HCC CARCINOGENESIS

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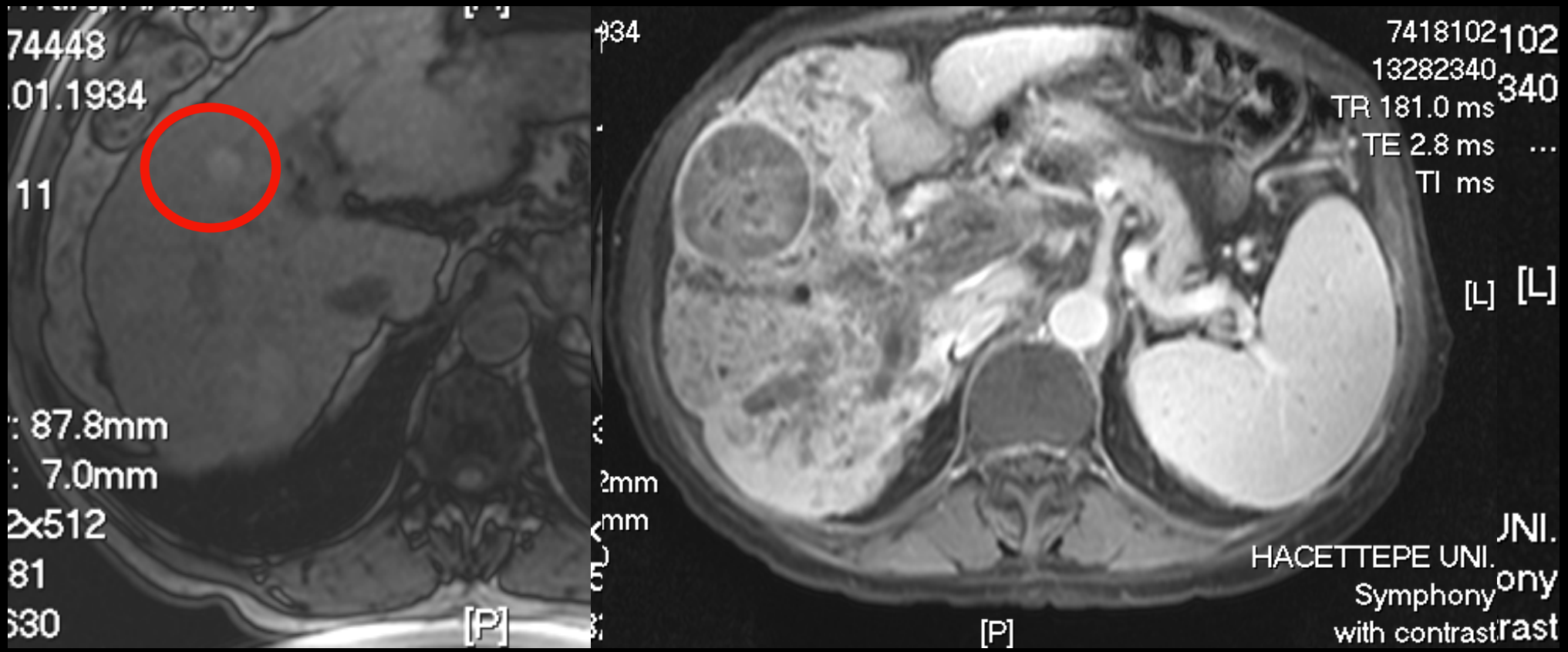
LIVER IMAGING TEAM

HACETTEPE UNIVERSITY SCHOOL OF MEDICINE

2003

2006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TE 2.8 ms
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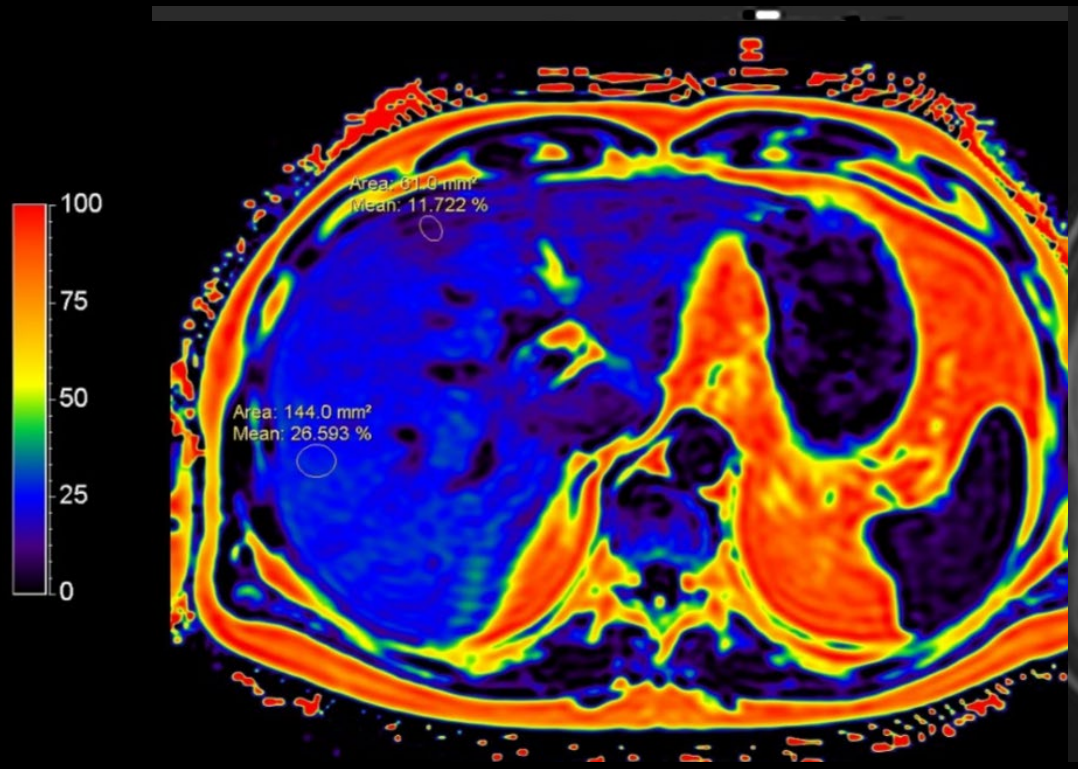
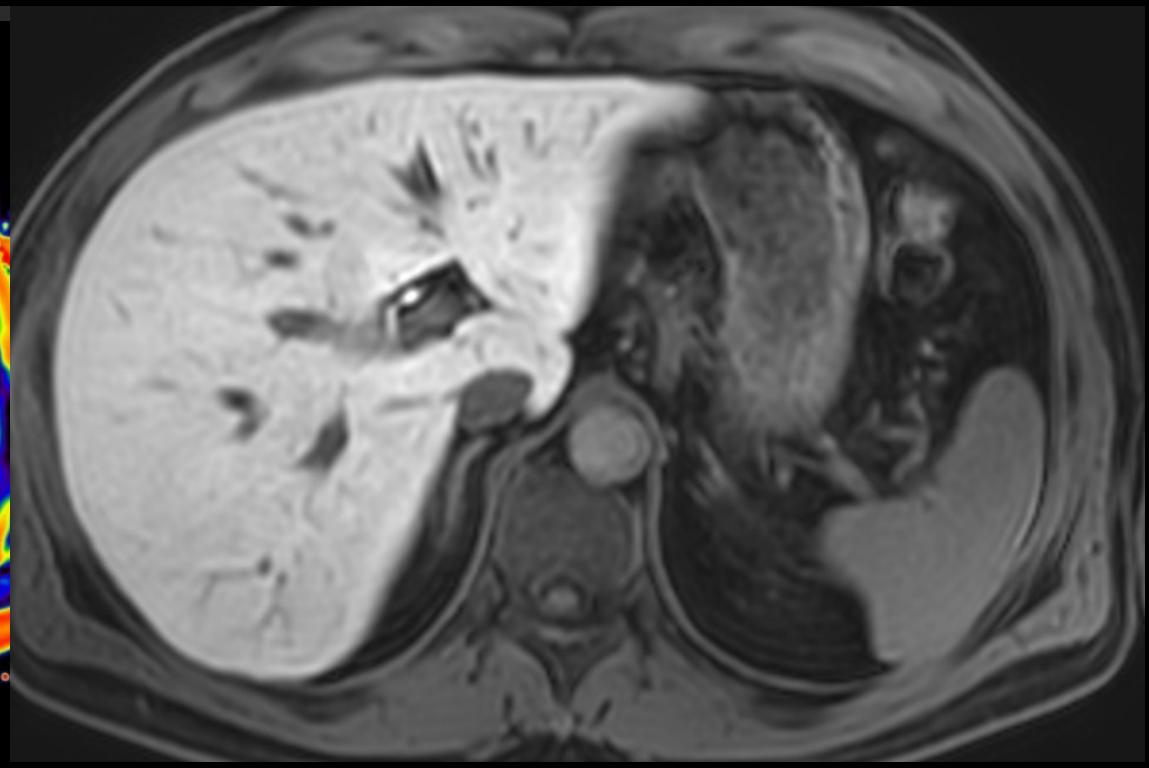
HACETTEPE UNI.
Symphony
with contrast
[P]

OUR GOALS IN LIVER IMAGING

- WE SHOULD NOT DIAGNOSE A BENIGN LESION AS A HCC
- WE HAVE TO SEE MORE (EARLY HCC)
- WE HAVE TO SEE THE UNSEEN
- WE HAVE TO SOLVE CLINICAL PROBLEMS
- WE HAVE TO PREDICT MORE - PROGNOSIS
- SUMMARY

