

**Dose escalation in prostate
cancer with IMRT (76-80 Gy).
Acute and late toxicity.**

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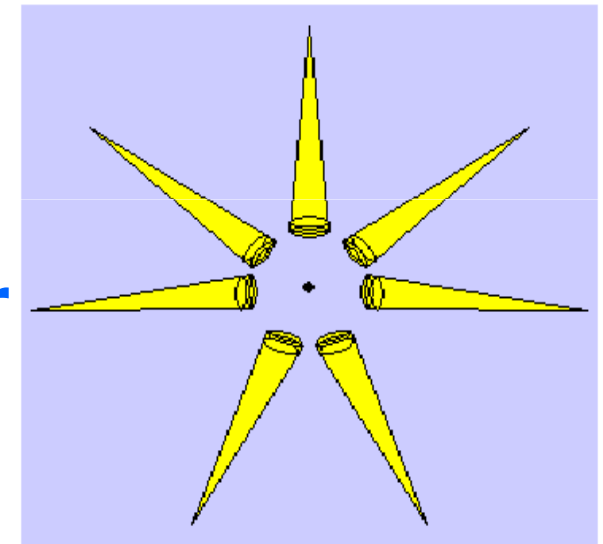
IMRT prostate

- **July 2001-March 2005**
- **175 patients**
 - **Low Risk: 69 (39,4%)**
 - **Intermediate Risk: 58 (33,1%)**
 - **High Risk: 48 (27,4%)**
- **78,9% HT with CAB**
- **Dose**
 - **76 Gy: 90 (51,4%) (July-01 - August-03)**
 - **80 Gy: 85 (48,6%) (August-03 - March-05)**

