

EDUCATION SERIES – RARE MALIGNANCIES

NUCLEAR MEDICINE – DIAGNOSIS AND THERAPEUTIC ASPECTS

AMEYA PURANIK

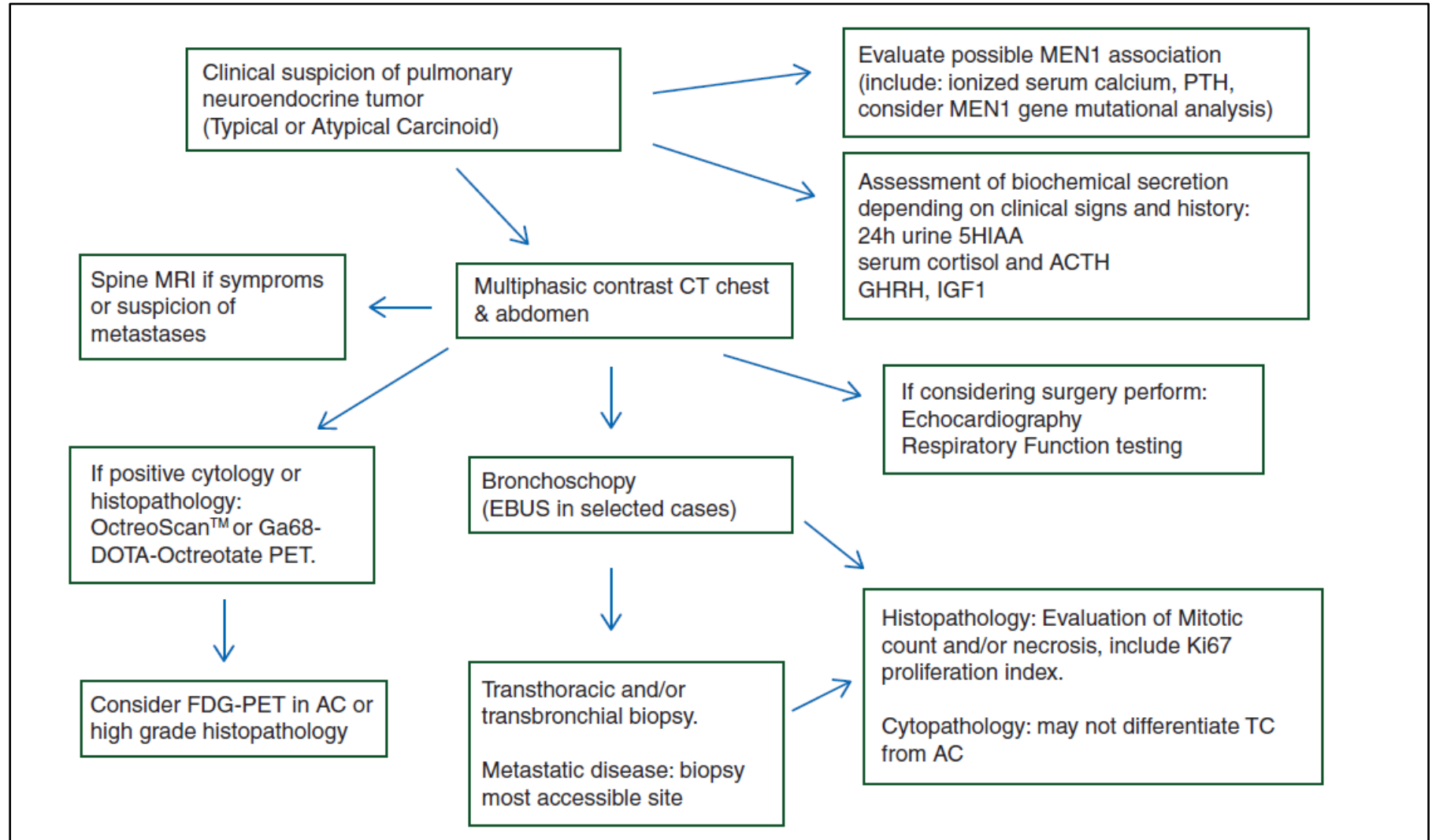
Lung Carcinoid

- Typical carcinoid (TC) tumors represent 1%–2% of lung tumors.
- In addition, 5%–15% have lymph node metastasis at presentation and 3% have distant metastasis.
- Atypical carcinoid (AC) tumors represent 0.1%–0.2% of lung tumors, 40%–50% with LN mets at presentation, and 20% with distant mets

TC Stage	10-yr DSS	AC Stage	10-yr DSS
I	96	I	88
II	85	II	75
III	81	III	47
IV	59	IV	18

Pulmonary neuroendocrine (carcinoid) tumors: European Neuroendocrine Tumor Society expert consensus and recommendations for best practice for typical and atypical pulmonary carcinoids

Annals of Oncology 26: 1604–1620, 2015



Somatostatin analogues (SSA) are commonly used for advanced lung NETs, without specific evidence until very recently, with publication of the *LUNA trial*.

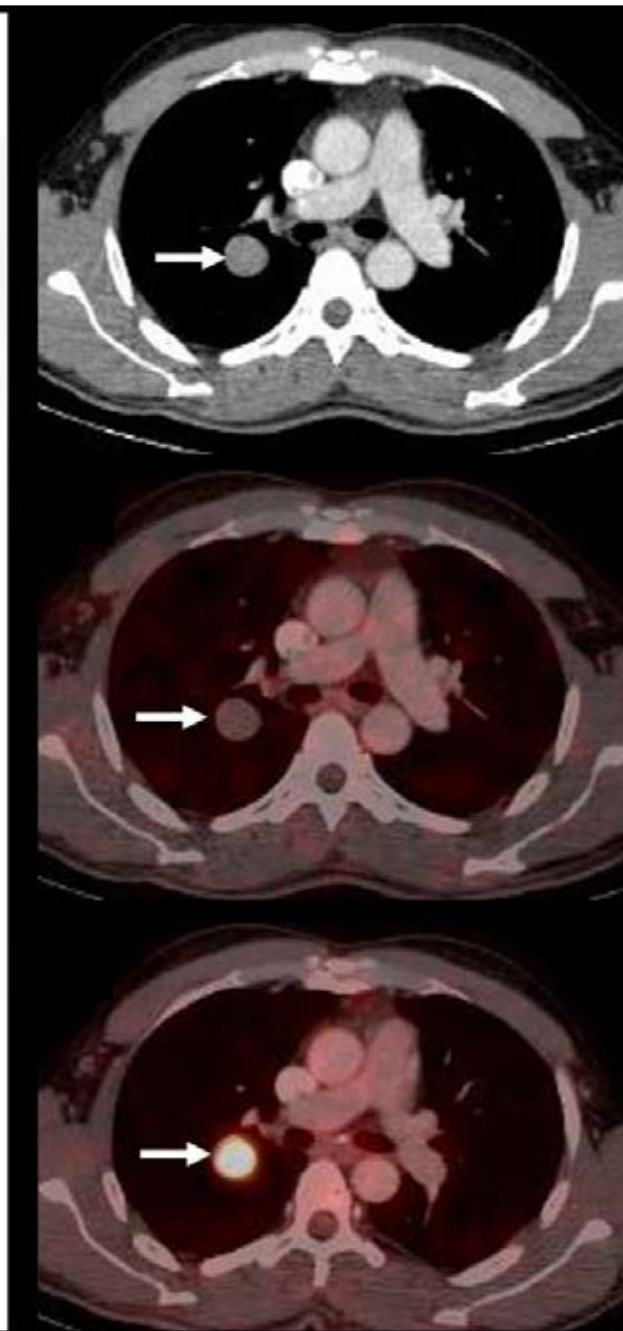
This phase II study randomised patients with lung and thymic NETs to receive long acting pasireotide, everolimus, or a combination of both agents, and showed a

