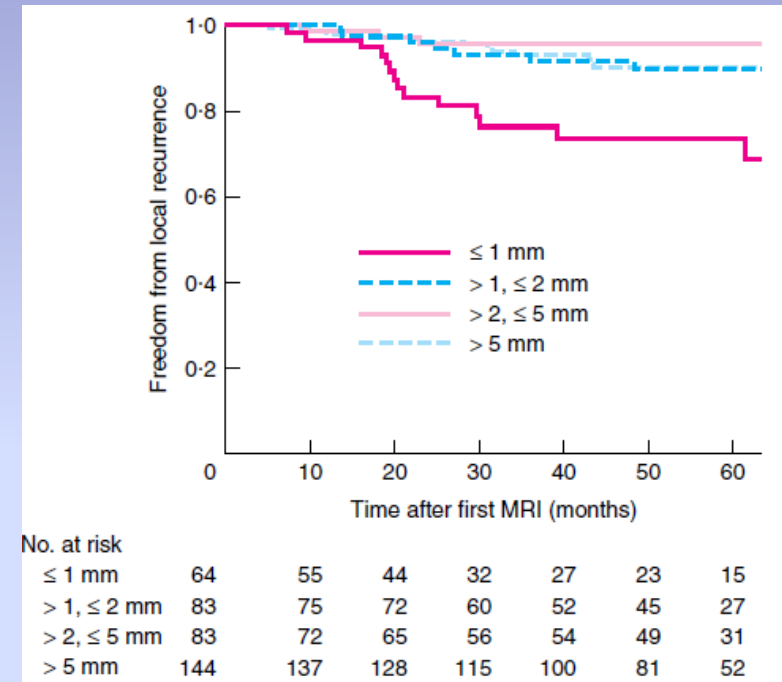
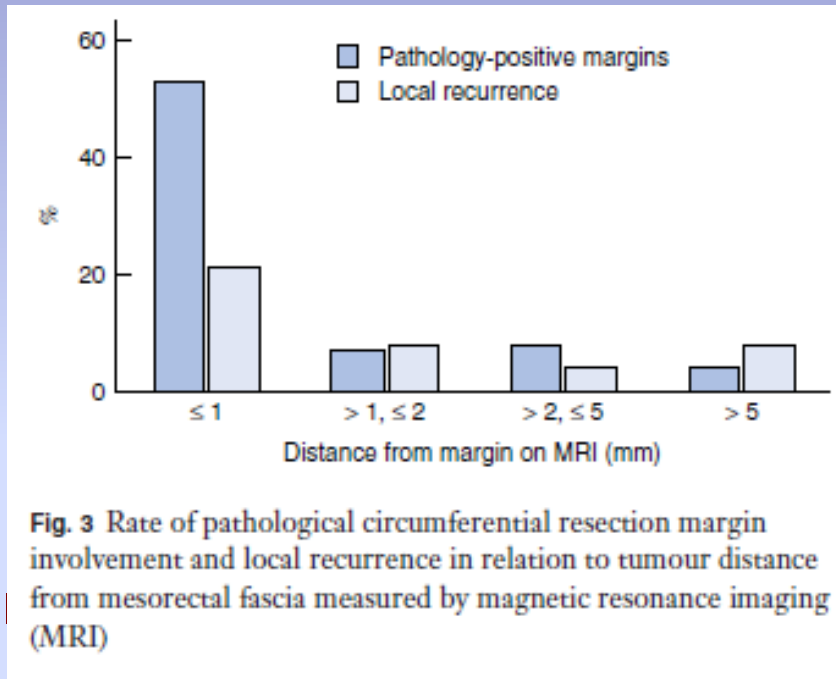


<b>MRI feature</b>	<b>Good prognosis</b>	<b>Poor prognosis</b>
<b>CRM</b>	<b>&gt; 1 mm clear</b>	<b>&lt; 1 mm involved</b>
<b>Low rectal &lt; 5 cm</b>	<b>Intersphincteric plane clear of tumor</b>	<b>Intersphincteric plane involved by tumor</b>
<b>T stage</b>	<b>T1-T2;T3a &lt; 1mm,T3b 1- 5mm extramural spread</b>	<b>T3c &gt; 5mm extramural spread, T4</b>
<b>Extramural venous invasion</b>	<b>Negative</b>	<b>positive</b>

