



**PHILIPS**

Advanced molecular  
imaging

Ingenuity TF PET/CT

# Clinical case book

## Oncology cases



# Ingenuity TF PET/CT Oncology cases

## Loyola Medicine, USA

6

1. Melanoma	8
2. Ovarian Ca	10
3. Breast Ca	12
4. Lymphoma	14
5. Carcinoid tumor	16
Single day example	18

## Apollo Gleneagles Hospital, Kolkata, India

20

1. Recurrent fibrolamellar variant of hepatocellular carcinoma	22
2. Moderately differentiated squamous cell carcinoma of the left lateral border of the tongue, treated by left hemiglossectomy along with left sided modified neck dissection	24
3. Metastatic adenocarcinoma of right sided cervical lymph node but unknown primary. Treated by right sided radical neck dissection, 2014. Follow up study	26
4. Metastatic poorly differentiated carcinoma to D8 done for unknown primary	28
5. Adenocarcinoma of the splenic flexure of the colon with infiltration of spleen, tail of pancreas, stomach, and transdiaphragmatic extension to lower lobe of the left lung	30
6. Squamous cell carcinoma of the left tonsil with lymph node metastases treated by concurrent chemoradiation. Treatment evaluation	32

7. Papillary carcinoma of thyroid. Negative radioiodine scan and rise of Thyroglobulin	34
8. Alzheimer's type of dementia	36
9. Non-small cell lung cancer. For Staging	38
10. Moderately differentiated squamous cell carcinoma of the lower alveolus with extensive metastasis in lymph nodes, lung, adrenal and bones	40
11. Ca Breast	42

## University Hospital, Salzburg, Austria

44

1. Pulmonary 4D gating	46
2. Gastric lymphoma before and after treatment	48
3. Young Patient with non-small cell lung-ca before and after treatment	50
4. F-18 FDG PET/CT in a patient with soft-tissue sarcoma	52

## **Isala, Zwolle, The Netherlands 54**

1. Primary breast cancer with several axillary metastases between 7 and 12 mm 56
2. Breast cancer primary with axillary metastases 8 mm and very subtle 4 mm parasternal metastatic lesion 58
3. Mid-esophageal tumor with mediastinal nodes as small as 3–4 mm picked up on FDG PET and degenerative disease in cervical spine 60
4. Burkitt lymphoma in the lower abdomen mimicking intestinal loops with small upper abdominal mets anterior to liver 62
5. Pulmonary adenocarcinoma with extensive metastatic spread to mediastinum, axilla, bone and soft tissue 64
6. Patient with known colon carcinoma 66
7. FDG PET study showing small lung metastasis of thyroid cancer patient 68
8. FDG PET detects very small lymph nodes in patient with sarcoidosis, most convincingly on 2 mm recons 70
9. MIP images of a patient with a medical history of vasculitis 72
10. Breast cancer restaging with interfering FDG uptake in brown fat 74
11. Primary lung tumor (20 mm diameter) with 1 small satellite lesion (10 mm) and two hilar lymph nodes (11 mm and 10 mm) 76
12. Small axillary lymph node metastases in a patient with breast cancer, best appreciated on 2 mm recons 78

13. Improved visibility of small lung metastasis (9 and 7 mm) in upper left lung and lower right lung using respiratory gating and 2 mm recons 80

## **University Hospital Cleveland 82**

1. History of lymphoma 84
2. Multiple areas of increased uptake with chest mass 86
3. Mass in the right lower lung with variable uptake 88
4. History of lymphoma 90
5. History of coronary artery disease. A mismatch is seen between the perfusion (NH4) and viability (FDG) images 92
6. Suspicion of coronary artery disease 94



*“Images we get from the Ingenuity TF are high quality. They allow me to see small lesions and help to provide the necessary information to my referring physicians and enable more personalized care for their patients. The Ingenuity TF gives me great confidence in my diagnostic interpretations and will serve my purposes now and for years ahead as one of my key instruments as molecular imaging evolves.”*

**Dr. Robert Wagner M.D.,** M.S.M.I.S., FACR, FACNP Professor, Medical Director, Nuclear Medicine



# Clinical cases

# Loyola Hospital

1. Melanoma	8
2. Ovarian Ca	10
3. Breast Ca	12
4. Lymphoma	14
5. Carcinoid tumor	16
Single day example	18

# Case 1

## Melanoma

**Study 1:** Innumerable hypermetabolic lesions in the skin, subcutaneous tissue, lungs, liver, kidneys and bones are consistent with metastatic disease.

### General characteristics

Patient	Female
Age	70 years
Height	1.60 m
Bodyweight	106 kg

### Scan characteristics

12.9 mCi F18 FDG
62 min uptake time
60 sec/bed

**Study 2:** 10 weeks later. Disease progression seen in the chest, liver and skeleton.

### General characteristics

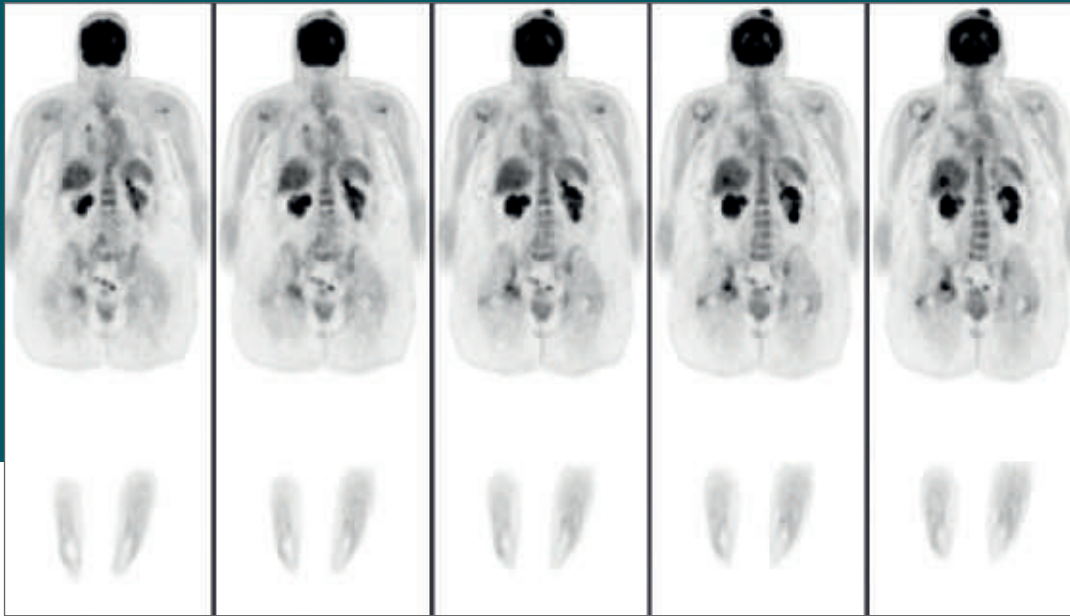
Patient	Female
Age	70 years
Height	1.60 m
Bodyweight	99 kg

### Scan characteristics

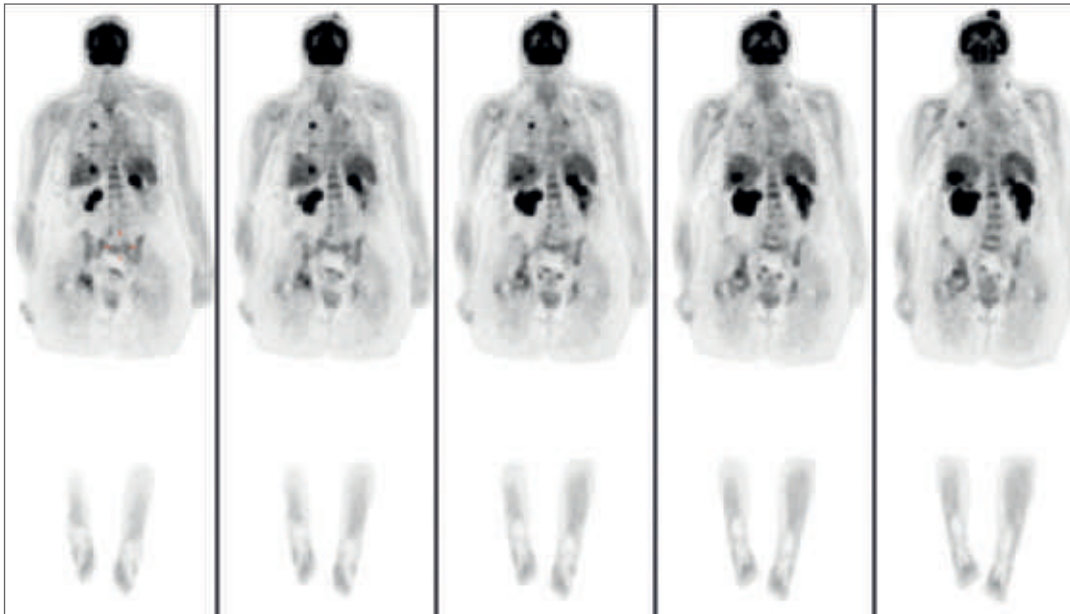
11.2 mCi F18 FDG
64 min uptake time
60 sec/bed



Study 1



Study 2



## Case 2

### Ovarian Ca

Interval decrease in size and slightly decreased FDG uptake of the right posterior lobe hepatic metastasis, when compared to the previous study.

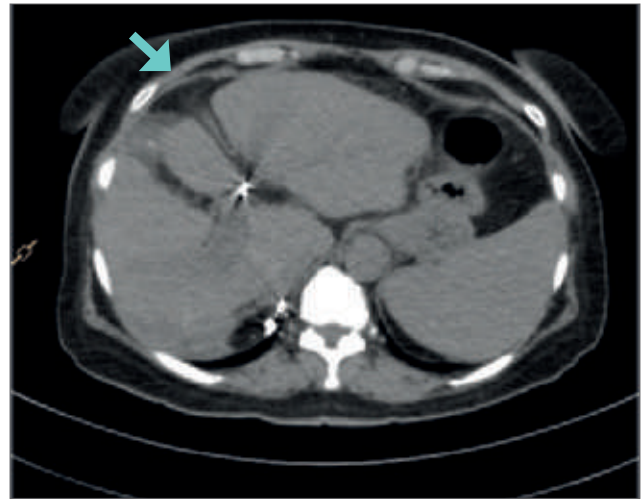
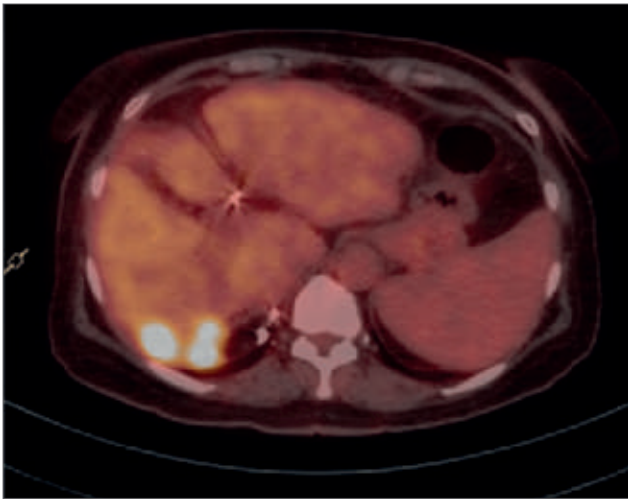
#### General characteristics

Patient	Female
Age	63 years
Height	1.55 m
Bodyweight	65 kg

#### Scan characteristics

10.1 mCi F18 FDG
59 min uptake time
90 sec/bed

In addition to visualization of the liver lesion, image contrast capability is demonstrated in the area around the liver.



# Case 3

## Breast Ca

Patient with a history of triple negative breast cancer with right mastectomy, and waxing/waning lung nodules. PET 1 year prior to study 1 was negative for metastases.

### Study 1

#### General characteristics

Patient	Female
Age	59 years
Height	1.60 m
Bodyweight	60 kg

#### Scan characteristics

<b>PET</b>	9.1 mCi F18 FDG 65 min uptake time 90 sec/bed
<b>CT</b>	120 kVp, 75 mAs iDose <sup>4</sup> , 5 CTDI vol

### Study 2

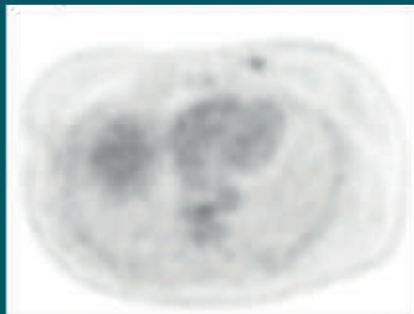
#### General characteristics

Patient	Female
Age	60 years
Height	1.60 m
Bodyweight	60 kg

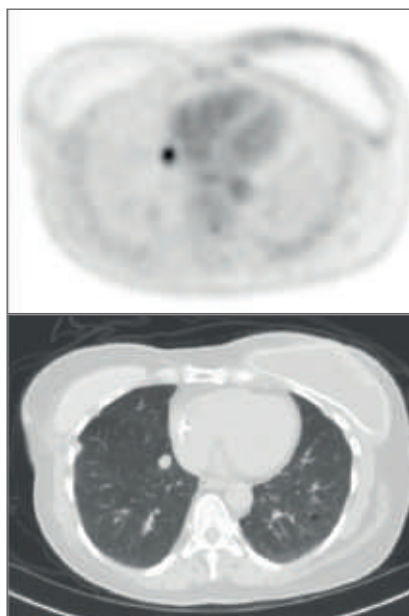
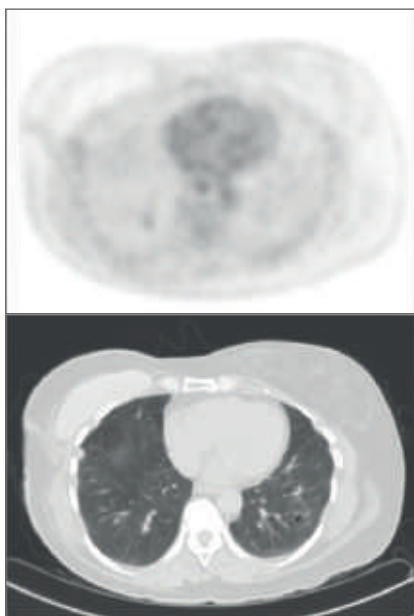
#### Scan characteristics

<b>PET</b>	9.2 mCi F18 FDG 58 min uptake time 90 sec/bed
<b>CT</b>	120 kVp, 61 mAs iDose <sup>4</sup> , 4 CTDI vol

Soft tissue nodule with SUVmax 1.9

Study  
1

Study 2 performed after a CT that demonstrated a growing lung nodule. Reconstruction of the left breast performed since study 1. An FDG-avid, round, 1.1 cm nodule is identified with an SUVmax of 5.2, highly concerning for metastatic disease.



SUVmax 5.2

Study  
1Study  
2

# Case 4

## Lymphoma

Time of Flight contributes to the image quality seen in this large patient. Visualization of the deep structures (kidneys and spine) compared to peri-renal fat is noted. Lymphadenopathy in the right inguinal region.

Diffuse marrow metabolic activity is likely secondary to marrow reconversion from anemia.

### General characteristics

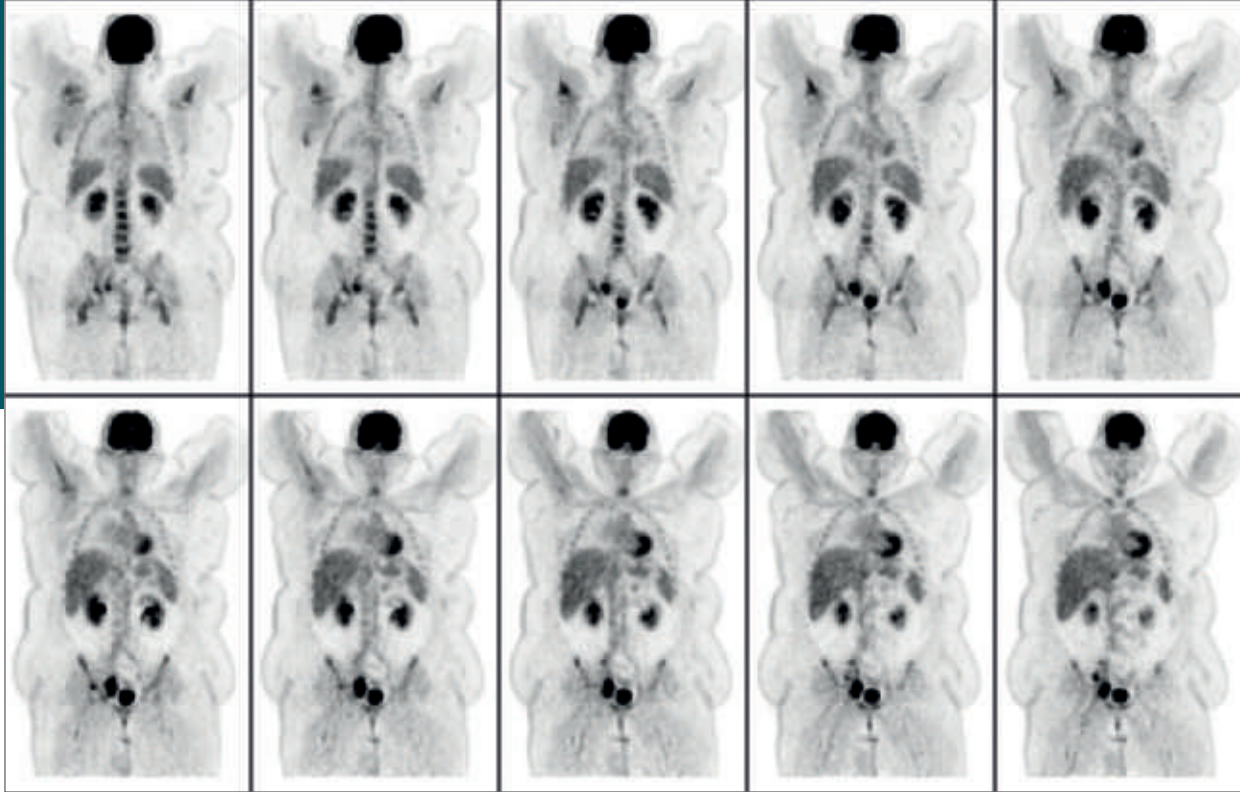
Patient	Female
Age	35 years
Height	1.63 m
Bodyweight	156 kg

### Scan characteristics

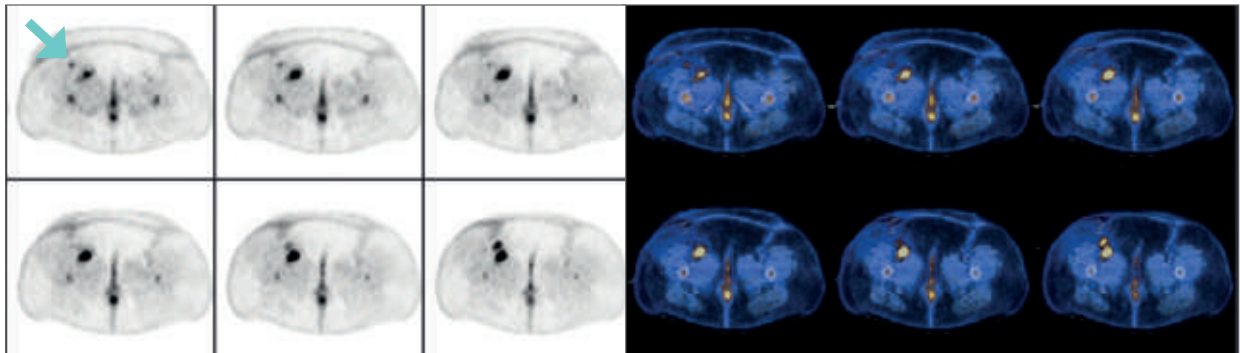
<b>PET</b>	11.1 mCi F18 FDG 62 min uptake time 150 sec/bed
<b>CT</b>	120 kVp, 140 mAs iDose <sup>4</sup> , 6.6 CTDI vol



ToF mage quality in a large patient



**Lymphadenopathy in the right inguinal region.**  
**Observe the correlation with the CT seen on the fusion image.**



# Case 5

## Carcinoid tumor

History of carcinoid tumor. Previously identified skull and cervical spine lesions. Lower CT technique for arms up in second study. The patient has a pelvic kidney (activity collection in the r kidney, at the bottom left of the images).

