

# Tidiga erfarenheter: bildkvalitet och diagnostik

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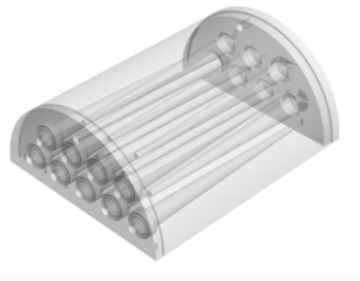
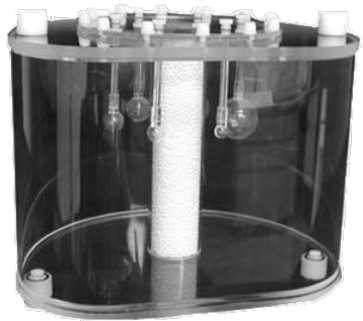
# Förutsättningar

- Etikgodkännande
- Utrustning
- Fo-medel
- Medhjälpare

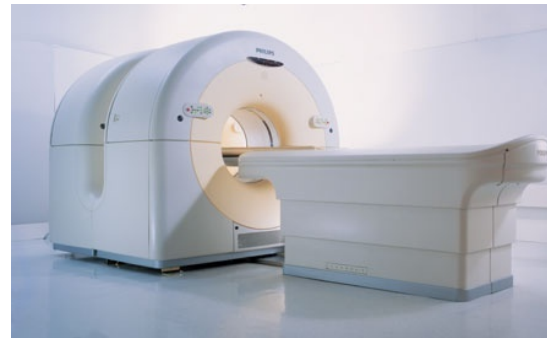
- Elin Trägårdh, MD, PhD, associate professor, specialist in medical radiology and nuclear medicine, Skåne University Hospital, Malmö
- Jenny Oddstig, PhD, medical physicist, Skåne University Hospital, Lund
- Helén Almquist, MD, PhD, consultant in clinical physiology and nuclear medicine, Skåne University Hospital, Lund
- Sabine Garpered, MD, consultant in clinical physiology and nuclear medicine, Skåne University Hospital, Malmö
- Per Wollmer, MD, PhD, professor in clinical physiology and nuclear medicine, Skåne University Hospital, Lund University, Malmö
- Ulrika Bitzén, MD, PhD, consultant in clinical physiology and nuclear medicine, Skåne University Hospital, Lund
- Fredrik Hedeer, MD, specialist in clinical physiology and nuclear medicine, Skåne University Hospital, Lund
- Annika Welinder, MD, PhD, specialist in clinical physiology, Skåne University Hospital, Lund
- Richard Petersson, MD, resident in clinical physiology, Skåne University Hospital, Lund
- Douglas Hägerström, MD, consultant in clinical neurophysiology, Skåne University Hospital, Lund
- Jonas Jögi, MD, PhD, consultant in clinical physiology and nuclear medicine, Skåne University Hospital, Lund and Malmö
- Henrik Engblom, MD, PhD, associate professor and specialist in clinical physiology, Skåne University Hospital, Lund
- Sophia Zackrisson, MD, PhD, associate professor and consultant in medical radiology, Skåne University Hospital, Malmö
- Kerstin Lyttkens, MD, PhD, associate professor and consultant in medical radiology, Skåne University Hospital, Lund
- Carin Cronberg, MD, consultant in medical radiology, Skåne University Hospital, Malmö
- Berit Olsson, technologist in nuclear medicine, Skåne University Hospital, Lund
- Liselott Johansson, technologist in nuclear medicine, Skåne University Hospital, Malmö
- Sigrid Leide Svegborn, PhD, associate professor and medical physicist, Skåne University Hospital, Malmö
- David Minarik, PhD, medical physicist, Skåne University Hospital, Malmö
- Cecilia Hindorf, PhD, associate professor and medical physicist, Skåne University Hospital, Lund
- Tomas Olsson, PhD, medical physicist, Skåne University Hospital, Lund
- Gustav Brodin, medical physicist, Skåne University Hospital, Lund
- Lena Jönsson, PhD, medical physicist, Skåne University Hospital, Lund
- Silke Engelholm, MD, consultant in oncology and radiation therapy, Skåne University Hospital, Lund
- Katarina Steen Carlsson, PhD, Health Economic Unit, Lund University