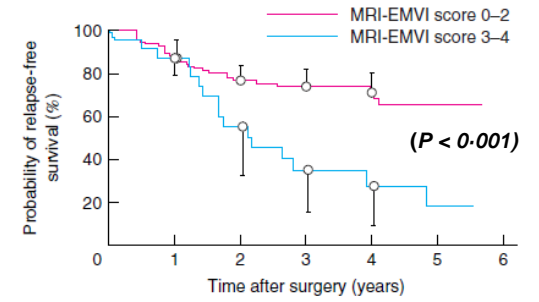
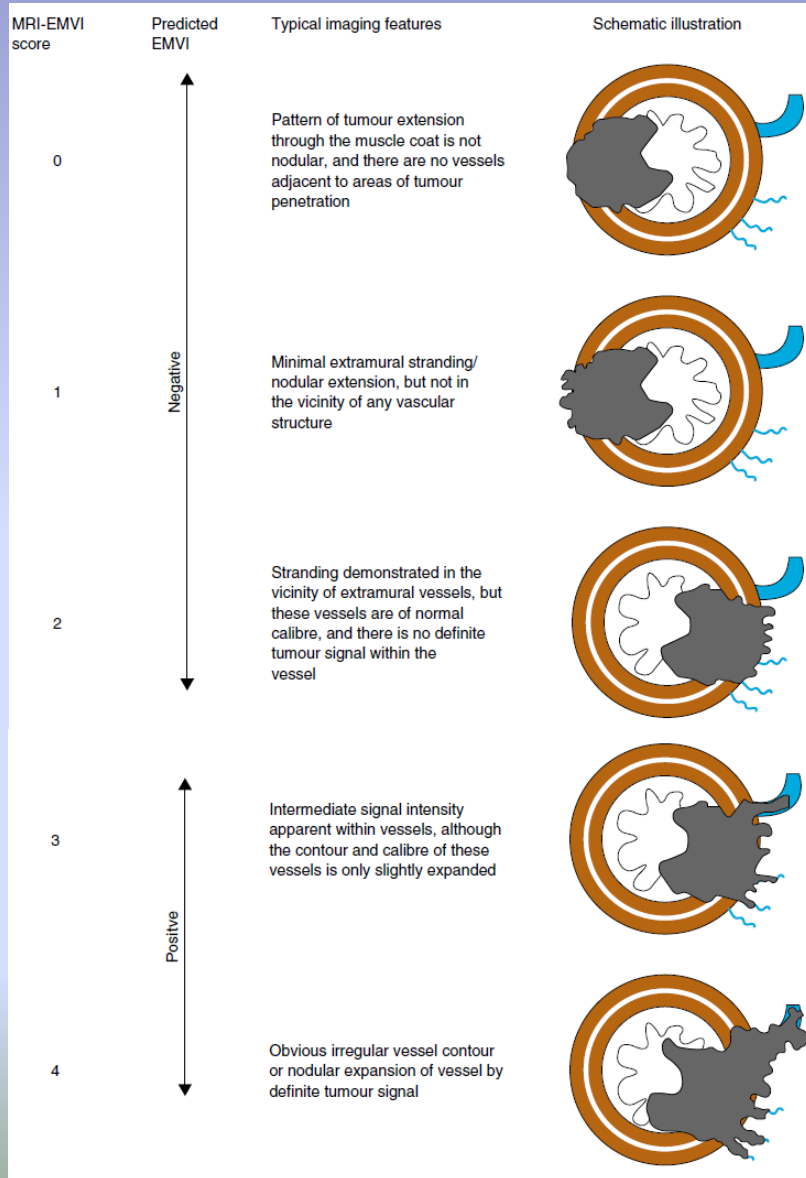
# One millimetre is the safe cut-off for magnetic resonance imaging prediction of surgical margin status in rectal cancer

Taylor 2011



For preoperative staging of rectal cancer, the best cut-off distance for predicting CRM involvement using MRI is 1 mm. Using a cut-off greater than this does not appear to identify patients at higher risk of local recurrence.