**Study 1:** Patient is 230 pounds. Increased uptake diffusely along the posterior thoracic ribs bilaterally is most likely vascular in nature. Brown fat activity is noted.

### General characteristics

Patient	Female
Age	58 years
Height	1.80 m
Bodyweight	104 kg

### Scan characteristics

<b>PET</b>	12.4 mCi F18 FDG 58 min uptake time 135 sec/bed
<b>CT</b>	120 kVp, 100 mAs iDose <sup>4</sup> , 6.6 CTDI vol

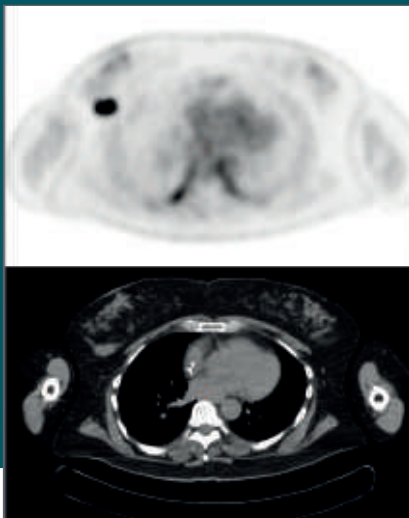
**Study 2:** Multiple metastatic lesions noted

### General characteristics

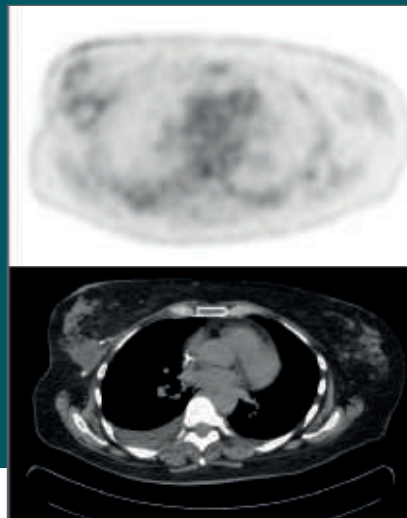
Patient	Female
Age	58 years
Height	1.80 m
Bodyweight	93 kg

### Scan characteristics

<b>PET</b>	12.2 mCi F18 FDG 61 min uptake time 90 sec/bed
<b>CT</b>	120 kVp, 80 mAs iDose <sup>4</sup> , 3.2 CTDI vol

Study  
1

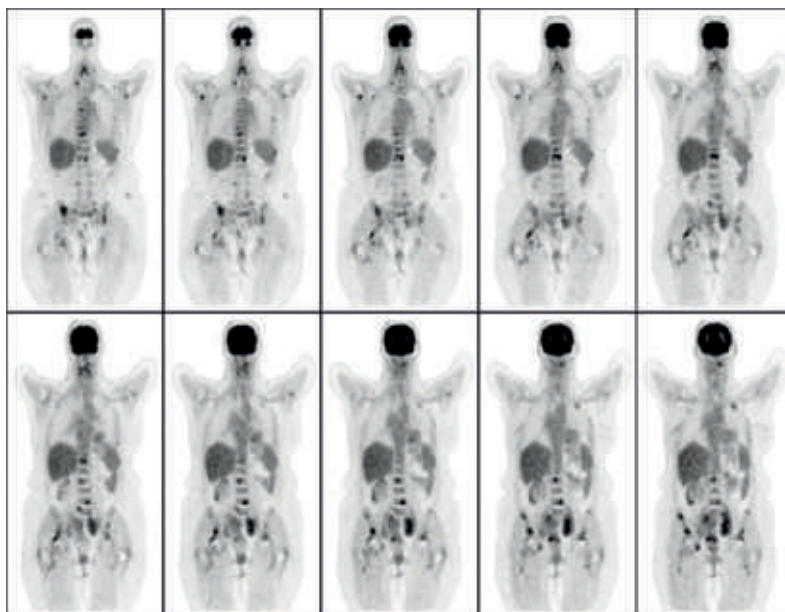
SUVmax 9.7

Study  
2

Body position changes from arms down (study 1) to arms up (study 2). Note the similarity in image quality. This is good.

**Study 1:** Right breast lesion with SUVmax of 9.2 is most consistent with primary malignancy. Increased uptake diffusely along the posterior thoracic ribs bilaterally is most likely vascular in nature. Brown fat activity is noted.

**Study 2:** 5 months after study 1. Post operative lumpectomy changes are seen. Multiple metastatic lesions in the skeleton.



**Study 2:** Multiple areas of increased skeletal uptake consistent with metastatic carcinoid.

**Image quality with multiple small bone lesions**

## Single day example

An example of a single day at the facility. Study volume has g  
Acquisition time for a whole body study is 90 sec/bed, resulti  
of 15 minutes for the PET scan. The nominal delay time is 60 m



### General characteristics

Time 08.30  
Bodyweight 94 kg

### Scan characteristics

11.7 mCi



### General characteristics

Time 09.25  
Bodyweight 56 kg

### Scan characteristics

8.4 mCi



### General characteristics

Time 11.20  
Bodyweight 92 kg

### Scan characteristics

12.4 mCi



### General characteristics

Time 12.45  
Bodyweight 156 kg

### Scan characteristics

11.2 mCi

rown from 4/day to 7-8/day.  
ng in a typical duration  
minutes.



**General characteristics**

Time 13.40  
Bodyweight 95 kg

**Scan characteristics**

12.2 mCi



**General characteristics**

Time 14.55  
Bodyweight 65 kg

**Scan characteristics**

10.1 mCi




**General characteristics**

Time 15.55  
Bodyweight 93 kg

**Scan characteristics**

12.8 mCi





*“Ingenuity TF PET/CT has allowed us to develop our own patient-specific optimized protocols. We have been able to decide how much [18F]-FDG and how much time per bed position are appropriate for a given patient depending on his or her BMI, thus avoiding unnecessary length of acquisition.”*

**Dr. Pushan Bharadwa**, Consultant in nuclear medicine and head of PET-CT at Apollo Gleneagles Hospital, Calcutta, India



# Clinical cases

## Apollo Gleneagles Hospital, Kolkata, India

1. Recurrent fibrolamellar variant of hepatocellular carcinoma	22
2. Moderately differentiated squamous cell carcinoma of the left lateral border of the tongue, treated by left hemiglossectomy along with left sided modified neck dissection	24
3. Metastatic adenocarcinoma of right sided cervical lymph node but unknown primary. Treated by right sided radical neck dissection, 2014. Follow up study	26
4. Metastatic poorly differentiated carcinoma to D8 done for unknown primary	28
5. Adenocarcinoma of the splenic flexure of the colon with infiltration of spleen, tail of pancreas, stomach, and transdiaphragmatic extension to lower lobe of the left lung	30
6. Squamous cell carcinoma of the left tonsil with lymph node metastases treated by concurrent chemoradiation. Treatment evaluation	32
7. Papillary carcinoma of thyroid. Negative radioiodine scan and rise of Thyroglobulin	34
8. Alzheimer's type of dementia	36
9. Non-small cell lung cancer. For Staging	38
10. Moderately differentiated squamous cell carcinoma of the lower alveolus with extensive metastasis in lymph nodes, lung, adrenal and bones	40
11. Ca Breast	42

# Case 1

## Recurrent fibrolamellar variant of hepatocellular carcinoma

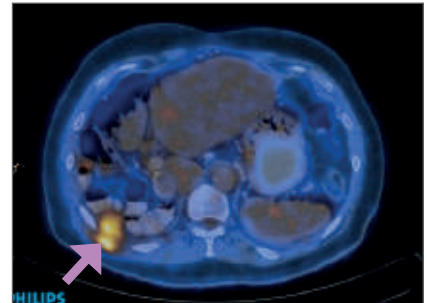
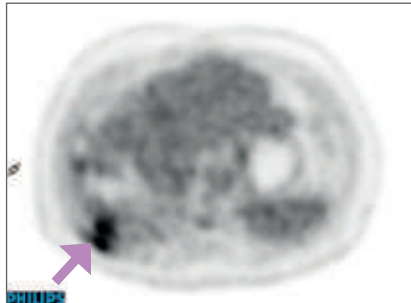
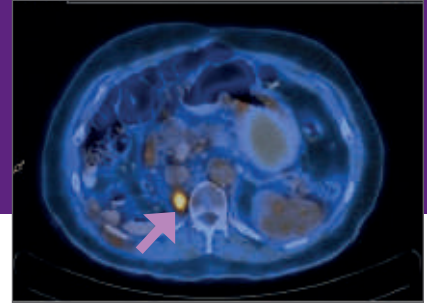
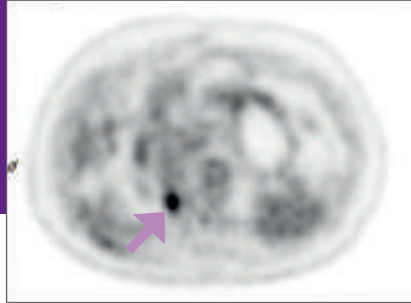
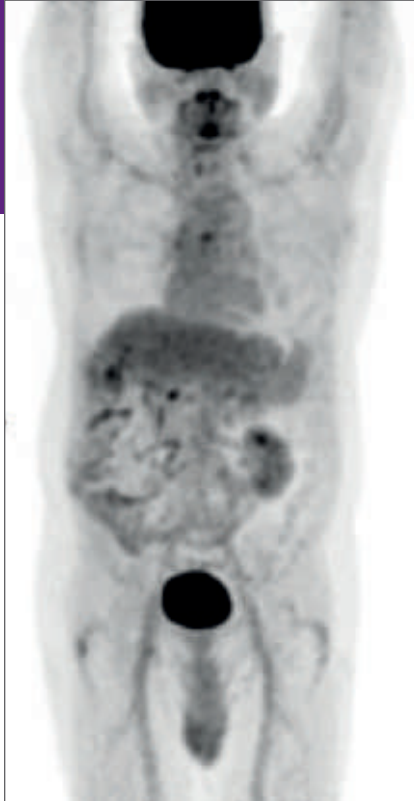
Chest wall recurrence with a nodule in the right crus of the diaphragm in the retrocaval region.

### General characteristics

Patient	Male
Age	63 years
Height	1.56 m
Bodyweight	63 kg

### Scan characteristics

18F-FDG: 8.4 mCi
Time/Bed: 60sec
200mAs and 120KV
DLP: 1231.4 mGy*cm



## Case 2

Moderately differentiated squamous cell carcinoma of the left lateral border of the tongue, treated by left hemiglossectomy along with left sided modified neck dissection

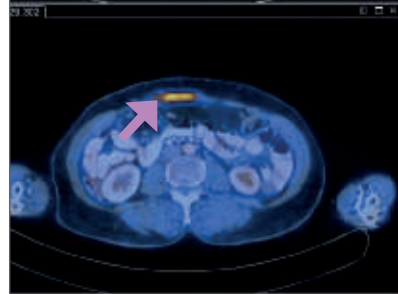
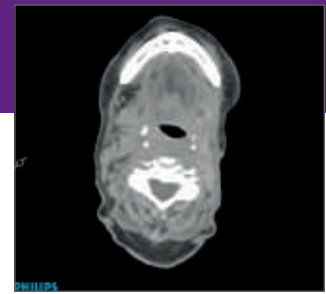
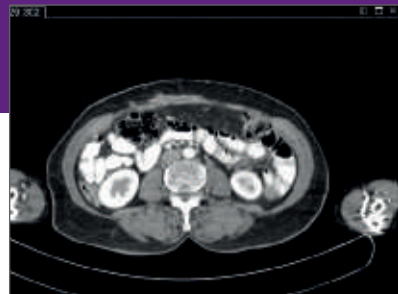
An example of various non oncologic findings which include physiological activity in right mylohyoid muscle, thyroid and sinus tract in the anterior abdominal wall.

### General characteristics

Patient	Female
Age	66 years
Height	1.44 m
Bodyweight	49 kg

### Scan characteristics

18F-FDG: 7.5 mCi
Time/Bed: 60sec
200mAs and 120KV
DLP: 1231.4 mGy*cm



## Case 3

Metastatic adenocarcinoma of right sided cervical lymph node but unknown primary. Treated by right sided radical neck dissection, 2014. Follow up study

Complete response of metastatic adenocarcinoma of right sided cervical lymph node which was removed and followed study did not reveal any new site of metastasis although the primary was unknown.

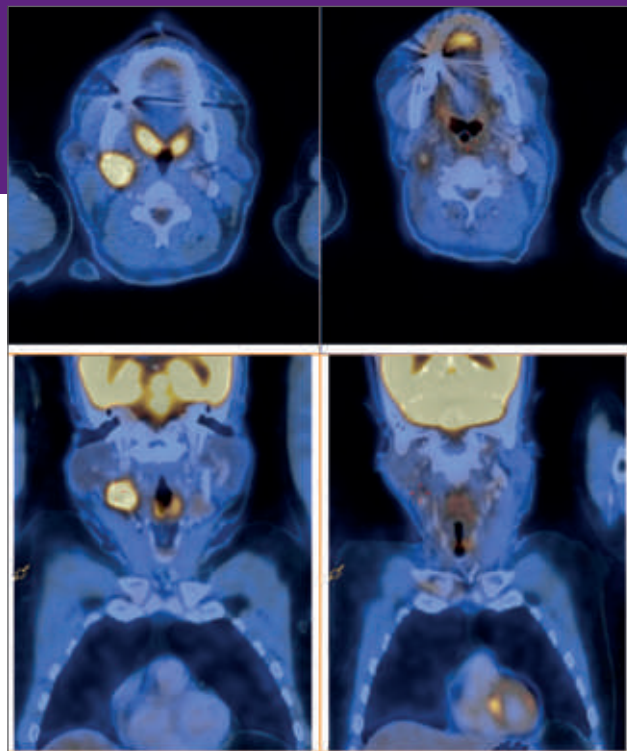
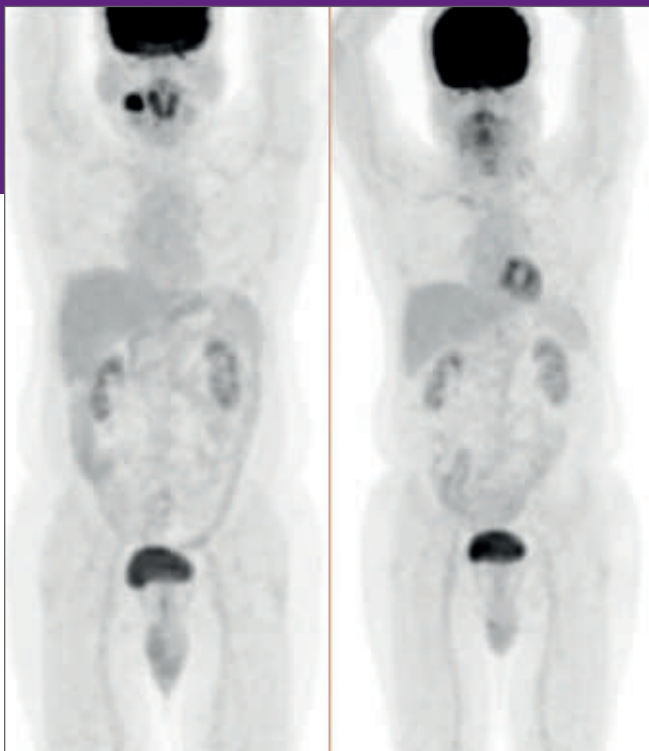
### General characteristics

Patient	Male
Age	70 years
Height	1.61 m
Bodyweight	63 kg

### Scan characteristics

18F-FDG: 1st Scan: 11.8 mCi, 2nd Scan: 8.6 mCi
Time/Bed: 60sec
200mAs and 120KV
DLP: 1336.2mGy*cm





## Case 4

# Metastatic poorly differentiated carcinoma to D8 done for unknown primary

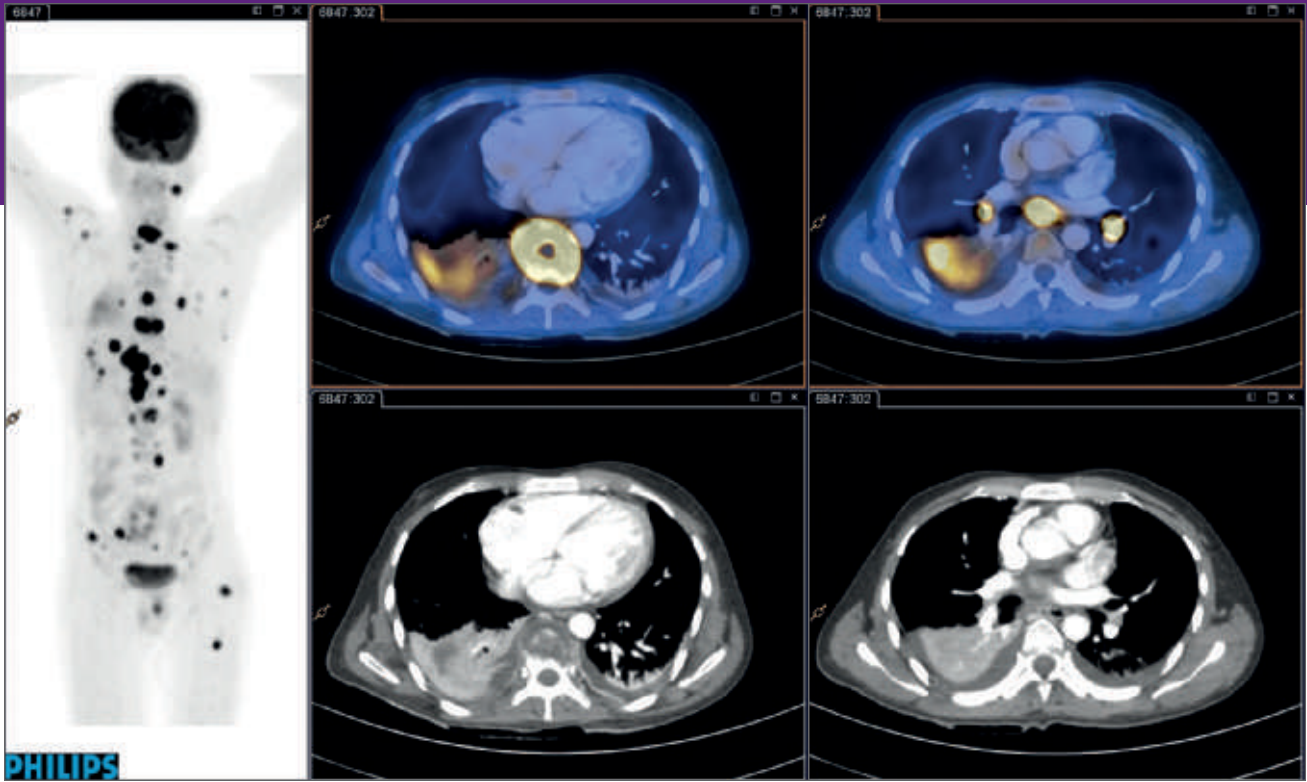
Multiple metastasis to bone, liver, lymph nodes and soft tissue.