# Jämföra konventionell och digital PET-CT avseende bildkvalitet och diagnostik

- Fantom



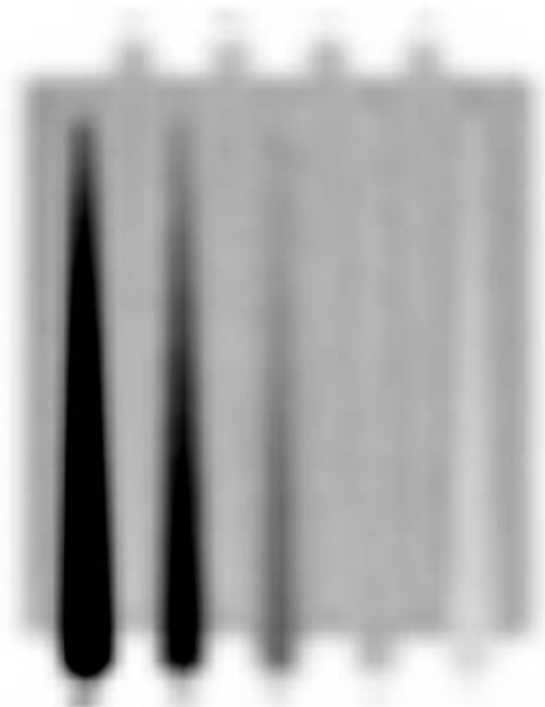
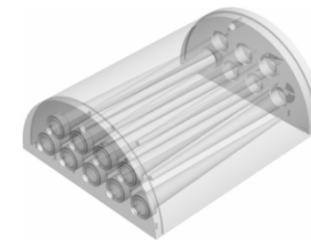
- 16 patienter undersökta både på Philips Gemini TF och GE Discovery MI



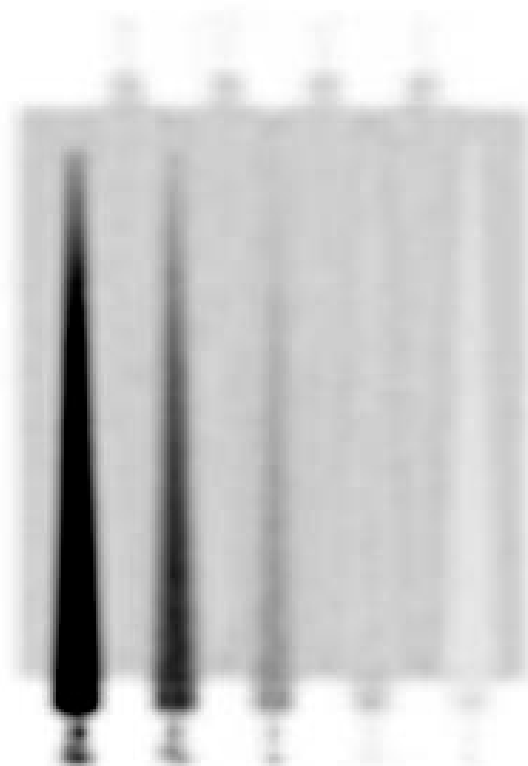
# Bildkvalitet

## MADEIRA-fantomet

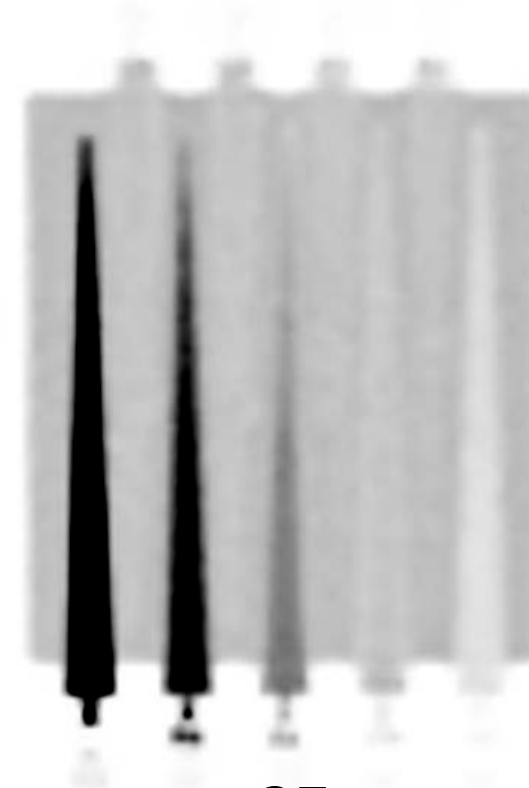
(kon:bkg: 8:1 ; 4:1 ; 2:1 ; 1;1 ; 0,5:1)



