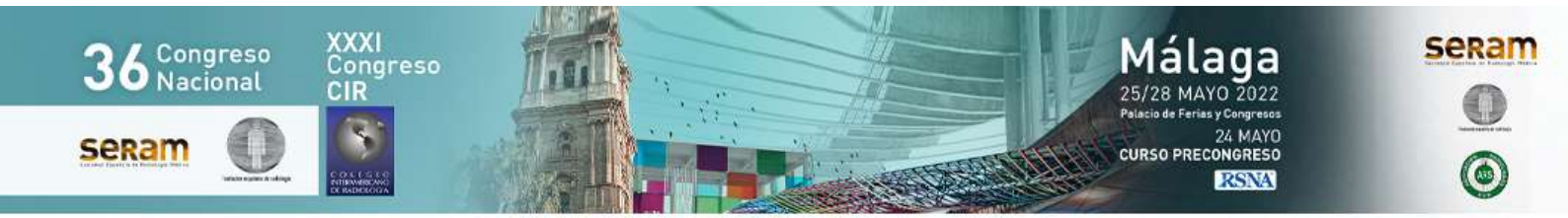

PET-TC y PET-RM EN EL DIAGNOSTICO DE METASTASIS HEPATICAS EN CANCER COLORRECTAL

Antonio Maldonado Suarez , Eric Alexander Rodriguez Gallo , Raquel Cano Alonso , Ana Fernandez Alfonso , Paula Orenes Castrillo 1, Johanna Marcela Vasquez Veloza , Clara Maria Romero Martinez , Vicente Martinez De Vega Fernandez .

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OBJETIVO DOCENTE

Describir el rendimiento diagnóstico de la PET-TC con FDG y PET-RM en la detección de metástasis hepáticas de pacientes con cáncer colorrectal

Abordar la influencia en las medidas terapéuticas y el rendimiento diagnóstico de estas pruebas de imagen.

REVISION DEL TEMA

Las metástasis hepáticas influyen tanto en el pronóstico como en las opciones terapéuticas en los pacientes
oncológicos. Es importante para elegir la mejor terapia (cirugía, quimioterapia o radiocirugía), determinar de forma exacta su localización y diferenciar si la afectación es uni o bilobar.

Frente a la TC, la RM hepática, gracias a su excelente caracterización tisular, ofrece una elevada sensibilidad especialmente en lesiones <10 mm.

La PET con FDG permite valorar el metabolismo tumoral intrahepático, mostrando una sensibilidad discretamente inferior a la RM con una similar especificidad.

El estudio de la afectación hepática tanto durante como tras tratamientos de quimioterapia conlleva con frecuencia una disminución del rendimiento diagnóstico de las pruebas de imagen.

La unión de la información anatomo-metabólica PET-RM puede obtener una adecuada valoración de la situación tumoral en esta situación clínica.

Entre los dilemas a considerar está el manejo de lesiones tratadas y en respuesta completa metabólica PET que persisten en la imagen RM

El **HIGADO** es el órgano de preferencia para la afectación metastásica del CCR, pudiendo ser la localización única en el **40%** de los casos.

Sitio de elección metastásico del Ca de colon y de recto superior al drenar vía vena porta