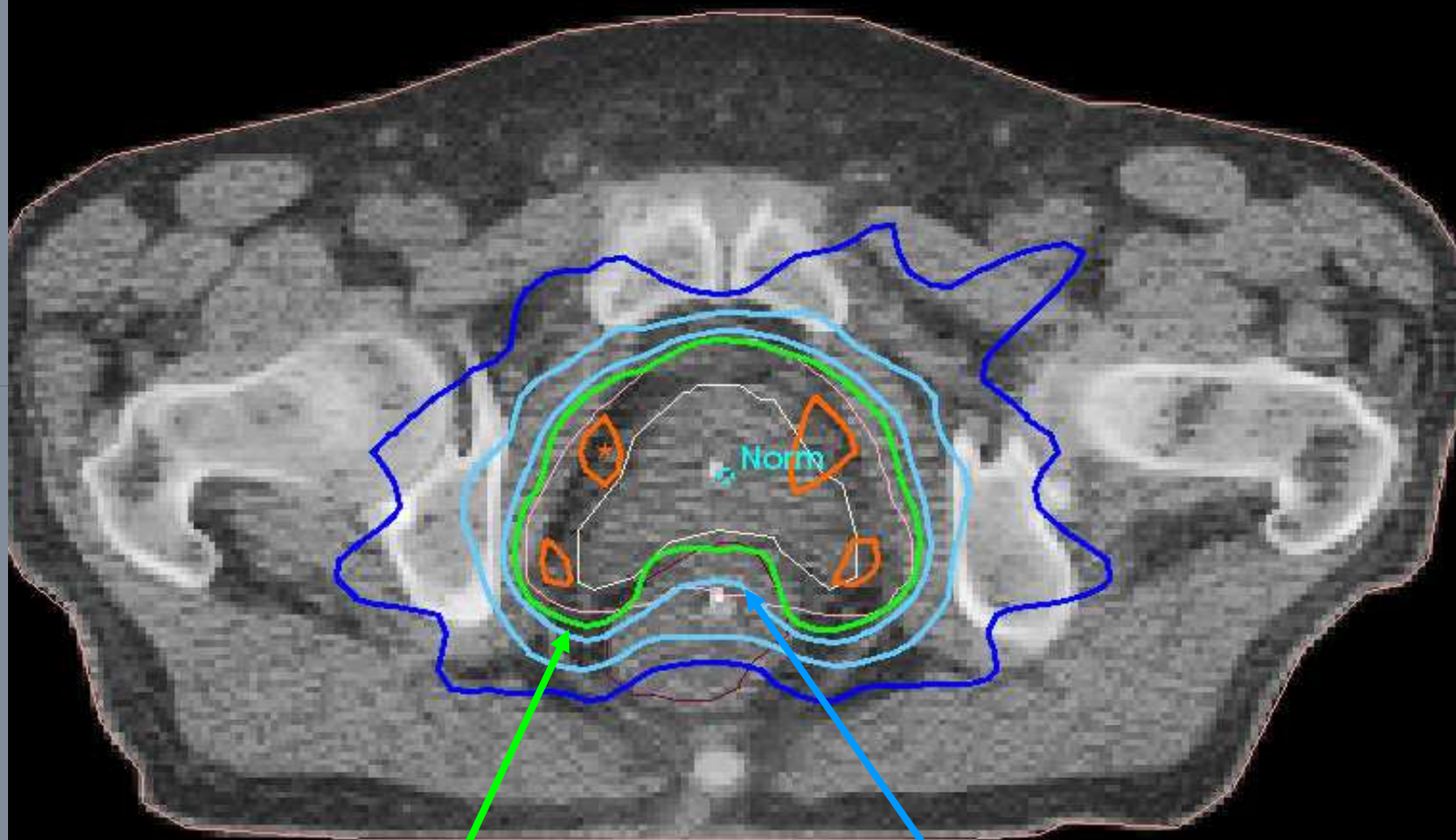
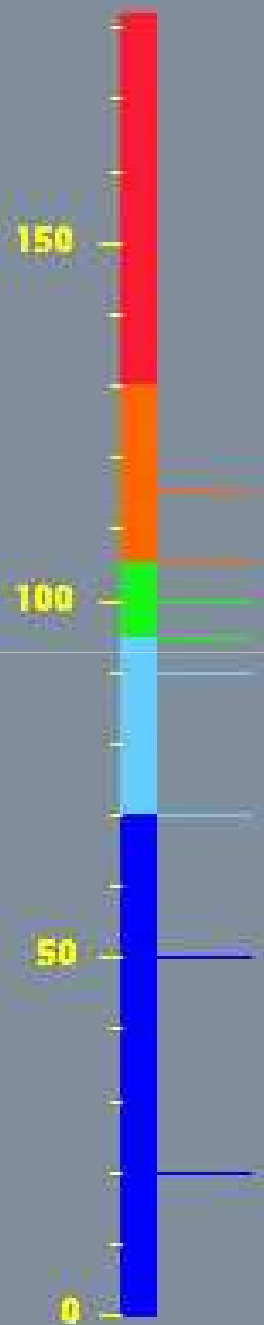
IMRT prostate

IMRT with forward planning

- **7 co-plane incidences**
- **(0°, 52°, 95°, 155°, 205°, 265°, 308°)**
- **18-20 segments**
 - 2-3 segments per incidences
 - 1: PTV of prostate +/- S.V.
 - 1-2: PTV without rectum
- **Dose prescription at the isocenter**
 - **Prostate: 76 - 80 Gy**
 - **S.V.: 50 - 58 Gy**
- **Constraints**
 - **PTV covered by isodose of 95% except in the overlap with rectum.**
 - **The overlap of PTV-rectum is covered with the isodose of 88%.**



