Associazione Medici Endocrinologi

AME Emilia Romagna

1° CONVEGNO AME EMILIA ROMAGNA

I giocolieri – Pablo Picasso - 1905

Bologna - 15 Maggio 2010

Bologna
Relais Bellaria Hotel & Congressi

Annibale Versari

Medicina Nucleare-Centro PET
Arcispedale S.Maria Nuova
Reggio Emilia

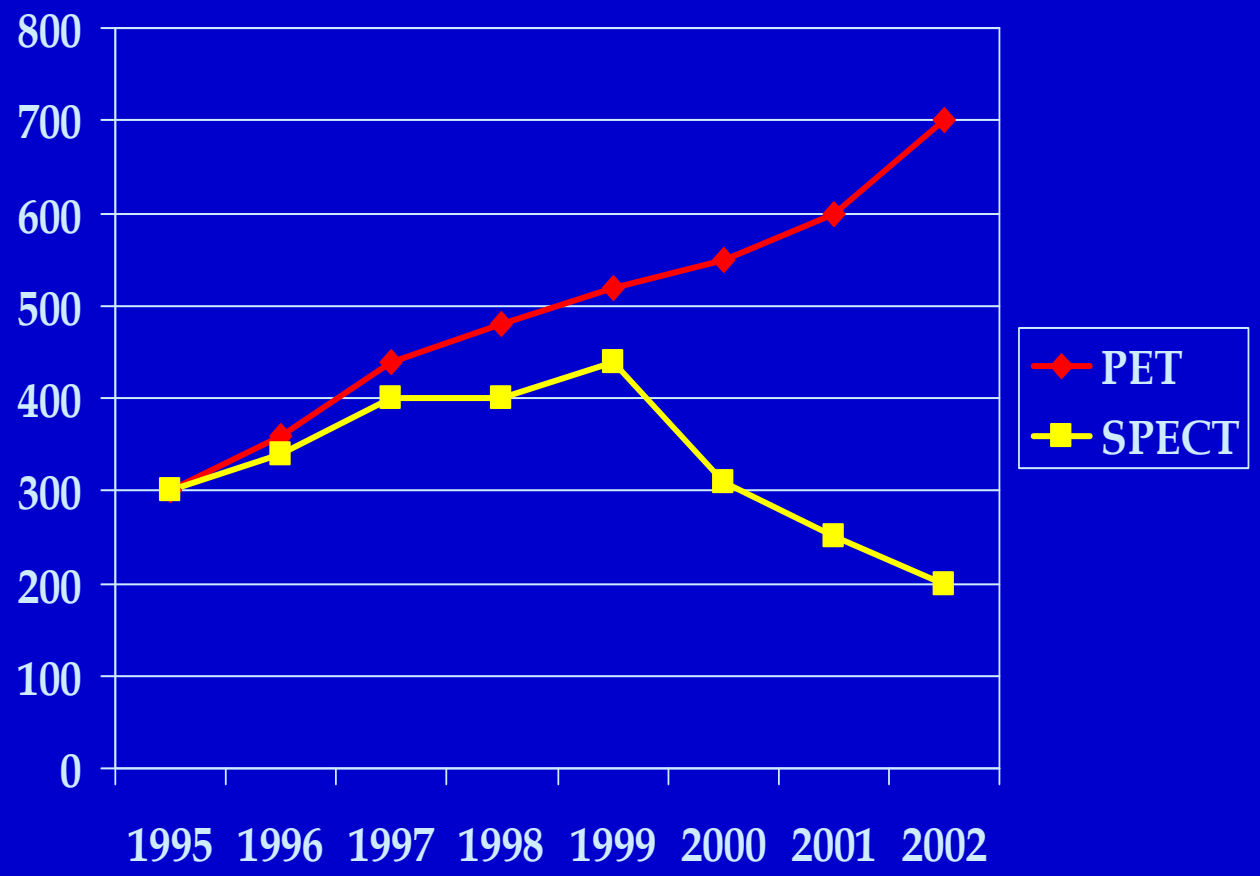
ASMN
ARCISPEDALE SANTA MARIA NUOVA
AZIENDA OSPEDALIERA REGGIO EMILIA
Regione Emilia-Romagna

La PET in Endocrinologia Oncologica

PET/TC: Up-to-date dopo 10 anni di utilizzo in clinica

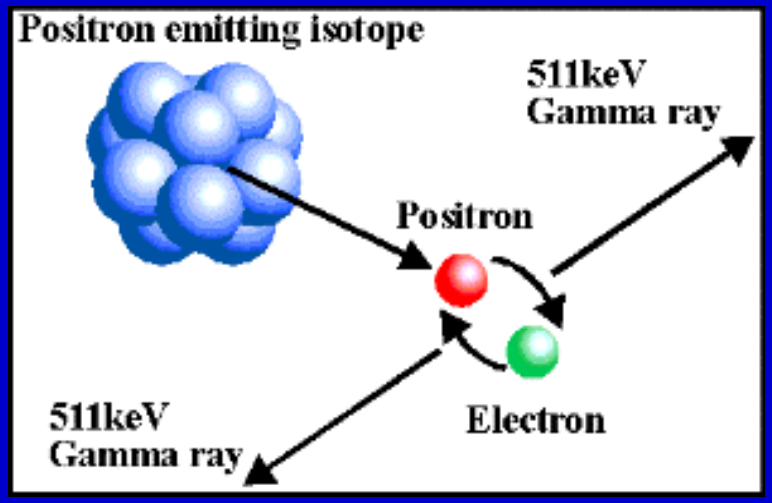
versari.annibale@asmn.re.it

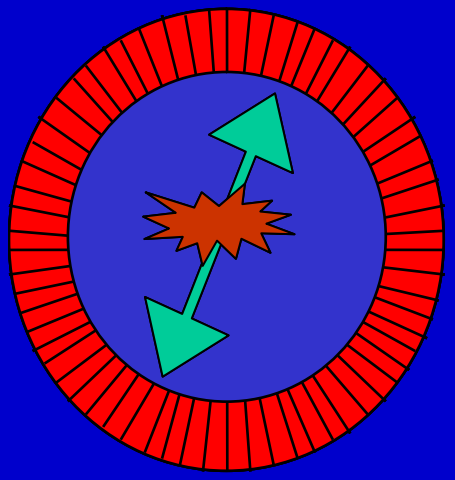
Contributi scientifici su PET/SPECT al Congresso della Society of Nuclear Medicine (U.S.A.)



Positron Emission Tomography (PET)

Indagine medico-nucleare che utilizza molecole biologiche (zuccheri, aminoacidi, ormoni, ecc.) marcate con atomi emettitori di positroni (β+)





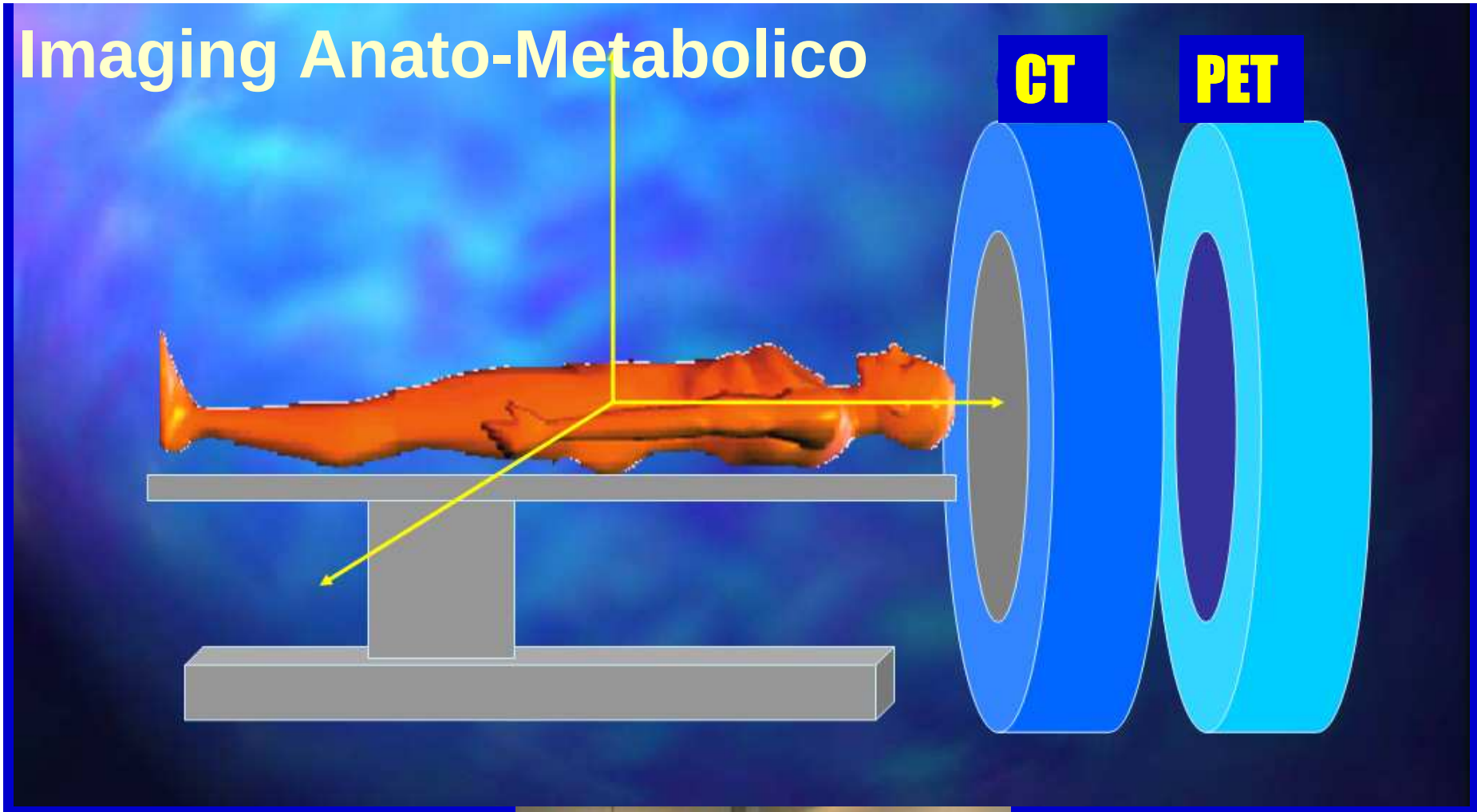
PET

La PET

- valuta gli aspetti fisiologici e biochimici piuttosto che quelli anatomici

- offre una prospettiva diversa della malattia (caratterizzazione biologica) ponendo le premesse per una diagnosi
  - più precoce
  - più precisa