39.0% DCR with pasireotide alone

33.3% for everolimus alone and

58.5% for the combination.

Adverse events (AEs) requiring dose adjustment or interruption were reported in 24%, 52%, and 61% of patients in the pasireotide, everolimus, and the combination arm, respectively





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Seminars in Diagnostic Pathology

journal homepage: www.elsevier.com/locate/sem_dp

Review article

Recent advances and current controversies in lung neuroendocrine neoplasms[☆]

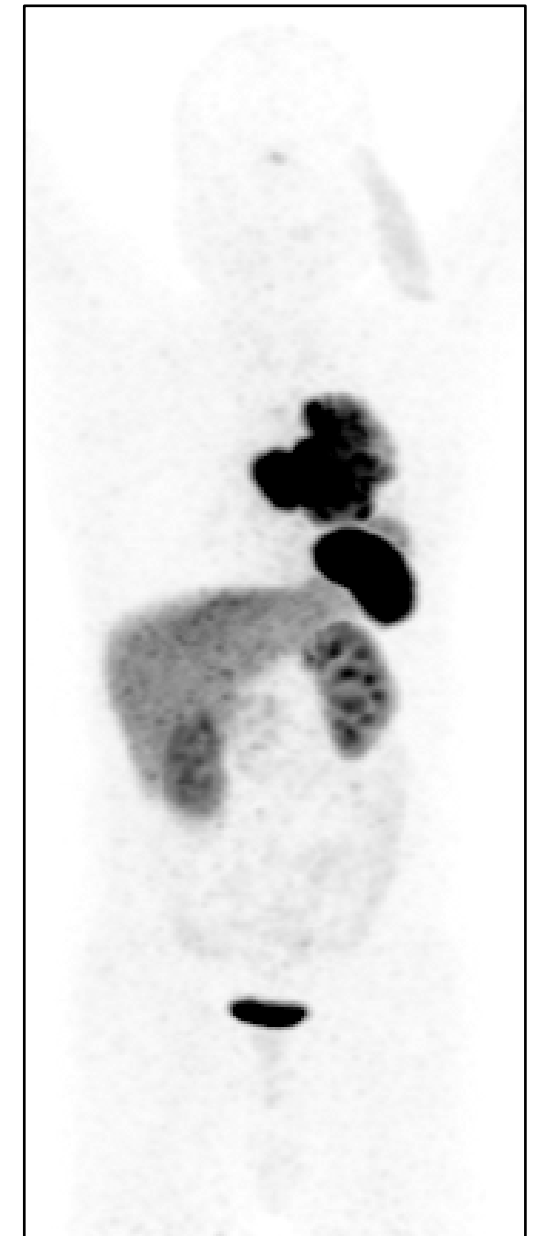
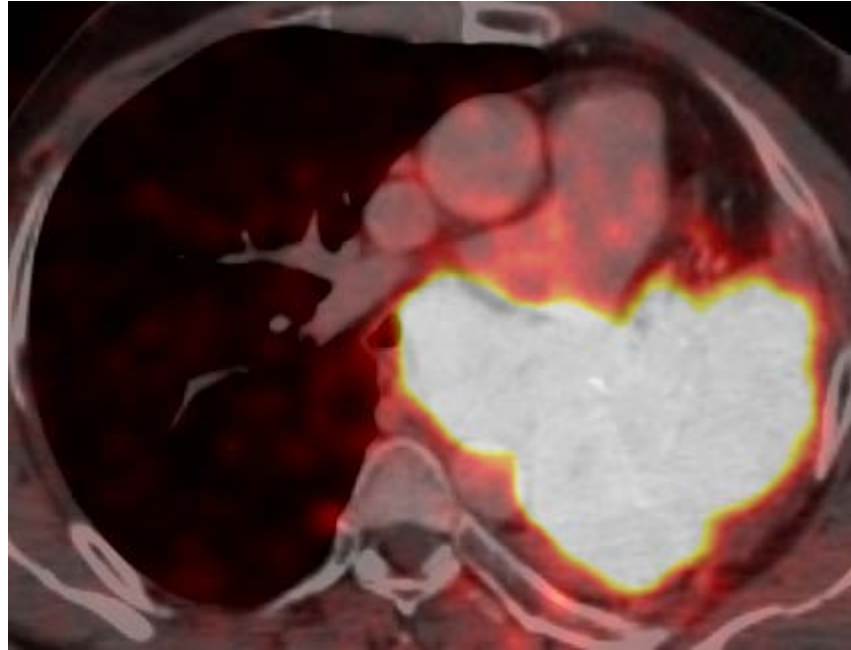
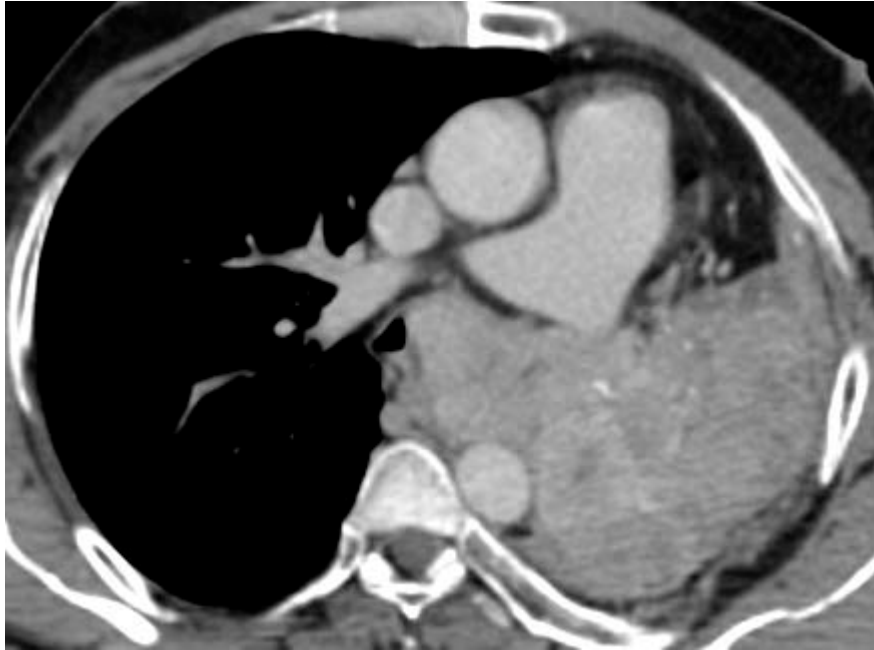
Tumor grading	NED	Diagnostic criteria for lung	Lung terminology
Low grade	WD	<2 mitosis per 2 mm ² ; no necrosis	Typical carcinoid, G1
Intermediate grade	WD	2–10 mitoses per 2 mm ² and/or punctate necrosis	Atypical carcinoid, G2
High grade	WD	>10 mitoses per 2 mm ² and/or more extensive necrosis	Carcinoid with increased proliferation rates and/or Ki-67
High grade	PD	>10 mitoses per 2 mm ² ; extensive necrosis; small cells (even chromatin & inconspicuous nucleoli)	NEC, small cell (SCLC), pure forms & combined variants
	PD	>10 mitoses per 2 mm ² ; extensive necrosis; large cells (coarser chromatin, conspicuous nucleoli, NE markers)	NEC, large cell (LCNEC), pure forms & combined variants