### General characteristics

Patient	Male
Age	36 years
Height	1.60 m
Bodyweight	48 kg

### Scan characteristics

18F-FDG: 7.8 mCi
Time/Bed: 60sec
200mAs and 120KV
DLP: 1231.4mGy*cm



## Case 5

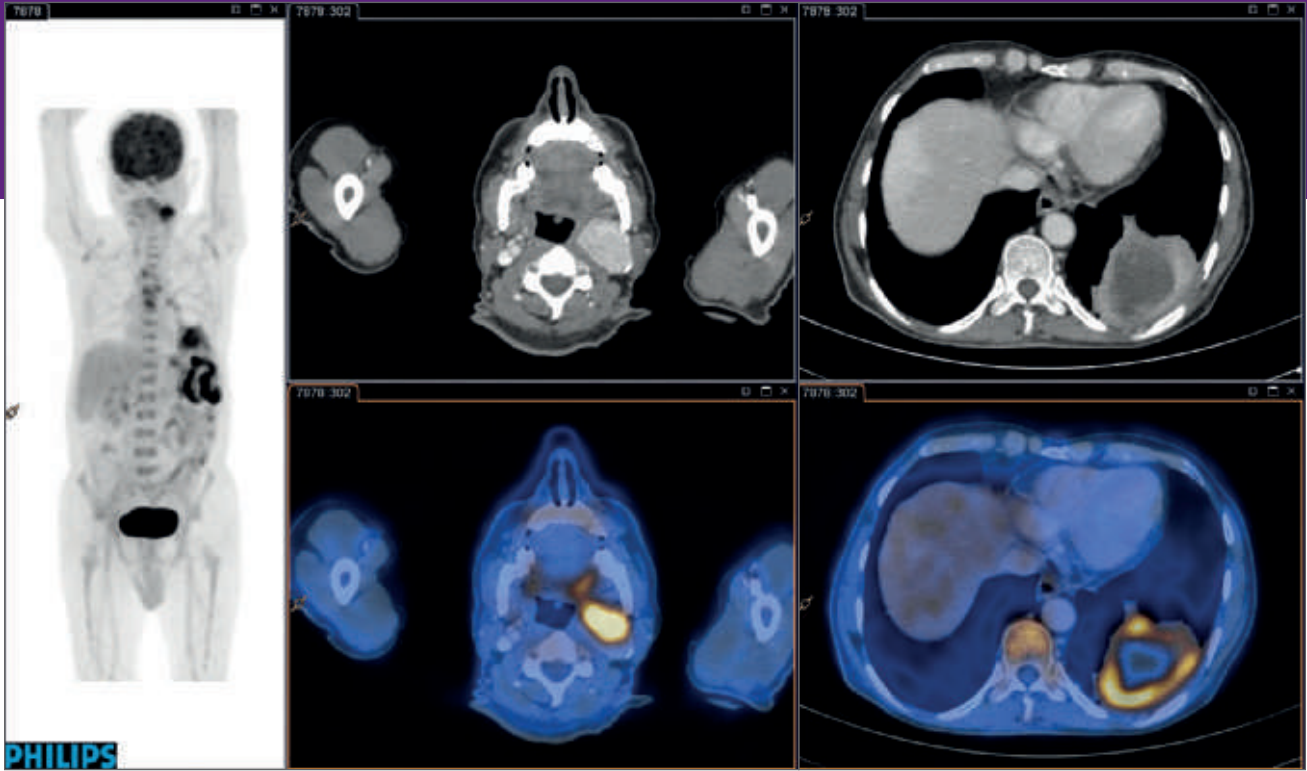
Adenocarcinoma of the splenic flexure of the colon with infiltration of spleen, tail of pancreas, stomach, and transdiaphragmatic extension to lower lobe of the left lung

### General characteristics

Patient	Male
Age	54 years
Height	1.57 m
Bodyweight	45 kg

### Scan characteristics

18F-FDG: 7.8 mCi
Time/Bed: 60sec
200mAs and 120KV
DLP: 1231.4mGy*cm



## Case 6

Squamous cell carcinoma of the left tonsil with lymph node metastases treated by concurrent chemoradiation. Treatment evaluation

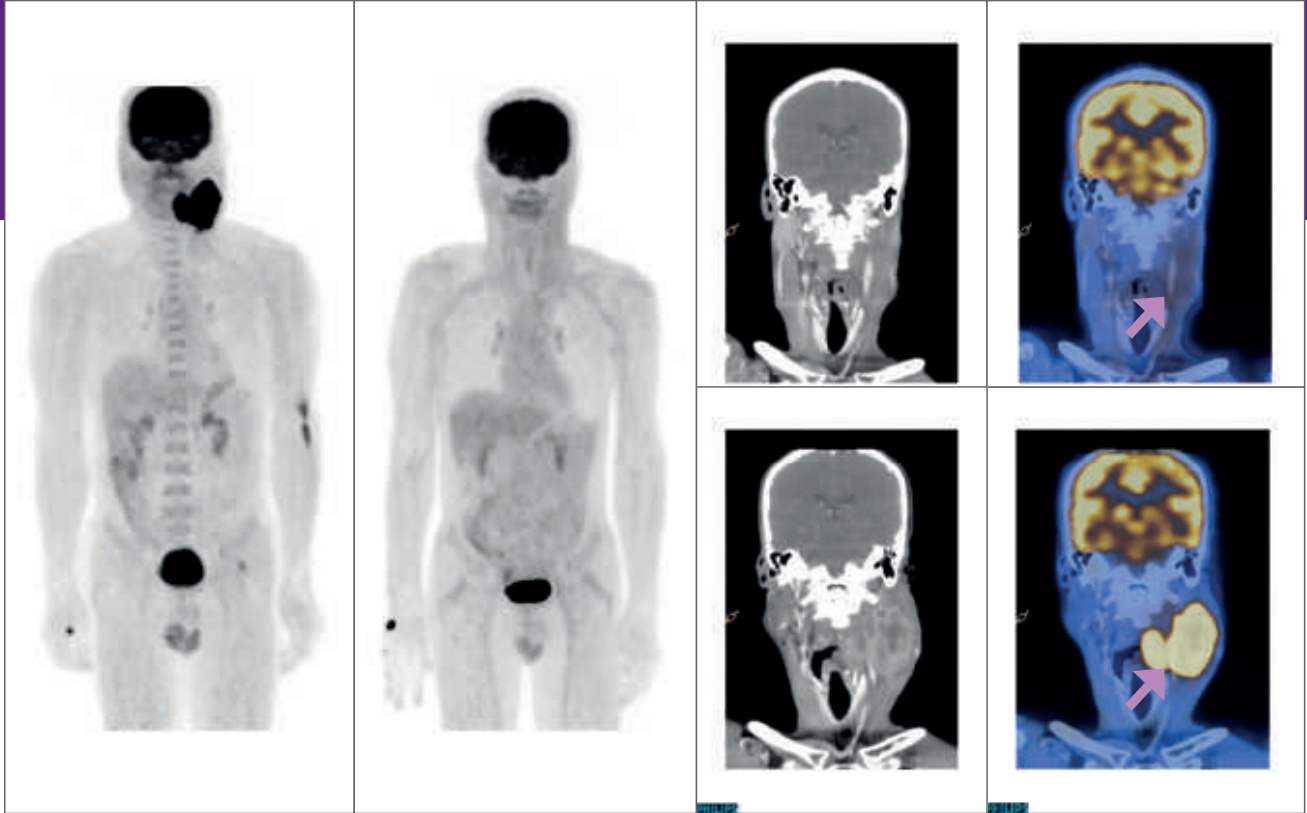
Complete resolution of metabolic activity in the primary tumor and persistent mass shows no uptake indicating complete response.

### General characteristics

Patient	Male
Age	60 years
Height	1.58 m
Bodyweight	45 kg

### Scan characteristics

18F-FDG: 1st Scan: 9.4 mCi, 2nd Scan: 5.1 mCi
Time/Bed: 60sec
200mAs and 120KV
DLP: 1336.2mGy*cm





## Case 7

Papillary carcinoma of thyroid. Negative radioiodine scan and rise of Thyroglobulin

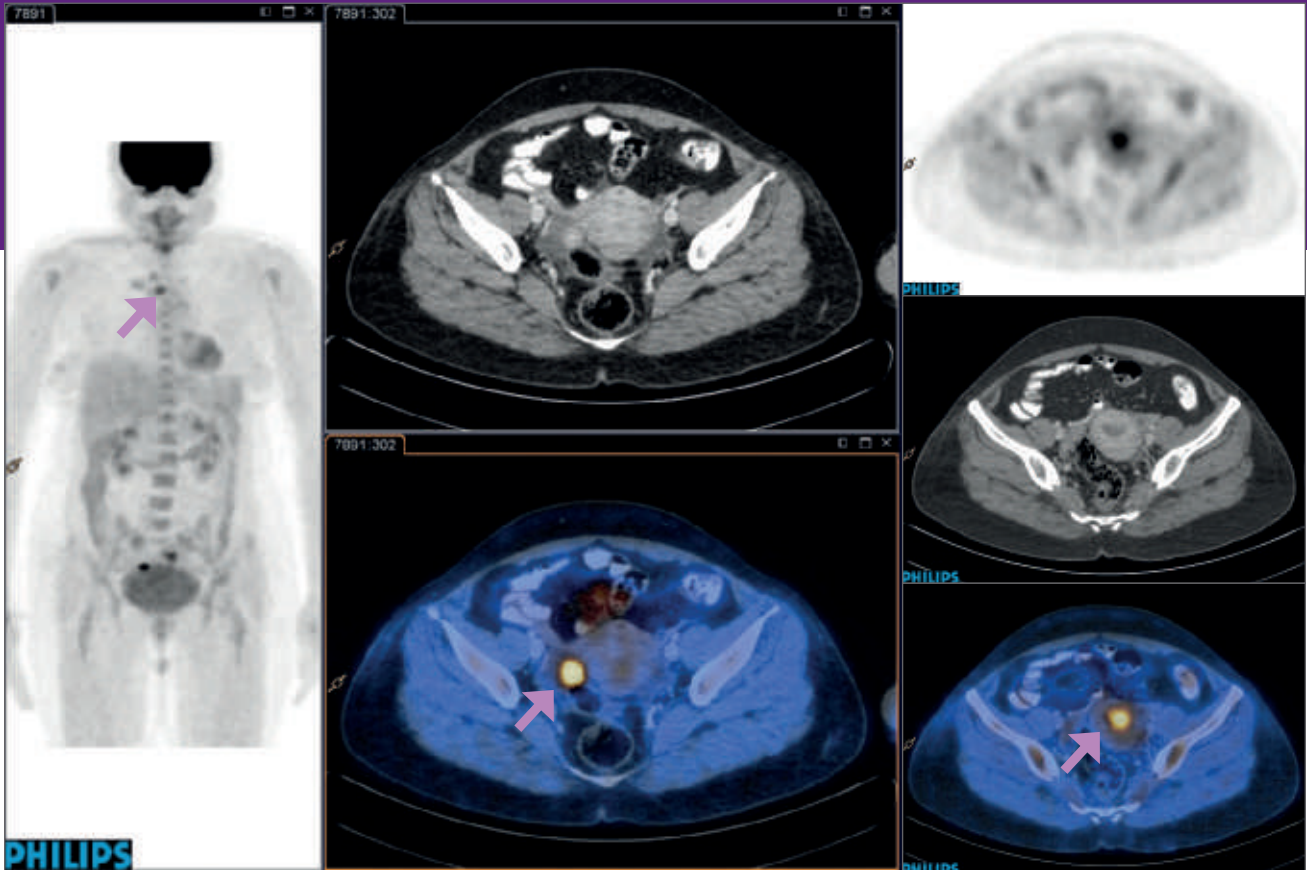
Physiological uptake in ovary and uterus.  
Pathological uptake in sternum.

### General characteristics

Patient	Female
Age	36 years
Height	1.44 m
Bodyweight	56 kg

### Scan characteristics

18F-FDG: 8 mCi
Time/Bed: 60sec
200mAs and 120KV
DLP: 1231.4mGy*cm



## Case 8

Alzheimer's type of dementia

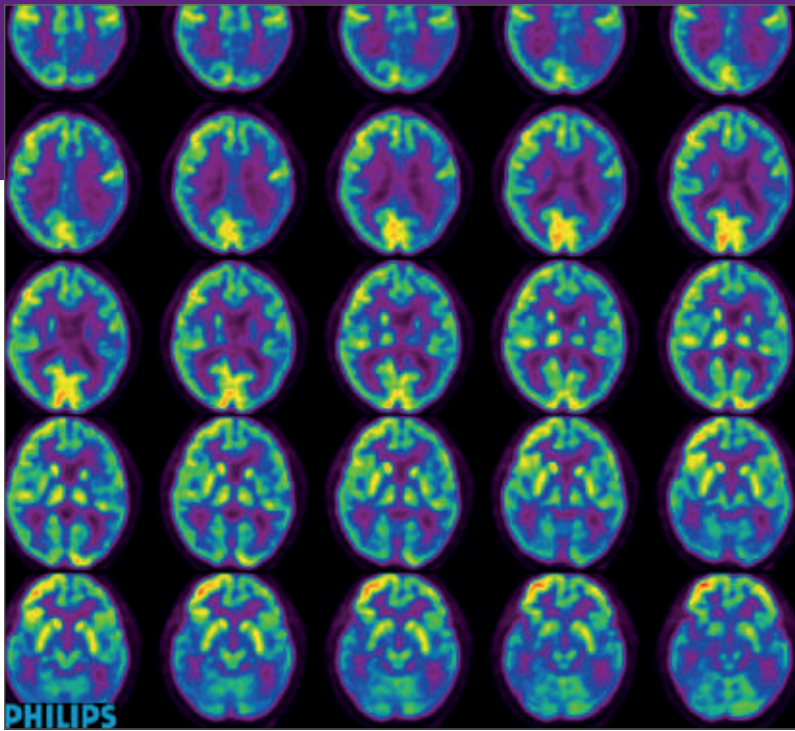
**Conclusion:** Significantly abnormal metabolic scan of the brain, more likely to be due to Alzheimer's type of dementia

### General characteristics

Patient	Female
Age	55 years
Height	1.47 m
Bodyweight	57 kg

### Scan characteristics

18F-FDG: 8.7 mCi  
Time: 10 min Acquisition  
80mAs and 140KV  
DLP: 39.7mGy\*cm



## Case 9

### Non-small cell lung cancer. For Staging

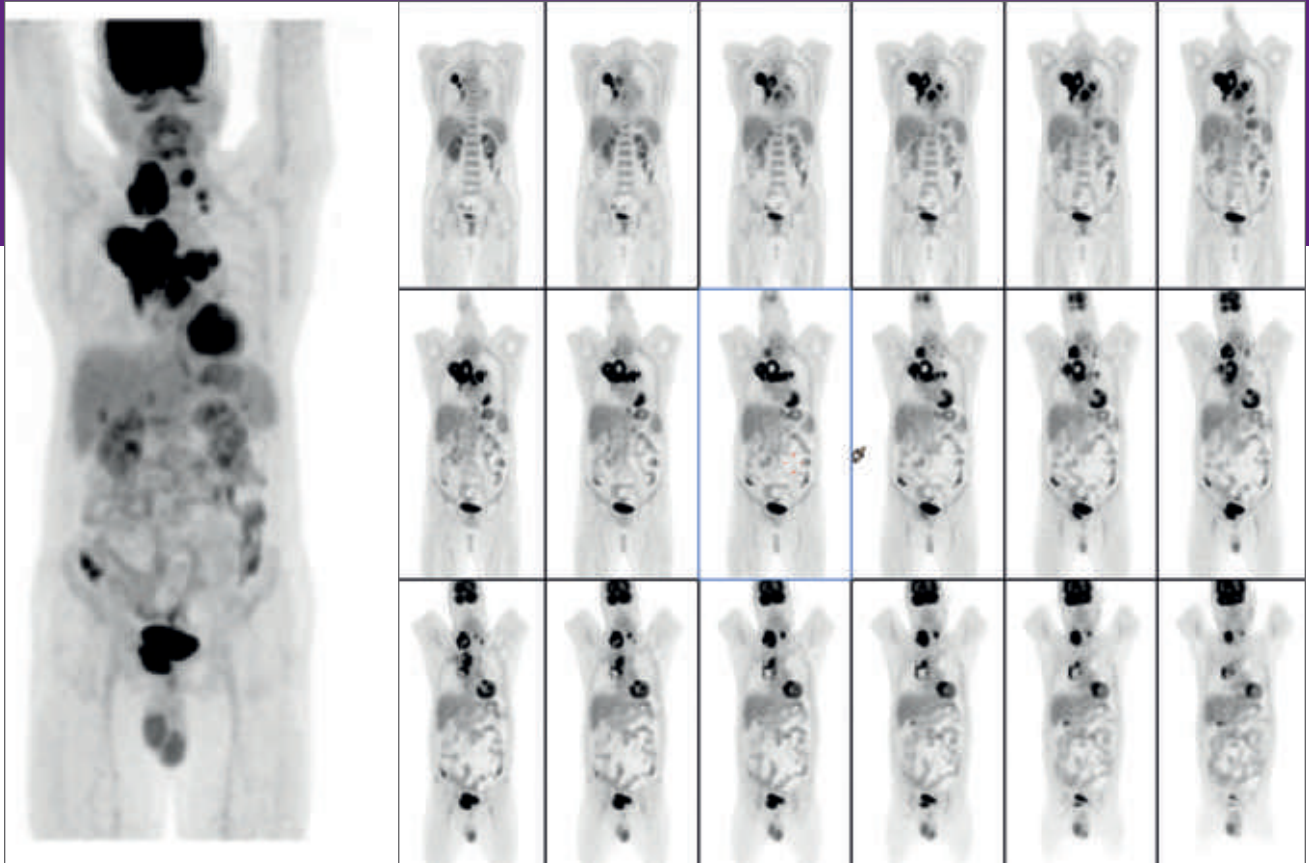
High grade metabolic activity in a large lobulated soft tissue intrapulmonary mass, multiple lymph nodes in neck and sub centimeter pulmonary nodules.

