



Universitätsklinik für Strahlentherapie
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The predictive value of dose volume parameters on local tumor control in MRI assisted brachytherapy of cervix cancer

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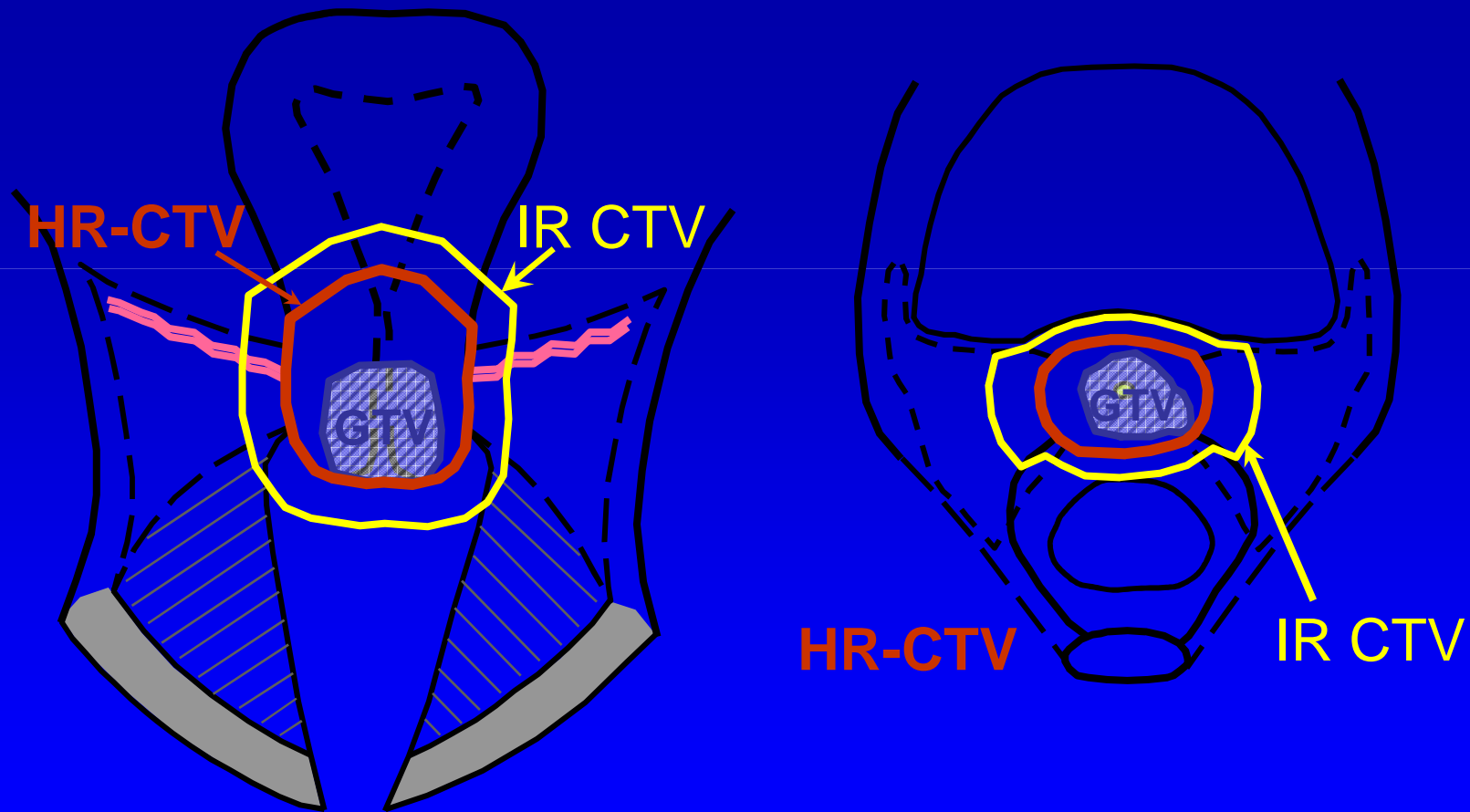
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Background & Aim

- Large mono-institutional experience with MRI assisted cervix cancer brachytherapy (n=145 patients)
- Local control rates of ~90% (tumors >5cm)
- 18/145 local recurrences
- Recurrence analysis focussing on DVH-Parameters
- Determination of (predictive) Value for Local Tumor Control

Material & Methods (I)