Imaging Anato-Metabolico



PET/CT

Applicazioni in Endocrinologia Oncologica

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FDG-PET in oncologia

Criteri per un uso appropriato

Tiroide

Scenario clinico	Categoria di appropriatezza
identificazione delle recidive nei pazienti con elevati livelli di tireoglobulina e I 131 negativo	Appropriato
identificazione di recidive e metastasi in pazienti ad alto rischio con sospetto di malattia più estesa rispetto alle metastasi captanti I 131	Di utilità tuttora non documentata

Annals of Surgical Oncology

10.1245/s10434-007-9611-5

Endocrine Tumors
Original Paper

Combined [^{18}F]Fluorodeoxyglucose Positron Emission Tomography and Computed Tomography (FDG-PET/CT) for Detection of Recurrent, ^{131}I-Negative Thyroid Cancer

Steven E. Finkelstein[1], Perry W. Grigsby[2, 4], Barry A. Siegel[3, 4], Farrokh Dehdashti[3, 4], Jeffrey F. Moley[1, 4] and Bruce L. Hall[1, 4]

(1) Department of Surgery, Washington University School of Medicine, St. Louis, MO, USA
(2) Department of Radiation Oncology, Washington University School of Medicine, St. Louis, MO, USA
(3) Division of Nuclear Medicine, Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, MO, USA
(4) Alvin J. Siteman Cancer Center, Washington University School of Medicine, St. Louis, MO, USA

	FDG-PET/CT result			
	Positive	**Negative**	**Total**	
Disease				
Positive	43 (TP)	1 (FN)	44	**Sensitivity 98%**
Negative	4 (FP)	17 (TN)	21	**Specificity 81%**
Total	47	18	65	
	PPV 91%	**NPV 94%**		

Q J NUCL MED MOL IMAGING 2008;52:2-8

Fluorodeoxyglucose PET/CT in patients with differentiated thyroid cancer and elevated thyroglobulin after total thyroidectomy and ^{131}I ablation

B. SALVATORE [1, 2], G. PAONE [2], M. KLAIN [2], G. STORTO [3], E. NICOLAI [1], D. D'AMICO [1], A. M. DELLA MORTE [1], L. PACE [2, 3], M. SALVATORE [2, 3]

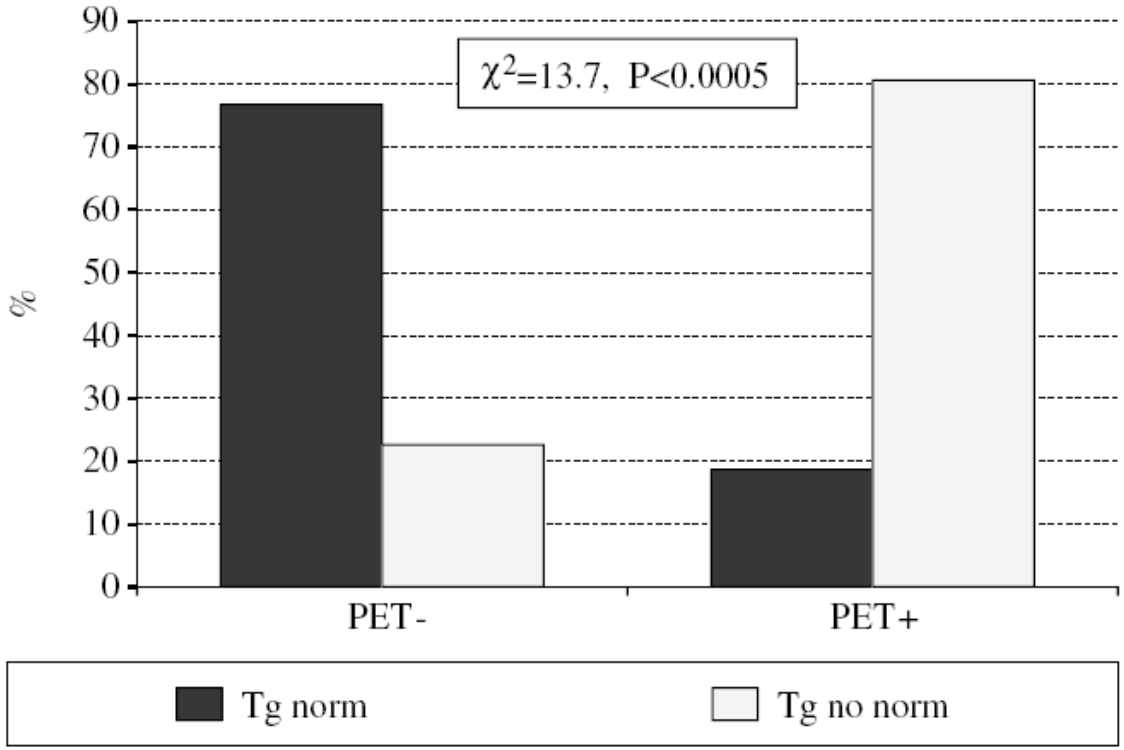

Figure 1.—FDG-PET *vs* thyroglobulin evaluation at short-term follow-up. PET$^-$: negative FDG-PET/CT; PET$^+$: positive FDG-PET/CT.

Q J NUCL MED MOL IMAGING 2008;52:2-8

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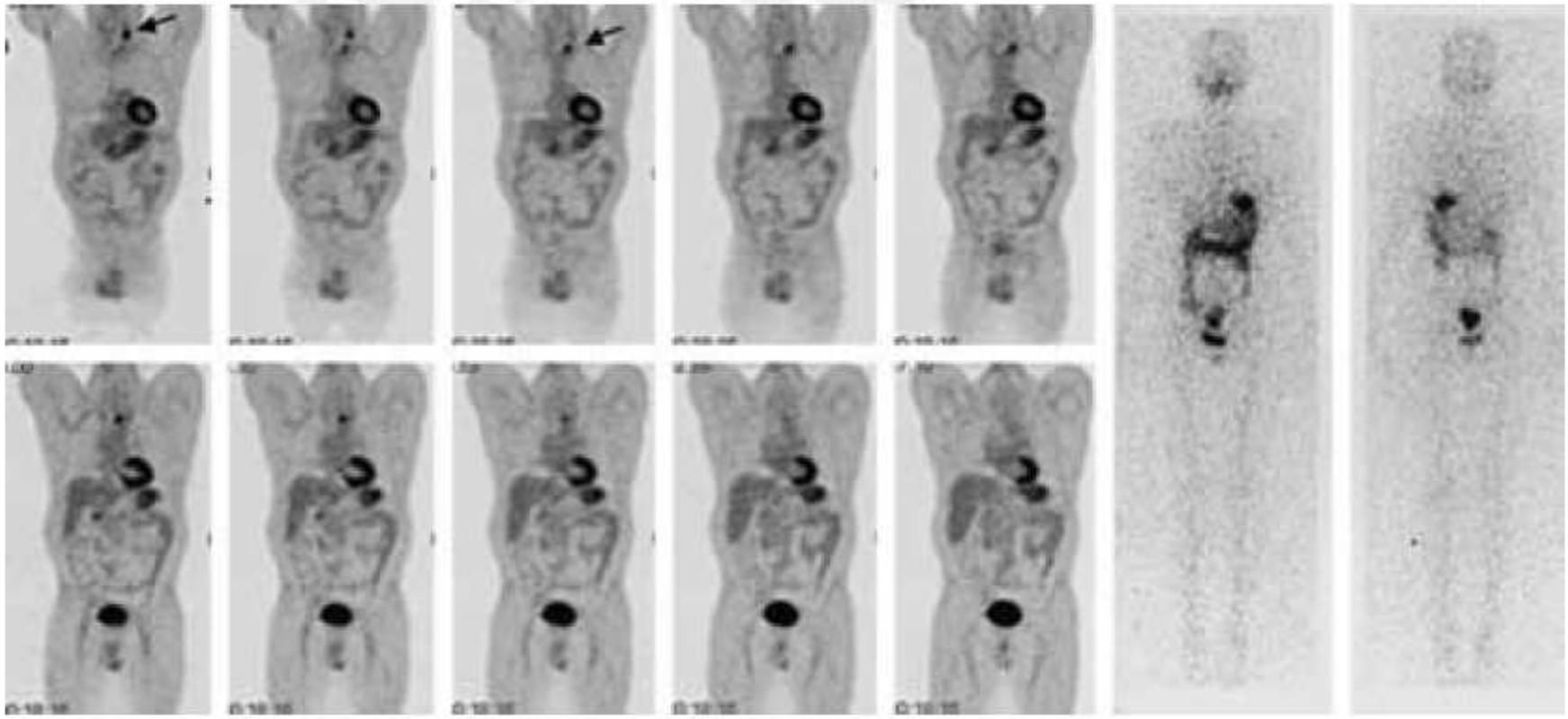

Figure 2.—A 62-year-old male patient with positive FDG-PET/CT and negative post-therapy ^{131}I whole-body scan. Human thyroglobulin level at short-term follow-up was sensibly higher (200 ng/mL) than before therapy (100 ng/mL).

Nucl Med Commun. 2009 Mar;30(3):240-4.

Evaluation of thyroid FDG uptake incidentally identified on FDG-PET/CT imaging.

Chen W, Parsons M, Torigian DA, Zhuang H, Alavi A.

Division of Nuclear Medicine, Department of Radiology, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA.

OBJECTIVES: To characterize the prevalence and malignancy of thyroid F-flurodeoxyglucose (FDG) uptake incidentally identified on FDG-PET/computed tomography (CT) scan in a relatively large population. METHODS: Two thousand five hundred and ninety-four cases of FDG-PET/CT performed at our institute in the past 1 year and a half were retrospectively reviewed. Images with incidental focal or diffuse thyroid FDG uptake were identified. Data of the PET findings, thyroid functional assay, and pathological diagnosis were collected and analyzed. Incidental thyroid FDG uptake was defined as a new thyroid lesion initially identified on PET scan in a patient without a previous known history of thyroid disease. RESULTS: The prevalence of incidental thyroid FDG uptake (including both focal and diffuse lesions) was 3.8% (99 of 2594) on FDG-PET/CT, of which 1.8% (46 of 2594) were diffuse and 2.0% (53/2594) were focal. Of the 46 cases with diffuse uptake, 21 had thyroid functional assay and/or ultrasound study, and a diagnosis of chronic thyroiditis was made in all of the 21 cases. Eleven of the 53 patients with focal uptake had fine-needle aspiration or postsurgical pathological diagnosis, four benign lesions (four of 11=36.4%: two thyroid adenomas and two hyperplastic lesions); seven malignancies (seven of 11=63.6%: three papillary carcinomas, two follicular carcinoma, and two metastases). There was overlapping of the lesion SUVmax between the benign and malignant cases, with no statistical difference of the mean SUVmax between the two groups. CONCLUSION: Thyroid FDG uptake incidentally identified on FDG-PET/CT occurred at a frequency of 3.8%, with about half of focal and half of diffuse lesions. The risk of thyroid malignancy was 63.6% in lesions with focal uptake, whereas the majority of diffuse uptake cases represents chronic thyroiditis. More data are needed to elucidate the role of SUV in the differentiation of benign and malignant lesions.

