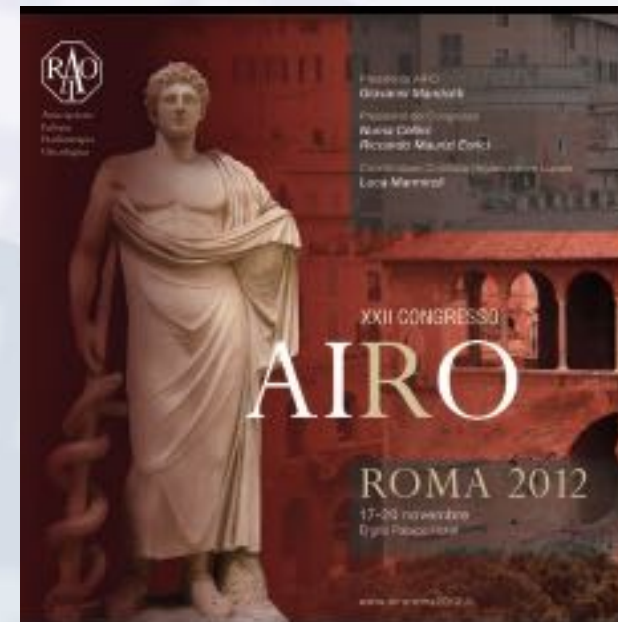
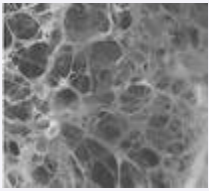


Radioterapia stereotassica ipofrazionata a livello extracranico: esperienza dell'Istituto Europeo di Oncologia

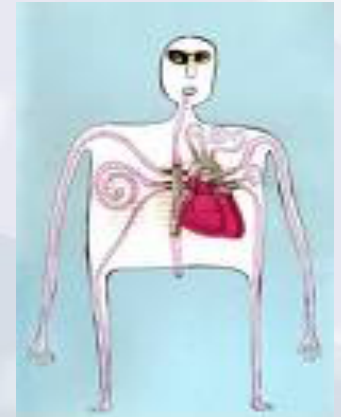
Roberta Lazzari MD

**Advanced Radiotherapy Center
Istituto Europeo di Oncologia-Milano**





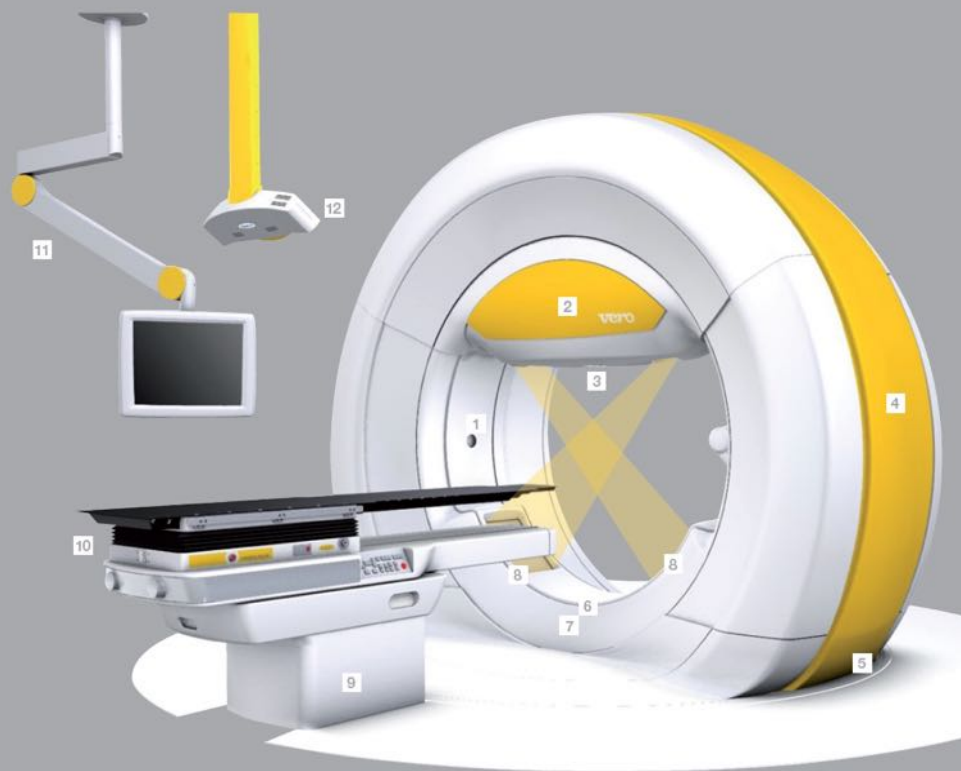
**il 20- 25% of the pts are not
suitable for surgical
intervention:
Radiosurgery is an alternative**



**New paradigm in oncology:
chronic
or even
chronic curable cancer**

MHI-TM2000 *alias* “VERO-System”

Brainlab AG and Mitsubishi Heavy Industries Ltd

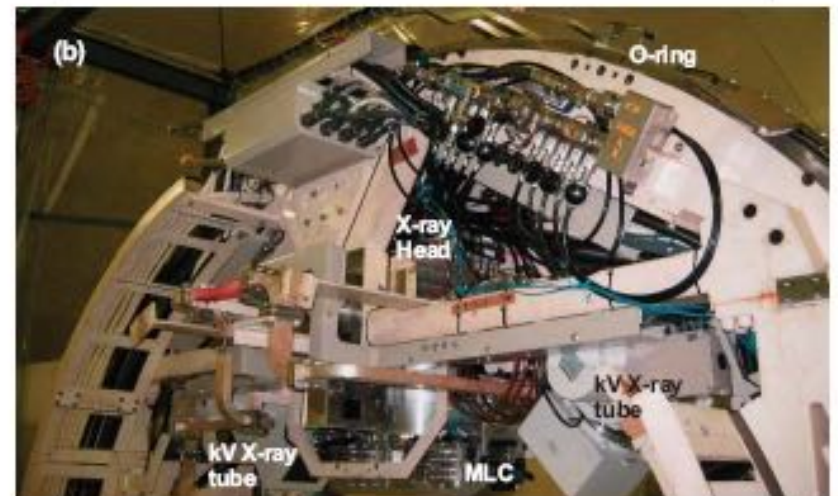
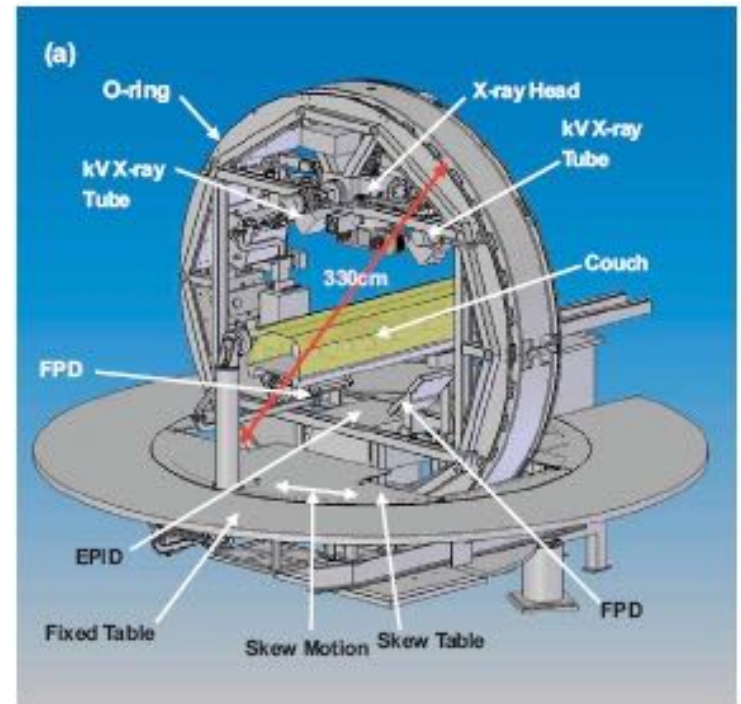