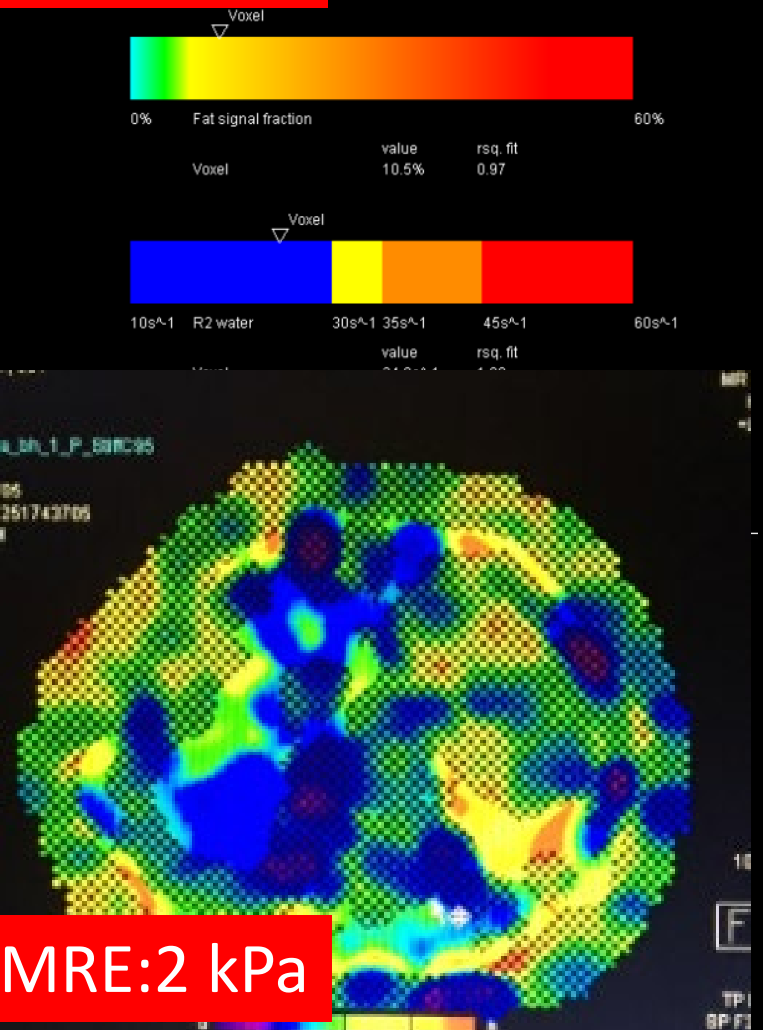
DIFFERENTIATE LIVER FROM NON-LIVER





N(M)AFLD

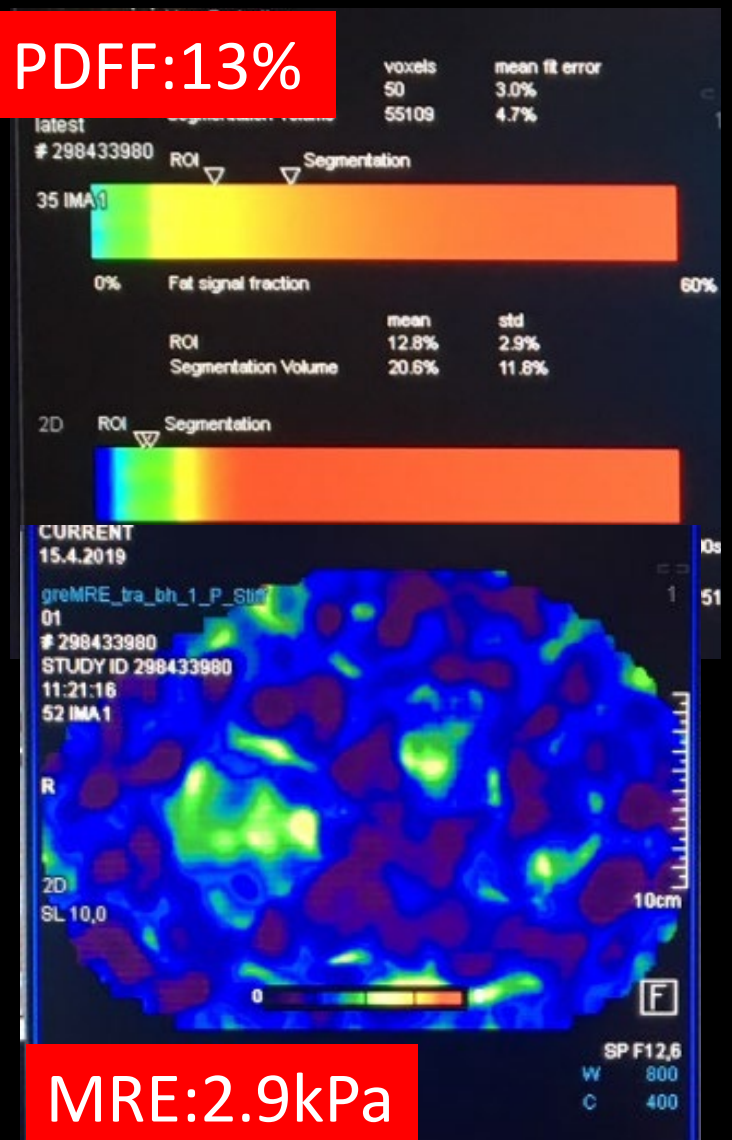
PDFF:11%



MRE:2 kPa

NASH

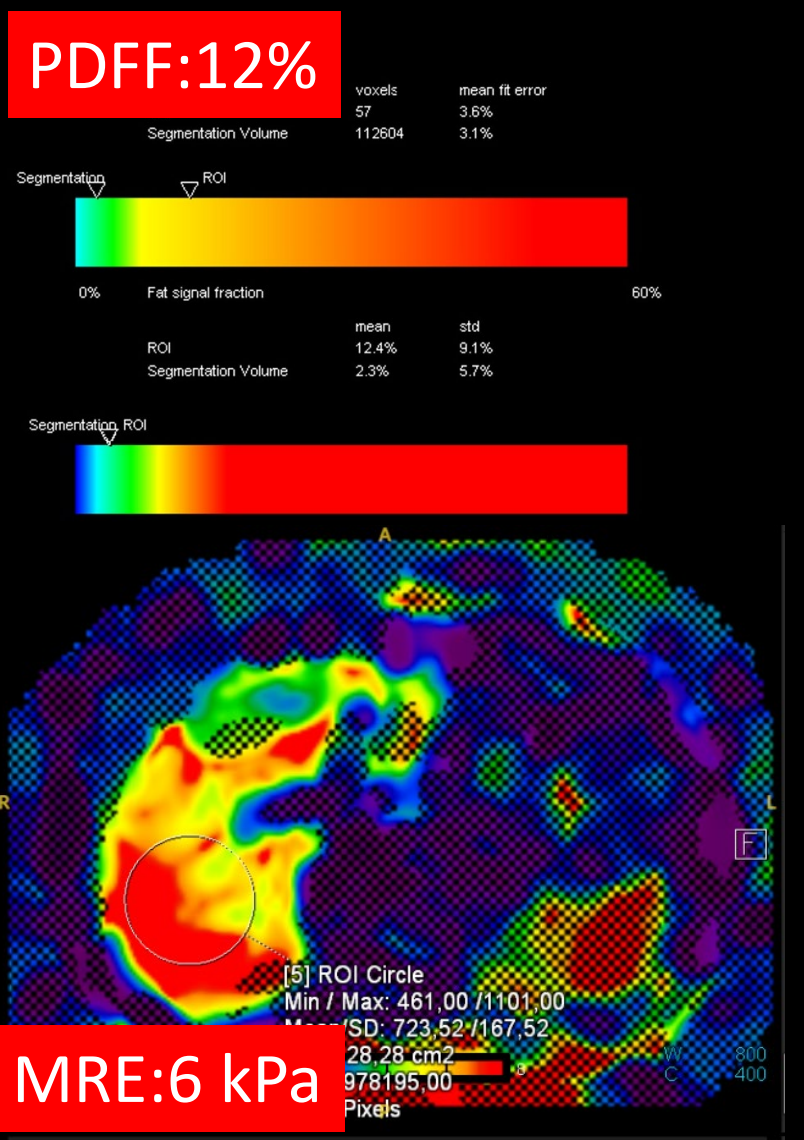
PDFF:13%



MRE:2.9kPa

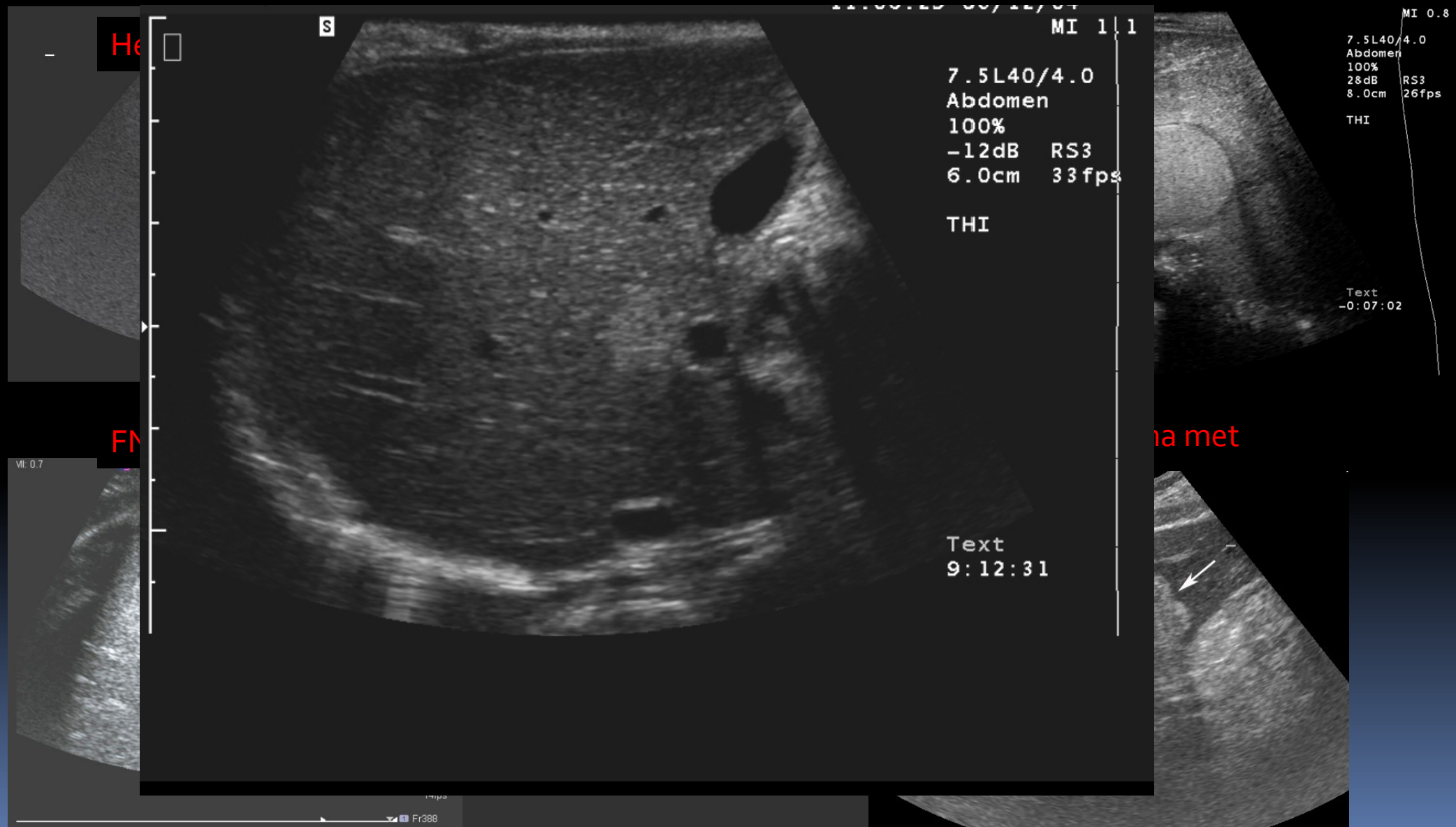
CIRRHOSIS

PDFF:12%



MRE:6 kPa

US ……


MI 1.1
7.5L40/4.0
Abdomen
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-12dB RS3
6.0cm 33fps
THI
Text
9:12:31
MI 0.8
7.5L40/4.0
Abdomen
100%
28dB RS3
8.0cm 26fps
THI
Text
-0:07:02

US THE BEST TEST?

- OPERATOR DEPENDENT
- BODY HABITUS
- NEEDLE IN HAYSTACK
- YOU ARE NOT SEEING EVERY PART OF LIVER, BLIND AREAS

Abdominal Radiology (2023) 48:263–270
https://doi.org/10.1007/s00261-022-03702-2

HEPATOBILIARY

HCC screening with ultrasound: assessment of quality using ultrasound LI-RADS score

Michael J. King[1] · Karen M. Lee[1] · Sonam Rosberger[1] · Hsin-hui Huang[2,3] · Gabriela Hernandez Meza[4] · Sara Lewis[1,2] · Bachir Taouli[1,2]

Received: 15 June 2022 / Revised: 4 October 2022 / Accepted: 5 October 2022 / Published online: 15 October 2022

Abstract

Purpose To describe ultrasound (US) quality for hepatocellular carcinoma (HCC) screening/surveillance using the US LI-RADS scoring system, and to assess predictive factors of worse US quality scores.

Methods This retrospective study included adult patients ($n = 470$; M/F 264/206, median age 59y) at risk for HCC that underwent US for HCC screening/surveillance. US examinations were independently reviewed by 2 radiologists that assigned a visualization score (A: no/minimal, B: moderate, C: severe limitation) and US diagnostic category (US LI-RADS 1: negative, US LI-RADS 2: subthreshold, US LI-RADS 3: positive) to each study. A generalized linear mixed model was used to assess the predictive factors of worse visualization score using OR (odds ratio) statistics. Simple Kappa coefficient (K) assessed inter-reader agreement.

Results For readers 1 and 2, 295/320 (62.8%/68.1%) cases were scored A, 153/134 (32.6%/28.5%) were scored B, and 22/16 (4.6%/3.4%) were scored C, respectively. There was moderate inter-reader agreement for US LI-RADS visualization score ($K = 0.478$) and 100% concordance for US diagnostic category ($K = 1$), with 30 (6.4%) cases scored as positive (US LI-RADS 3). Cirrhosis and obesity were significant independent predictors of worse visualization scores (B/C) (cirrhosis: OR 10.4 confidence intervals: [4.25–25.48], $p < 0.001$; obesity: OR 3.61 [2.11–6.20], $p < 0.001$). Of the 30 lesions scored as US LI-RADS 3, 9 were characterized as probable or definite HCC on confirmatory CT/MRI, yielding a PPV of 30% (9/30) and a false-positive rate of 70% (21/30).

Conclusion Moderate to severe limitations in quality of US performed for HCC screening/surveillance was observed in approximately one-third of patients. Patients with cirrhosis and/or elevated BMI have poorer quality US studies and may benefit from other screening modalities such as CT or MRI.

WHAT IS LIVER MRI ?

