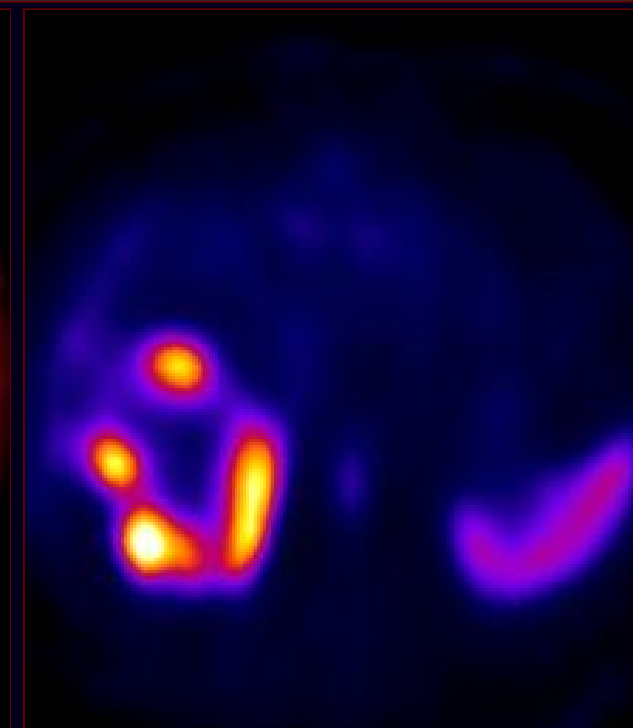
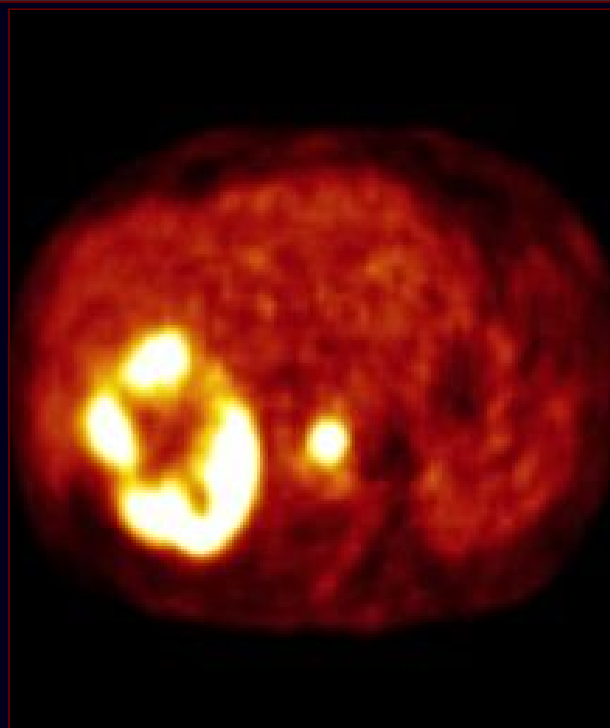


Diagnostika nádorů jater

# HYBRIDNÍ ZOBRAZENÍ



Jiří Ferda,

Klinika zobrazovacích metod LFUK a FN v Plzni

# Hybridní zobrazení a játra

## ♦ Hybridní zobrazení

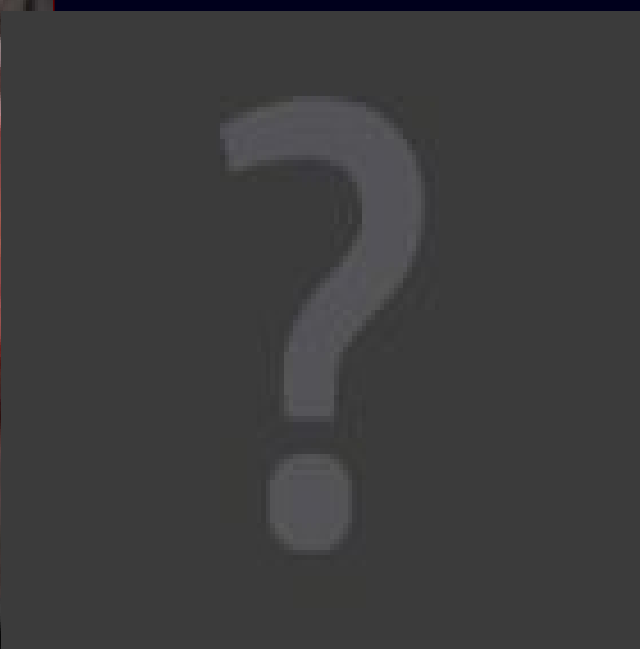
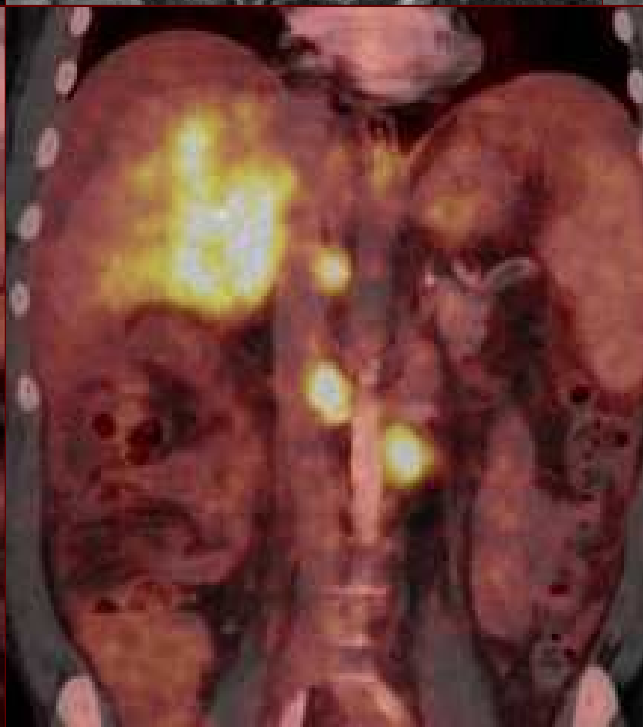
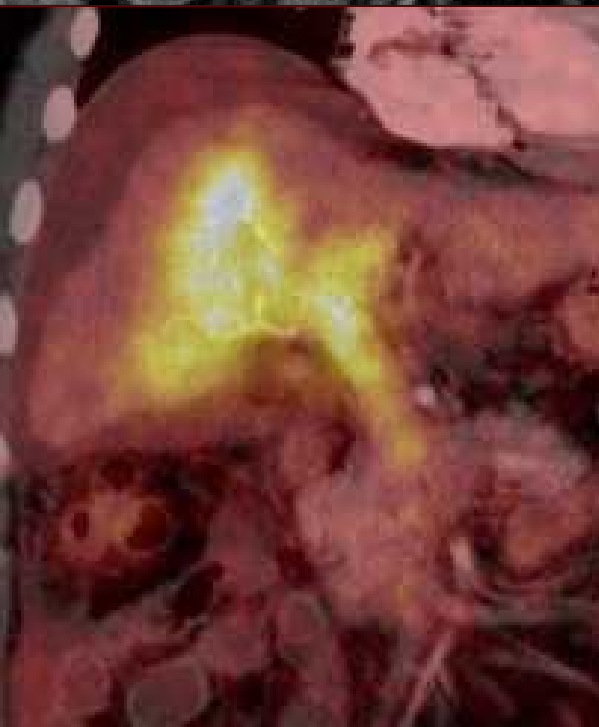
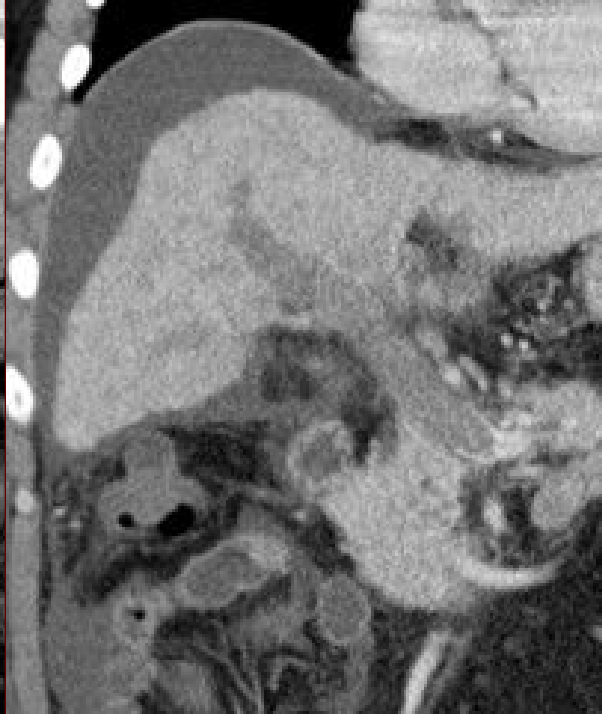
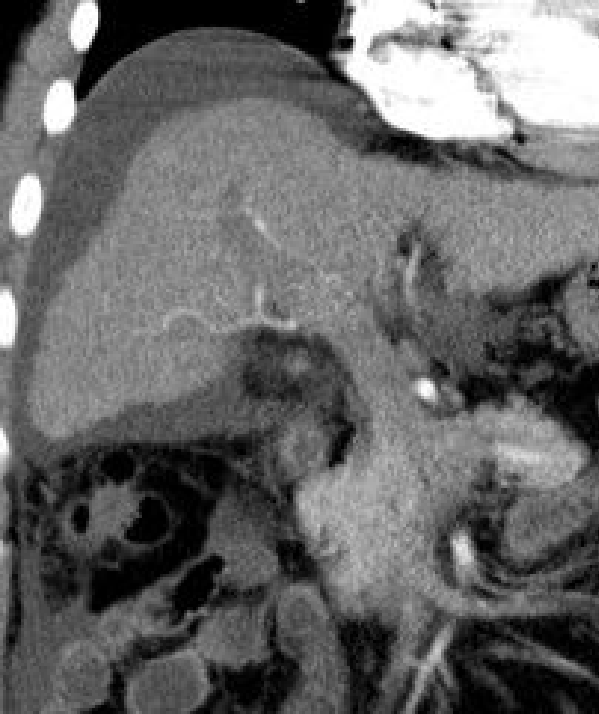
- ♦ v kombinaci s plně hodnotným dvoufázovým zobrazěním v arteriální a portální fázi dovoluje provést syntézu informací o vaskularizaci, cévním zásobení, invazi nádoru do portální žíly a metabolické aktivitě nádoru.