Technical Overview

- 1 Laser for semi-automatic patient pre-positioning
- 2 Gimbal mechanism for isocenter calibration and tumor chasing
- 3 Dynamic micro MLC with low leakage and high drive speed
- 4 Ring
 - > mechanically extremely stable
- 5 Ring rotation mechanism
 - > +/- 60°
 - > quick and precise switch from coplanar to non-coplanar treatments
- 6 EPID
Electronic Portal Imaging Device for MV x-ray imaging
- 7 Beam stopper to reduce radiation shielding requirements
- 8 Patient positioning and diagnostic imaging system „Exactrac® Vero”
- 9 Couch
Freedom of motion: 5D (lateral, longitudinal, vertical, roll & pitch)
- 10 ROBOTICS
Allows fast robotic tilt adjustment of treatment tabletop for precise patient set-up
- 11 In-room monitor arm
- 12 Infrared real-time patient monitoring

MHI-TM2000 *alias* “VERO-System”

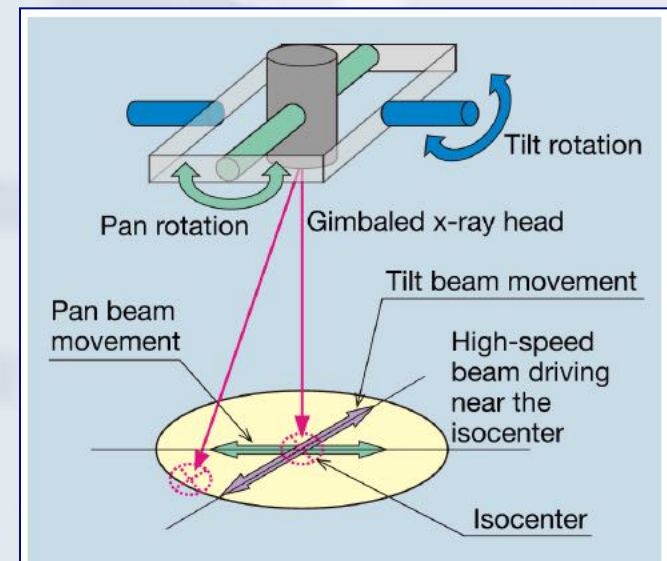
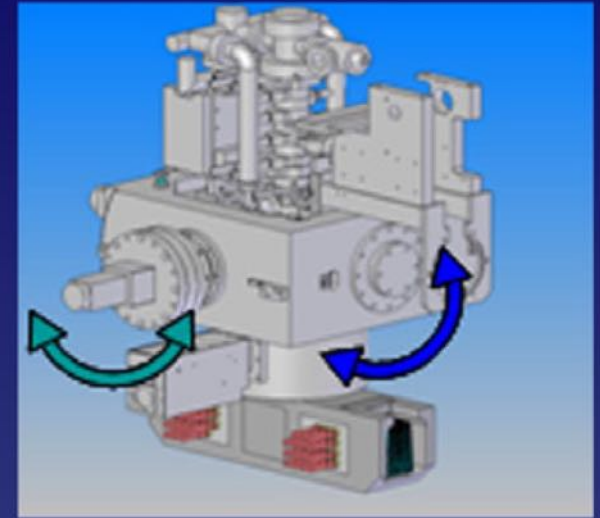
Outstanding accuracy is maintained through the adoption of an O-ring shaped mechanical structure offering advantages in rigidity



MHI-TM2000 *alias* “VERO-System”

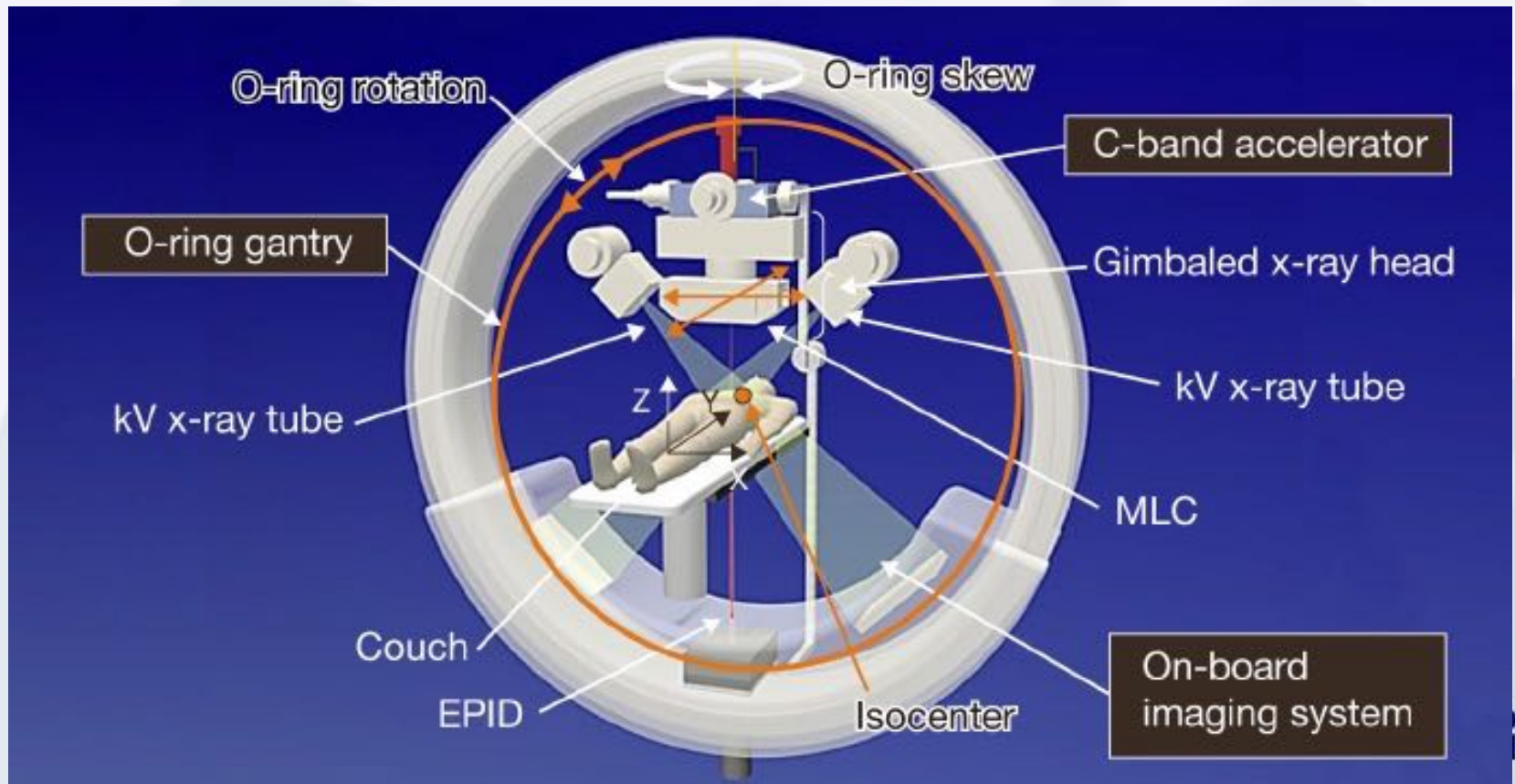
- The X-ray head is mounted on a gimbals mechanism that allows fine adjustment of the radiation direction with tilt and pan rotation functions
- Compact 6 MV linac, 38 cm long and 10 kg in weight
- The beam delivery system also includes a multileaf collimator with 30 pairs of 5 mm leaves
- Maximum field size: 15x15 cm
- **Fast treatment planning calculation**

