Advanced Prostate Cancer

Frank A. Vicini, Carlos Vargas, Gregory Edmundson, Larry Kestin, and Alvaro Martinez

Group	EBRT Dose (Gy)	HDR Fractionation Scheme	No. of Implants	Total BT Dose (Gy)	Timing of Implant	Interval Between Implants
William Beaumont Hospital[2]	46	5.5-6.5 × 3	3	16.5-19.5	During EBRT	2 weeks
		8.5-10.5 × 2	2	17-21		
		11.5 × 2	2	23		
Seattle Prostate Institute (1989-1995)[28]	50	3-4.0 × 4	1	16	Before EBRT	4 fx within 40 hours
Seattle Prostate Institute (1996-present)[28]	45	5.5 × 3	1	16.5	Before EBRT	3 fx within 24 hours
Kiel, Germany[32]	50 pelvis 40 prostate	9.0 × 2 15 Gy to peripheral zone	2	18	During EBRT	2 weeks
California Endocurietherapy Cancer Center[29]	36	6.0 (×4) Plus 0.5 to 0.75 boost*	2	24	Variable	1 week
Goteburg, Sweden[27]	50	10 × 2	2	20	During EBRT	2 weeks
Berlin, Germany[30]	Before 12/93 - 40 After T3 50.4	9.0-10.0 × 2	2	18-20	Before EBRT	1 week
Munich, Germany[24]	36	9 × 2†	2	18	Before EBRT	1 week
Lahey Clinic[25]	50	6 × 3	1	18	Before EBRT	3 fx within 24 hours
Long Beach Memorial Medical Center[23]	45	T1c-T2a 5.5 × 4	1	22	Variable	4 fx within 24 hours
		T2b-c 6 × 4	1	24		
		T3a-b 6.5 × 4	1	26		

Abbreviations: LBMMC, Long Beach Memorial Medical Center; fx, fraction.
*Additional boost dose given to GTV as concurrent boost when needed.
†In 8 patients, hyperthermia given 30 minutes after each fraction.

EBRT 36,75 – 50,4 Gy
Solo Prostata? - Pelvi?
Ipofraz o convenzionale?

*BRT 3 Gy * 4 – 10 Gy * 2 – 15 Gy * 1*
Dose totale BRT 16 – 26

BED(1,5) 79 – 120,7

Seminars in Radiation Oncology,
Vol 13, No 2 (April), 2003: pp 98-108

The Role of High-Dose Rate Brachytherapy in Locally Advanced Prostate Cancer

Frank A. Vicini, Carlos Vargas, Gregory Edmundson, Larry Kestin, and Alvaro Martinez

Table 5. Comparison of Biochemical Control Rates for Locally Advanced Prostate Cancer with Various Forms of Treatment

Author	*No. of Pts*	*Median PSA*	*Median Gleason (%)*	*Median T-Stage (%)*	*F/U (yr)*	*Biochemical Control (%)*	*PSA Endpoint*
EBRT + brachytherapy							
William Beaumont Hospital[2]	207	11.5	7	T2b	4.4	74	CP
Northwest Hospital[35]	54	4-10	5-6	T2b	9.9	80	>0.5 ng/mL
Swedish Hospital[28]	29	10-20	6	T2a	3.8	84	3 rises
Swedish Hospital[28]	20	≥20	6	T2a	3.8	50	3 rises
3D conformal EBRT							
Fox Chase Cancer Center (τ 76 Gy)[5,36]	26	≥20	≤6	T2	4.9	30	>1.5 ng/mL and rises
M.D. Anderson[3]	305	NA	2-6 (49) 7 (33) 8-10 (18)	T1/2 (79) T3 (21)	3.4	69 (70 Gy) 79 (78 Gy)	CP
University of Michigan (69 Gy)[7]	>380	10-20	NR	NR	3.0	37	>2.0 ng/mL and rises
EBRT + neutrons							
Wayne State University[37]	150	24.0	≥8	T3	NR	41 at 4 years	NR
EBRT + androgen deprivation							
EORTC[38]	203	5-10	WHO 2	T3	3.8	81	>1.5 ng/mL and rises
RTOG 8531[39]	477	NR	6-7	T3	4.5	53	≥1.5 ng/mL
Radical prostatectomy							
Northwestern University[40]	116	31	7	T2b	7.0	46 at 15 yr	Detectable
Johns Hopkins[41]	2404	<10 (79%) 10-20 (17%) >20 (5%)	2-6 (62) 7 (31) 8-10 (7)	T1 (44) T2 (54) T3 (2)	6.3	48- (GS 7) 15- (GS 8-10)	Detectable
Multiple institutions[42]	298	10-20	5-7	T3	2.2	16	>0.4 ng/mL

Abbreviations: NR, not reported; EBRT, external beam radiation therapy; WHO, World Health Organization grade; CP, consensus panel; GS, Gleason score.

