



Radiotherapie voor prostaatkanker

Frederik Vandaele

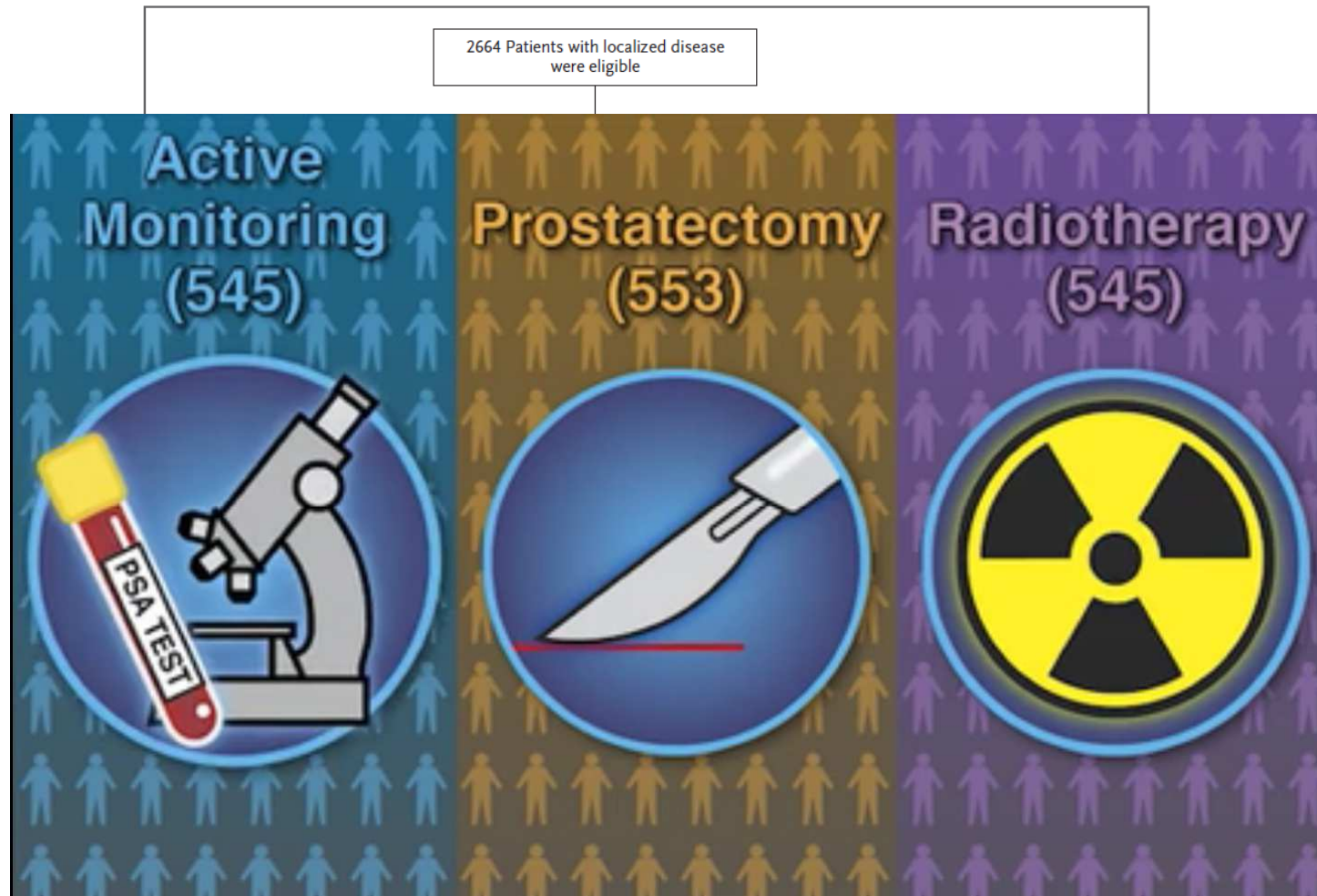
Radiotherapie

Iridium Kankernetwerk

Frederik.vandaele@gza.be

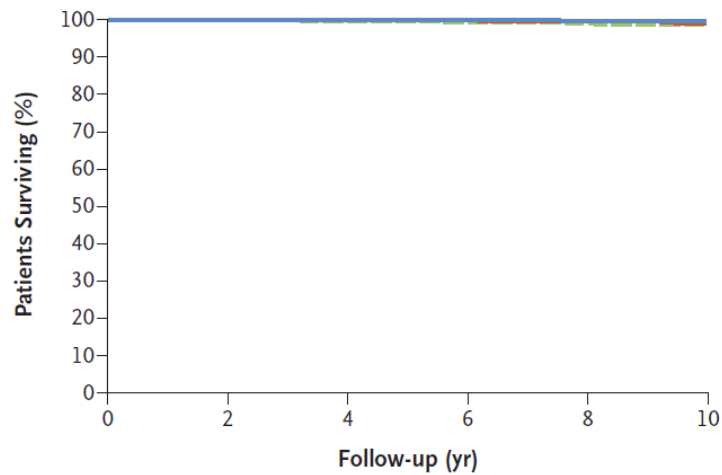
www.iridiumkankernetwerk.be

PROTECT TRIAL (1)



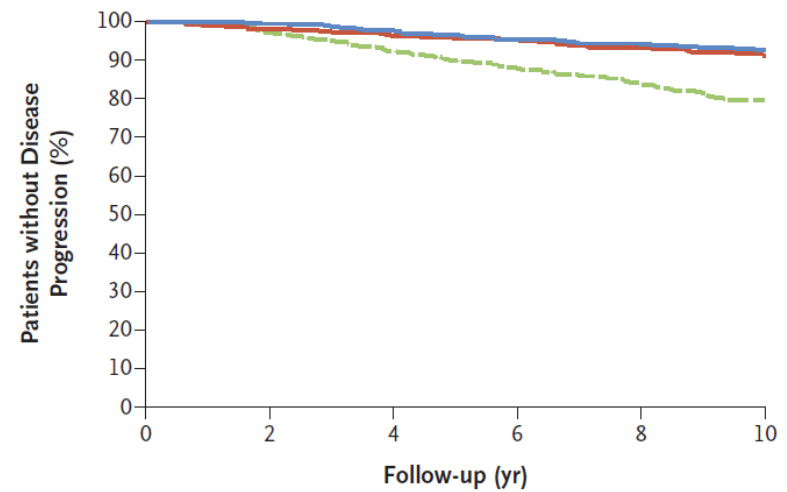
PROTECT TRIAL (2)

A Prostate-Cancer-Specific Survival



No. at Risk 1643 1628 1605 1575 1286 746

B Freedom from Disease Progression



No. at Risk 1643 1601 1533 1467 1175 666

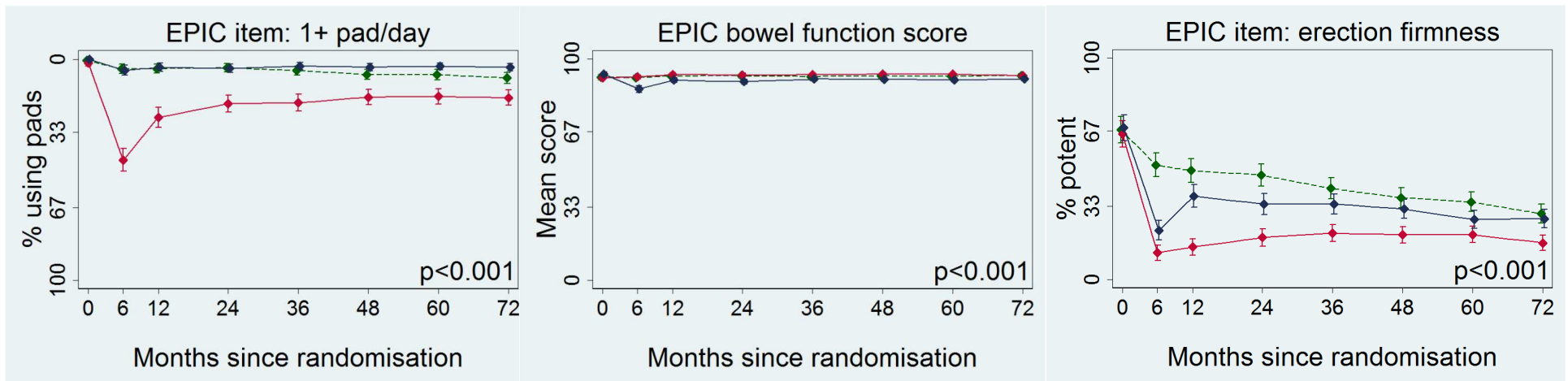
— Surgery — Radiotherapy - - - Active monitoring

PROTECT TRIAL (3) Patient Reported Outcomes (PRO)

Incontinentie

Darm functie

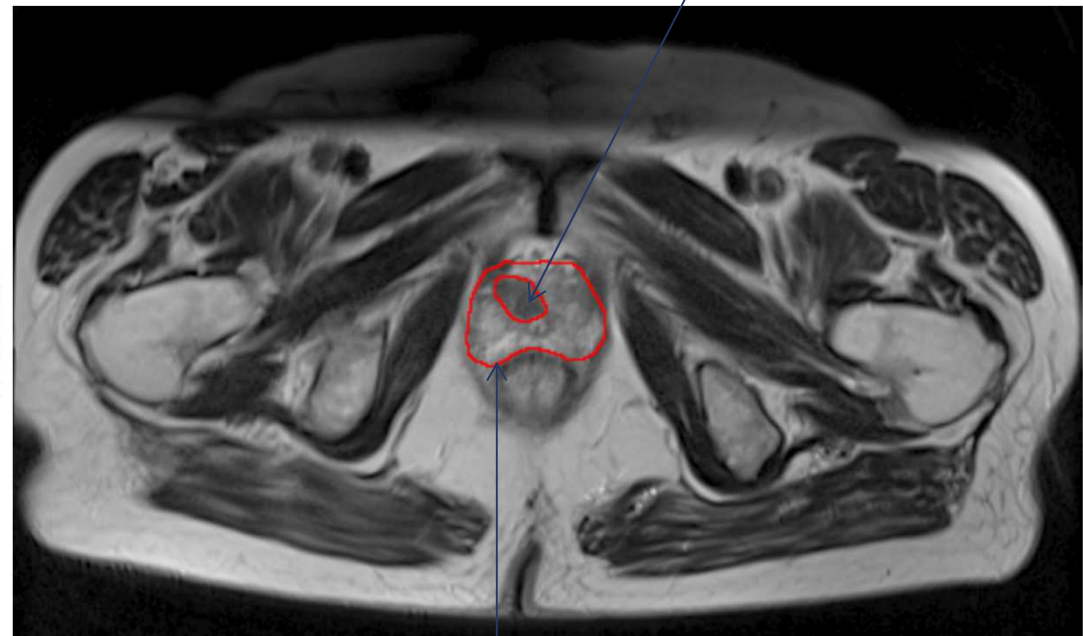
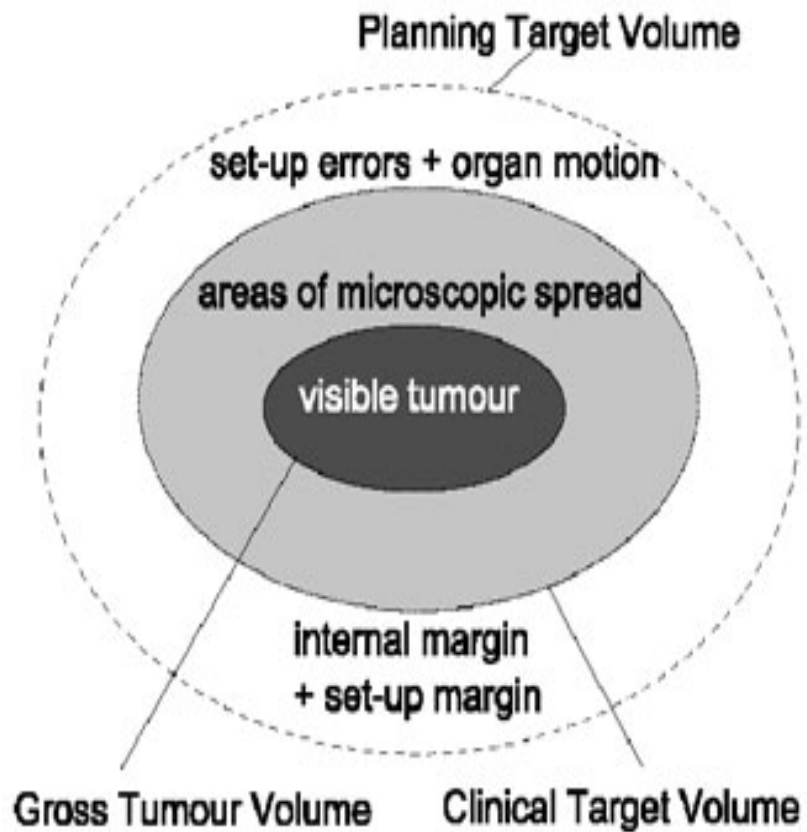
Erectiele functie



