2° Convegno interregionale AME
- Emilia Romagna
- Friuli Venezia Giulia
- Lombardia
- Trentino Alto Adige
- Veneto

Sessione I
TUMORI NEUROENDOCRINI DEL TRATTO GEP

L'iter diagnostico : fondamentale il gioco di squadra

Dobbiamo considerare solo Octreoscan e/o PET-DOTATOC?

Annibale Versari
Medicina Nucleare - Centro PET
Az.Osp.S.Maria Nuova - IRCCS
Reggio Emilia
versari.annibale@asmn.re.it

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Ospedaliera di Reggio Emilia
Arcispedale S. Maria Nuova

Istituto in tecnologie avanzate e modelli assistenziali in oncologia
Istituto di Ricovero e Cura a Carattere Scientifico

ASMN
ARCISPEDALE SANTA MARIA NUOVA
AZIENDA OSPEDALIERA REGGIO EMILIA
Regione Emilia-Romagna

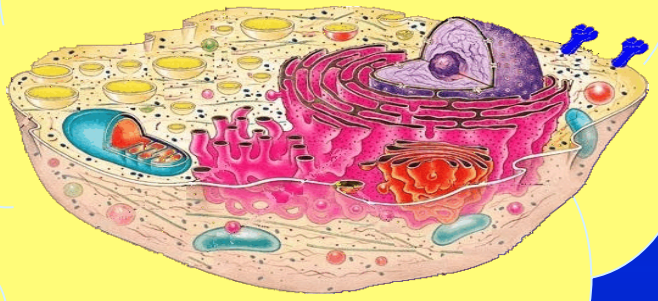
Imaging medico-nucleare=Imaging molecolare

Le immagini sono espressione delle caratteristiche biochimiche e metaboliche dei tessuti

Peptidi

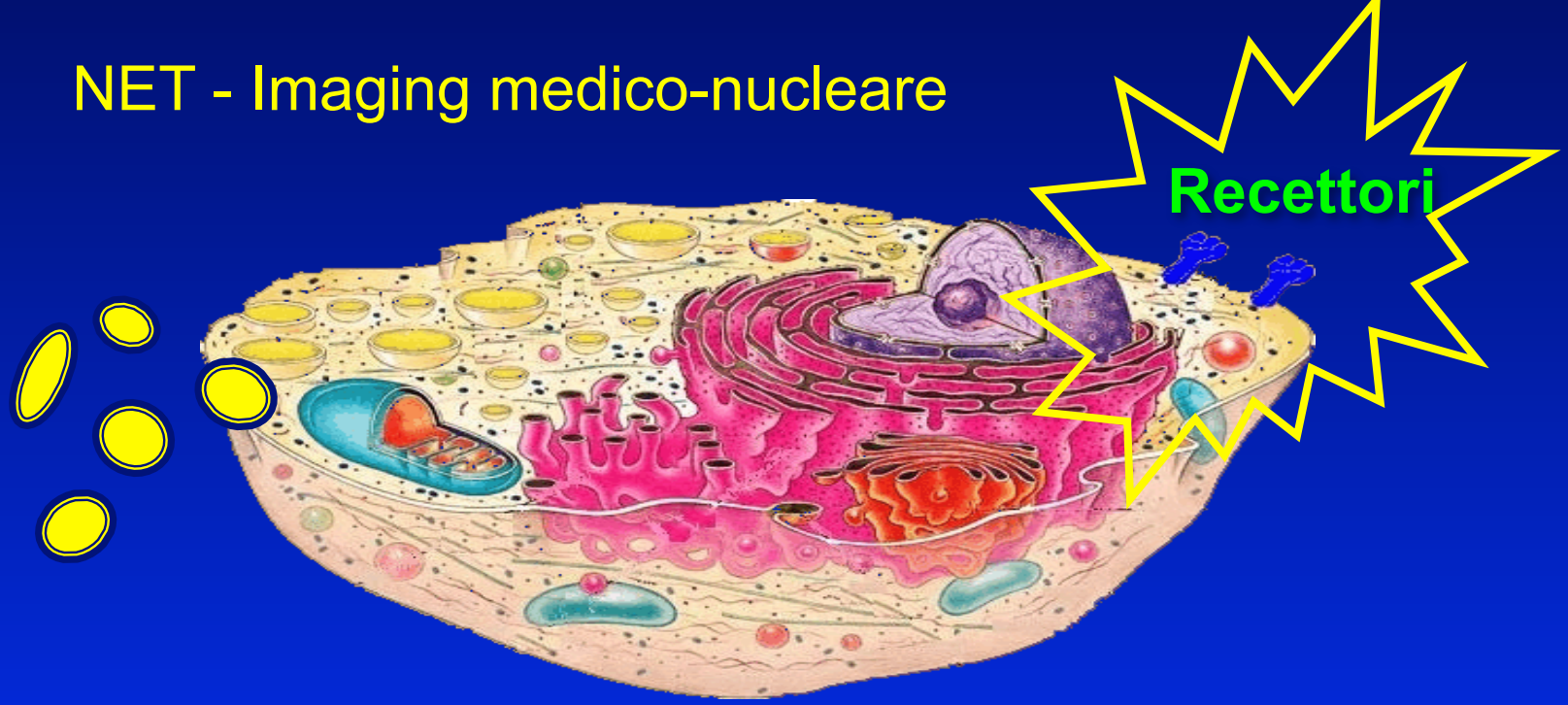
Recettori

Ormoni



Neurotrasmettitori

NET - Imaging medico-nucleare



Recettori per Peptidi Espressi Preferenzialmente dai Tumori GEP

- **Somatostatina (5 sotto-tipi)**
- **Bombesina (3 sotto-tipi)**
- **Colecistochinina (2 sotto-tipi)**
- **VIP (2 sotto-tipi)**
- **Glucagone (1 principale)**