#### General characteristics

Patient	Male
Age	55 years
Height	1.72 m
Bodyweight	62 kg

#### Scan characteristics

18F-FDG: 10.3 mCi
Time/Bed: 60 secs
200mAs and 120KV
DLP: 1231.4mGy*cm



## Case 10

Moderately differentiated squamous cell carcinoma of the lower alveolus with extensive metastasis in lymph nodes, lung, adrenal and bones

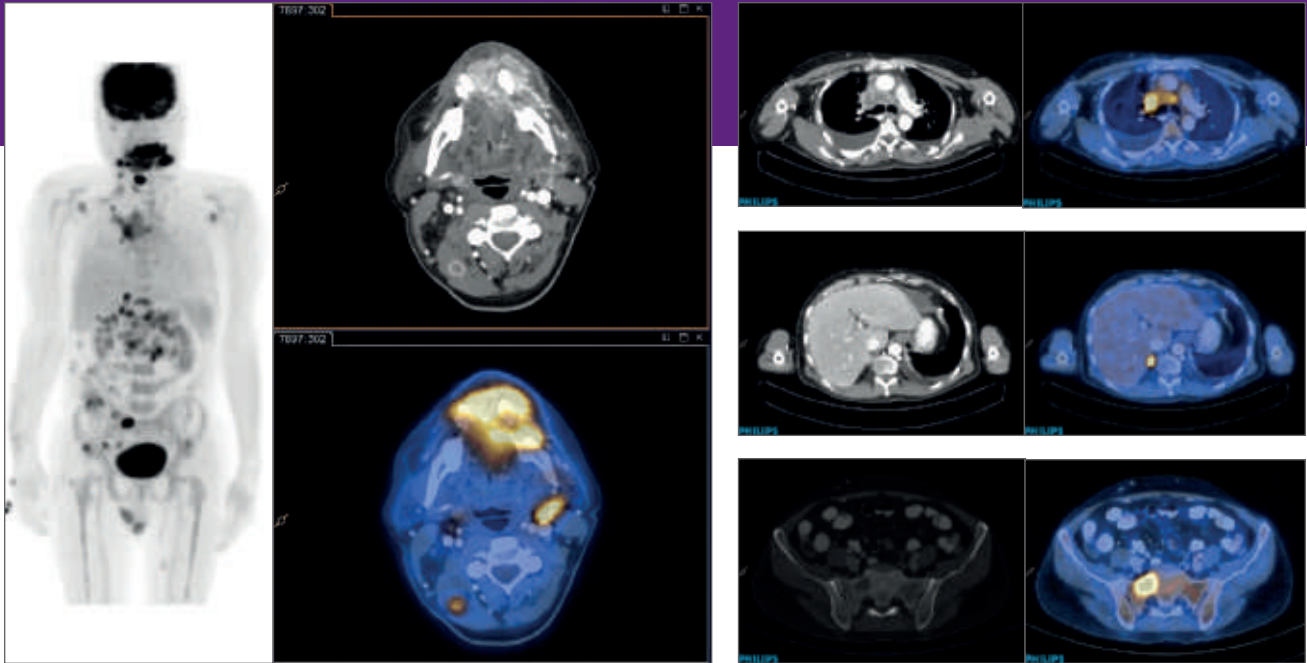
### General characteristics

Patient	Male
Age	61 years
Height	1.60 m
Bodyweight	53 kg

### Scan characteristics

18F-FDG: 8.4 mCi
Time/Bed: 80 sec
200mAs and 120KV
DLP: 1231.4mGy*cm





# Case 11

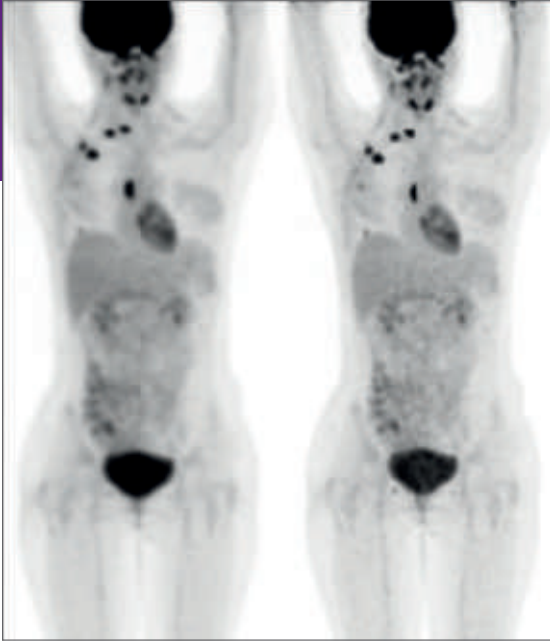
## Ca Breast

### General characteristics

Patient	Female
Age	32 years
Height	1.60 m
Bodyweight	68 kg

### Scan characteristics

18F-FDG: 8.9 mCi  
Time/Bed: 30sec  
200mAs and 120KV  
DLP: 1231.4mGy\*cm



Astonish Recon

Astonish + PSF



Astonish Recon

Astonish + PSF

versitätsinstitut  
für Radiologie

Radiotherapie  
Bettenstation

Nuklear-  
Medizin

↑ Radio logie ↑

Radiotherapie →

# Clinical cases

## University Hospital Salzburg

1. Pulmonary 4D gating	46
3. Gastric lymphoma before and after treatment	48
3. Young Patient with non-small cell lung-ca before and after treatment	50
4. F-18 FDG PET/CT in a patient with soft-tissue sarcoma	52

*“Image quality is not just about single images. We perform about 2,500 PET scans a year – what really matters is that we obtain very good images from 12–16 scans a day, day after day.” With the fivefold patient increase over the last decade, the department invested in a Philips Ingenuity TF PET/CT system at the end of 2013 to manage the demanding workload without sacrificing exceptional images.”*

**Prof. Dr. Christian Pirich**, head of the Department of Nuclear Medicine and Endocrinology, Salzburger Landeskliniken (SALK) University Hospital Salzburg Paracelsus Private Medical University Salzburg

# Case 1

## Pulmonary 4D gating

### Case information

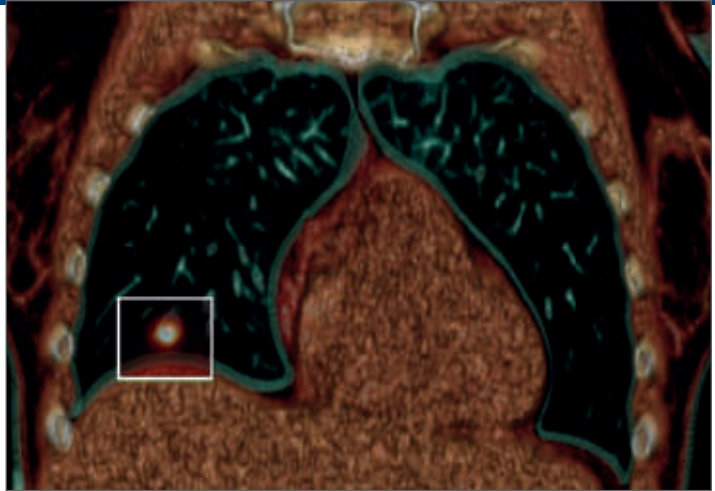
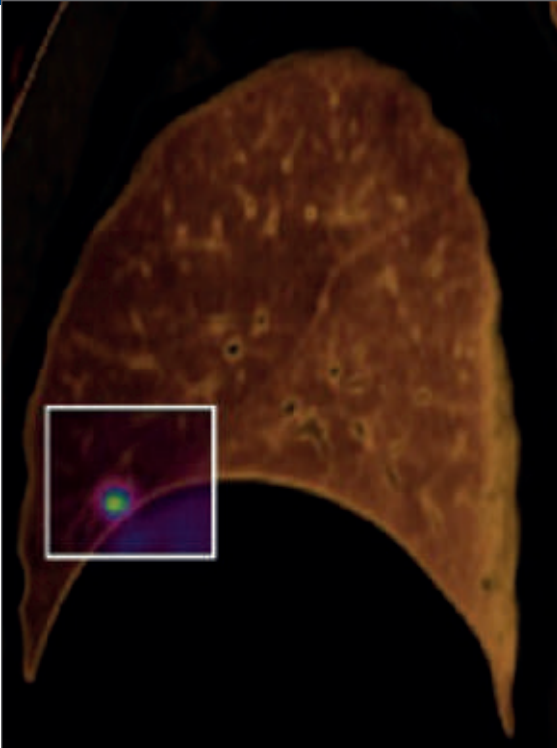
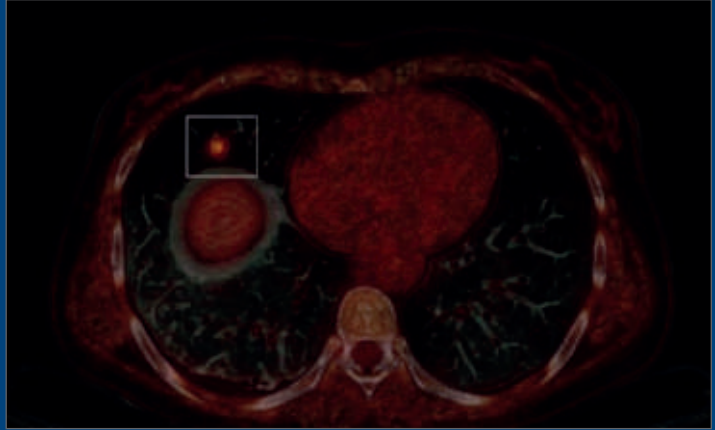
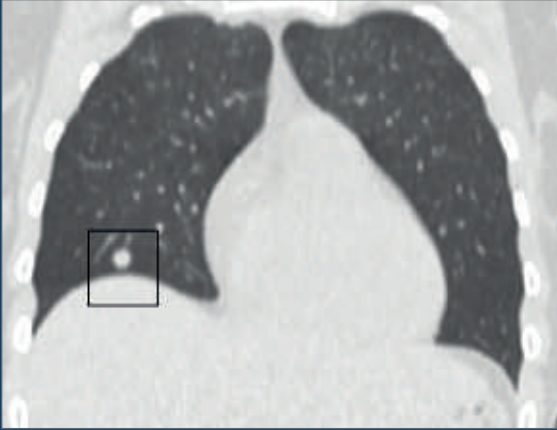
F18 – fdg: 7.0 mCi  
100Kv – average mAs: 45 ; Total body  
100Kv – average mAs 120 ; Pulmo  
IDose<sup>4</sup>: Level 3  
Total 320dlp mGy\*cm; total ctdi 3.5mGy  
75Sec / bed + Pulmo 8min  
Patient with bronchial CA

### Patient information

Female patient with a small, incidentally detected FDG-avid solitary pulmonary nodule close to the diaphragm which was clearly delineable using respiratory gating technique.

Height	1.67 m
Bodyweight	65 kg







## Case 2

# Gastric lymphoma before and after treatment

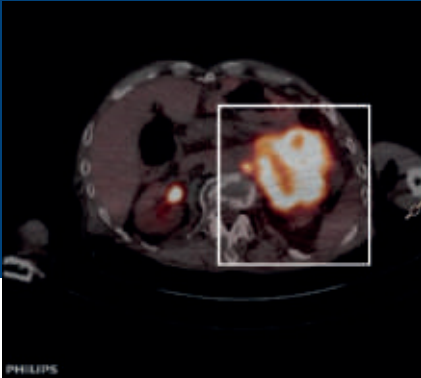
### Case information

F18 – FDG: 6,9 mCi  
100kV – Average mAs: 59  
iDose<sup>4</sup>: Level 3  
210DLP mGy\*cm; CTDi 2.1mGy  
75sec /bed position

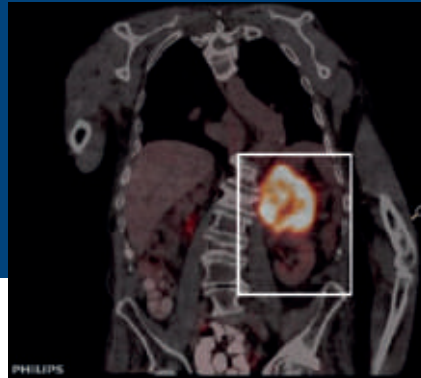
### Patient information

Male patient with gastric lymphoma undergoing both radiation and chemotherapy. Follow-up imaging revealed resolution of the tumor lesions in the stomach while new lesions manifested in multiple cervical lymph nodes.

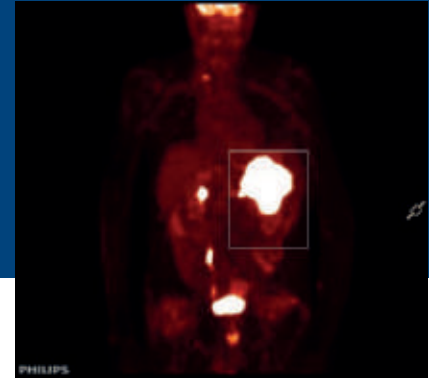
Height 1.71 m  
Bodyweight 69 kg



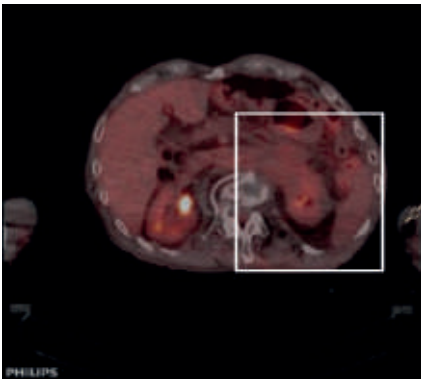
**Axial fused stomach before treatment**



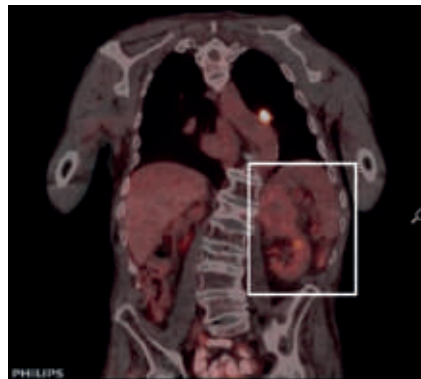
**Coronar fused stomach before treatment**



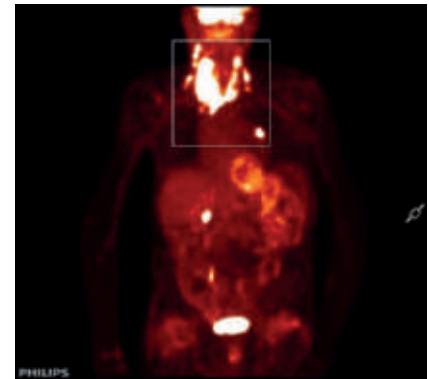
**Stomach Lymphoma before treatment**



**Axial fused stomach after treatment**



**Coronar fused stomach after treatment**



**Stomach Lymphoma after treatment**

## Case 3

# Young Patient with non-small cell lung-ca before and after treatment

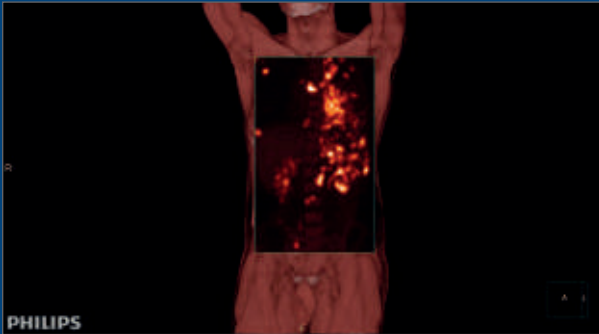
### Case information

F18 – FDG: 7,6 mCi  
100kV – Average mAs: 49  
iDose<sup>4</sup>: Level 3  
170DLP mGy\*cm; CTDi 1.8mGy  
75sec /bed position

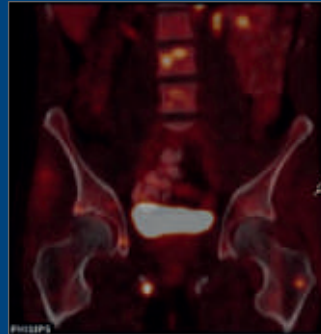
### Patient information

37 year old male patient with non-small cell lung cancer (squamous cell type, positive for ALK mutation status) in the left lobe, baseline tumor stage T2 N3 M1b. Therapy with crizotinib resulted in clinical response with regression of primary tumor, pleural, lymph node, adrenal, muscular and osseous metastases as demonstrated in the follow up PET/CT study.