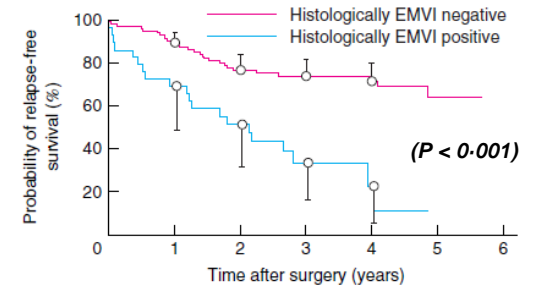
# Prognostic significance of magnetic resonance imaging-detected extramural vascular invasion in rectal cancer



No. at risk

MRI-EMVI 0-2	97	84	66	46	27	9
MRI-EMVI 3-4	24	21	12	6	4	1

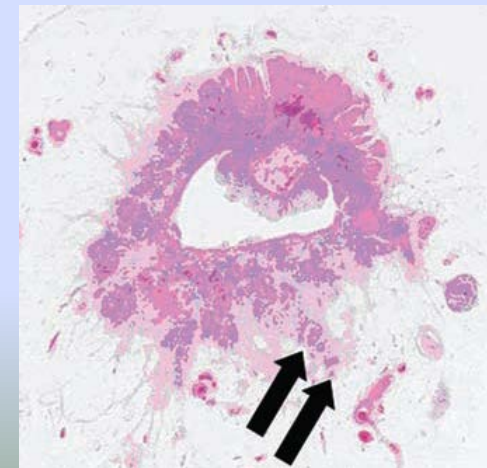
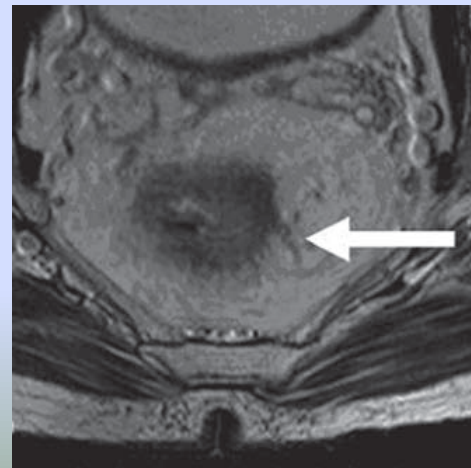
**a** MRI-EMVI score



No. at risk

EMVI negative	100	88	67	48	29	10
EMVI positive	29	20	14	6	2	

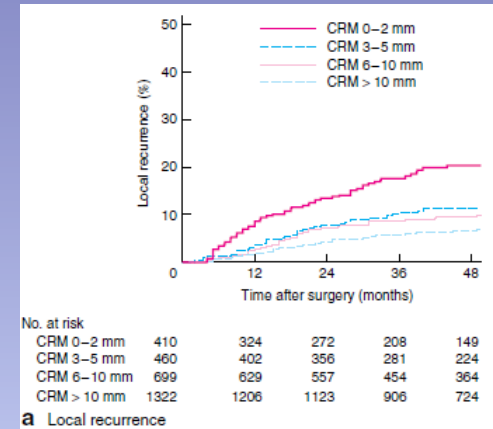
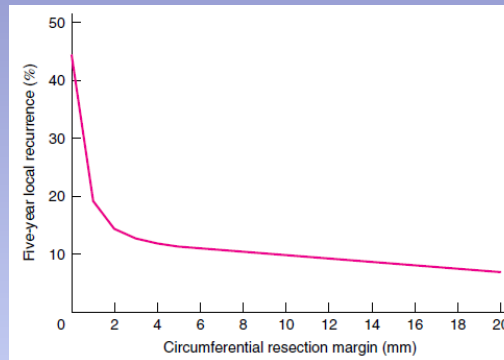
**b** Histological EMVI status