- **TRIPHASIC CT = POSTCONTRAST T1W**

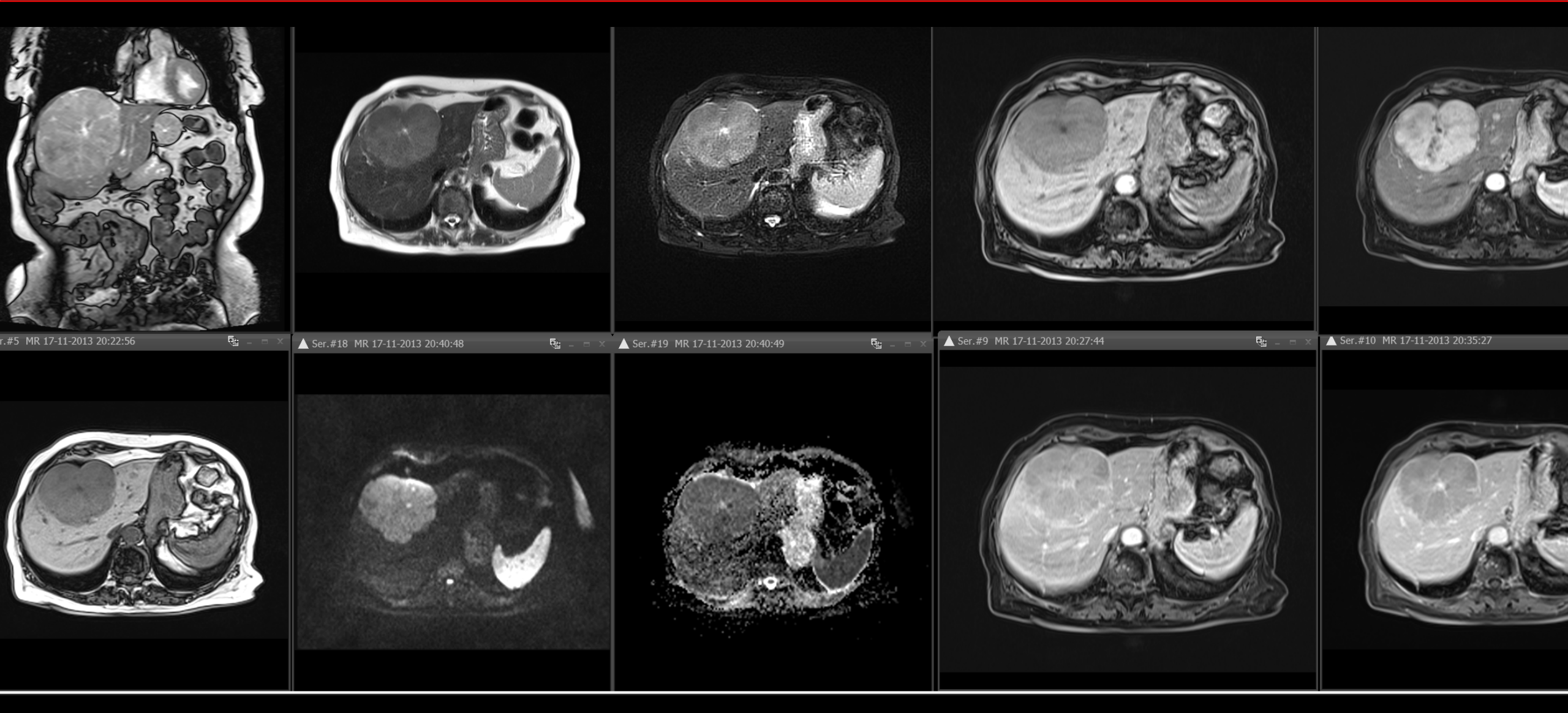
+

- IN OUT OF PHASE T1W : FAT-SUSCEPTIBILITY
- T2 W SS : FREE WATER
- FAT SATURATION : MACRO FAT
- CONTRAST AGENTS : SOLID OR NOT
  - GD-EOB-DTPA : FUNCTION, PROGNOSIS
- DWI : CELLULARITY
- MR ELASTOGRAPHY : STIFFNESS

LIVER MRI FOR GD-EOB-DTPA

- T1W IN/OUT (PDFF/DIXON)
- PRE – POST DYNAMIC IMAGING T1W
- T2W
- MR ELASTOGRAPHY
- **DWI**
- T1W HEPATOBILIARY PHASE – 15/20 min

FOCAL NODULAR HYPERPLASIA?



ABBREVIATED MRI (AMRI) – COLON CANCER/HCC

- ARTERIAL PHASE MAY NOT BE VERY CRITICAL
- ABBREVIATED MRI PROTOCOL (AMRI): INITIALLY FOR HCC
  - DWI + HEPATOBILIARY PHASE AFTER GD-EOB :
    - Besa et al . Abdominal Radiol 2017
    - Marks RM et al. AJR 2015
- DON'T CARE ABOUT RESPIRATION – NAVIGATOR OR GATED
- NOW LOOKS PROMISING FOR COLON CANCER SURVEILLANCE

Eur Radiol. 2019 Nov;29(11):5852-5860. doi: 10.1007/s00330-019-06113-y. Epub 2019 Mar 19.

Lesion detection performance of an abbreviated gadoxetic acid-enhanced MRI protocol for colorectal liver metastasis surveillance.

Canellas R[1], Patel MJ[2], Agarwal S[3,4], Sahani DV[2].

Author information

Abstract

OBJECTIVE: To assess the lesion detection performance of an abbreviated MRI (AMRI-M) protocol consisting of ultrafast SE T2W, DWI, and T1W-HBP at 20 min for colorectal liver metastasis (CRLM) surveillance.

CONCLUSION: Our proposed AMRI-M protocol (ultrafast SE T2W, DWI, and T1W-HBP at 20 min) is fast, low-cost alternative to the standard MRI protocol and has a high lesion detection performance.