## ♦ $^{18}\text{F}$ FDG-PET/CT

- ♦ HCC, cholangiogenní karcinomy, sek. nádory

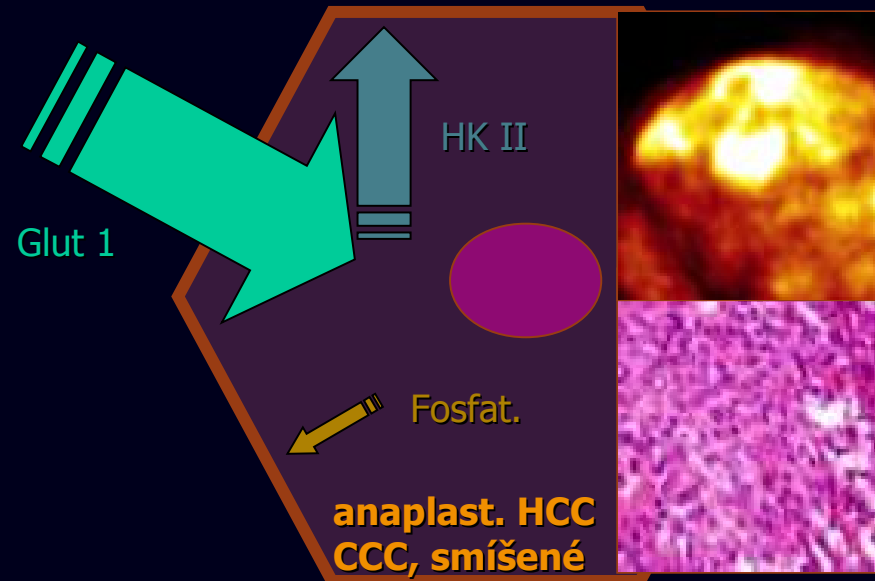
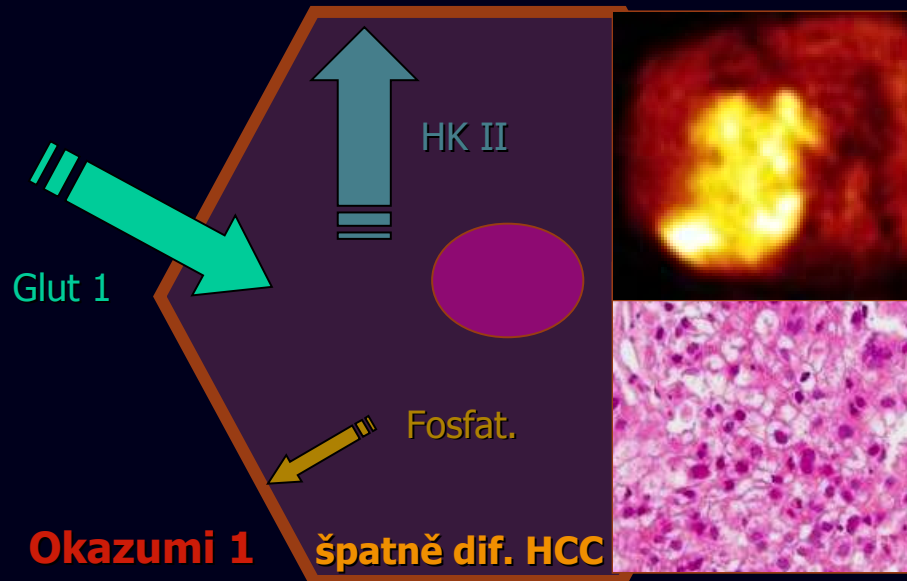
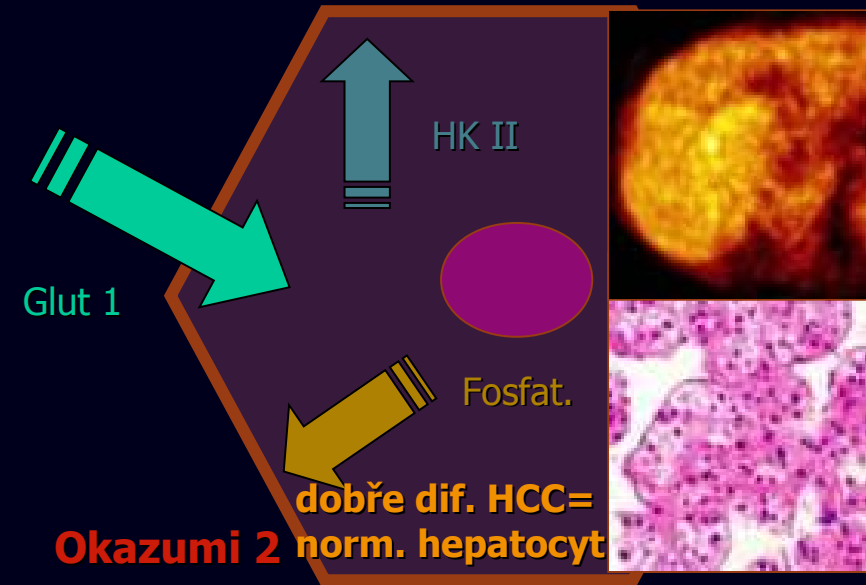
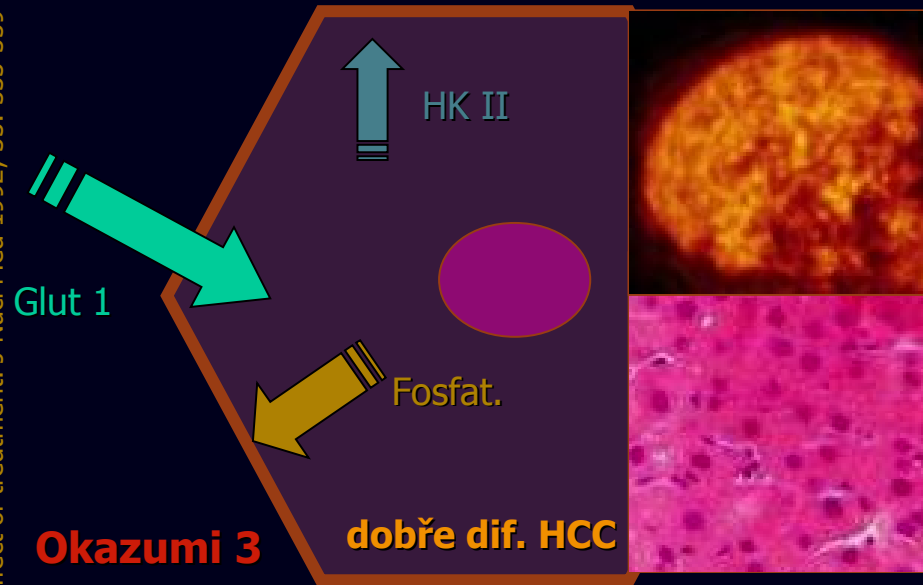
## ♦ $^{111}\text{In}$ -octreotid-SPECT/CT, $^{123}\text{I}$ -MIBG-SPECT/CT