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The Role of High-Dose Rate Brachytherapy in Locally Advanced Prostate Cancer

Frank A. Vicini, Carlos Vargas, Gregory Edmundson, Larry Kestin, and Alvaro Martinez

Group	*GU Toxicity*	*GI Toxicity*	*Erectile Dysfunction (%)*
William Beaumont Hospital[2]	4% urethral stricture or incontinence	No chronic grade 3	27
Seattle Prostate Institute[28]	6.7% stricture 1.9% moderate frequency/dysuria	2% rectal bleeding	—
Kiel, Germany[32]	5% mild frequency/urgency 7% moderate frequency/urgency 2% severe frequency/urgency 1 case of osteoradionecrosis	7% mild frequency/urgency 6% moderate frequency/urgency 3% rectal bleeding	—
California Endocurietherapy Cancer Center[29]	4% incontinence	0.5% rectal bleeding	25
Goteburg, Sweden[27]	8% acute, 4% chronic dysuria 2% chronic hematuria	2% rectal bleeding	12
Berlin, Germany[30]	10% frequency/dysuria 7.4% urethral stricture 3% incontinence	1.7% recto-urethral fistula	—
Munich, Germany[24]	5% prostate necrosis 10% urethritis 80% acute mild hematuria	2.5% recto-vesical fistula 10% proctitis	23
Lahey Clinic[25]	57% mild frequency	74% mild frequency/urgency 1.6% rectal wall necrosis 1.6% rectal bleeding	—
Long Beach Memorial Medical Center[23]	10% acute grade 3-4 1.5% urethral stricture 0.5% incontinence	20% acute grade 3-4 1.5% chronic grade 3	30 50 with androgens

Seminars in Radiation Oncology, Vol 13, No 2 (April), 2003: pp 98-108

I “raggi” fanno bene… 1920

Doramad
Dentifricio al thorio per ….
“Sbiancare” i denti

Revigator
Sistema per creare acqua radioattiva…fa bene!

Radiotherapy and Oncology 84 (2007) 128–134
www.thegreenjournal.com

Prostate brachytherapy

Patterns of toxicity following high-dose-rate brachytherapy boost for prostate cancer: Mature prospective phase I/II study results

Gillian Mary Duchesne*, Scott Garrick Williams, Ram Das, Keen Hun Tai

Peter MacCallum Cancer Centre and University of Melbourne, Melbourne, Vic., Australia

- 108 pazienti
- 46 Gy EBRT (box 18 MV su P+Vs)
- BRT 4 o 5 Gy x 4
- 880 questionari sulla qualità di vita
- Follow up 78 mesi dal 1999 in poi