La ecografía y el CT con frecuencia infraestiman la afectación hepática

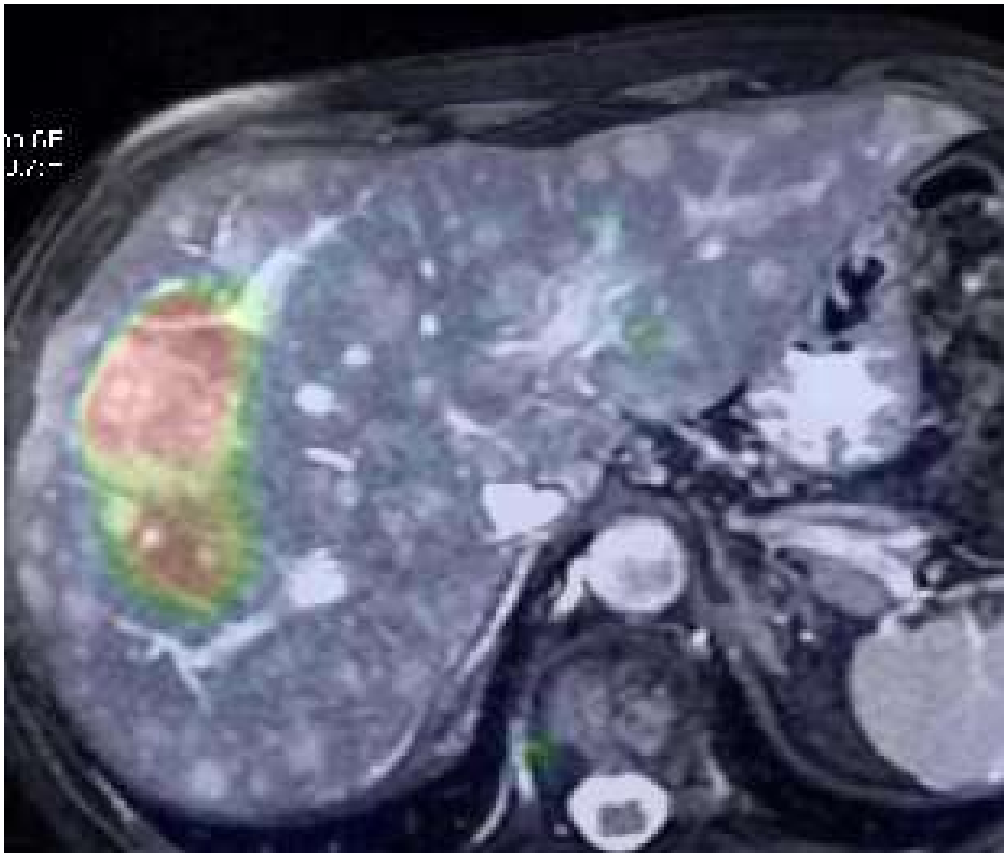


Imagen metabólica PET

Revista	Año	Autor	Estudio	N	Sensibilidad
Radiology	2005	Bipat	Metaanálisis		75,9%
J Gastrointest Surg	2007	Lubezky	Prospectivo	27	93%
Clin Nucl Med	2002	Rohren	Retrospectivo	23	95%
J Clin Ultrasound	2007	Wildi	Prospectivo	16	77%
J Clin Oncol	2002	Ruers	Prospectivo	51	65%
Cancer	2005	Wiering	Metaanálisis		88%
Ann SUrg	2004	Selzner	Prospectivo	76	91%
Br J Surg	2005	Truant	Prospectivo	53	78%
Annals Surg Oncol	2007	Wiering	Prospectivo	131	85%
					83,1%

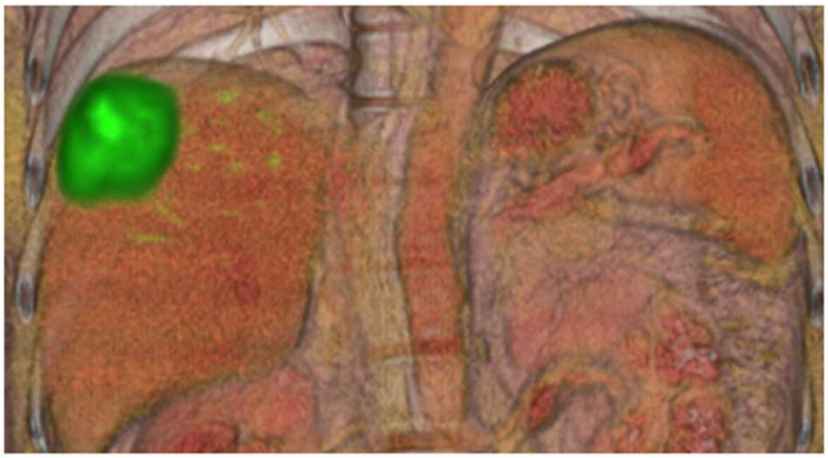
Rendimiento PET-CT

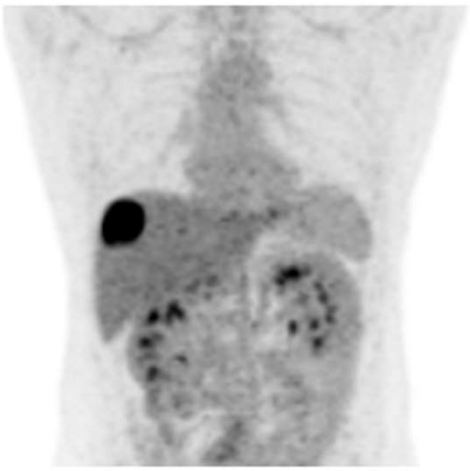
	Sb	Ep
PET-CT	80-90%	85-92%

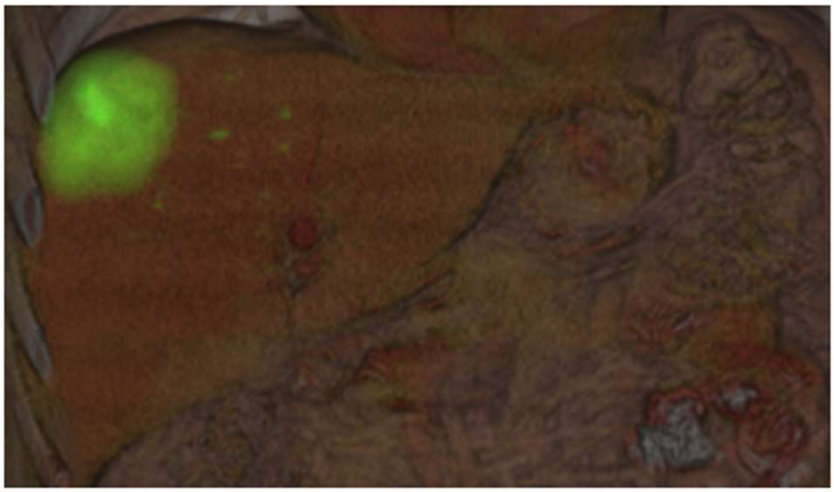
- Las **imágenes TARDIAS** (a los 90 min post-inyección) aumentan el rendimiento diagnóstico

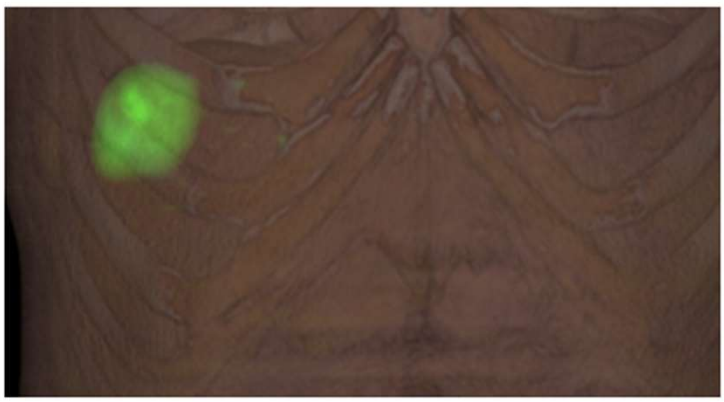
- La QT disminuye la sensibilidad de la PET, siendo recomendable dejar **intervalo de 2-3 semanas** tras su finalización.