— Surgery — Radiotherapy - - - Active monitoring



Intekening doelvolumes

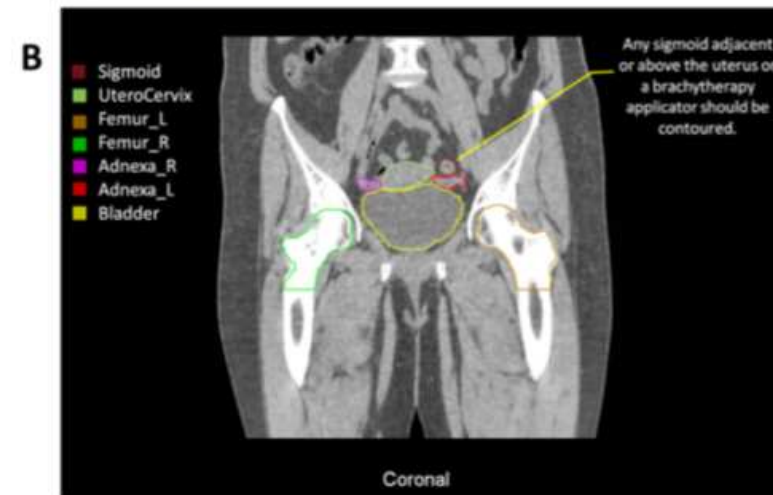
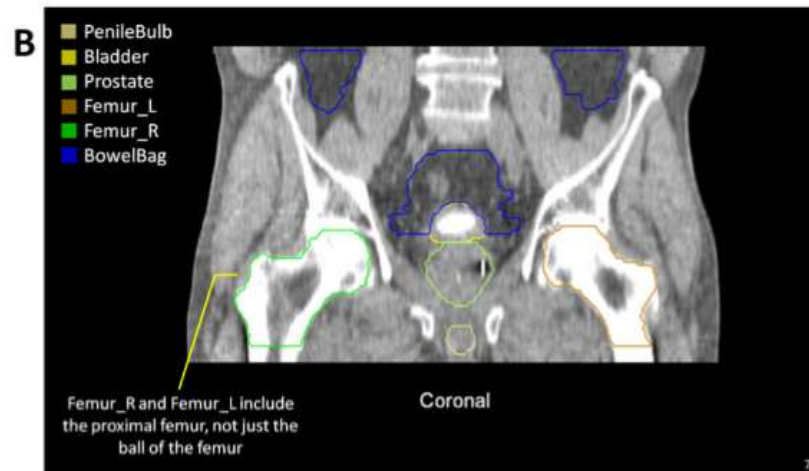
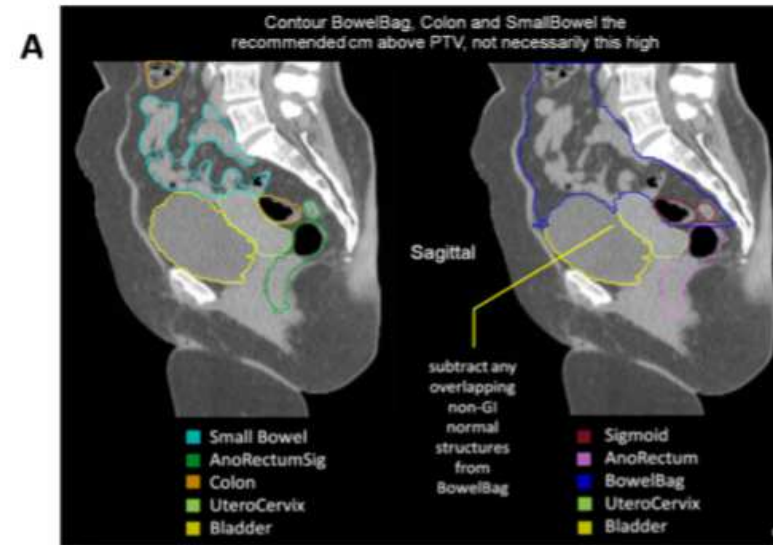
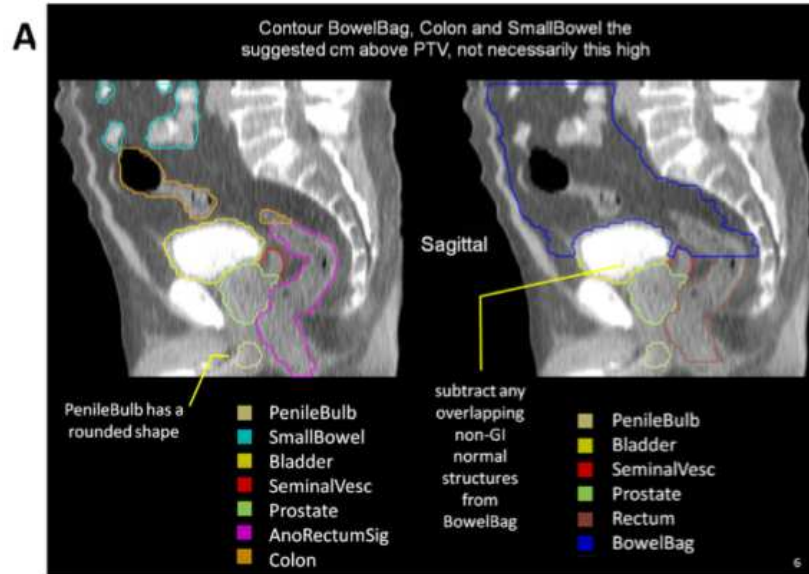


GTV = tumor

CTV = gans de prostaat



Risico organen(OAR)



Risico groepen

Laag risico:

- prostaat **77Gy** (35x2,2Gy); zbl 56 Gy (35x1,6Gy)
- Geen hormonale therapie

Intermediair risico:

- prostaat **77 Gy**, zbl 56Gy
- pelvis 56 Gy indien >15% of argumenten voor aantasting
- 6maand hormonale therapie

Hoog risico:

- prostaat **77 Gy**, zlb 56-77Gy
- Pelvis 56 Gy
- 2-3jaar hormonale therapie

ALLES in 35x

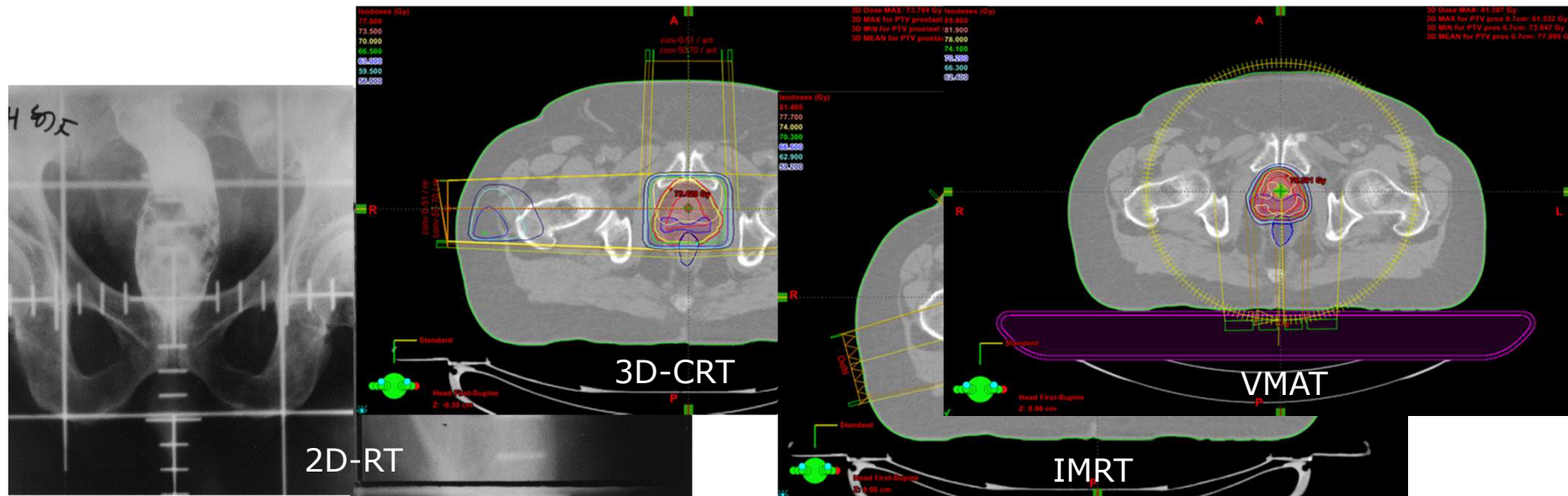
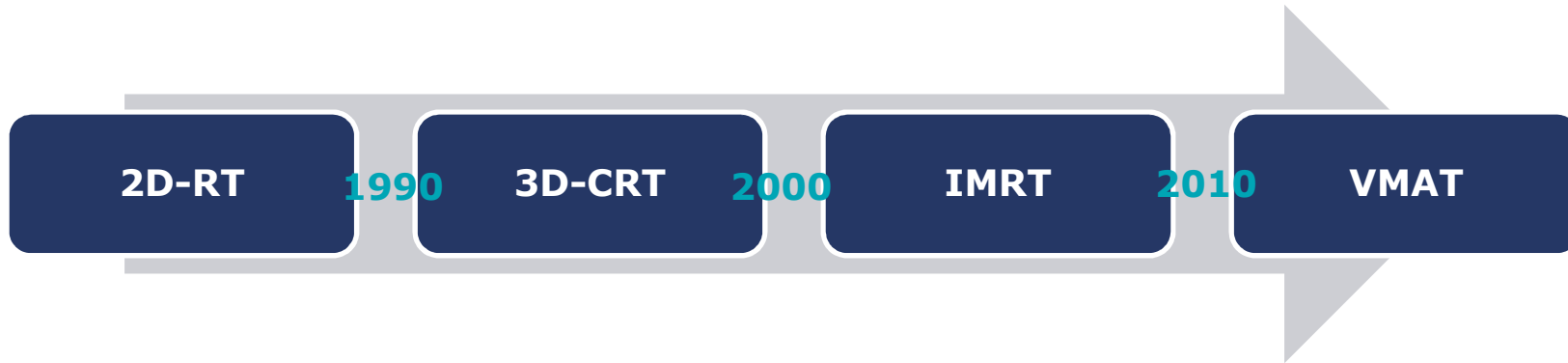