46/M, beedi smoker (Aug 2019)

c/o increased breathlessness since 2 months, cough with whitish expectoration

FOB - growth in LMB with extrinsic compression of LMB

Biopsy- Typical carcinoid



DOTATATE PET/CT

Original article

Does ^{68}Ga -DOTA-NOC-PET/CT impact staging and therapeutic decision making in pulmonary carcinoid tumors?

Nilendu C. Purandare^a, Ameya Puranik^a, Archi Agrawal^a,
Sneha Shah^a, Rajiv Kumar^b, Sabita Jiwnani^c, George Karimundackal^c,
C.S. Pramesh^c and Venkatesh Rangarajan^a

Nearly 10.2% of TC showed distant metastatic disease

SUV max on FDG PET was higher for AC than TC

So when should FDG PET be added to DOTANOC PET..??

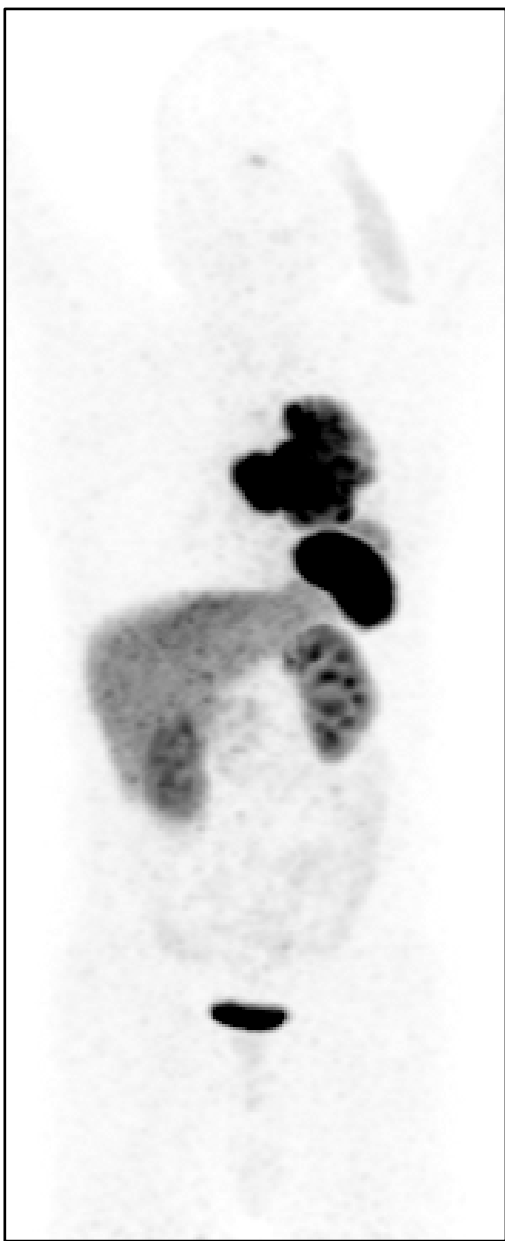
Theranostic implications of molecular imaging phenotype of well-differentiated pulmonary carcinoid based on ^{68}Ga -DOTATATE PET/CT and ^{18}F -FDG PET/CT

[Lamiaa Zidan](#) , [Amir Iravani](#), [Grace Kong](#), [Tim Akhurst](#), [Michael Michael](#) & [Rodney J Hicks](#)

56 patients (median age 66.5 years, 32 female), 22 had TC, and 34 had AC.