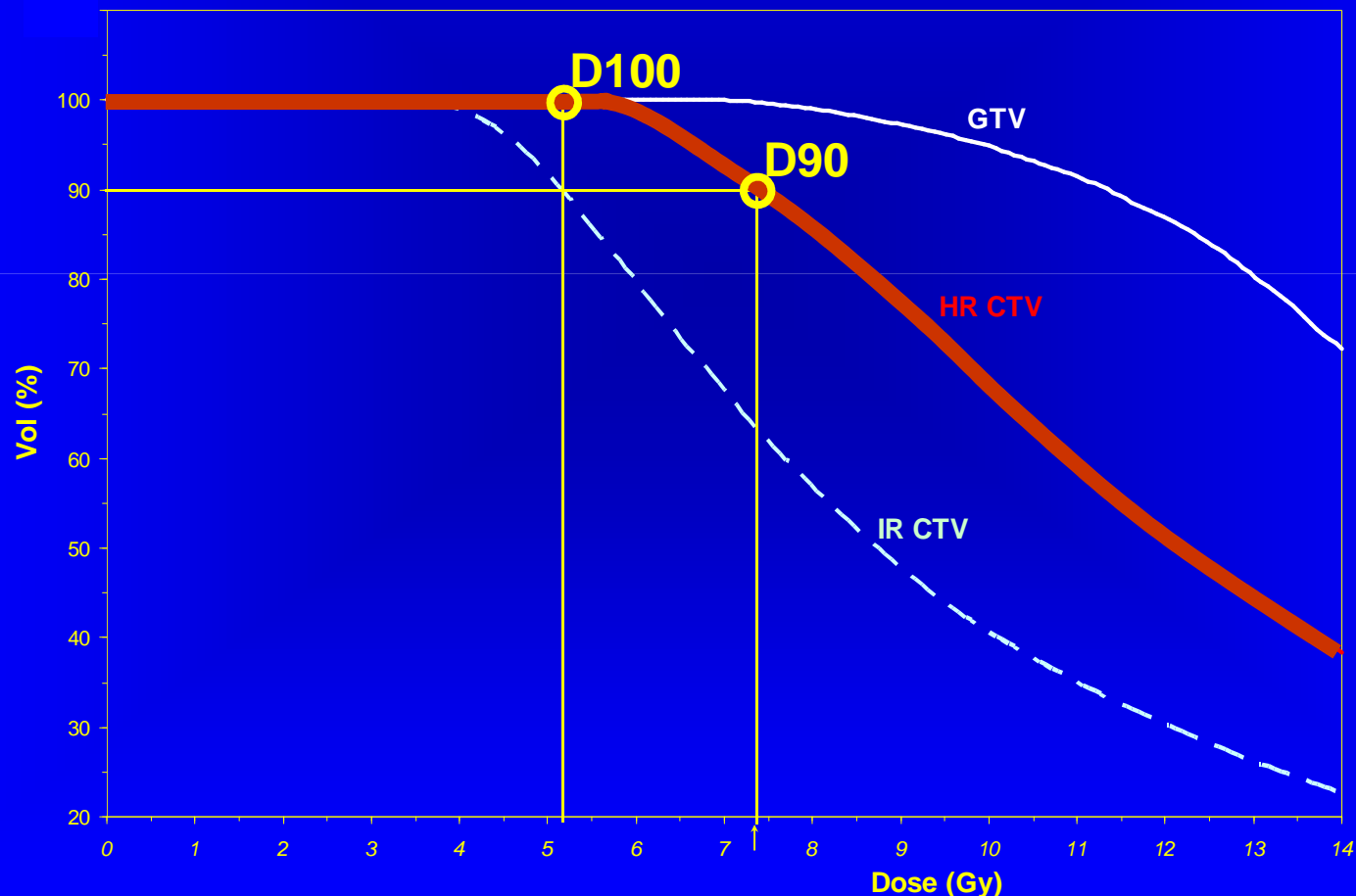
Target re-contouring of MRI data sets of 141 patients
523 treatment plans / 608 fractions



GEC-ESTRO Recommendations I+II, R&O 2005+2006

Material & Methods (II)

Estimation of target related DVH-Parameters in 141 pts
523 treatment plans / 608 fractions



GEC-ESTRO Recommendations I+II, R&O 2005+2006

Material & Methods (III)

Analysis (141 pts)