Imaging medico-nucleare

Presupposti fisiopatogici

Metodiche

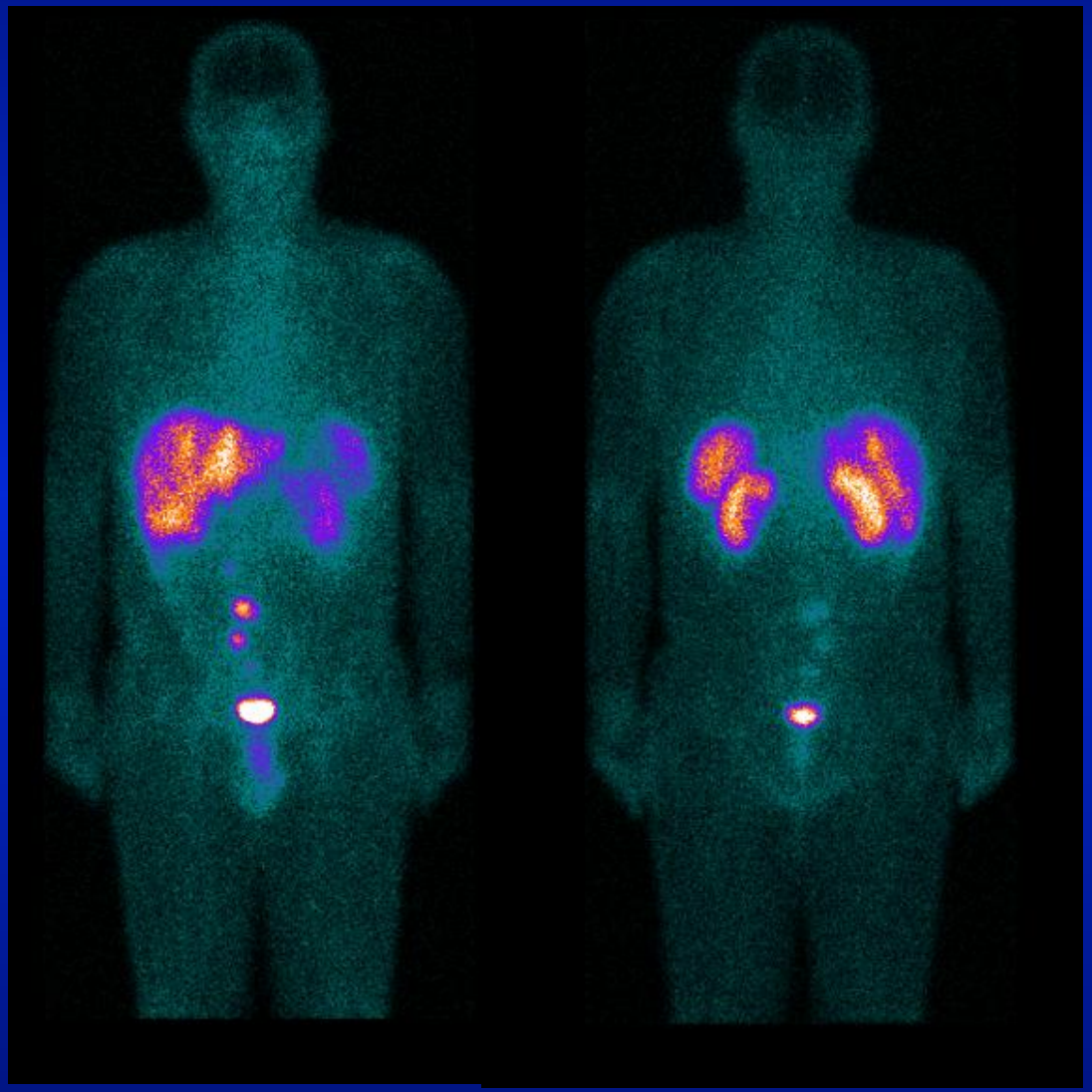
Scintigrafia, SPECT, SPECT/CT con

- ^{111}In-Octreoscan

PET/CT con

- ^{68}Ga-DOTATOC
- ^{68}Ga-DOTANOC
- ^{68}Ga-DOTATATE

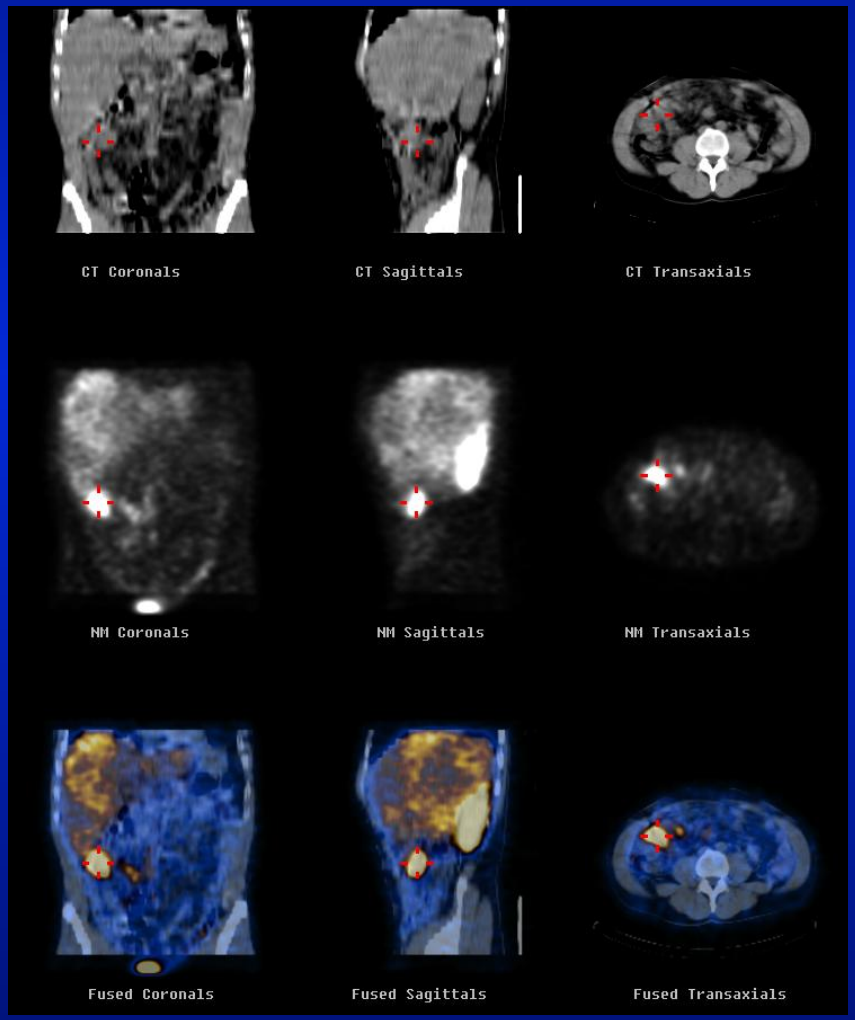
Scintigrafia con ^{111}In-Octreoscan

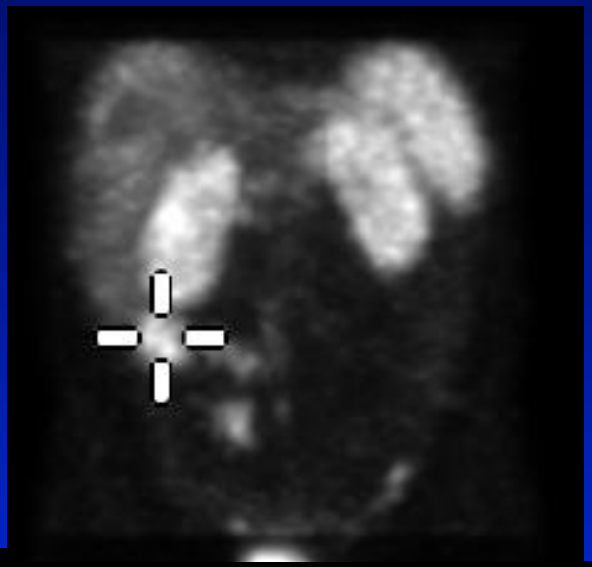


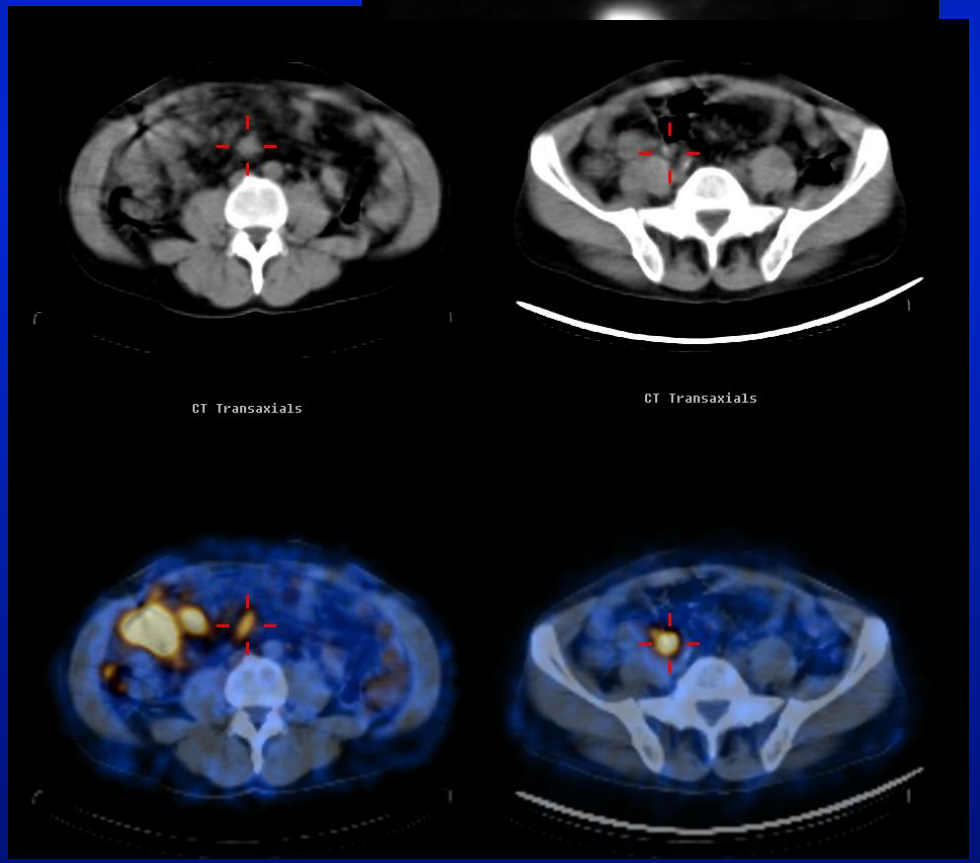
Carcinoide Ileale

Octreoscan®: SPECT/CT

Carcinoide Ileale







Prof. Giuliano Mariani - Pisa

Functional Imaging of Neuroendocrine Tumors: A Head-to-Head Comparison of Somatostatin Receptor Scintigraphy, ^{123}I-MIBG Scintigraphy, and ^{18}F-FDG PET

Tina Binderup[1,2], Ulrich Knigge[2,3], Annika Loft[1], Jann Mortensen[1], Andreas Pfeifer[1,2], Birgitte Federspiel[4], Carsten Palnaes Hansen[3], Liselotte Højgaard[1,2], and Andreas Kjaer[1,2]

[1]Department of Clinical Physiology, Nuclear Medicine and PET, Rigshospitalet, Copenhagen, Denmark; [2]Cluster for Molecular Imaging, Faculty of Health Sciences, University of Copenhagen, Copenhagen, Denmark; [3]Department of Surgical Gastroenterology, Rigshospitalet, Copenhagen, Denmark; and [4]Department of Pathology, Rigshospitalet, Copenhagen, Denmark

J Nucl Med 2010; 51:704–712

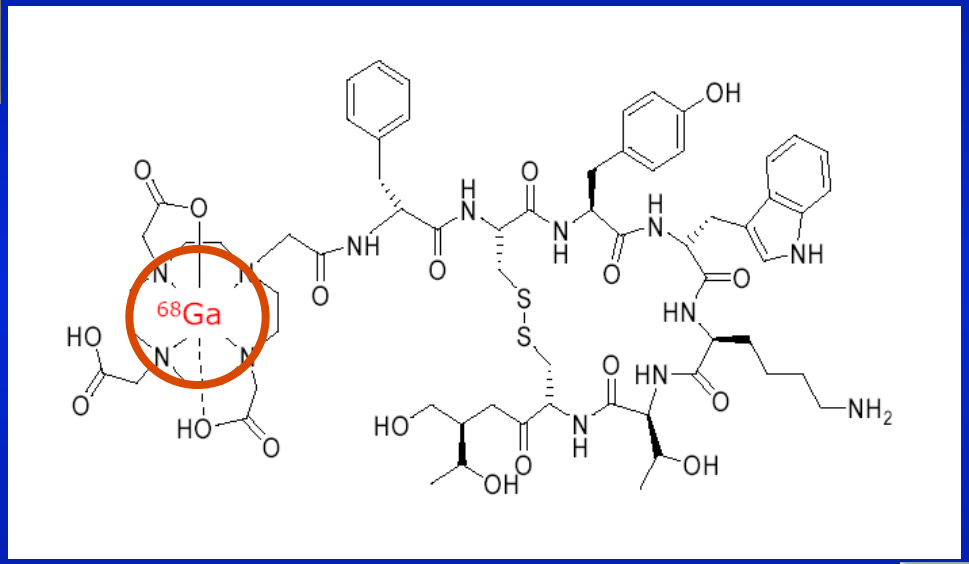
TABLE 5. Sensitivity of Functional Imaging Results Based on Origin of Tumor

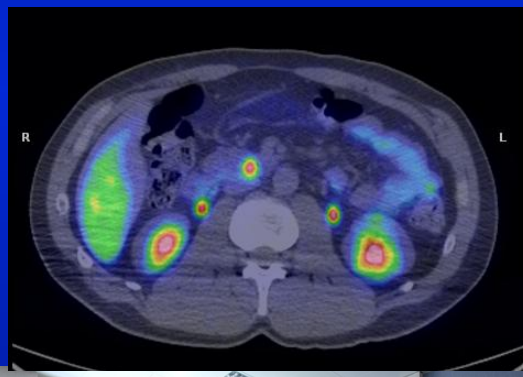
Origin of tumor	SRS	^{123}I-MIBG	^{18}F-FDG
Ileal neuroendocrine (n = 45)	91% (41)	71% (32)	36% (16)
Pancreaticoduodenal neuroendocrine (n = 29)	90% (26)	31% (9)	79% (23)
Neuroendocrine of lung (n = 7)	86% (6)	57% (4)	71% (5)
Colonic neuroendocrine (n = 6)	67% (4)	17% (1)	83% (5)
Unknown or rare origin (n = 9)	89% (8)	44% (4)	78% (7)
Total	89% (85)	52% (50)	58% (56)

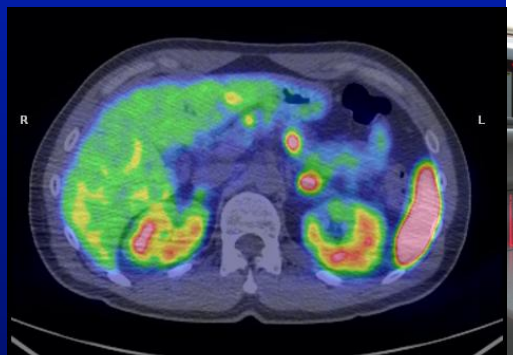
Data in parentheses are numbers of patients.