Gimbals Mechanism



MHI-TM2000 *alias* “VERO-System”

For IGRT, an (EPID) and two kV X-ray imaging devices **with flat panel**



MHI-TM2000 *alias* “VERO-System”

vero
SBRT **UNLEASHED**

Our experience

From April 2012 to October 2012

Tot. Patients: 245

- Gynaecological cancer: 9 pts
- Prostate cancer: 81 pts
- Lung cancer: 31 pts
- M+ lymph-node: 38 pts
- Others (breast, gastrointestinal, sarcoma, bone): 86 pts

Stereotactic body radiotherapy (SBRT): Technological innovation and application in gynecologic oncology

Daniel S. Higginson ^{a,*}, David E. Morris ^a, Ellen L. Jones ^a, Daniel Clarke-Pearson ^b, Mahesh A. Varia ^a

^a Department of Radiation Oncology, University of North Carolina at Chapel Hill, 101 Manning Drive, Chapel Hill, NC 27514, USA

^b Department of Obstetrics and Gynecology, University of North Carolina at Chapel Hill, 3009 Old Clinic Building, CB#7570, Chapel Hill, NC 27599, USA

Gynecologic patients

April 2012- October 2012

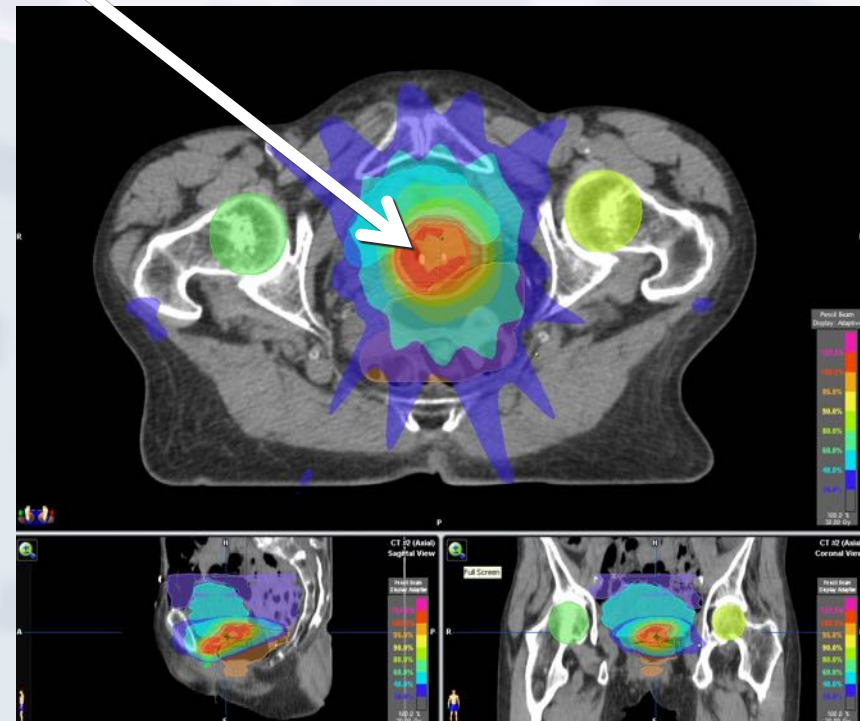
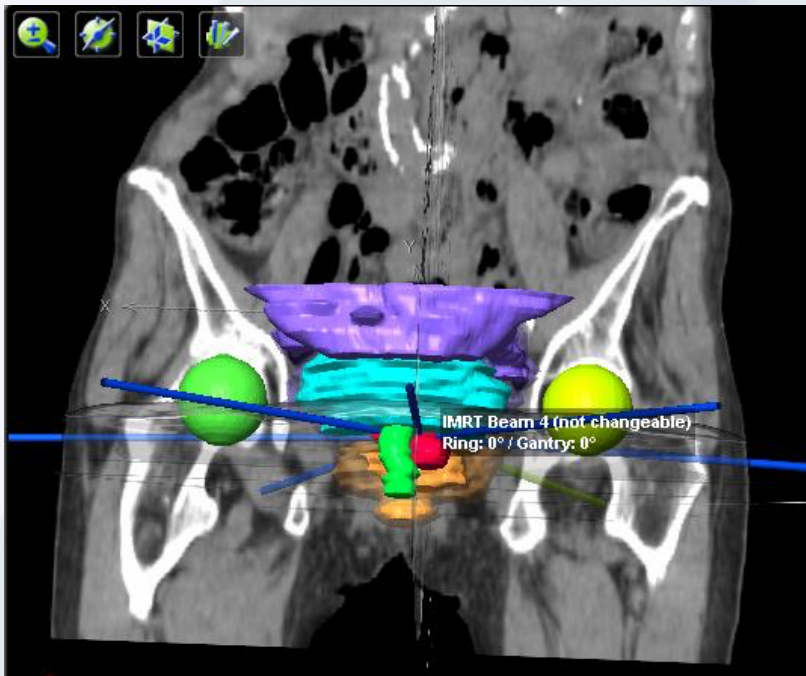
- 9 pts (5 cervix boost and 2 pelvic boost after Trilogy 50.4 Gy, 2 radical treatment for recurrence of endometrial cancer)
- Dose: 5 Gy/ 5 fractions = EQD2= 31.3 Gy