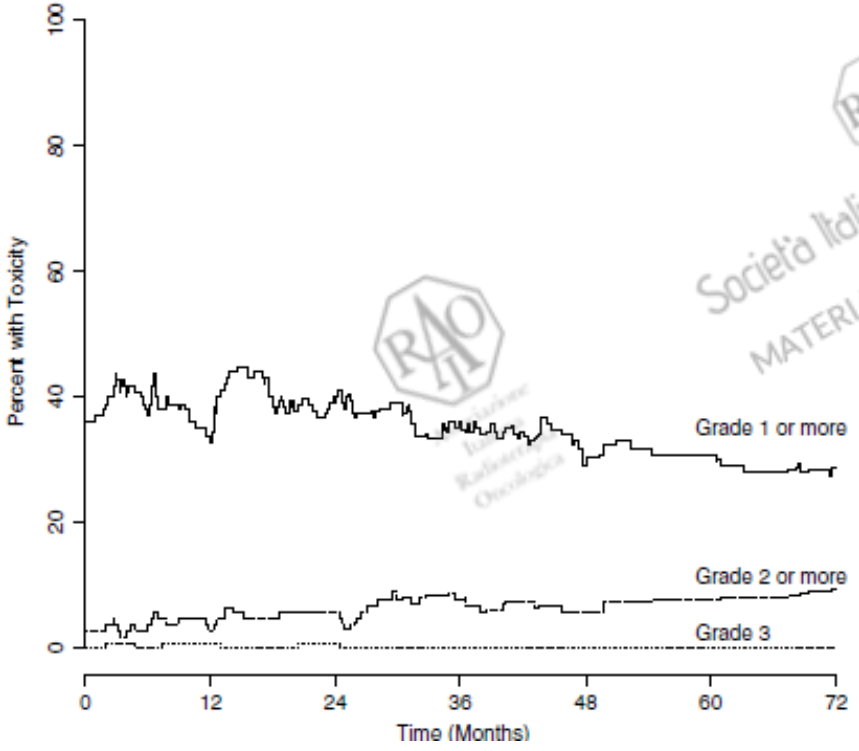
Australia 2007

Table 2
Actuarial incidence and prevalence estimates of urinary and rectal symptoms for the total cohort

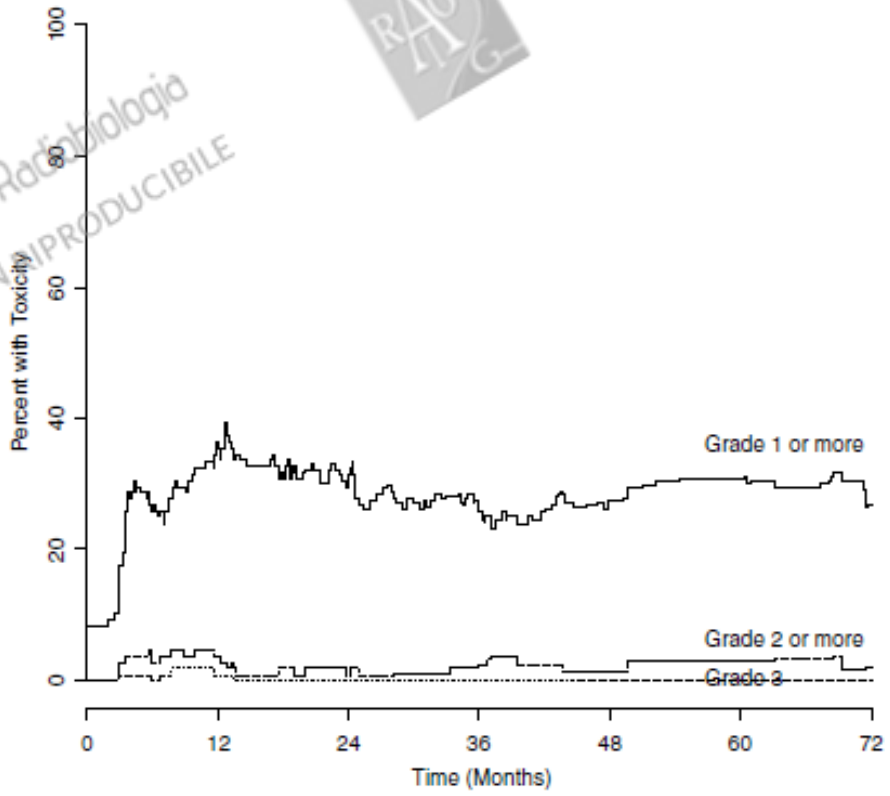
	Grade	Baseline prevalence (95% CI)	5-year actuarial incidence (95% CI)	Peak prevalence (95% CI)	Time to peak prevalence (months)	5-year actuarial prevalence (95% CI)
Overall urinary symptoms	1 or more	36.5% (27.8–45.1%)	87.6% (81.6–93.5%)	44.7% (35.6–54.5%)	15	30.6% (20.0–41.3%)
	2 or more	2.8% (0–5.9%)	24.9% (16.8–33.5%)	9.3% (2.2–18.9%)	72	7.7% (1.8–14.5%)
	3	0% (0–0%)	4.5% (0.9–9.7%)	0.9% (0–3.1%)	23	0% (0–0%)
Overall bowel symptoms	1 or more	8.1% (3.2–13.6%)	78.6% (69.9–85.8%)	39.3% (29.2–48.2%)	13	30.3% (19.7–41.7%)
	2 or more	0% (0–0%)	11.3% (5.6–17.1%)	4.2% (0.9–8.7%)	6	3.0% (0.0–7.6%)
	3	0% (0–0%)	2.8% (0–6.5%)	1.7% (0–5.0%)	8	0% (0–0%)
Erectile dysfunction[a]	1 or more	0% (0–0%)	92.0% (84.2–98%)	87.5% (76.4–97.1%)	36	77.4% (62.7–91.7%)
	2 or more	0% (0–0%)	77.0% (64.9–88.1%)	60.0% (45.5–72.8%)	24	45.3% (27.2–64.6%)
	3	0% (0–0%)	57.1% (43.3–71.8%)	37.1% (24.4–52.0%)	21	29.6% (14.3–47.8%)