Comparison: local recurrences/ without local recurrence

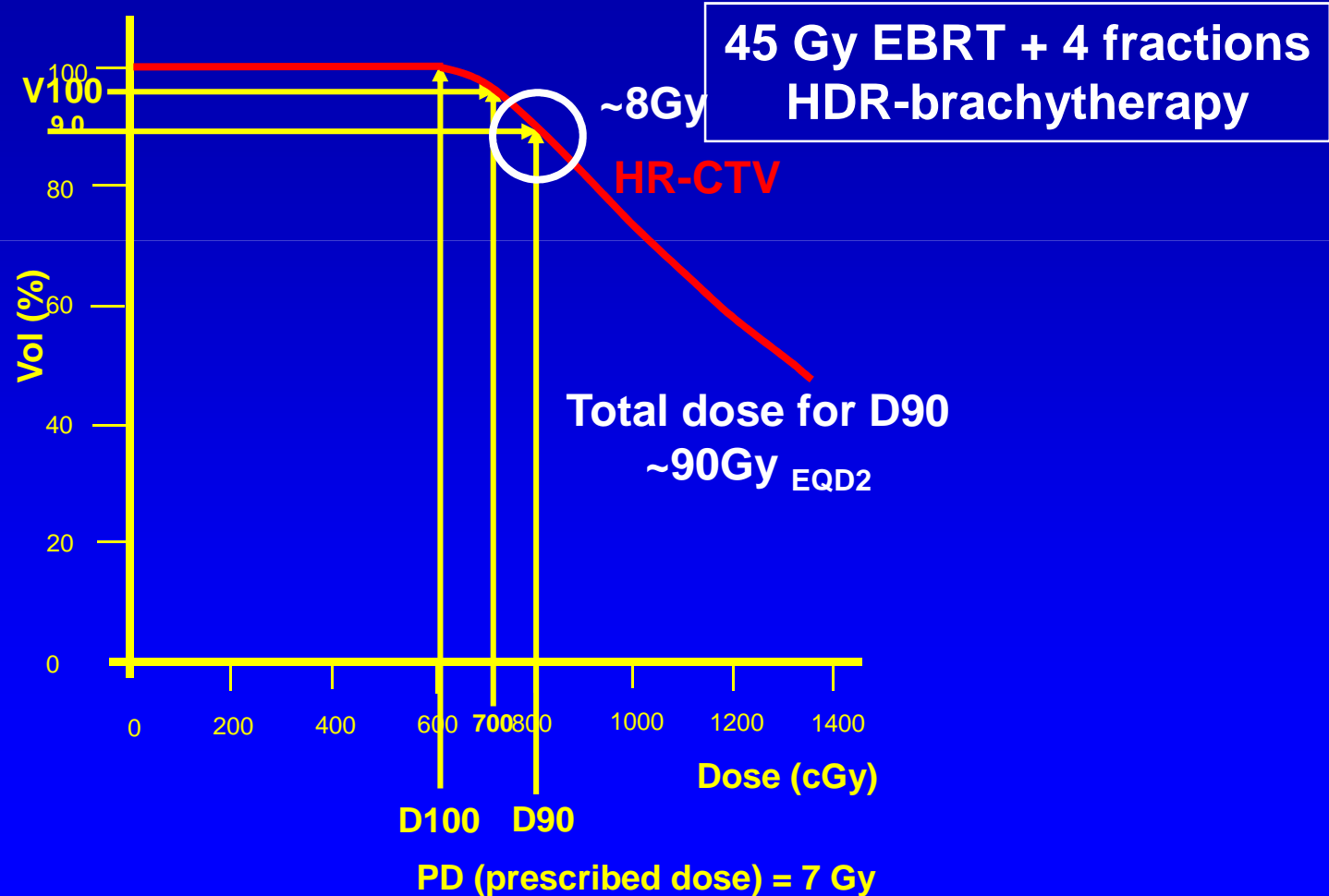
- Evaluation based on clinical data
 - 18/141 local recurrences, 123/141 locally controlled
- Estimate mean values of target related DVH-Parameters (D90, D100, V100)
 - patients with local recurrence
 - patients without local recurrence
- Definition of cut-off level for D90 and NPV for local control
- Analysis of recurrence topography
 - relation to HR-CTV
 - relation to High dose volume (within the prescribed isodose)

Material & Methods (III)

Estimate of target related DVH Parameters

(D90, D100, V100)