- Considerar **el tipo histológico** como fuente de posibles FN









Detección de lesiones hepáticas tras neoadyuvancia QT precirugía

- El rendimiento de la PET-FDG para detectar metástasis hepáticas **disminuye tras neoadyuvancia QT** dado el efecto precoz del tratamiento a nivel metabólico

Revista	Año	Autor	Estudio	Nº lesiones	Sb-CT	Sb-PET
J Gastrointest Surg	2007	Lubezky	Prospectivo	122	65,3%	49%
J Clin Ultrasoound	2007	Wildi	Prospectivo			63%
						56%

- La exploración PET-FDG debe ser hecha SIEMPRE antes de la neoadyuvancia. No utilidad posterior a QT

- Respuesta metabólica completa post neoadyuvancia QT precirugía, ¿ Qué significa? *Tan et al. J.Gastrointest Surg.2007*
  - 14 pacientes con RC metabólica
  - Sólo el **15%** de las lesiones (21% de los pacientes presentaban RC patológica)

La respuesta metabólica completa no debe ser el criterio a utilizar para la realización de la cirugía

Mol Imaging Biol. 2011 Jun;13(3):565-72. doi: 10.1007/s11307-010-0394-x.

Detection of hepatic metastases using dual-time-point FDG PET/CT scans in patients with colorectal cancer.

Lee JW[1], Kim SK, Lee SM, Moon SH, Kim TS.

Author information

Abstract

PURPOSE: The purpose of this study was to determine the most useful parameter of dual-time-point 2-deoxy-2-[^{18}F]fluoro-D: -glucose positron emission tomography/computed tomography (PET/CT) for detection of hepatic metastases in patients with colorectal cancer.

PROCEDURES: Thirty-nine patients had undergone a dual-time-point PET/CT scan and a subsequent histopathological confirmation for a workup of hepatic metastases. Detection rates were compared for visual analysis score, standardized uptake value (SUV), tumor-to-liver uptake ratio (TLR), and percent changes of the SUV and TLR.

RESULTS: Of 91 liver lesions, 86 lesions were confirmed as metastases. The SUV and TLR of metastatic lesions on the delayed images were higher than those on the first scan ($p < 0.001$). The signal-to-noise ratio of the delayed PET scan was higher than that of the first scan ($p < 0.0001$). The TLR and SUV of the delayed scan showed the highest detection rates of 92% and 88%, whereas percent changes of SUV and TLR showed the lowest detection rates (51%, 67%). Visual analysis detected 87% on the delayed scan and 77% on the first scan.

CONCLUSIONS: A delayed scan is more favorable for the detection of hepatic metastases of colorectal cancer, and the TLR on the delayed scan was the most useful parameter.

N: 91 lesiones	BASAL	TARDIO
Valoración visual	Sb-77%	Sb-87%
TLR (lesión/tejido sano)	Sb-82%	Sb- 92%

Clin Nucl Med. 2013 Nov;38(11):869-73. doi: 10.1097/RLU.0000000000000221.

Improvement of hepatic lesion characterization by 18F-FDG PET/CT with the use of the lesion to background liver activity ratio.

Jolepalem P[1], Rydberg JN, Wong CO.

Author information

Abstract

OBJECTIVE: This study aimed to develop a reproducible method to improve (18)F-FDG PET/CT's diagnostic accuracy when characterizing hepatic lesions.

METHODS: This was a retrospective study of 76 patients with various types of cancer who had 134 liver lesions described on diagnostic CT, MRI, or (18)F-FDG PET/CT. All 134 lesions were imaged by PET/CT. For comparison, all 134 lesions were also imaged either by MRI (58 lesions) or by diagnostic CT (107), with some imaged by both. The original reader's interpretation was used to determine the diagnostic validity of each modality. The (18)F-FDG PET/CT findings were then re-stratified using the ratio of the SUV(max) of the liver lesion to the SUV(avg) of liver background (SUV(TLR)). The standard of reference was histopathology and/or imaging follow-up. Eighty-nine out of the 134 lesions were positive for metastases. Two-tailed P values were calculated using a chi-square test.

RESULTS: A SUV(TLR) greater than 2.0 strongly correlated with metastasis, while less than 2.0 strongly correlated with benign activity. Based on the original interpreter's visual analysis (PET(VA)), (18)F-FDG PET/CT had an accuracy of 74.6% with a high sensitivity (95.5%), but limited specificity (33.3%). Using the SUV(TLR) cutoff value of 2.0 to objectively re-stratify these cases, there was improvement in accuracy to 97.8%, sensitivity to 100%, and specificity to 93.3%. These values were statistically significant by chi-square analysis, with P = 0.0001 for both PET(VA) and SUV(TLR). The 58 MRI lesions and 107 diagnostic CT lesions that were reviewed had accuracies of 70.7% (P = 0.008) and 73.8% (P = 0.0001), respectively.

CONCLUSION: Using a cutoff value of 2.0 for SUV(TLR) to objectively evaluate for potential hepatic metastases on (18)F-FDG PET results in a significant improvement in diagnostic accuracy over subjective visual analysis alone. In this limited study, use of SUV(TLR) more accurately characterized hepatic lesions than the original CT or MRI interpretations.