Generatore 68Ge/68Ga

^{68}Ga DOTATOC PET/CT

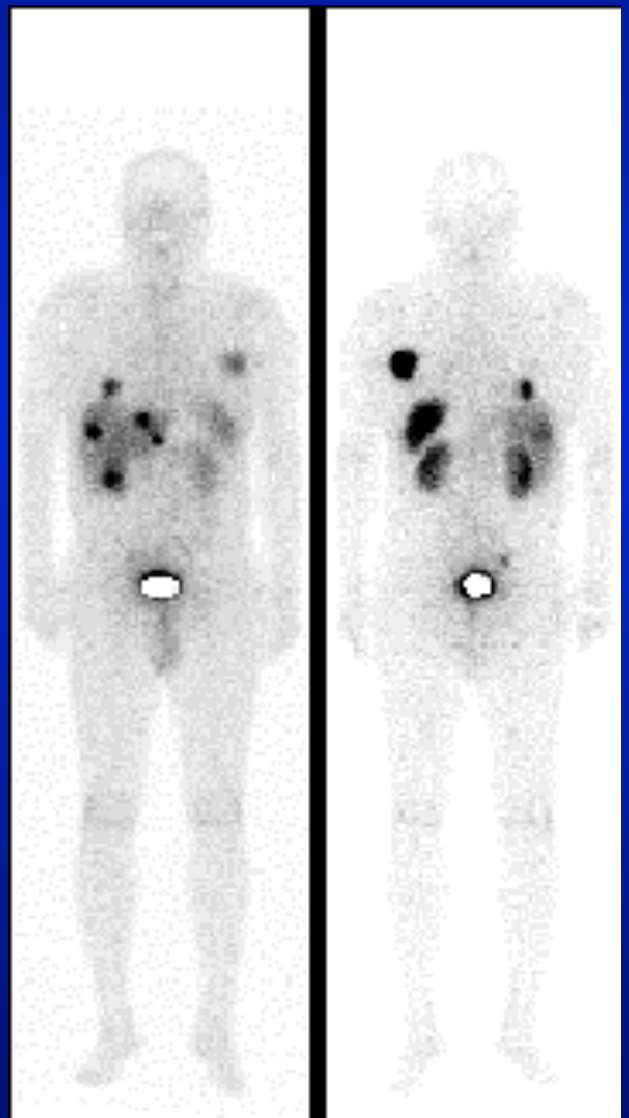




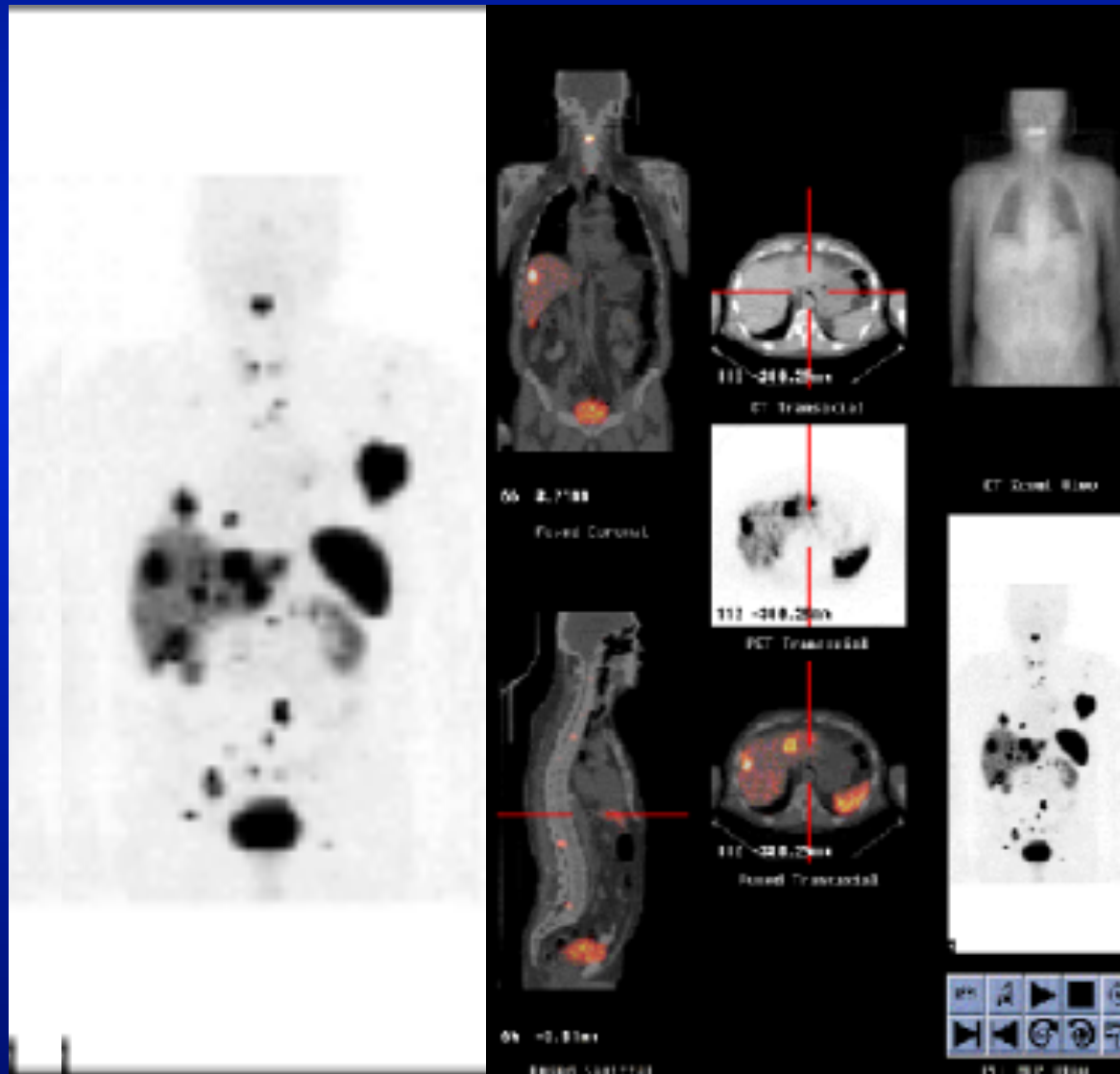


Tumore neuroendocrino del tratto gastroenteropancreatico metastatico

111In-Octreoscan



^{68}Ga-Dotatoc PET/CT



^{68}Ga-DOTATOC Versus ^{68}Ga-DOTATATE PET/CT in Functional Imaging of Neuroendocrine Tumors

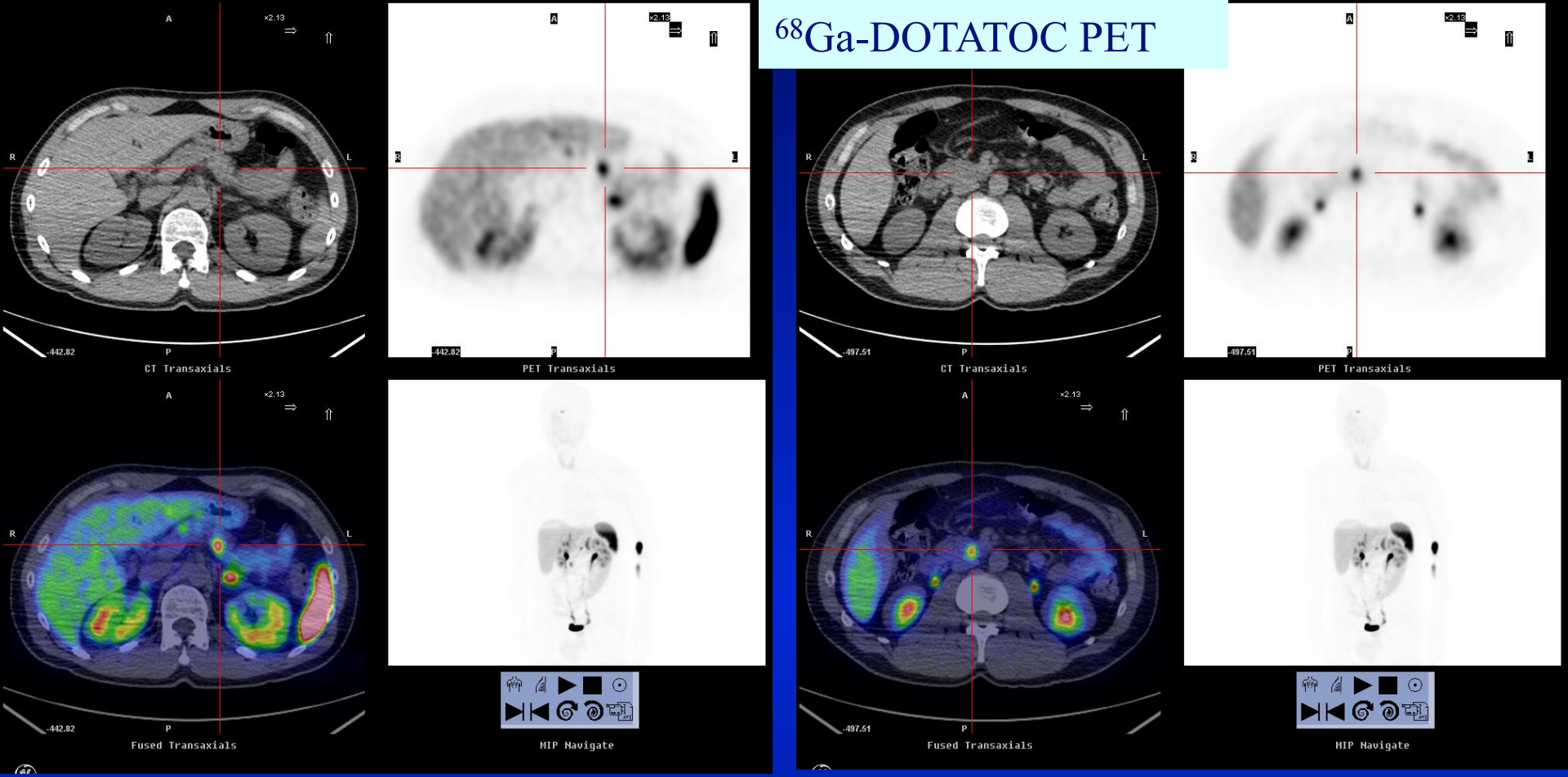
Thorsten D. Poeppel[1], Ina Binse[1], Stephan Petersenn[2], Harald Lahner[2], Matthias Schott[3], Gerald Antoch[4], Wolfgang Brandau[1], Andreas Bockisch[1], and Christian Boy[1]

[1]Department of Nuclear Medicine, University Essen, Essen, Germany; [2]Department of Endocrinology, University Essen, Essen, Germany; [3]Department of Endocrinology, University Dusseldorf, Dusseldorf, Germany; and [4]Department of Diagnostic and Interventional Radiology, University Dusseldorf, Dusseldorf, Germany

J Nucl Med 2011; 52:1864–1870

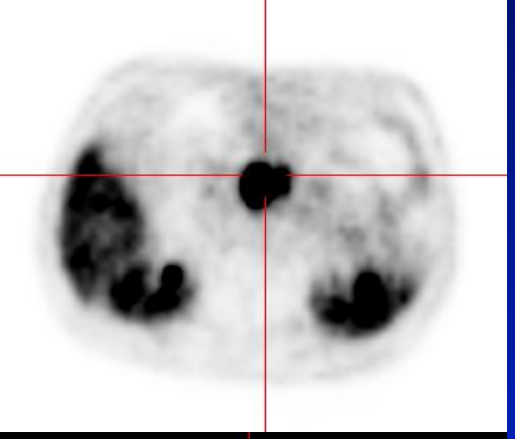
CONCLUSION

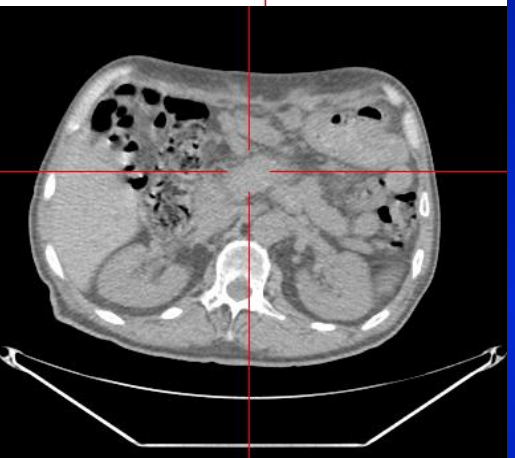
68Ga-DOTATOC and 68Ga-DOTATATE possess a comparable diagnostic value in the detection of lesions of NETs