Nieuwe technieken

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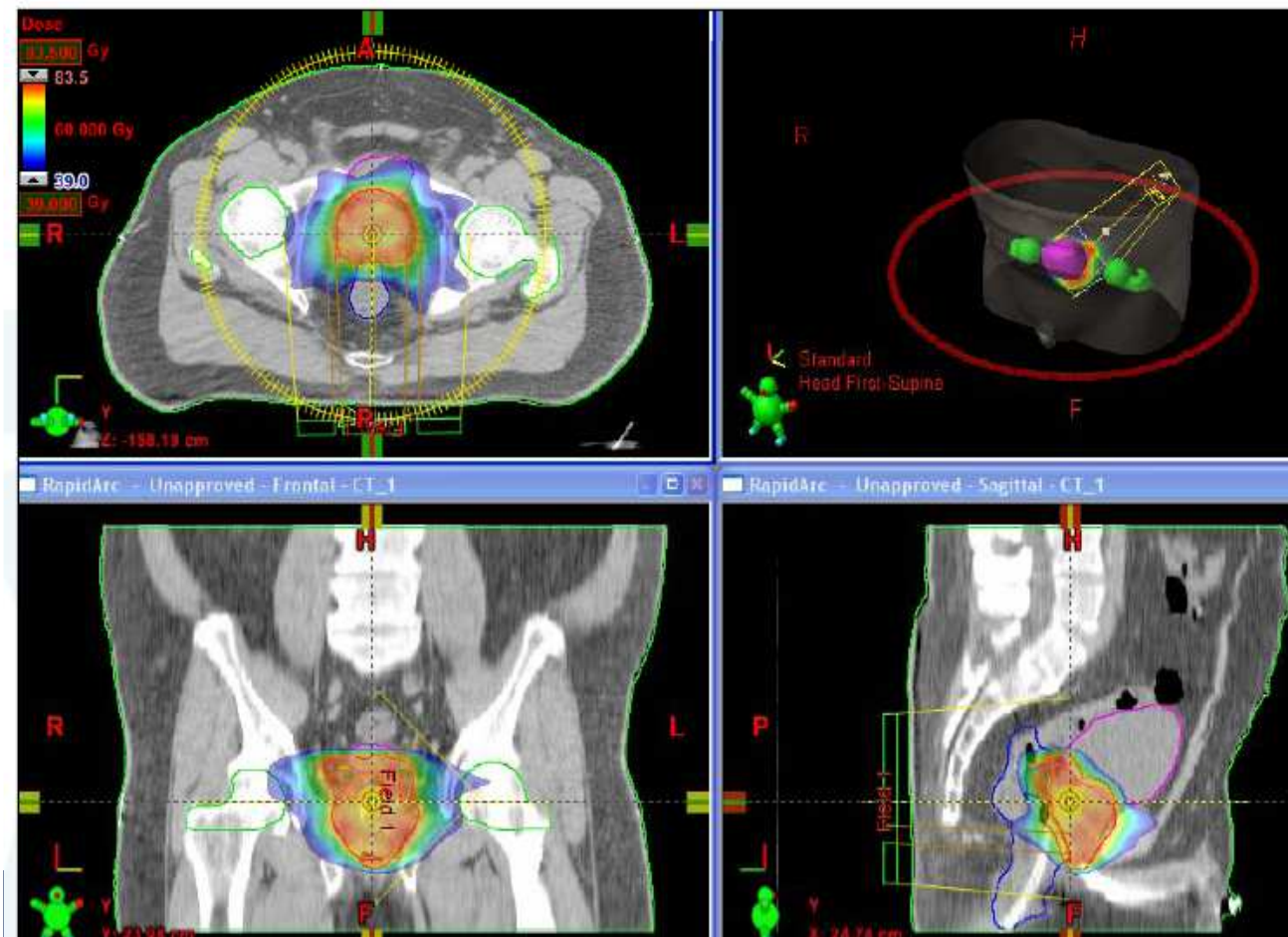
Nieuwe technieken: planning



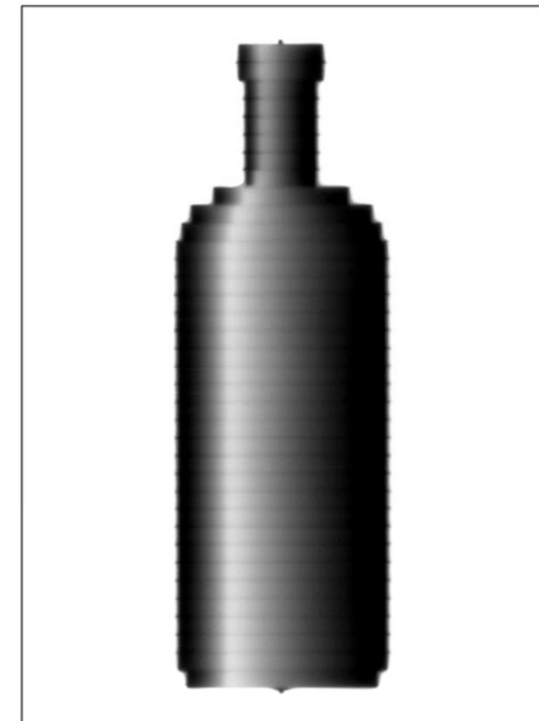
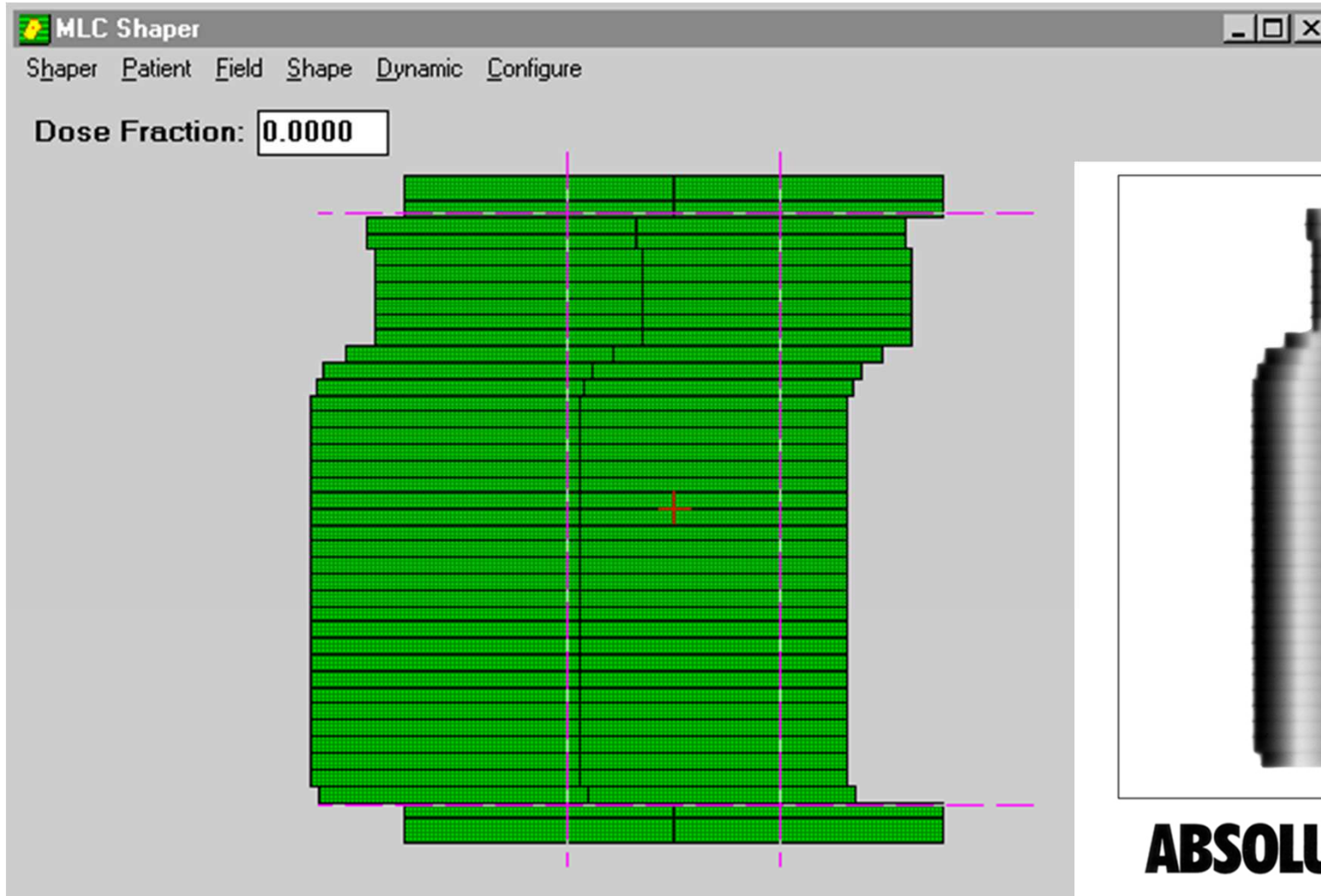
VoluMetric Arc Therapy (VMAT)

Rapid Arc

VARIAN
medical systems



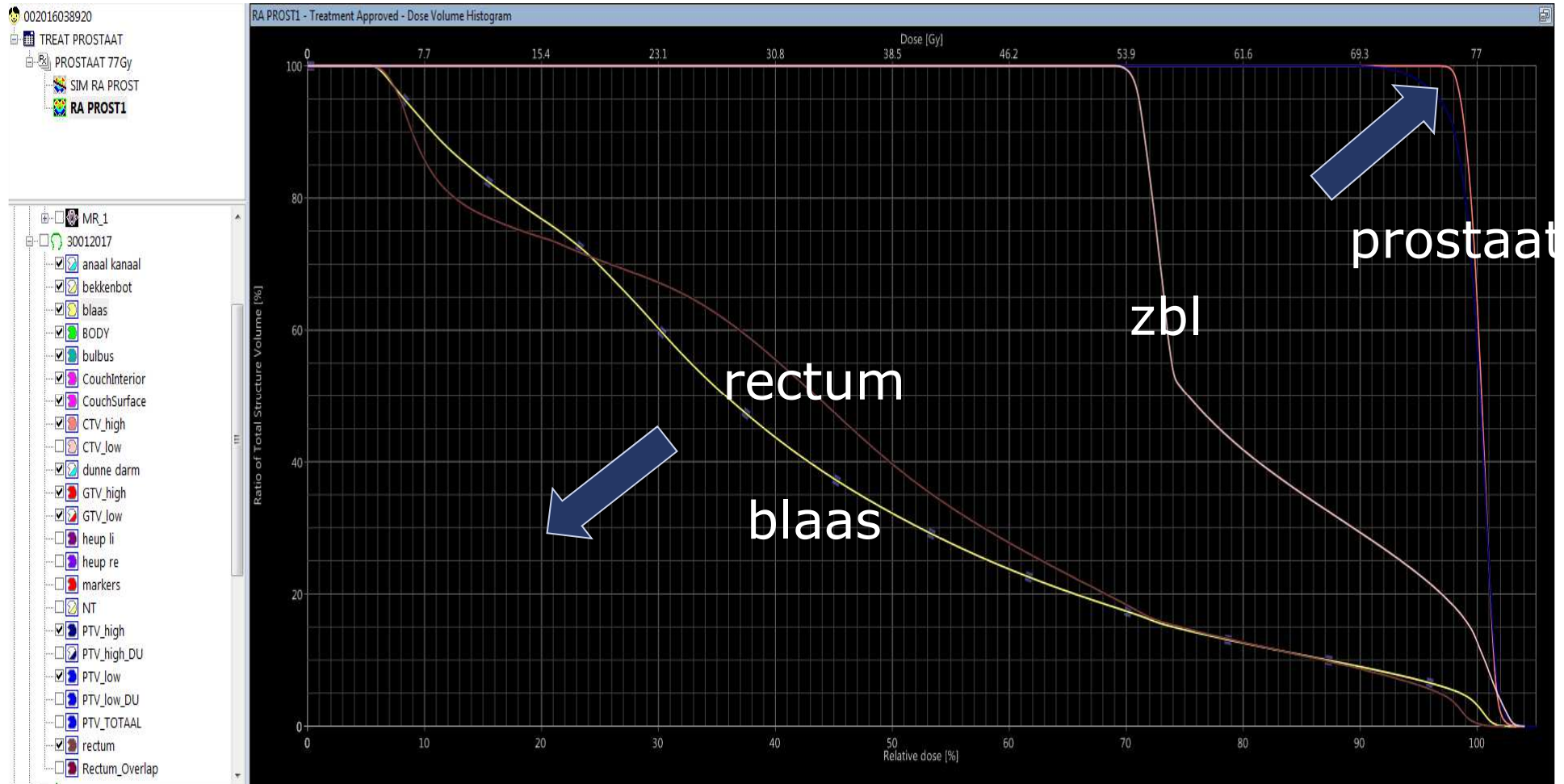
1. IMRT kwaliteit
→ nog beter sparen gezonde organen
2. Tijdsbesparend
duur +/- 2 MIN
3. Lagere MU

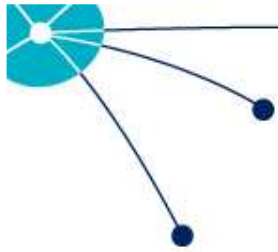


ABSOLUT DMLC.