N: 134 lesiones	Sb	Ep	ED
Valoración visual	95,5%	33,3%	74,6%
TLR (lesión/tejido sano) cut off: 2	97-100%	93,3%	97,8%

Appropriate Use Criteria for ^{18}F-FDG PET/CT in Restaging and Treatment Response Assessment of Malignant Disease

Hossein Jadvar[1], Patrick M. Colletti[4], Roberto Delgado-Bolton[2], Giuseppe Esposito[1], Bernd J. Krause[2], Andrei H. Iagaru[1], Helen Nadel[1,5,6], David I. Quinn[3], Eric Rohren[1], Rathan M. Subramaniam[4], Katherine Zukotynski[1], Julie Kauffman[1], Sukhjeet Ahuja[1], and Landis Griffeth[1]

[1]Society of Nuclear Medicine and Molecular Imaging (SNMMI); [2]European Association of Nuclear Medicine (EANM); [3]American Society of Clinical Oncology (ASCO); [4]American College of Nuclear Medicine (ACNM); [5]Society for Pediatric Radiology (SPR); and [6]Canadian Association of Nuclear Medicine (CANM)

J Nucl Med 2017; 00:1–12
DOI: 10.2967/jnumed.117.197988

is taken to mean the period in which there is concern for new or progressive disease after completion of prior therapy. This document excludes "initial staging" and "surveillance." These appropriate use criteria (AUC) are intended to aid referring medical practitioners in the appropriate use of PET/CT for restaging of breast cancer, colorectal cancer, lymphoma, lung cancer, melanoma, sarcoma, and head and neck cancer.

	Sensibilidad	Especificidad
RECIDIVA HEPATICA	93,6%	96,4%
RESPUESTA TRATAMIENTO MTX HEPATICAS	85%	92%

Eur J Nucl Med Mol Imaging. 2014 Oct 16. [Epub ahead of print]

Diagnostic accuracy and impact on management of 18F-FDG PET and PET/CT in colorectal liver metastasis: a meta-analysis and systematic review.

Maffione AM[1], Lopci E, Bluemel C, Giammarile F, Herrmann K, Rubello D.

Author information

Abstract

PURPOSE: The first aim of the review (aim 1) was to obtain the diagnostic performance values of ^{18}F-FDG PET for the detection and staging of liver metastases in patients with colorectal cancer (CRC), the second aim (aim 2) was to compare PET and conventional imaging modalities, and the third aim (aim 3) was to evaluate the impact of PET on patient management. The incidence of extrahepatic disease (EHD) detected by PET is also reviewed.

METHODS: A comprehensive search was performed on PubMed/MEDLINE for studies evaluating PET and PET/CT in CRC patients with liver metastases up to June 2014. For inclusion PET had to have been performed prior to surgery, there had to be at least 18 patients in the study, and the reported data had to allow calculation of 2 × 2 contingency tables (for aim 1). A total of 18 studies were eligible for at least one of the three intended subanalyses including a total of 1,059 patients. Pooled sensitivity, specificity and accuracy and the corresponding 95 % confidence intervals were derived from the contingency tables on a patient basis (patient-based analysis, PBA) and a lesion basis (lesion-based analysis, LBA) for eight studies.

RESULTS: Pooled sensitivity and specificity of PET on PBA were both 93 %. Corresponding values for LBA were 60 % and 79 %, respectively. Areas under the summary ROC were 0.97 for PBA and 0.67 for LBA. Regarding aim 2, PET had a slightly lower sensitivity than MRI and CT on PBA (93 %, 100 % and 98 %, respectively) and LBA (66 %, 89 % and 79 %, respectively) but appeared to be more specific than MRI and CT (86 %, 81 % and 67 %, respectively). PET findings resulted in changes in the management of a mean of 24 % of patients. The mean incidence of PET-based EHD was 32 %.

CONCLUSION: This meta-analysis suggests that FDG PET/CT is highly accurate for the detection of liver metastases on a patient basis but less accurate on a lesion basis. Compared to MRI, PET is less sensitive but more specific and affects the management of about one-quarter of patients.

La RM posee una mayor sensibilidad que el PET-CT pero con similar especificidad

RADIATION— REVIEW ARTICLE

Meta-analysis of diagnosis of liver metastatic cancers: Comparison of ^{18}FDG PET-CT and gadolinium-enhanced MRI

Jinlong Deng, Jiande Tang and Naipeng Shen

Department of Medical Imaging Center, The Affiliated Hospital of Weifang Medical College, Weifang, China

J Deng MD; **J Tang** MD; **N Shen** MD.

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Email: tangjd2014@sohu.com

Funding: No external funding was received in this study.

Conflict of interest: None.

Submitted 30 April 2014; accepted 23 July 2014.

doi:10.1111/1754-9485.12231

Abstract

Introduction: We performed a meta-analysis to compare the performance of 18F-fluorodeoxyglucose (^{18}FDG) positron emission tomography-CT (PET-CT) with that of gadolinium-enhanced MRI for the detection of liver metastatic cancers.

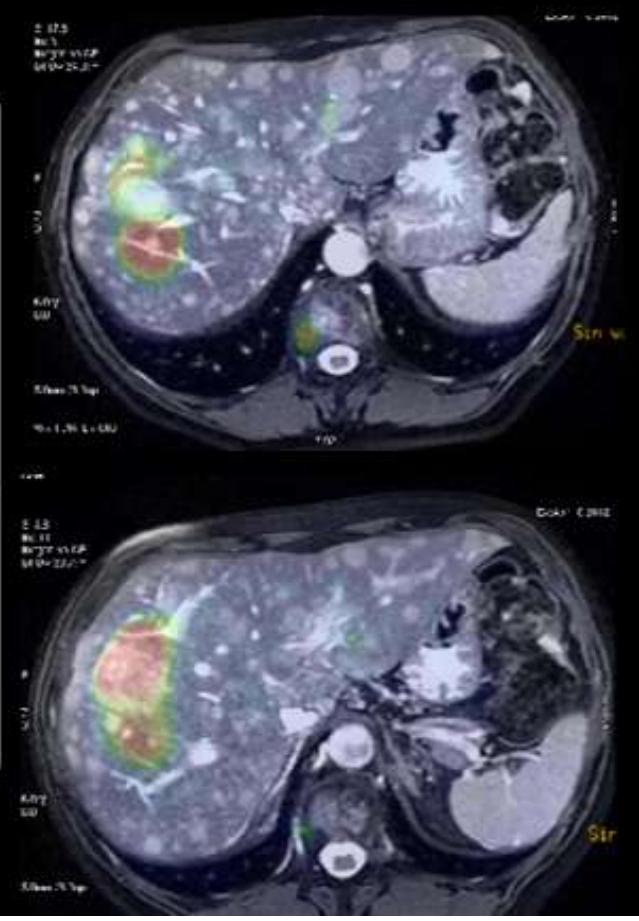
Methods: The MEDLINE and EMBASE databases were searched for relevant original articles. The histology and/or imaging follow-up data served as the reference standard. We calculated the pooled sensitivities, specificities, positive likelihood ratios, negative likelihood ratios and constructed summary receiver operating characteristic curves for ^{18}FDG PET-CT and gadolinium-enhanced MRI, respectively.