Philips  
Gemini TF



GE  
Discovery 690



GE  
Discovery MI



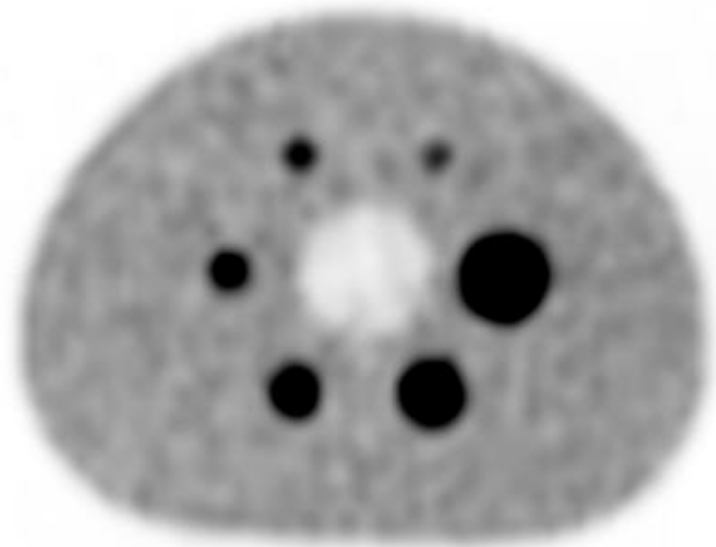
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# Bildkvalitet