Dosis Volume Histogram

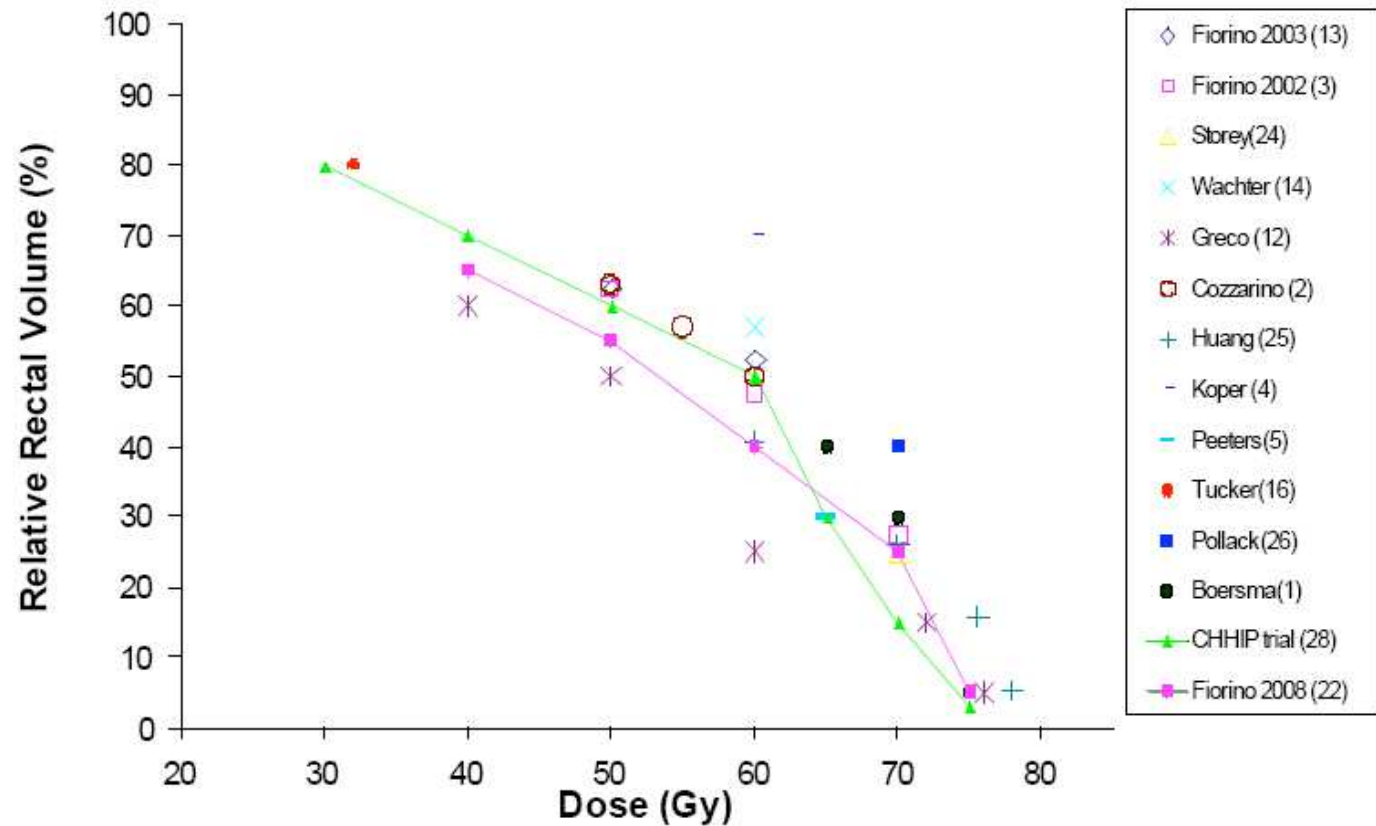




DVH rectum

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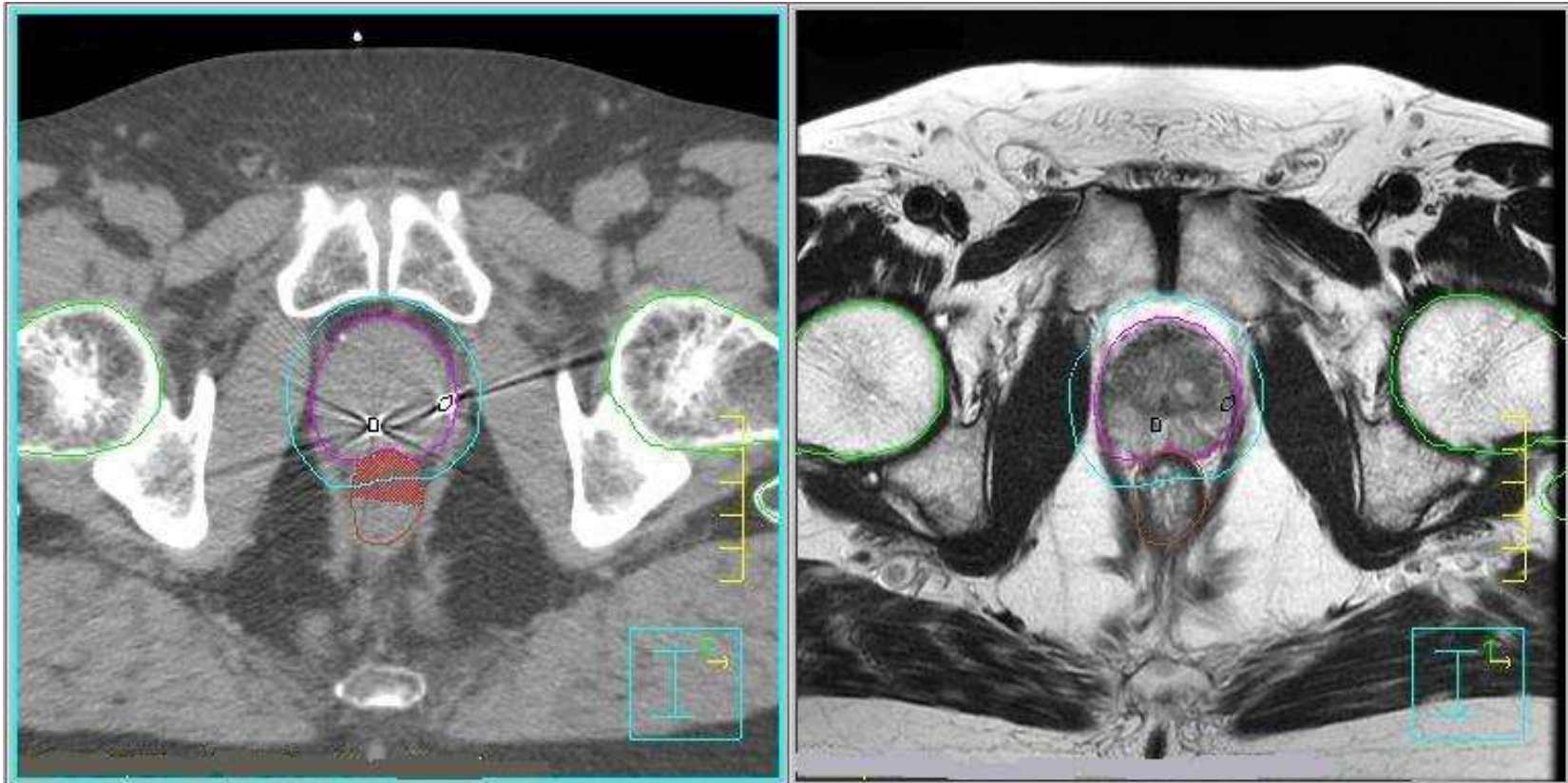
Radiation proctitis



Late rectale toxiciteit (radiorectitis) = dose-limiting toxicity (DLT)

Fusie met MRI

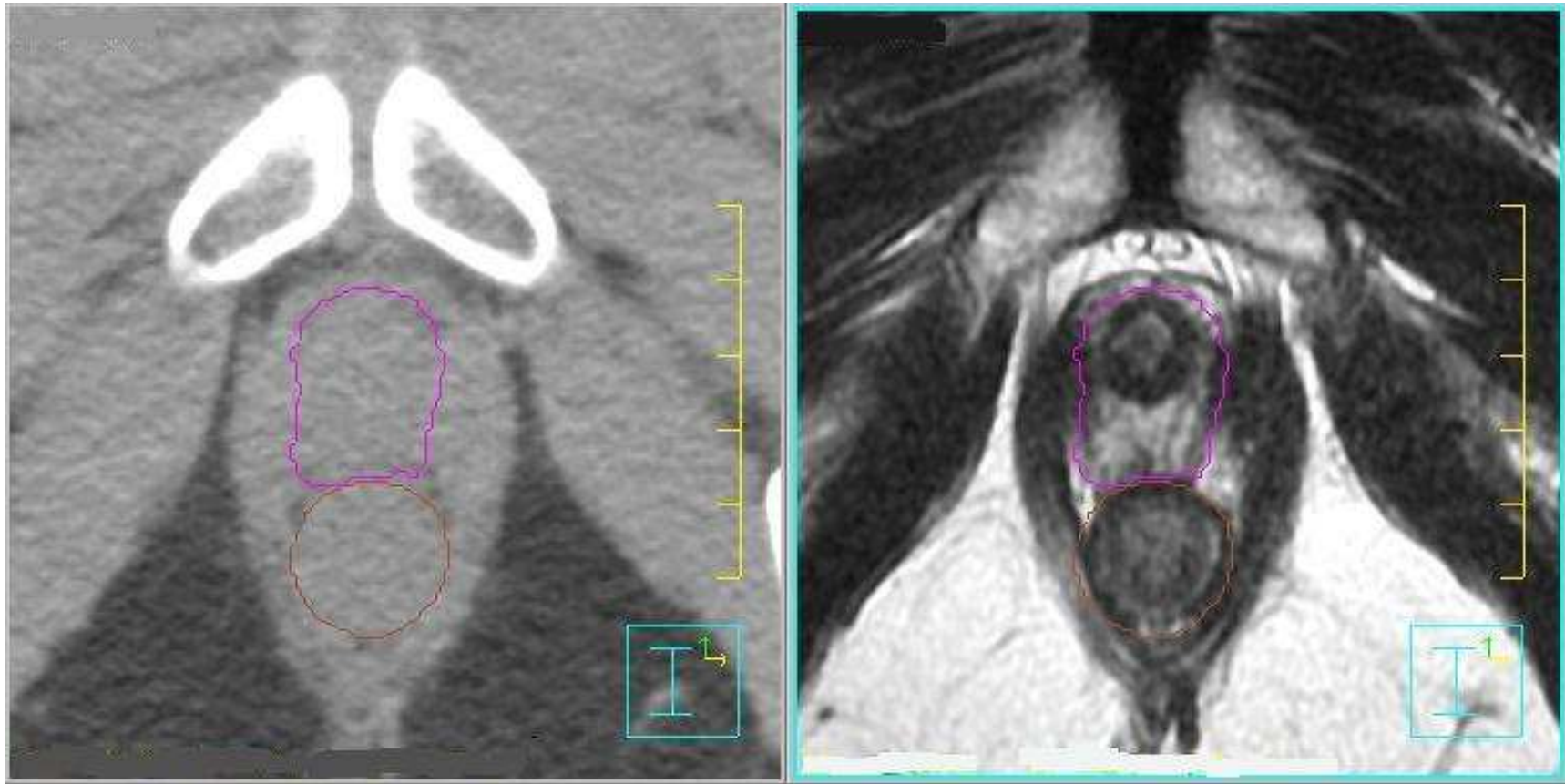
- beter weke delen- contrast
- nauwkeuriger doelvolumen
- kleiner doelvolumen





Fusie met MRI : apex

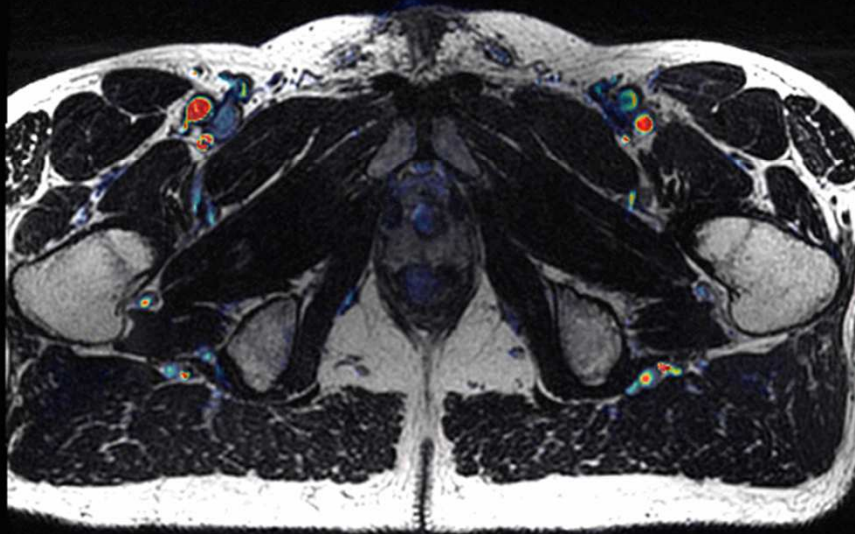
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Functionele imaging