Distant metastases were seen in 32% of TC and 94% of AC

50% patients with AC showed FDG positivity

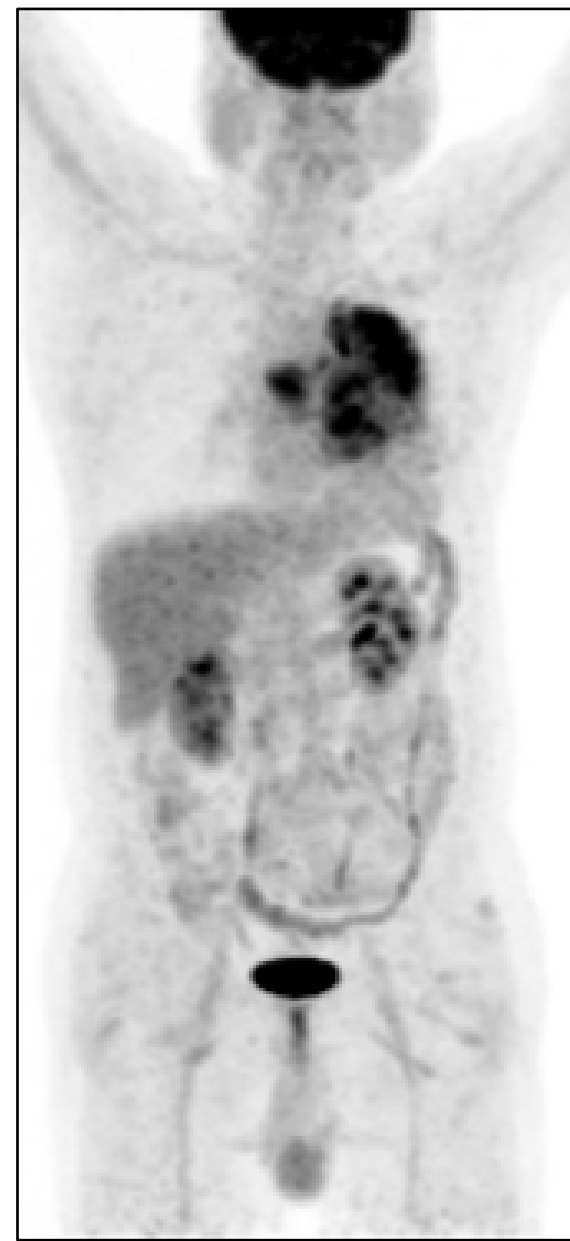


DOTATATE PET/CT

4# PRRT
→



DOTATATE PET/CT



FDG PET/CT

The Oncologist

Endocrinology |  Free Access

Capecitabine and Temozolomide in Advanced Lung Neuroendocrine Neoplasms

Taymeyah Al-Toubah, Brian Morse, Jonathan Strosberg 

First published: 27 August 2019 | <https://doi.org/10.1634/theoncologist.2019-0361> | Citations: 30

20 patients were treated with capecitabine and temozolomide.

14 TC, 5 AC, 1 had LC-NEC

16/20 patients had prior lines of systemic treatment

Median PFS was 13, median OS was 68 months

Toxicity profile was mild with mainly grade 1, expected toxicities.

Six patients required dose reduction because of toxicity.

32/F,

Evaluated for fever and cough in Nov 2021

CECT TAP - Left LL lesion with endobronchial extension and mediastinal LN and liver lesions; ?hydatid cyst

FOB - LMB completely occluded 1cm beyond carina; Scope not passed beyond

Underwent Left open pneumonectomy on 19.1.22

HPR - NET grade 2; Bronchial cartilage involved

Nature of Material Received: 11 Stained slide[BH-07/22,22W-1684],11 Paraffin block[BH-07/22,22W-1684]

Microscopic Description:

Left lung - Left pneumonectomy (11 paraffin blocks + 11 stained slides):

Section key is not provided.

Typical carcinoid.

Mitotic activity is inconspicuous.

Necrosis is not seen

Lymphovascular emboli are identified.

Perineurial invasion is not identified.

Five lymph nodes show reactive lymphoid tissue, negative for metastasis (0/5).

Resection margins are not labelled, cannot be commented upon.

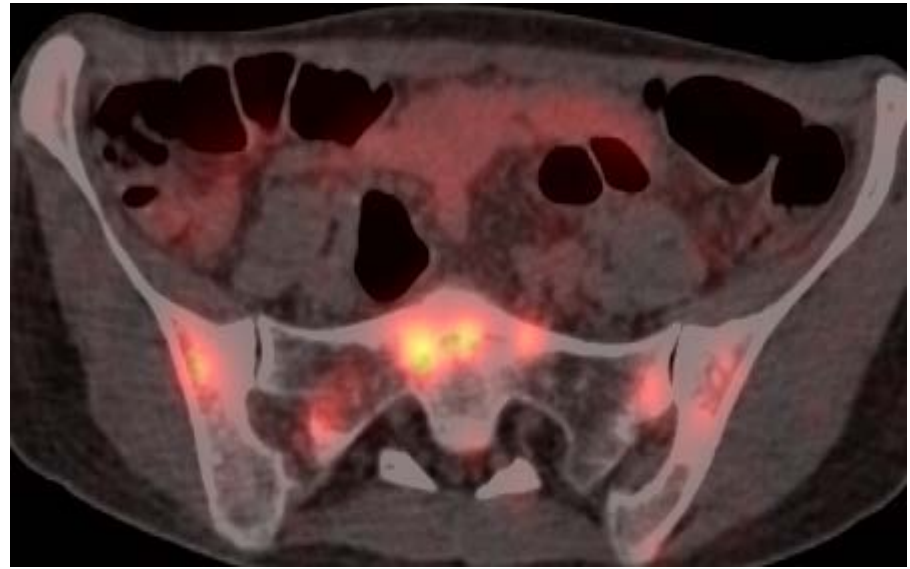
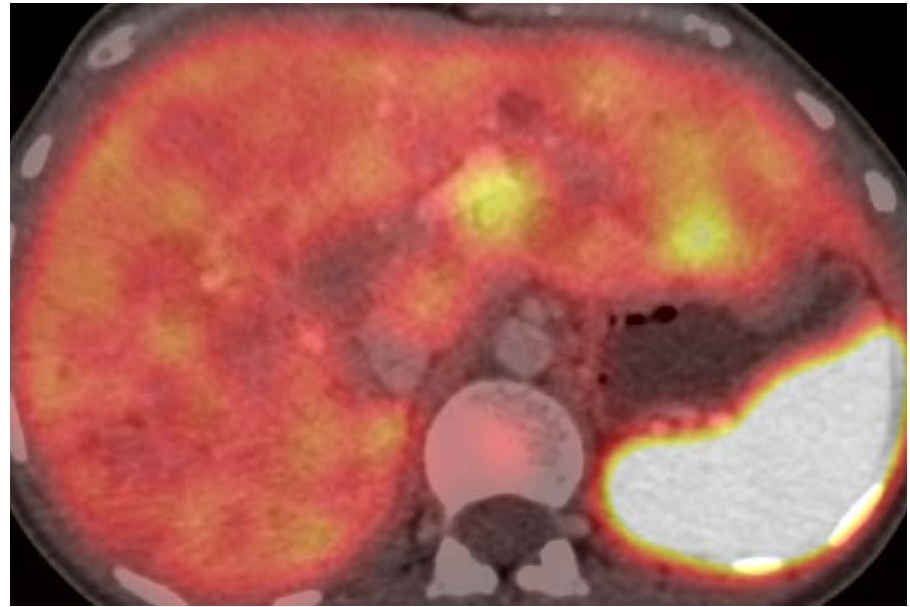
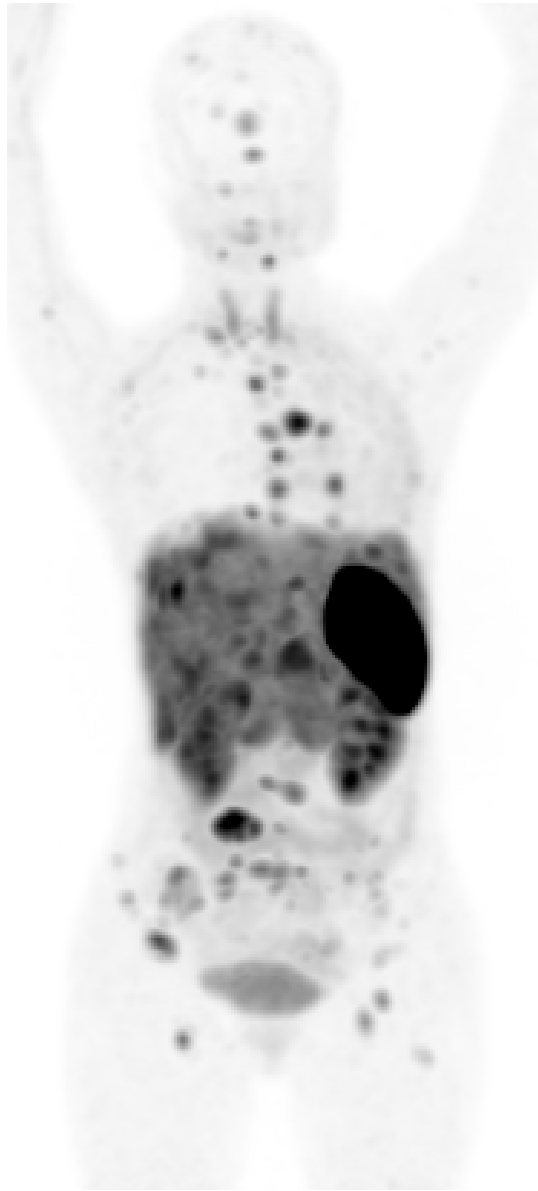
Tumour is seen involving the cauterized margin.