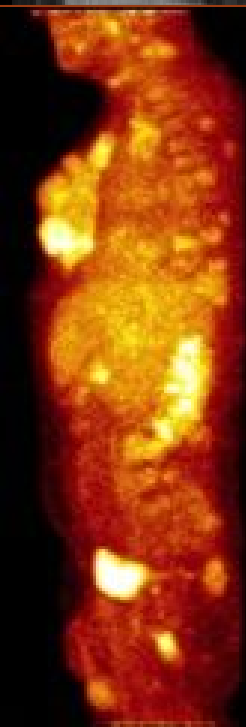
- ♦ Nádory neuroendokrinního původu – islet-tumory pankreatu, karcinoid, feochromocytom, paraganglioblastom, medulární karcinom štítné žlázy a dále u některých malobuněčných karcinomů



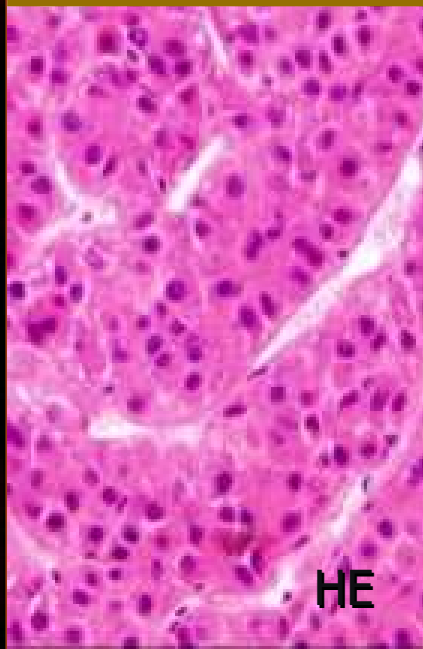
# $^{18}\text{F}$ -FDG-PET/CT a HCC

\*Okazumi S, Isono K, Enomoto K et al. Evaluation of liver tumors with fluorine-18-fluorodeoxyglucose PET: characterisation of tumor and assessment of effect of treatment. J Nucl Med 1992; 33: 333-339

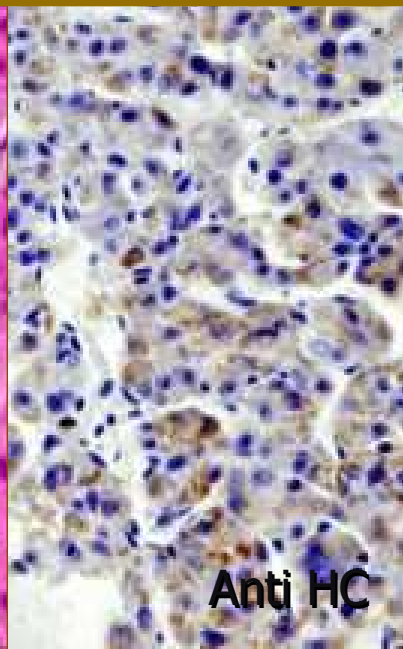




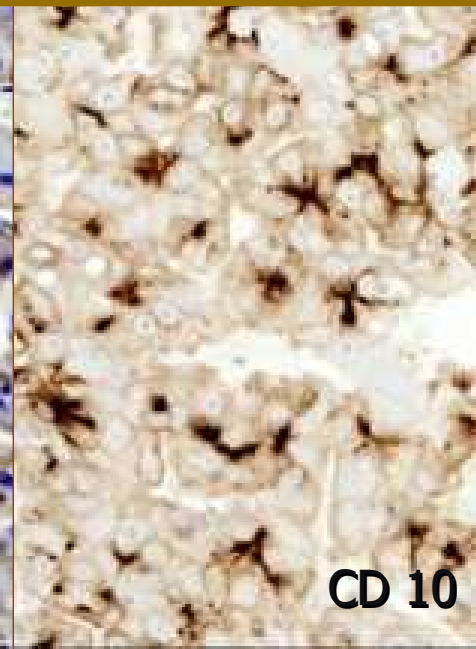
M 58 let, cirhóza, hepatitida C, dobře dif. HCC