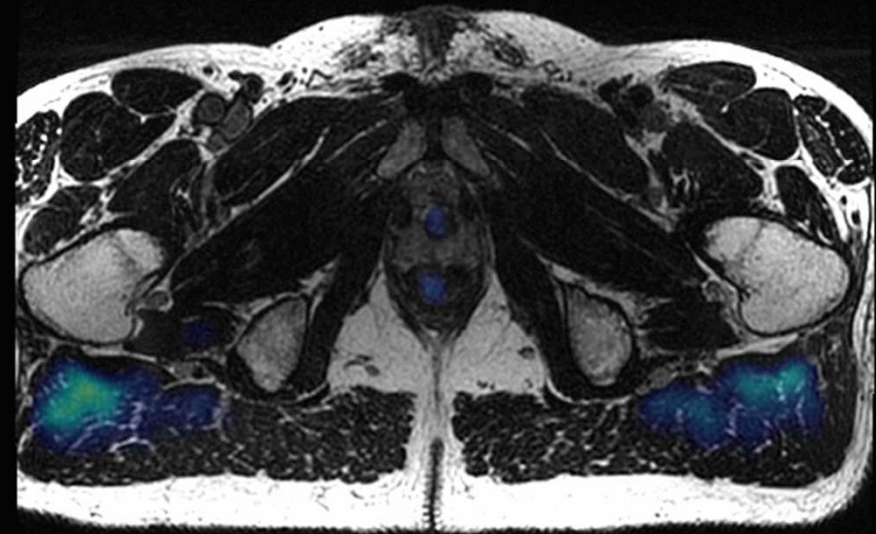
DCE MRI

K-trans overlaid on T2 weighted image



Acetate-PET

Overlaid on T2 weighted image



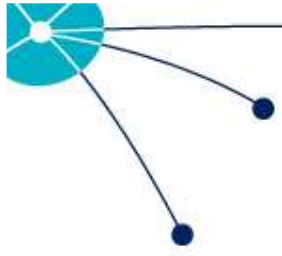


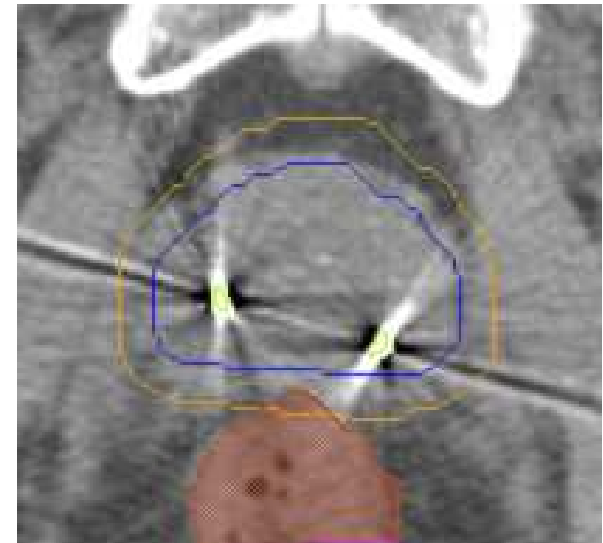
Image Guided Radiotherapy (IGRT)

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Image Guided Radiotherapy

- Set up marge: ligging vd ***patiënt***
 - laser; immobilisatiestukken
- Interne marge: ligging vd ***prostaat***
 - blaas- en darmvoorbereiding
 - IGRT





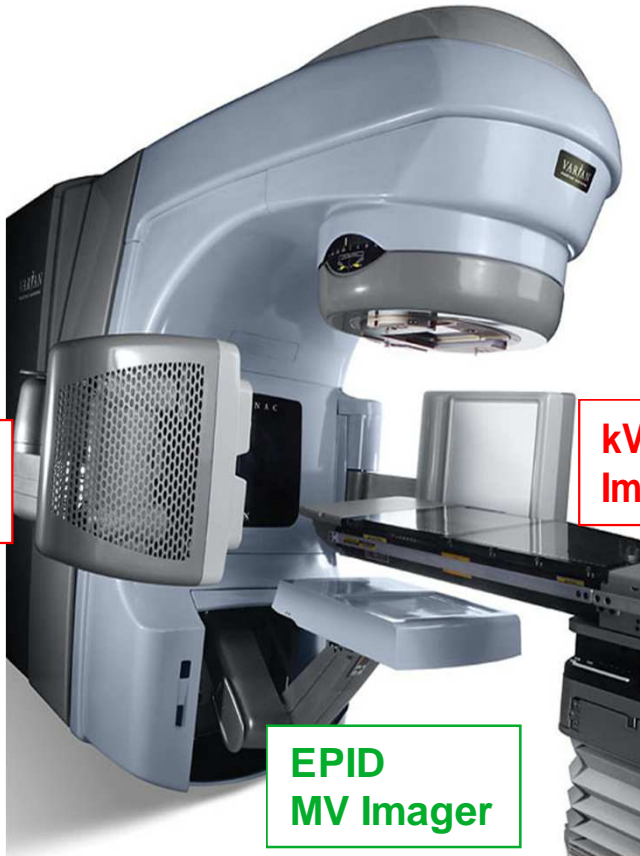
On-board Imaging (OBI)

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MV X-ray
tube



kV X-ray
tube



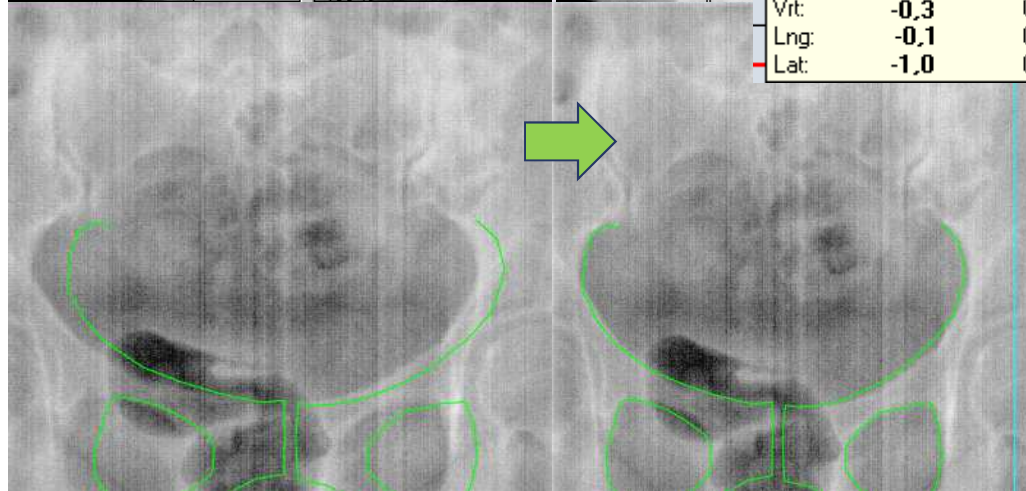
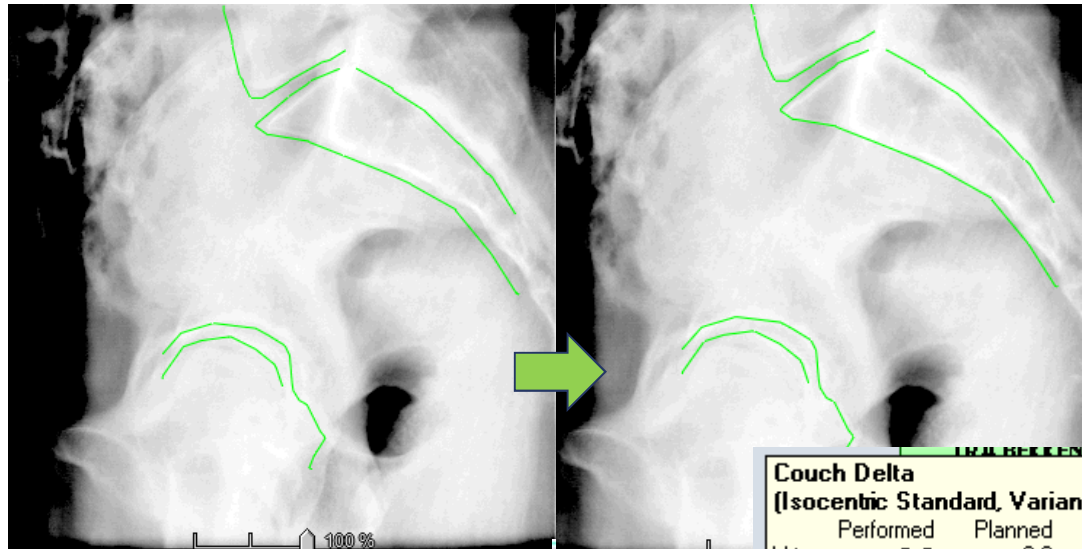
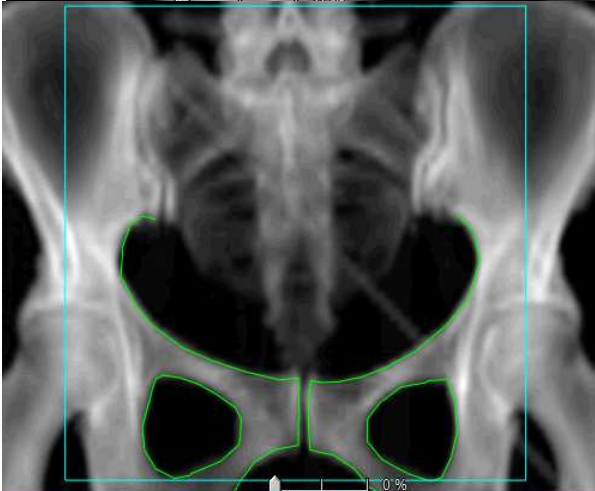
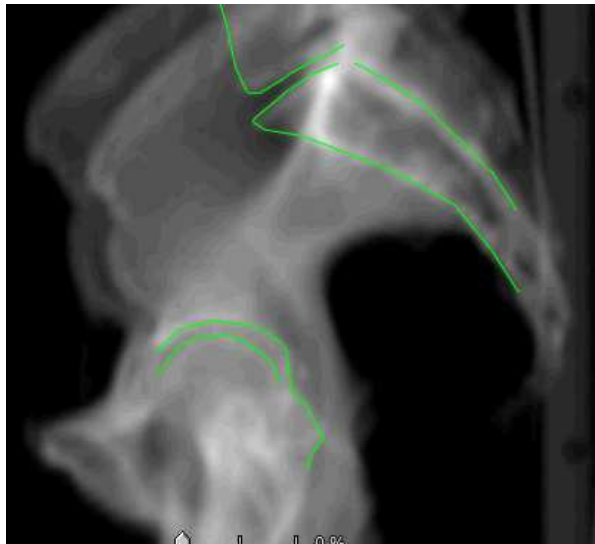
kV On-Board
Image Detector



EPID
MV Imager

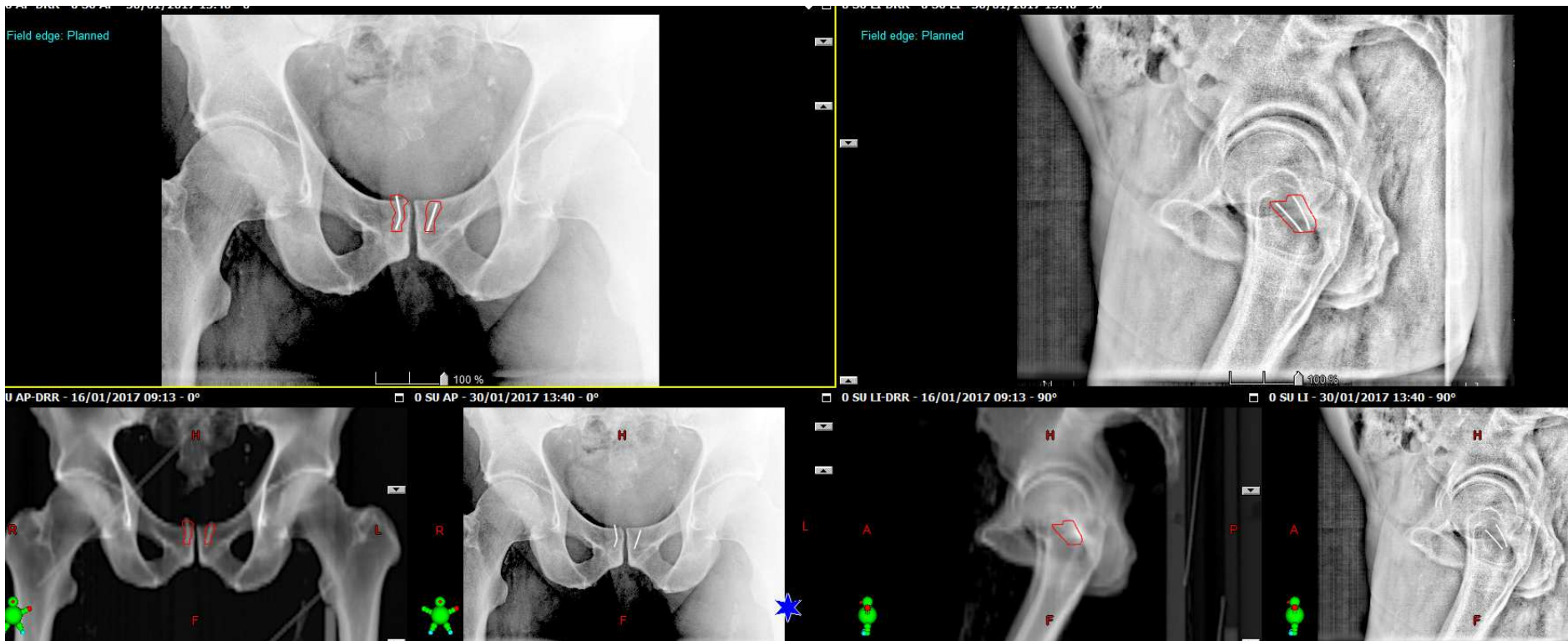


kV-MV "matching" op botstructuren



Couch Delta (Isocentric Standard, Varian IEC)		
	Performed	Planned
Vrt:	-0,3	0,0 cm
Lng:	-0,1	0,0 cm
Lat:	-1,0	0,0 cm

kV-MV "matching" op goudmarkers (fiducials)