# Circumferential resection margin as a prognostic factor in rectal cancer

Bernstein

British Journal of Surgery 2009

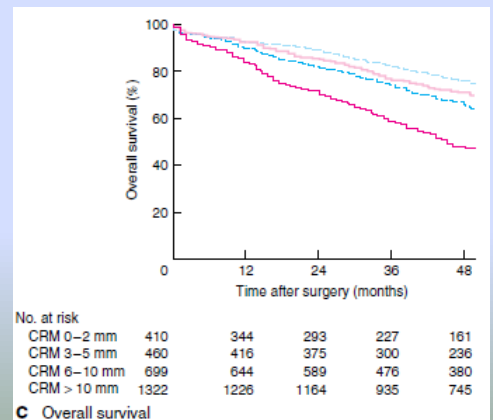
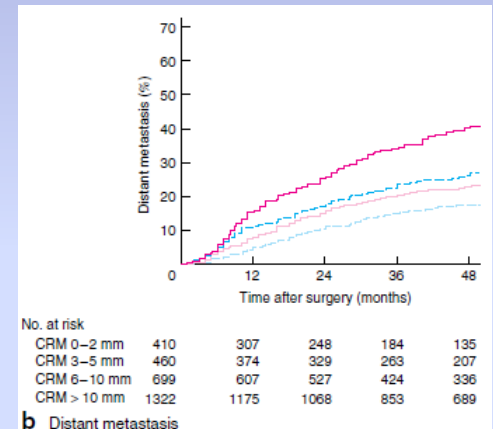


## What is the role for the circumferential margin in the modern treatment of rectal cancer?

17.500 patients

Nagtegaal JCO 2008

- ➔ after neoadjuvant RT/CRT the predictive value of the CRM for local recurrence is significantly higher than when no preoperative therapy has been applied (hazard ratio [HR] = 6.3 v 2.0, respectively;  $P < .05$ )
- ➔ involvement of the CRM is a powerful predictor of both development of distant metastases (HR = 2.8; 95% CI, 1.9 to 4.3) and survival (HR = 1.7; 95% CI, 1.3 to 2.3).



# PREOPERATIVE CHEMORADIATION IN FIXED DISTAL RECTAL CANCER: DOSE TIME FACTORS FOR PATHOLOGICAL COMPLETE RESPONSE

MOHIUDDIN M.

*IJROBP 46: 883–888, 2000*

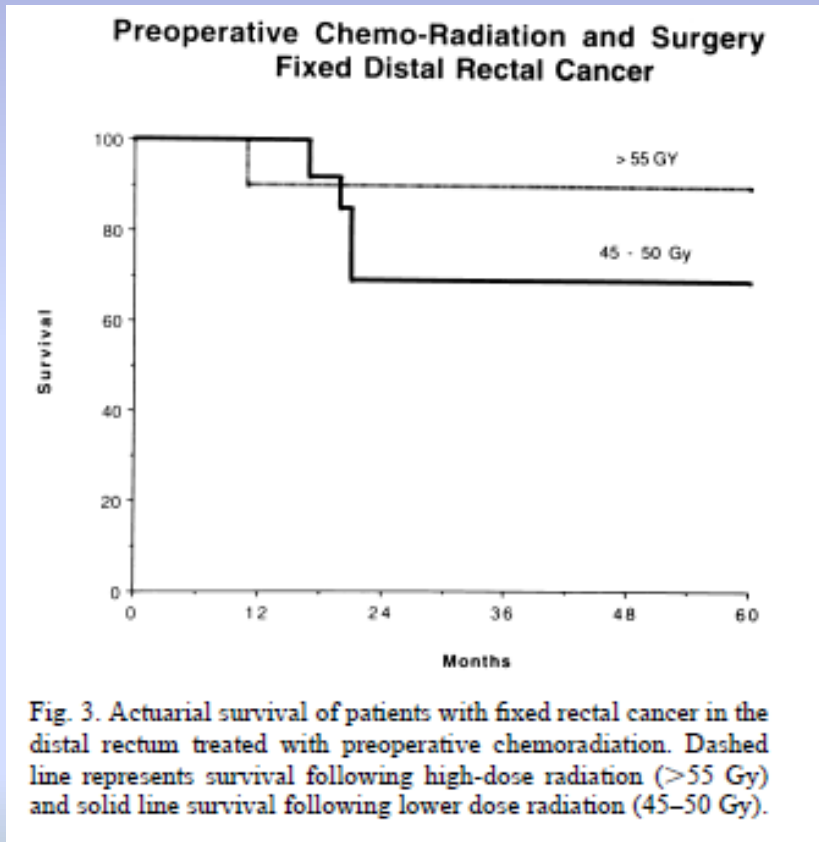


Table 6. Preoperative chemoradiation and surgery: effect of dose time fractionation