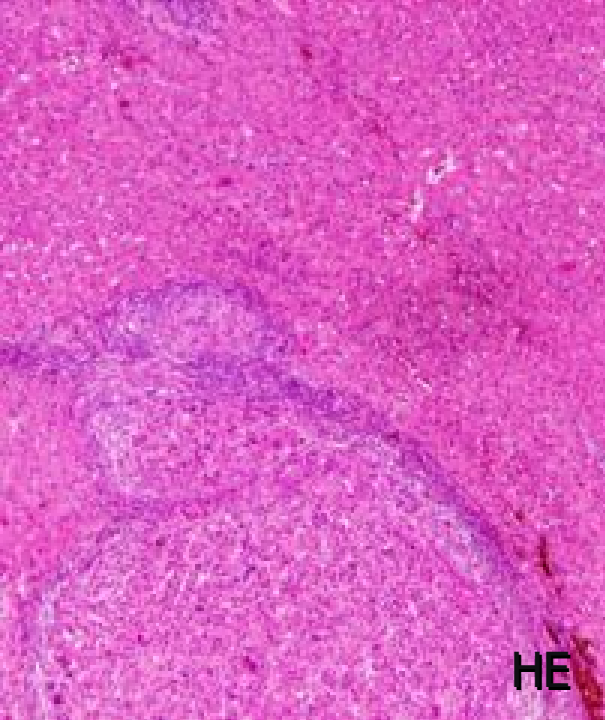
HE



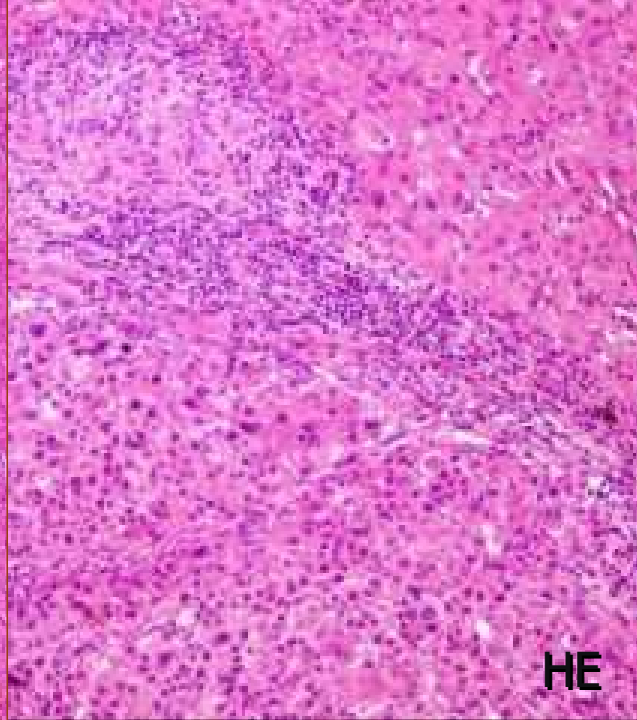
Anti HC



CD 10



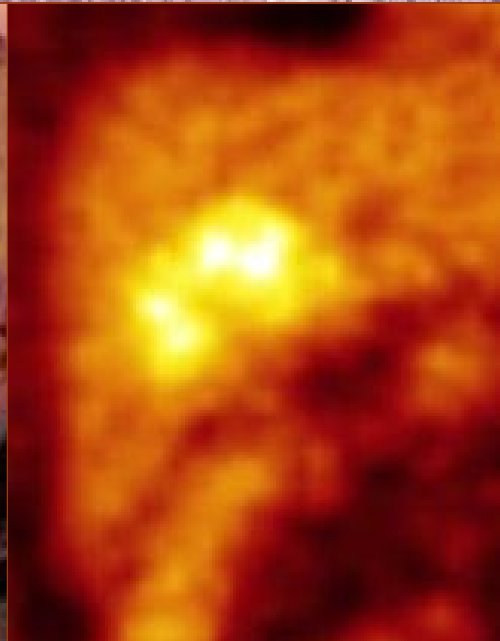
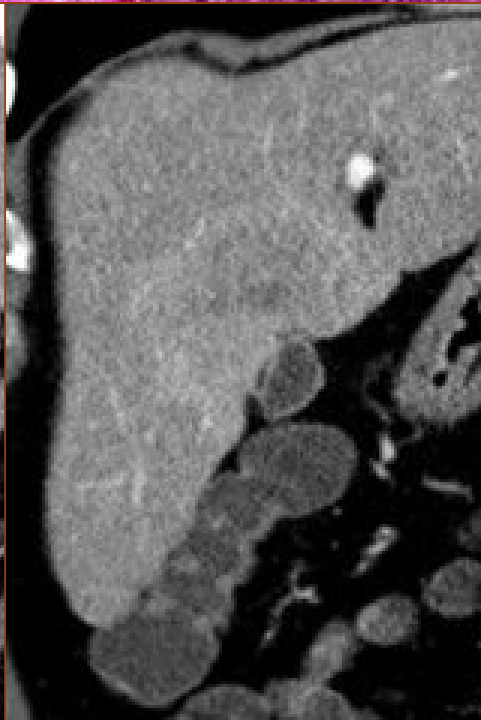
HE



HE



retikulin



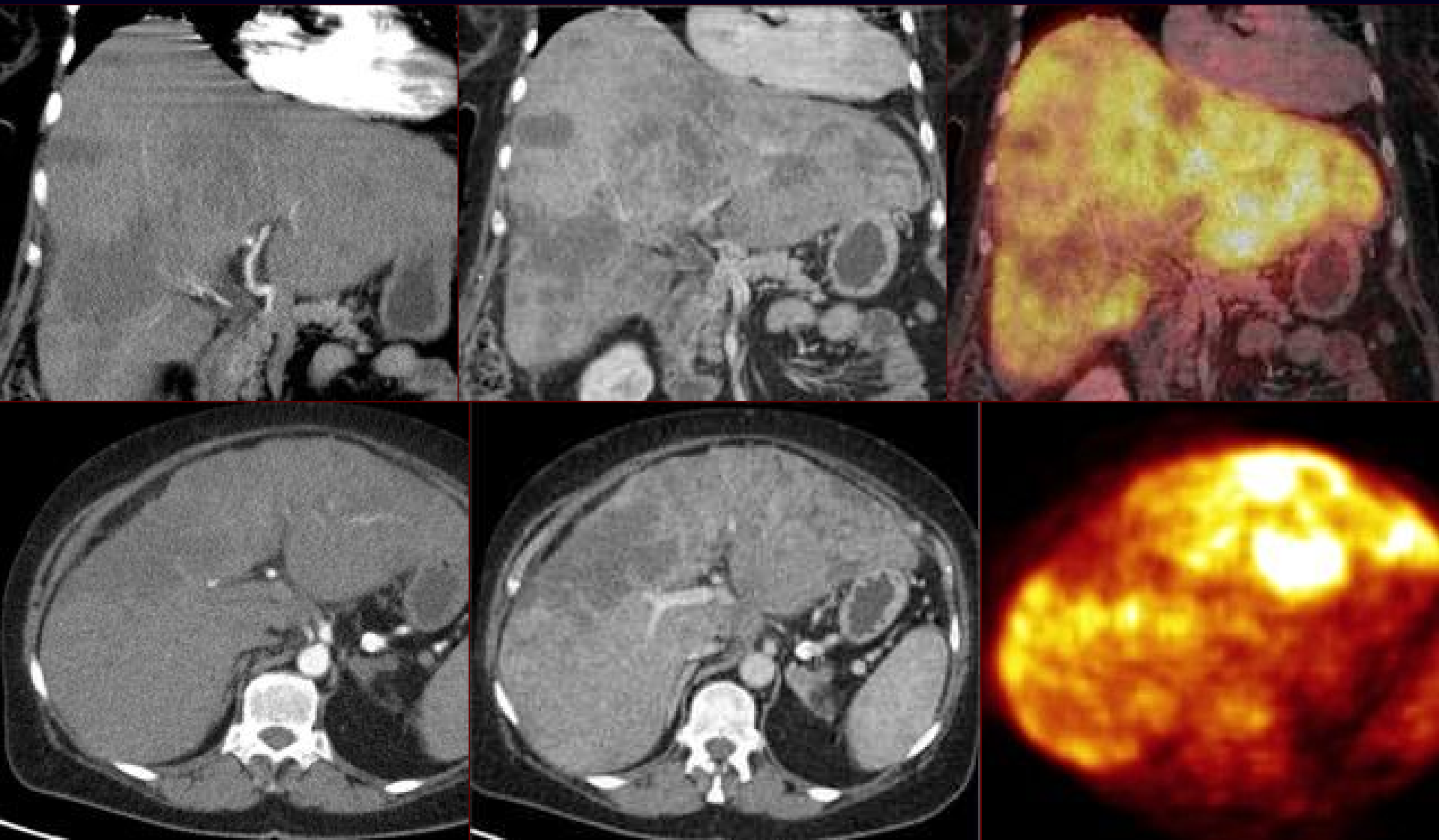
M 60 let, hubnutí a anémie, špatně dif. HCC

# Cholangiogenní karcinomy

- CCC intrahepatální i kystadenoCa mají vysokou akumulaci FDG – vysoká aktivita GLUT1 a nízká úroveň fosfatázy