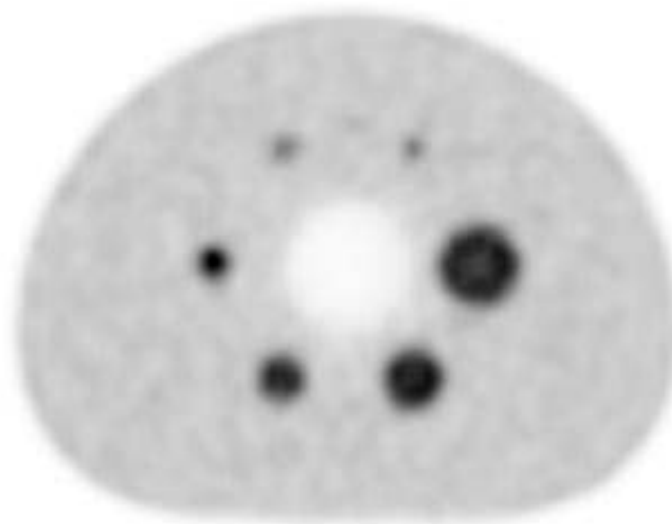


Insamlingstid: 2 min/bed



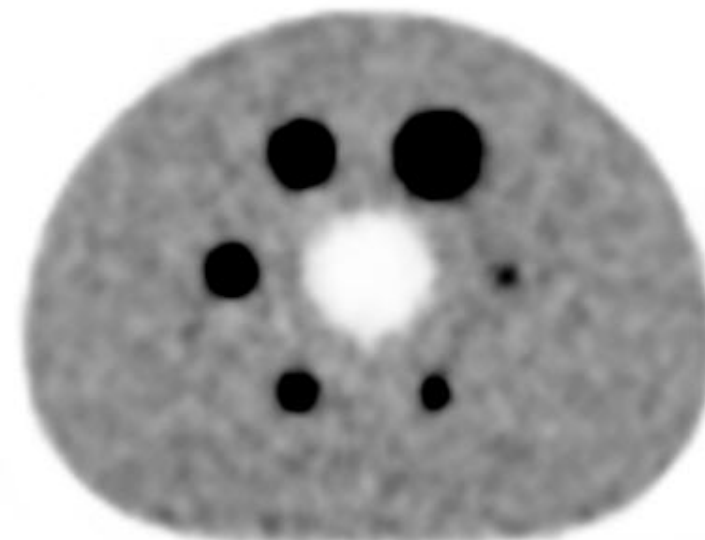
Philips Gemini TF  
2006

2 min/bed



GE Discovery 690  
2011

1,5 min/bed



GE Discovery MI  
2017