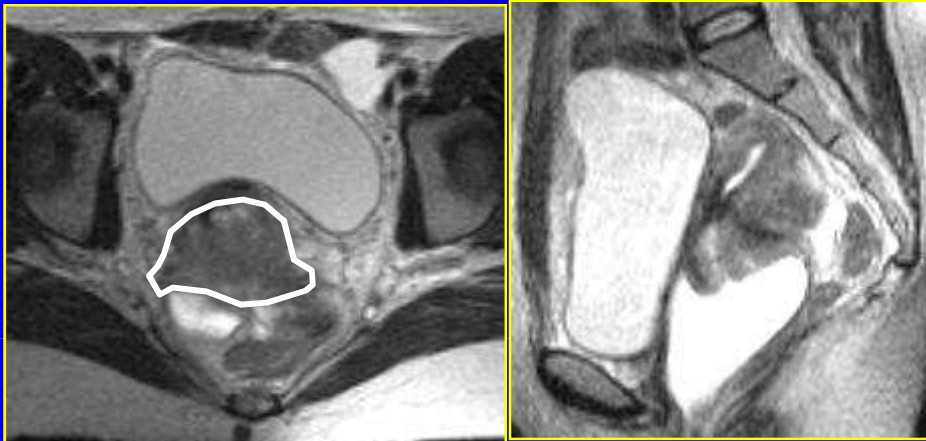
Combined intracavitary / interstitial brachytherapy



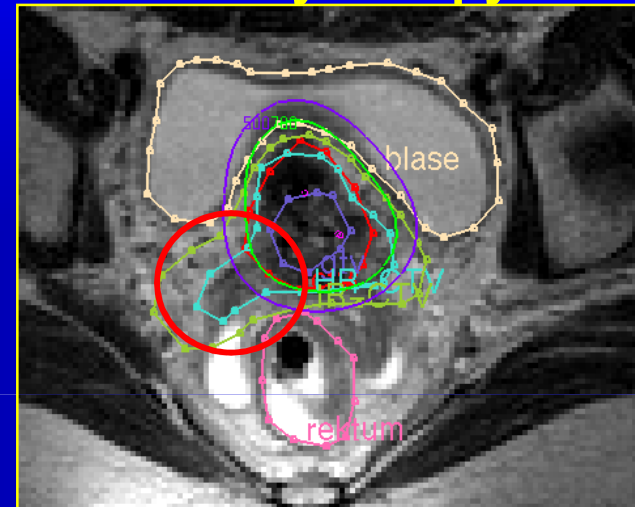
Material & Methods (III)

Analysis of recurrence topography (High dose area, HR-CTV)