Stage	<50 Gy	>55 Gy
0	2/15 (13%)	8/18 (45%)
T1/2	3/15 (20%)	2/18 (11%)
T3	6/15 (40%)	6/18 (33%)
N+	4/15 (27%)	2/18 (11%)

$p = 0.05.$

# PREOPERATIVE RADIATION WITH CONCURRENT CHEMOTHERAPY FOR RESECTABLE RECTAL CANCER: EFFECT OF DOSE ESCALATION ON PATHOLOGIC COMPLETE RESPONSE, LOCAL RECURRENCE-FREE SURVIVAL, DISEASE-FREE SURVIVAL, AND OVERALL SURVIVAL

WILTSHIRE K L

IJROBP 64:709–716, 2006

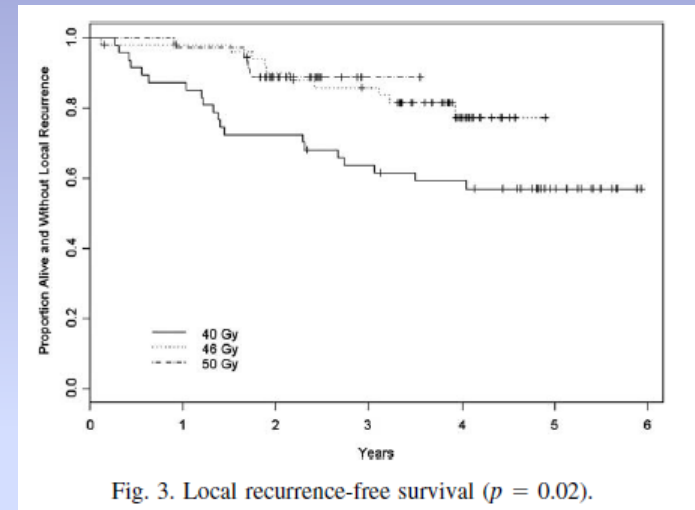
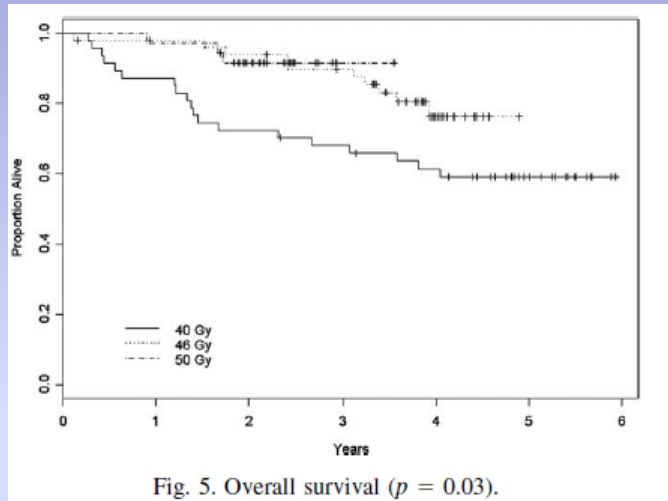


Table 5. Site of local recurrence

	40 Gy	46 Gy	50 Gy
Presacral	2	0	0
Anastomosis	1	1	1
Perineum	0	1	0
Pelvic lymph nodes	0	1	0
Unknown	0	1	0

Table 6. Multivariate analysis

Outcome	Dose group versus 40 Gy	Hazard ratio	$p$ value
Predictor local recurrence-free survival	46 Gy	0.30 (0.12–0.76)	0.025
	50 Gy	0.27 (0.08–0.96)	
Predictor disease-free survival	46 Gy	0.29 (0.12–0.68)	0.024
	50 Gy	0.52 (0.22–1.23)	
Predictor overall survival	46 Gy	0.33 (0.13–0.86)	0.066
	50 Gy	0.32 (0.09–1.16)	