IMRT isodose



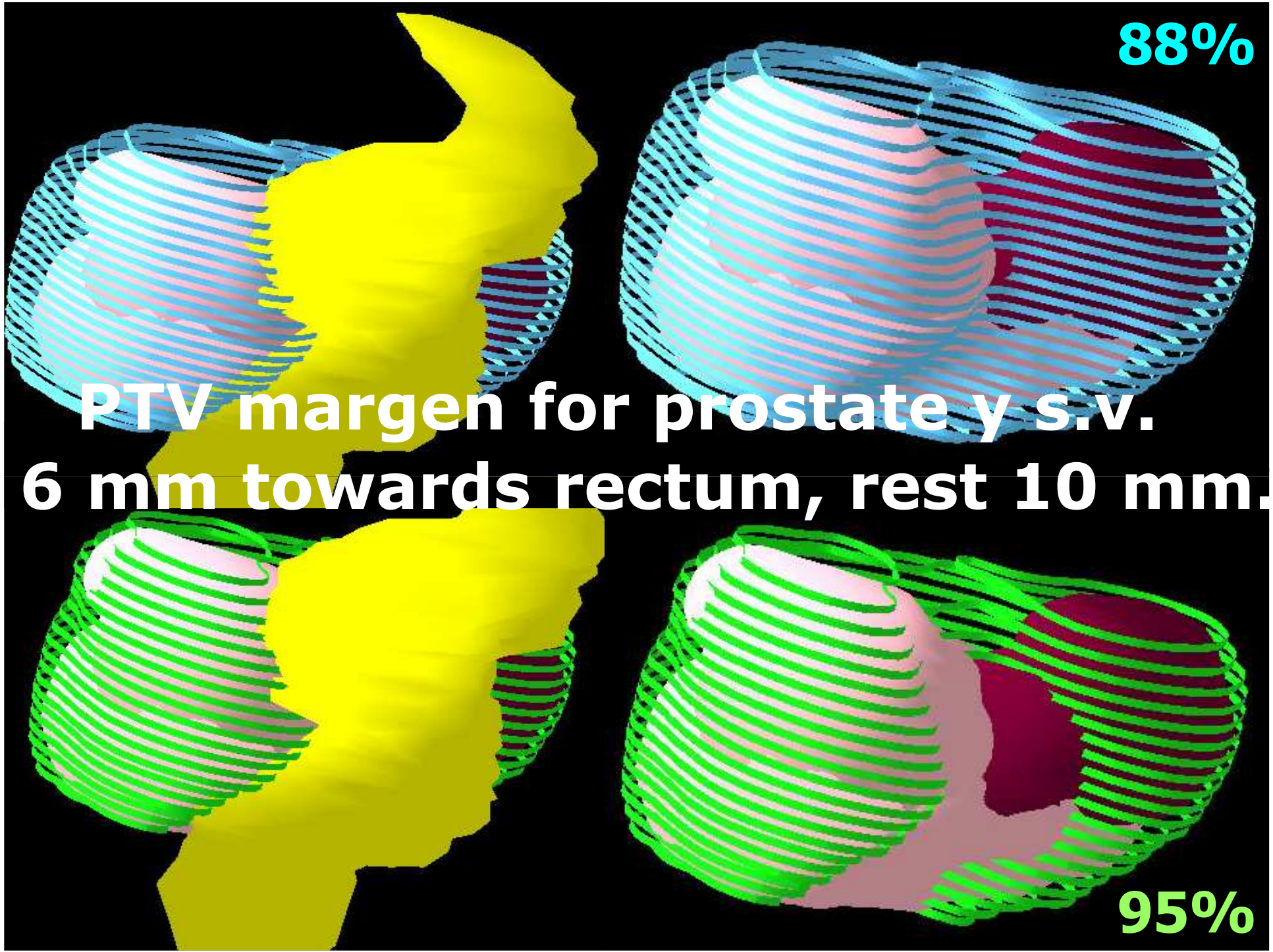
95%

88%

88%

**PTV margin for prostate y s.v.
6 mm towards rectum, rest 10 mm.**

95%



Genito-Urinary Acute Toxicity (EORTC/RTOG)

Grade Dose	G0	G1	G2	G3	G4
	30 17,1%	75 42,9%	44 25,1%	25 14,3%	1 0,6%
			40%		
76 Gy	16 17,8%	34 37,8%	25 27,8%	15 16,7%	0
			44,5% vs 35,4%		
80 Gy	14 16,5%	41 48,2%	19 22,4%	10 11,8%	1 1,2%

Gastro-intestinal acute toxicity (EORTC/RTOG)

Grade Dose	G0	G1	G2	G3	G4
	107 61,1%	36 20,6%	32 18,3%	0	0
76 Gy	50 55,6%	21 23,3%	19 21,1%	0	0
80 Gy	57 67,1%	15 17,6%	13 15,3%	0	0

Genito-Urinary Late toxicity (EORTC/RTOG) inpatients with IMRT

Minimum follow-up: 30 vs 12 months

Grade Dose	G0	G1	G2	G3	G4
76 Gy	7 7,8%	42 46,7%	36 40,0%	5 5,6%	0
80 Gy	31 36,5%	29 34,1%	24 28,2%	1 1,2%	0

45,6% vs 29,4%

GU G₂₋₃: 8 vs 1 patients with hematuria.