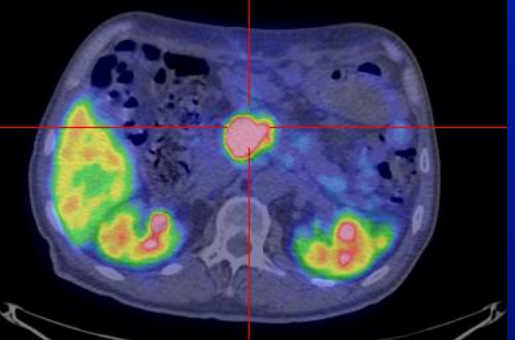


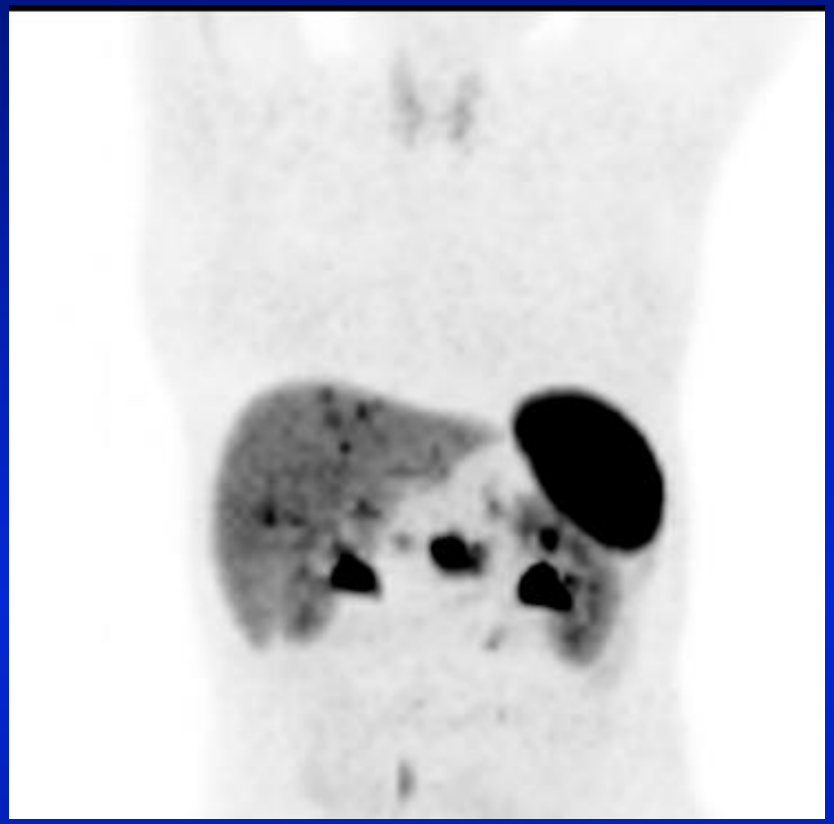
Gastrinoma del pancreas

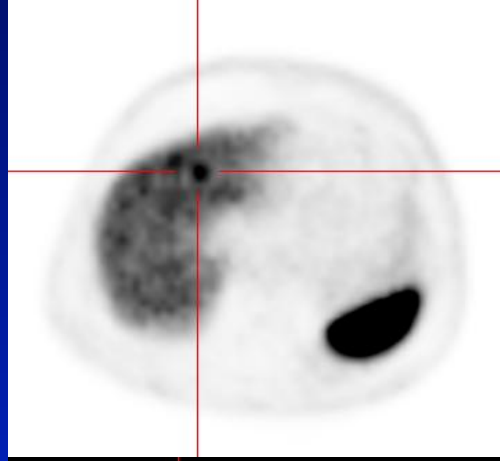
^{68}Ga-DOTATOC PET

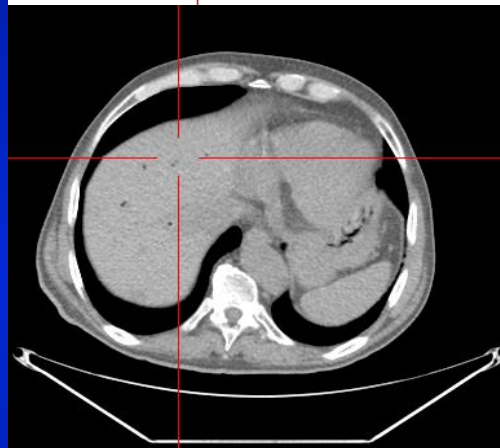


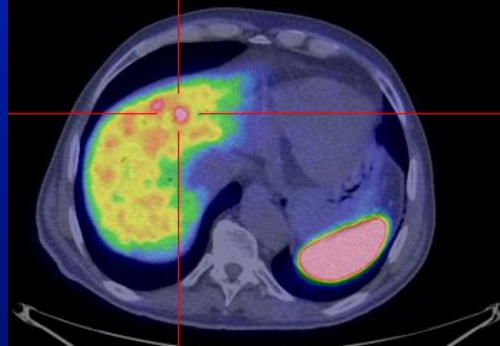




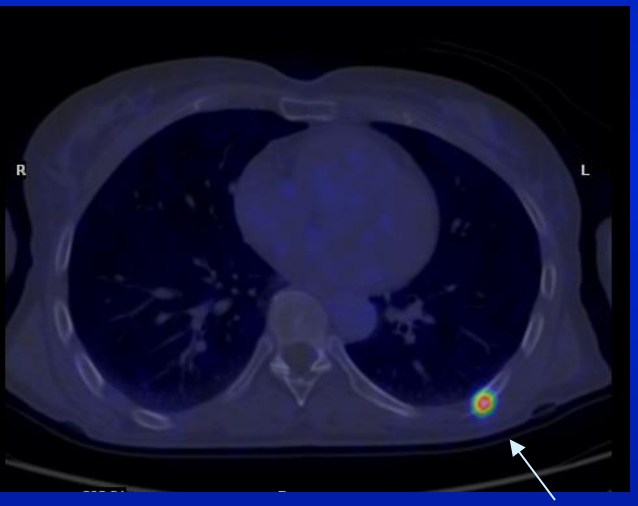


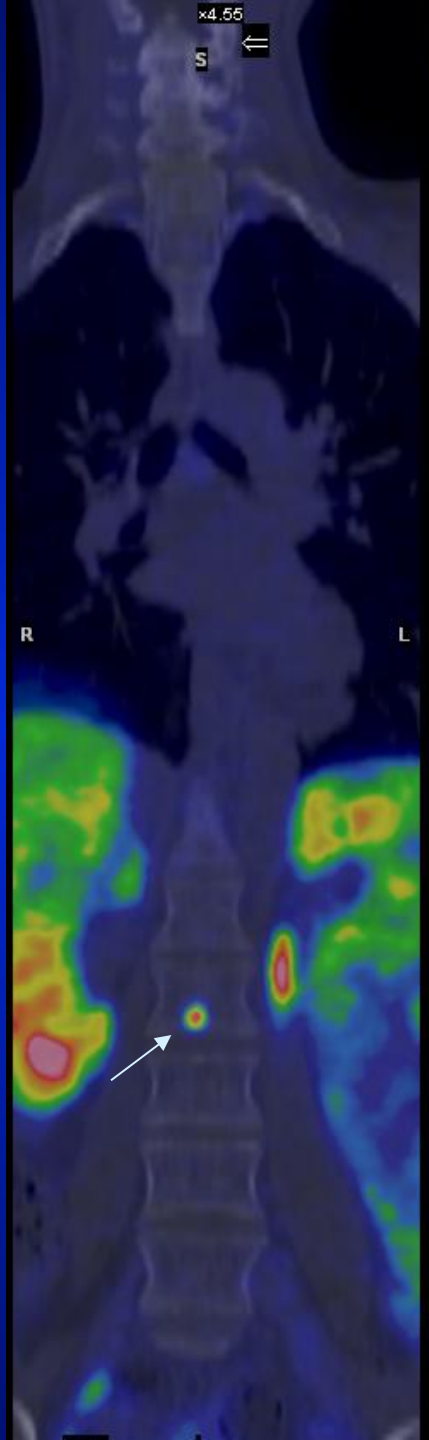


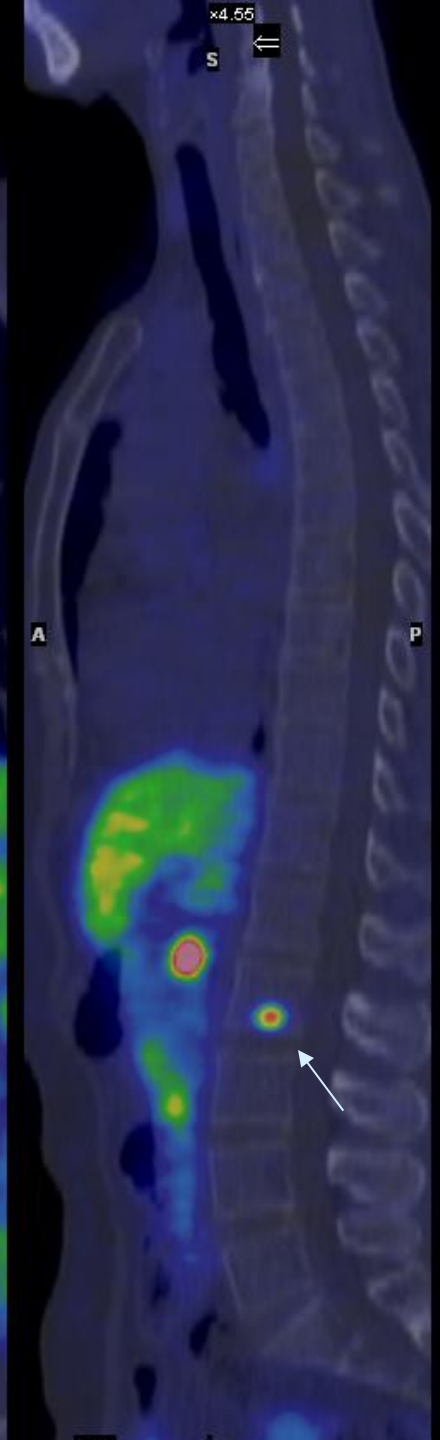


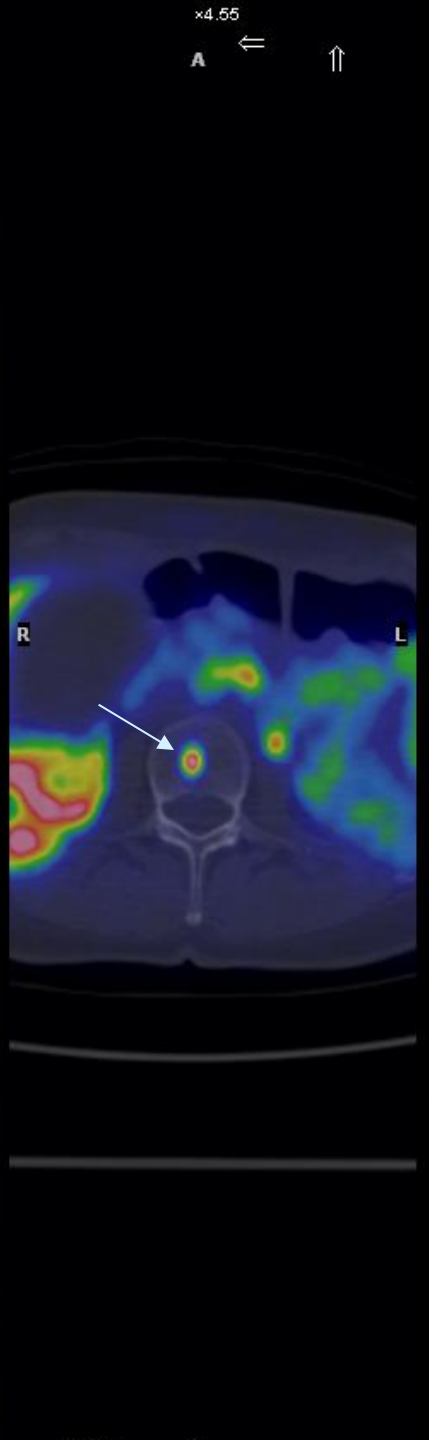


Carcinoma neuroendocrino del pancreas
con metastasi epatiche









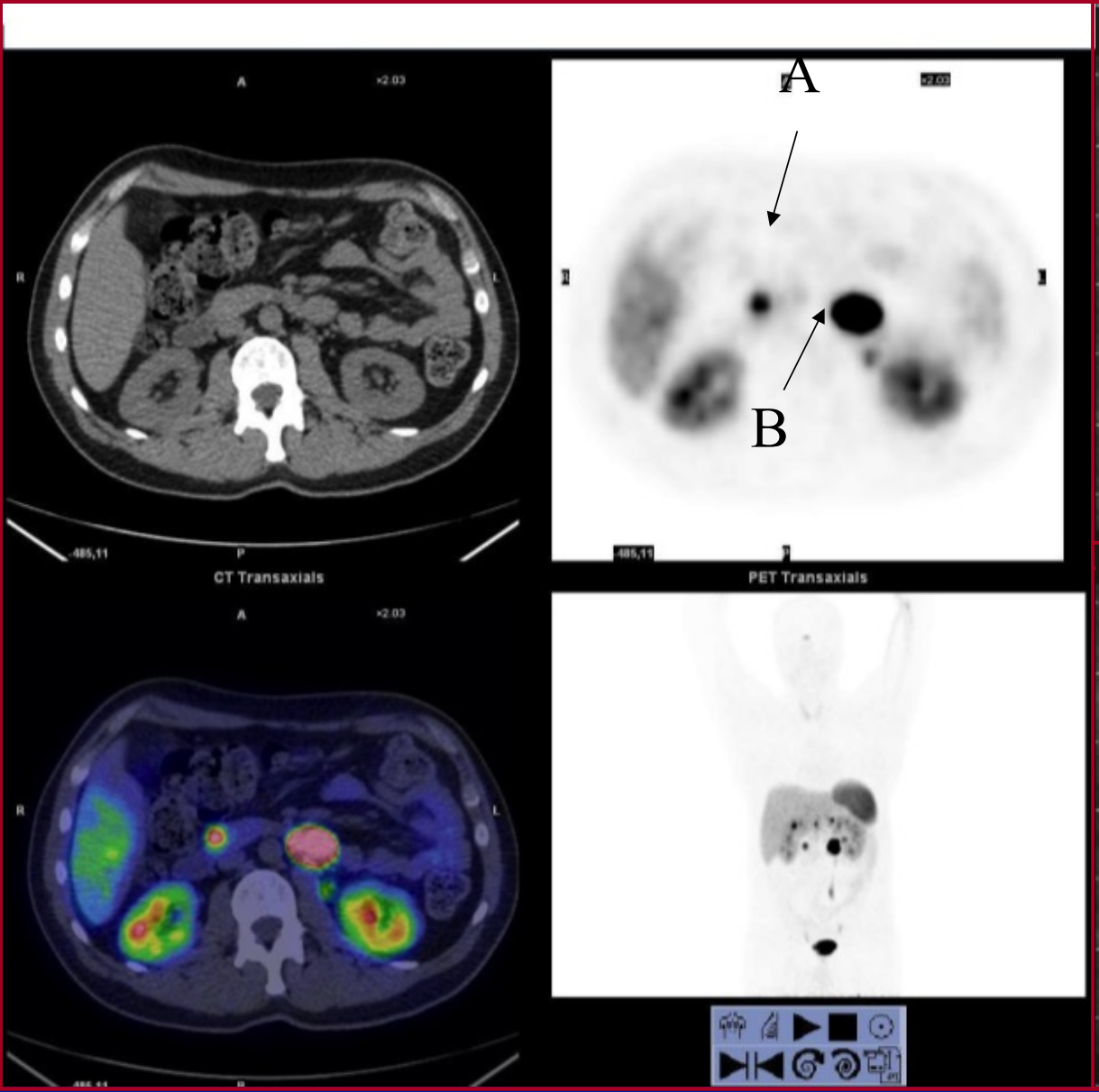
Metastasi scheletriche da NET pancreatico