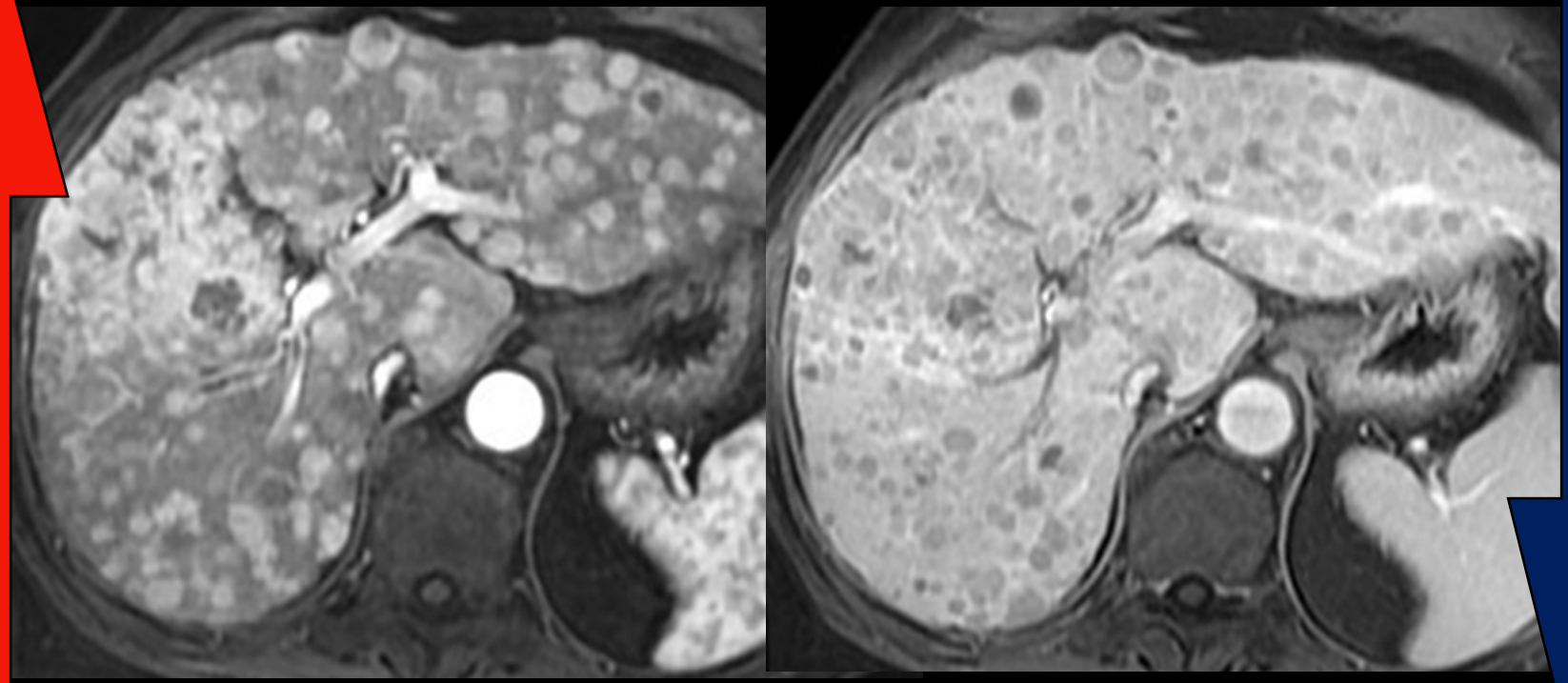
HCC CARCINOGENESIS

- HCC DEVELOPMENT
- OATP
- GD-EOB-DTPA
- EARLY HCC DIAGNOSIS
- PROGNOSIS
- FUTURE

HEPATOCELLUAR CARCINOMA

ARTERIAL HYPERVASCULAR

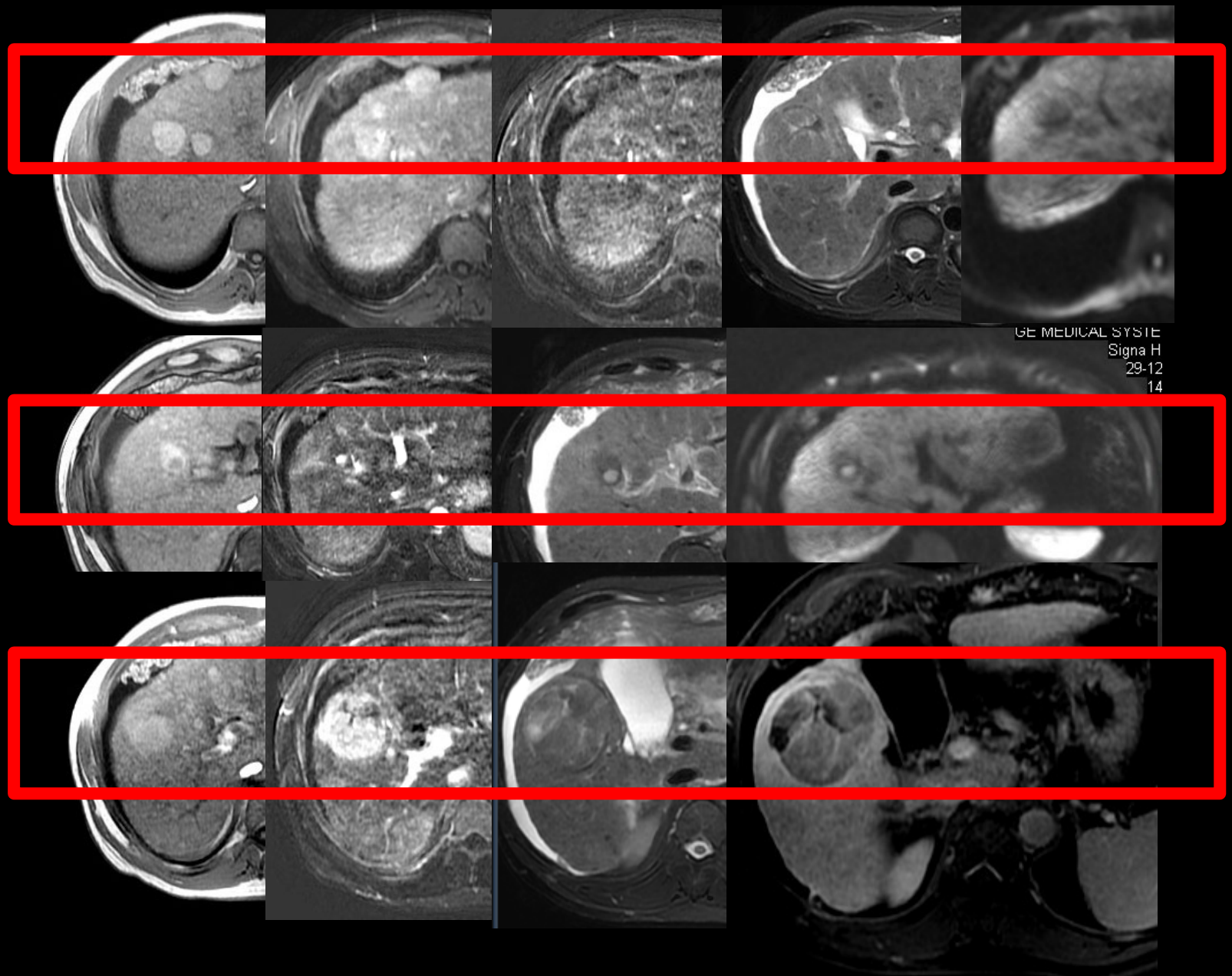
VENOUS WASHOUT



ARTERIAL FEEDING

PORTAL SUPPLY

HCC BIGGER THAN 1CM CAN BE DIAGNOSED BY MRI WO Bx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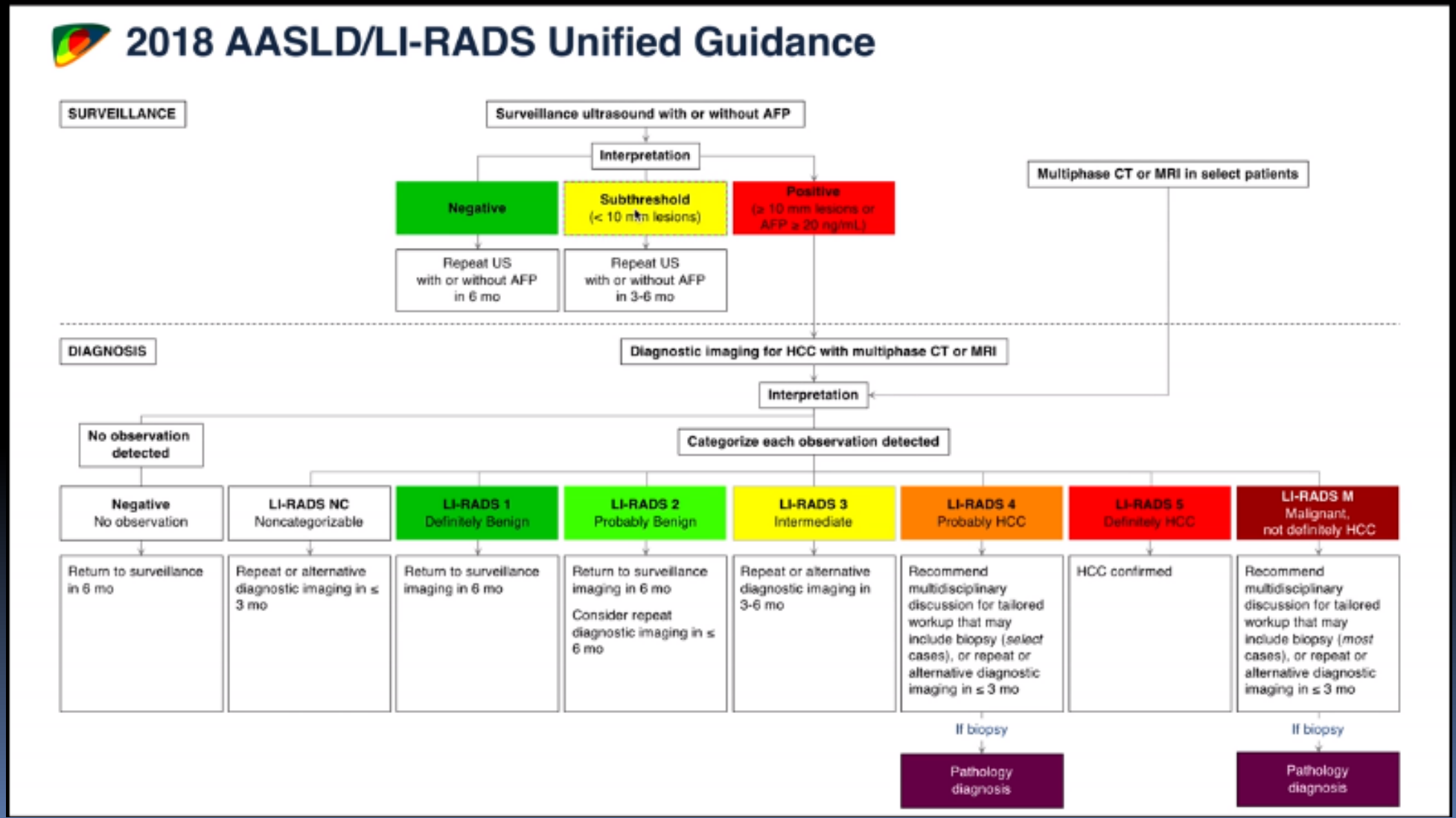
14

LI-RADS: HI SPECIFICITY



ASIA-PACIFIC : HIGH SENSITIVITY

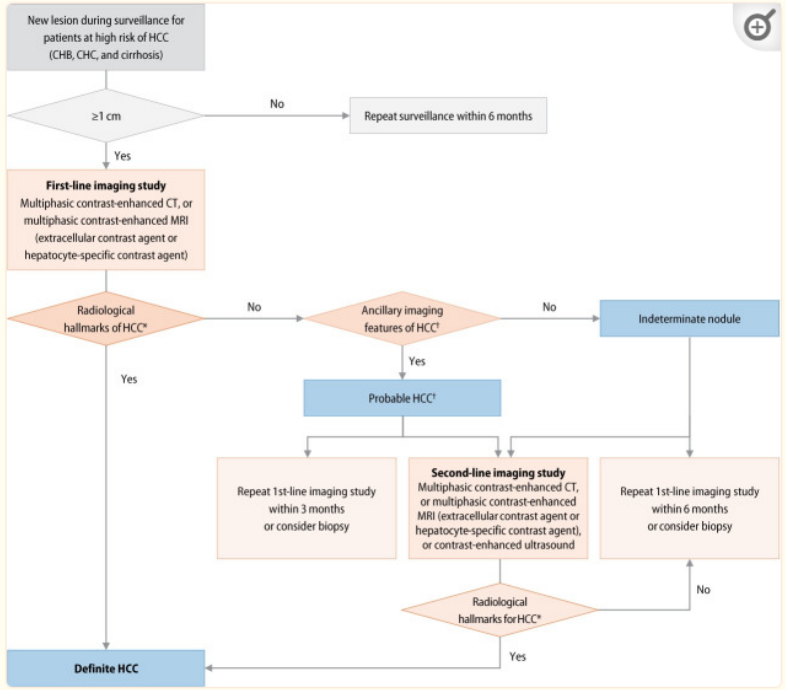
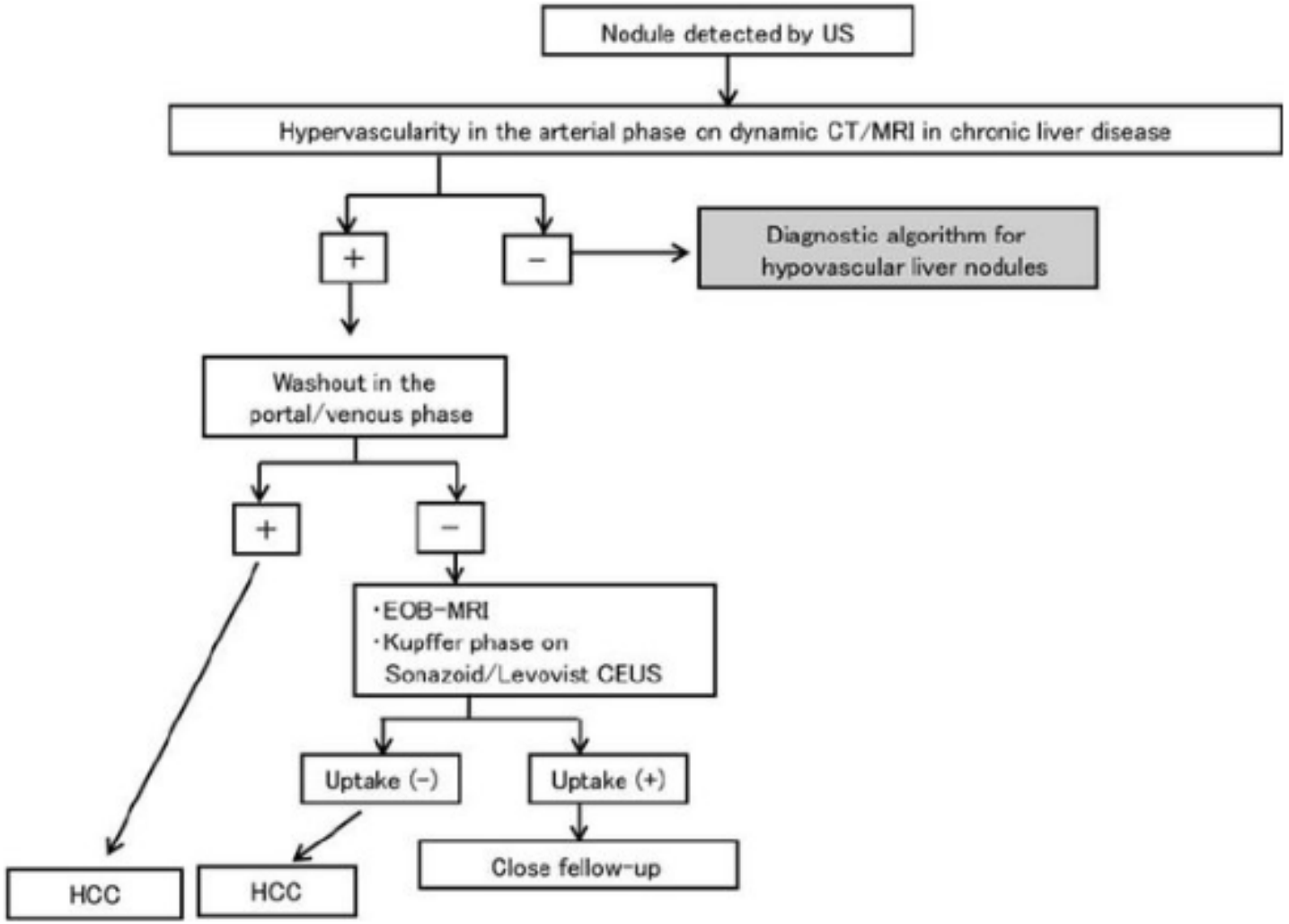
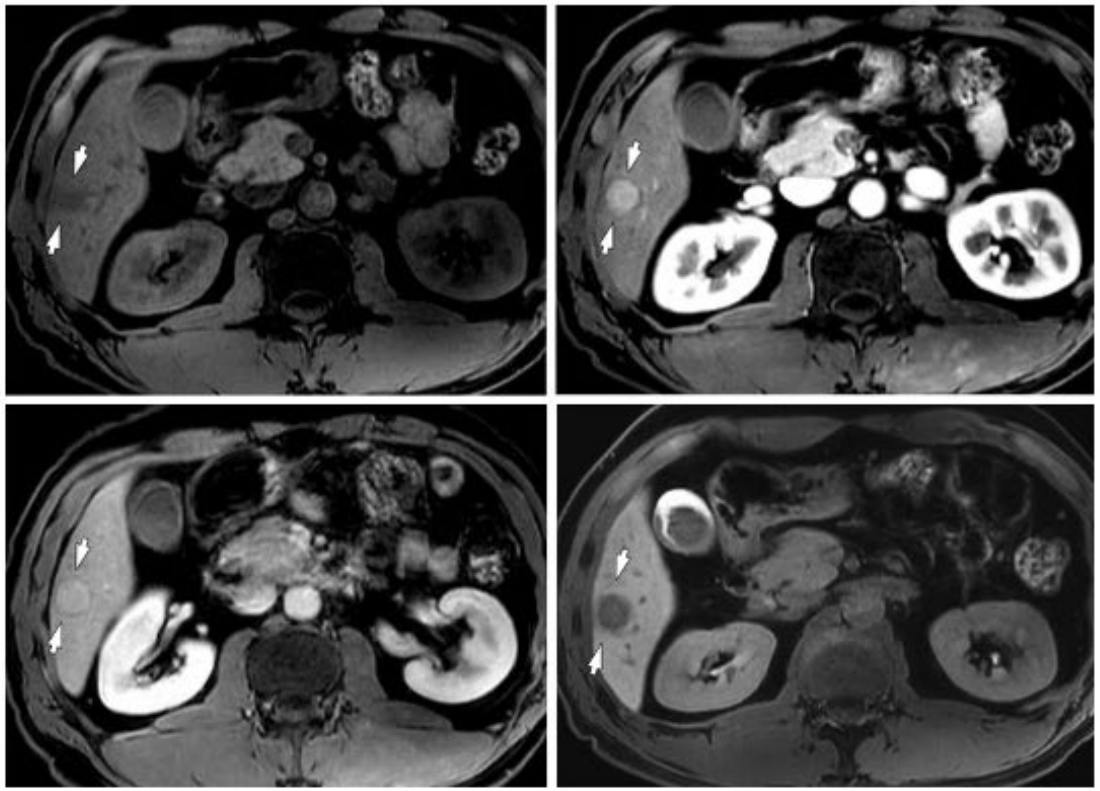


Figure 3.