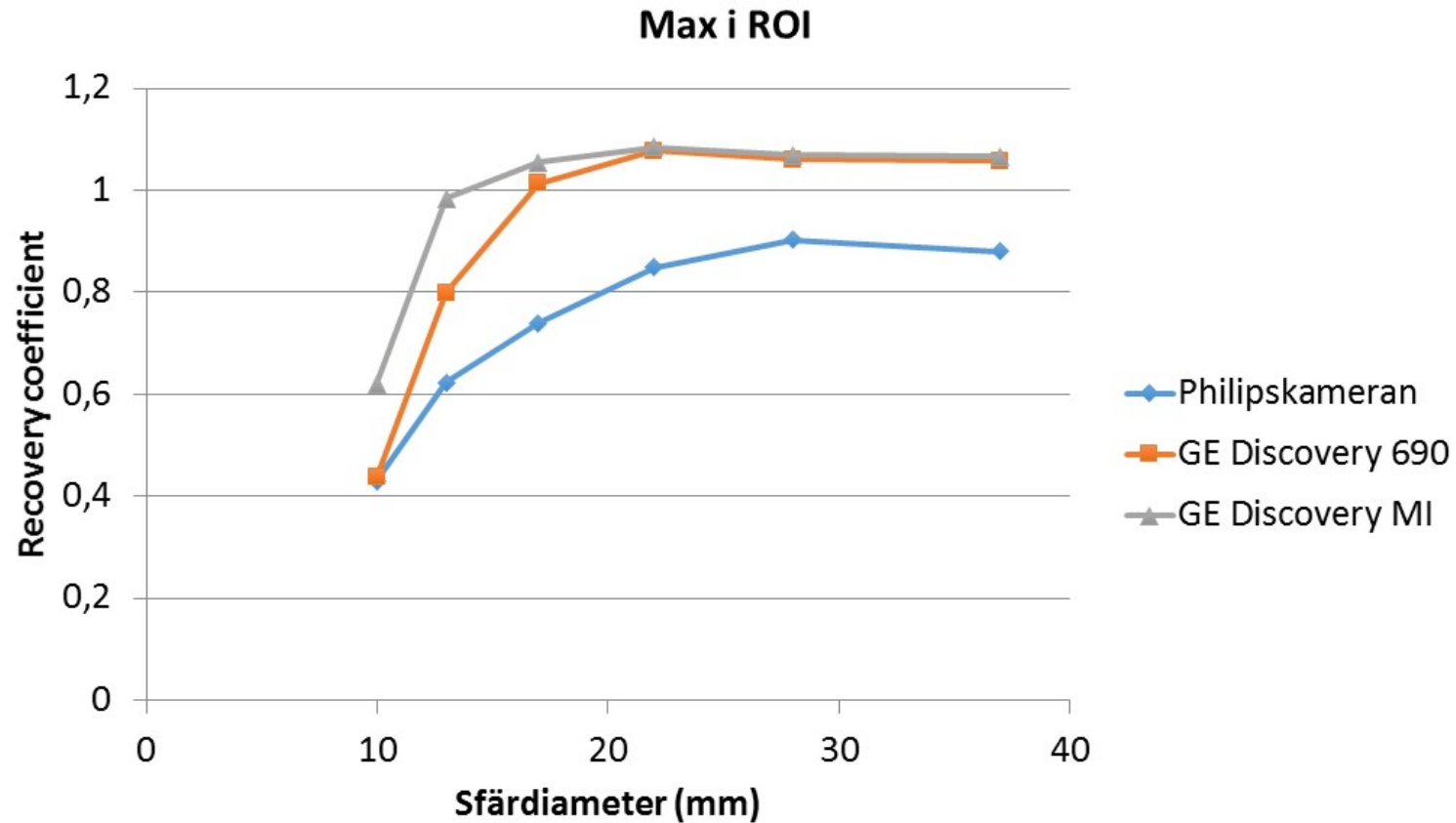
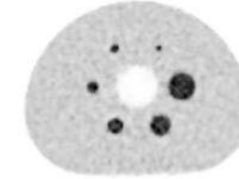
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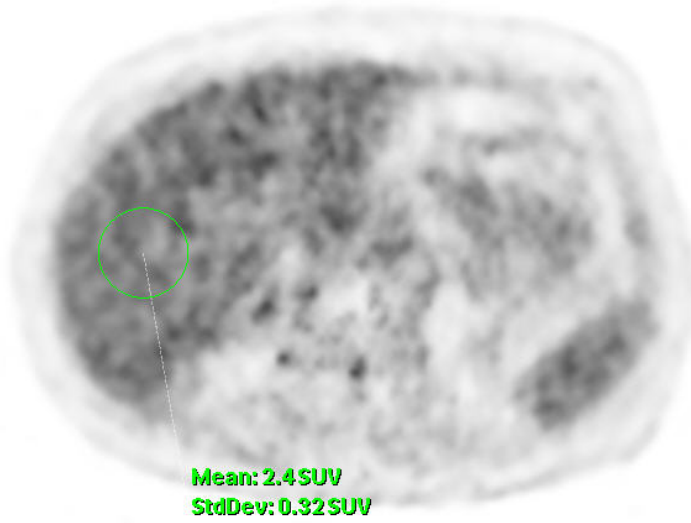
# Hur väl kan upptaget i sfärer av olika storlek mätas?