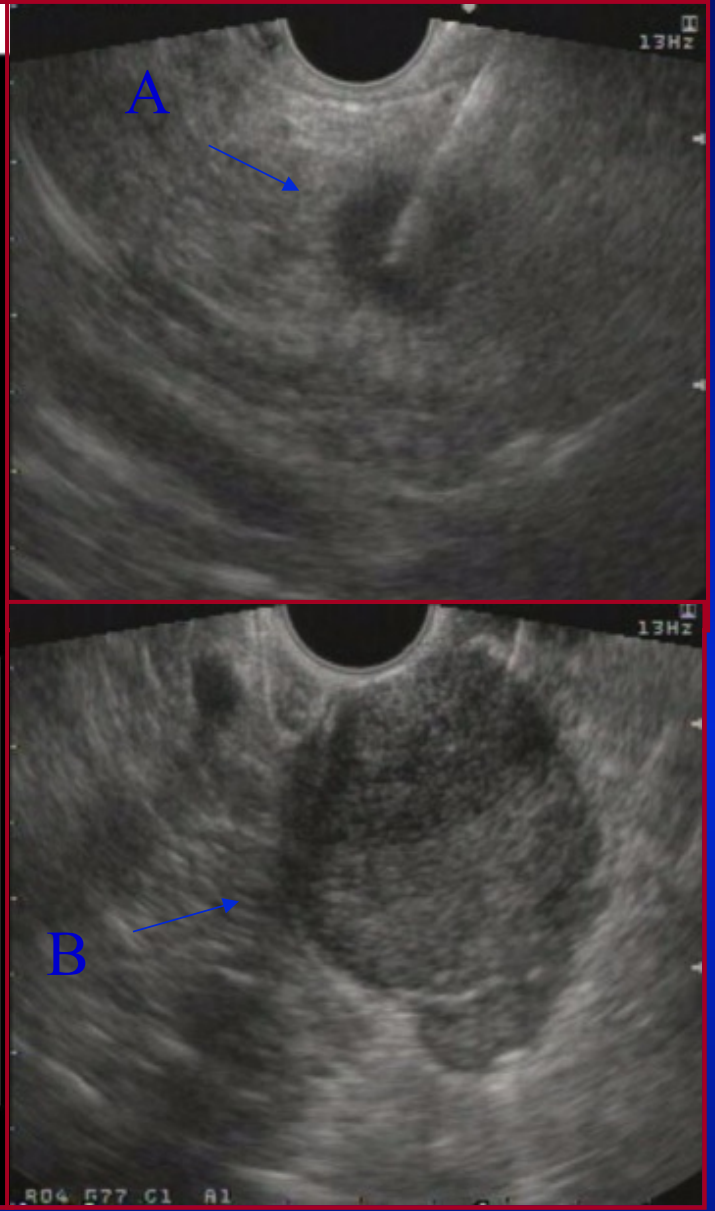
Ga-68 DOTATOC PET, Endoscopic Ultrasonography, and Multidetector CT in the Diagnosis of Duodenopancreatic Neuroendocrine Tumors

A Single-Centre Retrospective Study

Annibale Versari, MD, Lorenzo Camellini, MD,† Gabriele Carlinfante, MD,‡ Andrea Frasoldati, MD,* Franco Nicoli, MD,§ Elisa Grassi, ●●●,¶ Carmine Gallo, MD,‡ Francesco Giunta, MD,* Alessandro Fraternali, MD,* Diana Salvo, MD,* Mattia Asti, ●●●,* Francesco Azzolini, MD,† Veronica Iori, MD,† and Romano Sassatelli, MD†*

Clin Nucl Med 2010;





Head pancreatic NET (A) with lymph node metastasis (B)

Table 3. Comparison of results of EUS, PET, MDCT in duodeno-pancreatic NETs

19 paz	patient-based analysis			lesion-based analysis		
	EUS	PET	MDCT	EUS	PET	MDCT
Detection rate	15/19 (79%)	13/19 (68%)	11/16 (69%)	25/28 (89%)	23/28 (82%)	16/22 (73%)
True positive	13	12	10	22	20	13
True negative	4	5	4	4	5	4
False positive	2	1	1	2	1	1
False negative	0	1	1	1	3	5
Sensitivity %	100	92	91	96	87	72
Specificity %	67	83	80	67	83	80

CT was performed in 16 patients; in these patients 22 suspected lesions were detected by at least a method. All comparison among rates and operative characteristics in the table are not significant.

A Versari, L Camellini, G Calinfante et al Clin Nucl Med 2010

Ga-68 DOTATOC PET, Endoscopic Ultrasonography, and Multidetector CT in the Diagnosis of Duodenopancreatic Neuroendocrine Tumors

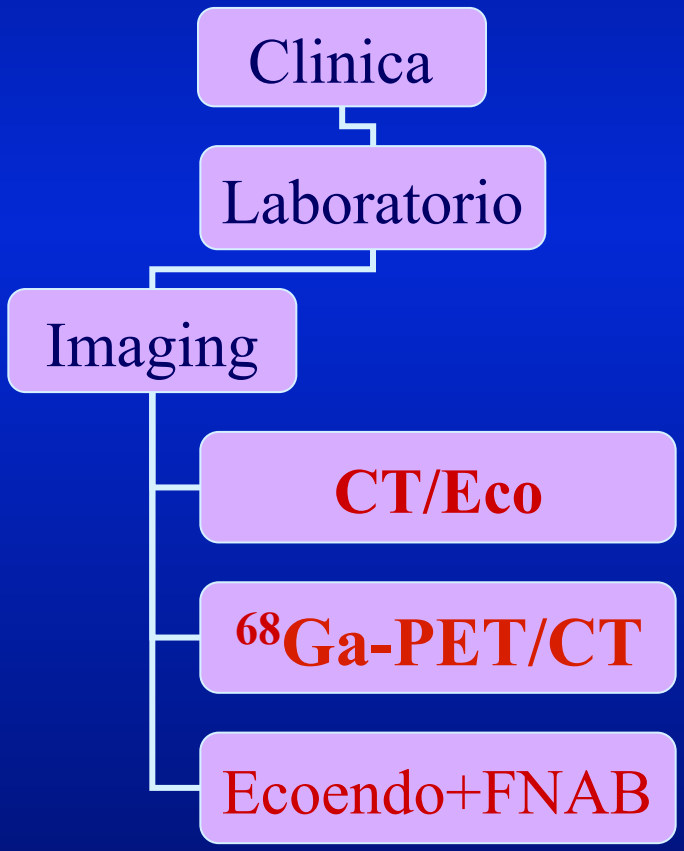
A Single-Centre Retrospective Study

Annibale Versari, MD, Lorenzo Camellini, MD,† Gabriele Carlinfante, MD,‡ Andrea Frasoldati, MD,* Franco Nicoli, MD,§ Elisa Grassi, ●●●,¶ Carmine Gallo, MD,‡ Francesco Giunta, MD,* Alessandro Fraternali, MD,* Diana Salvo, MD,* Mattia Asti, ●●●,* Francesco Azzolini, MD,† Veronica Iori, MD,† and Romano Sassatelli, MD†*

Conclusions: EUS, Ga-68 DOTATOC PET, and MDCT seem to have comparable accuracy in diagnosis of duodenopancreatic NET and their combination may allow an optimal preoperative diagnosis.

Clin Nucl Med 2010;

Tumori neuroendocrini duodeno-pancreatici
Proposta di percorso diagnostico



Accuracy and clinical impact of 68-Ga-labeled octreotide analogues PET in diagnosis and staging of duodeno-pancreatic neuroendocrine tumours. A multicenter, prospective clinical trial

Proponenti:

Annibale Versari (Medicina Nucleare - PI)

Lorenzo Camellini (Endoscopia Digestiva)

Andrea Frasoldati (Endocrinologia)

Gabriele Carlinfante (Anatomia Patologica)

Pierpaolo Pattacini (Radiologia)

ARCISPEDALE SANTA MARIA NUOVA
AZIENDA OSPEDALIERA REGGIO EMILIA
Regione Emilia-Romagna

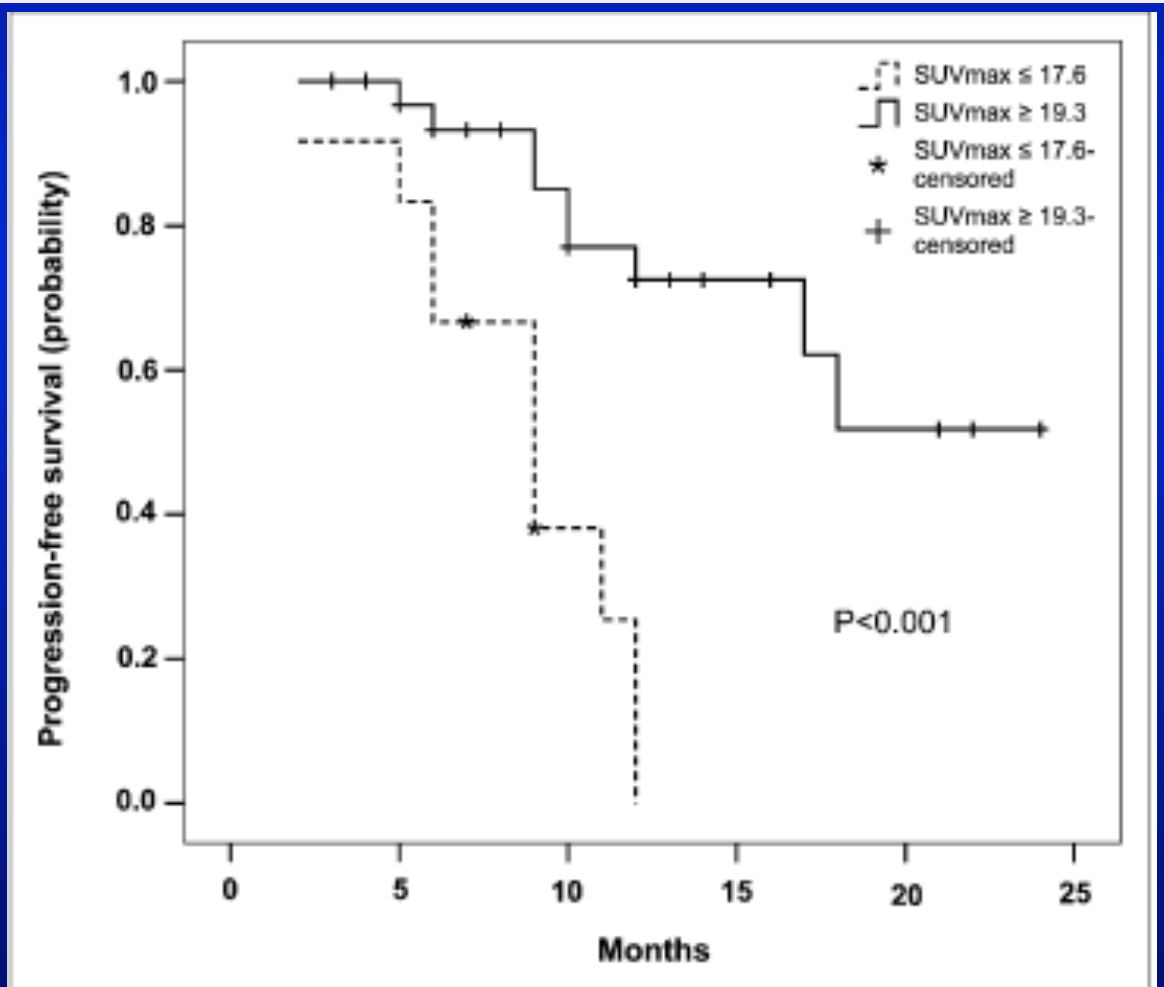
SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Ospedaliera di Reggio Emilia
Arcispedale S. Maria Nuova

Istituto in tecnologie avanzate e modelli assistenziali in oncologia
Istituto di Ricovero e Cura a Carattere Scientifico

Standardized Uptake Values of ^{68}Ga-DOTANOC PET: A Promising Prognostic Tool in Neuroendocrine Tumors

J Nucl Med 2010; 51:353–359

Davide Campana[1], Valentina Ambrosini[2], Raffaele Pezzilli[1], Stefano Fanti[2], Antonio Maria Morselli Labate[1], Donatella Santini[3], Claudio Ceccarelli[3], Francesca Nori[1], Roberto Franchi[2], Roberto Corinaldesi[1], and Paola Tomassetti[1]



Functional Imaging of Neuroendocrine Tumors With Combined PET/CT Using ^{68}Ga-DOTATATE (Dota-DPhe^1,Tyr^3-octreotate) and ^{18}F-FDG

Irfan Kayani, FRCR[1]
Jamshed B. Bomanji, MD, PhD, FRCR[1]
Ashley Groves, MD[1]
Gerard Conway, MD[2]
Sveto Gacinovic, MD[1]
Thida Win, MD[3]
John Dickson, PhD[1]
Martyn Caplin, FRCP[4]
Peter Joseph Ell, FRCR, FRCP[1]

TABLE 2
Numbers of Patients Showing Predominant Uptake of ^{68}Ga-DOTATATE or ^{18}F-FDG According to Tumor Grade