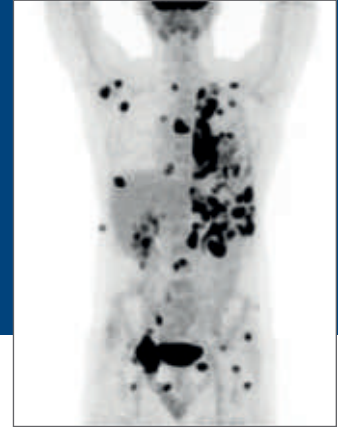
Height 1.74 m  
Bodyweight 75 kg



**Fused volume before treatment**



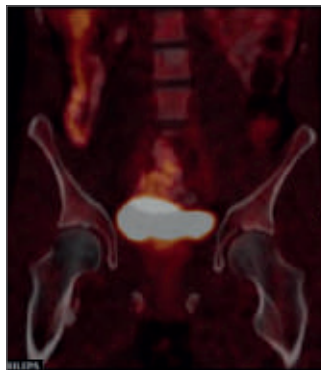
**Pelvis before treatment**



**Before treatment PET volume**



**Fused volume after treatment**



**Pelvis after treatment**



**After treatment PET volume**

# Case 4

## F-18 FDG PET/CT in a patient with soft-tissue sarcoma

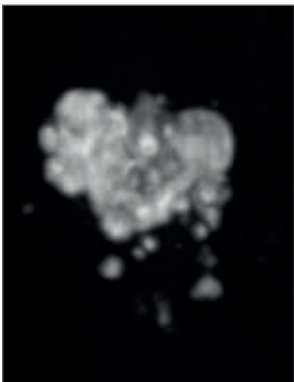
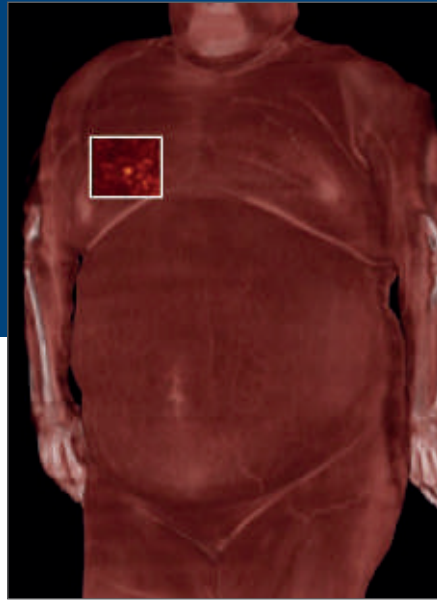
### Case information

F18 – FDG: 10,0 mCi  
120kV – Average mAs: 46  
iDose<sup>4</sup>: Level 3  
390DLP mGy\*cm; CTDi 3mGy  
75sec /bed position

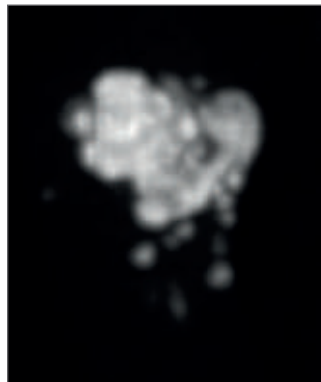
### Patient information

Overweight female patient with huge soft-tissue sarcoma in the right thigh region and previously unknown right breast cancer.

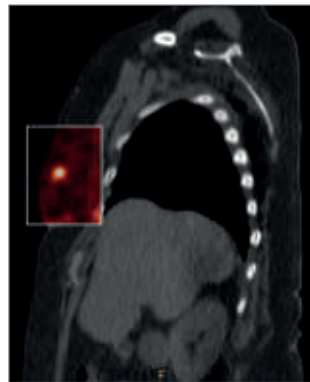
Height 1.75 m  
Bodyweight 150 kg



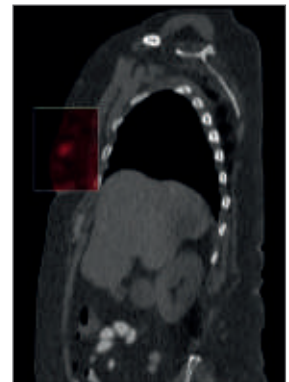
2 mm



4 mm



2 mm



4 mm



*“With Ingenuity TF, we are able to do 2mm PET recons. They quickly became the standard in our practice. The added value is evident. Ingenuity TF is easy to describe: we do more patients in less time with a better image quality.”*

**Piet Jager, MD, PhD.** – Nuclear Medicine specialist





# Clinical cases

## Isala, Zwolle, The Netherlands

- |   |    |  |    |
|---|----|--|----|
| 1. Primary breast cancer with several axillary metastases between 7 and 12 mm   | 56 | 8. FDG PET detects very small lymph nodes in patient with sarcoidosis, most convincingly on 2 mm recons  | 70 |
| 2. Breast cancer primary with axillary metastases 8 mm and very subtle 4 mm parasternal metastatic lesion                         | 58 | 9. MIP images of a patient with a medical history of vasculitis  | 72 |
| 3. Mid-esophageal tumor with mediastinal nodes as small as 3–4 mm picked up on FDG PET and degenerative disease in cervical spine | 60 | 10. Breast cancer restaging with interfering FDG uptake in brown fat   | 74 |
| 4. Burkitt lymphoma in the lower abdomen mimicking intestinal loops with small upper abdominal mets anterior to liver             | 62 | 11. Primary lung tumor (20 mm diameter) with 1 small satellite lesion (10 mm) and two hilar lymph nodes (11 mm and 10 mm)                      | 76 |
| 5. Pulmonary adenocarcinoma with extensive metastatic spread to mediastinum, axilla, bone and soft tissue                         | 64 | 12. Small axillary lymph node metastases in a patient with breast cancer, best appreciated on 2 mm recons                                      | 78 |
| 6. Patient with known colon carcinoma   | 66 | 13. Improved visibility of small lung metastasis (9 and 7 mm) in upper left lung and lower right lung using respiratory gating and 2 mm recons | 80 |
| 7. FDG PET study showing small lung metastasis of thyroid cancer patient  | 68 |  |    |

# Case 1

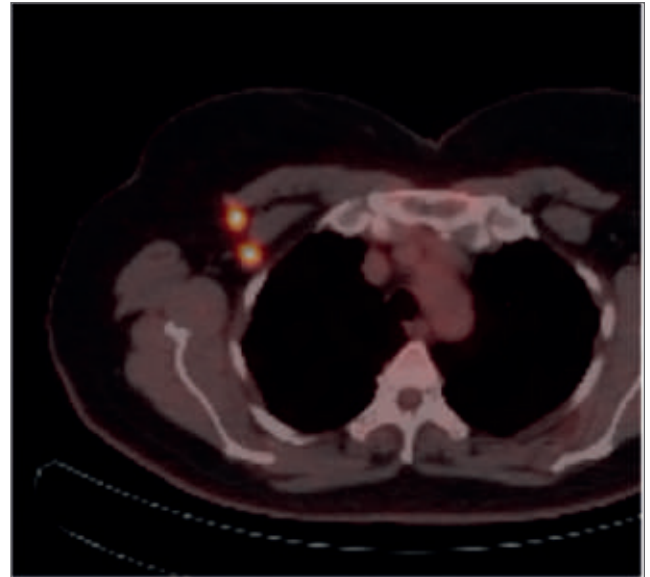
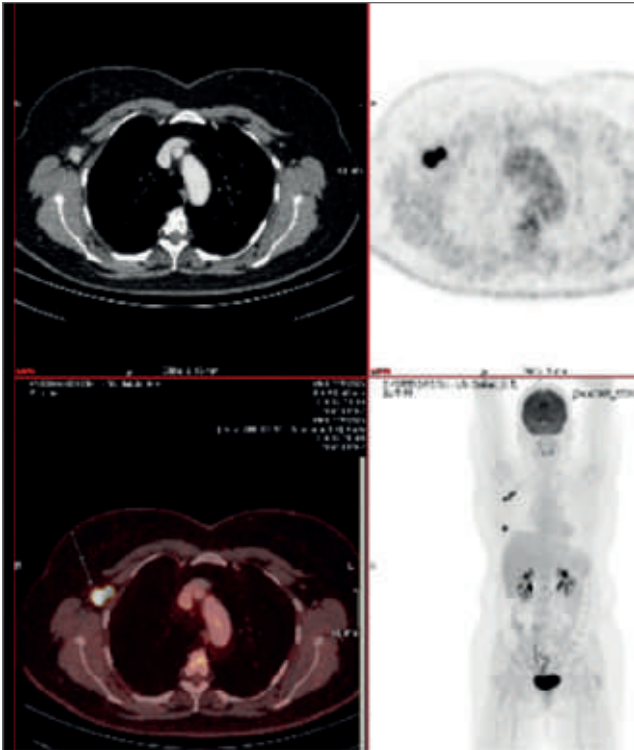
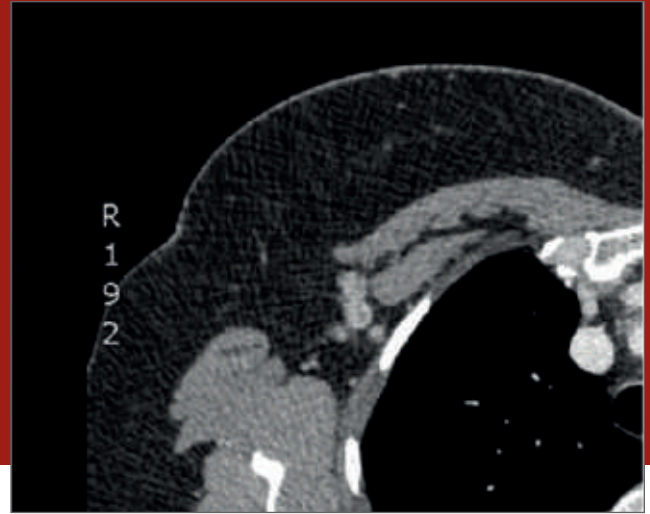
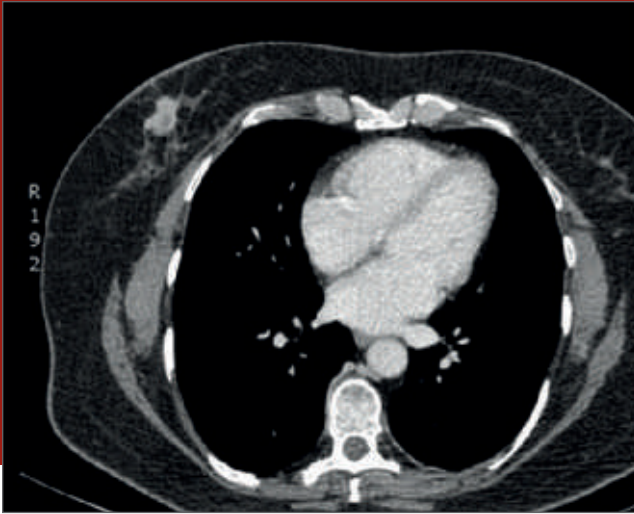
Primary breast cancer with several axillary metastases between 7 and 12 mm

## General characteristics

Patient	Female
Age	60 years
Height	1.66 m
Bodyweight	82 kg
BMI	29.8 kg/m <sup>2</sup>
Indication	Breast cancer restaging

## Scan characteristics

Adm activity (FDG)	8.6 mCi
Acq time	60 sec/bp
Tube voltage	120 kV
Tube current	62 mAs
DLP	532.7 mGy*cm



## Case 2

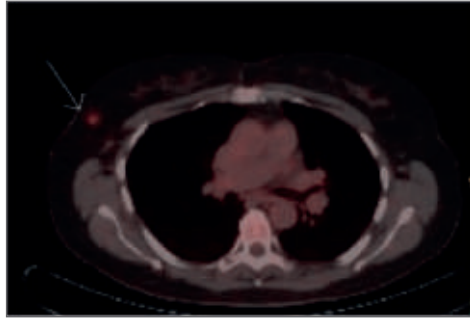
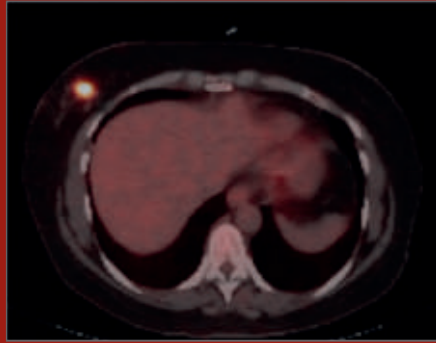
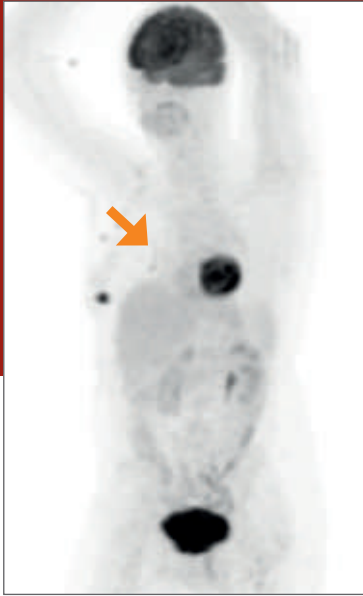
Breast cancer primary with axillary metastases 8 mm and very subtle 4 mm parasternal metastatic lesion

### General characteristics

Patient	Female
Age	59 years
Height	1.72 m
Bodyweight	73 kg
BMI	24.7 kg/m <sup>2</sup>
Indication	Breast cancer staging

### Scan characteristics

Adm activity (FDG)	10.1 mCi
Acq time	60 sec/bp
Tube voltage	120 kV
Tube current	50 mAs
DLP	453.4 mGy*cm



## Case 3

Mid-esophageal tumor with mediastinal nodes as small as 3–4 mm picked up on FDG PET and degenerative disease in cervical spine

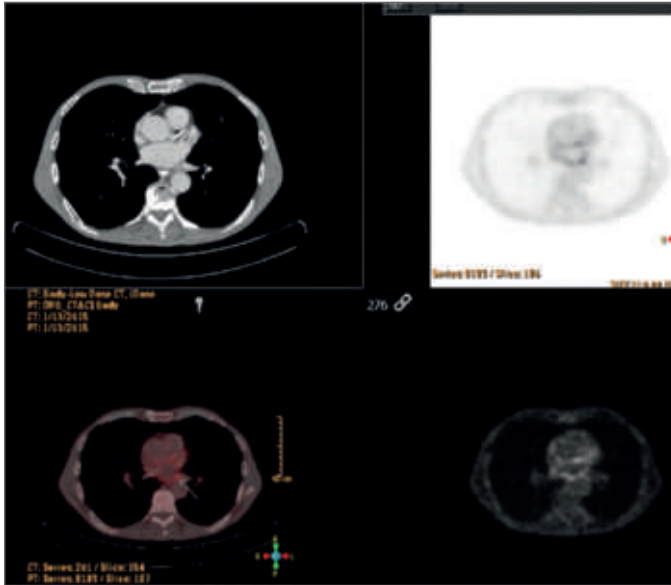
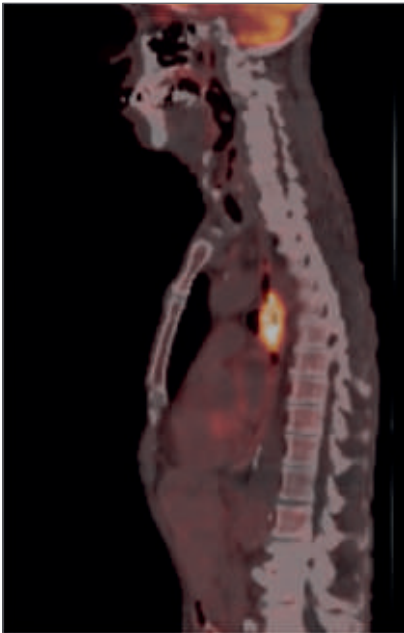
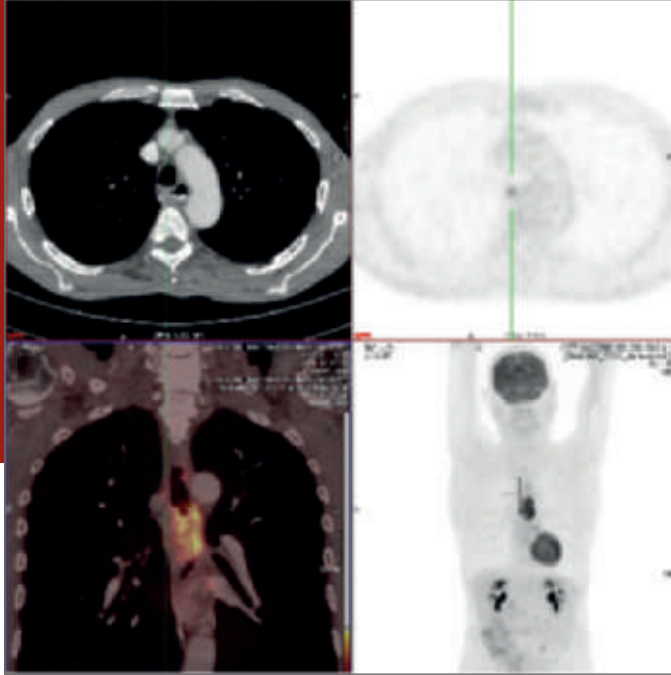
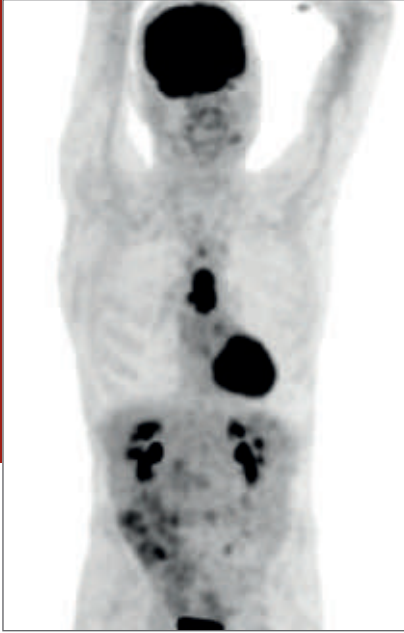
Hotspot cervical spine proves degenerative.