# Chemoradiotherapy for Rectal Cancer: An Updated Analysis of Factors Affecting Pathological Response

Sanghera P *Clinical Oncology (2008) 20: 176e183*

**Table 4 – The relationship of radiotherapy dose and pathological complete response (pCR) rate**

Dose range (Gy)	Weighting (number of patients)	Adjusted pCR means with 95% confidence interval	P
<45	458	0.09 (0.05, 0.13)	0.02
45–<50	1914	0.14 (0.11, 0.19)	
50–<55	2236	0.16 (0.12, 0.20)	
55+	124	0.20 (0.10, 0.31)	
Estimated biological equivalent dose			0.02
<50	481	0.09 (0.05, 0.14)	0.02
50–<55	1631	0.14 (0.10, 0.19)	
55–<60	1726	0.15 (0.11, 0.19)	
60+	894	0.17 (0.13, 0.22)	

**4732 patients**

**64 phase II  
7 phase III trials**

## **Group Recommendations: Boost Volumes**

**The group did recommend that any boost clinical target volumes extend to entire mesorectum and presacral region at involved levels, including ~2 cm cephalad and caudad in the mesorectum and ~2 cm on gross tumor within the anorectum.**

# Impact of Integrated PET/CT on Variability of Target Volume Delineation in Rectal Cancer

*Technology in Cancer Research and Treatment, 2007*

**SI:** inter-observer similarity index

**0:** complete disagreement  
**1:** complete agreement

## GTVp: primary gross tumor volumes

Comparison of GTVp PET inter-observer similarity index (SI) to CT scan.

Modality	Estimated SI	Standard Error	95% CI		
CT	0.77	0.03	0.69	0.84	
FDG	0.81	0.03	0.75	0.870	
FLT	0.80	0.03	0.74	0.86	
Inter-modality Difference	SI difference	Standard Error	P-value	95% CI	
FDG-CT	0.04	0.02	0.01	0.01	0.07
FLT-CT	0.03	0.02	0.09	-0.004	0.06
FDG-FLT	0.01	0.02	0.54	-0.02	0.04

## GTVn: nodal gross tumor volumes

Comparison of GTVn PET inter-observer similarity index (SI) to CT scan.

Modality	Estimated SI	Standard Error	95% CI		
CT	0.22	0.12	-0.087	0.52	
FDG	0.70	0.12	0.47	0.94	
FLT	0.70	0.12	0.46	0.94	
Inter-modality Difference	SI difference	Standard Error	P-value	95% CI	
FDG-CT	0.49	0.07	<.0001	0.35	0.63
FLT-CT	0.49	0.08	<.0001	0.34	0.64
FDG-FLT	0.001	0.08	0.98	-0.15	0.15

**FLT:** 18F-fluorodeoxythymidine

**FDG:** 18F-fluorodeoxyglucose

**Boost target volumes in rectal cancer based on combined PET/CT results in lower inter-observer variability compared with CT alone, particularly for nodal disease.**

# DELINEATION OF GROSS TUMOR VOLUME (GTV) FOR RADIATION TREATMENT PLANNING OF LOCALLY ADVANCED RECTAL CANCER USING INFORMATION FROM MRI OR FDG-PET/CT: A PROSPECTIVE STUDY