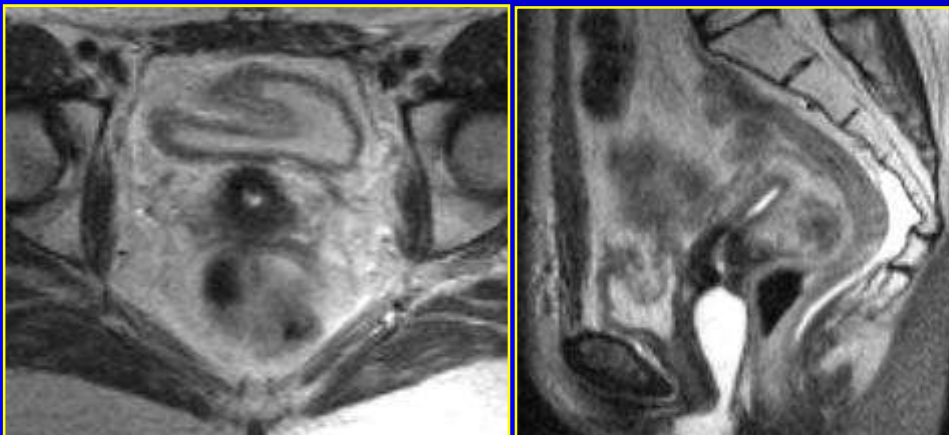
Diagnosis



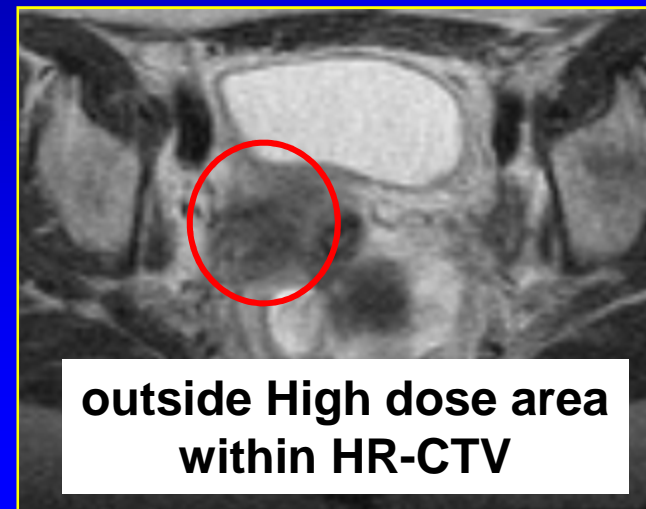
Brachytherapy



6 months after treatment



9 months after treatment



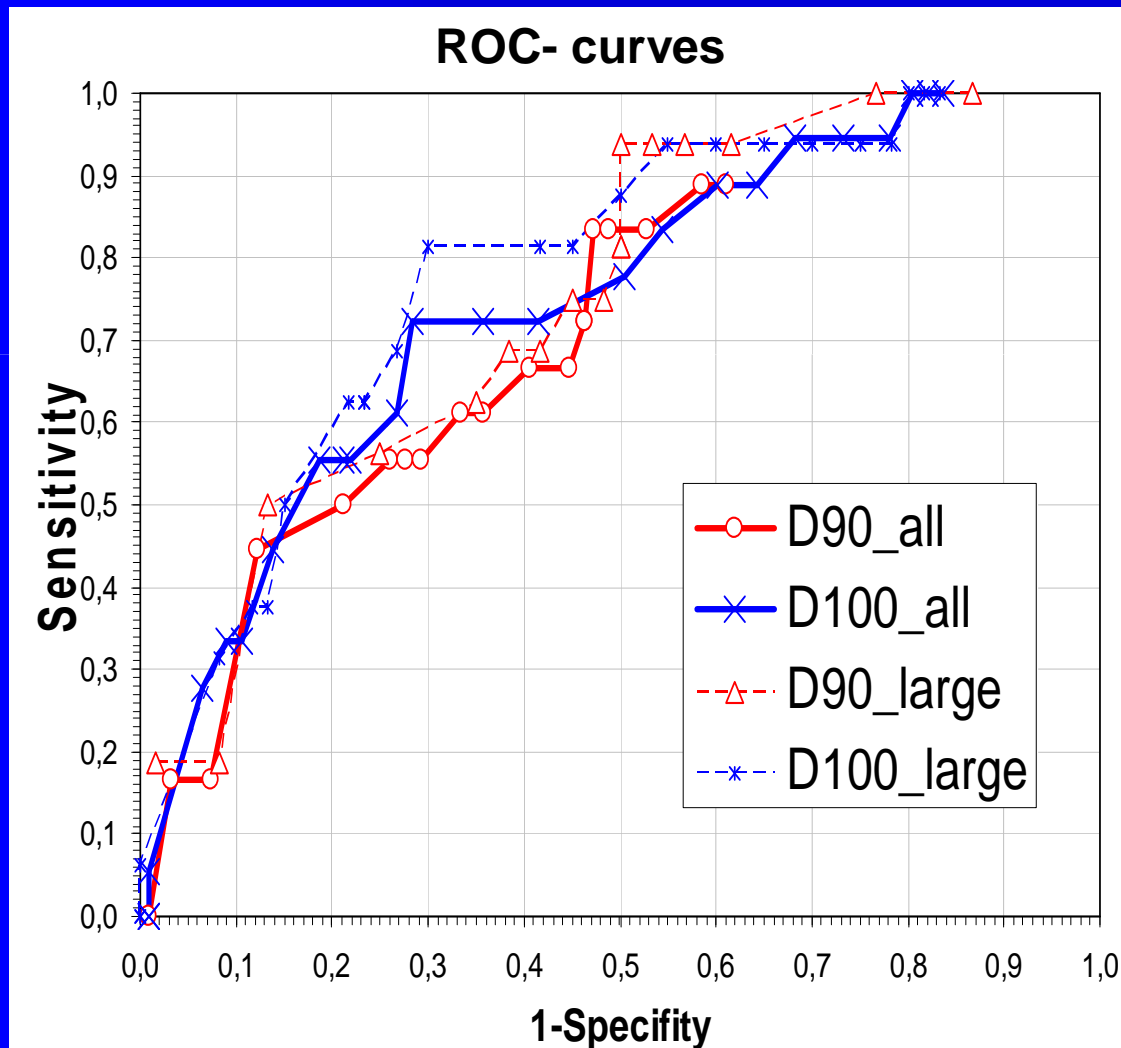
Results (I)