### General characteristics

Patient	Female
Age	59 years
Height	1.72 m
Bodyweight	73 kg
BMI	24.7 kg/m <sup>2</sup>
Indication	Breast cancer staging

### Scan characteristics

Adm activity (FDG)	10.1 mCi
Acq time	60 sec/bp
Tube voltage	120 kV
Tube current	50 mAs
DLP	453.4 mGy*cm





## Case 4

Burkitt lymphoma in the lower abdomen mimicking intestinal loops with small upper abdominal mets anterior to liver

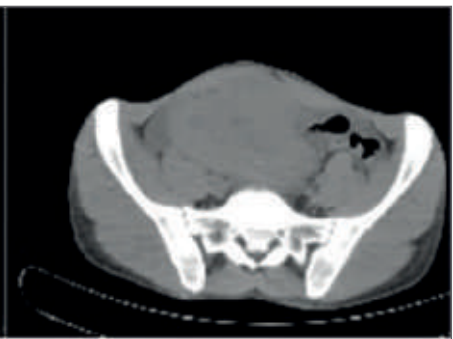
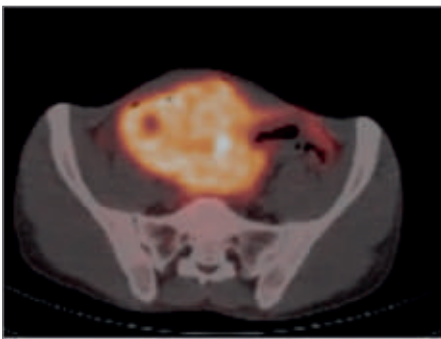
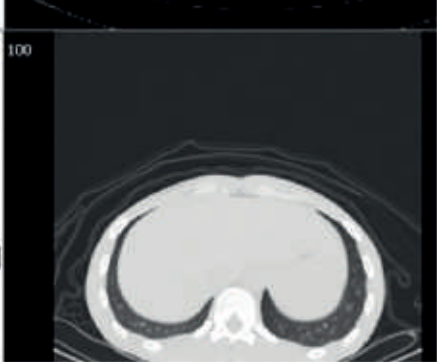
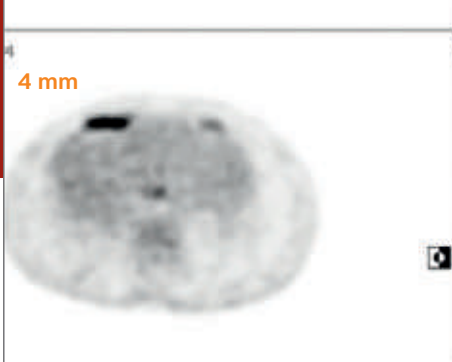
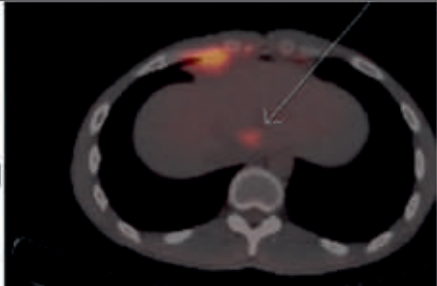
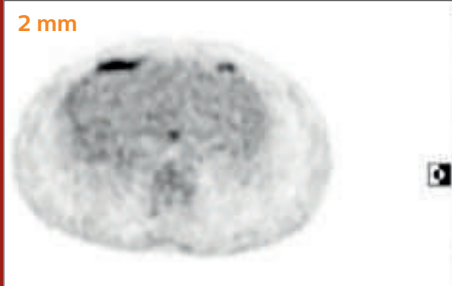
A comparison of 4x4x4mm<sup>3</sup> and 2x2x2 mm<sup>3</sup> voxel size reconstructions.

### General characteristics

Patient	Male
Age	26 years
Height	1.90 m
Bodyweight	61 kg
BMI	16.9 kg/m <sup>2</sup>
Indication	Burkitt lymphoma

### Scan characteristics

Adm activity (FDG)	7.3 mCi
Acq time	60 sec/bp
Tube voltage	120 kV
Tube current	39 mAs
DLP	292.2 mGy*cm



## Case 5

Pulmonary adenocarcinoma with extensive metastatic spread to mediastinum, axilla, bone and soft tissue

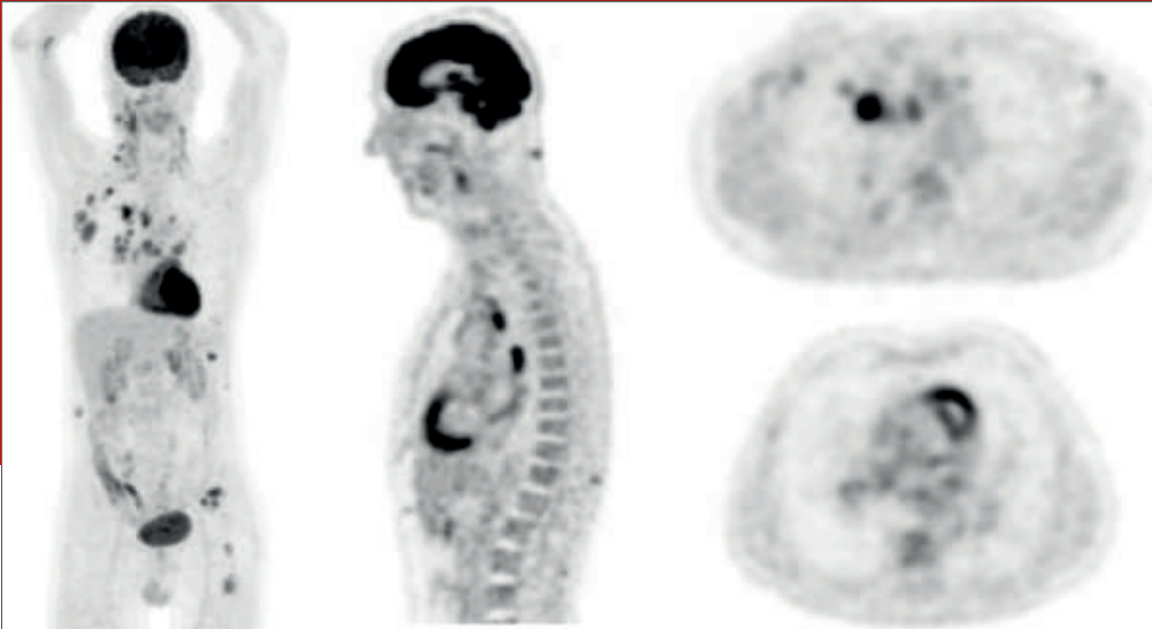
### General characteristics

Patient	Male
Age	67 years
Height	1.86 m
Bodyweight	71 kg
BMI	20.5 kg/m <sup>2</sup>
Indication	Unknown primary tumour

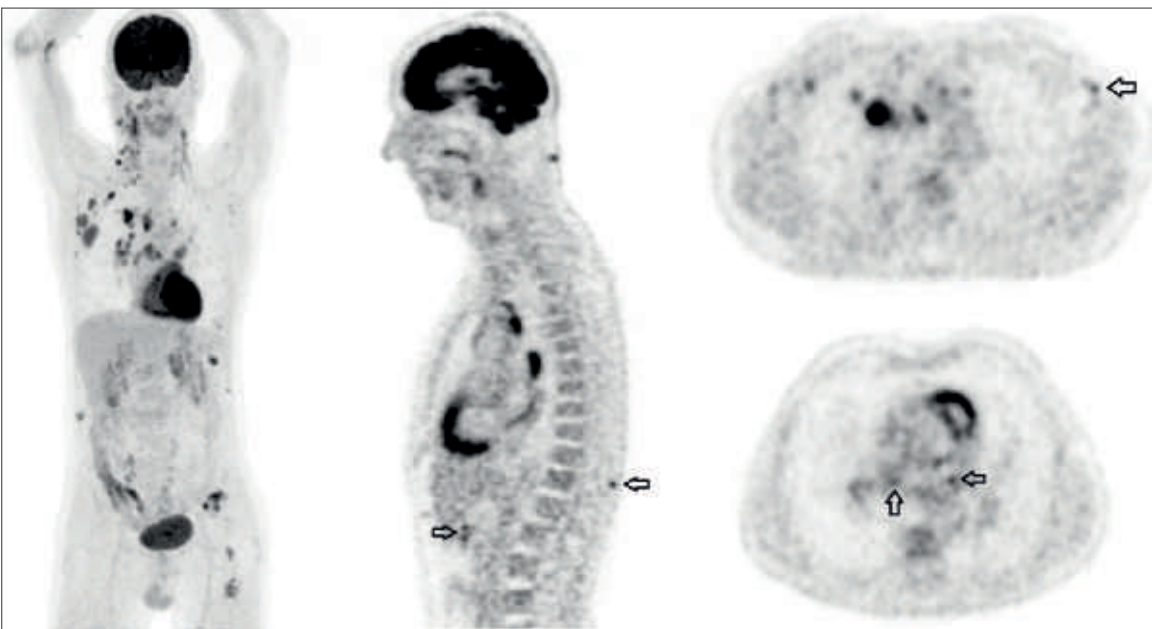
### Scan characteristics

Adm activity (FDG)	9.3 mCi
Acq time	60 sec/bp
Tube voltage	120 kV
Tube current	46 mAs
DLP	350.6 mGy*cm

4 mm recon



2 mm recon



## Case 6

### Patient with known colon carcinoma

On MRI, one large liver metastasis (33 mm) in segment 8 was visualised. Furthermore there was one small doubtful liver lesion, near the vena porta, detected on MRI. To get a final diagnosis, an additional FDG-PET/CT was performed. This scan showed increased FDG-uptake in both liver lesions. The presence of the small metastasis near the vena porta made radiofrequency ablation (RFA) impossible and the patient was therefore treated with stereotactic radiotherapy.

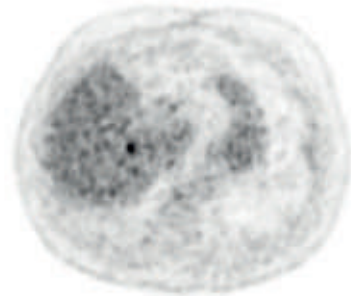
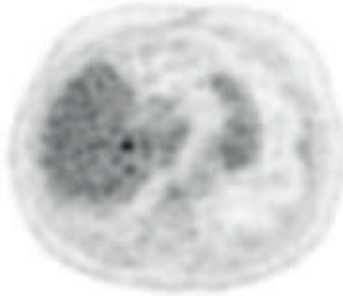
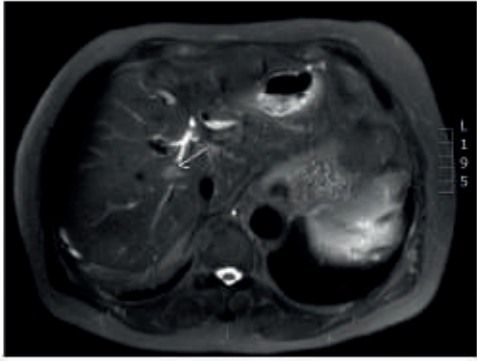
#### General characteristics

Patient	Male
Age	70 years
Height	1.69 m
Bodyweight	85 kg
BMI	29.8 kg/m <sup>2</sup>
Indication	Restaging colon carcinoma

#### Scan characteristics

Adm activity (FDG)	7.6 mCi
Acq time	120 sec/bp
Tube voltage	120 kV
Tube current	75 mAs
DLP	500.8 mGy*cm

Suspected lesion on MRI



4 mm recon

2 mm recon

## Case 7

# FDG PET study showing small lung metastasis of thyroid cancer patient

On the 2 mm PET reconstruction, there is a good correlation in lung metastasis size between PET and CT.

### General characteristics

Patient	Male
Age	66 years
Height	1.82 m
Bodyweight	106 kg
BMI	32.0 kg/m <sup>2</sup>
Indication	FU FDG-PET thyroid carcinoma with metastases

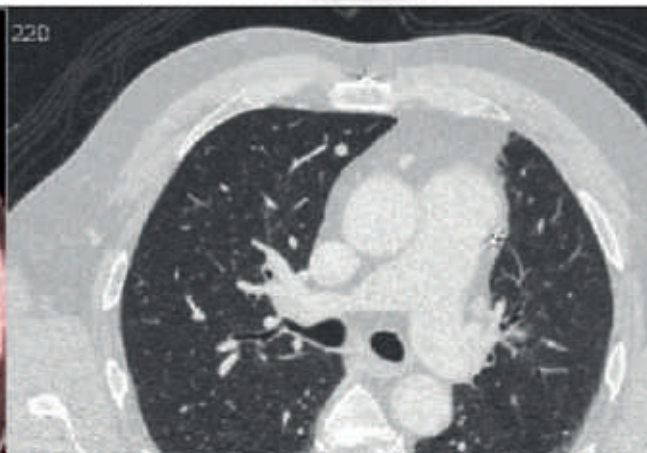
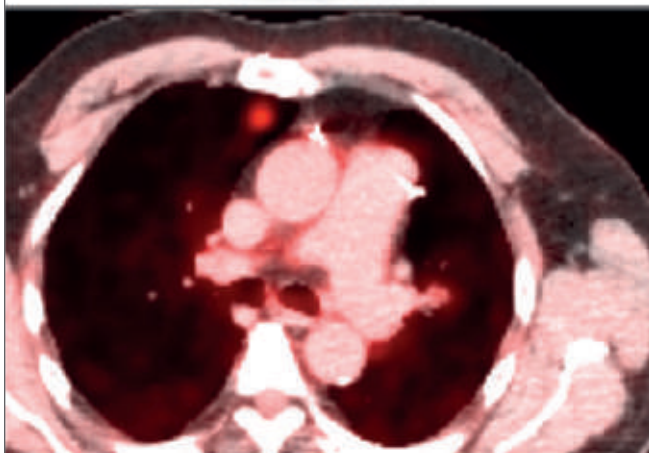
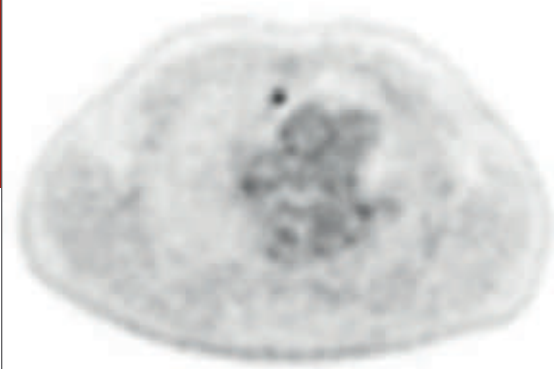
### Scan characteristics

Adm activity (FDG)	11.0 mCi
Acq time	120 sec/bp
Tube voltage	120 kV
Tube current	83 mAs
DLP	585.9 mGy*cm



4 mm recon

2 mm recon



## Case 8

FDG PET detects very small lymph nodes in patient with sarcoidosis, most convincingly on 2 mm recons

### General characteristics

Patient	Male
Age	41 years
Height	1.81 m
Bodyweight	76 kg
BMI	23.2 kg/m <sup>2</sup>
Indication	Evaluation sarcoidosis

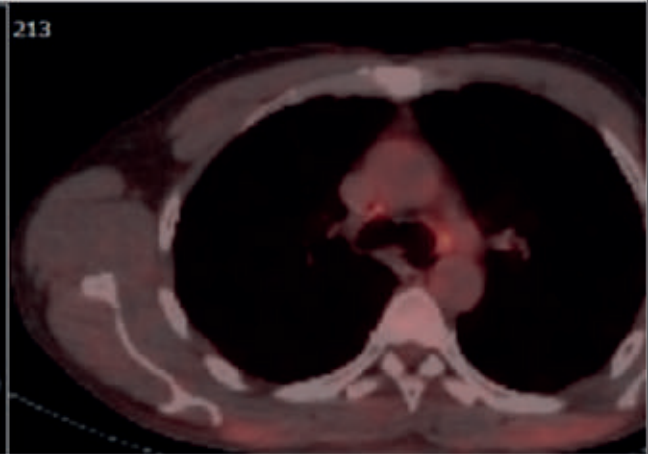
### Scan characteristics

Adm activity (FDG)	10.7 mCi
Acq time	60 sec/bp
Tube voltage	120 kV
Tube current	48 mAs
DLP	336.3 mGy*cm

2 mm recon



4 mm recon



## Case 9

### MIP images of a patient with a medical history of vasculitis

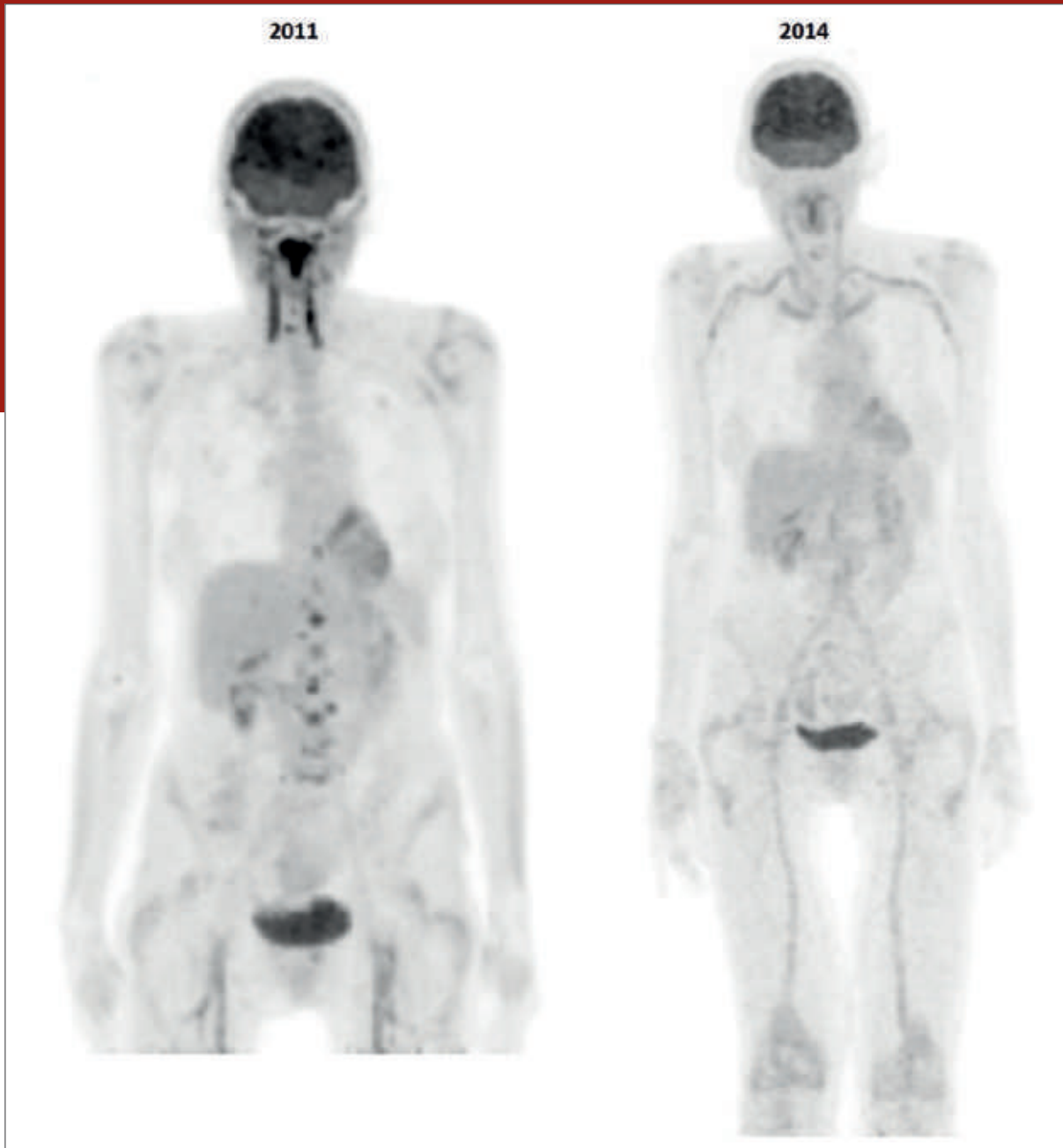
A periodical blood test revealed an increased erythrocyte sedimentation rate (ESR). Therefore, a FDG-PET/CT scan was acquired. This scan showed recurrent vasculitis in several blood vessels in the arms and legs.