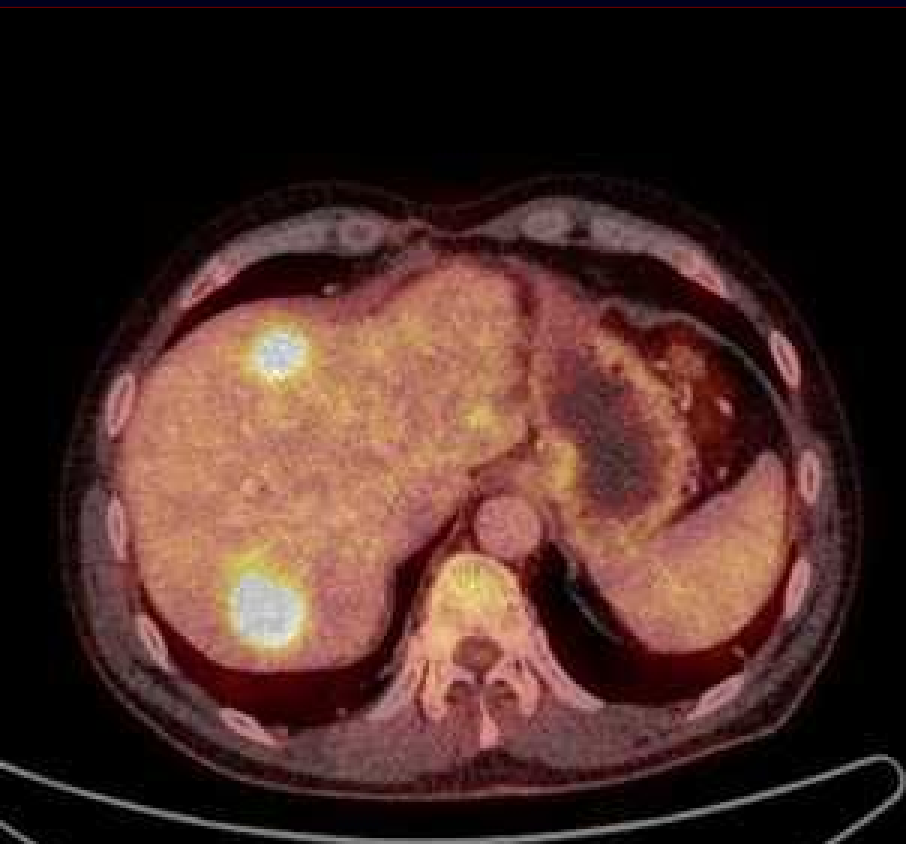
# Dediferencované nádory





# Sekundární nádory

- ♦  $^{18}\text{F}$ -FDG-PET/CT - detekce jaterních metastáz v rámci celkového stagingu onemocnění, zejména vyloučení extrahepatického postižení



Kong G, Jackson C, Koh DM, Lewington V, Sharma B, Brown G, Cunningham D, Cook GJ. The use of  $^{18}\text{F}$ -FDG PET/CT in colorectal liver metastases--comparison with CT and liver MRI. *Eur J Nucl Med Mol Imaging*. 2008 Jul;35(7):1323-9. Epub 2008 Mar 18. PubMed PMID: 18347794.

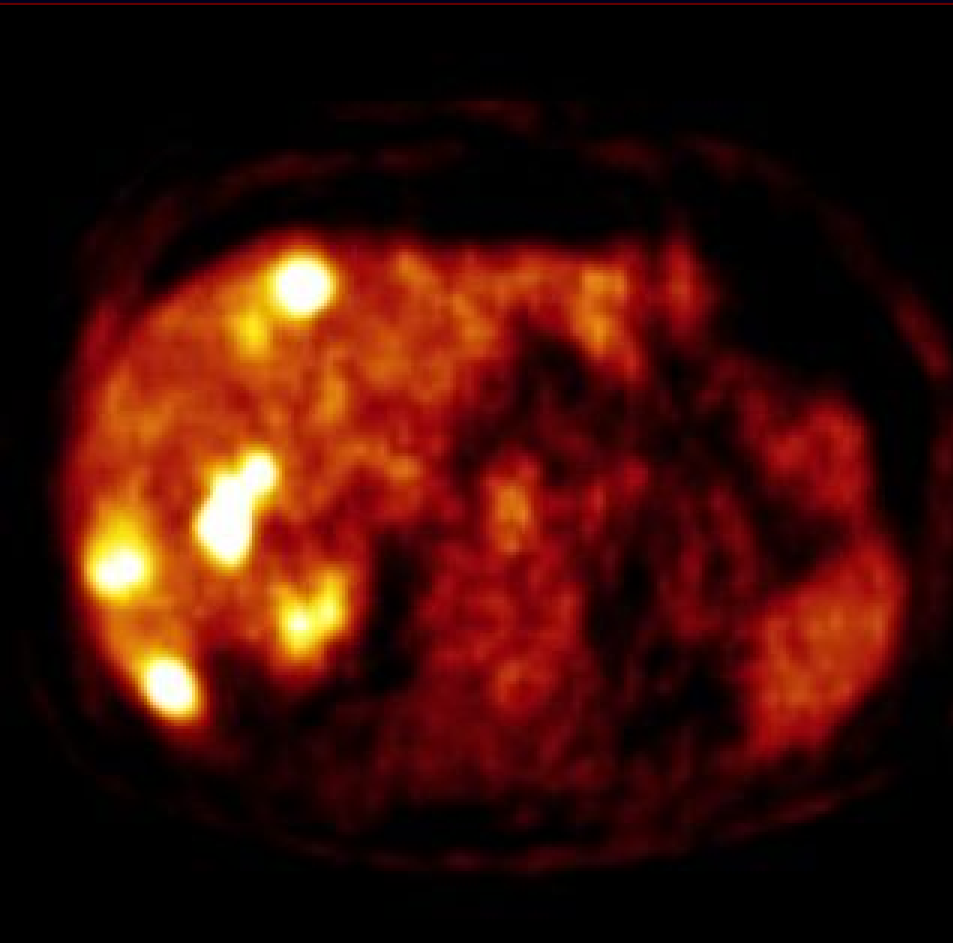
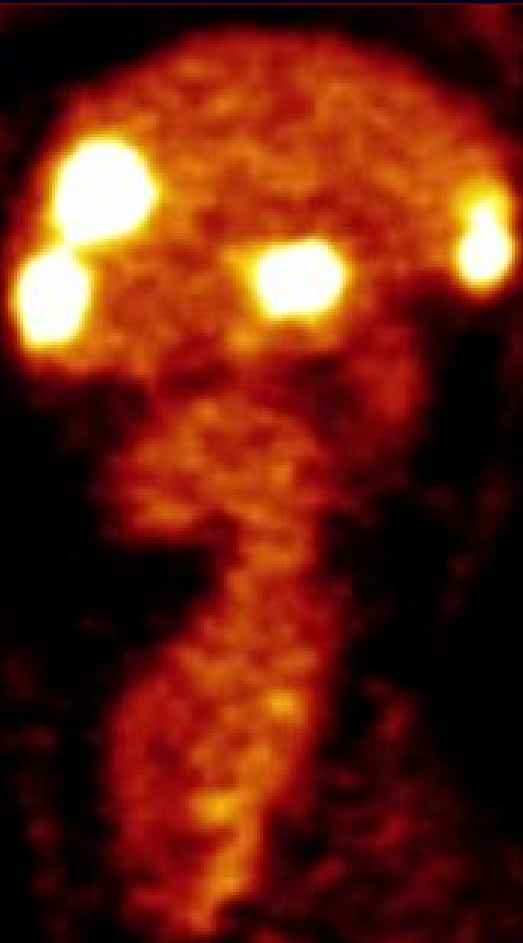
# Sekundární nádory

- ♦ Úroveň akumulace FDG je závislá na histologické diagnóze
- ♦ Dediferenciace nebo regresivní změny ji mohou ovlivnit