... high dose treatment

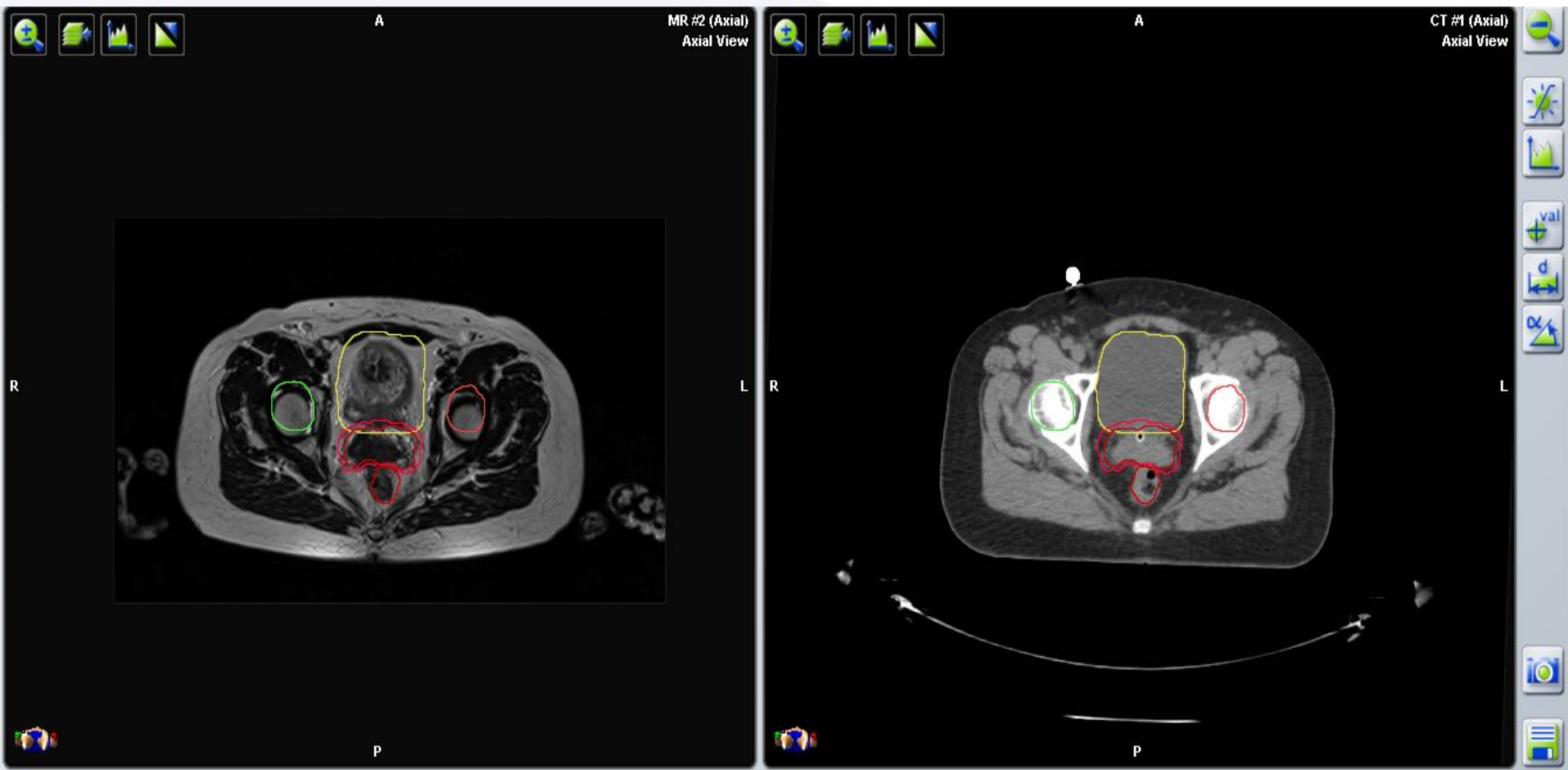
VERO system (BrainLab/MHI)



Vaginal cuff recurrence

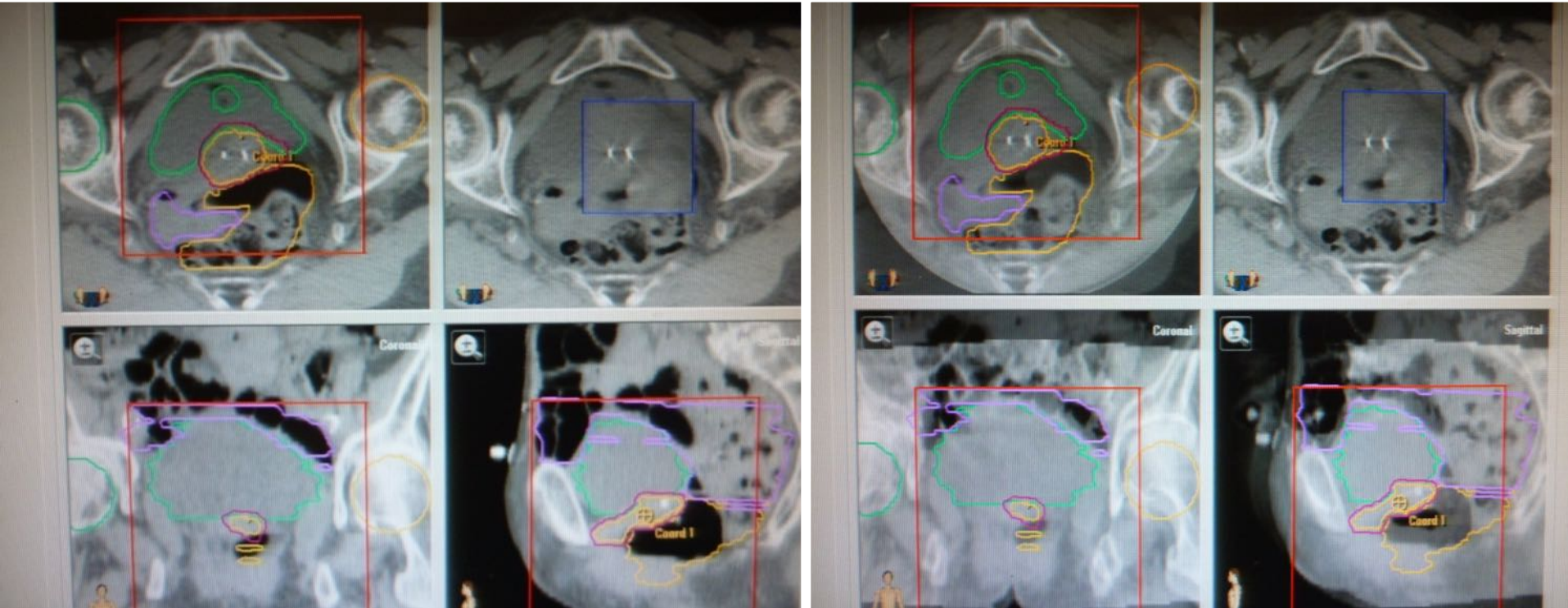


MRI fusion



CT simulation

CBCT



Shift during treatment

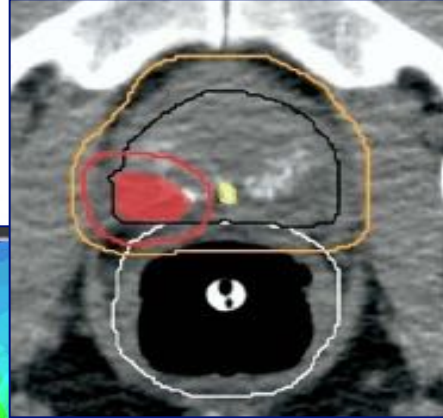
Approve Shift

Shift		
Vertical	-8.56	0.53 °
Longitudinal	-15.34	-0.13 °
Lateral	-2.54	2.80 °

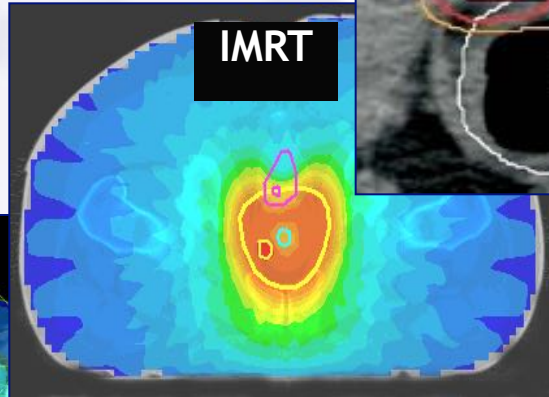
Overlay

Prostate: high precision radiotherapy...

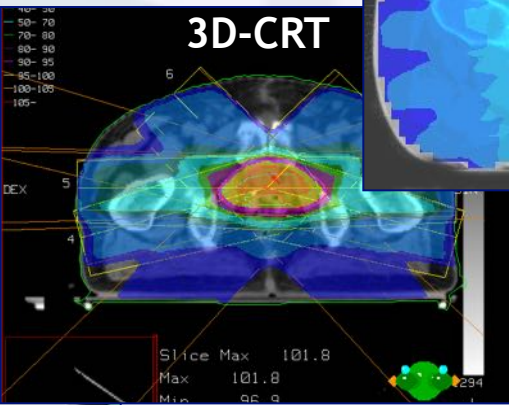
> 90 Gy?