*IJROBP in press*

BRÆNDENGEN M

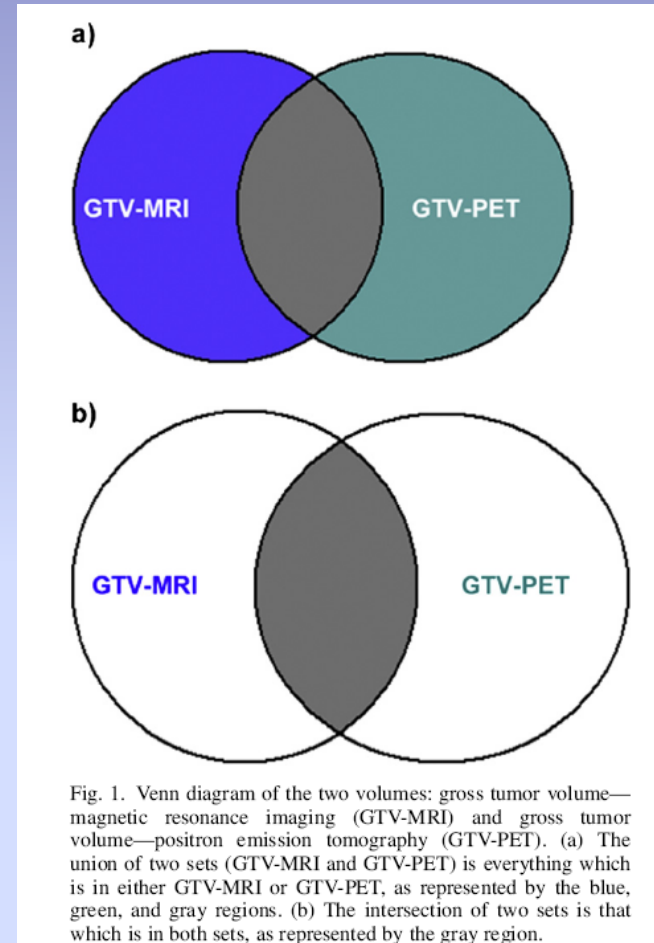
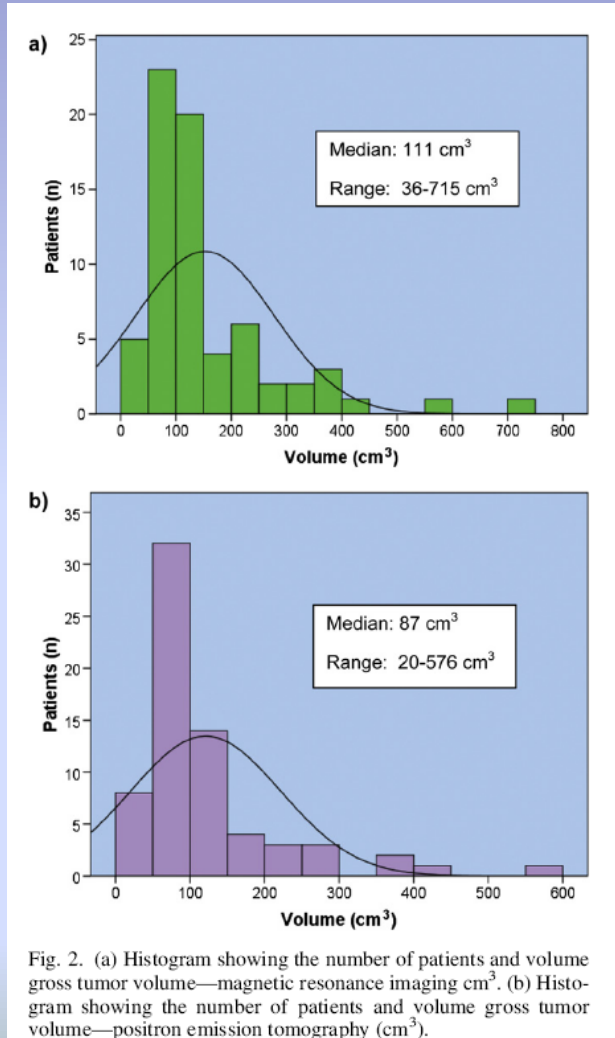


Fig. 1. Venn diagram of the two volumes: gross tumor volume—magnetic resonance imaging (GTV-MRI) and gross tumor volume—positron emission tomography (GTV-PET). (a) The union of two sets (GTV-MRI and GTV-PET) is everything which is in either GTV-MRI or GTV-PET, as represented by the blue, green, and gray regions. (b) The intersection of two sets is that which is in both sets, as represented by the gray region.

***“Prospective, preferably randomized, studies are needed to know the appropriate target to receive a higher radiation dose than tissues only at risk of containing subclinical disease. Is it the GTV-PET, or even subvolumes of GTV-PET, or is it a volume up to the union of GTV-PET and GTV-MRI?”***