On immunohistochemistry, tumour cells are diffusely positive for synaptophysin, chromogranin.

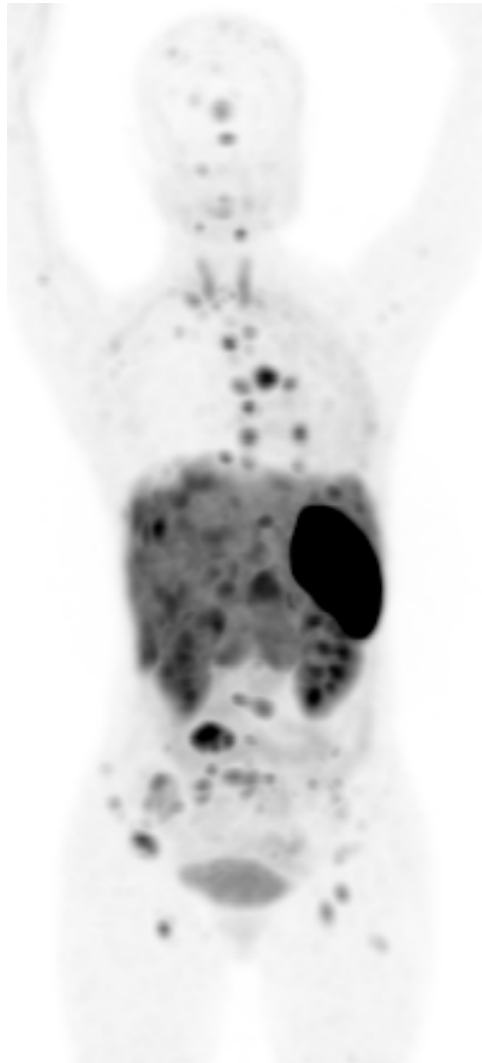
Mib1 labelling index is approximately 4-5%.

Impression:

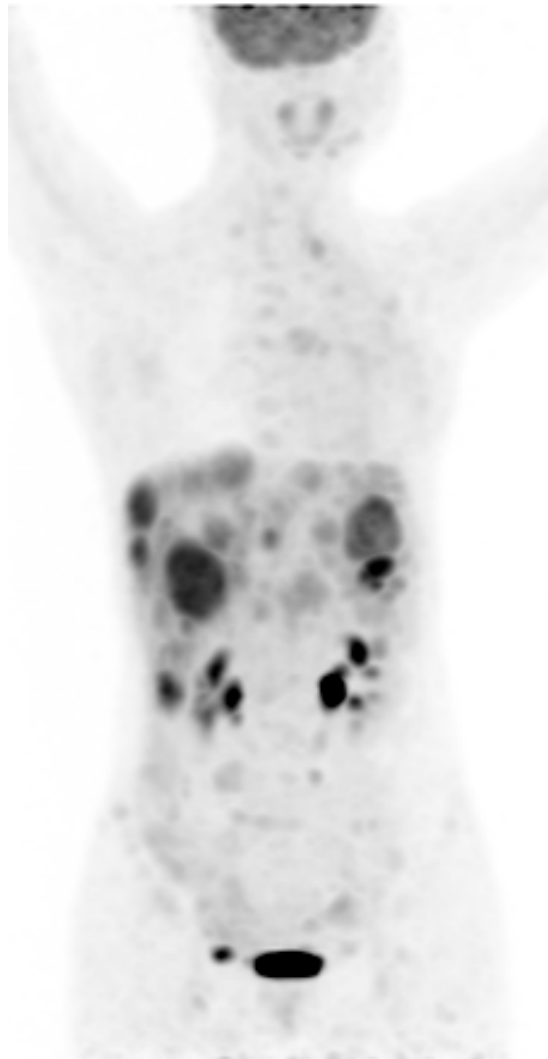
- Left Lung Left -Pneumonectomy (11 paraffin blocks + 11 stained slides) :
- Typical carcinoid



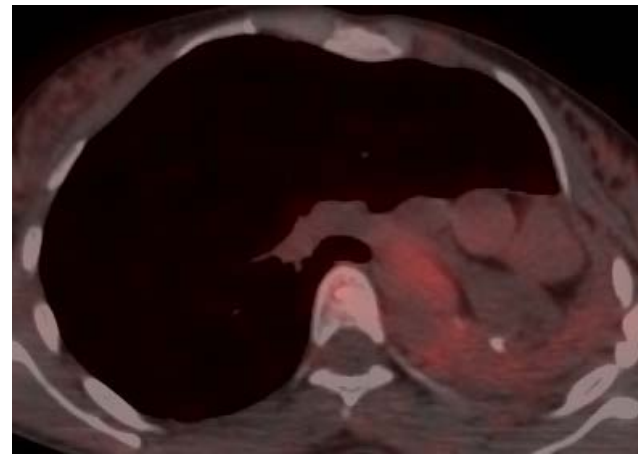
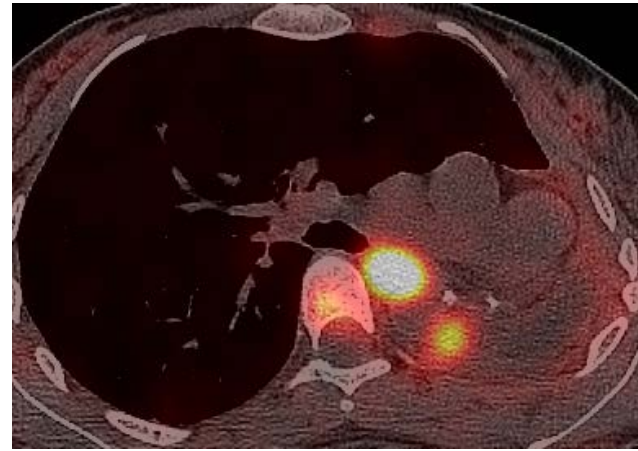
DOTATATE PET/CT