$$\text{Recovery coefficient (RC)} = \frac{\text{uppmätt aktivitet (max)}}{\text{sann aktivitet}}$$

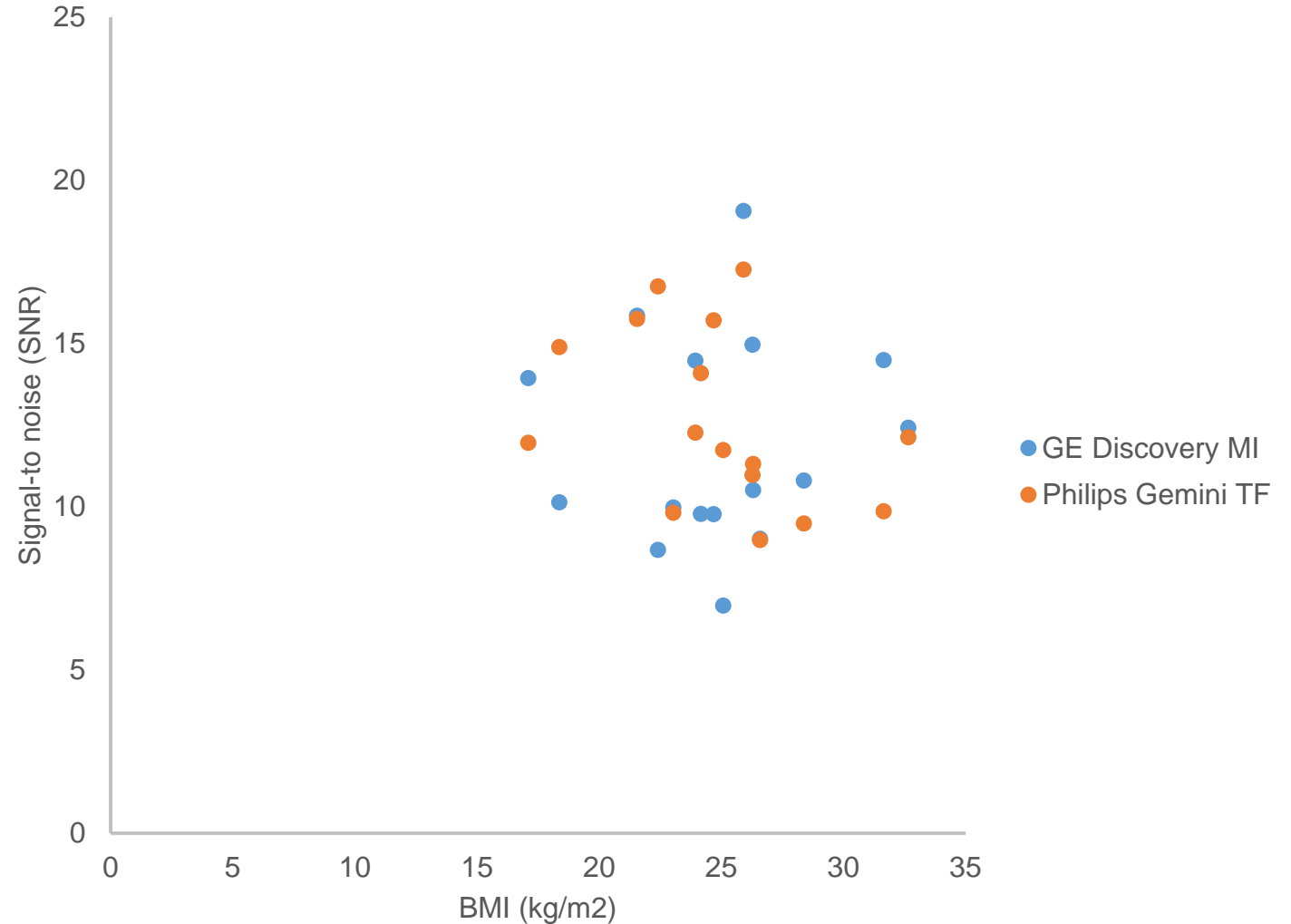


# Insamlingstid

Insamlingstid Philips Gemini TF: 2 min/bed  
Insamlingstid GE Discovery MI: 1,5 min/bed



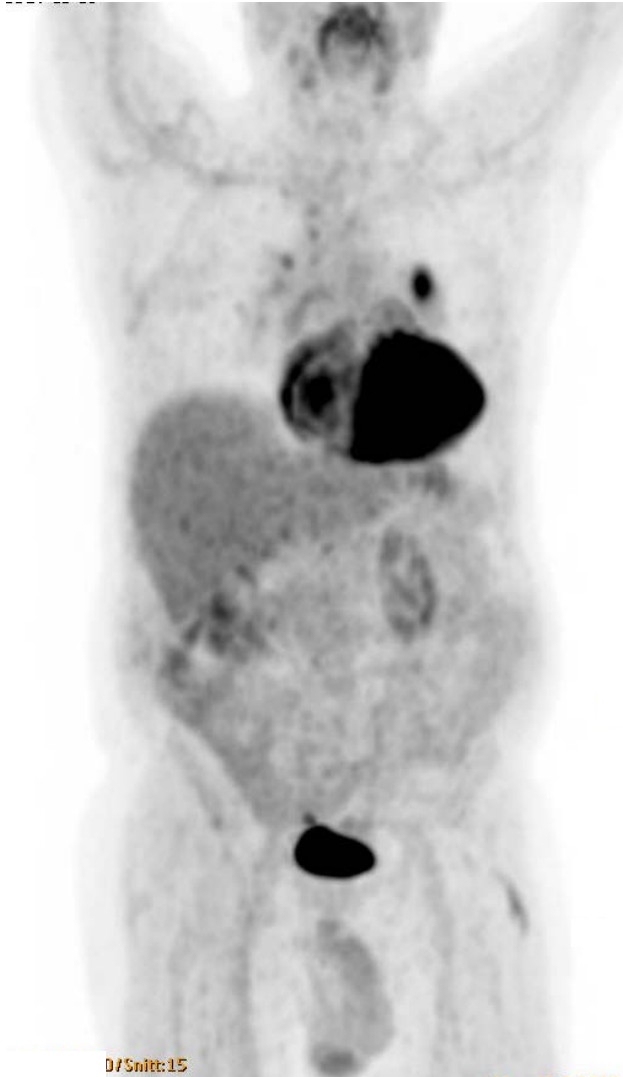
$$\text{Signal-to-noise (SNR)} = \frac{\text{SUV}(\text{"medel signal"})}{\text{SD}_{\text{SUV}}(\text{"variationen"})}$$