Diagnostic algorithm. HCC, hepatocellular carcinoma; CHB, chronic hepatitis B; CHC, chronic hepatitis C; CT, computed tomography. *The radiological hallmarks for diagnosing "definite" HCC on multiphasic contrast-enhance CT or magnetic resonance imaging (MRI) are arterial phase hyperenhancement (APHE) with washout appearance in the portal venous, delayed, or hepatobiliary phases. These criteria should be applied only to a lesion that does not show either marked T2 hyperintensity or targetoid appearances on diffusion-weighted images or contrast-enhanced images. For a second-line imaging modality, the radiologic hallmarks of contrast-enhanced ultrasonography (blood-pool contrast agent or Kupffer cell-specific contrast agent) for a "definite" diagnosis of HC are APHE with mild and late (≥60 seconds) washout. These criteria should be applied only to a lesion that does nc show either rim or peripheral globular enhancement in the arterial phase. †For the diagnosis of "probable" HCC, ancillary imaging features are applied as follows: there are two categories of ancillary imaging features, including



Comparison of HCC Diagnostic Guidelines with Gadoxetic acid–enhanced Liver MRI

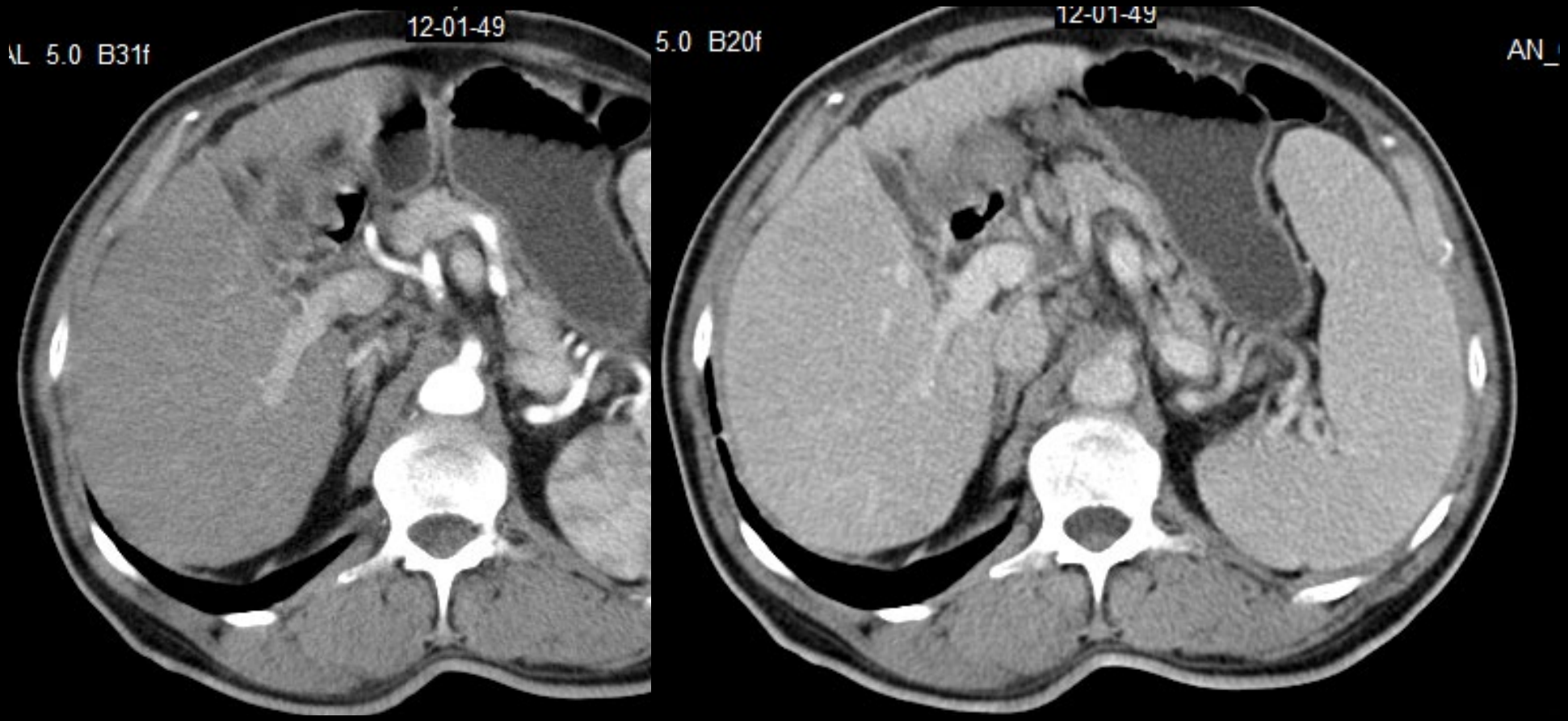


- Retrospective study comparing four HCC diagnostic guidelines in 2237 patients at risk for HCC with 2445 focal liver lesions (1694 were HCC) at gadoxetic acid–enhanced liver MRI.
- Eastern guidelines had higher sensitivity than Western guidelines (78%–89% vs 69%–71%), whereas Western guidelines had higher specificity (88%–90% vs 52%–84%).
- In lesions < 20 mm (*n* = 766), Eastern guidelines showed higher accuracy than Western guidelines (80% vs 73%).

Yoon JH and Kim YK et al. Published Online: April 2, 2024
https://doi.org/10.1148/radiol.233114

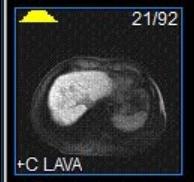
Radiology

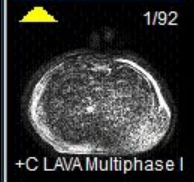
CIRRHOSIS, HIGH AFP, 63Y

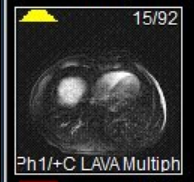


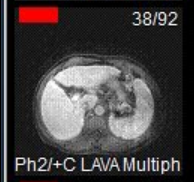
FOLDER REFRESH STUDY Layout Presentation Zoom Pg Format Sync... SYNC PRIOR Key Images MPR Help

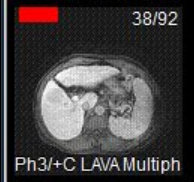
Navigator

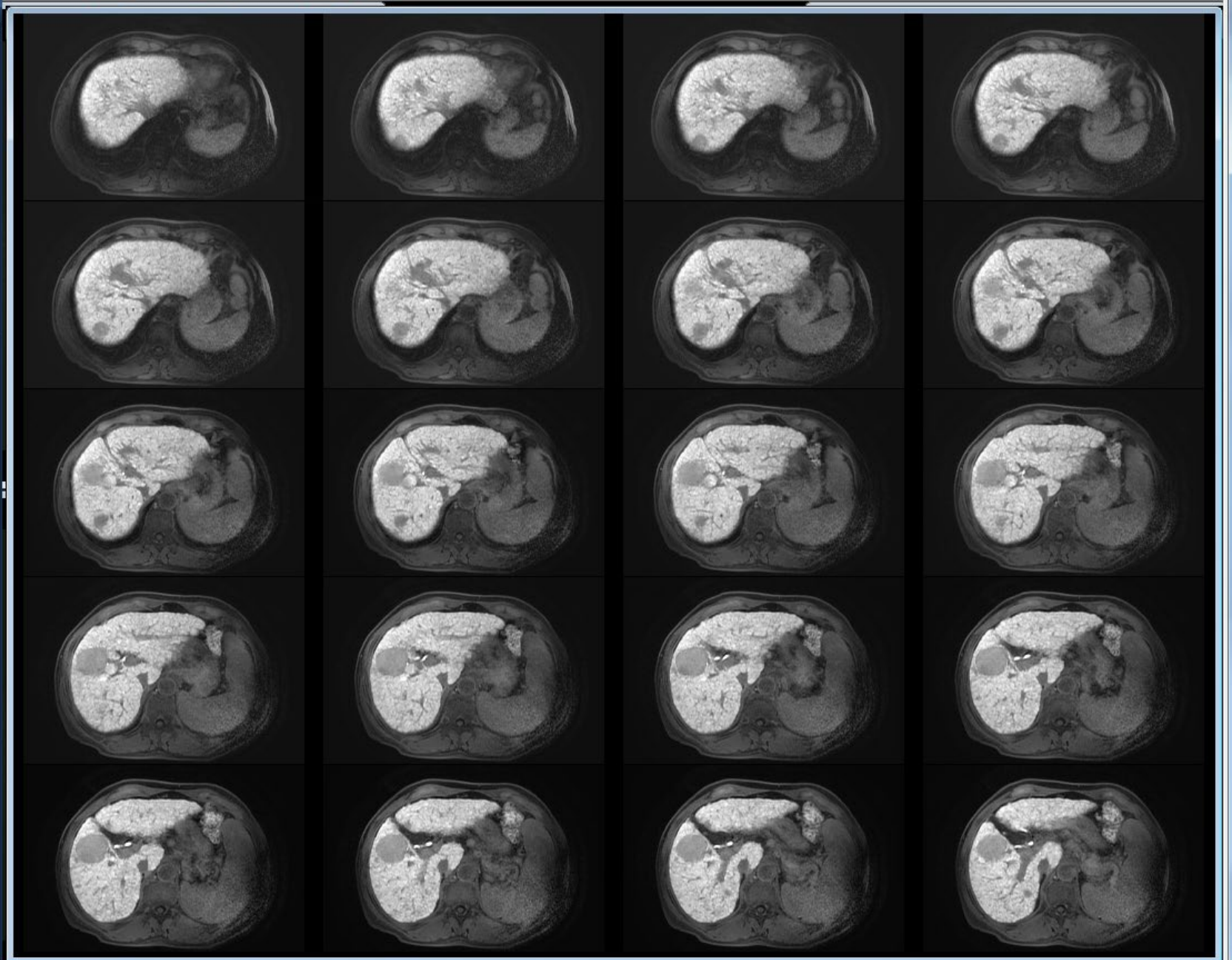






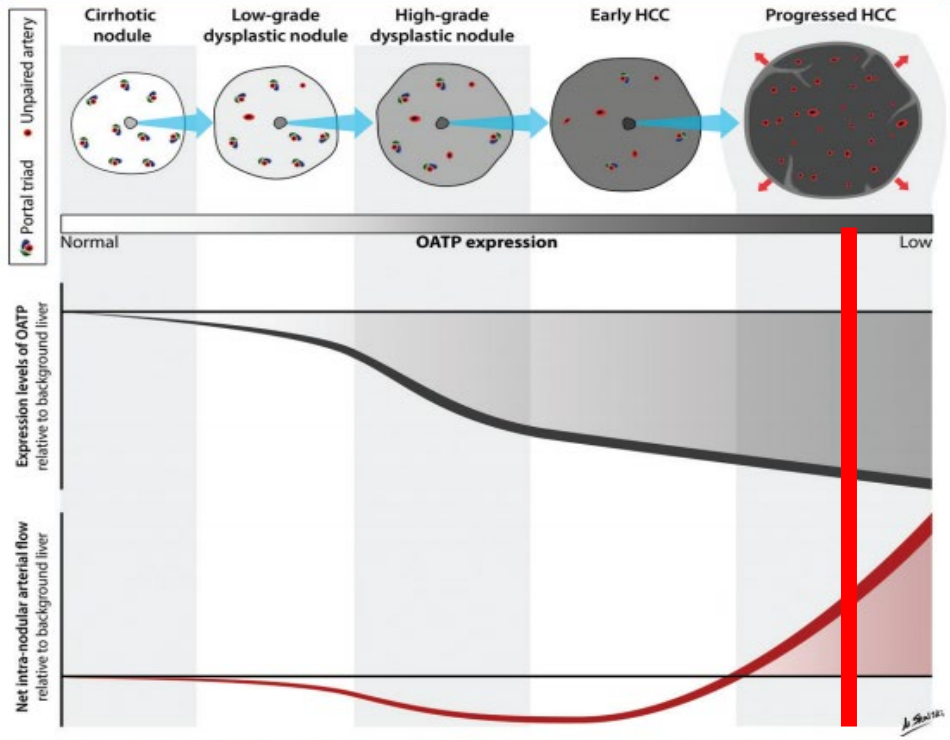






EARLY HCC DIAGNOSIS

Figure 1



NONHYPERVASCULAR HEPATOBILIARY PHASE HYPOINTENSE NODULES

European Radiology (2023) 33:493–500
https://doi.org/10.1007/s00330-022-09000-1

GASTROINTESTINAL

Non-hypervascular hepatobiliary phase hypointense lesions detected in patients with hepatocellular carcinoma: a post hoc analysis of SORAMIC trial to identify risk factors for progression

Osman Öcal[1] · Christoph J. Zech[2] · Matthias P. Fabritius[1] · Christian Loewe[3] · Otto van Delden[4] · Vincent Vandecaveye[5] · Bernhard Gebauer[6] · Thomas Berg[7] · Christian Sengel[8] · Irene Bargellini[9] · Roberto Iezzi[10] · Alberto Benito[11] · Maciej Pech[12] · Antonio Gasbarrini[13] · Bruno Sangro[14] · Peter Malfertheiner[15] · Jens Ricke[1] · Max Seidensticker[1]

Received: 20 May 2022 / Revised: 20 May 2022 / Accepted: 29 June 2022 / Published online: 26 July 2022

Abstract

Objectives To identify clinical and imaging parameters associated with progression of non-hypervascular hepatobiliary phase hypointense lesions during follow-up in patients who received treatment for hepatocellular carcinoma.