DOTATATE PET/CT



FDG PET/CT



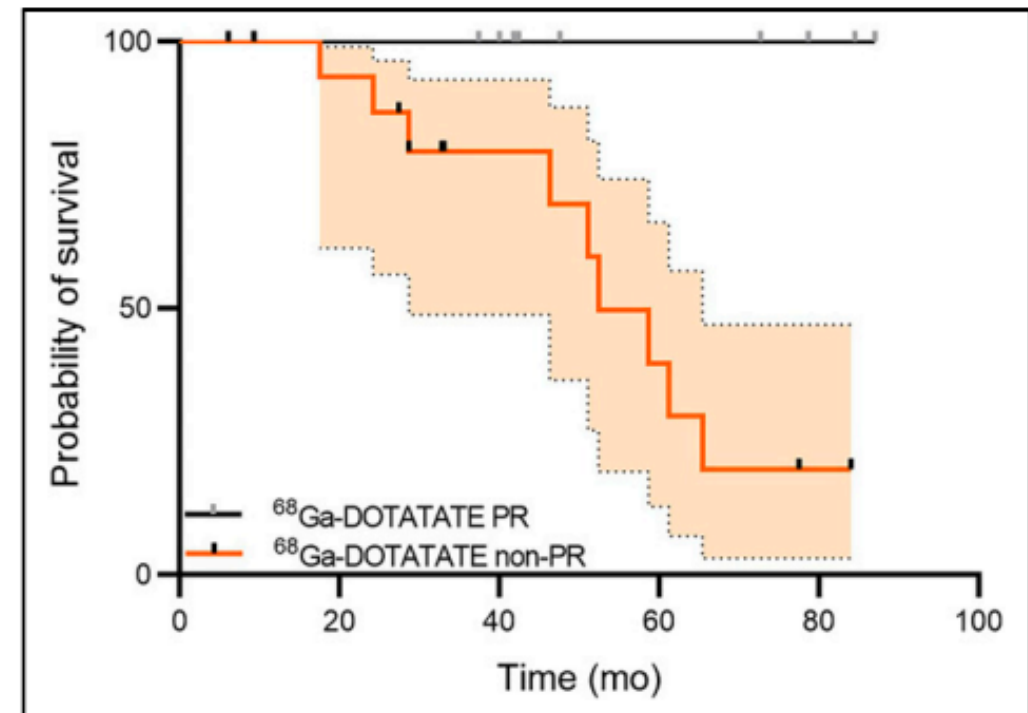
Efficacy and Safety of ^{177}Lu -DOTATATE in Lung Neuroendocrine Tumors: A Bicenter study

Lamiaa Zidan*¹, Amir Iravani*¹⁻³, Kira Oleinikov⁴, Simona Ben-Haim^{5,6}, David J. Gross⁴, Amichay Meirovitz⁷, Ophra Maimon⁷, Tim Akhurst^{1,2}, Michael Michael^{2,8}, Rodney J. Hicks^{1,2}, Simona Grozinsky-Glasberg*⁴, and Grace Kong*^{1,2}

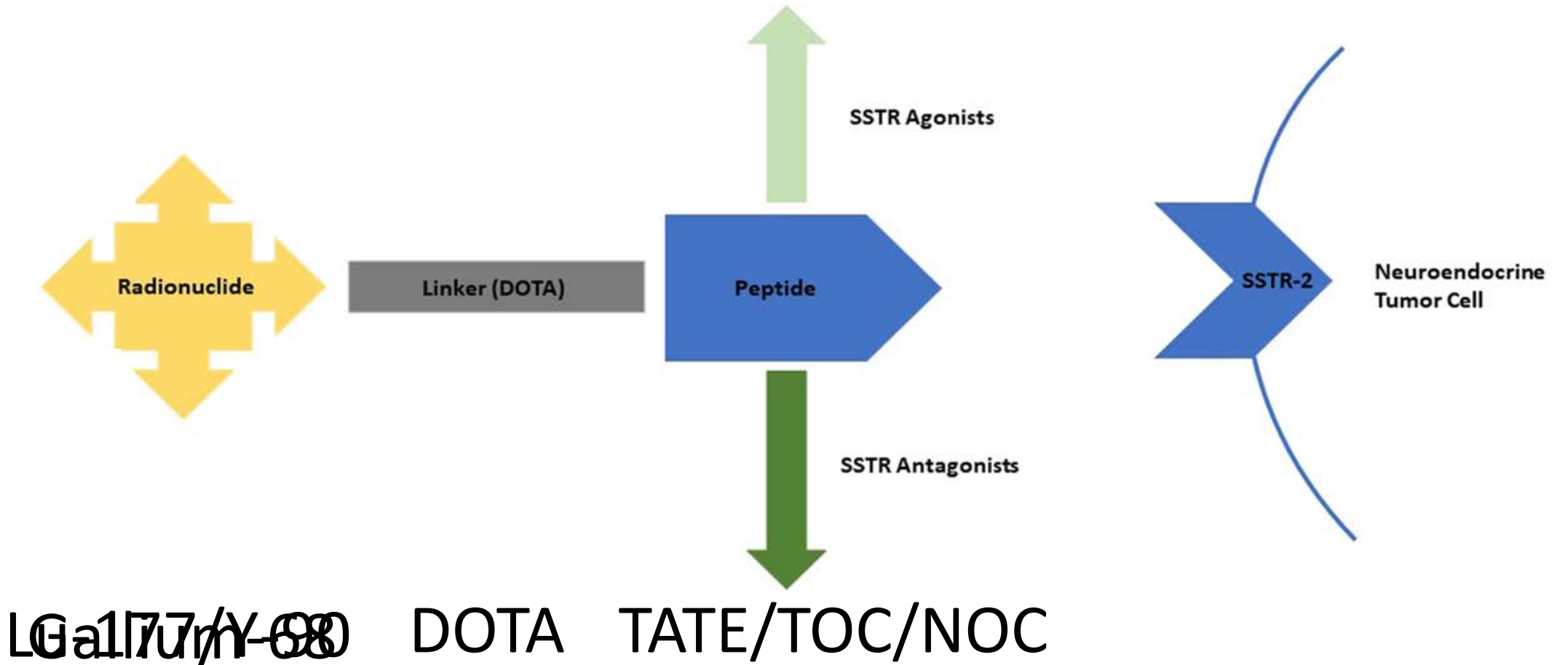
Of 48 patients, 43 (90%) had AC and 5 (10%) TC.