[a] Only includes those with no dysfunction prior to treatment and did not receive androgen deprivation therapy ($n = 53$).

Australia 2007



Tox urinaria



Tox rettale

Radiotherapy and Oncology 117 (2015) 252–257

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

rmaci innovativi e ipofrazionamento

ACONGRESSI DI RIMINI - 30 settembre, 1 - 2 ottobre 2016

HDR brachytherapy in prostate

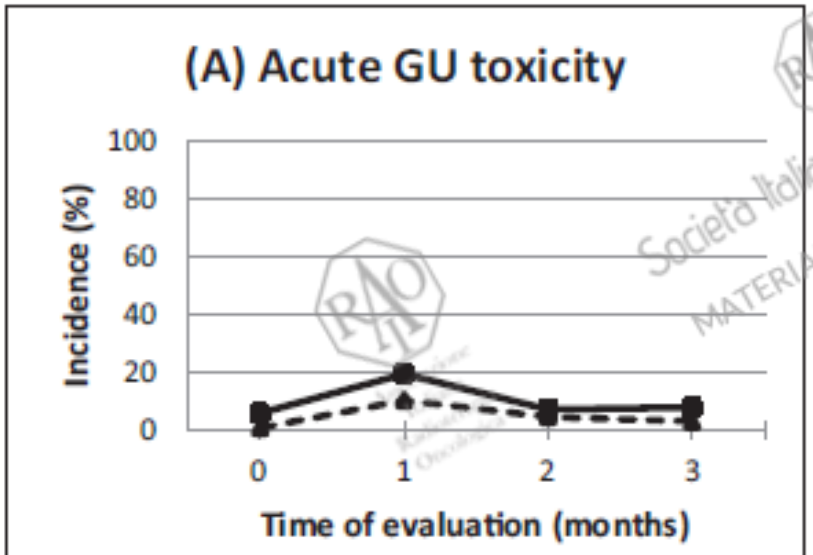
Toxicity and quality of life after high-dose-rate brachytherapy as monotherapy for low- and intermediate-risk prostate cancer

Shafak Aluwini [a,*], Wendy M.H. Busser [a], Wendimagegn Ghidey Alemayehu [b], Joost L. Boormans [c], Wim J. Kirkels [c], Peter P. Jansen [a], John O. Praag [a], Chris H. Bangma [c], Inger-Karine K. Kolkman-Deurloo [a]

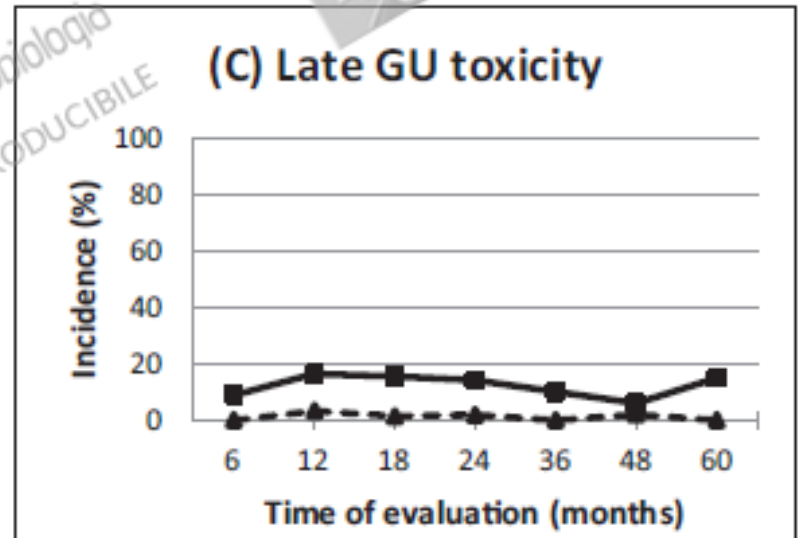
[a] Department of Radiation Oncology; [b] Clinical Trial Center; and [c] Department of Urology, Erasmus MC Cancer Institute, Rotterdam, The Netherlands