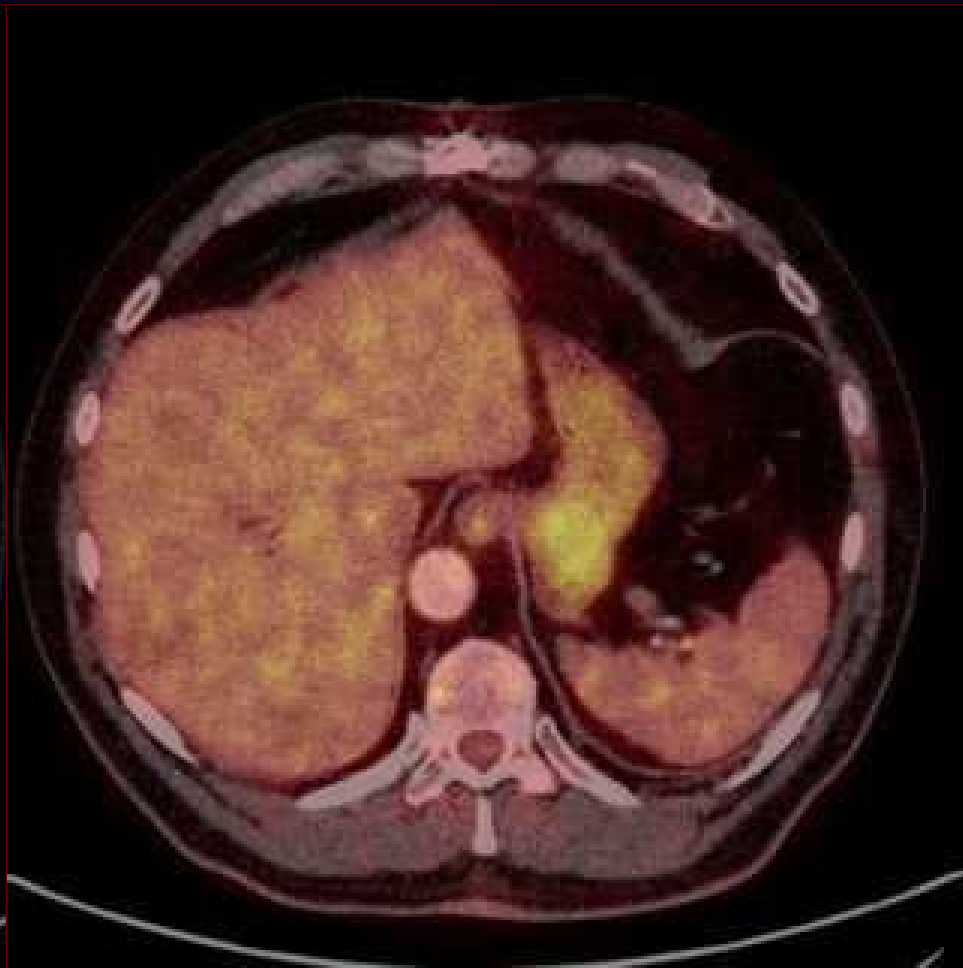
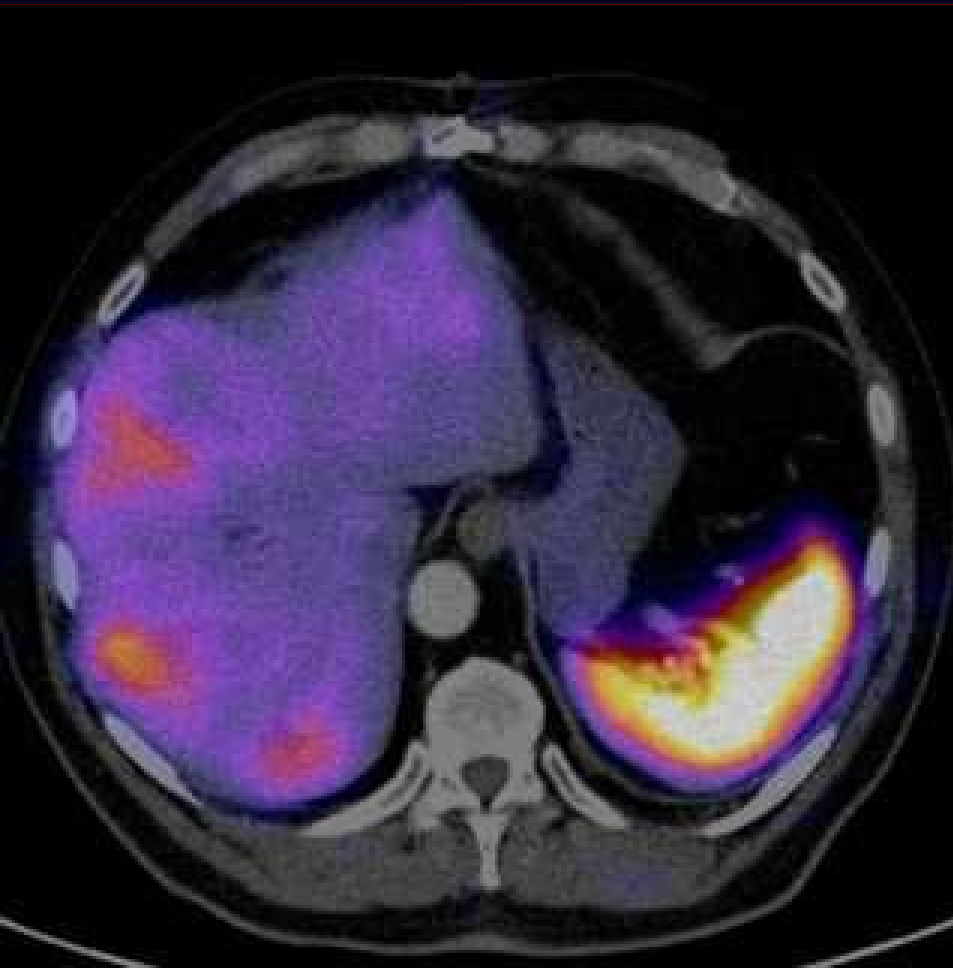
# Sekundární nádory

- $^{18}\text{F}$ -FDG-PET/CT – restaging nebo odpověď na terapii
- Není-li CT nebo MRI s jednoznačným závěrem



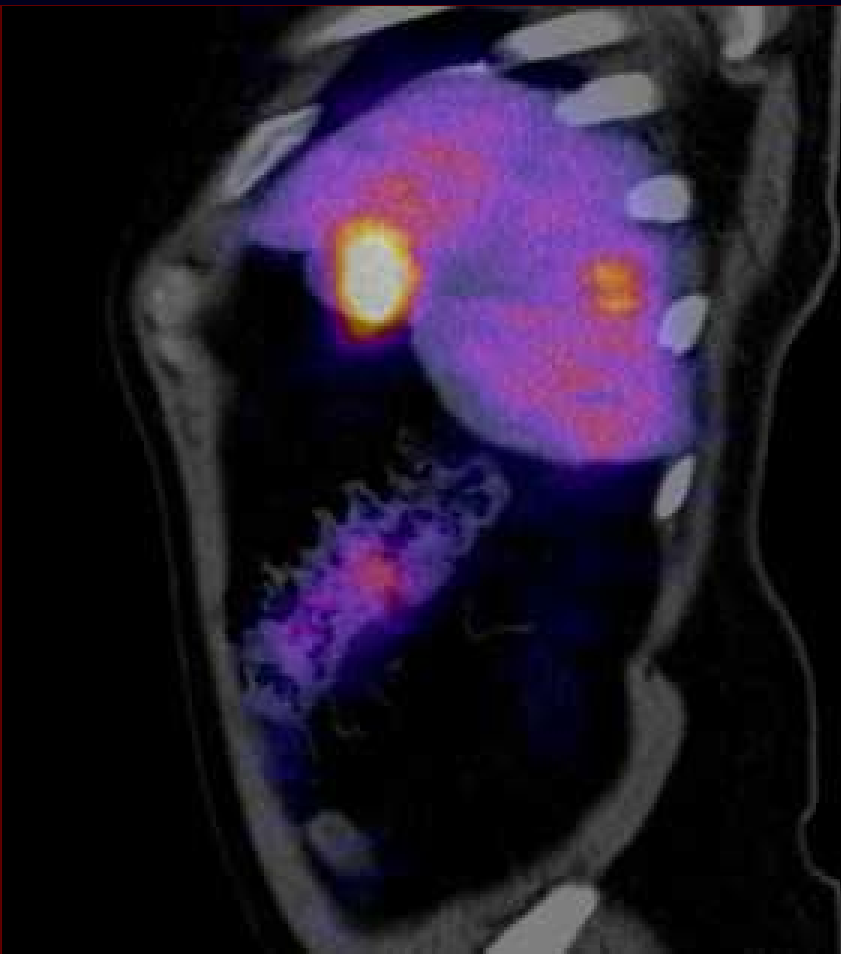
# $^{111}\text{In}$ -octreotid-SPECT/CT

- U NET s expresí genu pro SSRS2 – gastrinom, karcinoid, etc., neboť u dobře diferencovaných NET, byť maligních, je  $^{18}\text{F}$ -FDG-PET/CT negativní