Almost all patients (47, 98%) were treated due to progression.

Most grade 3/4 AEs were reversible and the most common was lymphopenia (14%) with no incidence of myelodysplasia or leukemia.



PRRT – Peptide Receptor Radionuclide Therapy



52 yr old female, Dentist by profession

Now c/o Lower backache significant in November 2020

CECT Chest 22/12/2020- Broad based pleural and Rt lower intrathoracic lesion Medial basal and superior segmental homogenously enhancing lesion without paraspinal extension

Extent- 7.1X6.3X5.4cms D6-D9 Region

Multiple ill defined lesions in segment VIII of liver largest 3.4x3.2cms

CT Guided Biopsy on 26/12/2020

HPE- S/o Neuroendocrine Tumour Grade 1, Ki-67% -2%

FINAL HISTOPATHOLOGY REPORT WITH SUPPLEMENT

Nature of Material Received: 2 Paraffin block[HS-5525]

Microscopic Description:

Paraspinal mass (2 paraffin blocks):

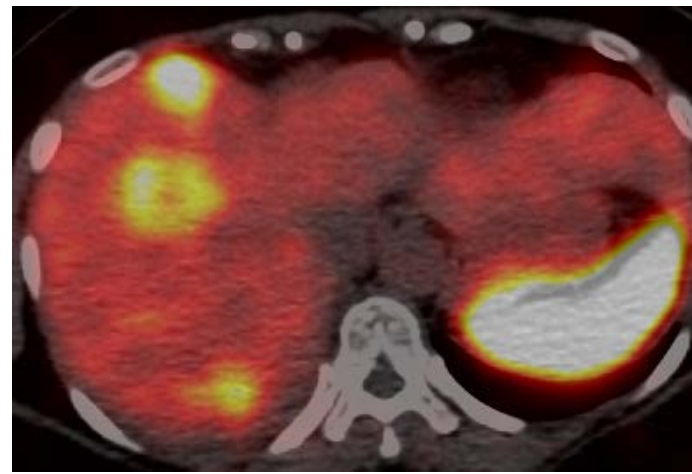
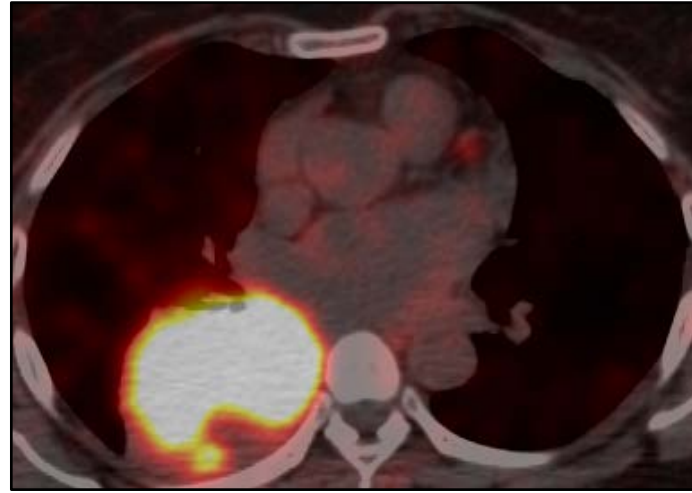
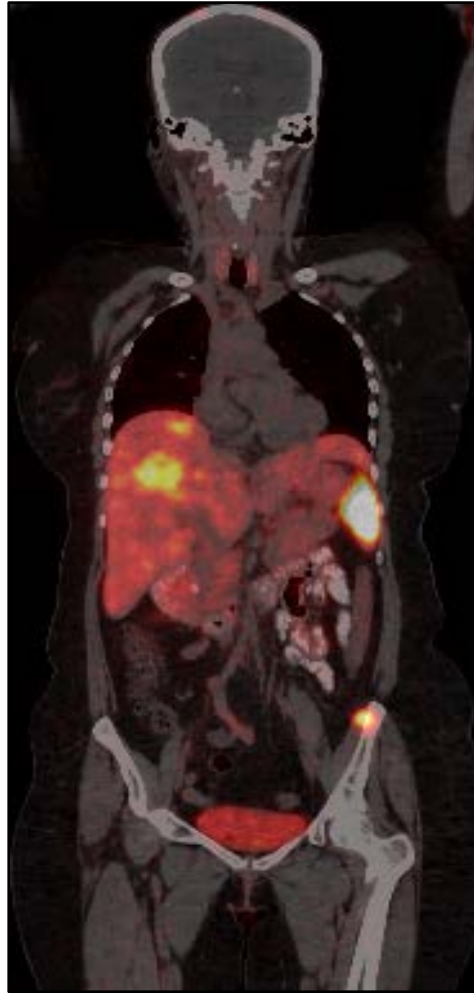
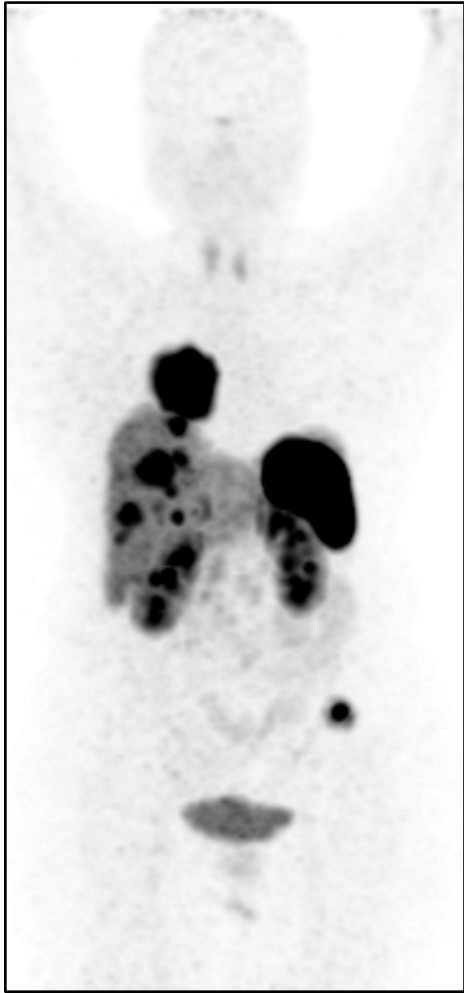
Suspect neuroendocrine tumour.