BRT Eclusiva

- Tox urinaria G2 –G3 acuta e tardiva



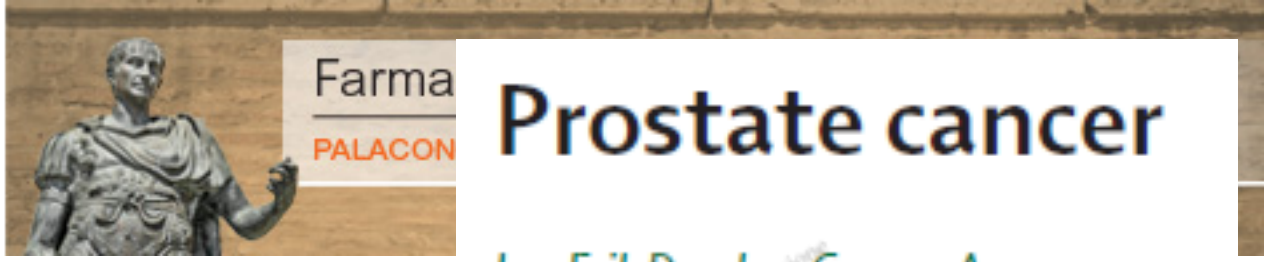
	0	1	2	3
Grade 2 (%)	5.8	19.3	7.0	7.9
Grade 3 (%)	0.7	10.3	4.5	2.9



	6	12	18	24	36	48	60
Grade 2 (%)	8.9	16.4	15.5	14.2	10.1	6.0	15.0
Grade 3 (%)	0	3.3	1.4	1.9	0	2.0	0

Tossicità BRT

- **Acuta (< 12 m)**
  - sintomi urinari irritativi (G1-2) 46-54%
  - Ritenzione Urinaria Acuta 1-14%
  - proctite 1-2%
- **Cronica (> 12 m)**
  - sintomi urinari irritativi >G1 14%
  - incontinenza 5-6%
  - *incontinenza dopo TURP* *13%*
  - ematuria 1-2%
  - stenosi 1-2%
  - proctite 1-3%
  - impotenza 4-14%



Farmaci…

Side-effects of radical prostatectomy

- Erectile dysfunction (20–100%)
- Urinary incontinence (any 0–70%; severe 0–4%)
- Stricture (0–12%)
- Mortality (<1%)

Side-effects of radiotherapy

- Gastrointestinal toxic eff ects (any 2–100%, severe 0–20%)
- Genitourinary toxic eff ects (any 0–70%, severe 0–20%)
- Urinary incontinence (any 0–60%, severe 2–15%)
- Erectile dysfunction (10–85%)
- Mortality (<1%)

Side-effects of hormonal therapy

- Castration
- Loss of libido
- Erectile dysfunction
- Hot flushes (55–80% of patients during androgen deprivation therapy)
- Gynaecomastia and breast pain (49–80% diethylstilbestrol, 50% CAB, 10–20% castration)
- Increase in body fat
- Muscle wasting
- Anaemia (severe in 13% CAB)
- Decrease in bone mineral density
- Cognitive decline

Lancet 2008; 371: 1710–21

Società Italiana di Radiobiologia

XXVI CONGRESSO NAZIONALE AIRO
XXX CONGRESSO NAZIONALE AIRB
IX CONGRESSO NAZIONALE AIRO GIOVANI

Farmaci innovativi e ipofrazionamento

PALACONGRESSI DI RIMINI - 30 settembre, 1 - 2 ottobre 2016

ELSEVIER

Radiotherapy and Oncology 74 (2005) 137–148

RADIOTHERAPY & ONCOLOGY

www.elsevier.com/locate/radonline

GEC/ESTRO-EAU recommendations on temporary brachytherapy using stepping sources for localised prostate cancer

Josef Hammer[d], [f], Hagen Bertermann[g]

ELSEVIER

Brachytherapy 11 (2012) 20–32

BRACHYTHERAPY

American Brachytherapy S… p…

Yoshiya Yamada[1,*], Lela…
Bradley R. Prestidge[5], …
Mi…

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Review

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]

BRACHITERAPIA
LINEE GUIDA

	GEC-ESTRO-EUA	ABS
Monoterapia		
HDR	investigazionale	**standard**
LDR	**standard**	**standard**
Boost		
HDR	**standard**	**standard**
LDR	n.s.	**standard**
Salvataggio		
HDR	investigazionale	limitato
LDR	n.s.	n.s.