Mean values of DVH-Parameters

	$V_{HR\ CTV}$	$D90_{HR\ CTV}$	$D100_{HR\ CTV}$	$V100_{HR\ CTV}$
Overall	36 (± 23)	86 (± 16)	65 ± 10	87 (± 11)
Recurrence free	33 (± 23)	88 (± 16)	66(± 10)	89 (± 1)
Recurrences	50 (± 24)	76 (± 12)	60(± 7)	78 (± 16)

Results (II)

determination of cut off levels
ROC-Curves for D90 of HR-CTV



		Disease		
		+	-	
Test	+	TP	FP	Pos.predict.value = $\frac{TP}{TP + FP}$
	-	FN	TN	Neg.predict.value = $\frac{TN}{TN + FN}$
		sensitivity = $\frac{TP}{TP + FN}$	specificity = $\frac{TN}{TN + FP}$	

Cut off level:

D90 = 87Gy_{EQD2}

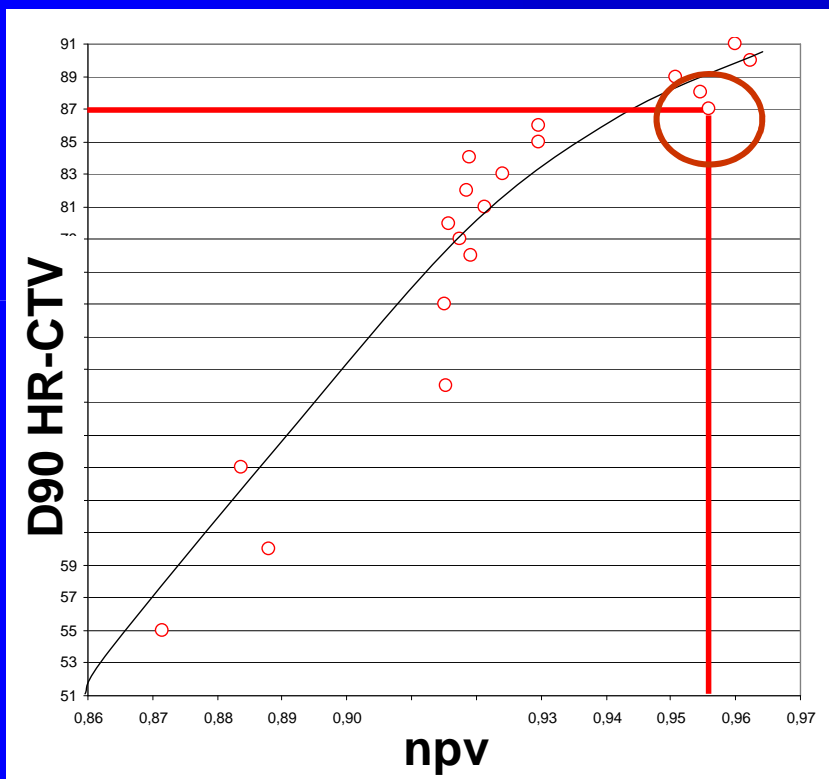
D100 = 63Gy_{EQD2}

Based on 4 different Tests

**ROC-test
sens. + spec.
yield in, yield out**

Results (III)

Negative predictive value and D90



npv	sens	spec	D90
0,96	0,83	0,53	87

Cut off level for D90HR-CTV of 87 Gy_{EQD2}
Incidence of true pelvic recurrences:
5% (3/65) vs. 20% (15/76) - p=0.006.

Results (IV)

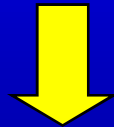
Analysis of recurrence topography

	inside HR-CTV	outside HR-CTV
inside high dose region	0 <i>impossible to avoid</i>	0
outside high dose region	7 <i>possible to avoid</i>	5 <i>???</i>

Conclusion

Evaluation of target related DVH parameters

(n=141 patients, treatment plans=523, fractions=608)

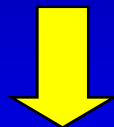


D90_{HR-CTV} predictive for local tumor control

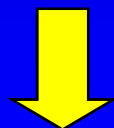
CUT-OFF LEVEL D90_{HR-CTV} = 87 Gy_{EQD2}

(negative predictive value for local control =

Probability for local control = 96%)



introduction of this cut-off level as a constraint in phase II+III studies



proposal: systematic treatment strategy

Proposal for a systematic treatment strategy

sufficient response

insufficient response or unfavourable topography

Intracavitary

Intracavitary

interstitial

Individualised Treatment planning

Individualised Application

Individualised Treatment planning

$D_{90HR-CTV} > 87 \text{ Gy}$