# Mikrometastázy

- Vysoká hustota somatostatinových receptorů je i u mikrometastáz velikostí tak malých, že není patrný ani CT nález „bush in bloom“



# Shrnutí

## 🔥 $^{18}\text{F}$ -FDG-PET/CT

### 🔥 Hodnocení stupně diferenciacie HCC a jeho prognózy

Higashi T, Hatano E, Ikai I, et al.. FDG PET as a prognostic predictor in the early post-therapeutic evaluation for unresectable hepatocellular carcinoma. *Eur J Nucl Med Mol Imaging*. 2010 Mar;37(3):468-82. Epub 2009 Oct 17.

Lee JD, Yun M, Lee JM, et al. Analysis of gene expression profiles of hepatocellular carcinomas with regard to 18F-fluorodeoxyglucose uptake pattern on positron emission tomography. *Eur J Nucl Med Mol Imaging*. 2004 Dec;31(12):1621-30.

### 🔥 Vyhledávání mimojaterního postižení

### 🔥 Nejednoznačné nálezy MDCT a MRI

Kong G, Jackson C, Koh DM, et al. The use of 18F-FDG PET/CT in colorectal liver metastases—comparison with CT and liver MRI. *Eur J Nucl Med Mol Imaging*. 2008 Jul;35(7):1323-9.

## 🔥 $^{111}\text{In}$ -octreotid-SPECT/CT, $^{131}\text{I}$ -MIBG-SPECT/CT

### 🔥 Detekce metastáz NET

### 🔥 Posouzení sekundární dediferenciacie nádoru

### 🔥 Odhadnutí efektu terapie pomocí somatostatinových analog

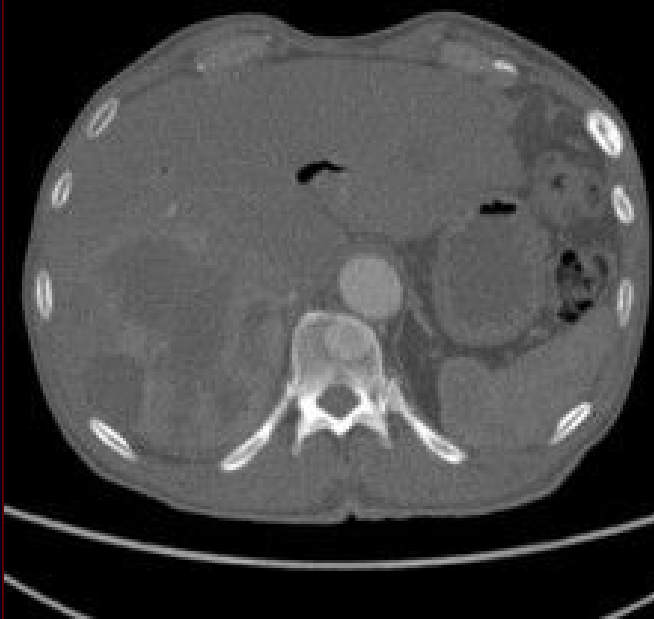
Hubble D, Kong G, Michael M, Johnson V, Ramdave S, Hicks RJ. 177Lu-octreotate, alone or with radiosensitising chemotherapy, is safe in neuroendocrine tumour patients previously treated with high-activity 111In-octreotide. *Eur J Nucl Med Mol Imaging*. 2010 Oct;37(10):1869-75. *Eur J Nucl Med*. 1997 Apr;24(4):368-71

### 🔥 K posouzení možnosti léčebného využití $^{90}\text{Y}$ -octreotidu nebo $^{131}\text{I}$ -MIBG k paliativní léčbě jaterních ložisek.

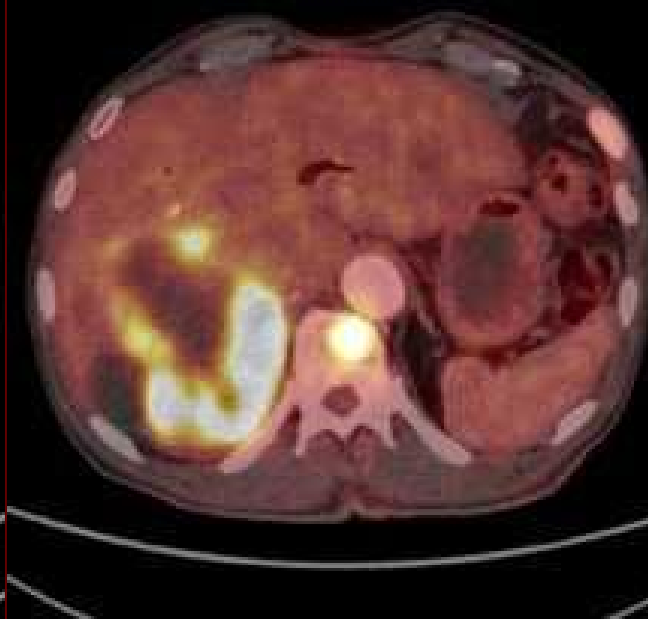
de Jong M, Bakker WH, Krenning EP, et al. Yttrium-90 and indium-111 labelling, receptor binding and biodistribution of [DOTA0,d-Phe1,Tyr3]octreotide, a promising somatostatin analogue for radionuclide therapy.

Popp M, Strumpf A, Zöphel K, Stroszczyński C, Kotzerke J. Increased uptake of ( $^{131}\text{I}$ )-MIBG after intra-arterial application in liver metastases of a neuroendocrine tumor. *Eur J Nucl Med Mol Imaging*. 2010 Jan;37(1):180.