	Predominant uptake of ^{68}Ga-DOTATATE	Predominant uptake of ^{18}F-FDG	Total
High/intermediate-grade NET	3	11	14
Low-grade NET	21	0	21
Total	24	11	35

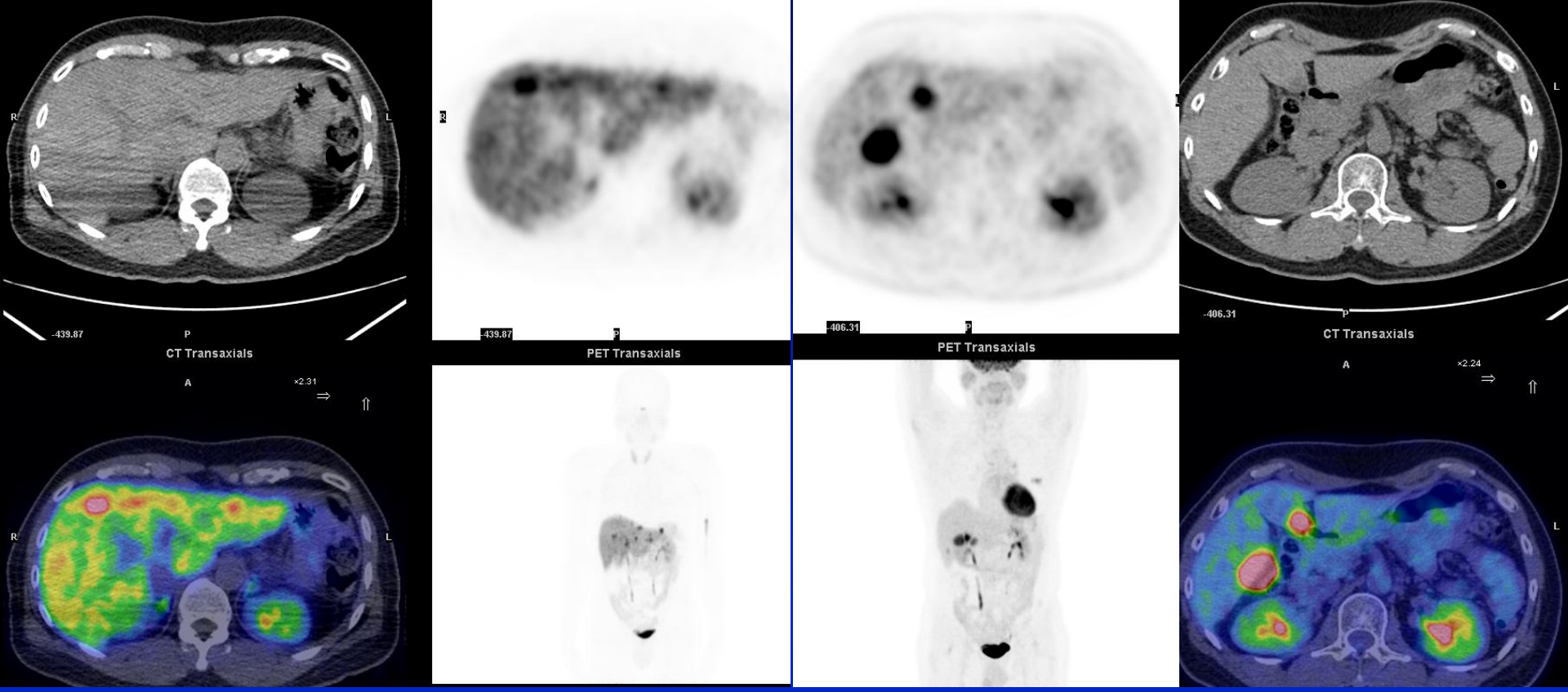
Two-tailed $P < .0001$. Fisher exact T-test.
NET indicates neuroendocrine tumors; ^{68}Ga-DOTATATE, ^{68}Ga-DOTA-[SCAP]D[R]Phe^1,Tyr^3-octreotate; ^{18}F-FDG, ^{18}F-Fluorodeoxyglucose.

TABLE 3
SUVmax of ^{68}Ga-DOTATATE and ^{18}F-FDG According to Tumor Grade

	^{68}Ga-DOTATATE	^{18}F-FDG	*P*
All NET	16.9 (1.6–50)	4.2 (1.4–16.4)	.005
Low-grade NET Ki67 index ≤2%	29 (3.3–45)	2.9 (1.5–12)	<.001
Intermediate NET Ki67 index 3%–20%	15.5 (1.8–50)	10.5 (2.0–13.9)	NS
High-grade NET Ki67 index >20%	4.4 (1.6–8.9)	11.7 (4.1–16.4)	.03

SUVmax is the median SUVmax with range in parentheses.
SUVmax indicates maximum standardized uptake value; NET, neuroendocrine tumor; ^{68}Ga-DOTATATE, ^{68}Ga-DOTA-[SCAP]D[R]Phe^1,Tyr^3-octreotate; ^{18}F-FDG, ^{18}F-Fluorodeoxyglucose.

CANCER June 1, 2008 / Volume 112 / Number 11



68Ga-DOTATOC

Gen 2011

FDG-PET/CT

Feb 2011

^{18}F-Fluorodihydroxyphenylalanine PET/CT in Patients with Neuroendocrine Tumors of Unknown Origin: Relation to Tumor Origin and Differentiation

J Nucl Med 2014; 55:1–6

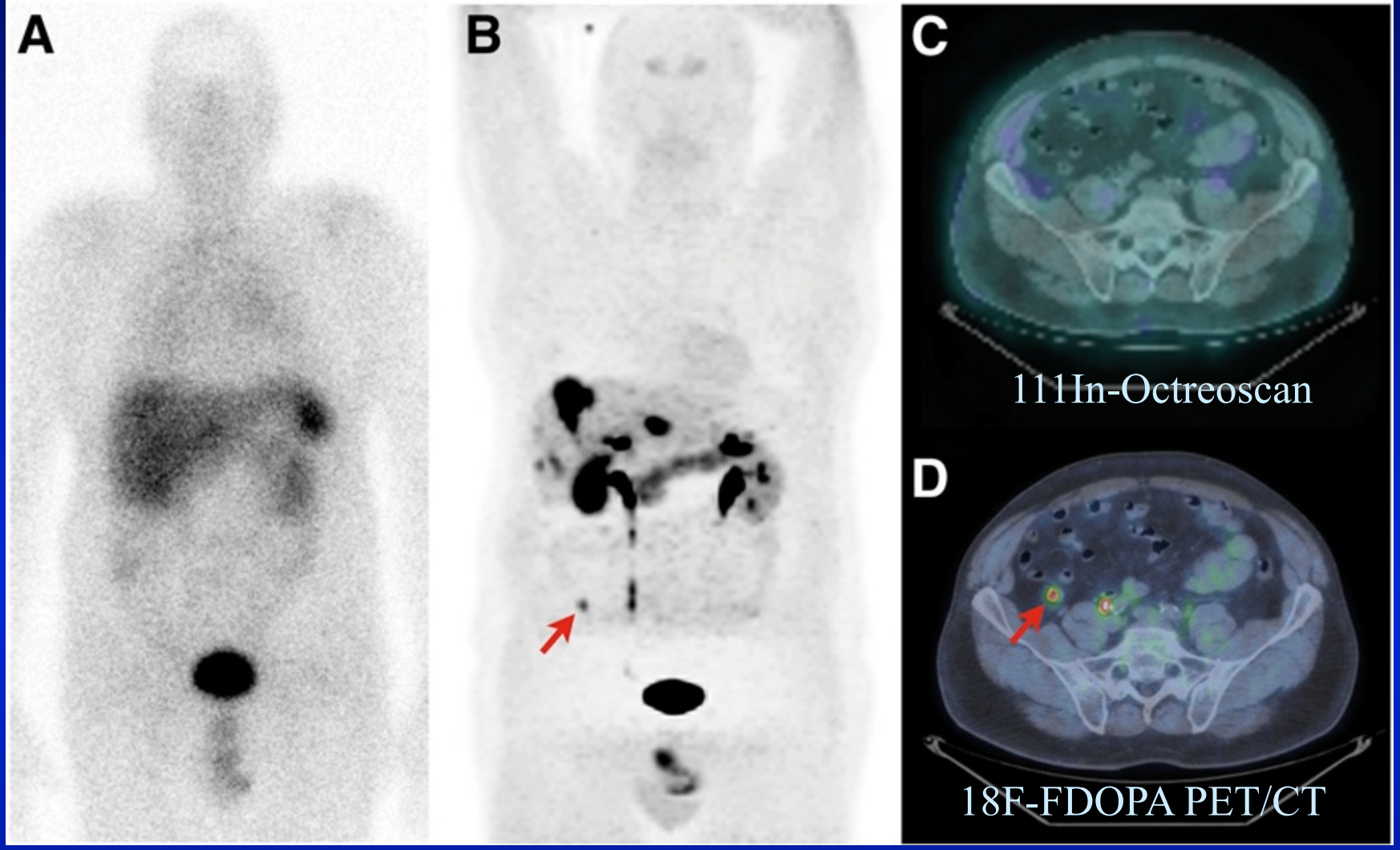
Alessio Imperiale[1,2], Edmond Rust[1], Sophie Gabriel[3], Julien Detour[4], Bernard Goichot[5], Bernard Duclos[6], Jean-Emmanuel Kurtz[7], Philippe Bachellier[8], Izzie-Jacques Namer[1,2], and David Taïeb[3]

[1]Biophysics and Nuclear Medicine, Hautepierre University Hospital, Strasbourg, France; [2]ICube, University of Strasbourg/CNRS (UMR 7357) and FMTS, Faculty of Medicine, Strasbourg, France; [3]Nuclear Medicine, La Timone University Hospital, European Center for Research in Medical Imaging, Aix-Marseille University, Provence, France; [4]Radiopharmacy, Hautepierre University Hospital, Strasbourg, France; [5]Internal Medicine, Hautepierre University Hospital, Strasbourg, France; [6]Gastroenterology, Hautepierre University Hospital, Strasbourg, France; [7]Oncology, Hautepierre University Hospital, Strasbourg, France; and [8]Visceral Surgery and Transplantation, Hautepierre University Hospital, Strasbourg, France

Retrospective study of NET patients with negative conventional and somatostatin receptor scintigraphy (SRS) results

27 patients were evaluated with 18F-FDOPA PET/CT
The primary occult NET was localized by 18F-FDOPA PET/CT in 12 patients (overall sensitivity, 44%; 52% in patients evaluated at initial diagnosis

Conclusion:
18F-FDOPA PET appears to be a sensitive functional imaging tool for the detection of primary NETs occult on SRS, **especially tumors with a well-differentiated pattern and serotonin secretion**



111In-Octreoscan 18F-FDOPA PET/CT

A 56-y-old patient with metastatic NET of unknown origin. 18F-FDOPA PET/CT confirmed presence of liver metastases and identified primary tumor in ileum occult on both conventional imaging and SRS.