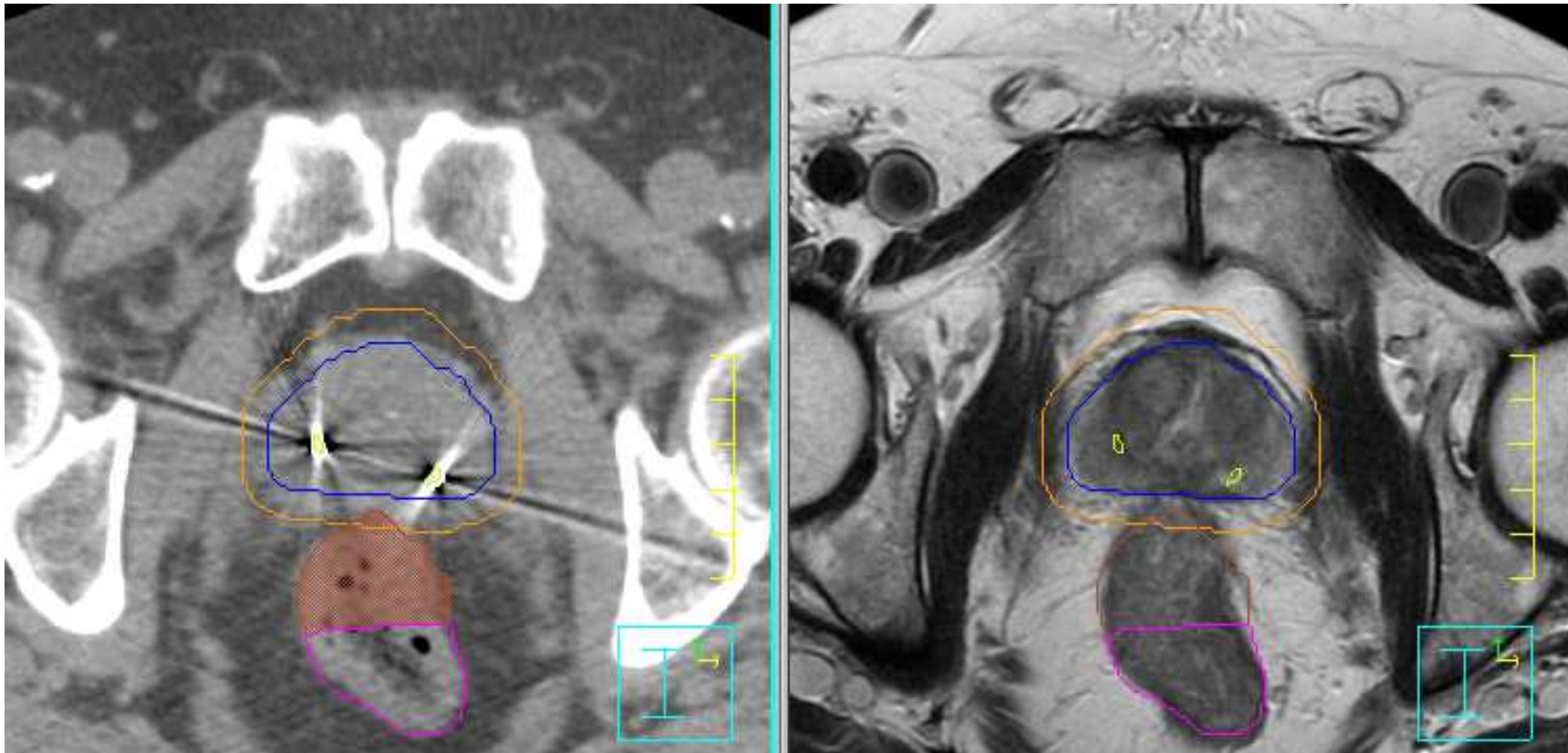


kV-MV "matching" op goudmarkers (fiducials)

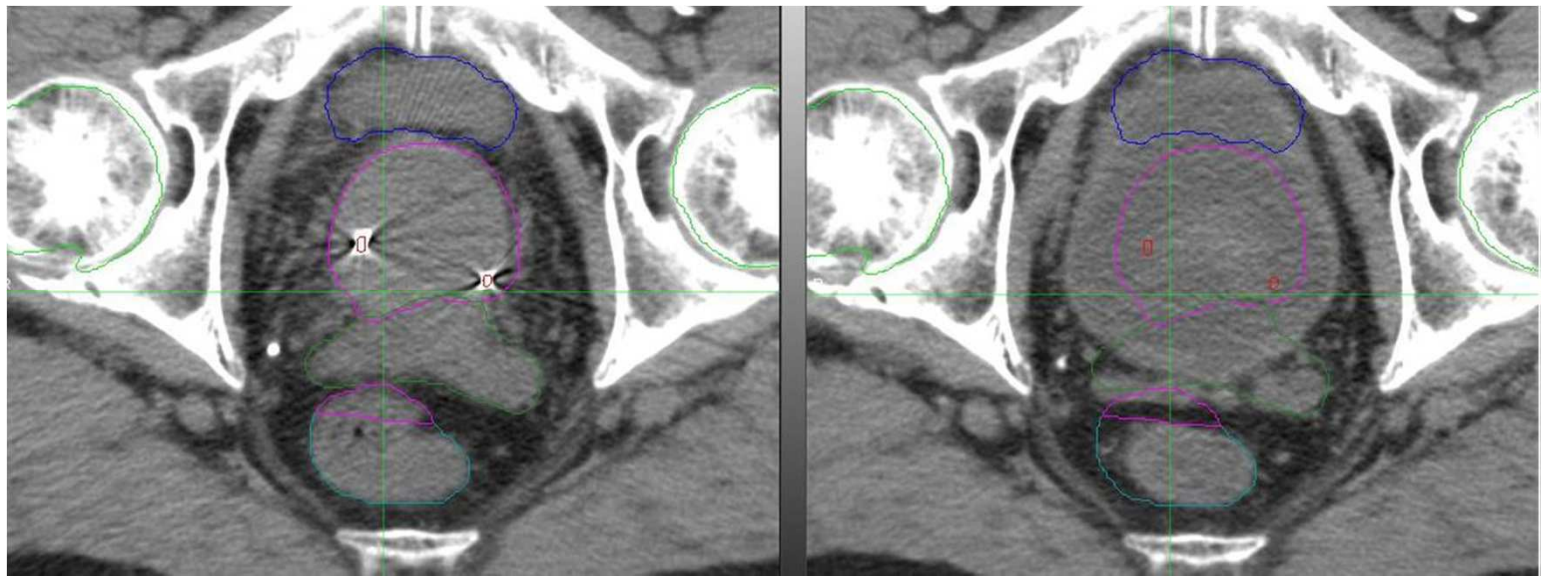
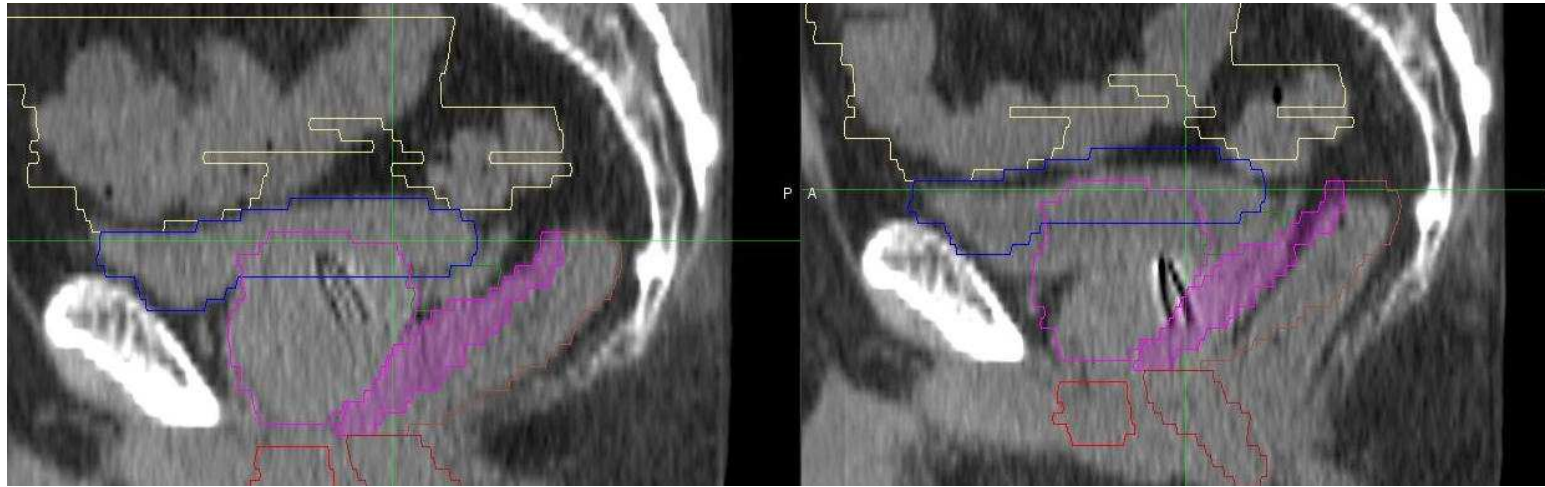
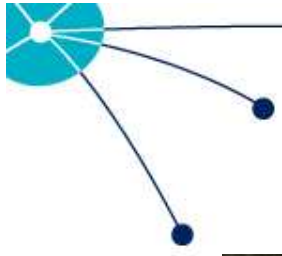