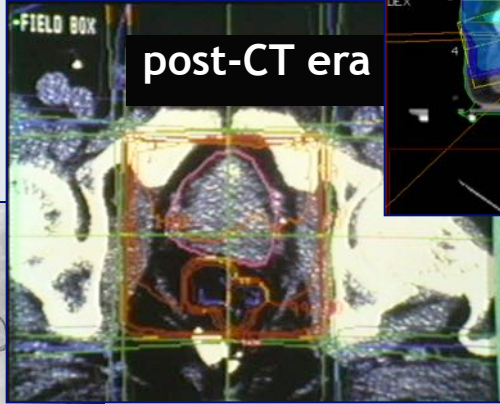
90 Gy



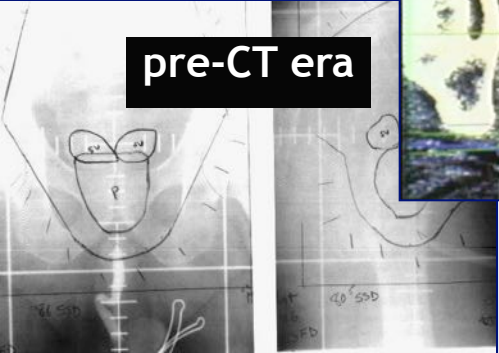
80 Gy



70 Gy



60 Gy



Localized prostate cancer

EFFECT OF INCREASING RADIATION DOSES ON LOCAL AND DISTANT FAILURES IN PATIENTS WITH LOCALIZED PROSTATE CANCER

PATRICK A. KUPELIAN, M.D.,* JAY CIEZKI, M.D.,† CHANDANA A. REDDY, M.S.,†
ERIC A. KLEIN, M.D.,‡ AND ARUL MAHADEVAN, M.D.†

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“dose escalation”



Table 1. Distribution of pretreatment and treatment parameters by radiation dose group

Variable	<72 Gy	≥72 but <82 Gy	≥82 Gy	p
Clinical T stage				0.003
T1-T2	512 (93)	199 (93)	152 (100)	
T3	40 (7)	16 (7)	0 (0)	
iPSA level (ng/mL)				<0.001
≤4	50 (9)	14 (7)	13 (8)	
>4 to ≤10	233 (42)	135 (63)	112 (74)	
>10 to ≤20	147 (27)	50 (23)	26 (17)	
>20	122 (22)	16 (7)	1 (1)	
bGS				<0.001
2-6	350 (63)	149 (69)	122 (80)	
7-10	202 (37)	66 (31)	30 (20)	
Risk group				<0.001
Low	161 (29)	96 (45)	99 (65)	
Intermediate	134 (24)	51 (24)	43 (28)	
High	257 (47)	68 (31)	10 (7)	
Total	552 (100)	215 (100)	152 (100)	

Abbreviations: iPSA = pretreatment prostate-specific antigen; bGS = biopsy Gleason score.

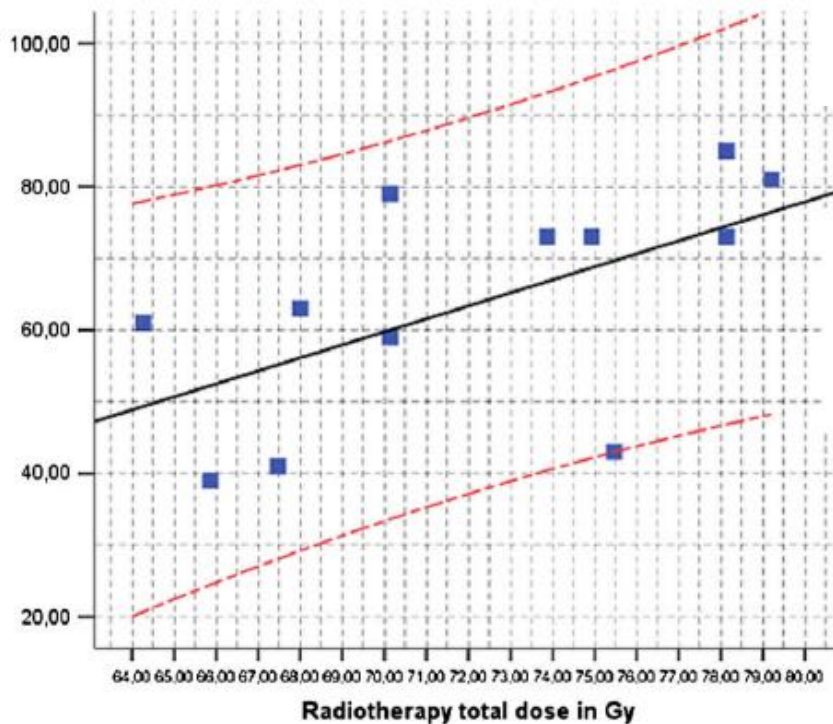
Data presented as number of patients, with percentages in parentheses.

↓ dose agli OAR +
↑ dose al bersaglio
= ↑ bNED

Dose escalation...why ???

HIGHER-THAN-CONVENTIONAL RADIATION DOSES IN LOCALIZED PROSTATE CANCER TREATMENT: A META-ANALYSIS OF RANDOMIZED, CONTROLLED TRIALS

GUSTAVO ARRUDA VIANI, M.D., EDUARDO JOSE STEFANO, M.D., AND SERGIO LUIS AFONSO, M.D.



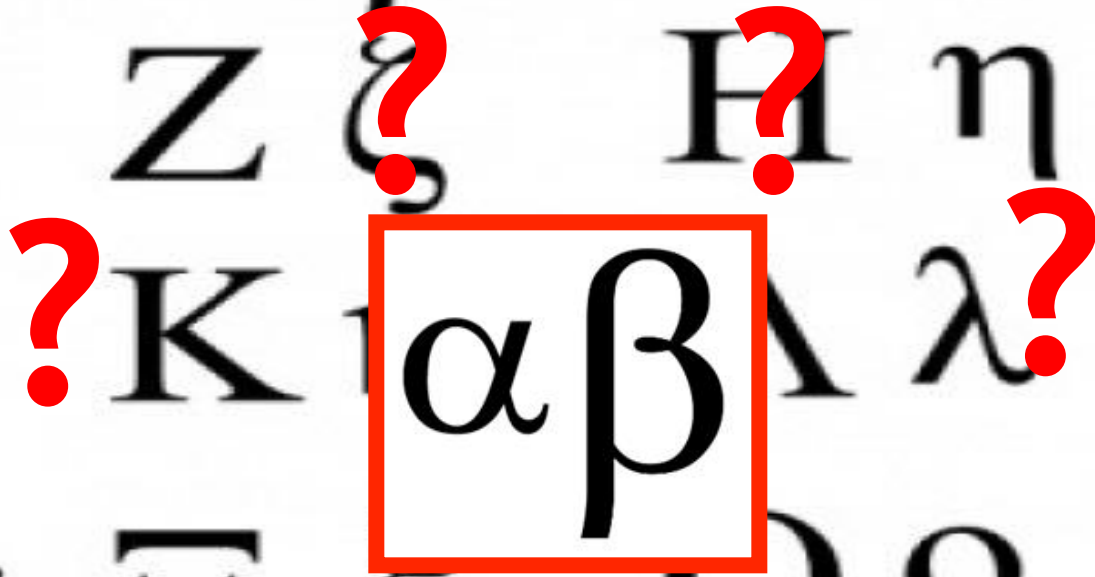
1° Meta-analisi

Aumento di 1.8% in PSA control

per ogni 1 Gy di dose in più somministrata

Fig. 10. Meta-regression analysis for biochemical control as a function of the radiotherapy total dose for all subgroups present in six trials. RTTD = radiotherapy total dose.