# Insamlingstid

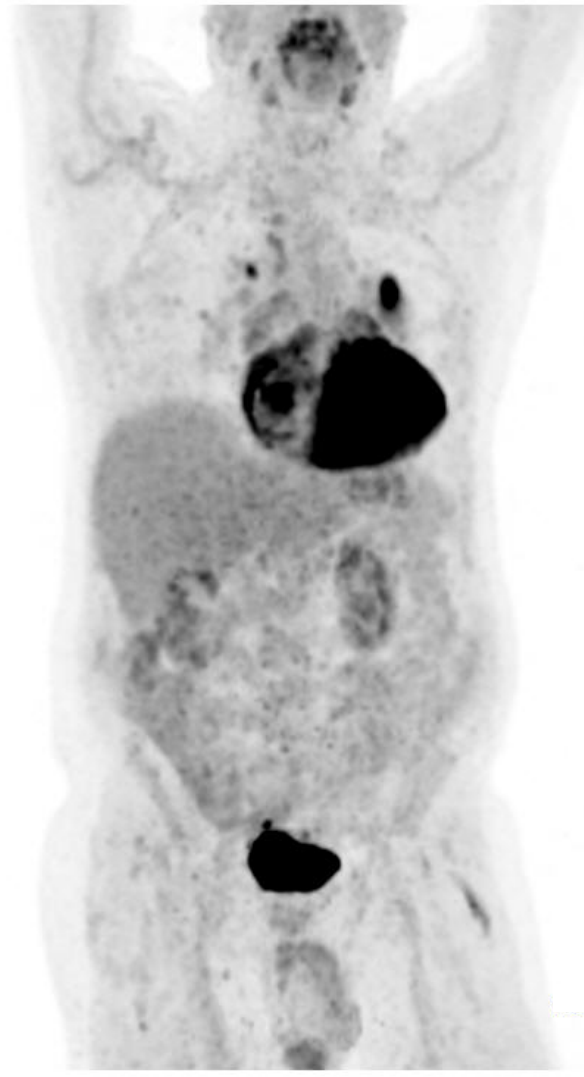
**Philips Gemini TF**  
2006

2 min/bed  
18cm FOV  
50% överlapp



**GE Discovery MI**  
2017

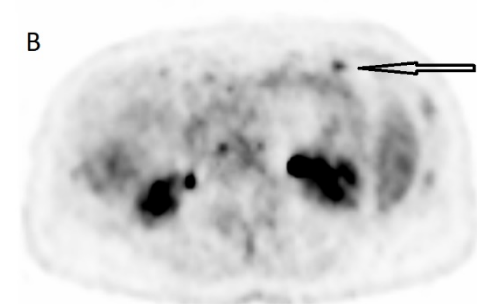
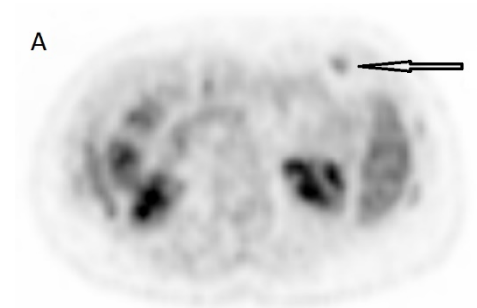
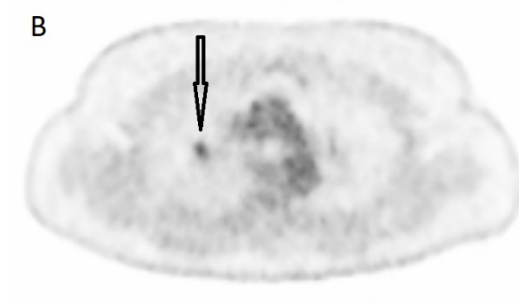
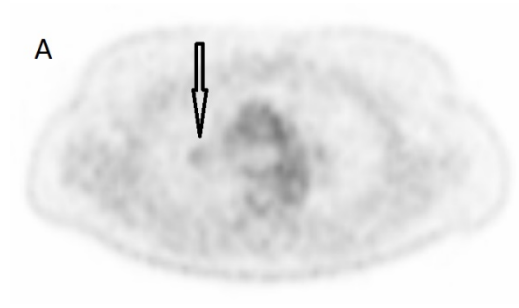
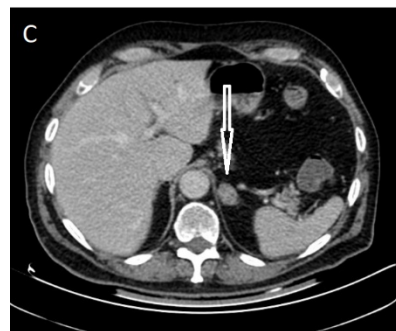
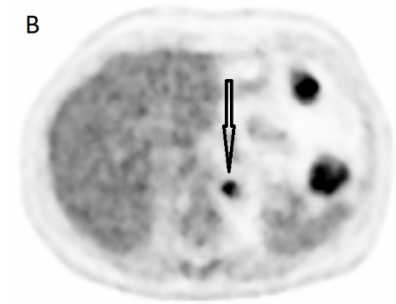
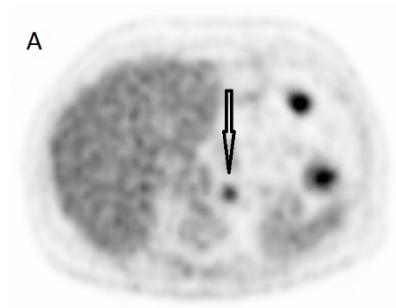
1,5 min/bed  
20cm FOV  
24% överlapp