Methods A total of 67 patients with 106 lesions were identified after screening 538 patients who underwent gadoxetic acid–enhanced MRI within the SORAMIC trial. All patients were allocated to the trial treatment according to the trial scheme, and 61 of 67 patients received systemic treatment with sorafenib (either alone or combined with locoregional therapies) during the trial

Conclusions Non-hypervascular hepatobiliary phase hypointense lesions are associated with subsequent progression after treatment in patients with HCC. T2 hyperintensity, diffusion restriction, cirrhosis, and higher ECOG-PS could identify lesions with increased risk. These factors should be considered for further diagnostic evaluation or treatment of such lesions.

Key Points

- *Non-hypervascular hepatobiliary phase hypointense lesions have considerable risk of progression in patients with hepatocellular carcinoma receiving treatment.*
- *T2 hyperintensity, cirrhosis, ECOG-PS, and hyperintensity at DWI are associated with increased risk of progression.*
- *Non-hypervascular hepatobiliary phase hypointense lesions should be considered in the decision-making process of locoregional therapies, especially in the presence of these risk factors.*

Keywords Magnetic resonance imaging · Gadoxetic acid · Hepatobiliary phase · Hepatocellular carcinoma · Hypovascular hypointense lesions

HCC CARCINOGENESIS

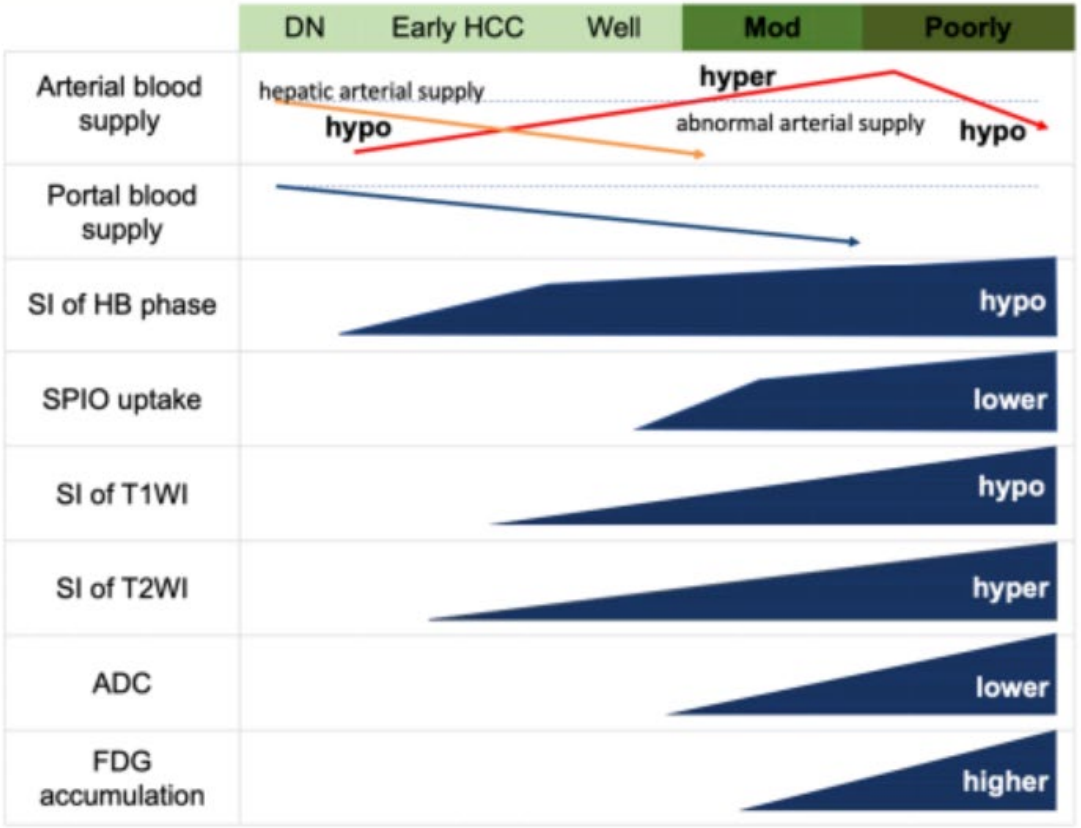
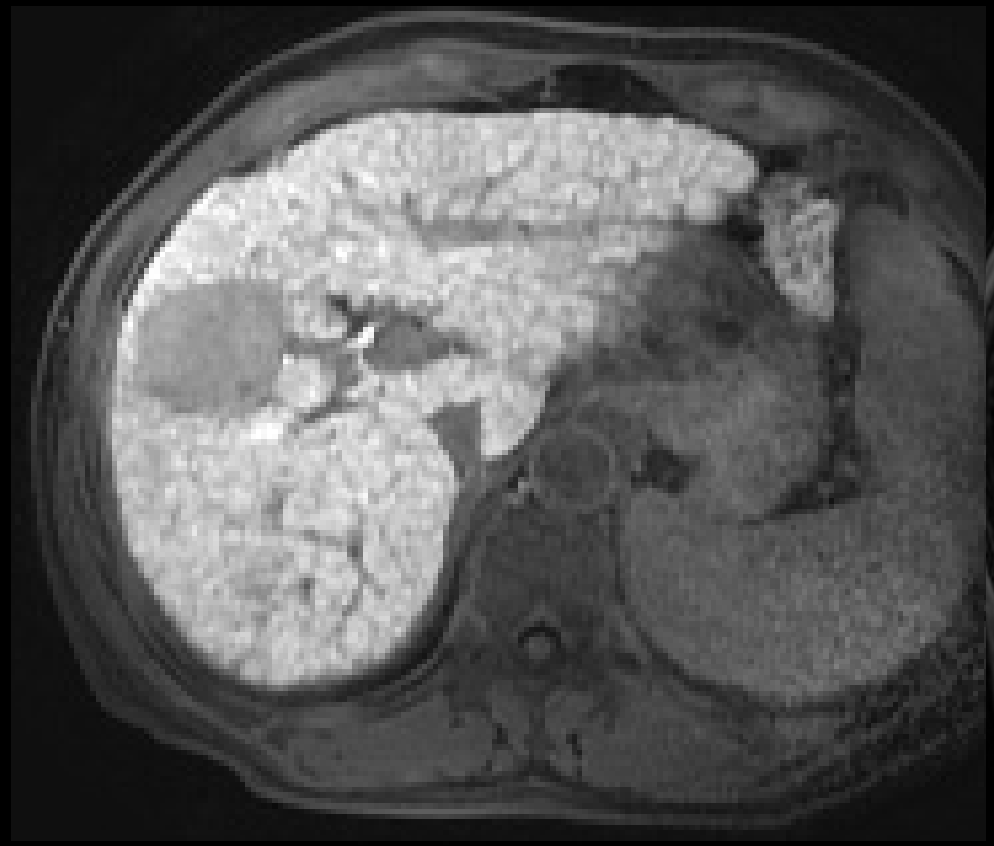
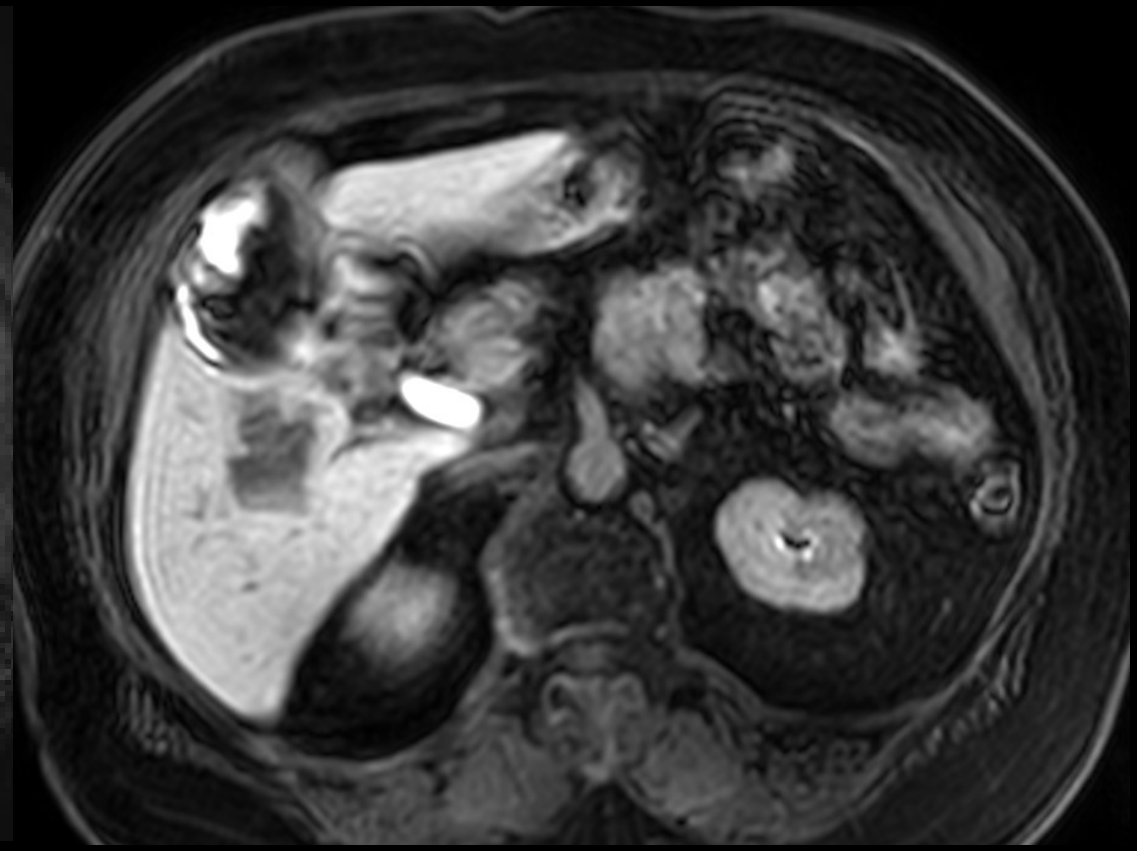


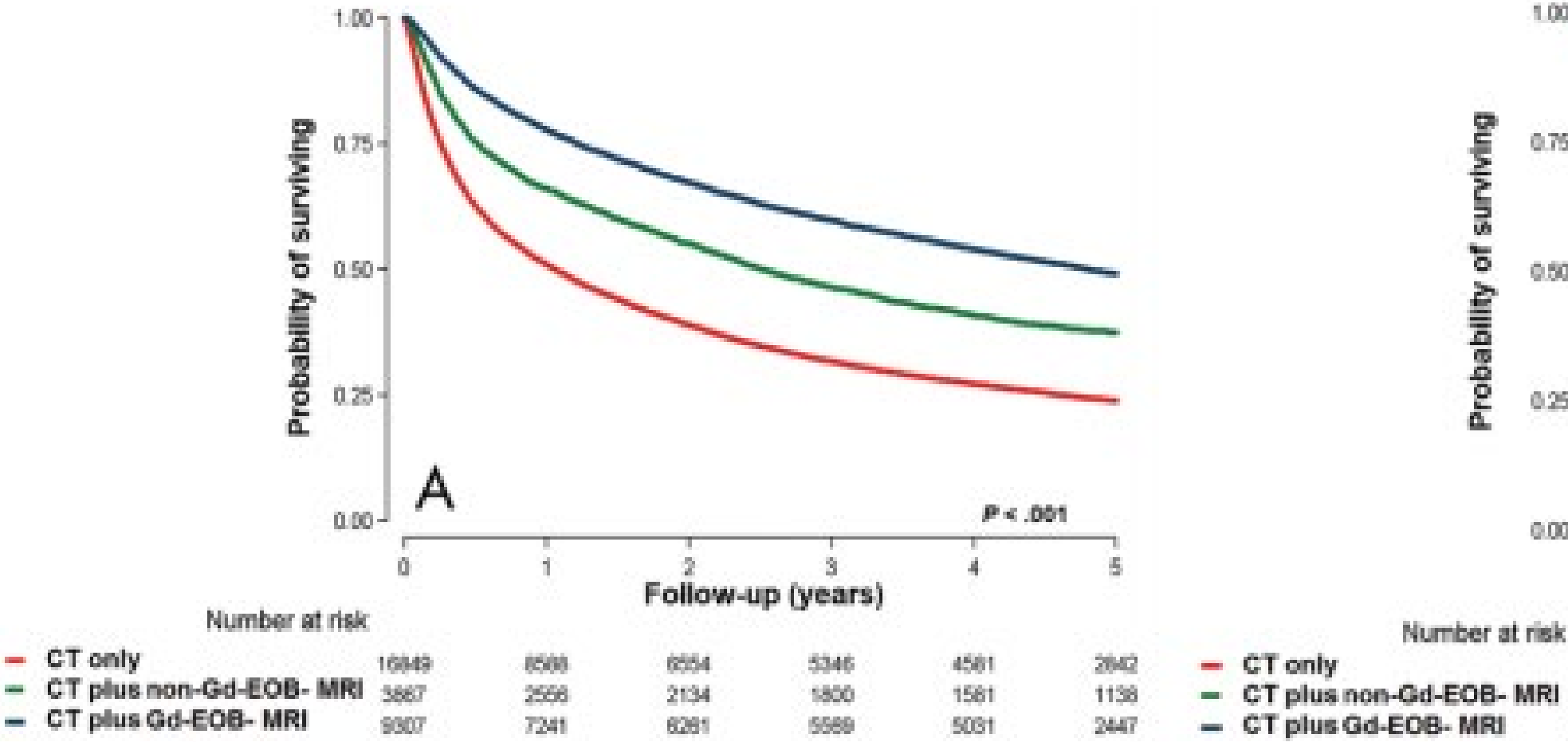
Fig. 6 Summary of the imaging biomarkers predicting the grade of differentiation in HCC. During hepatocarcinogenesis, the frequency of neovascularized arteries increases from dysplastic nodule (DN) to moderately differentiated HCC (Mod). However, arterial vascularity decreases again in poorly differentiated HCC (Por). In parallel with increasing grade of malignancy, the signal intensity of the hepatobiliary phase (HB phase) of gadoxetic acid-enhanced MR image and T1-weighted image and SPIO uptake are decreased, while the signal intensity of T2WI is increased. And lower value of apparent diffusion coefficient (ADC) on diffusion-weighted image (DWI) and higher accumulation of FDG are observed in the worse histological grades of HCC