Dose escalation...How ???



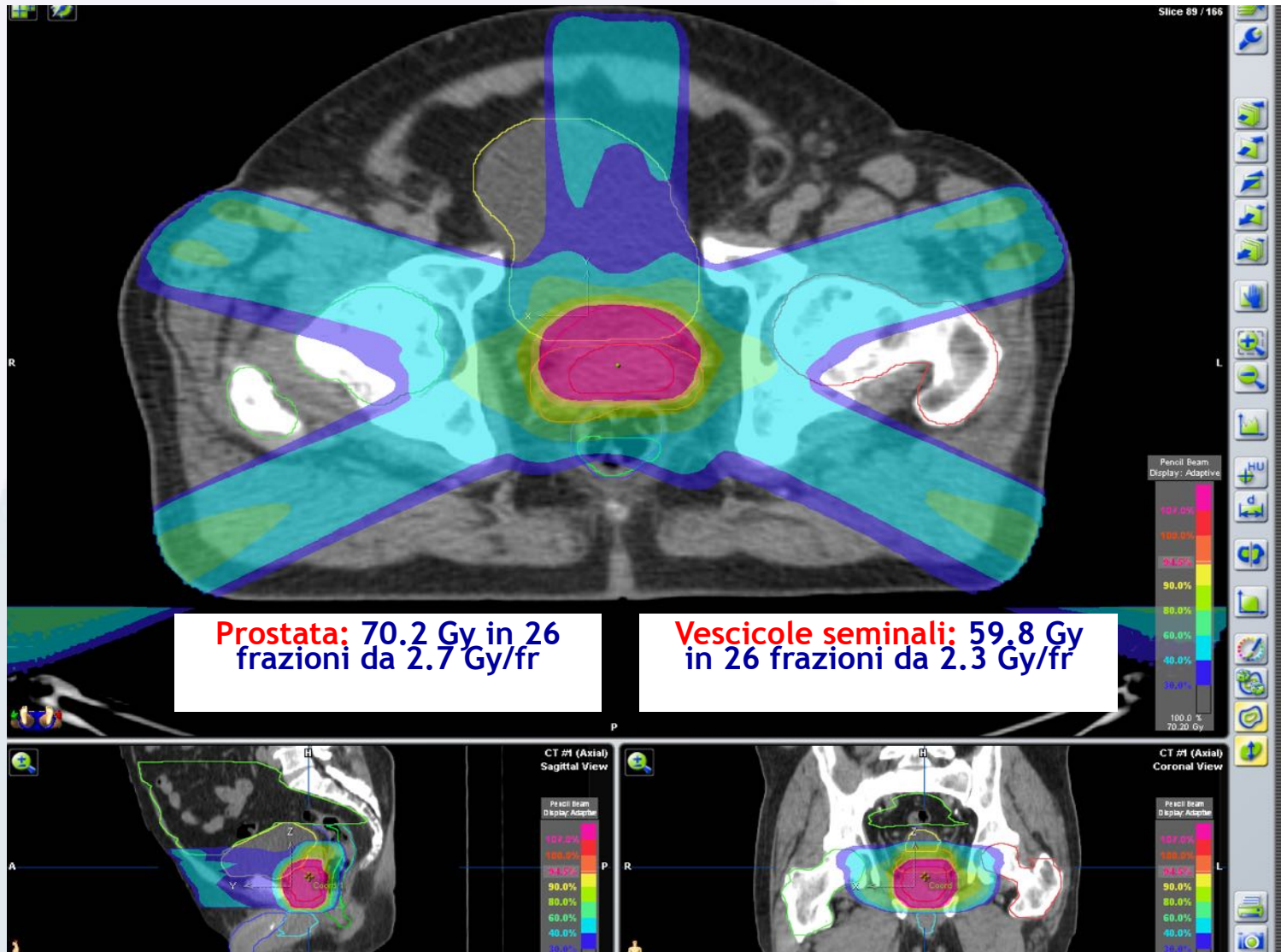
Prostata: 70.2 Gy in 26 frazioni da 2.7 Gy/fr
= dose biologicamente equivalente con frazionamento convenzionale di 2Gy/fr
(modello lineare quadratico alfa/beta 1.5 Gy)

= 84.4 Gy

Vescicole seminali: 59.8 Gy in 26 frazioni da 2.3 Gy/fr
= dose biologicamente equivalente con frazionamento convenzionale di 2Gy/fr
(modello lineare quadratico alfa/beta 1.5 Gy)

= 63 Gy

Prostata + vescicole seminali VERO (IMRT-SIB)



Salvage Stereotactic Body Radiotherapy for Patients With Limited Prostate Cancer Metastases: Deferring Androgen Deprivation Therapy

Patrick Berkovic,¹ Gert De Meerleer,¹ Louke Delrue,² Bieke Lambert,³ Valérie Fonteyne,¹ Nicolaas Lumen,⁴ Karel Decaestecker,⁴ Geert Villeirs,² Philippe Vuye,¹ Piet Ost¹

Abstract

Patients with metastatic prostate cancer are uniformly treated with castration (surgically or medically), which is

Results: We treated 24 patients with a median follow-up of 24 months. Ten patients started with ADT resulting in a median ADT-FS of 38 months. The 2-year local control and clinical progression-free survival was 100% and 42%, respectively. Eleven and 3 patients, respectively, required a second and third salvage treatment for metachronous low-volume metastatic disease. No grade 3 toxicity was observed. **Conclusion:** Repeated salvage SBRT is feasible, well tolerated and defers palliative ADT with a median of 38 months in patients with limited bone or lymph node PCa metastases.

ADT-FS of 38 months. The 2-year local control and clinical progression-free survival was 100% and 42%, respectively. Eleven and 3 patients, respectively, required a second and third salvage treatment for metachronous low-volume metastatic disease. No grade 3 toxicity was observed. **Conclusion:** Repeated salvage SBRT is feasible, well tolerated and defers palliative ADT with a median of 38 months in patients with limited bone or lymph node PCa metastases.