BRACHITERAPIA HDR
BOOST: ELEGGIBILITÀ

- rischio intermedio (≥ GPS 3+4, ≥4 prelievi positivi, (≥ cT2a, iPSA > 12 ng/ml) o alto
- TRUS per valutazione arcata pubica
- IIEF-5 e IIPS score (UFM nei casi dubbi)
- eventuale OT citoriduttiva
- no controindicazioni ad anestesia
- consenso informato
- RTE entro 3-10 gg (prostata+VS o pelvi)

BRT: criteri clinici di esclusione

- Aspettativa di vita < 5 anni
- fistola rettale
- recente TURP ampia
- rischio anestesiologico inaccettbile
- posizione litotomica non possibile
- metastasi a distanza
- no conferma istologica di CaP

BRACHITERAPIA HDR
CONTROINDICAZIONI (GEC ESTRO 2013)

- TURP (< 6 mesi)
- ~~sintomi ostruttivi~~ → Qmax <10 ml/s - IPSS > 20
- ipertrofia del lobo medio: prominenza in vescica
- ~~precedente RT pelvica~~
- interferenza arco pubico
- ~~volume > 60 cc~~
- infiltrazione del collo vescicale
- ~~distanza retto-prostata <5 mm (TRUS)~~
- posizione litotomica o anestesia non possibile
- fistola rettale

Kovacs G. et al. R & O, 74:137, 2005

Hoskin P et al R&O 107:325, 2013

Radiotherapy and Oncology 107 (2013) 325–332

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GEC/ESTRO recommendations

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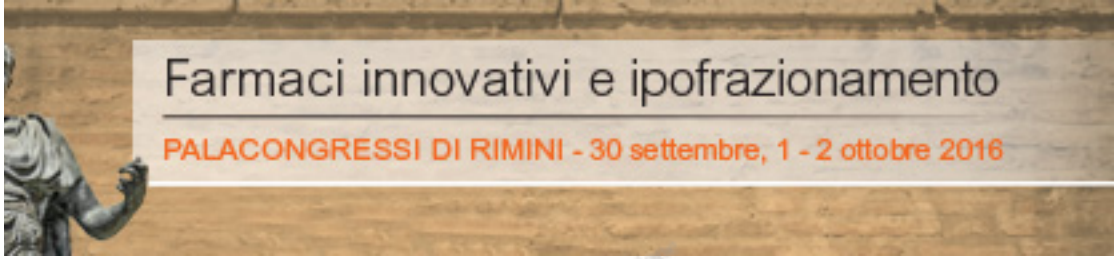
[a] Mount Vernon Cancer Centre, Northwood, UK; [b] Department of Radiotherapy, Manzoni Hospital, Lecco, Italy; [c] St. James Institute for Oncology, Leeds, UK; [d] Department of Radiotherapy, City Hospital Cologne, Germany; [e] DNR Norwegian Radium Hospital, Oslo, Norway; [f] Universitätsklinikum Schleswig-Holstein,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



2013

- EBRT
  - 45 Gy in 25 fractions over 5 weeks.
  - 46 Gy in 23 fractions over 4.5 weeks.
  - 35.7 Gy in 13 fractions over 2.5 weeks.
  - 37.5.Gy in 15 fractions over 3 weeks.
- BRT
  - 15 Gy in 3 fractions.
  - 11–22 Gy in 2 fractions.
  - 12–15 Gy in 1 fraction.
- LIMITI
  - 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

POSSIBILI SVILUPPI HDR

- boost concomitante su malattia accertata (istologia o PET con colina)
- contenimento della tossicità
  - valutazione dose fascio vascolo nervoso (EcoCD, RM)
  - valutazione dose bulbo penieno (RM)

Spengo .... Alla prossima...