World J Surg Oncol. 2009 Aug 10;7:63.

Incidental thyroid lesions detected by FDG-PET/CT: prevalence and risk of thyroid cancer.

Bae JS, Chae BJ, Park WC, Kim JS, Kim SH, Jung SS, Song BJ.

Department of Surgery, The Catholic University of Korea, Seoul, Korea. drbae@catholic.ac.kr

BACKGROUND: Incidentally found thyroid lesions are frequently detected in patients undergoing FDG-PET/CT. The aim of this study was to investigate the prevalence of incidentally found thyroid lesions in patients undergoing FDG-PET/CT and determine the risk for thyroid cancer. METHODS: FDG-PET/CT was performed on 3,379 patients for evaluation of suspected or known cancer or cancer screening without any history of thyroid cancer between November 2003 and December 2005. Medical records related to the FDG-PET/CT findings including maximum SUV(SUVmax) and pattern of FDG uptake, US findings, FNA, histopathology received by operation were reviewed retrospectively. RESULTS: Two hundred eighty five patients (8.4%) were identified to have FDG uptake on FDG-PET/CT. 99 patients with focal or diffuse FDG uptake underwent further evaluation. The cancer risk of incidentally found thyroid lesions on FDG-PET/CT was 23.2% (22/99) and the cancer risks associated with focal and diffuse FDG uptake were 30.9% and 6.4%. There was a significant difference in the SUVmax between the benign and malignant nodules (3.35 +/- 1.69 vs. 6.64 +/- 4.12; P < 0.001). There was a significant correlation between the SUVmax and the size of the cancer. CONCLUSION: The results of this study suggest that incidentally found thyroid lesions by FDG-PET/CT, especially a focal FDG uptake and a high SUV, have a high risk of thyroid malignancy. Further diagnostic work-up is needed in these cases.

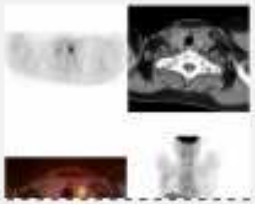

Figure 1. **Focal FDG uptake on PET/CT.** 54 year old female with breast cancer. The ^{18}F-FDG PET/CT revealed focal uptake with SUV of 7.6. The patients was performed total thyroidectomy with a final diagnosis of papillary thyroid carcinoma.

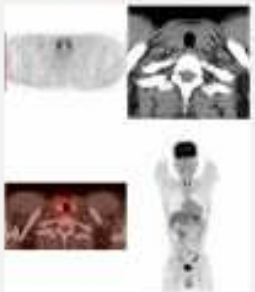

Figure 2. **Diffuse FDG uptatake on PET/CT.** 53 year old male. The ^{18}F-FDG PET/CT revealed diffuse uptake with SUV of 3.8. The sonographic features of the thyroid gland were strongly suggestive of the presence of thyroiditis.

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Clinical Investigation

Diagnostic Accuracy of ^{18}F-FDG PET in Restaging Patients with Medullary Thyroid Carcinoma and Elevated Calcitonin Levels

Seng C. Ong[1], Heiko Schöder[1], Snehal G. Patel[2], Ida M. Tabangay-Lim[2], Indukala Doddamane[1], Mithat Gönen[3], Ashok R. Shaha[2], R. Michael Tuttle[4], Jatin P. Shah[2] and Steven M. Larson[1]

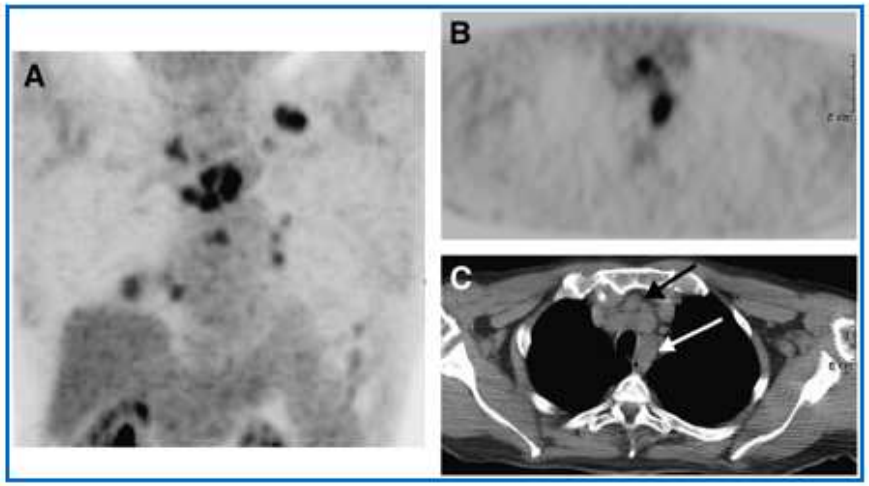

FIGURE 1. Maximum-intensity-projection (A), transaxial PET (B), and transaxial CT (C) images of 67-y-old man with calcitonin level of 119,000 pg/mL. Maximum-intensity projection shows multiple foci of ^{18}F-FDG uptake in neck, mediastinum, and lungs. ^{18}F-FDG PET and CT show metastatic mediastinal lymph nodes (arrows).

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CONCLUSION

Our results indicate that ^{18}F-FDG PET can detect residual, recurrent, or metastatic MTC in patients with elevated calcitonin levels after thyroidectomy. The probability for disease detection is higher in patients with higher calcitonin levels: ^{18}F-FDG PET can be used in a clinically meaningful manner in patients with calcitonin levels of more than 1,000 pg/mL (sensitivity, 78%), but its utility appears limited if the calcitonin level is below 500 pg/mL.

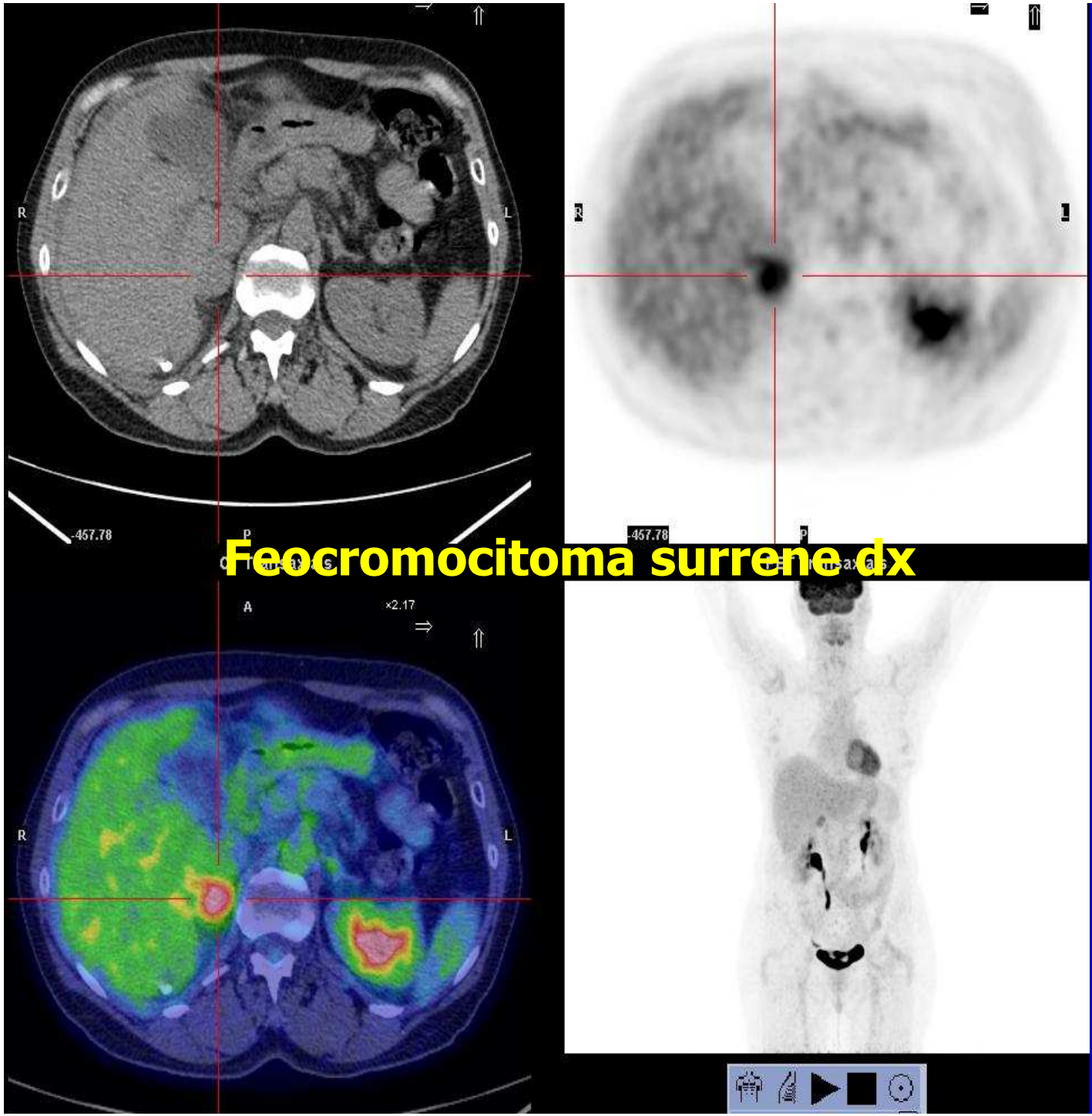
^{18}F-FDG Avidity of Pheochromocytomas and Paragangliomas: A New Molecular Imaging Signature?