Results: Ten studies (1105 patients) were included for this meta-analysis. ^{18}FDG PET-CT has similar patient-based specificity (1.00 and 0.99), positive likelihood ratios (253.1 and 138.2), negative likelihood ratios (0.16 and 0.10) and area under curves (0.99 and 0.99) with gadolinium-enhanced MRI. Gadolinium-enhanced MRI tends to have higher sensitivity (0.91 and 0.84) than ^{18}FDG PET-CT.

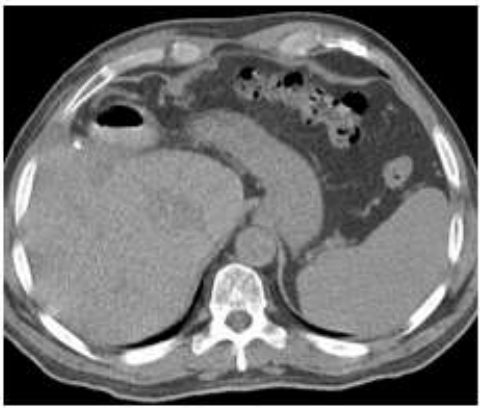
Conclusion: Both ^{18}FDG PET-CT and gadolinium-enhanced MRI have excellent diagnostic performance for the detection of liver metastatic cancer.

Key words: liver metastasis; malignant tumour; MRI; PET-CT.

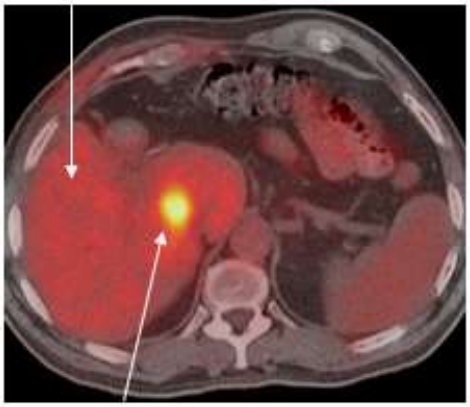
Tecnica de elección: PET-RM



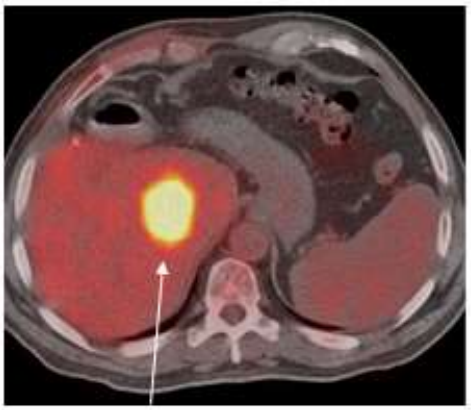
Evaluación preoperatoria de metástasis. Concordancia PET y CT.