On immunohistochemistry, the tumour cells are positive for synaptophysin and chromogranin.

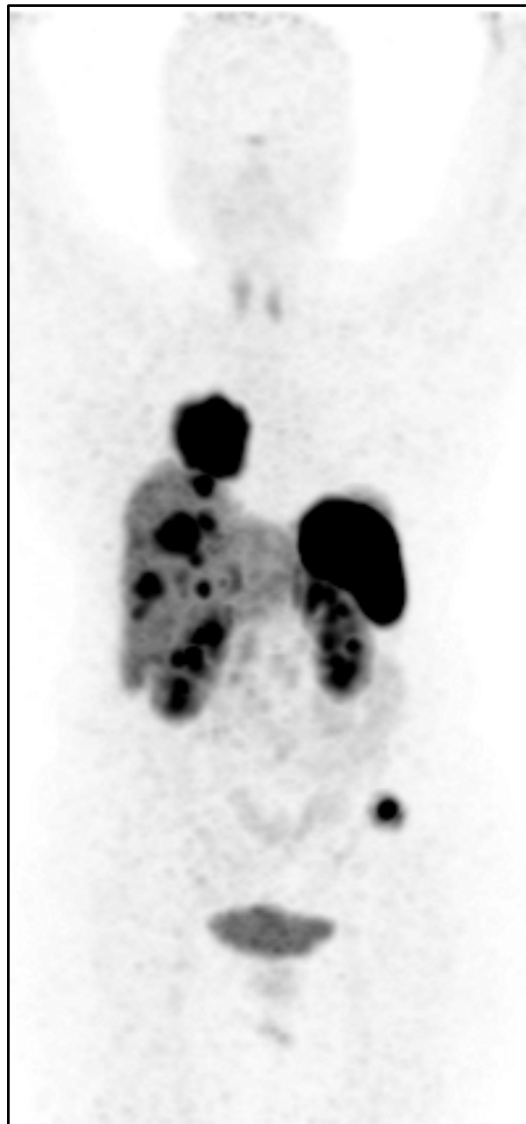
MIB-1 labelling index is 1-2% in highest proliferating areas.

Impression:

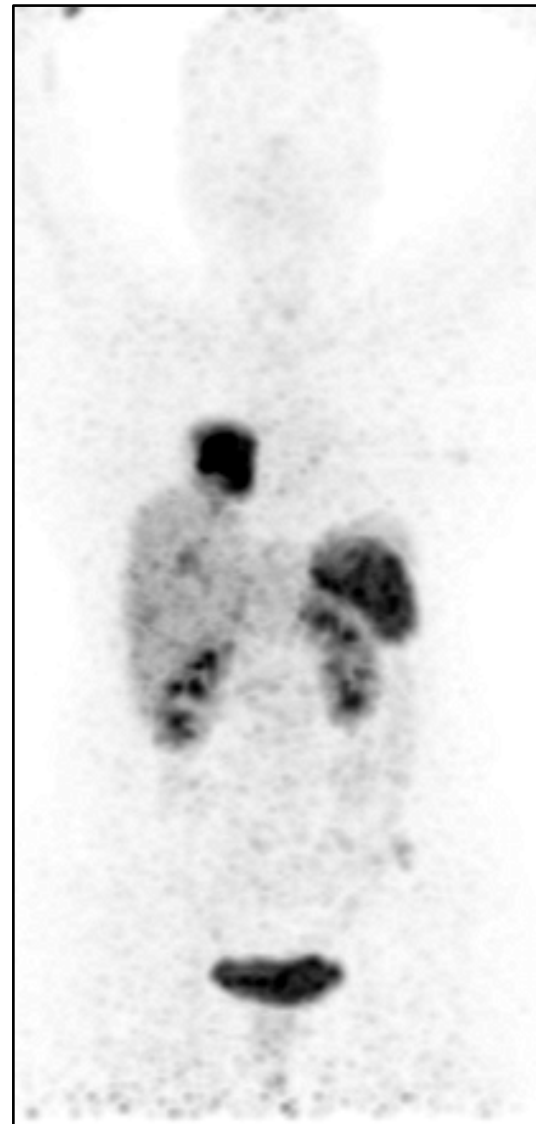
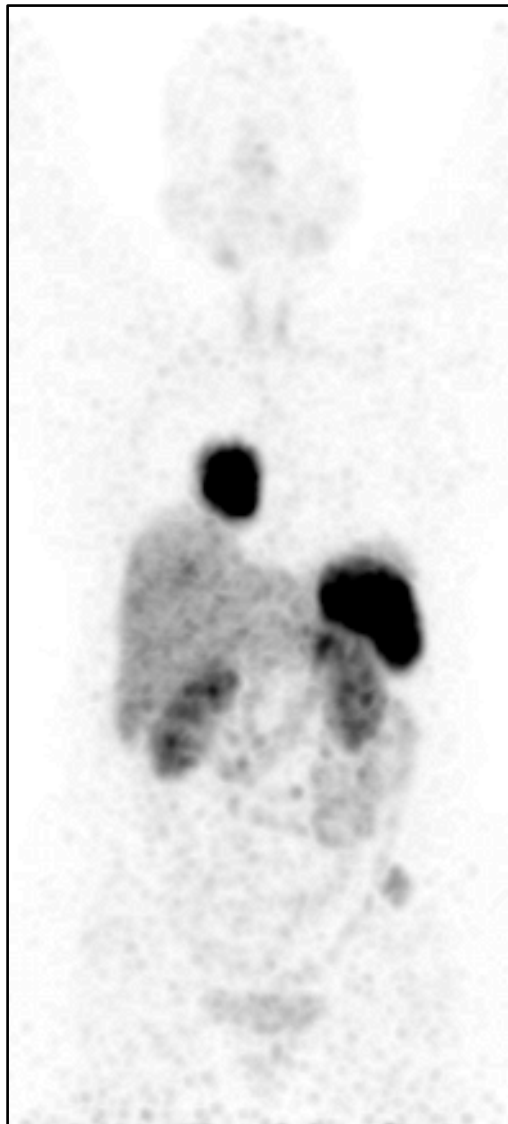
- **Paraspinal mass :**
- **Neuroendocrine tumor, grade 1**



DOTATATE PET/CT



4# PRRT



TAKE HOME MESSAGE

SSTR imaging with Ga-68 DOTATATE PET/CT is recommended in cases with Broncho-pulmonary carcinoid

FDG PET can be added if histology shows AC

PRRT is a safe and efficacious therapeutic option for locally advanced and metastatic lung carcinoids