Alessio Imperiale et al, J Nucl Med 2014; 55:1–6

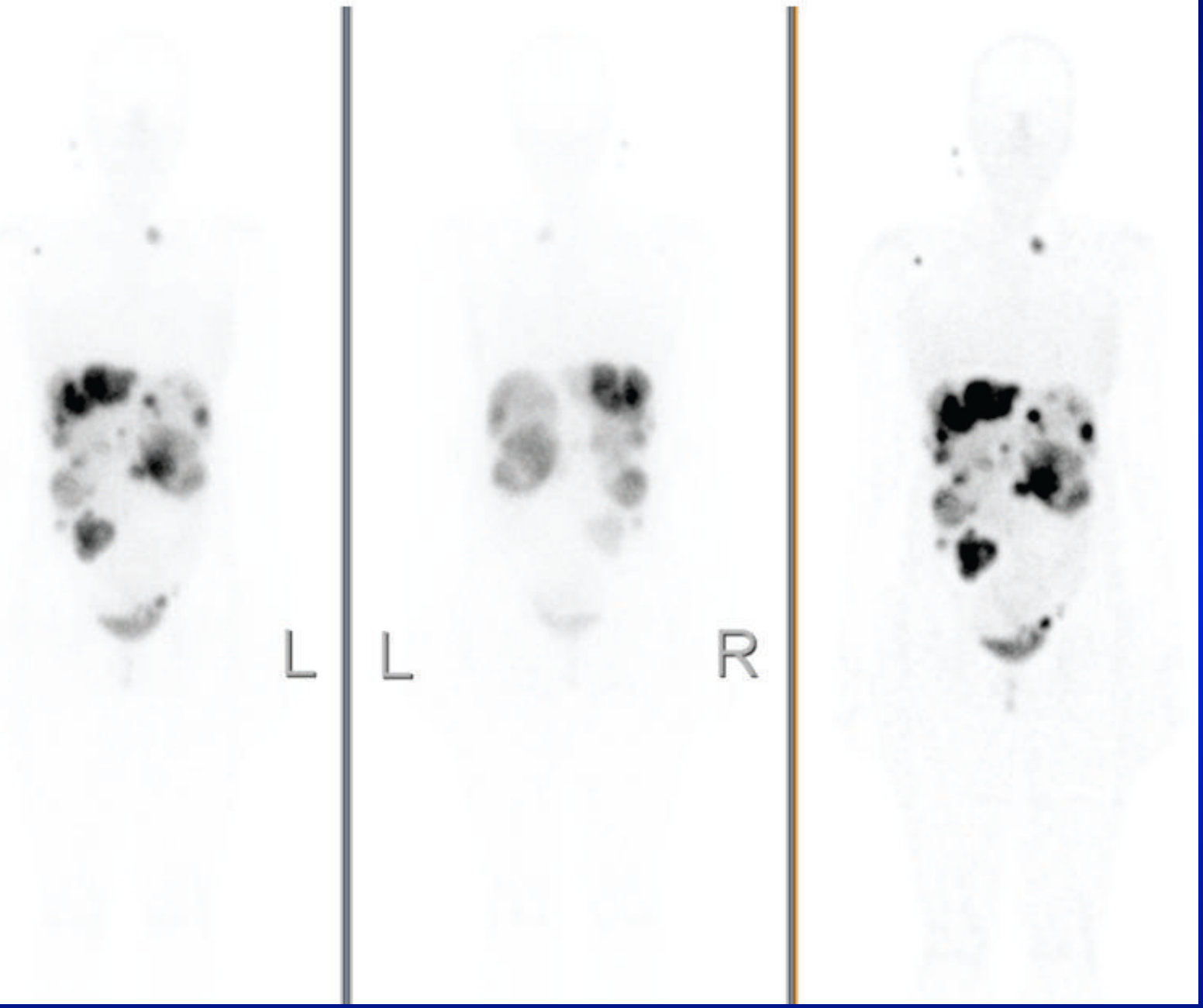
Insulinoma
e
diagnostica medico-nucleare

Spesso di piccole dimensioni

…e i recettori?

Densità di Espressione del SST-R2 nei Tumori GEP e Sensibilità dell' imaging con analoghi della somatostatina marcati

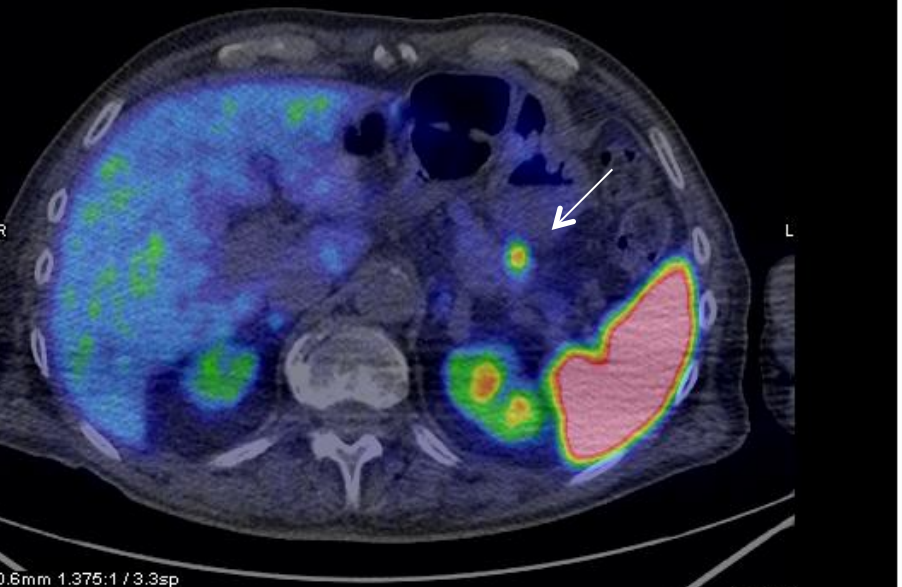
Gastrinoma	90-95%
Carcinoide	85-95%
VIP-oma	80-90%
Non-funzionanti	75-85%
Glucagonoma	70-80%
Insulinoma	50-60%