David Taïeb[1], Frederic Sebag[2], Anne Barlier[3], Laurent Tessonnier[1], Fausto F. Palazzo[2], Isabelle Morange[4], Patricia Niccoli-Sire[4], Nicolas Fakhry[5], Catherine De Micco[6], Serge Cammilleri[1], Alain Enjalbert[3], Jean-François Henry[2], and Olivier Mundler[1]

[1]Service Central de Biophysique et de Médecine Nucléaire, Centre Hospitalo-Universitaire de la Timone, Marseille, France; [2]Service de Chirurgie Générale et Endocrinienne, Centre Hospitalo-Universitaire de la Timone, Marseille, France; [3]Laboratoire de Biochimie et Biologie Moléculaire, Centre Hospitalier Universitaire Conception, Marseille, France; [4]Service d'Endocrinologie, Diabète et Métabolismes, Centre Hospitalo-Universitaire de la Timone, Marseille, France; [5]Service D'oto-Rhino-Laryngologie, Centre Hospitalo-Universitaire de la Timone, Marseille, France; and [6]Faculté de Médecine, Institut National de la Santé et de la Recherche Médicale, Marseille, France

Conclusion:
18F-FDG PET positivity is almost a constant feature of pheochromocytomas and paragangliomas.
It may be considered a molecular signature of such tumors

David Taieb et al , J Nucl Med 2009



^{18}F-FDG PET/CT

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Carcinoide

Scenario clinico	Categoria di appropriatezza
stadiazione	Inappropriato
follow up	Inappropriato

Tumori neuroendocrini

Scenario clinico	Categoria di appropriatezza
stadiazione	Inappropriato
valutazione della risposta al trattamento al termine della terapia	Inappropriato

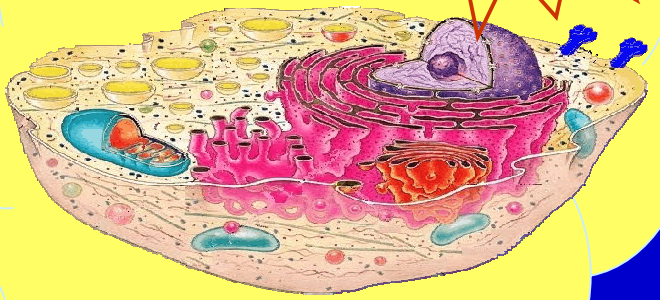
Imaging medico-nucleare=Imaging molecolare

Le immagini sono espressione delle caratteristiche biochimiche e metaboliche dei tessuti

Peptidi

Recettori

Ormoni



Neurotrasmettitori

Imaging medico-nucleare

Presupposti fisiopatogici

Sito di "aggancio" prevalente:
SSTR2

Bersaglio:

neoplasie neuroendocrine che esprimono recettori per la somatostatina

Analoghi della somatostatina

Metodiche

Scintigrafia, SPECT, SPECT/CT con

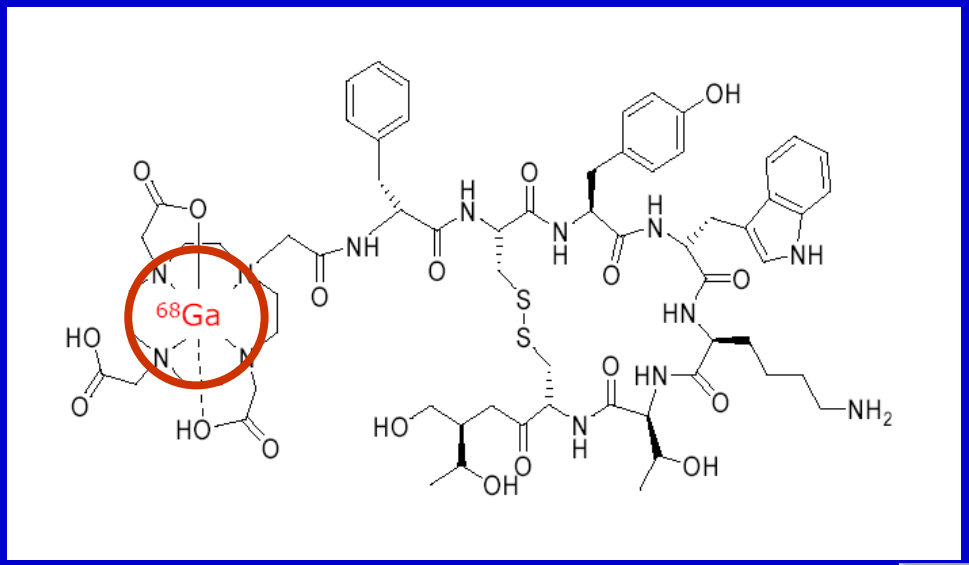
- **^{111}In-Octreoscan**

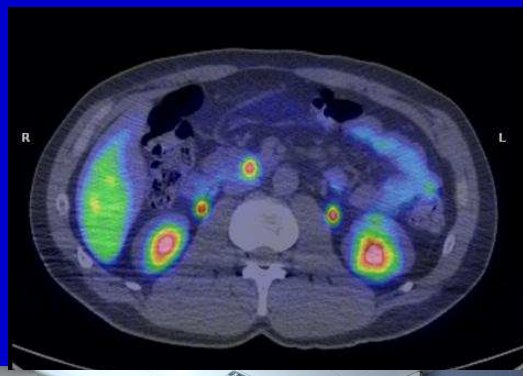
PET/CT con

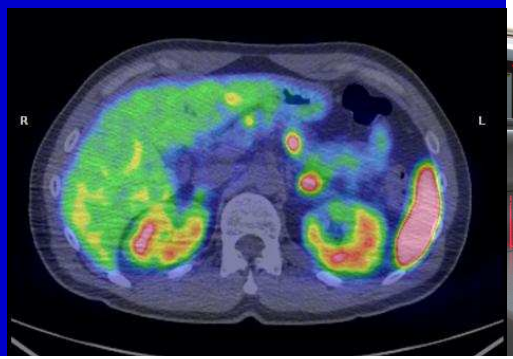
- **^{68}Ga-DOTATOC**
- **^{68}Ga-DOTANOC**

^{68}Ga DOTATOC PET/CT

Generatore 68Ge/68Ga





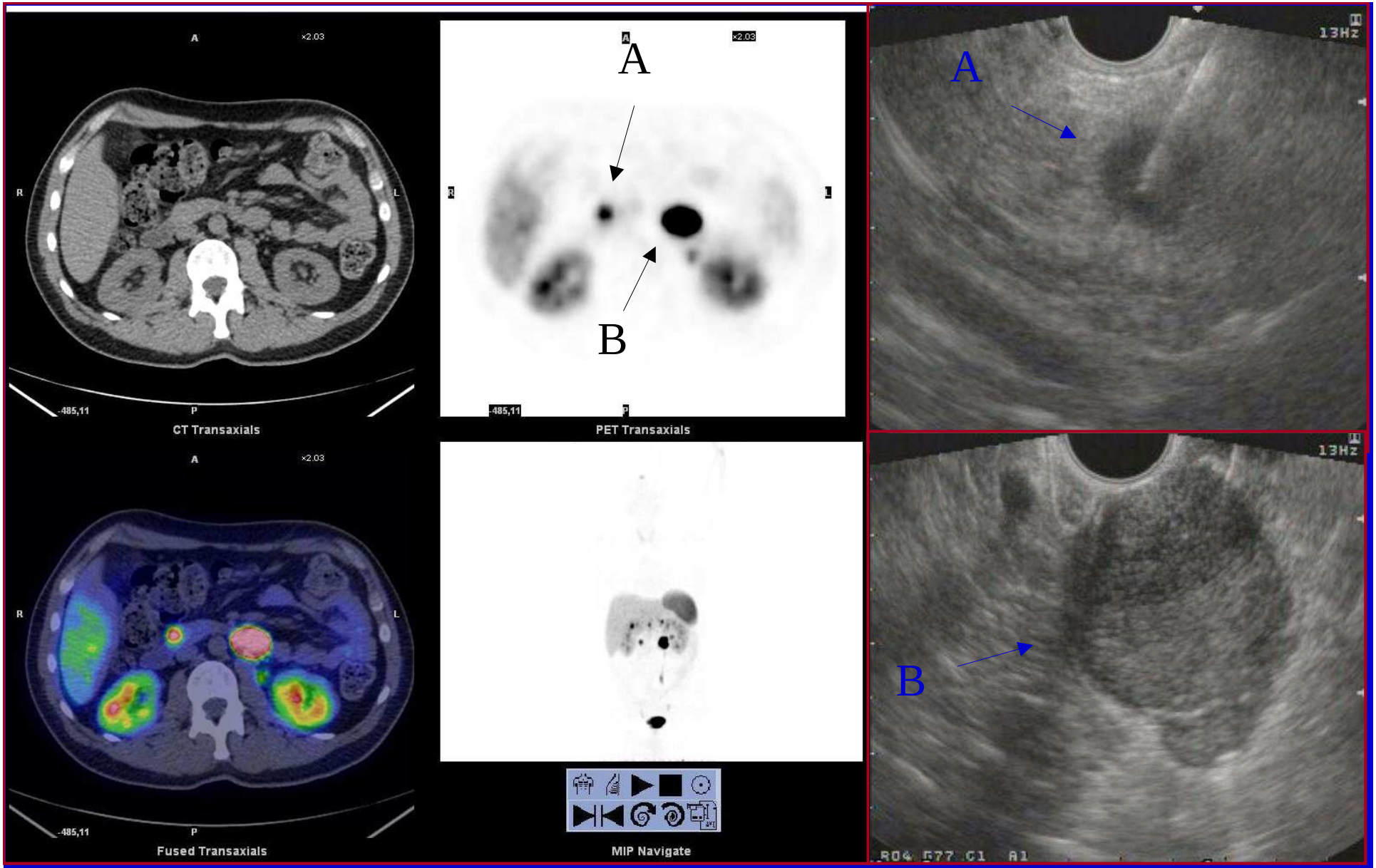


Ga-68 DOTATOC PET, Endoscopic Ultrasonography, and Multidetector CT in the Diagnosis of Duodenopancreatic Neuroendocrine Tumors