#### General characteristics

Patient	Male
Age	41 years
Height	1.81 m
Bodyweight	76 kg
BMI	23.2 kg/m <sup>2</sup>
Indication	Evaluation sarcoidosis

#### Scan characteristics

Adm activity (FDG)	10.7 mCi
Acq time	60 sec/bp
Tube voltage	120 kV
Tube current	48 mAs
DLP	336.3 mGy*cm



## Case 10

### Breast cancer restaging with interfering FDG uptake in brown fat

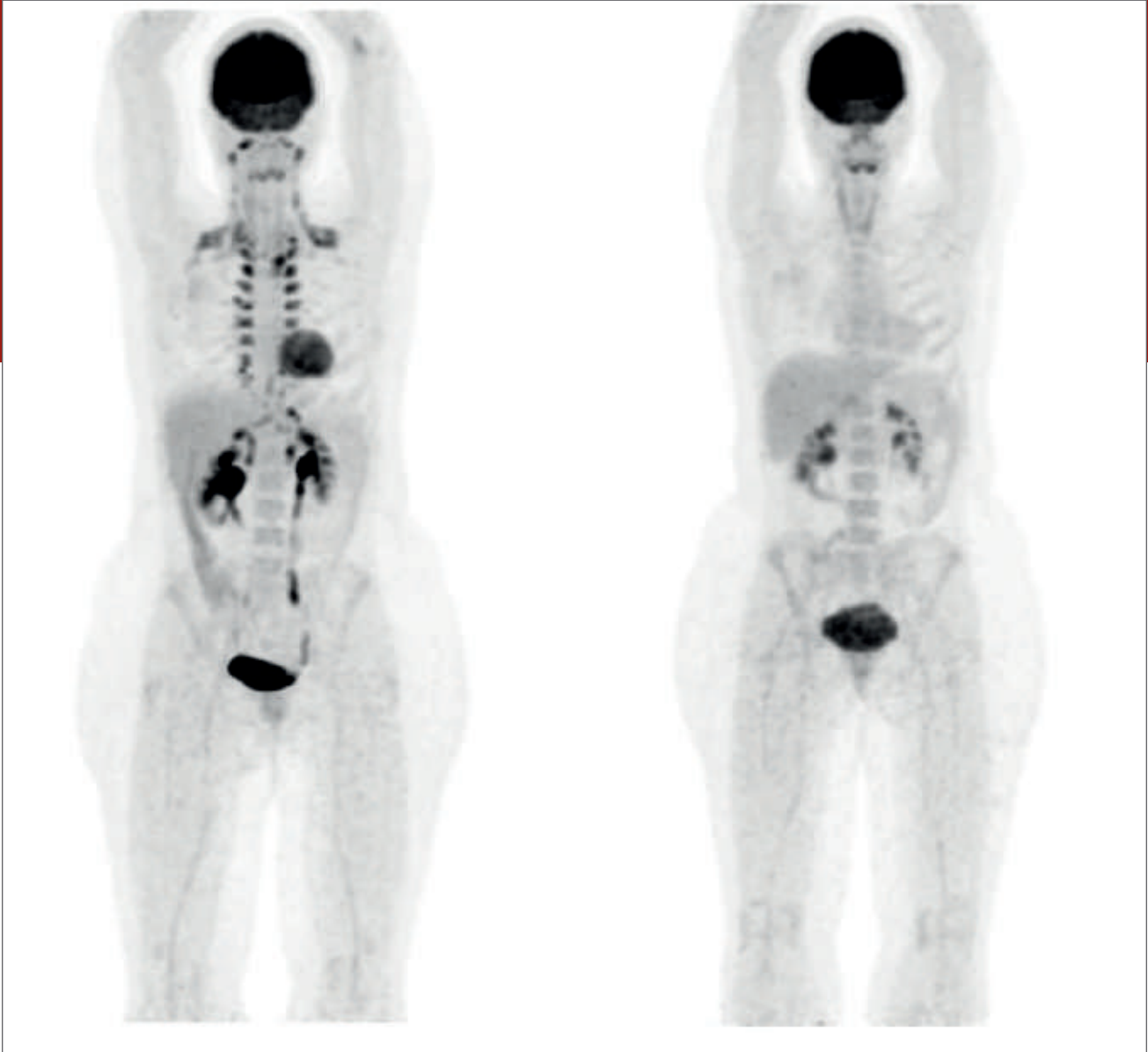
On the first PET scan, a large amount of brown fat was present. This made accurate evaluation of the scan impossible. Therefore, one week later the PET scan was repeated. This time, we administered 40 mg propranolol and 5 mg diazepam, 1 hour prior to the scan. In this patient, this “brown fat protocol” significantly improved the diagnostic quality of the PET scan.

#### General characteristics

Patient	Female
Age	51 years
Height	1.65 m
Bodyweight	83,7 kg
BMI	30.7 kg/m <sup>2</sup>
Indication	Breast cancer restaging

#### Scan characteristics

Adm activity (FDG)	6.8 mCi
Acq time	120 sec/bp
Tube voltage	120 kV
Tube current	62 mAs
DLP	546.3 mGy*cm





# Case 11

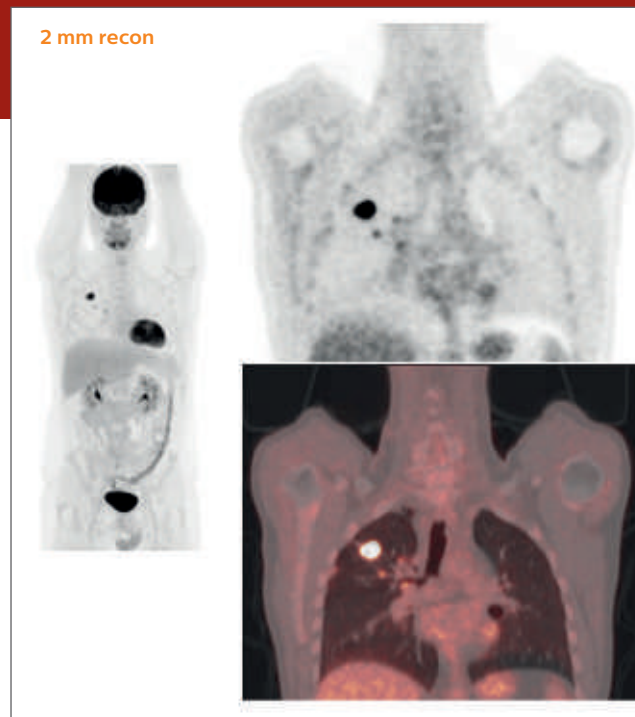
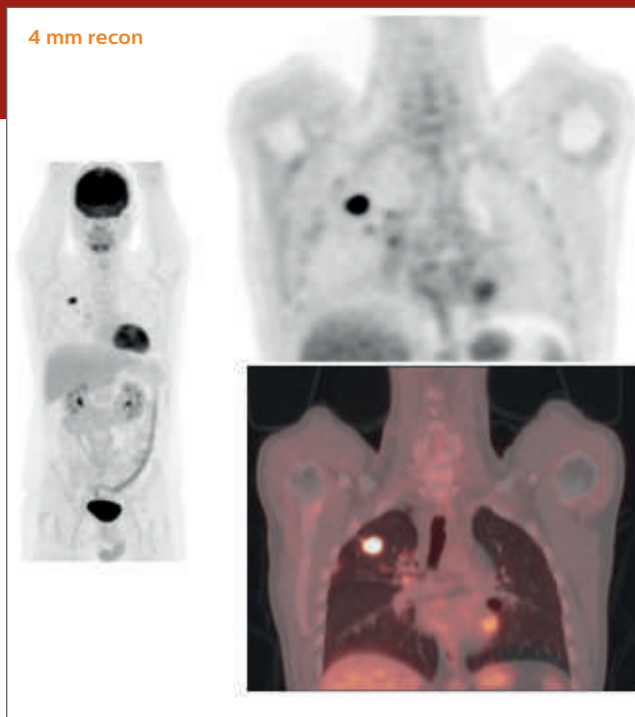
Primary lung tumor (20 mm diameter) with 1 small satellite lesion (10 mm) and two hilar lymph nodes (11 mm and 10 mm)

## General characteristics

Patient	Male
Age	41 years
Height	1.87 m
Bodyweight	90 kg
BMI	25.7 kg/m <sup>2</sup>
Indication	Lung cancer staging

## Scan characteristics

Adm activity (FDG)	10.6 mCi
Acq time	240 sec/bp
Tube voltage	120 kV
Tube current	66 mAs
DLP	466.6 mGy*cm



## Case 12

Small axillary lymph node metastases in a patient with breast cancer, best appreciated on 2 mm recons

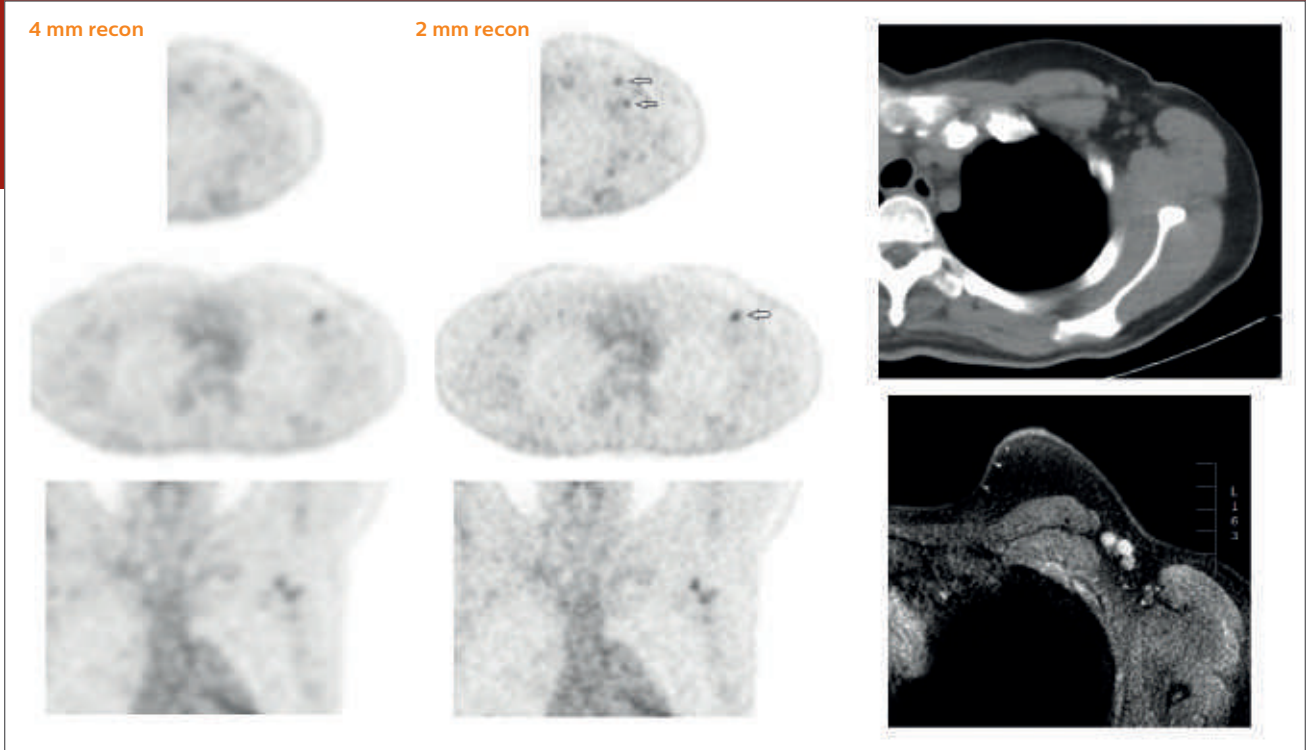
Ultrasound revealed two suspected axillary lymph nodes. Additional FDG-PET/CT confirmed the presence of three small (5-8 mm) PET-positive axillary lymph nodes, which were later also visible on MRI.

### General characteristics

Patient	Female
Age	51 years
Height	1,65 m
Bodyweight	83.7 kg
BMI	30.7 kg/m <sup>2</sup>
Indication	Breast cancer restaging

### Scan characteristics

Adm activity (FDG)	6.8 mCi
Acq time	120 sec/bp
Tube voltage	120 kV
Tube current	62 mAs
DLP	546.3 mGy*cm



## Case 13

Improved visibility of small lung metastasis (9 and 7 mm) in upper left lung and lower right lung using respiratory gating and 2 mm recons

Using 2x2x2 mm<sup>3</sup> voxel reconstruction. 65% increase in SUVmax.

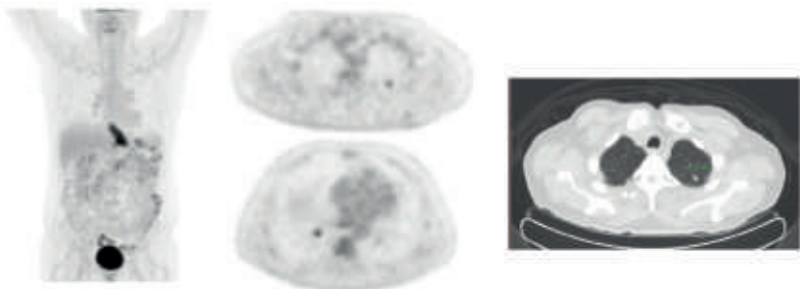
### General characteristics

Patient	Male
Age	71 years
Height	1.81 m
Bodyweight	82,5 kg
BMI	25.2 kg/m <sup>2</sup>
Indication	Oesophageal cancer staging

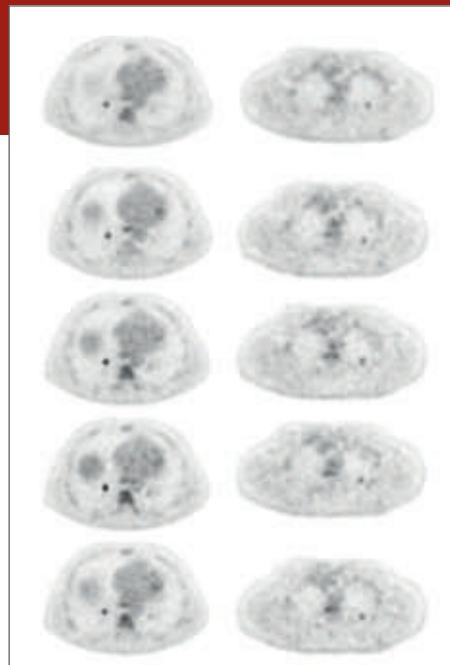
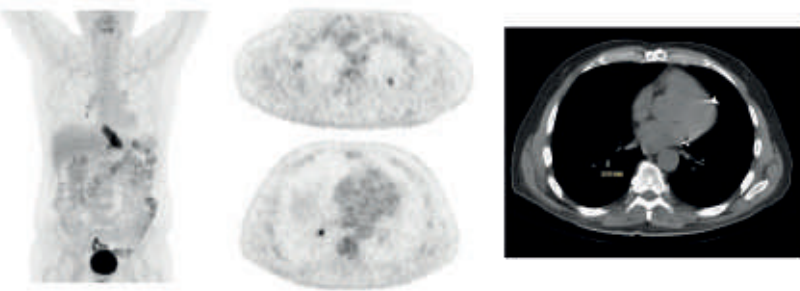
### Scan characteristics

Adm activity (FDG)	7.1 mCi
Acq time	120 sec/bp
Tube voltage	120 kV
Tube current	x mAs
DLP	x mGy*cm

4 mm recon



2 mm recon







# Clinical cases

## University Hospital Cleveland, USA

1. History of lymphoma	84
2. Multiple areas of increased uptake with chest mass	86
3. Mass in the right lower lung with variable uptake	88
4. History of lymphoma	90
5. History of coronary artery disease. A mismatch is seen between the perfusion (NH4) and viability (FDG) images	92
6. Suspicion of coronary artery disease	94

*“ We’re more accurate because it’s easier to see the lesion, and we’re seeing smaller things than we did before.”*

**Dr. Peter F. Faulhaber, MD**, Professor of Radiology, University Hospitals, Seidman Cancer Center, Cleveland, USA

# Case 1

## History of lymphoma

Study demonstrates multiple areas of increased uptake in the neck chest and abdomen.