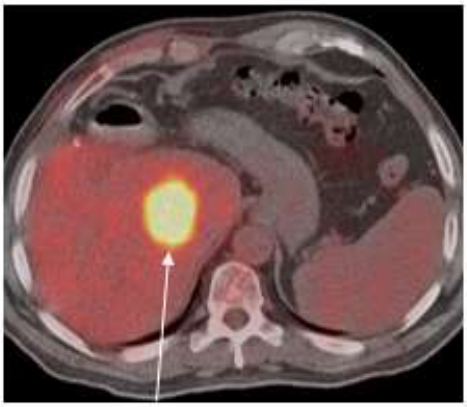
(SUV_{max}:2,6-3,2) parénquima normal



SUV_{max}:10,2

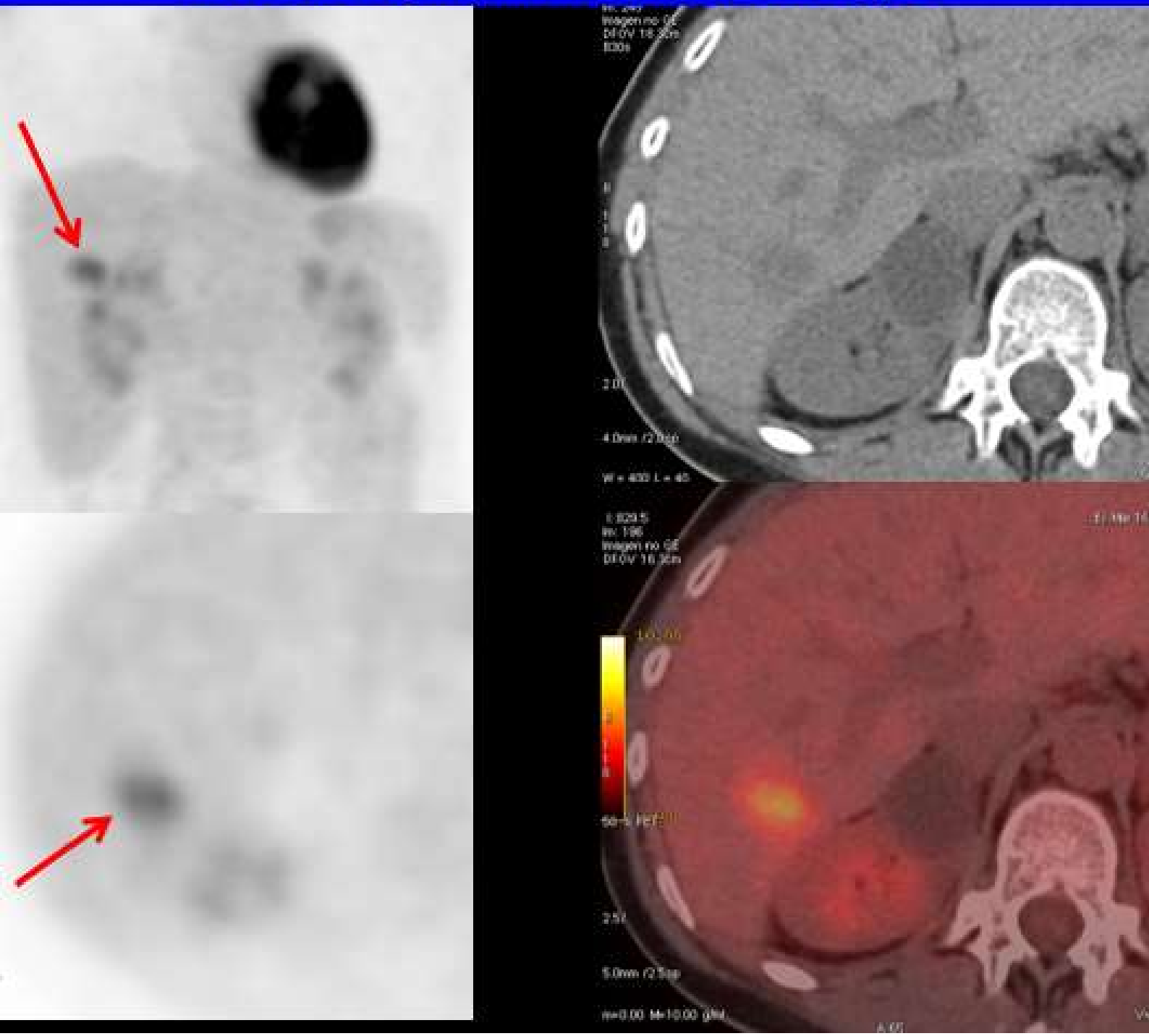


SUV_{max}:16,5