A Single-Centre Retrospective Study

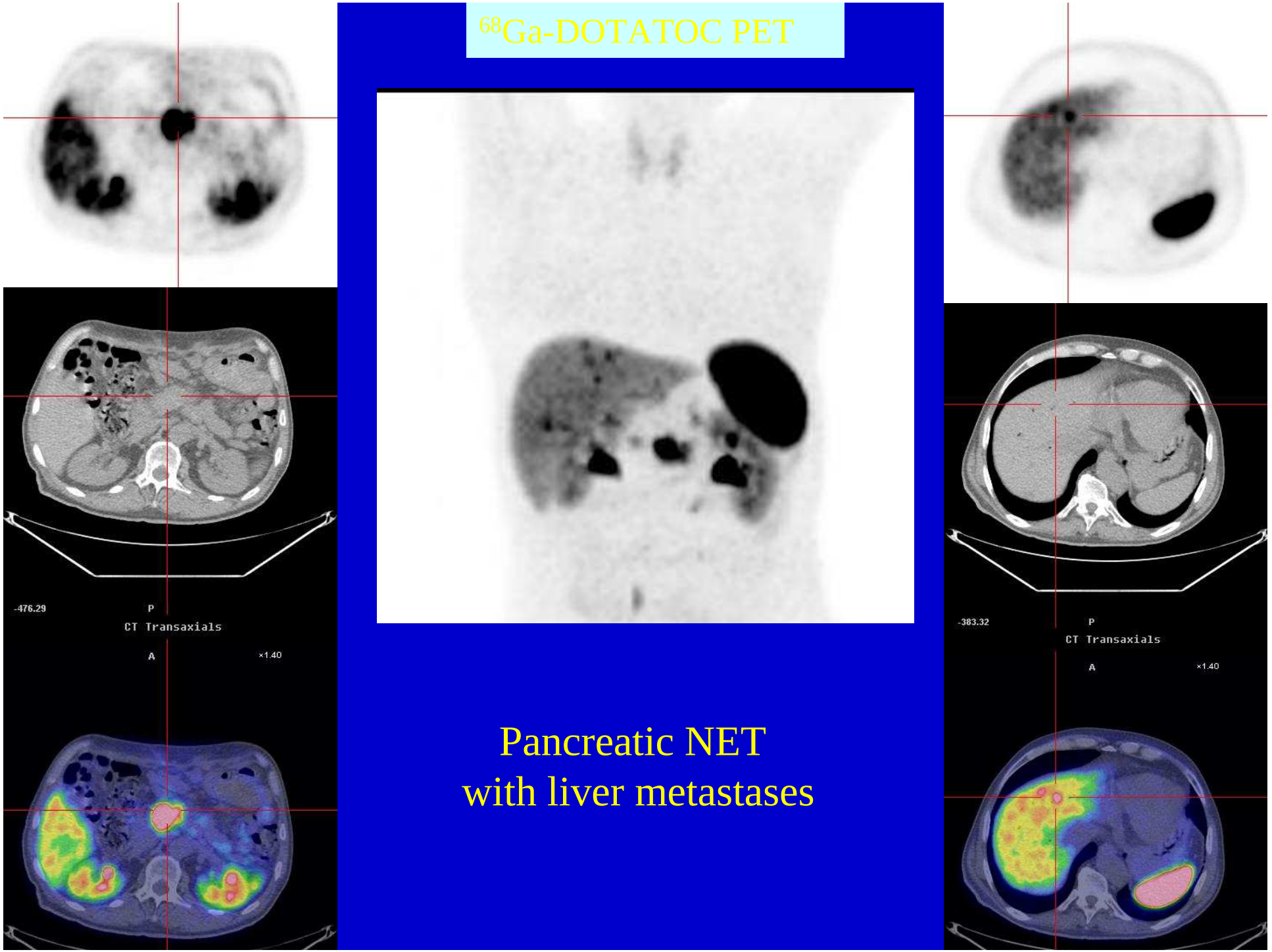
Annibale Versari, MD, Lorenzo Camellini, MD,† Gabriele Carlinfante, MD,‡ Andrea Frasoldati, MD,* Franco Nicoli, MD,§ Elisa Grassi, ●●●,¶ Carmine Gallo, MD,‡ Francesco Giunta, MD,* Alessandro Fraternali, MD,* Diana Salvo, MD,* Mattia Asti, ●●●,* Francesco Azzolini, MD,† Veronica Iori, MD,† and Romano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

Clin Nucl Med 2010;



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

^{68}Ga-DOTATOC PET



Pancreatic NET
with liver metastases

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

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

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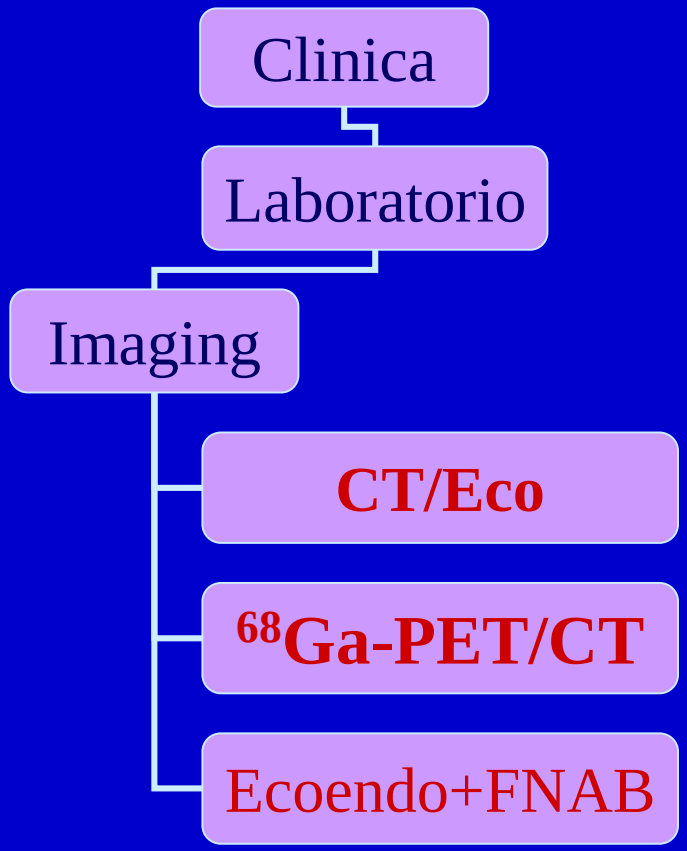
[redacted]

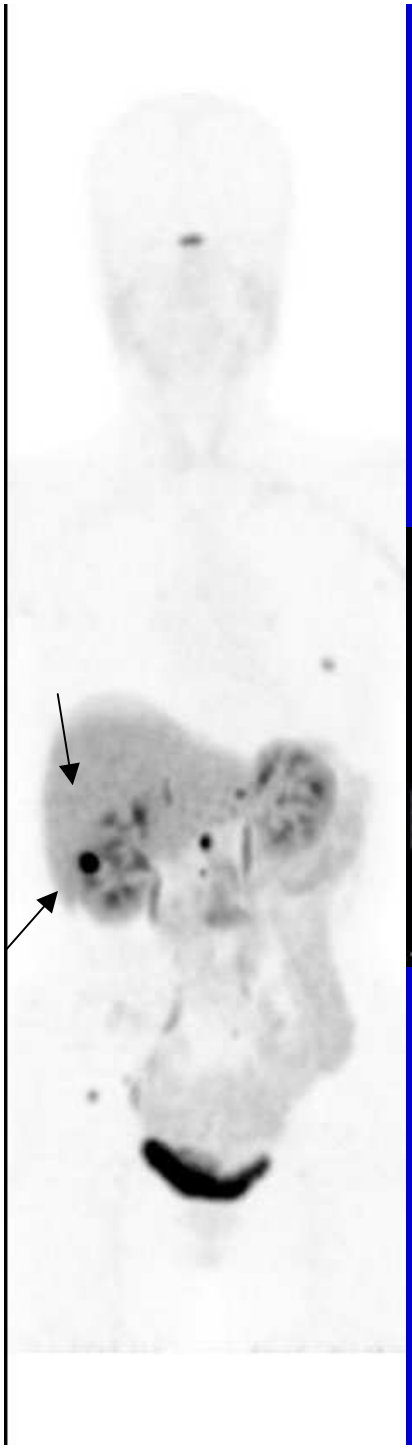
Conclusions: EUS, Ga-68 DOTATOC PET, and MDCT seem to have comparable accuracy in diagnosis of duodenopancreatic NET and their combination may allow an optimal preoperative diagnosis.

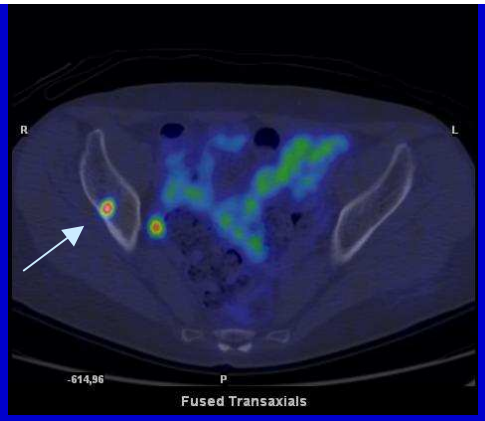
[redacted]

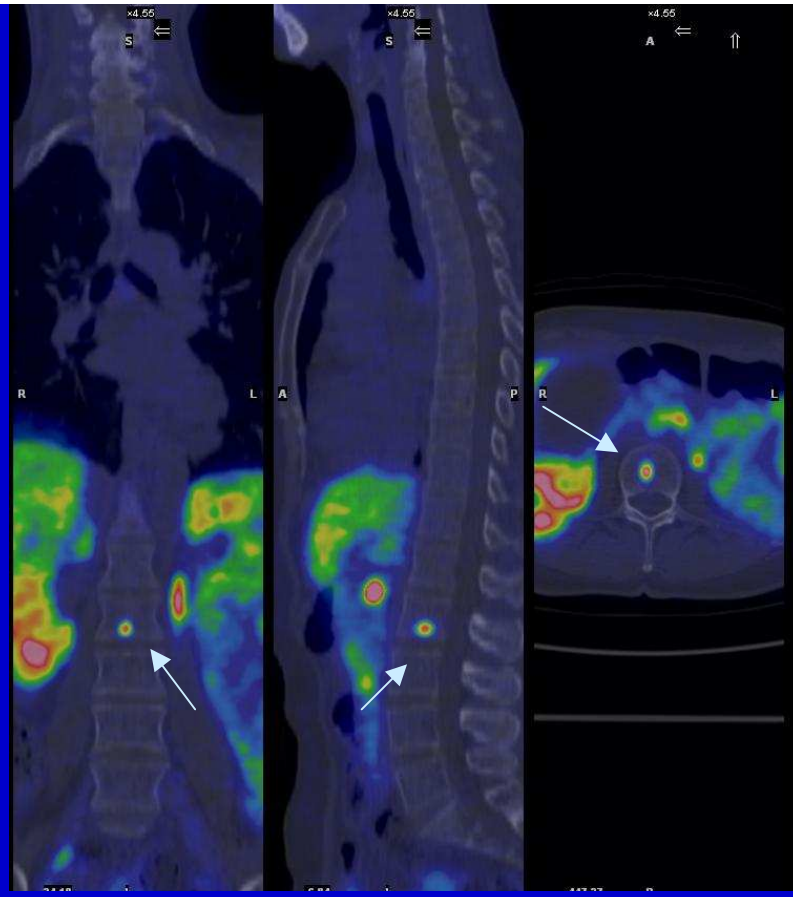
(*Clin Nucl Med* 2010;35: 000–000) In press

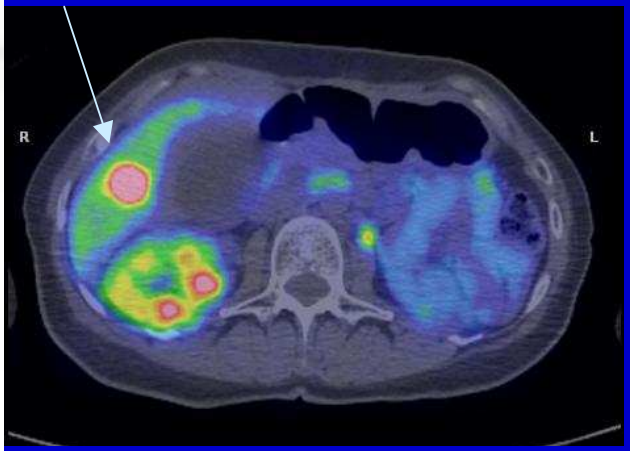
Tumori neuroendocrini duodeno-pancreatici
Proposta di percorso diagnostico