HYPOINTENSE HEPATOBILIARY PHASE

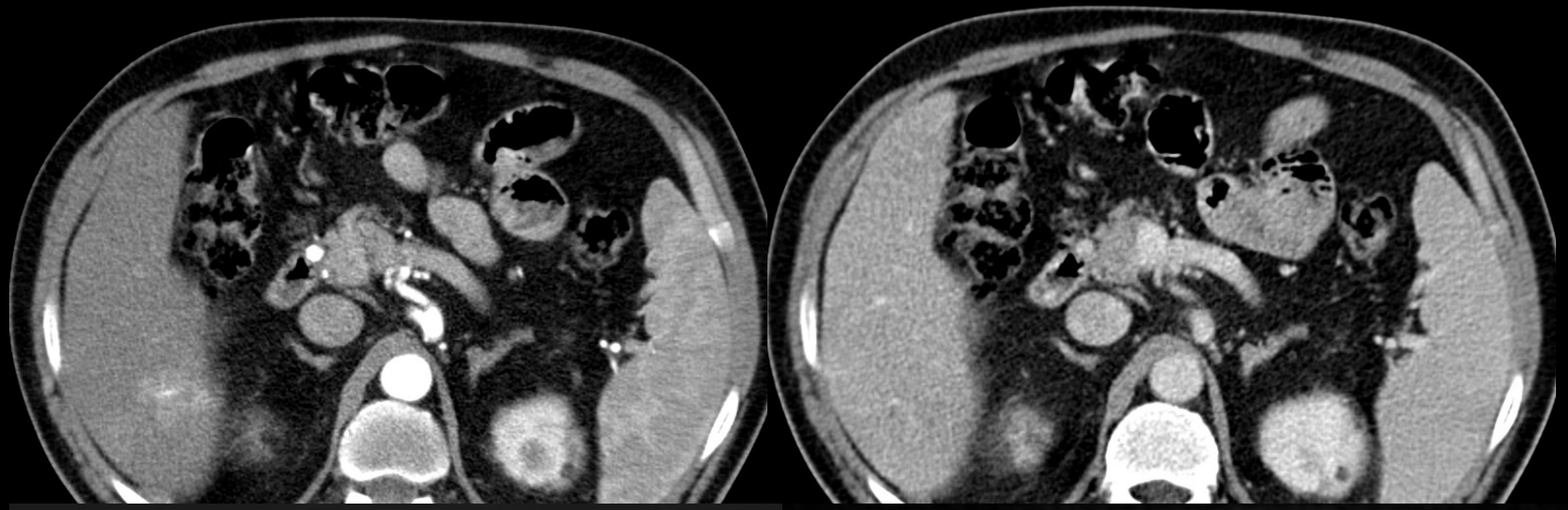


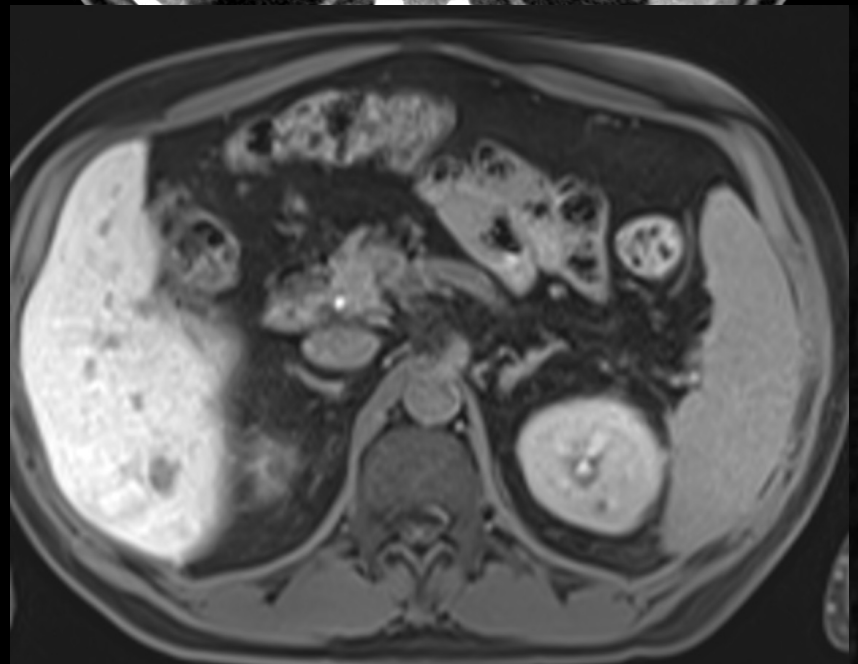


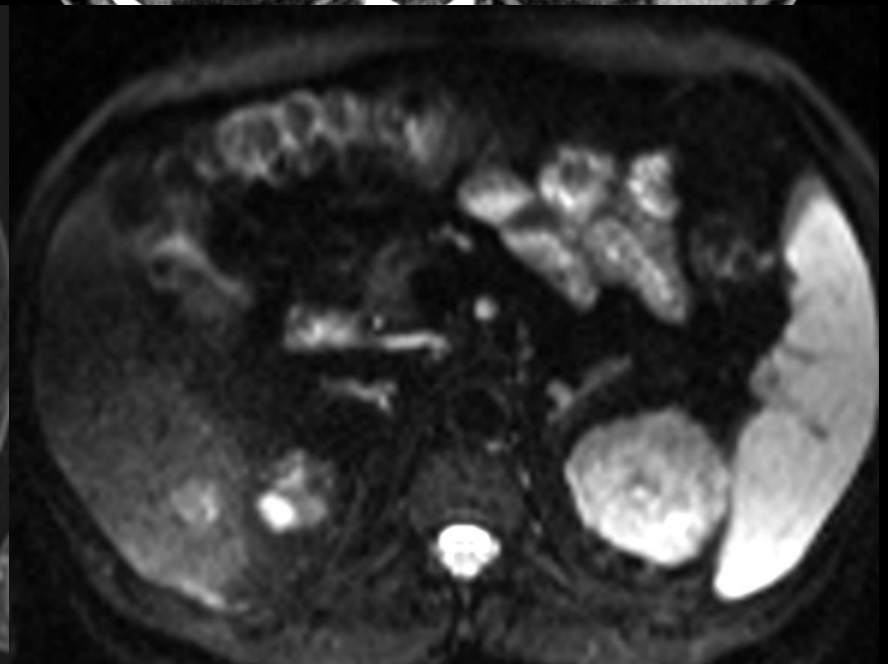
HCC GD-EOB MORTALITY



HYPERVASCULAR, NO WASHOUT

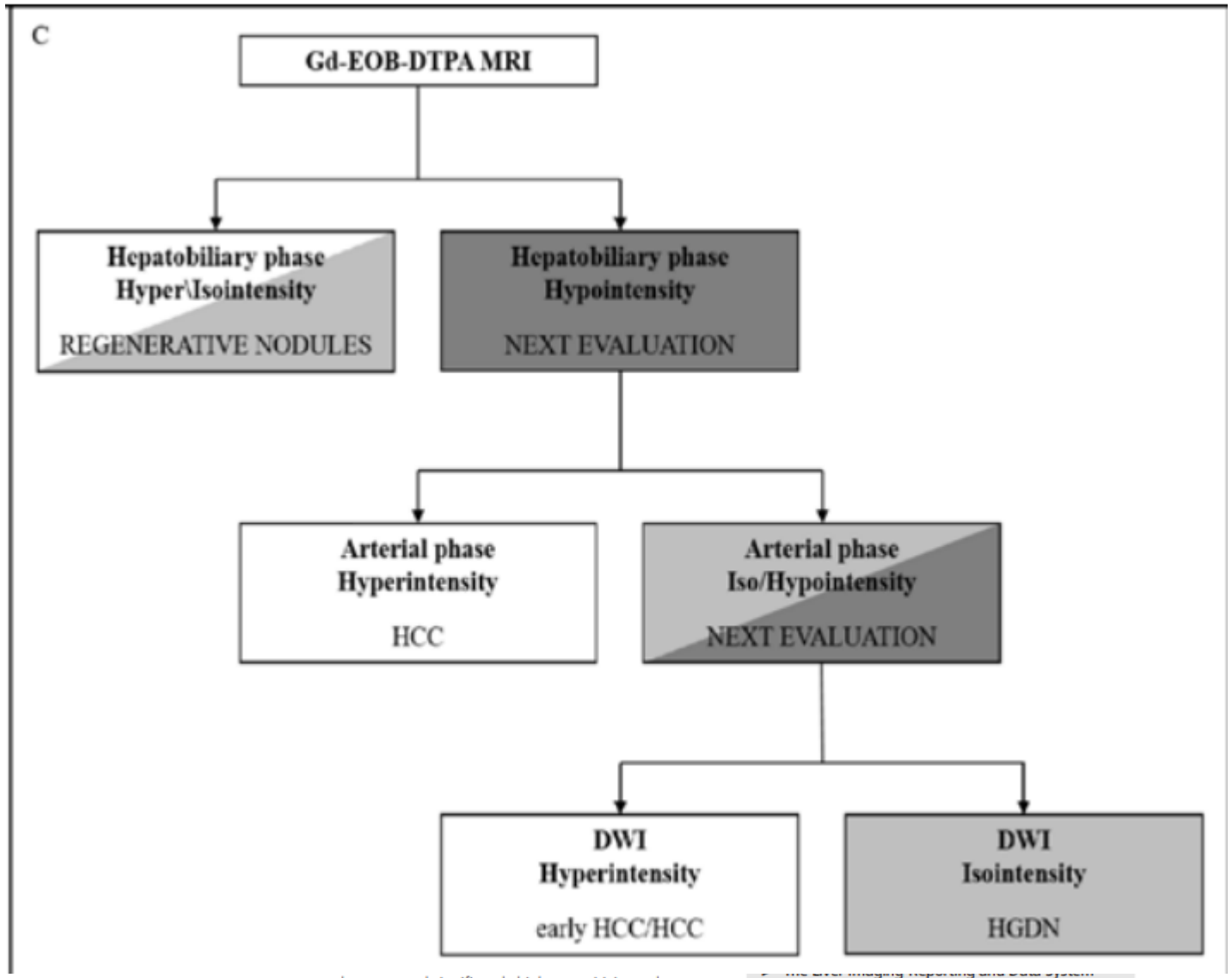






ORIGINAL ARTICLE

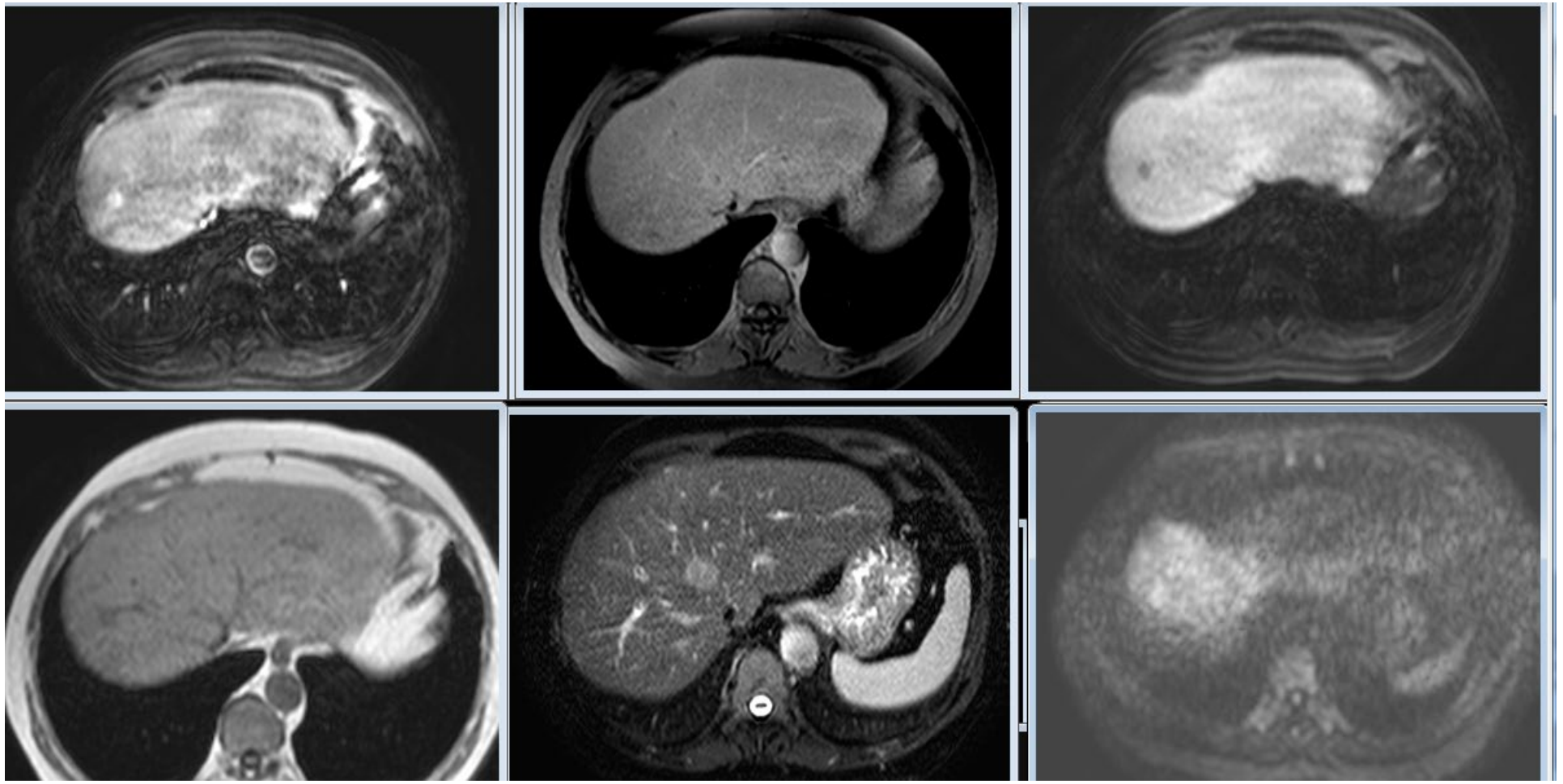
New hallmark of hepatocellular carcinoma, early hepatocellular carcinoma and high-grade dysplastic



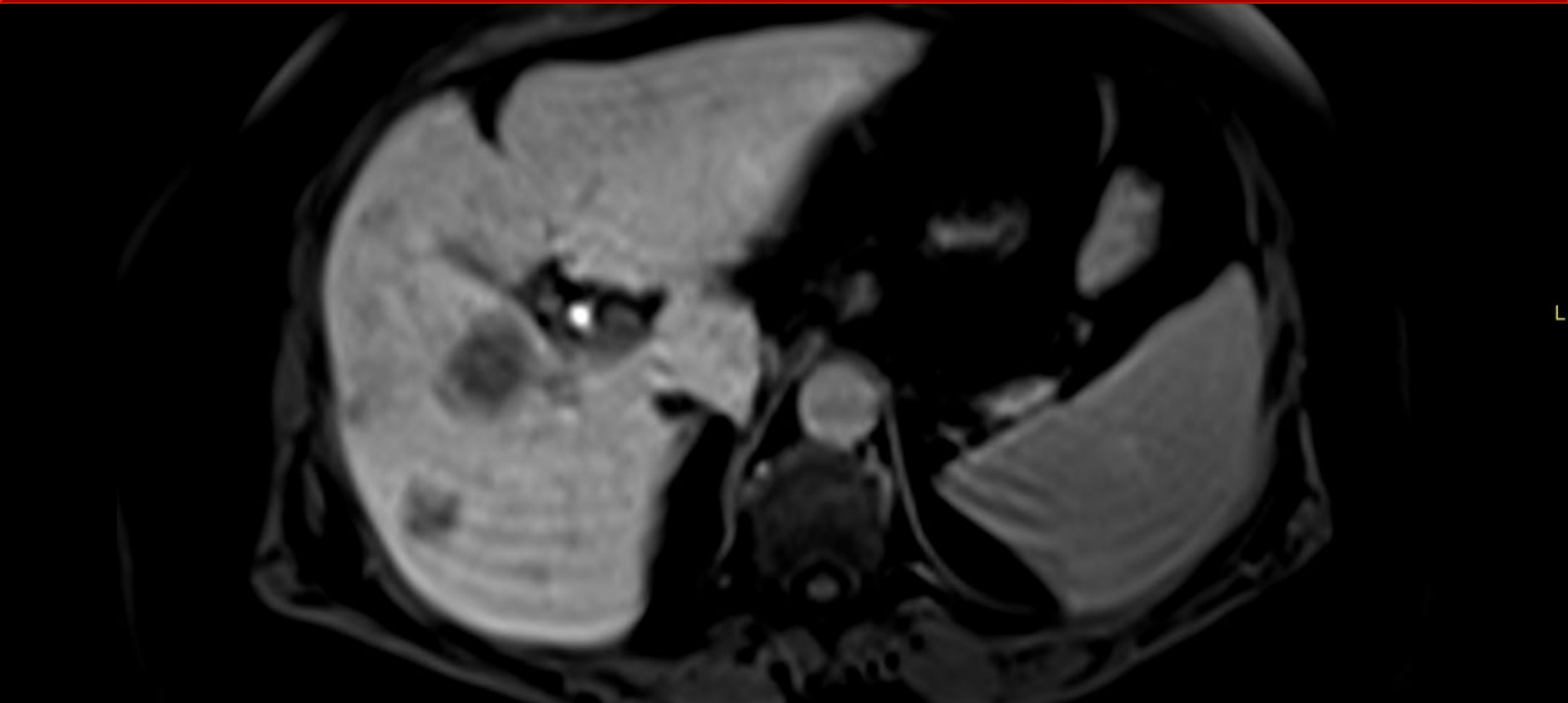