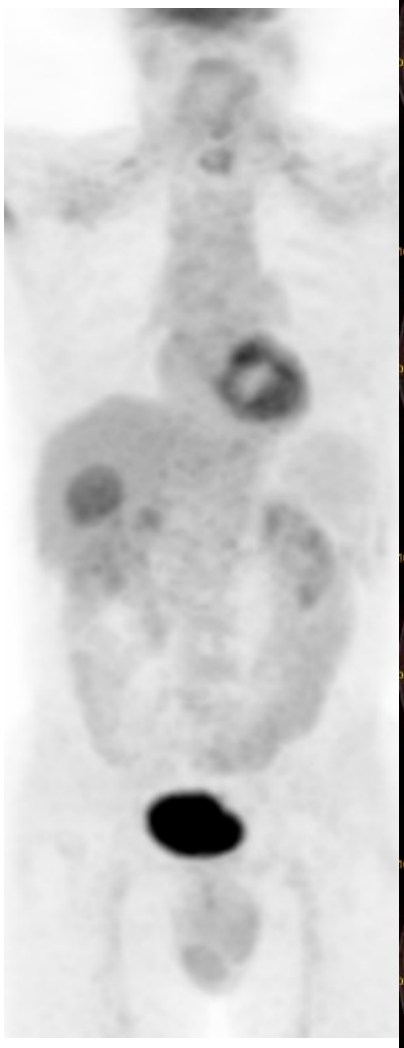


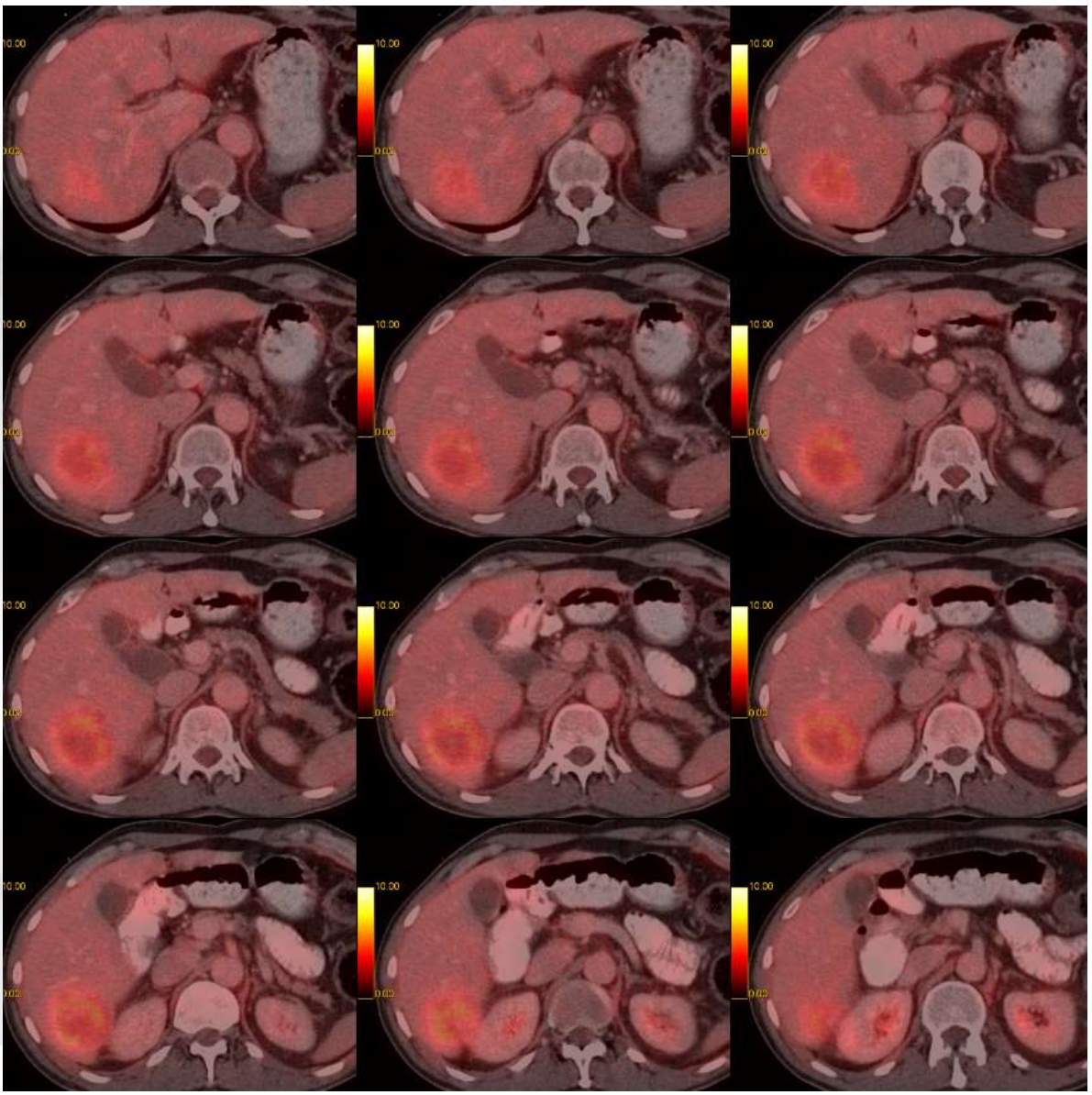
SUV_{max}:17,6

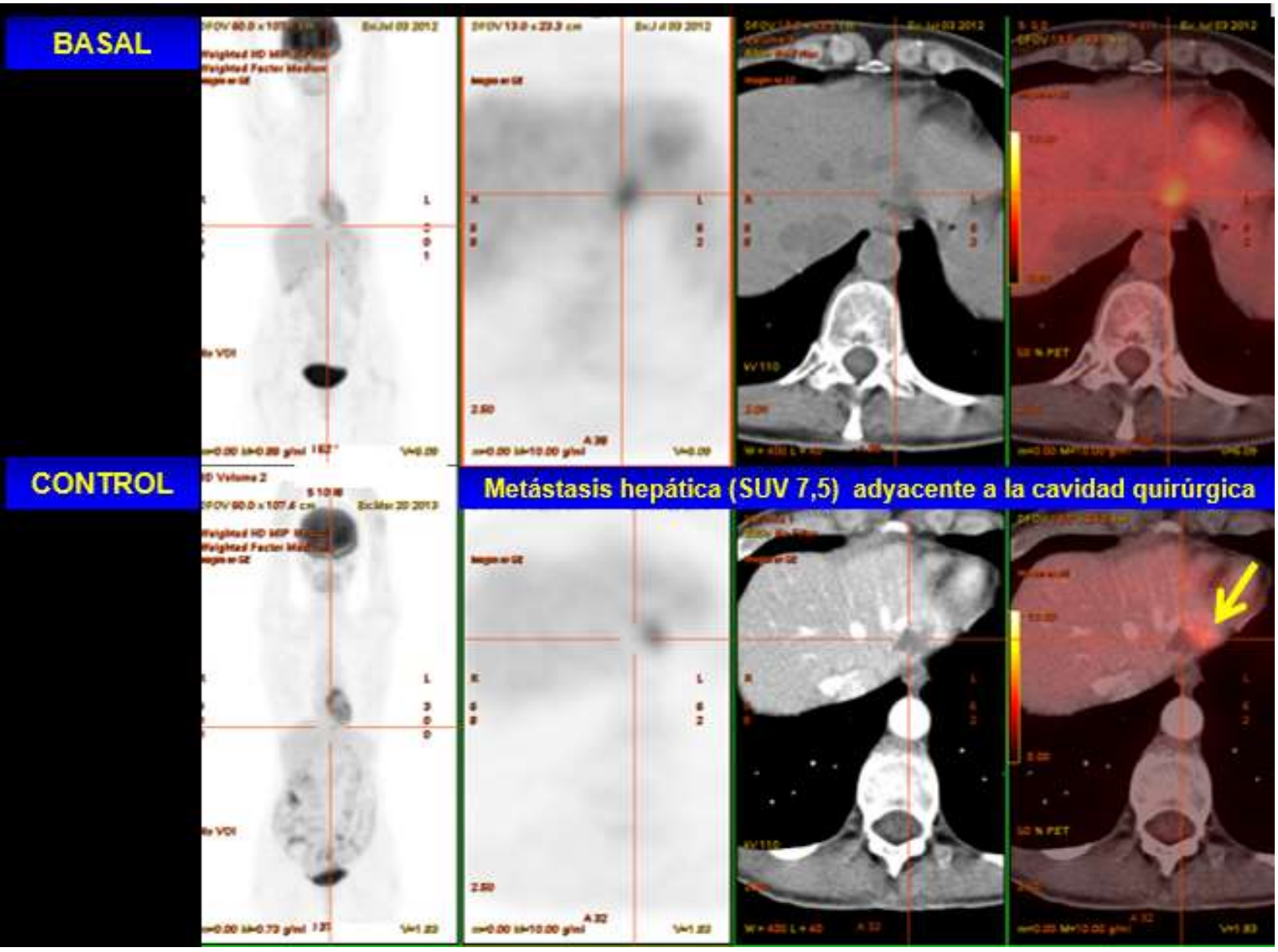
Recidiva hepática. Concordancia PET y CT