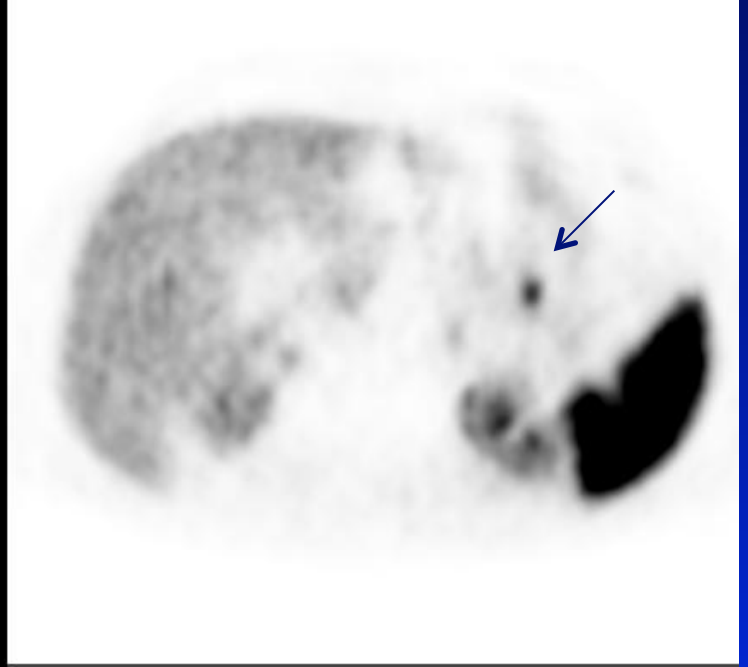


111In-Octreoscan

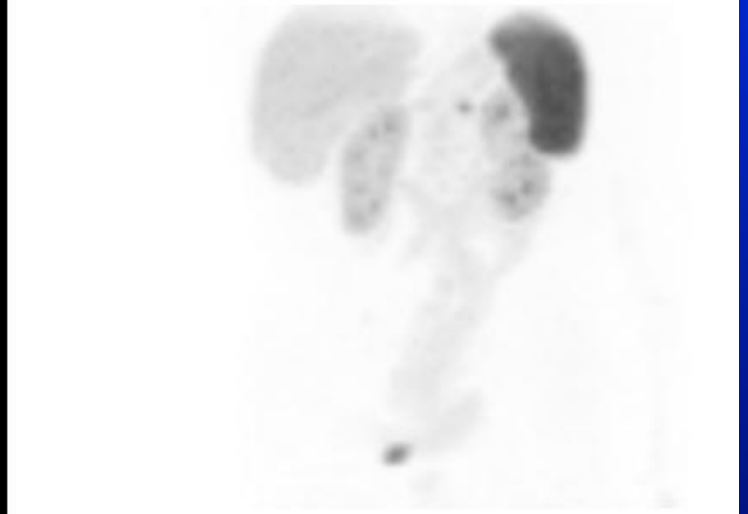
Metastatic insulinoma

R Costa et al Case Reports in Endocrinology 2013



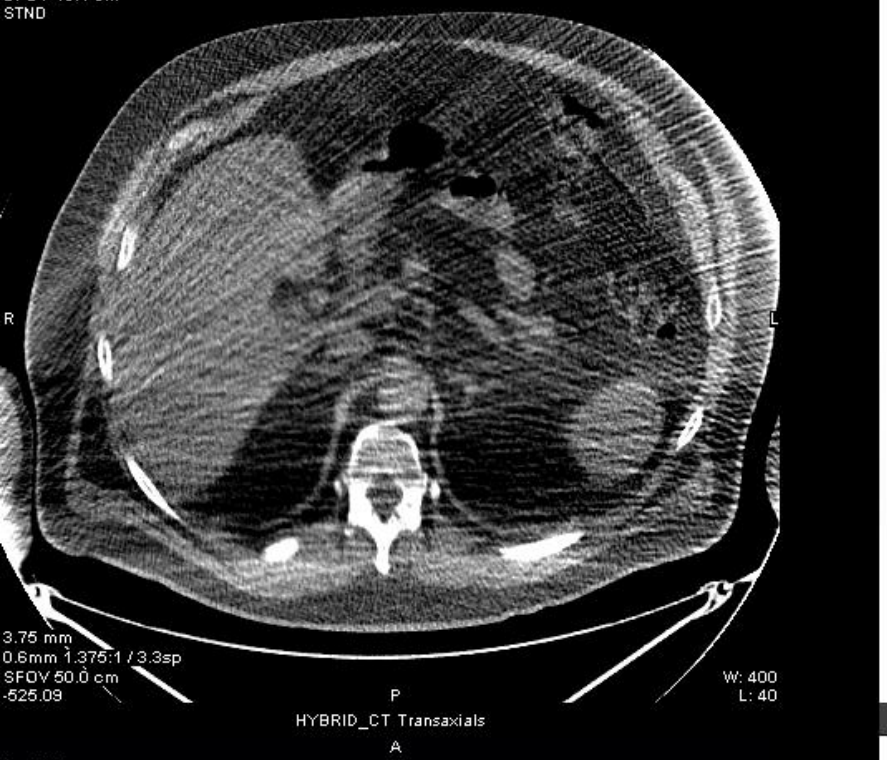


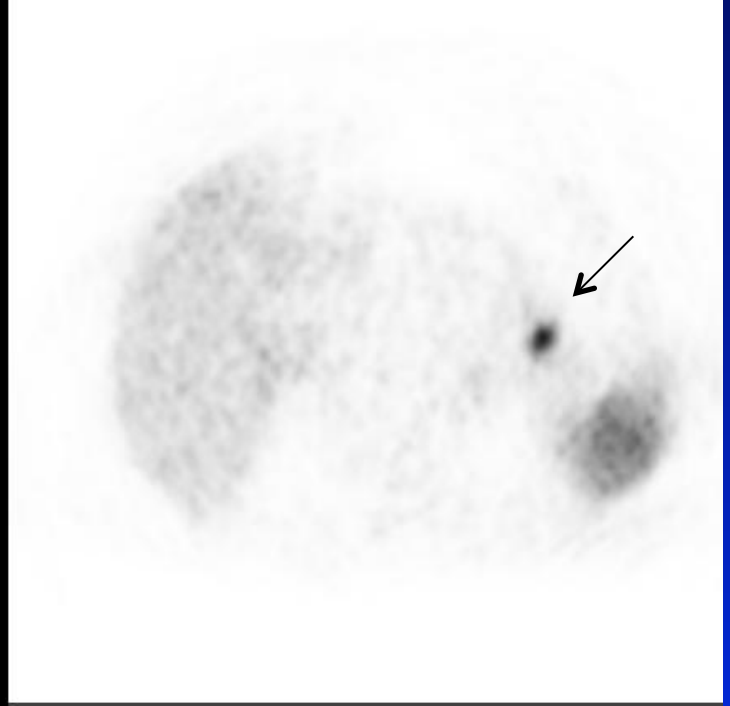
PT Transaxials



68Ga DOTATATE PET/CT

Insulinoma della coda del pancreas





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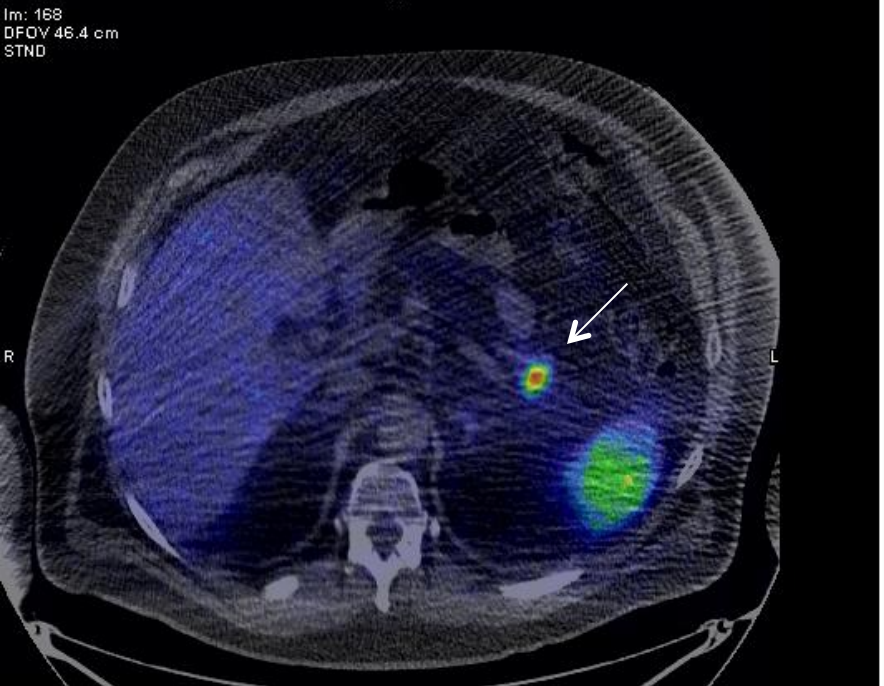
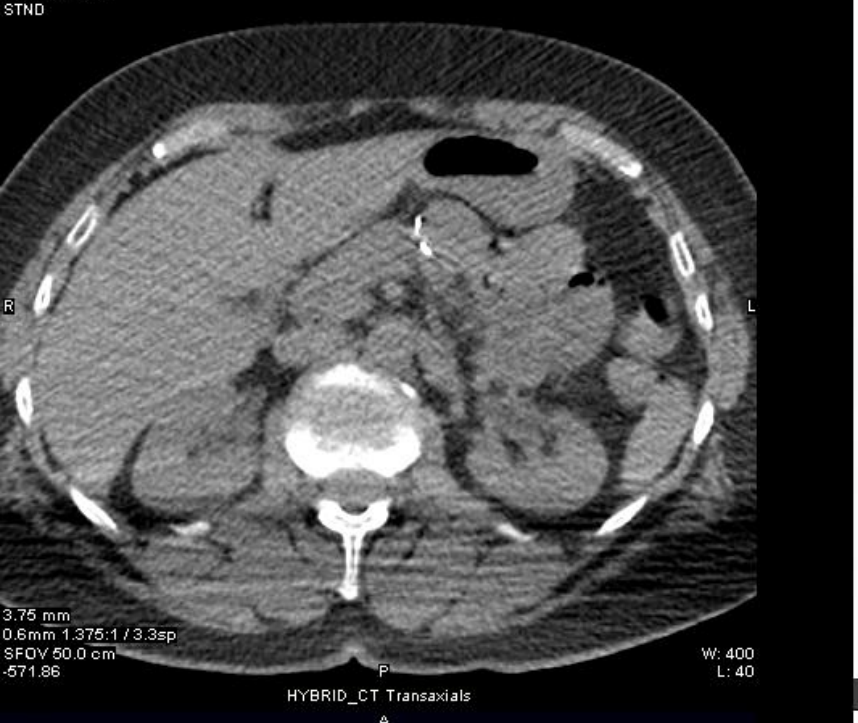
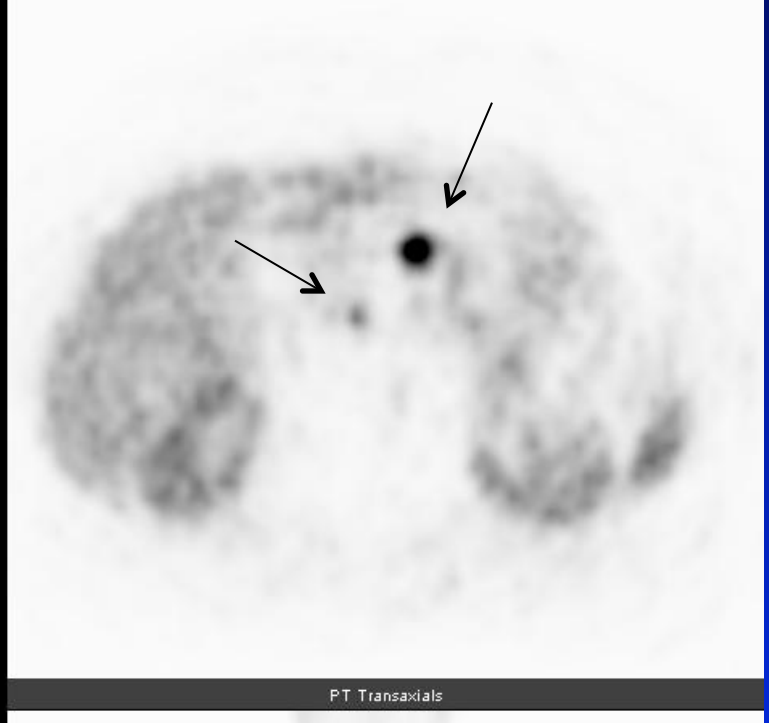
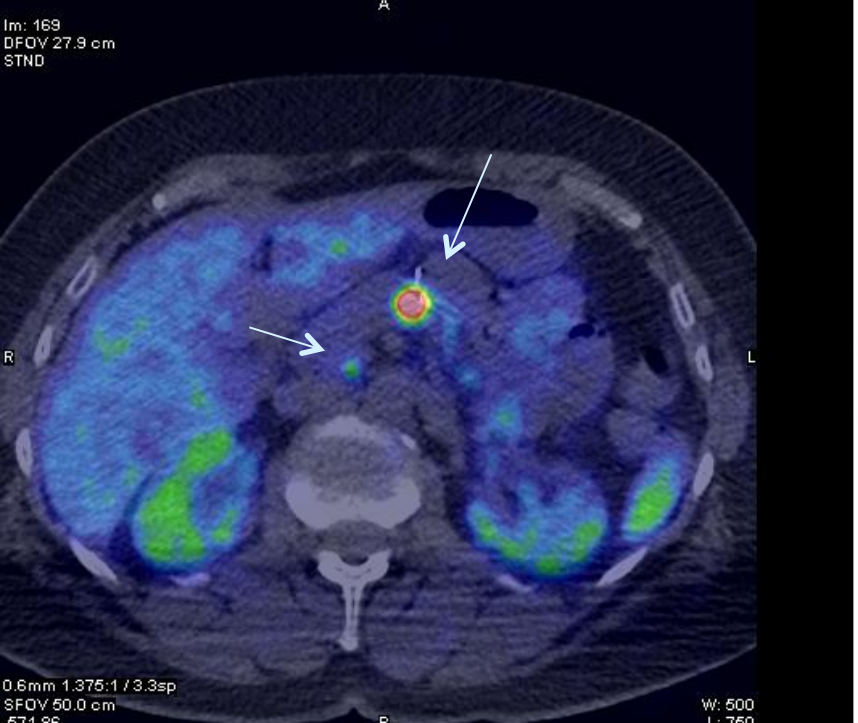


68Ga DOTATATE PET/CT

Insulinoma della coda del pancreas

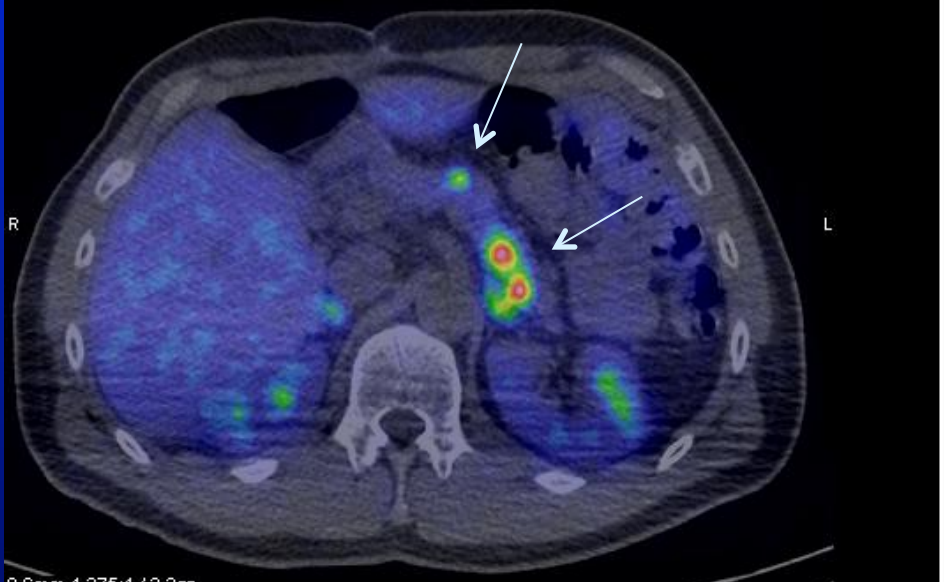


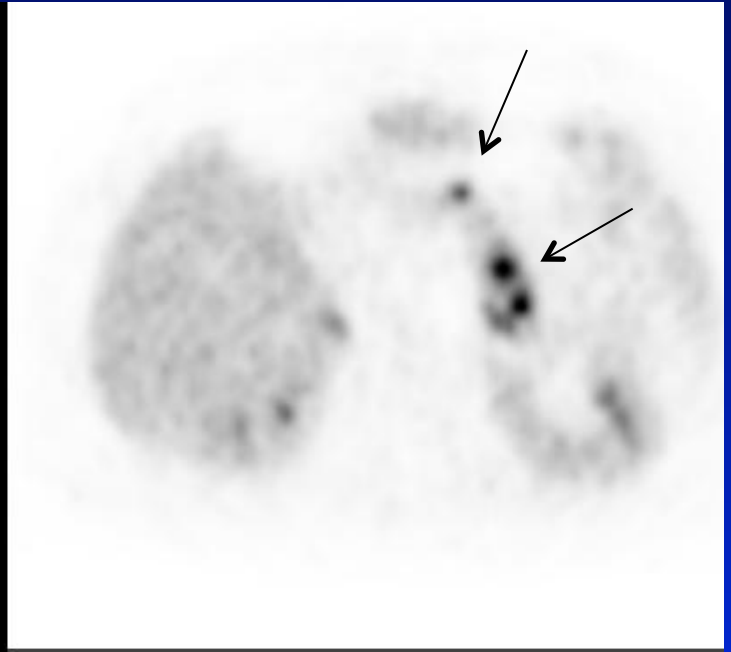


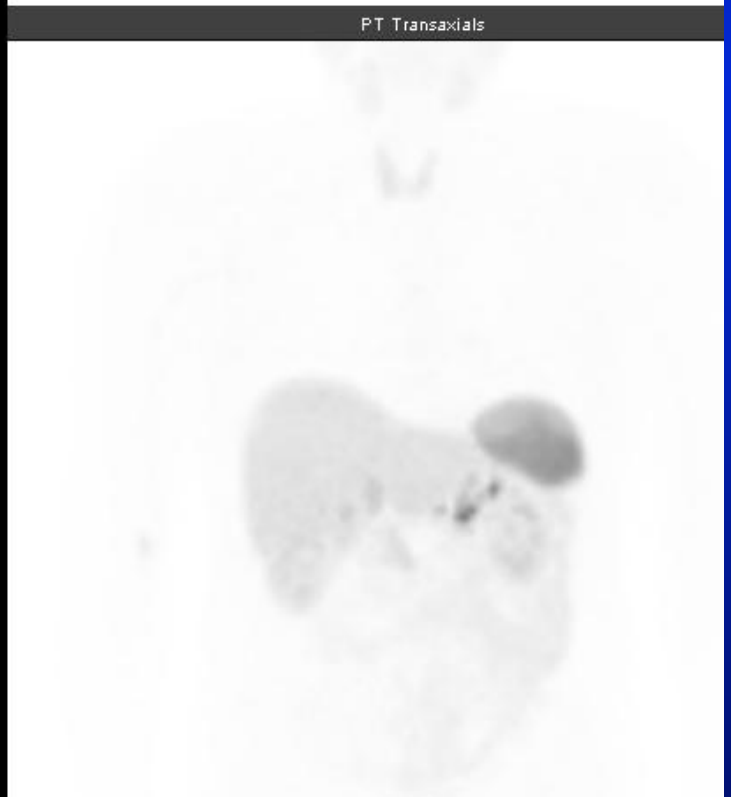


68Ga DOTATATE PET/CT

Insulinomi del corpo e testa del pancreas







68Ga DOTATOC PET/CT

Insulinomi multipli (recidiva)

Coda e corpo del pancreas

Somatostatin receptor based PET/CT imaging with 68Ga-DOTA-Nal3-Octreotide for localisation of clinically and biochemically suspected insulinoma

Sharma P1 et al Q J Nucl Med Mol Imaging. 2014 Apr 17

- 35 patients
- Sensitivity 25,8%
- Specificity 25%
- Accuracy 25,7%
- No significant difference was seen between Conventional Imaging and PET/CT
- 68Ga-DOTANOC PET/CT has limited utility for localising the primary tumor in patients with clinical and biochemical suspicion of insulinoma.
- DD benign/malignant?

Future?

Nucl Med Commun. 2012

Radiolabeled glucagon-like peptide-1 analogues: a new pancreatic β-cell imaging agent.

Zhang Y1, Chen W.

Grazie per l'attenzione