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Keywords: Low-volume metastasis, Oligometastases, SBRT

Patrick Berkovic and Gert De Meerleer contributed equally to this work

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Submitted: Apr 11, 2012; Revised: Jul 16, 2012; Accepted: Aug 16, 2012

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Fax: 0032-9-332-30-40; e-mail contact: patrick.berkovic@ugzghent.be

Introduction

Patients with metastasized prostate cancer (PCa) are generally considered palliative. The first line treatment is androgen deprivation therapy (ADT) attempting to defer progression in asymptomatic patients or to palliate symptoms in symptomatic patients.¹

In 1995, it was suggested that the evolution of metastatic disease has intermediate states in which metastases might be present in limited numbers, termed oligometastases.² This state implies that local control of oligometastases may yield improved systemic control. In PCa, this concept might also be valid as the overall survival of patients with metastatic disease varies as a function of the number of metastatic lesions.³



Contents lists available at ScienceDirect

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0360-3016/\$ - see front matter

doi:10.1016/j.ijrobp.2010.11.031

ORIGINAL ARTICLE

Linac-based Stereotactic Body Radiotherapy for Oligometastatic Patients With Single Abdominal Lymph Node Recurrent Cancer

Barbara A. Jereczek-Fossa, MD, PhD, † Gaia Piperno, MD,* Sara Ronchi, MD,* † Gianpiero Catalano, MD, ‡
Cristiana Fodor, MSc,* Raffaella Cambria, MSc,§ Piero Fossati Ing, MD,* †|| Federica Gherardi, MD,*
Daniela Alterio, MD,* Dario Zerini, MD,* Cristina Garibaldi, MSc,§ Guido Baroni, PhD, || ¶
Ottavio De Cobelli, MD, †# and Roberto Orecchia, MD* †||*

Reirradiazione loggia prostatica VERO (IMRT)

Caso clinico:

Recidiva ca prostata dopo chirurgia (2001)

RT salvataggio (2004) 70Gy

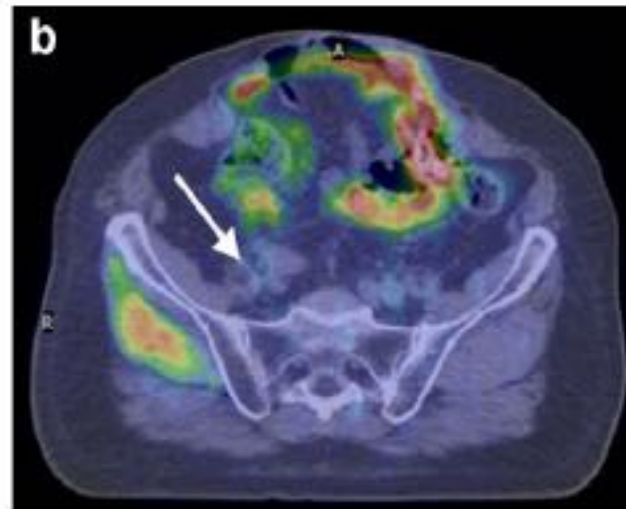
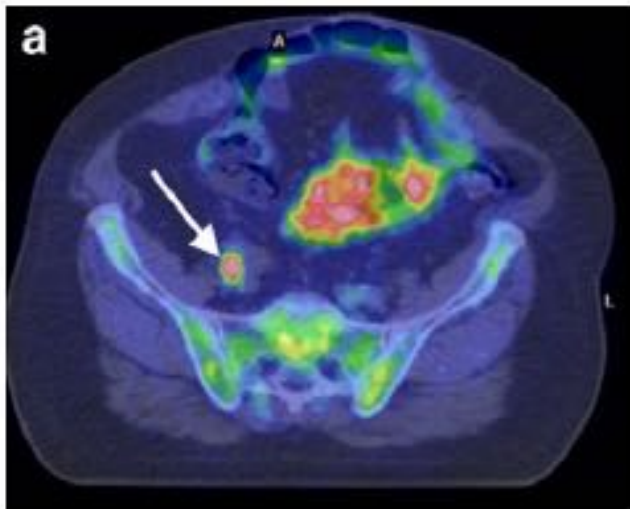
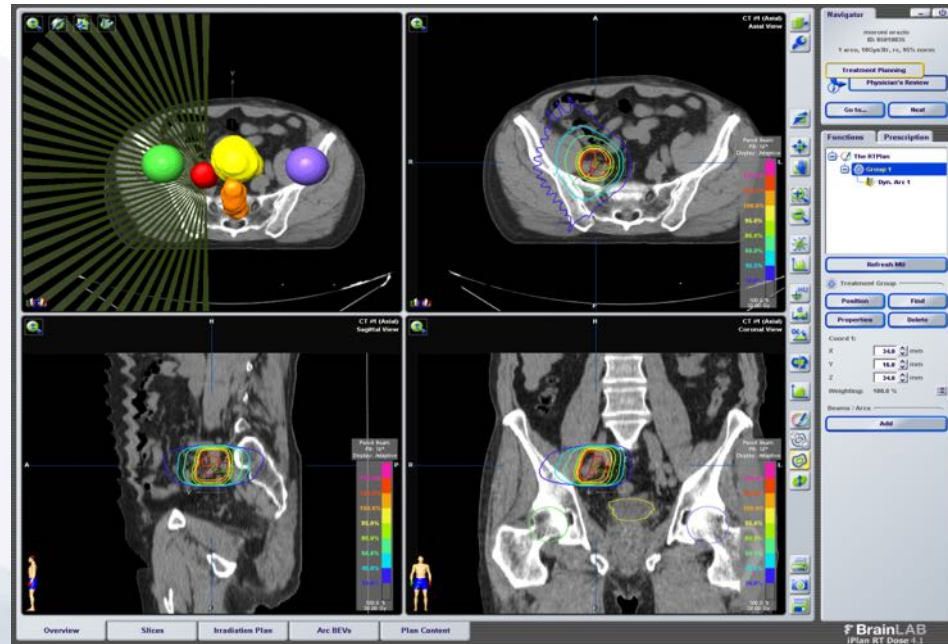
SBRT(24Gy) sul Inf iliaco est sx PET+ nel 2010

06/2012: RM pelvi + per ripresa di malattia, biopsia dell'anastomosi positiva

Dose: 25 Gy (5 Gy
in 5 frazioni) a
giorni alterni

organo	Limite dose(1/3 valori constraints Timmerman SBRT ipofrazionata K prostata)	Valori piano di cura
Bulbo penieno	Dmax <8 Gy	4 Gy
Cavità peritoneale	Dmax <20 Gy	0.6 Gy
Femori	D10cc <6 Gy	5 Gy
Parete ant retto	Dmax <9 Gy	15 Gy
Parete post retto	Dmax <4 Gy	4 Gy
vescica	D10cc < 10 Gy Dmax < 9 Gy	3 Gy 14Gy