Goudmarkers



betere fusie CT - MRI



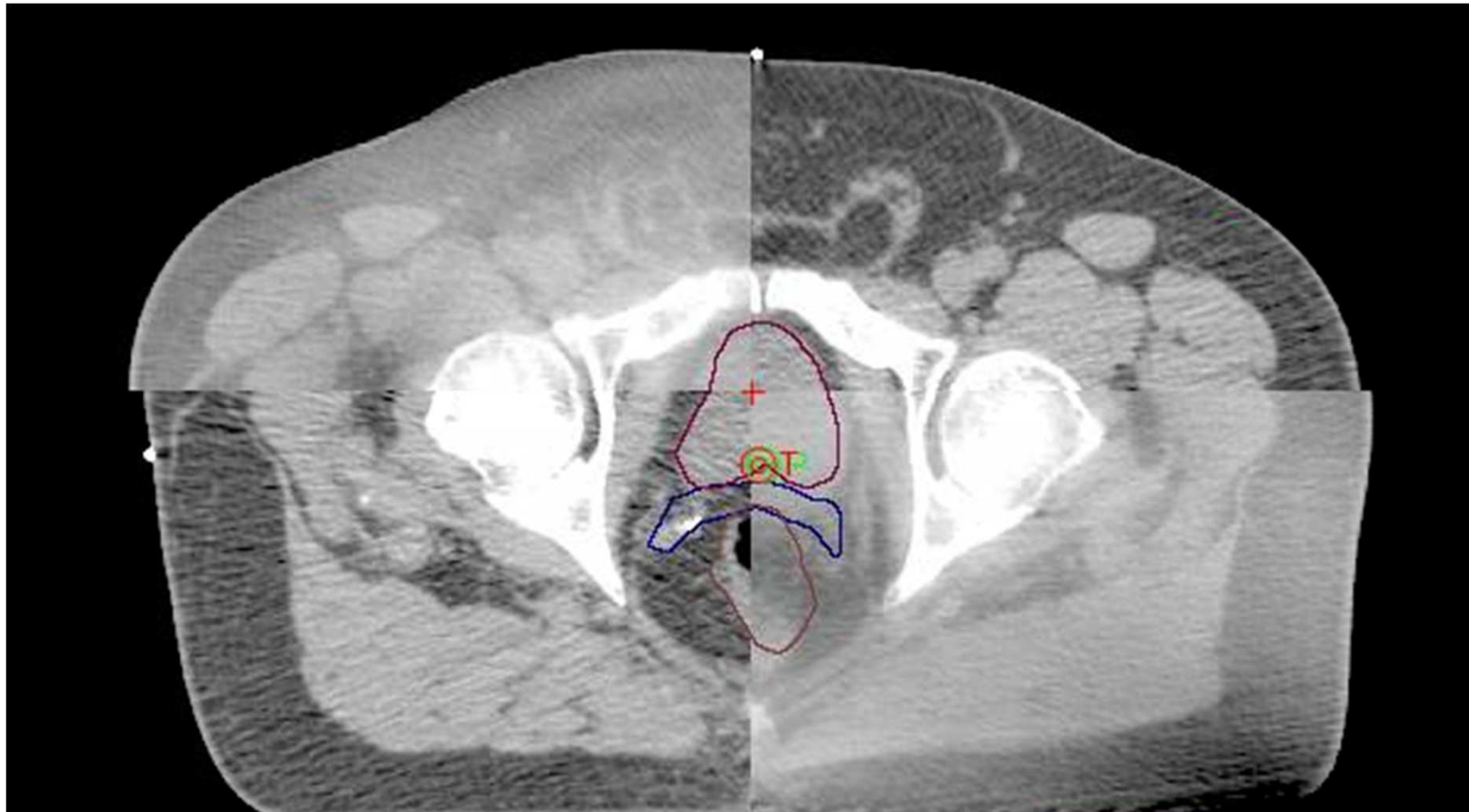


CB-CT "matching" op weke delen

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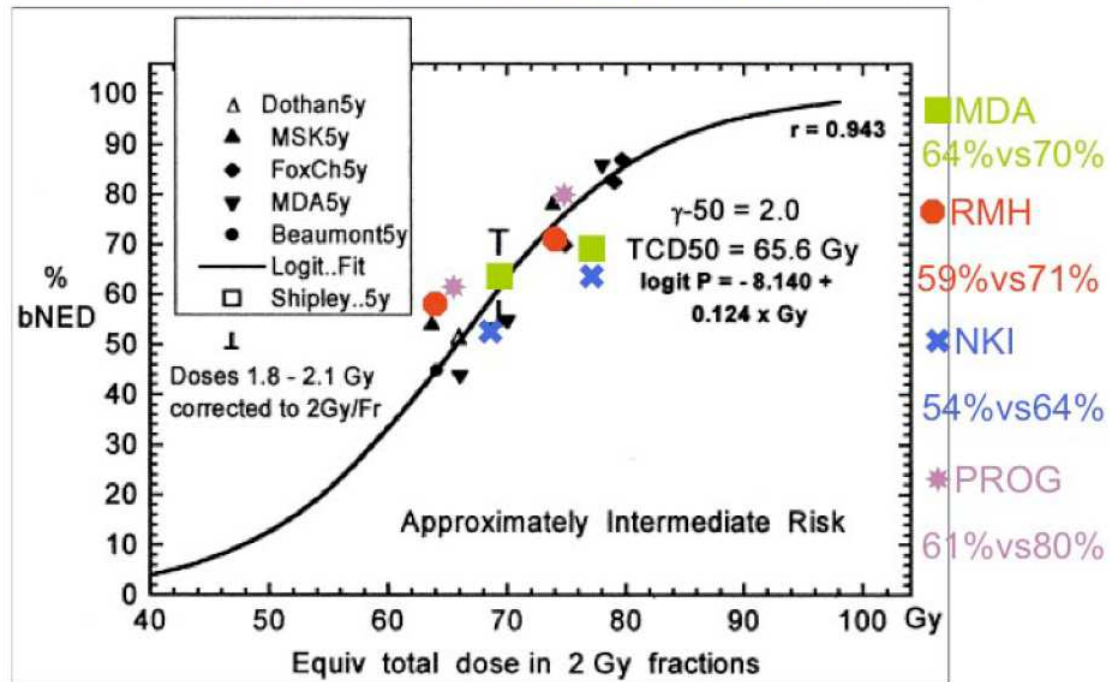
CB-CT "matching" op weke delen



Dosisescalatie

Dose response curve in Ca prostate

modified from Fowler et al IJROBP 2003 56 1093



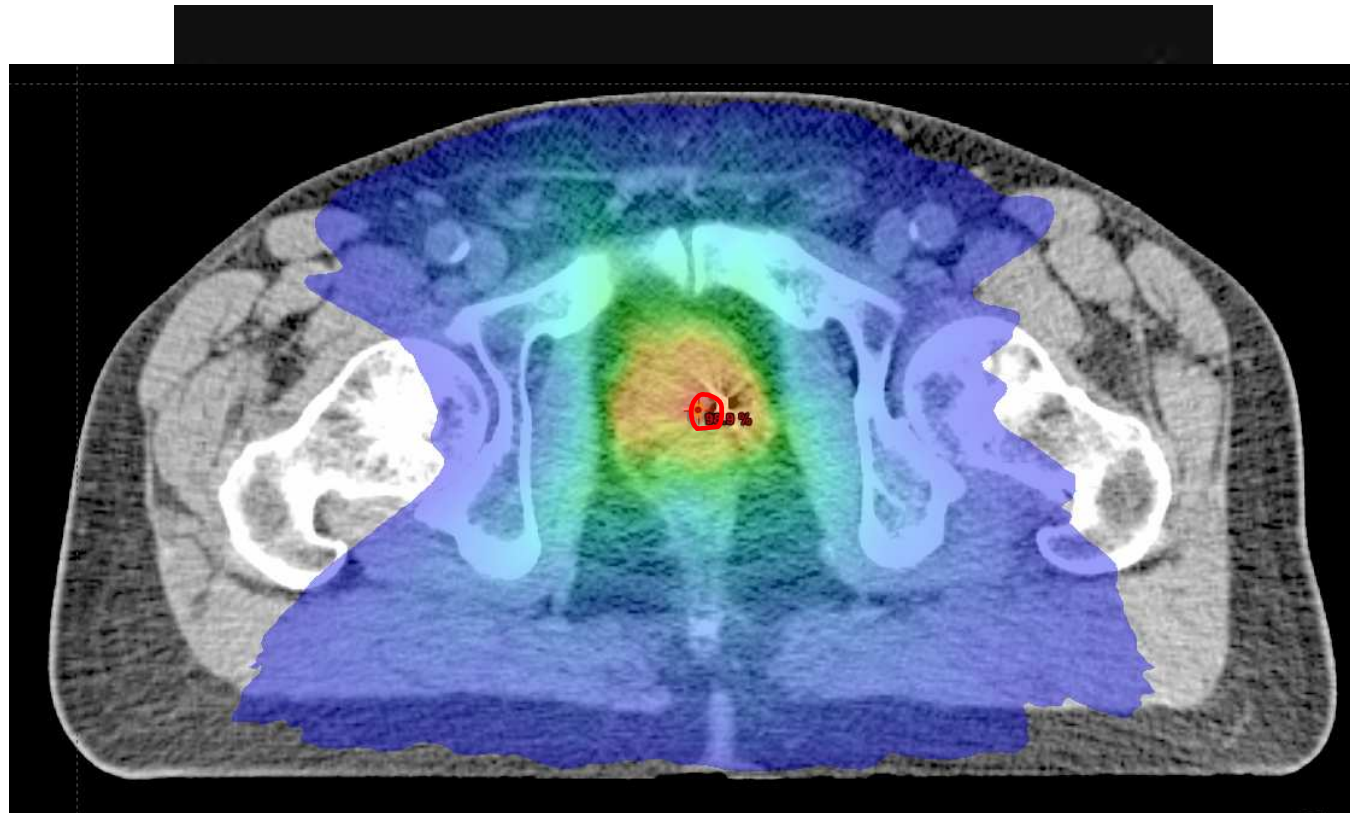
Iridium: 77.0 Gy in 35 fracties, equivalent > 80.0 Gy

RT dosis escalatie studies

Trial	N	Design	Results
Pollack 2002 Kuban 2008 M.D. Anderson	301	70 vs. 78 Gy	8-year bDFS significantly better in high-dose group (78% vs 59%)
Zietman 2005 MGH/Loma Linda	393	70.2 vs. 79.2 Gy	5-year bDFS significantly better in high-dose group (91.3% vs 78.8%)
Peeters 2006 Al-Mamgani 2008 Dutch trial	669	68 vs. 78 Gy	7-year bDFS significantly better in high-dose group (56% vs 45%)
Dearnaley 2007 MRC RT01	843	64 vs. 74 Gy	5-year bDFS significantly better in high-dose group (71% vs 60%)
Michalski 2015 RTOG 01-26	1499	70.2 vs. 79.2 Gy	10-year bDFS significantly better in high-dose group (74% vs. 57%)

IRIDIUM: 77.0 Gy in 35 fracties, equivalent > 80.0 Gy

Boost thv de tumor in de prostaat



Hypo-fractionatie

= hogere dosis per fractie

- Prostaatkanker: lage α/β
- kortere behandeling
- $20 \times 3 \text{ Gy} = 60 \text{ Gy}$

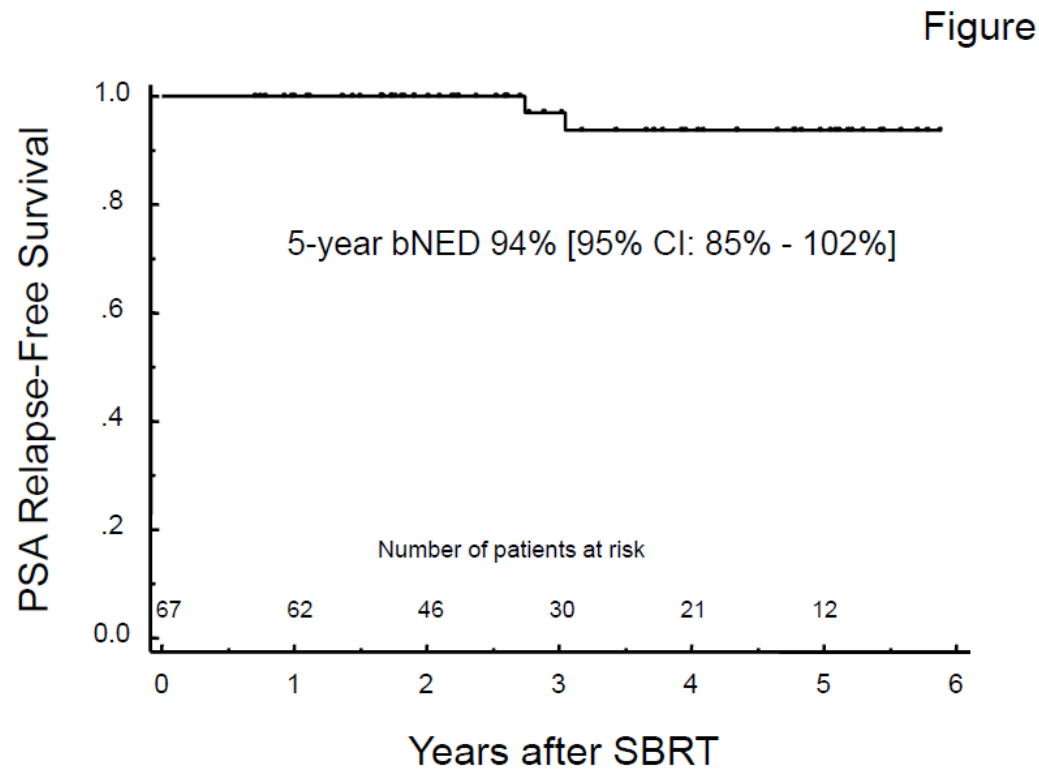
Hypofractionatie studies

	n	Population	RT dose	Outcome	Toxicity
CHHiP Dearnaley D. et al. ASCO GU 2016	3163	cT1b-3aN0	74/37 Gy vs. 60/20 Gy	88% vs. 90% 5-yr bDFS, p = NS	No significant differences in late toxicity
RTOG 04-15 Lee W.R. et al. JCO 2016	1115	LR only	73,8/41 Gy vs. 70,8/28 Gy	85% vs. 86% 5-yr bDFS, p = NS	Late grade 2-3 GU & GI toxicity significantly worse
HYPRO Incrocci L. et al. ASTRO 2015	820	IR-HR	78/39 Gy vs. 64,6/19 Gy	77% vs. 80% 5-yr bDFS, p = NS	Late grade ≥ 3 GU but not GI toxicity significantly worse
PROFIT Ontario Clinical Oncology Group	1204	IR only	78/39 Gy vs. 66/20 Gy	79% 5-year bDFS in both arms	lower incidence of late toxicity with hypofractionated radiotherapy.