**Totala insamlingstiden halverades**







# TNM-klassificering och antal lesioner

Patient	T+/-	N+/-	Patient	Malignant Gemini TF	Malignant Discovery MI	Reactive GeminiTF	Reactive Discovery MI	Unclear GeminiTF	Unclear Discovery MI
	Gemini TF								
1	+	?	1	1	3	0	13	13	13
2	+	-	2	1	1	8	7	4	16
3	-	-	3	0	0	0	0	0	0
4	+	-	4	1	1	3	4	1	0
5	+	?	5	1	2	0	0	2	2
6	-	-	6	2	2	0	3	0	0
7	-	-	7	0	0	11	17	0	0
8	-	-	8	0	0	0	0	1	2
9	+	-	9	11	16	2	1	0	0
10	+	+	10	3	2	0	0	0	1
11	+	-	11	2	2	1	0	1	1
12	N/A	N/A	12	0	0	Multiple	Multiple	0	0
13	-	-	13	0	0	0	3	0	0
14	?	-	14	0	1	1	1	1	0
15	+	-	15	1	1	2	2	0	0
16	+	-	16	1	1	1	4	1	3
16	+	-	Sum	24	32	29	55	24	38

# SUV i lesioner

SUV parameters	Discovery MI	Gemini TF	P
Lesions SUV <sub>max</sub> (n=68)	8.3 ± 6.5	5.2 ± 4.5	P<0.0001*
Lesions < 1 cm (n=32)	6.5 ± 3.5	3.5 ± 1.7	P<0.0001*
Lesions ≥ 1 cm (n=36)	9.9 ± 8.1	6.6 ± 5.6	P<0.0001*
Lesion-to-blood-pool SUV ratio	4.9 ± 4.0	3.7 ± 3.4	P=0.0002*
Lesions < 1 cm	3.9 ± 2.2	2.4 ± 1.6	P<0.0001*
Lesions ≥ 1 cm	5.9 ± 5.0	4.9 ± 4.2	P=0.053

# Slutsatser

PET-insamling  
halva tiden

Bättre bildkvalitet  
och  
detektionsmöjlighet

Stadie  
försämrades hos  
4/15 patienter

Högre SUV, högre  
SUV-ratio för små  
lesioner

... för digital PET jämfört med konventionell

# Studier framöver

- Optimera protokoll för olika radiofarmaka
- Dubbelundersökningar för olika typer av cancer
- Studier om sensitivitet/specificitet, outcome, hälsoekonomi

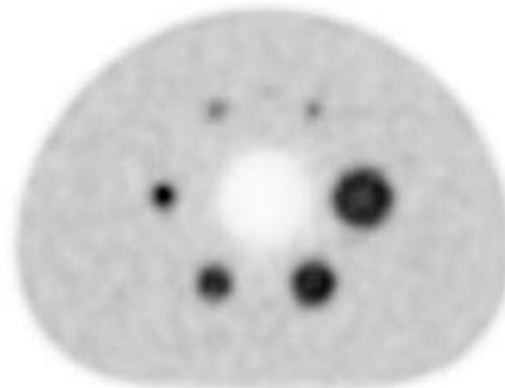


# Jämförelse av bildkvalitet

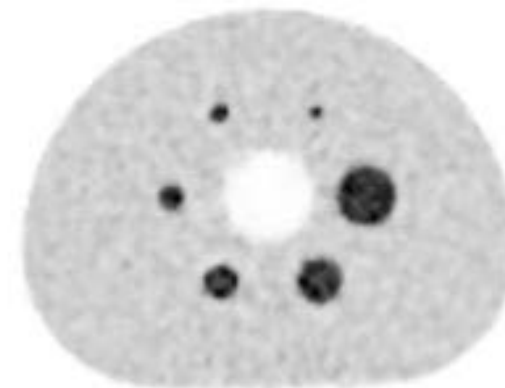
**NEMA Image Quality Phantom**  
**SBR 4, 5 kBq/mL, 2 min acq. time, colour scale 'SUV 5'**



Philips Gemini  
2006



GE Discovery 690  
2011



GE Discovery MI  
2017