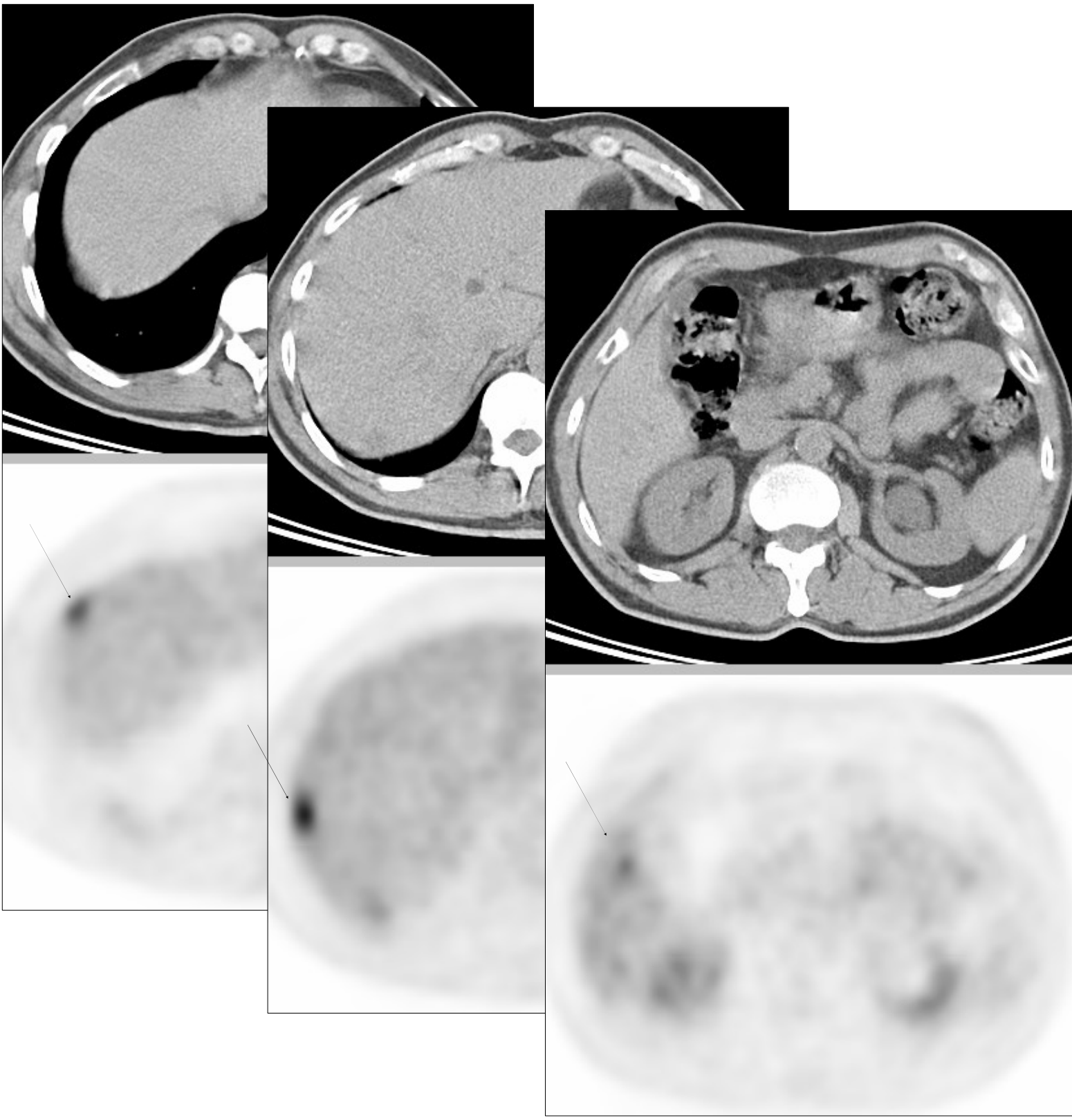
Recidiva Ca colon. Metástasis hepáticas






BASAL
CONTROL
Metástasis hepática (SUV 7,5) adyacente a la cavidad quirúrgica

Ca de sigma estadio C de Dukes. LOE hepáticas difíciles de catalogar en CT




Feb 2014
Mayo 2014
Recidiva hepática sin traducción morfológica

CONCLUSIONES

- PET-CT es de gran utilidad en el manejo de las metástasis hepáticas

- Mejora su rendimiento si se utiliza **imagen tardía** y el ratio **lesión/hígado**. **Falsos negativos** por neoadyuvancia y tipo histológico

- **Similar especificidad y menor sensibilidad** que RM. PET-RM técnica de elección

- **Dilema tras tratamiento**: lesiones en RM/CT y PET negativo

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Survival after liver resection and liver transplantation for colorectal liver metastases: a comparative analysis stratified by metabolic tumor volume assessed by 18F-FDG PET/CT. Grut H, Line PD, Labori KJ, Schulz A, Dueland S. HPB (Oxford). 2021 Dec 2:S1365-182X(21)01720-2

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