### General characteristics

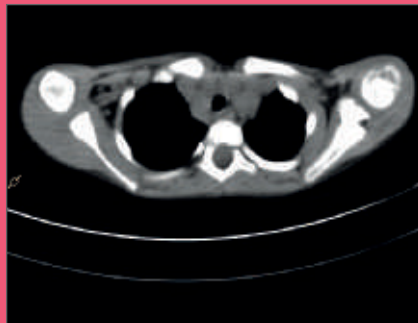
Patient	Male
Age	9 years
Height	1.26 m
Bodyweight	27 kg
BMI	17 kg/m <sup>2</sup>

### Scan characteristics

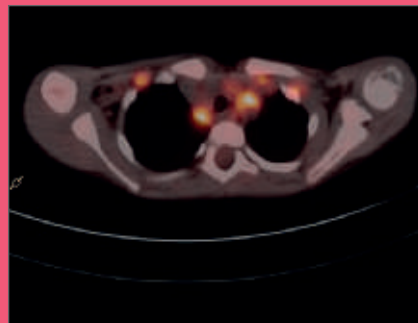
Adm activity	4 mCi F-18 FDG
Acq time	90 sec/bp
Tube voltage	100 kV
Tube current	42 mAs
DLP	1.6 mGy CTDIvol



PET



CT



Fusion



## Case 2

### Multiple areas of increased uptake with chest mass

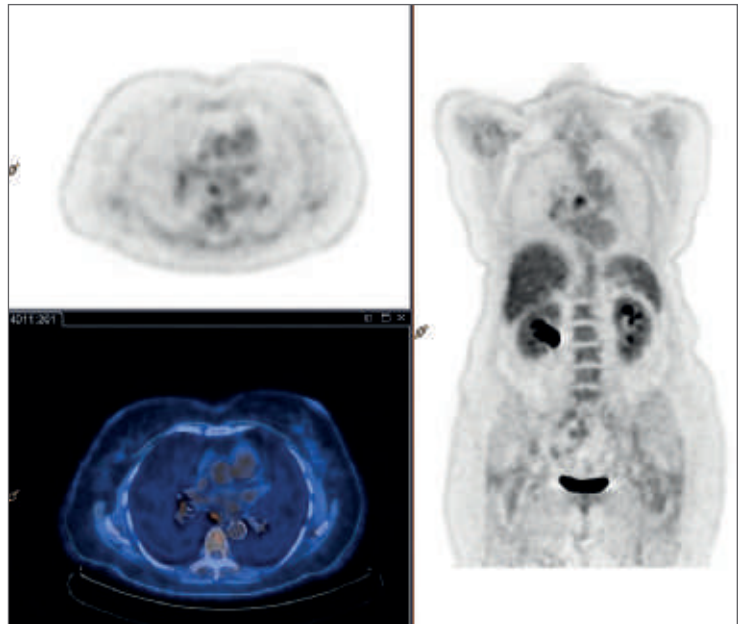
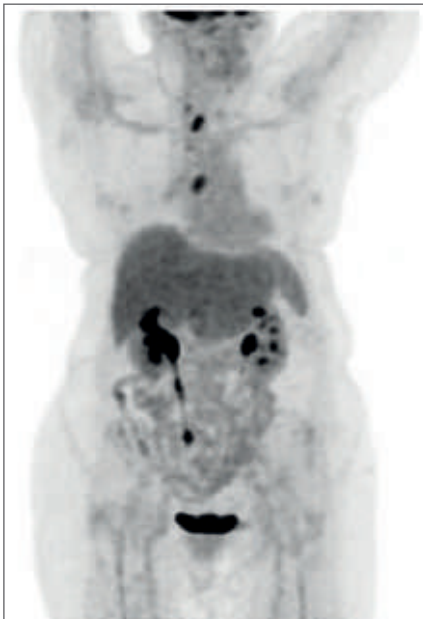
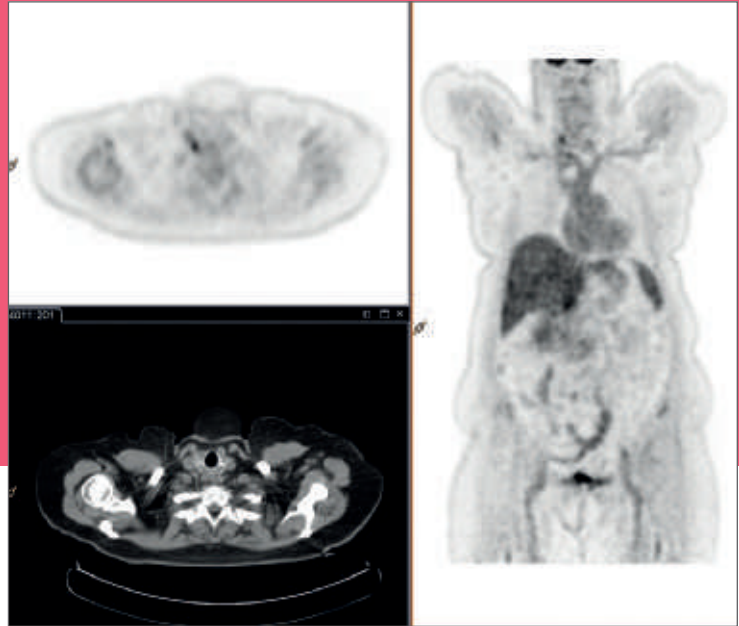
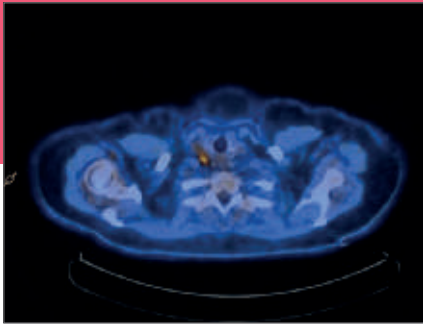
This study demonstrates multiple areas of increased uptake in a 98 kg patient with a chest mass.

#### General characteristics

Patient	Female
Age	70 years
Height	1.74 m
Bodyweight	98 kg
BMI	32,4 kg/m <sup>2</sup>

#### Scan characteristics

Adm activity	11.5 mCi F-18 FDG
Acq time	150 sec/bp
Tube voltage	120 kV
Tube current	144 mAs
DLP	9.4 mGy CTDIvol



## Case 3

### Mass in the right lower lung with variable uptake

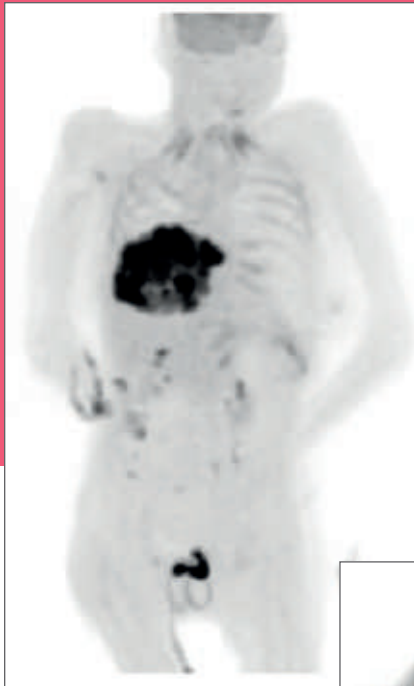
Study demonstrated a large area of increased uptake in the chest, with decreased uptake in the interior.

#### General characteristics

Patient	Female
Age	80 years
Height	1.62 m
Bodyweight	39 kg
BMI	14,9 kg/m <sup>2</sup>

#### Scan characteristics

Adm activity	14 mCi F-18 FDG
Acq time	90 sec/bp
Tube voltage	120 kV
Tube current	68 mAs
DLP	4 mGy CTDIvol





# Case 4

## History of lymphoma

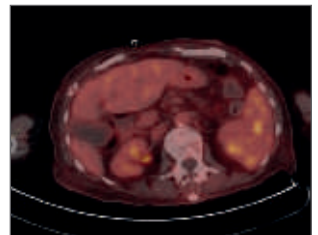
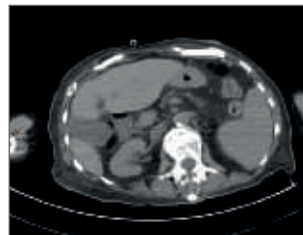
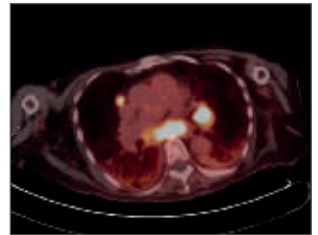
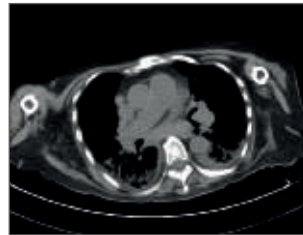
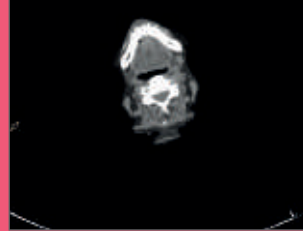
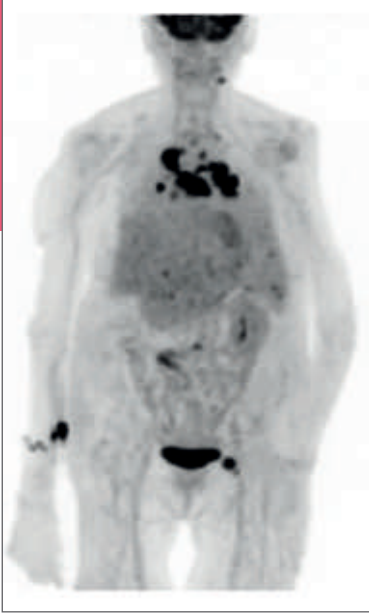
History of lymphoma. Study demonstrates a large area of increased activity in the chest. Smaller areas of increased uptake seen in the neck, pelvis and spleen.

### General characteristics

Patient	Female
Age	78 years
Height	1.62 m
Bodyweight	51 kg
BMI	19,4 kg/m <sup>2</sup>

### Scan characteristics

Adm activity	12.9 mCi F-18 FDG
Acq time	90 sec/bp
Tube voltage	120 kV
Tube current	71 mAs
DLP	4.6 mGy CTDIvol



## Case 5

History of coronary artery disease. A mismatch is seen between the perfusion (NH<sub>4</sub>) and viability (FDG) images

### General characteristics

Patient	Female
Age	86 years
Height	1.60 m
Bodyweight	52 kg
BMI	20,3

### Scan characteristics rest

Adm activity: 11 mCi N-13 NH<sub>4</sub>  
Acq time: 8 min/frame

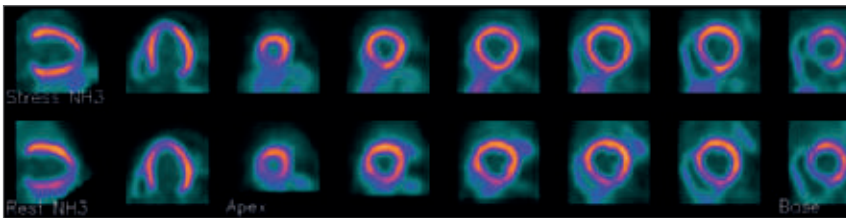
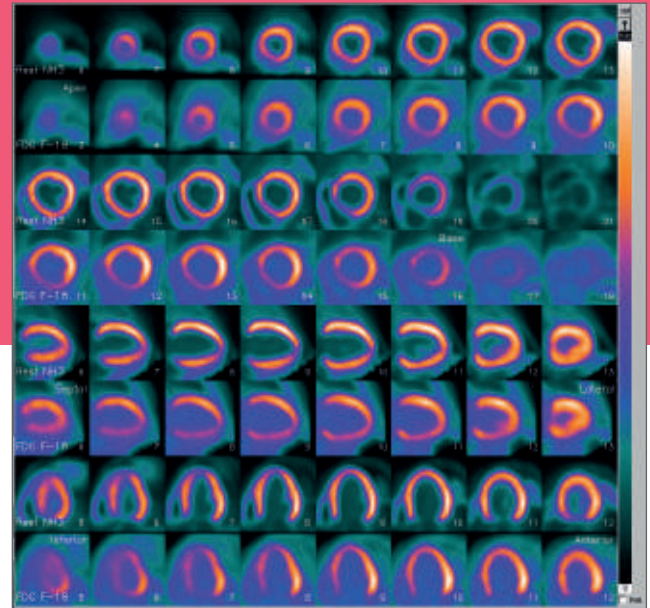
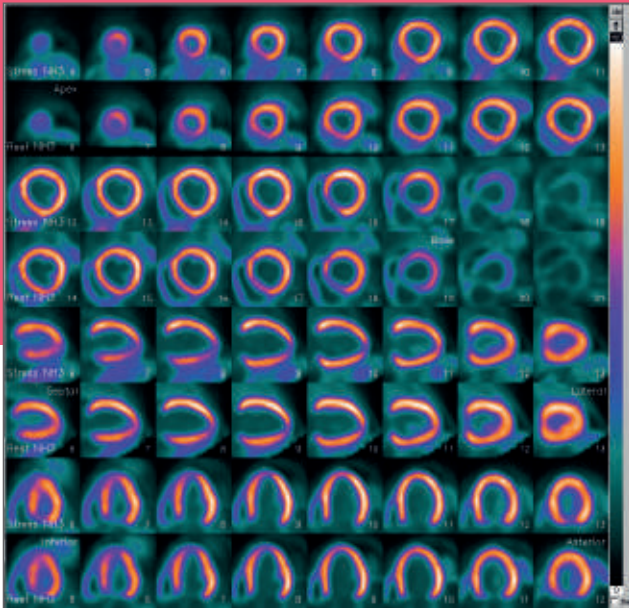
### Stress

Adm activity: 14 mCi N-13 NH<sub>4</sub>  
Acq time: 5 min/frame

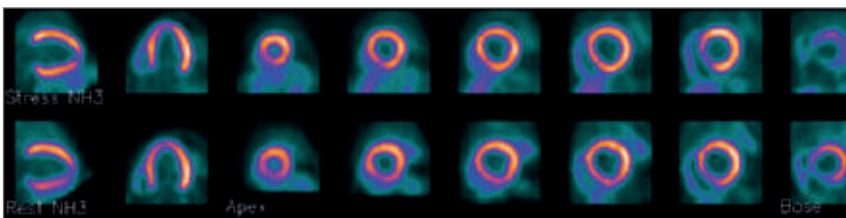
### Scan characteristics Viability

Adm activity: 13.4 mCi F-18 FDG  
Acq time: 10 min/frame

Tube voltage 120 kV  
Tube current 124 mAs  
DLP 8.1 mGy CTDivol



End Diastole



End Systole

# Case 6

## Suspicion of coronary artery disease

### General characteristics

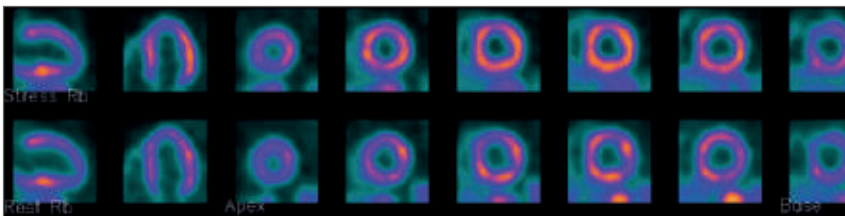
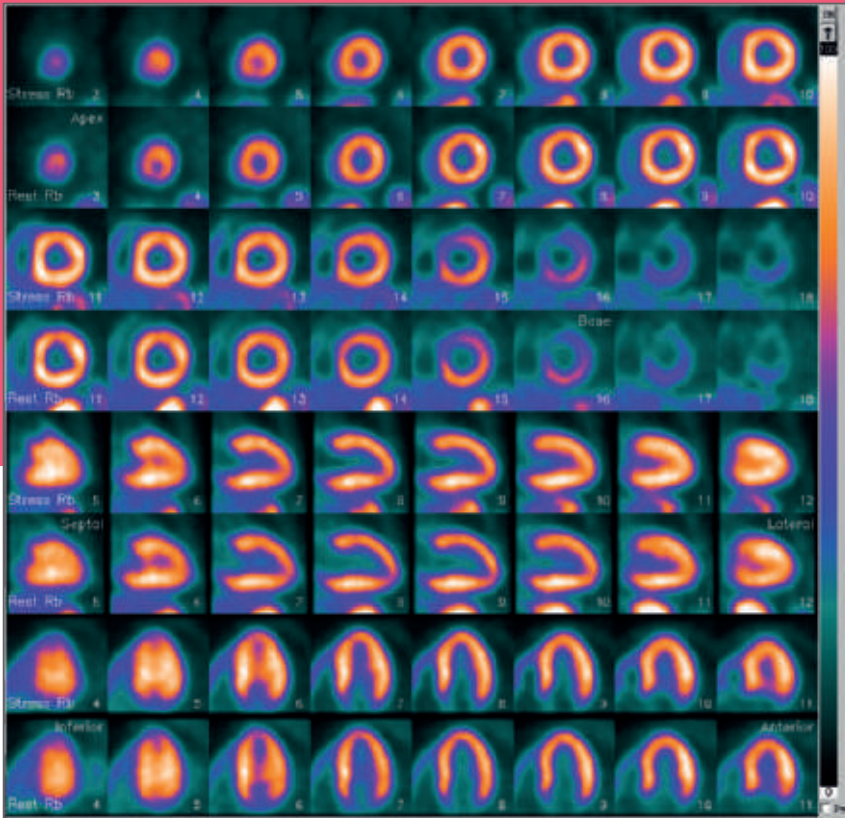
Patient	Male
Age	38 years
Height	1.75 m
Bodyweight	77 kg
BMI	25,1

### Scan characteristics rest

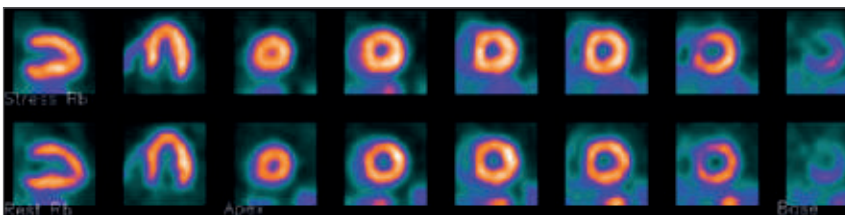
Adm activity: 25 mCi Rb-82 RbCl  
Acq time: 4.5 min/frame

### Scan characteristics Viability

Adm activity: 25 mCi Rb-82 RbCl  
Acq time: 4.5 min/frame  
  
Tube voltage 120 kV  
Tube current 124 mAs  
DLP 8.1 mGy CTDivol



End Diastole



End Systole