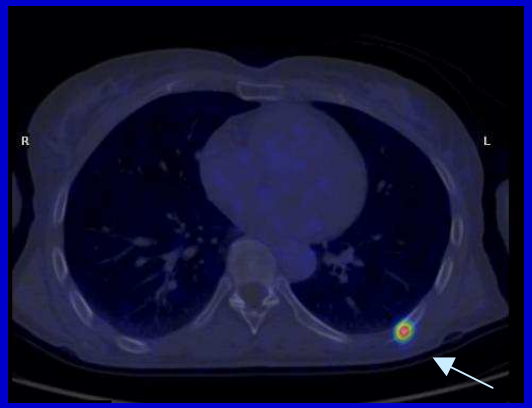








Multiple metastases from pancreatic NET



DOTATOC

Presupposto fisiopatologico per Diagnosi/Terapia

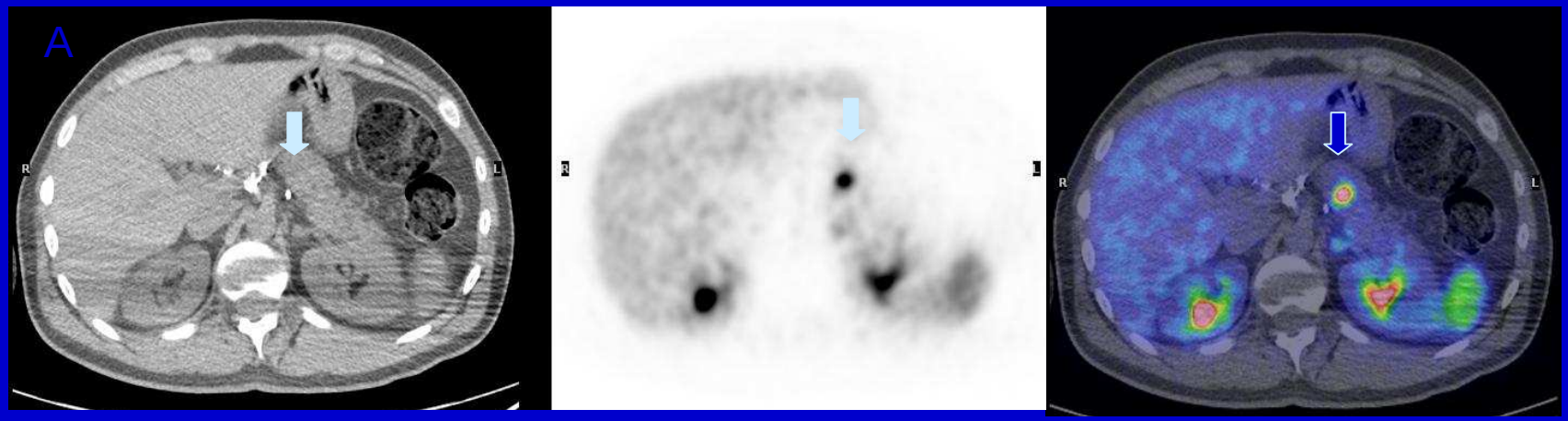
Bersaglio:

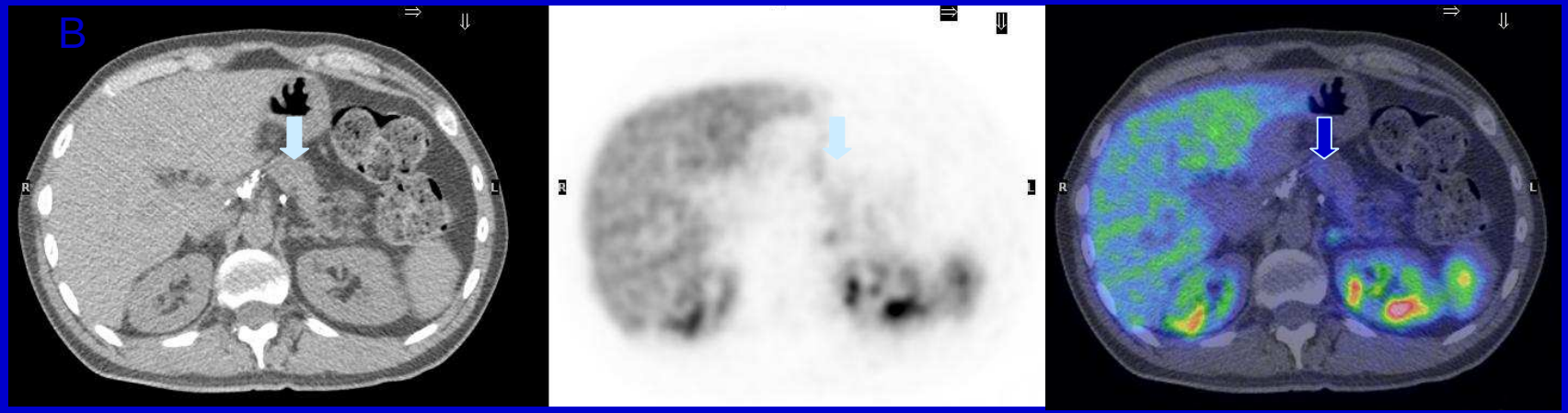
neoplasie che esprimono recettori per la somatostatina

Pancreatic NET pre and post 90Y DOTATOC Therapy

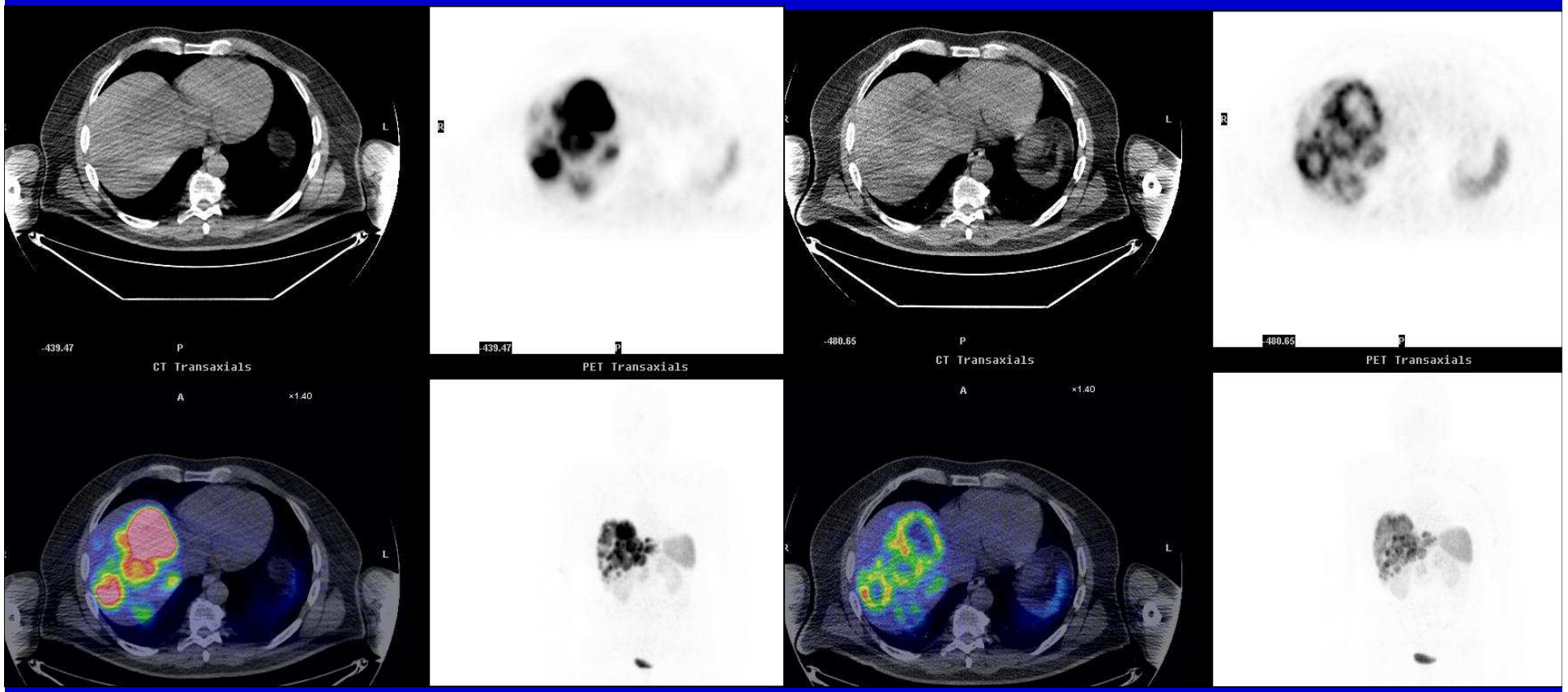
68Ga-DOTATOC PET

Pre-therapy





Post-therapy



Pre-therapy ^{68}Ga-DOTATOC PET/CT Post-therapy

R.A. male, 59 year old
Liver metastases from neuroendocrine carcinoma (primary site: unknown)
Partial Response to ^{90}Y-DOTATOC Treatment