Hypofractionatie waarschijnlijk niet inferieur aan conventionele fractionatie

SBRT: Stereotaxie

<6 fracties bv. 5x7Gy=35Gy (85 ED2)



Electieve pelviene radiotherapie

Study	Population	Field	No	bDFS	p
RTOG 94-13 Roach M. et al. JCO 2003	LNI \geq 15%	WPRT + NHT PORT + NHT WPRT + AHT PORT + AHT	320 316 319 320	38% at 6 yrs 34% 31% 37%	NS
GETUG-01 Pommier P. et al. JCO 2007	T1b-3N0	WPRT PORT	222 222	66% at 5 yrs 65%	NS
RTOG 09-24	IR-HR	PORT + ADT WPRT + ADT	1250 1250	Currently recruiting	

WPRT wanneer LNI risico > 15%

Electieve pelviene radiotherapie

Study

RTOG 94-13
Roach M. et al
JCO 2003

GETUG-01
Pommier P. et al
JCO 2007

RTOG 09-24

Memorial Sloan-Kettering Cancer Center

Prediction Tools > Prostate Cancer Nomograms > Pre-Treatment

mskcc.org
PREDICTION TOOLS

Change Prediction Tool

TEXT SIZE

Prostate Cancer Nomograms: Pre-Treatment

This nomogram can be used to predict probability of survival prior to a primary treatment (radical prostatectomy, brachytherapy, or external beam radiation therapy). To learn more, visit our [Frequently Asked Questions](#).

Enter Your Information Clear

To gather the information required below, download our PDF [worksheet](#).

Pre-Treatment PSA
PSA value from the laboratory report before receiving primary therapy. ng/ml (0.1 to 100)

Current Age
 years old (1 to 100)

Gleason Grade

Primary Gleason Grade
Primary Gleason grade from the biopsy pathology report.

Secondary Gleason Grade
Secondary Gleason grade from the biopsy pathology report.

Biopsy Gleason Grade Sum
Gleason grade sum will be automatically calculated.

Your Results

[Learn more](#) about your results below.

CURRENT MODEL	HISTORICAL MODEL
Extent of Disease Probability	
Indolent Cancer	N/A
Organ Confined Disease	50%
Extracapsular Extension	33%
Seminal Vesicle Invasion	12%
Lymph Node Involvement	4%
Primary Treatment Outcomes	
Progression Free Probability Radical Prostatectomy	5 Year 94%
	10 Year 91%
5 Year Progression Free	

p

NS

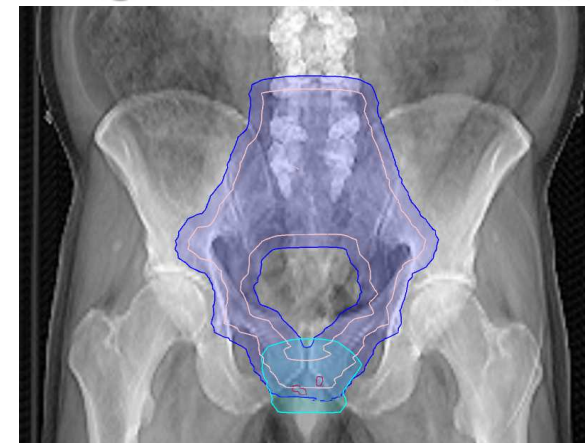
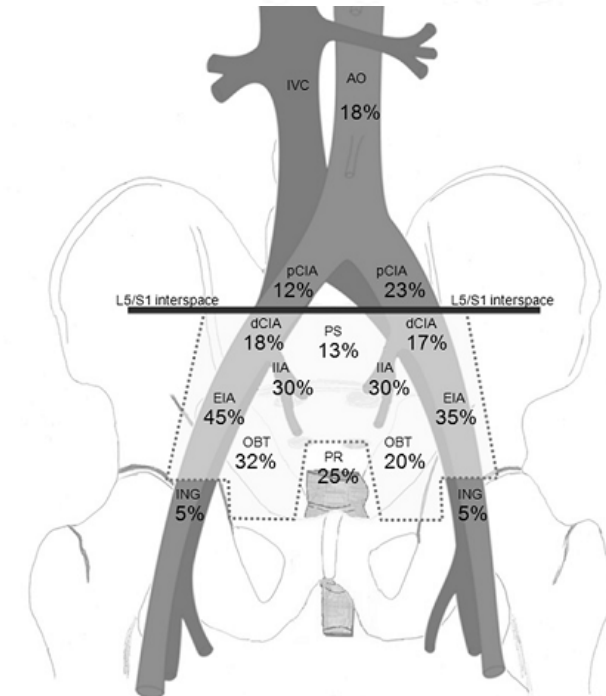
NS

stratifying

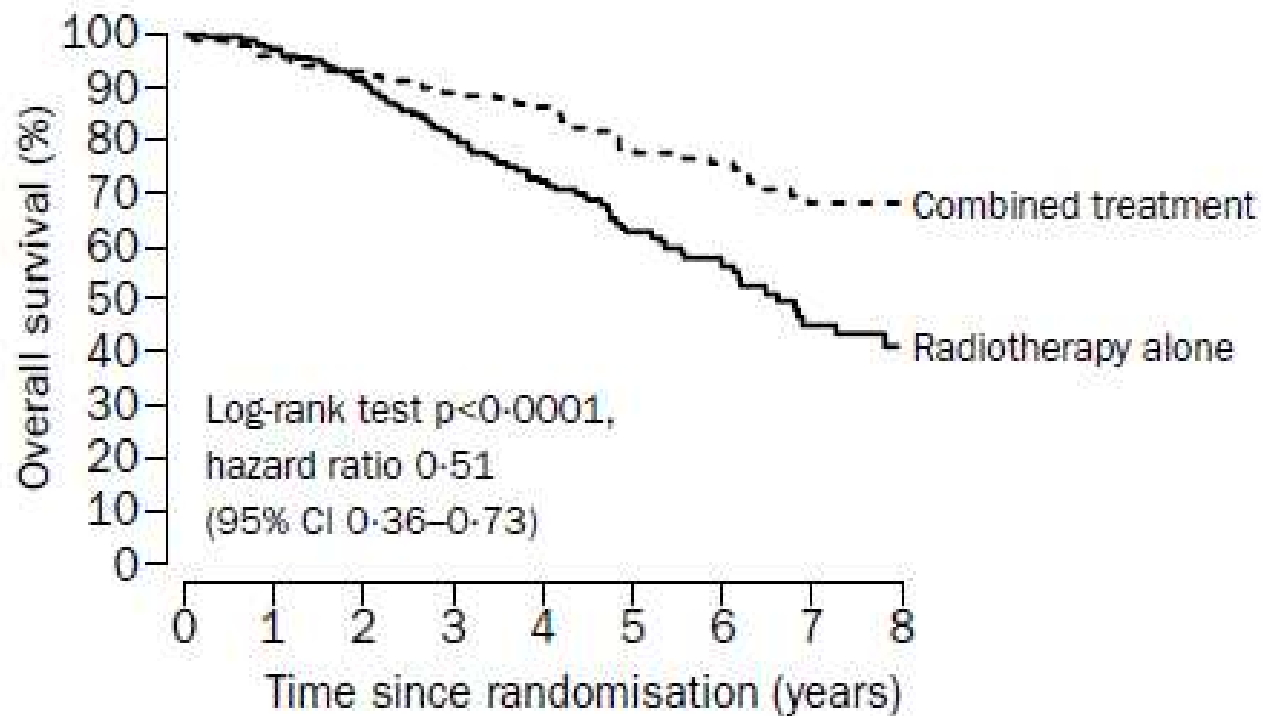
WPRT wanneer LNI risico > 15%

Pelvis radiotherapie

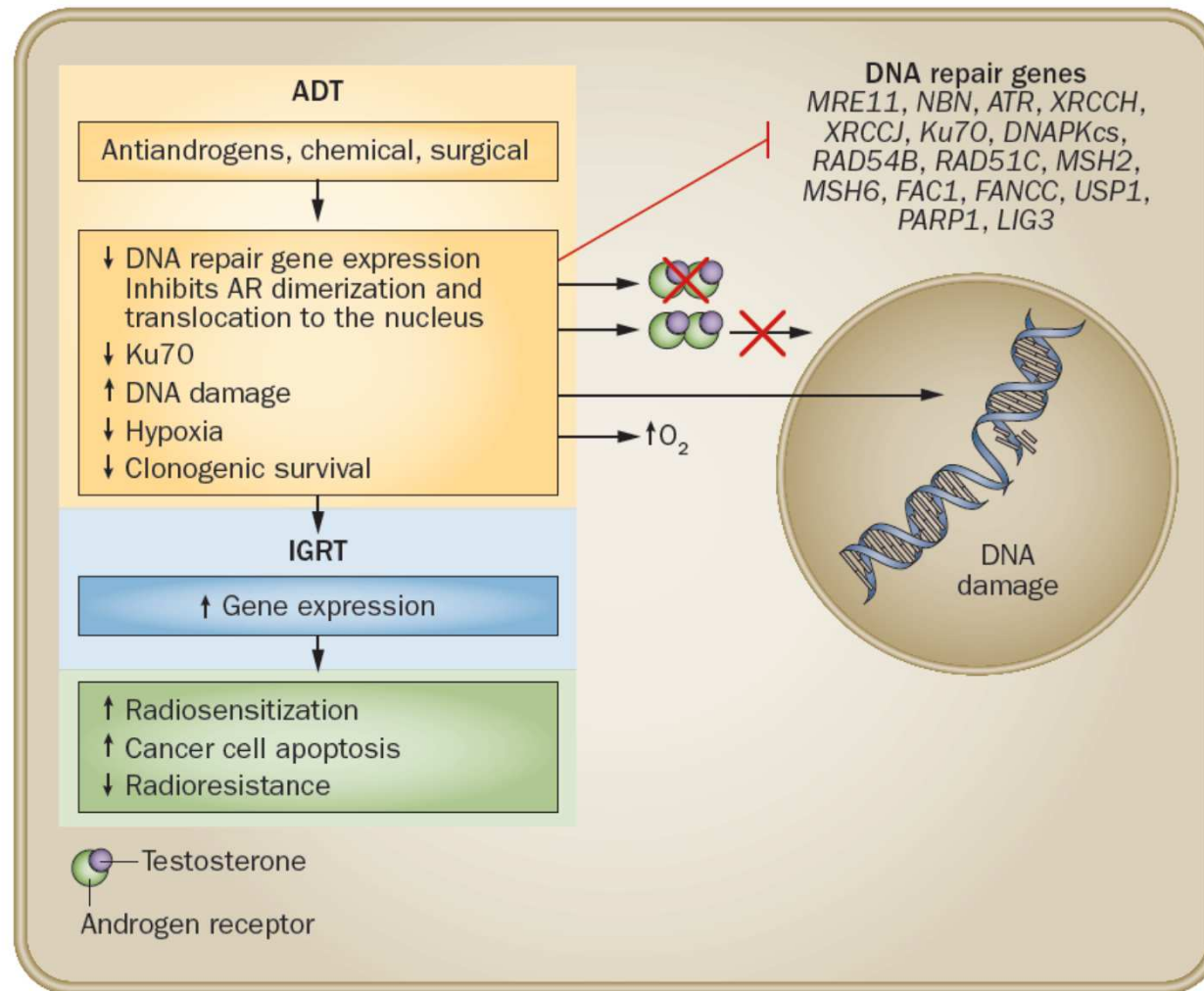
- RTOG consensus richtlijnen
 - Obturator regio
 - Iliaca interna
 - Iliaca externa
 - Presacraal (S1-3)
 - Iliaca communis (L4-5)
- Electieve dosis: 56 Gy in 35x
- verdachte adenopathie: 70 Gy
- Samen met hormonale therapie!



Hormonale therapie



Hormonale therapie: mechanismen



Risico groepen

Laag risico:

- prostaat **77Gy**; zbl 56 Gy
- **Geen hormonale therapie**

Intermediair risico:

- prostaat **77 Gy**, zbl 56Gy
- pelvis 56 Gy indien >15% of argumenten voor aantasting
- **6 maand hormonale therapie**

Hoog risico:

- prostaat **77 Gy**, zlb 56-77Gy
- Pelvis 56 Gy
- **2-3 jaar hormonale therapie**

Besluit:

- Evolutie technieken
- Evolutie beeldvorming (diagnostiek – IGRT)
- Hypofractionatie – SBRT?
- Nieuwe combinaties met RT?