Gastro-intestinal Late toxicity (EORTC/RTOG) patients with IMRT

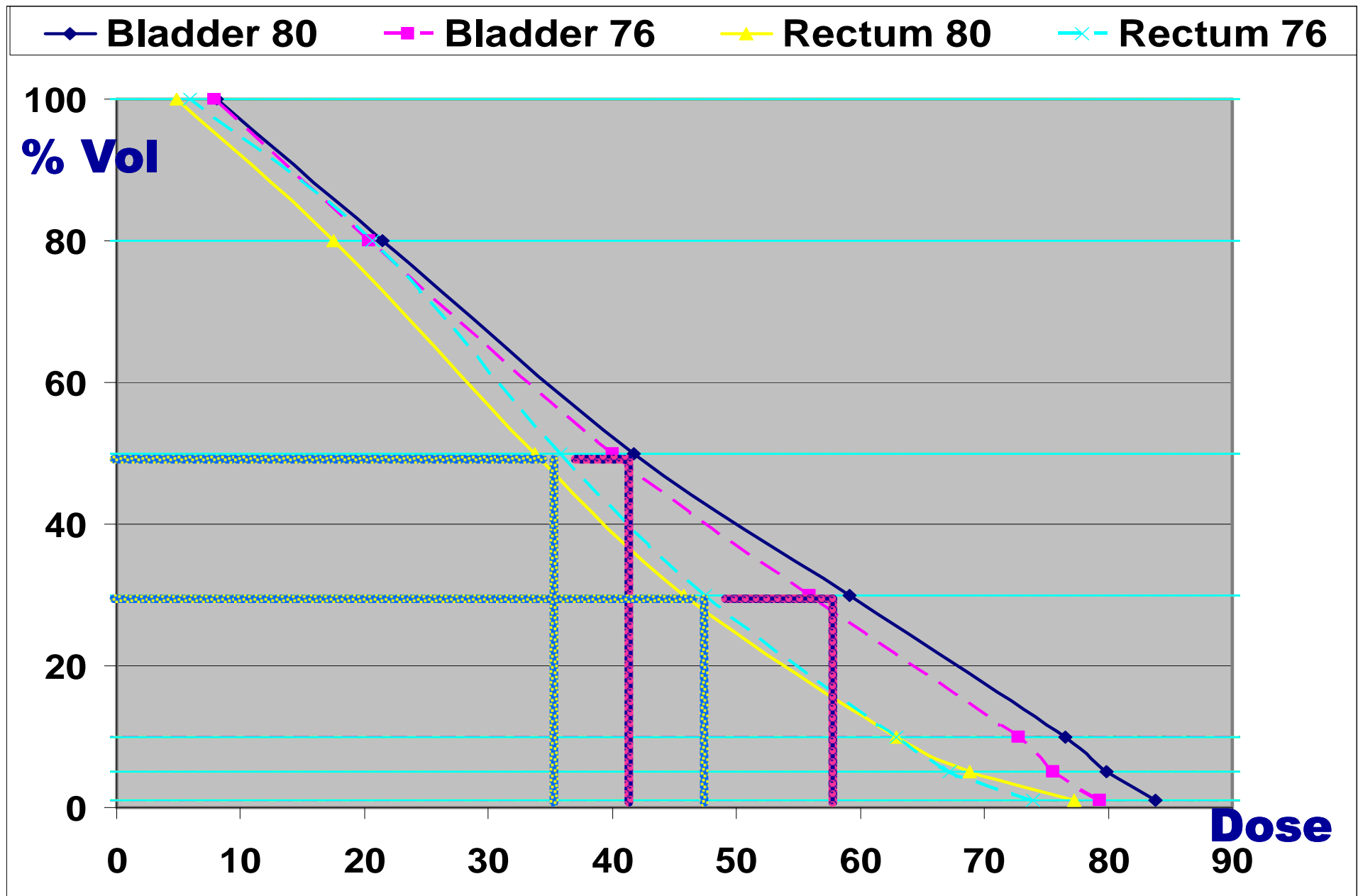
Minimum follow-up: 30 vs 12 months

Grade Dose	G0	G1	G2	G3	G4
76 Gy	75 83,4%	11 12,2%	2 2,2%	2 2,2%	0
80 Gy	71 83,5%	11 12,9%	2 2,4%	1 1,2%	0

4,4% vs 3,6%

GI G₂₋₃: rectal bleeding treated with laser.