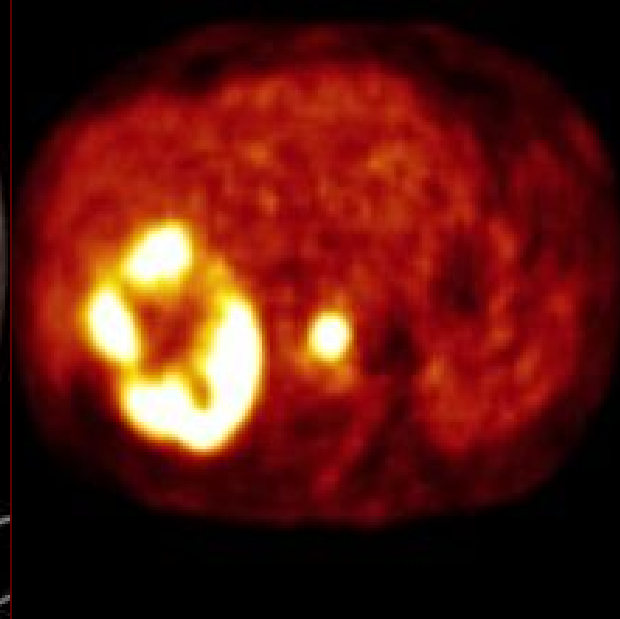
CT – arterial



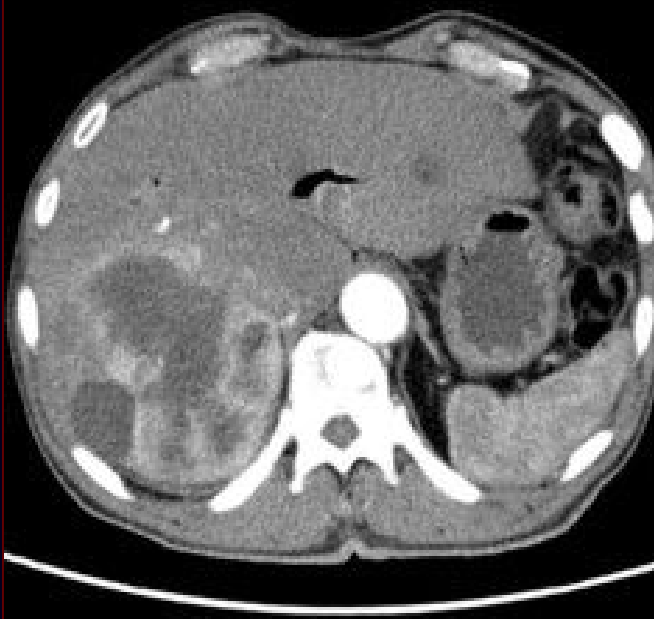
$^{18}\text{F}$ -FDG-PET/CT



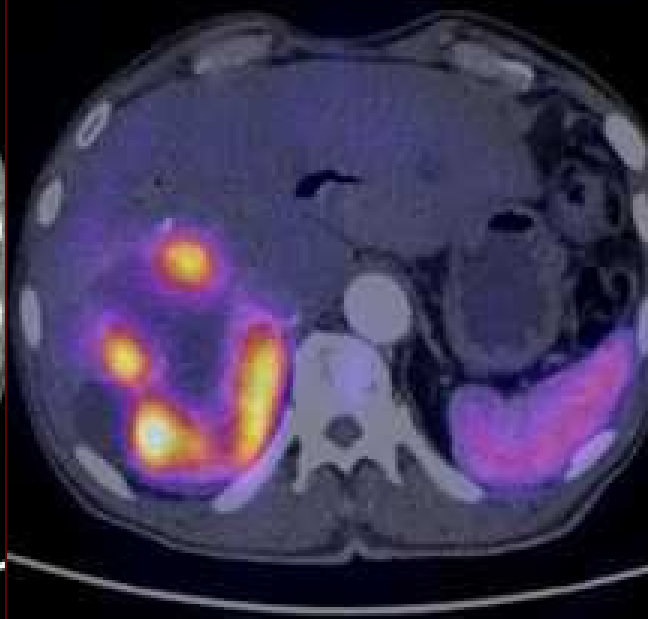
$^{18}\text{F}$ -FDG-PET



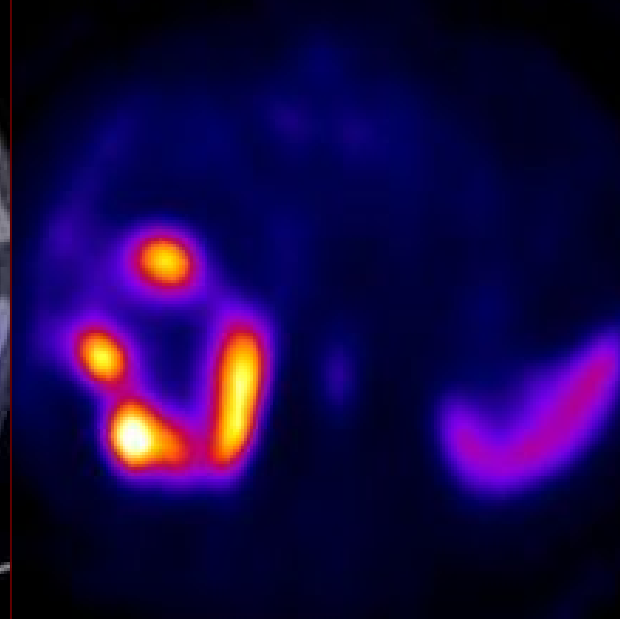
CT - arterial



$^{111}\text{In}$ -Octreotid-SPECT/CT

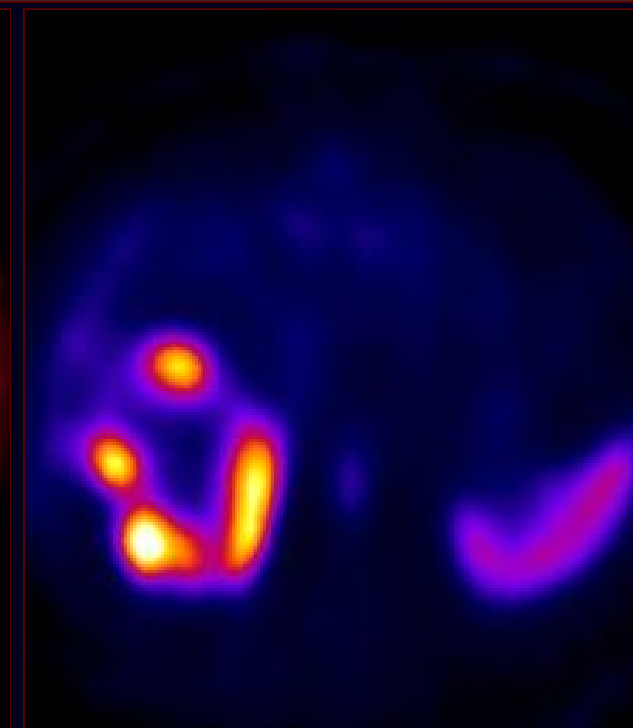


$^{111}\text{In}$ -Octreotid-SPECT



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Lee JD, Yun M, Lee JM, et al. Analysis of gene expression profiles of hepatocellular carcinomas with regard to 18F-fluorodeoxyglucose uptake pattern on positron emission tomography. *Eur J Nucl Med Mol Imaging*. 2004 Dec;31(12):1621-30.

Popp M, Strumpf A, Zöphel K, Stroszczynski C, Kotzerke J. Increased uptake of (131)I-MIBG after intra-arterial application in liver metastases of a neuroendocrine tumor. *Eur J Nucl Med Mol Imaging*. 2010 Jan;37(1):180. PubMed PMID: 19789869.

Limouris GS, Chatziioannou A, Kontogeorgakos D, Mourikis D, Lyra M, Dimitriou P, Stavrakia A, Gouliamos A, Vlahos L. Selective hepatic arterial infusion of In-111-DTPA-Phe1-octreotide in neuroendocrine liver metastases. *Eur J Nucl Med Mol Imaging*. 2008 Oct;35(10):1827-37. Epub 2008 Jun 7. PubMed PMID: 18536916.

Werner MK, Brechtel K, Beyer T, Dittmann H, Pfannenberger C, Kupferschläger J. PET/CT for the assessment and quantification of (90)Y biodistribution after selective internal radiotherapy (SIRT) of liver metastases. *Eur J Nucl Med Mol Imaging*. 2010 Feb;37(2):407-8. Epub 2009 Dec 9. PubMed PMID: 19997914.

Kong G, Jackson C, Koh DM, Lewington V, Sharma B, Brown G, Cunningham D, Cook GJ. The use of 18F-FDG PET/CT in colorectal liver metastases--comparison with CT and liver MRI. *Eur J Nucl Med Mol Imaging*. 2008 Jul;35(7):1323-9. Epub 2008 Mar 18. PubMed PMID: 18347794.

Travaini LL, Trifirò G, Ravasi L, Monfardini L, Della Vigna P, Bonomo G, Chiappa A, Mallia A, Ferrari M, Orsi F, Paganelli G. Role of [18F]FDG-PET/CT after radiofrequency ablation of liver metastases: preliminary results. *Eur J*