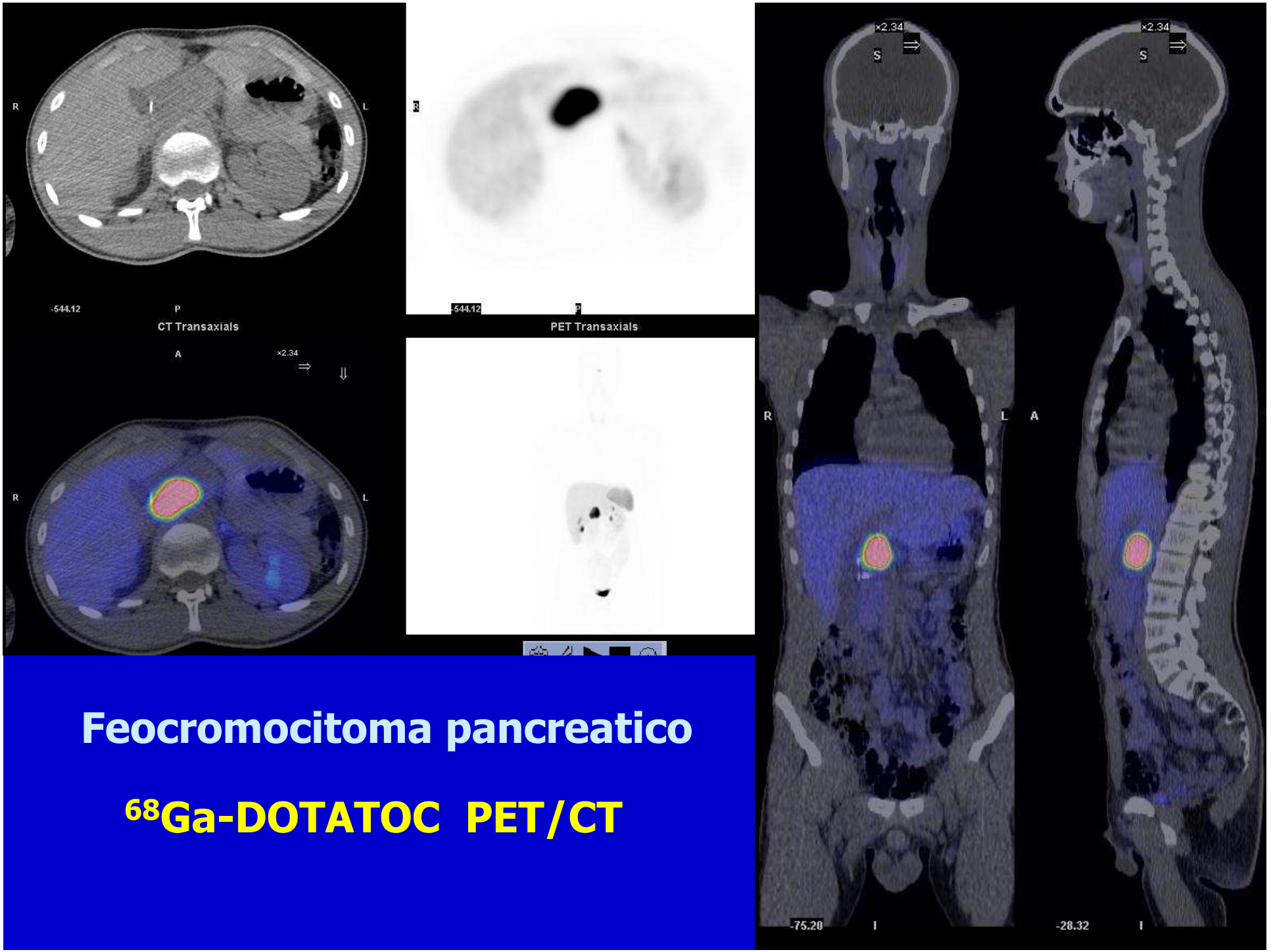
Feocromocitoma extra-surrenalico
Analoghi della Somatostatina Marcati

Planare, SPECT, SPECT/CT

- ^{111}In-Pentetreotide (Octreoscan)

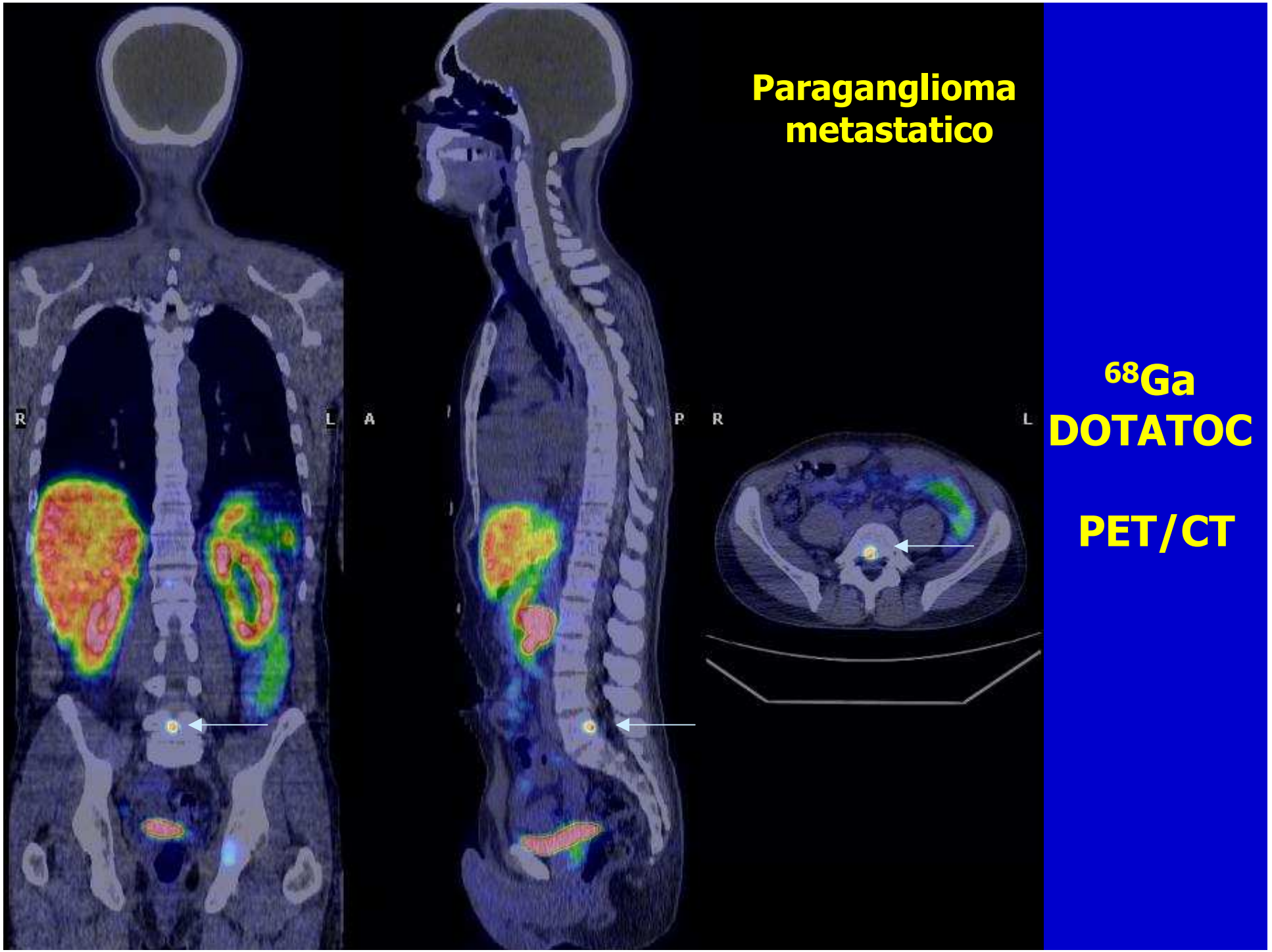
PET/CT

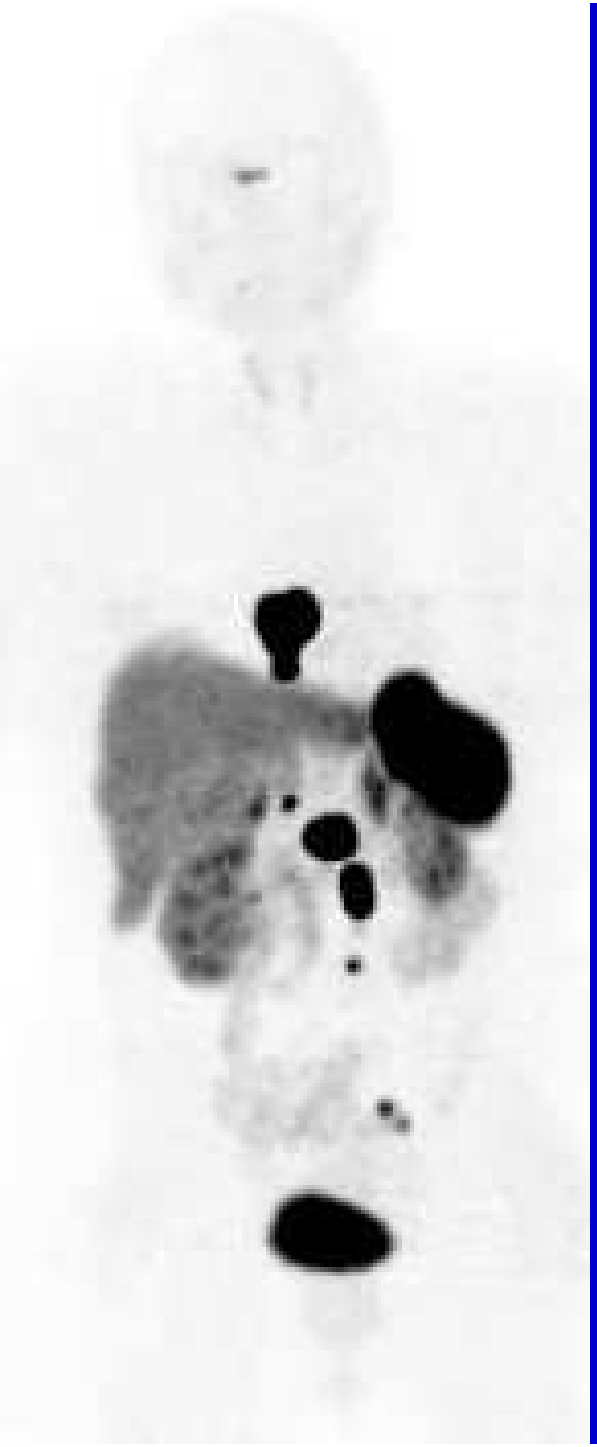
- ^{68}Ga-DOTATOC (DOTA-Tyr3-octreotide)
- ^{68}Ga-DOTANOC (DOTA-Nal3-octreotide)



Feocromocitoma pancreatico

^{68}Ga-DOTATOC PET/CT


Paraganglioma
metastatico
R
L
A
P
R
L
^{68}Ga
DOTATOC
PET/CT



Feocromocitoma maligno plurimetastatico

^{68}Ga-DOTATOC PET/CT

EANM'08 ANNUAL CONGRESS OF THE EUROPEAN ASSOCIATION OF NUCLEAR MEDICINE
October 11-15, 2008 – Munich, Germany

^{68}Ga-DOTATOC PET/CT and ^{90}Y-DOTATOC therapy: perspectives in patients with metastatic differentiated thyroid cancer negative at radioiodine scan

F. Giunta, A. Filice, A. Versari, A. Fraternali, A. Frasoldati, N. Cremonini(1), M. Asti, E. Grassi, D. Salvo.

Santa Maria Nuova Hospital, Reggio Emilia, ITALY.
(1)Maggiore-Bellaria Hospital, Bologna, ITALY.