Mean DVH 76 vs 80 Gy



Predictive factors analysis

- **Age**

- **Co-morbidity factor**

- **Diabetes, Hypertension, Previous abdominal surgery, Hemorrhoids, Medication that interferes with coagulation.**

- **Pre-radiotherapy Habits**

- **Urinary frequency, Nocturia, Bowel movement frequency.**

- **Treatment**

- **Hormonotherapy, DVH rectum, DVH bladder, Total dose.**

Complications

- **EORTC/RTOG Genito-urinary toxicity**
 - **Acute**
 - **Late**
- **Hematuria**
- **EORTC/RTOG Gastro-intestinal toxicity**
 - **Acute**
 - **Late**
- **Rectal bleeding**

Factors with significant correlation with toxicity

- **GU Acute Toxicity**
 - Nocturia before RT ($p=0,006$)
- **GU Late Toxicity**
 - Nocturia before RT ($p<0,001$)
- **Hematuria**
 - D_{30} ($p=0,03$) (<52 Gy)
 - D_{50} ($p=0,02$) (<33 Gy)
- **GI Acute Toxicity**
 - HT ($p=0,014$)
 - Age ($p=0,057$)

Quality of life after one month and after one year of RT

At Month

- **Nocturia**
 - 0-1: 24,2%
 - 2-3: 44,7%
- **Incontinence**
 - No: 88,5%
 - Occasional: 8,9%
- **Frequency bowel movements**
 - 1-2: 94,7%

69%

At Year

- **Nocturia**
 - 0-1: 32,2%
 - 2-3: 42,4%
- **Incontinence**
 - No: 88,1%
 - Occasional: 10,2%
- **Frequency bowel movements**
 - 1-2: 93,7%

74,6%

H. General of Valencia

- **3D RT 1999**

Follow-up > 30 months

- *Dose 70-76 Gy: 33 patients*

- **Acute Toxicity**

- GI: G2:17(51,5%)
- GU: G2:6(18,2%); G3:8(24,2%)

- **Late Toxicity**

- GI: G2:3(9,1%); G3:4(12,1%)
- GU: G2:8(24,2%); G3:1(3%); G4:1(3%)

- **IMRT 2001**

- *Dose 76 Gy (July 2001): 90 patients*

P=0,009

- **Acute Toxicity**

- GI: G2:19(21,1%)
- GU: G2:25(27,8%); G3:15(16,7%)

- **Late Toxicity**

- GI: G2: 2(2,2%); G3:2(2,2%)
- GU: G2:36(40,0%); G3:5(5,6%)

P<0,001

- *Dose 80 Gy (August 2003): 85 patients*

- **Acute Toxicity**

- GI: G2:13(15,3%)
- GU: G2:19(22,4%); G3:10(11,8%); G4:1(1,2%)

Conclusions I

- **The “class solution” presented to treat prostate tumors with RT at 76 Gy - 80 Gy is adequate because:**
 - **Low incidence of acute and late toxicity.**
 - **Simple constraints used to simplify the process of evaluation of the plan:**
 - **Isodose curve**
 - **Restriction of the dose to overlap rectum-PTV prostate**

Conclusions II

- **In the analysis of acute and late complications we found a relationship between:**
 - **Hematuria with D_{30} and D_{50} in the bladder**
 - **Nocturia before RT with acute and late GU toxicity**
 - **HT and age with acute GI toxicity**

Conclusions III

- **With a minimum follow-up of one year, dose escalations from 76 Gy to 80 Gy didn't increase the acute and late toxicity.**
- **In our institution, we observed a significant decrease of the acute and late GI toxicity when we compared patients treated with IMRT vs 3DCRT with the same dose.**