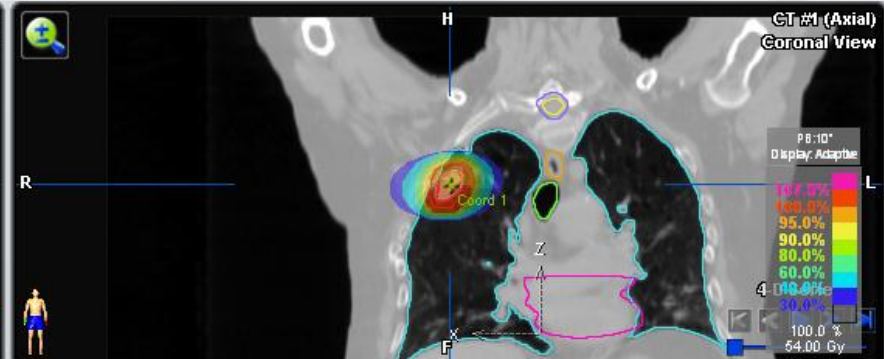
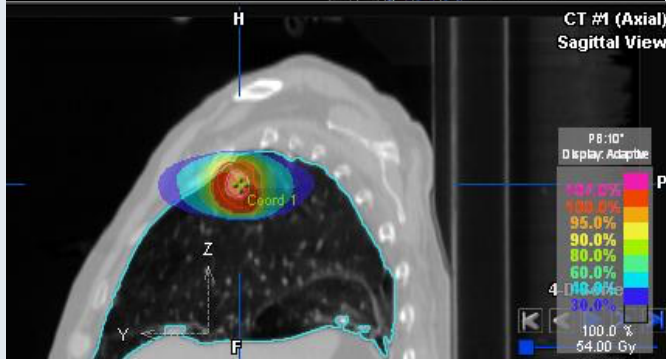
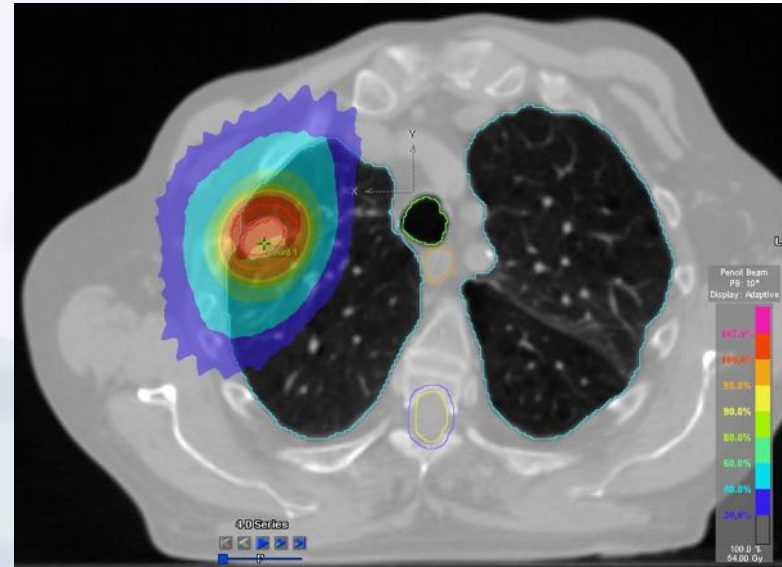
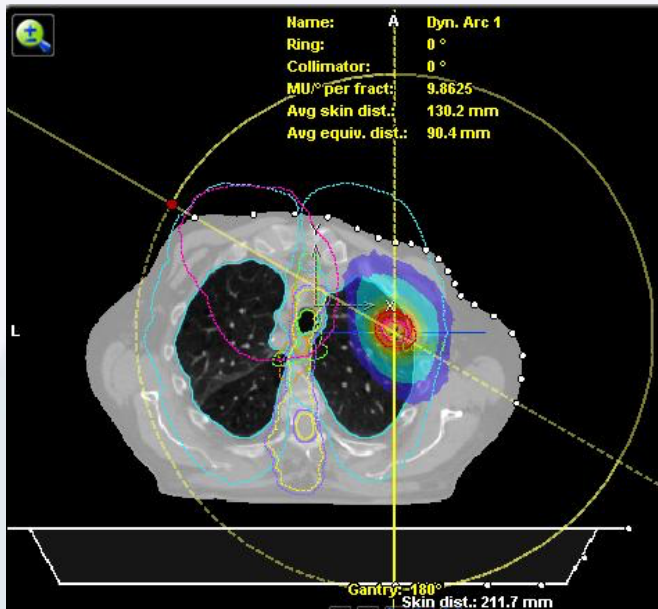
Isolated lymph node irradiation



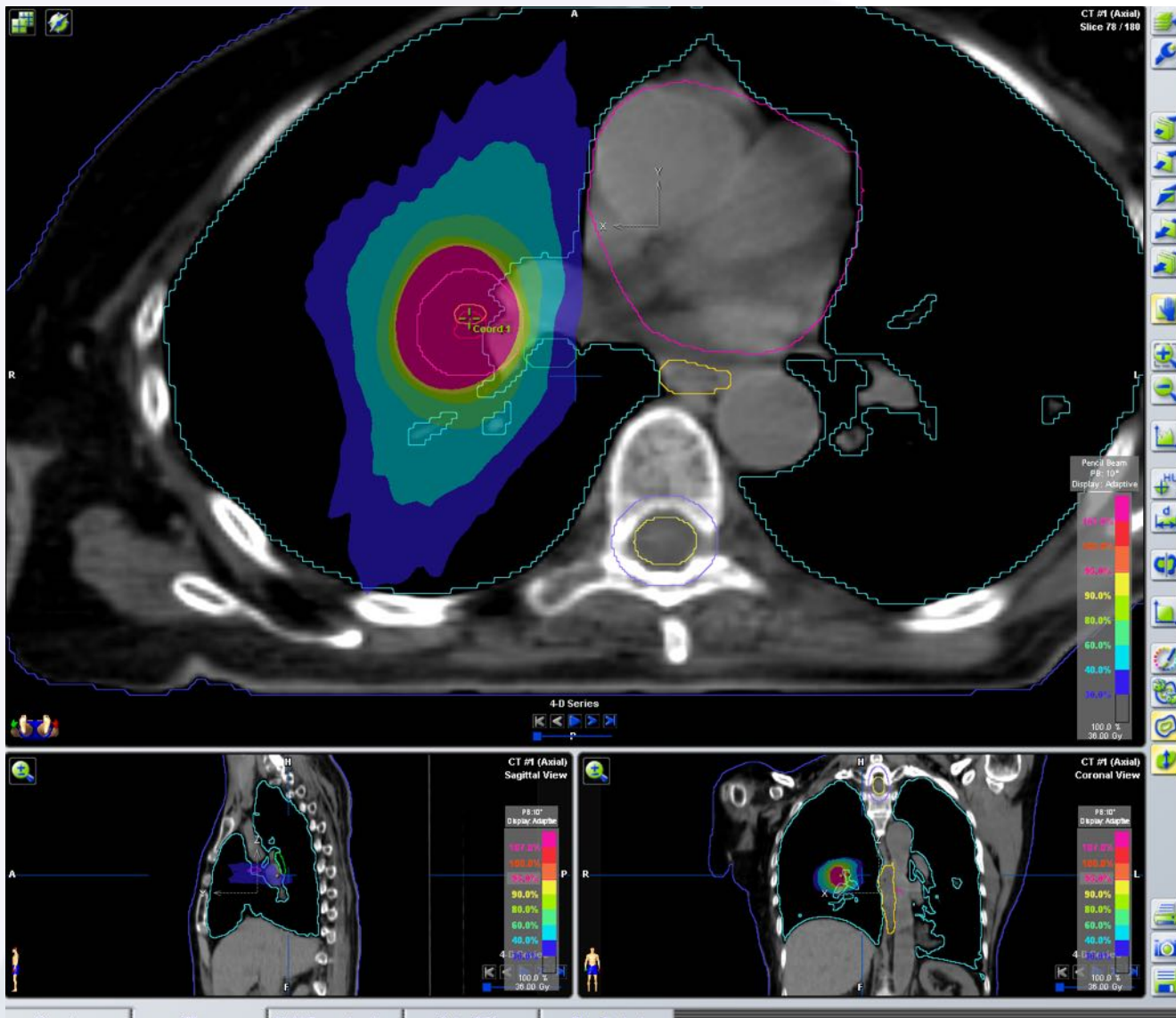
Pre and post treatment

LUNG SBRT with VERO

- ✓ 1-3 no-coplanar conformal dynamic arcs
- ✓ 15-18Gy x 3 fractions
- ✓ individualized margins



LUNG SBRT with VERO



Dose:
8-10 Gy x 4-5 fract
Steroid pre medication

Trilogy



SBRT Linac-based



Vero



Thank you for your attention



**European
Institute
of Oncology**

Cyberknife



Tomotherapy



IEO
Arc Advanced Radiotherapy Center



IEO
Istituto Europeo di Oncologia