MUNICH 2008

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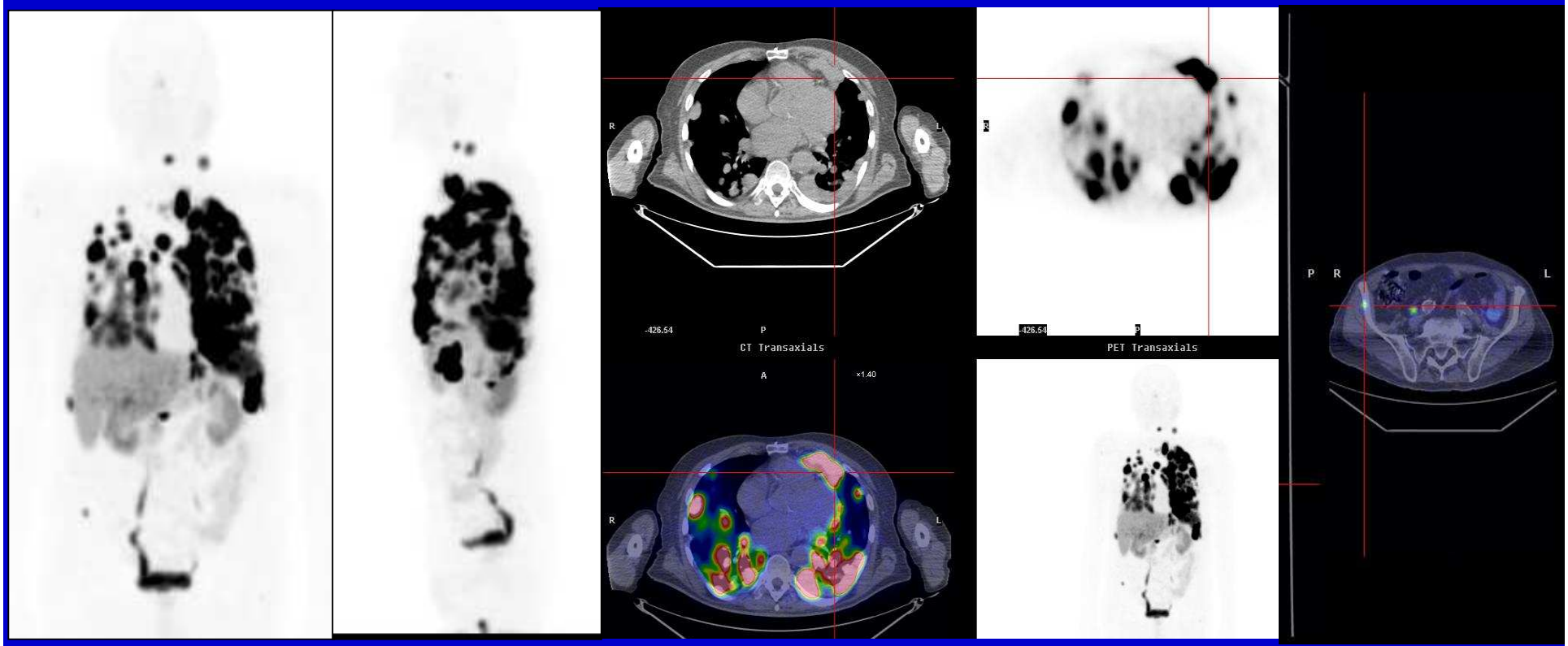
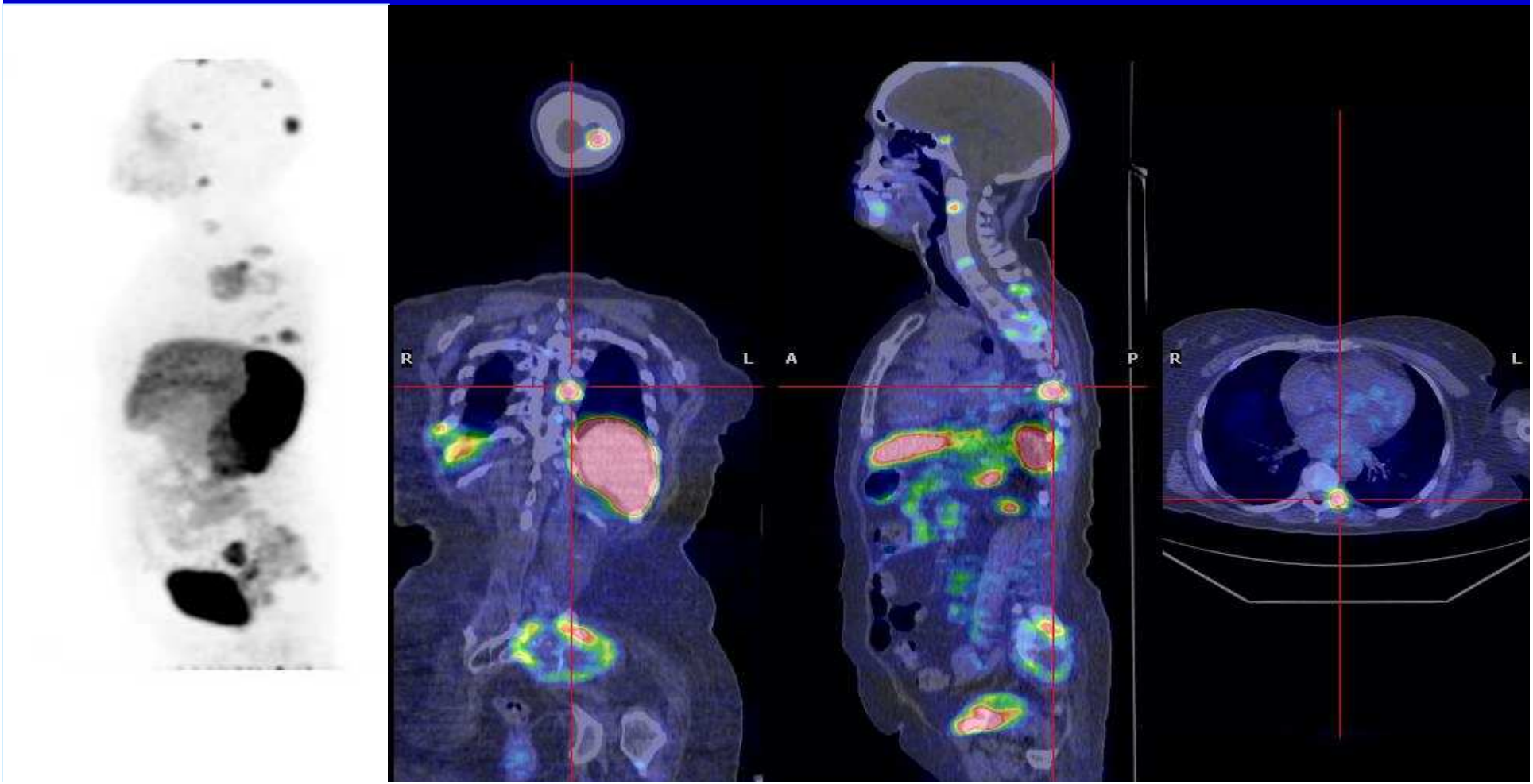
Metastatic differentiated thyroid cancer negative at radioiodine scan

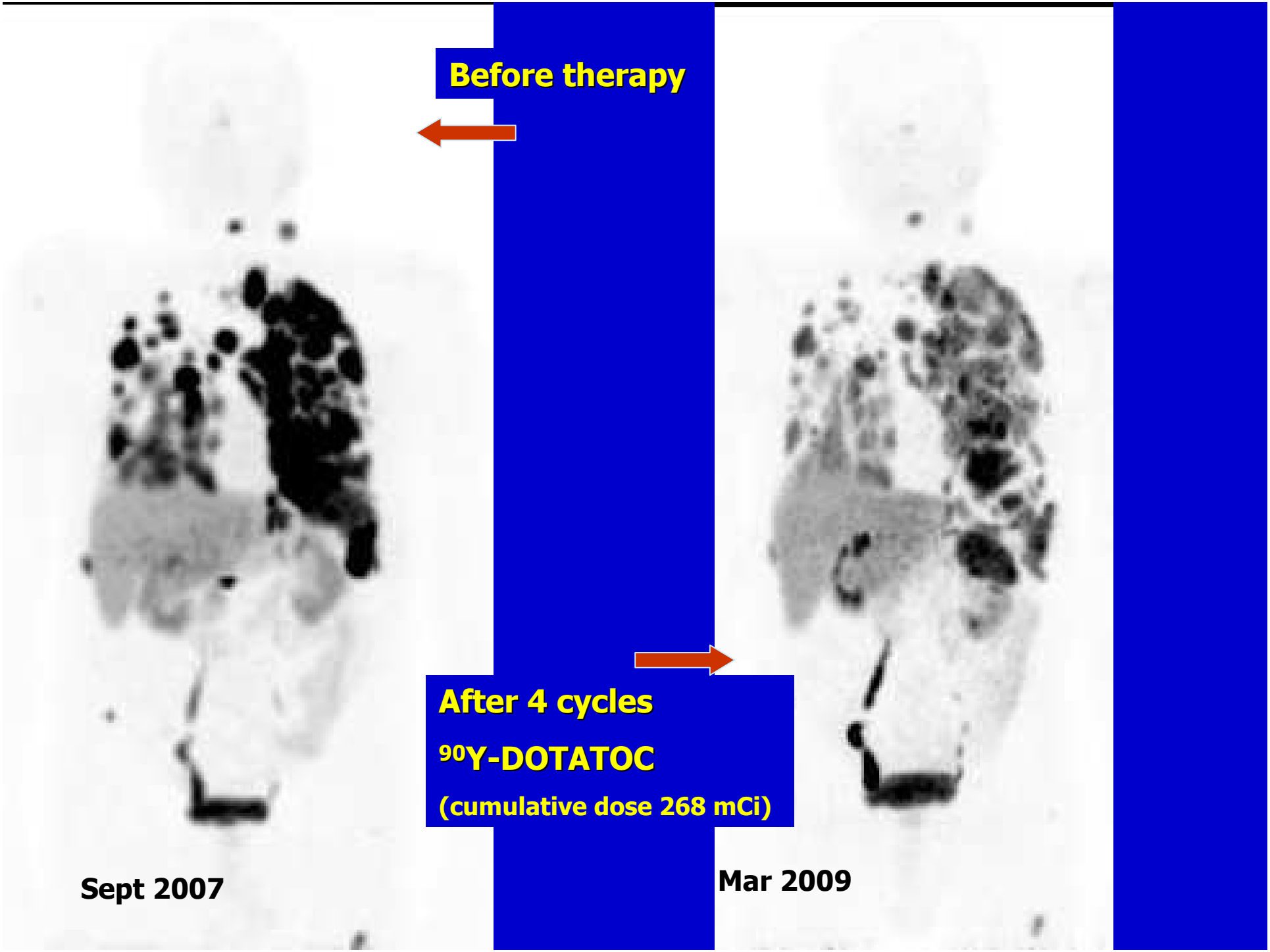
B.M. male, 75 year old ^{68}Ga-DOTATOC PET/CT:
Diffuse lung metastases (+ bone and lymph node mts)



Metastatic differentiated thyroid cancer negative at radioiodine scan

P.M. female, 61 year old
^{68}Ga-DOTATOC PET/CT: multiple bone metastases




Before therapy
After 4 cycles
90Y-DOTATOC
(cumulative dose 268 mCi)
Sept 2007
Mar 2009

Molto importante!!!!!

Discussione Interdisciplinare