demonstrated significantly higher sensitivity and comparable specificity than those of the AASLD imaging criteria for HCC in patients with cirrhosis evaluated using

(LI-RADS) did not demonstrate high-diagnostic efficacy in our series. However, according to

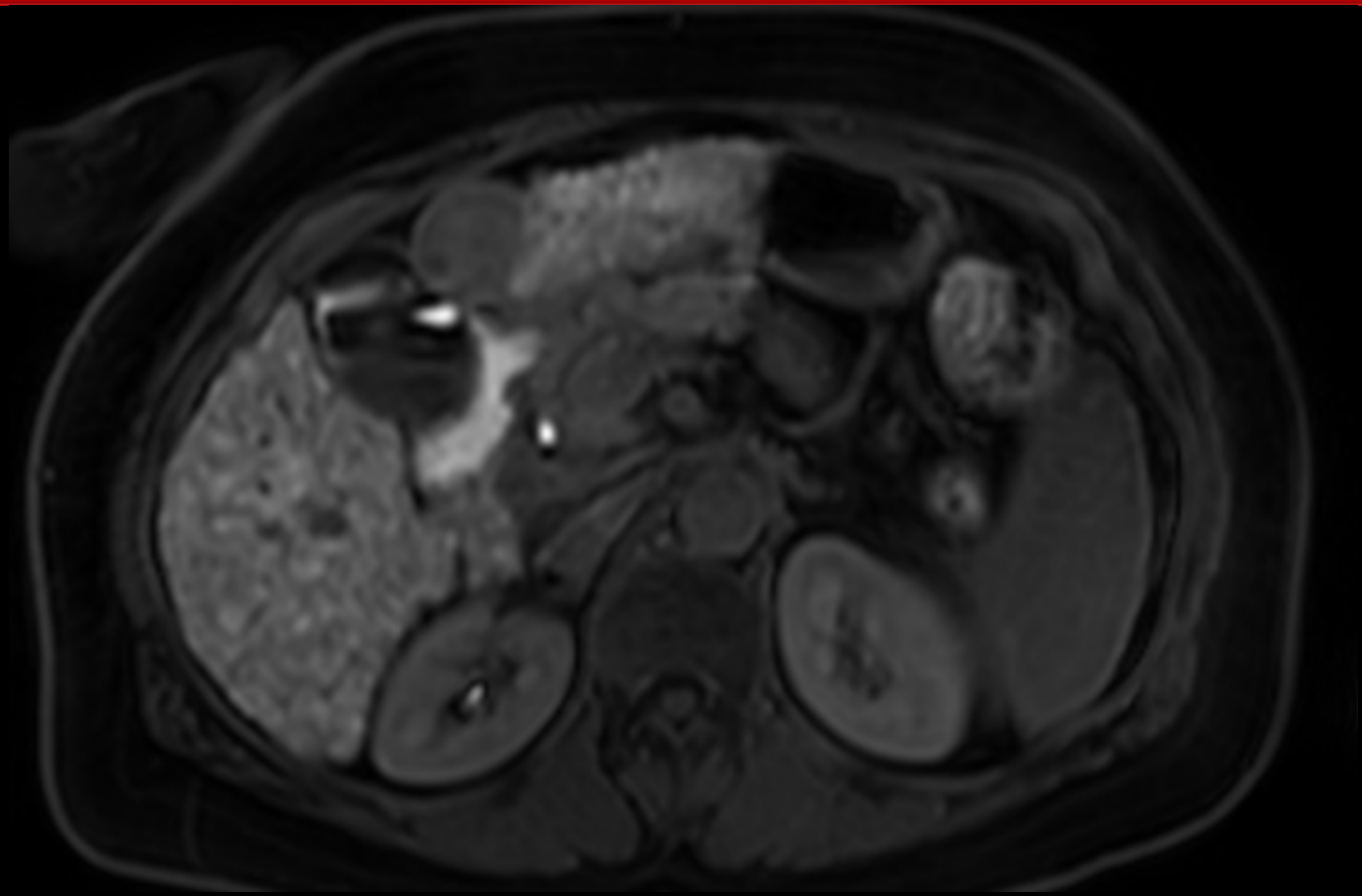
HCC CARCINOGENESIS



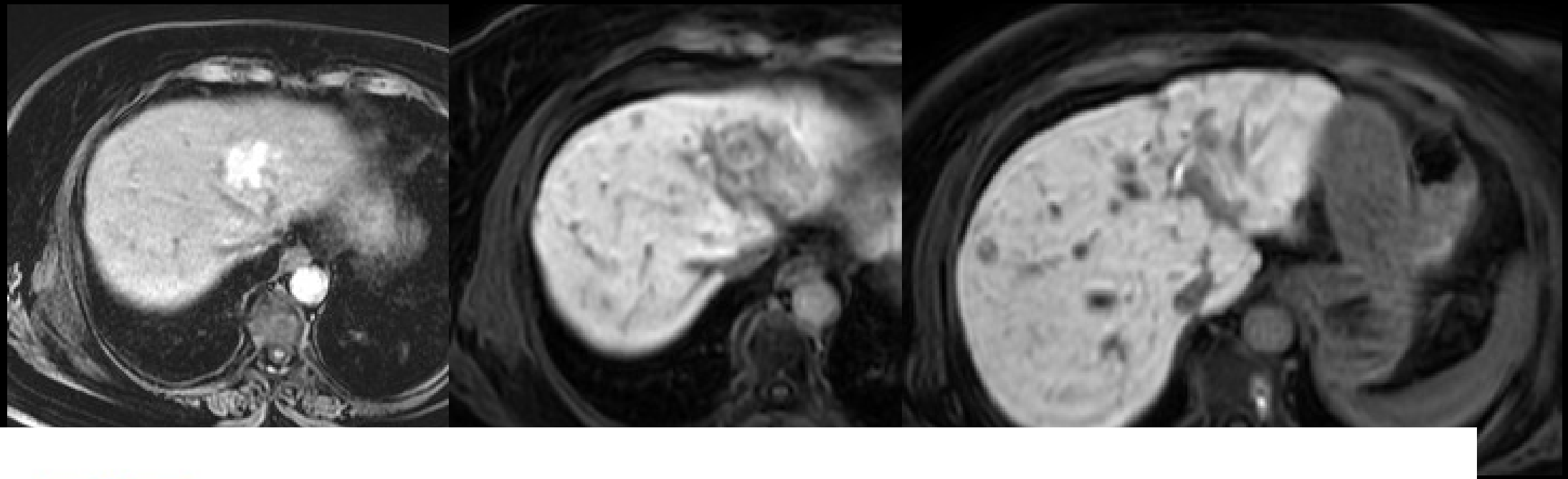
HCC MAPPING



HCC CARCINOGENESIS / AFP



HCC – SIZE?



DIR

Diagn Interv Radiol DOI 10.5152/dir.2015.15125

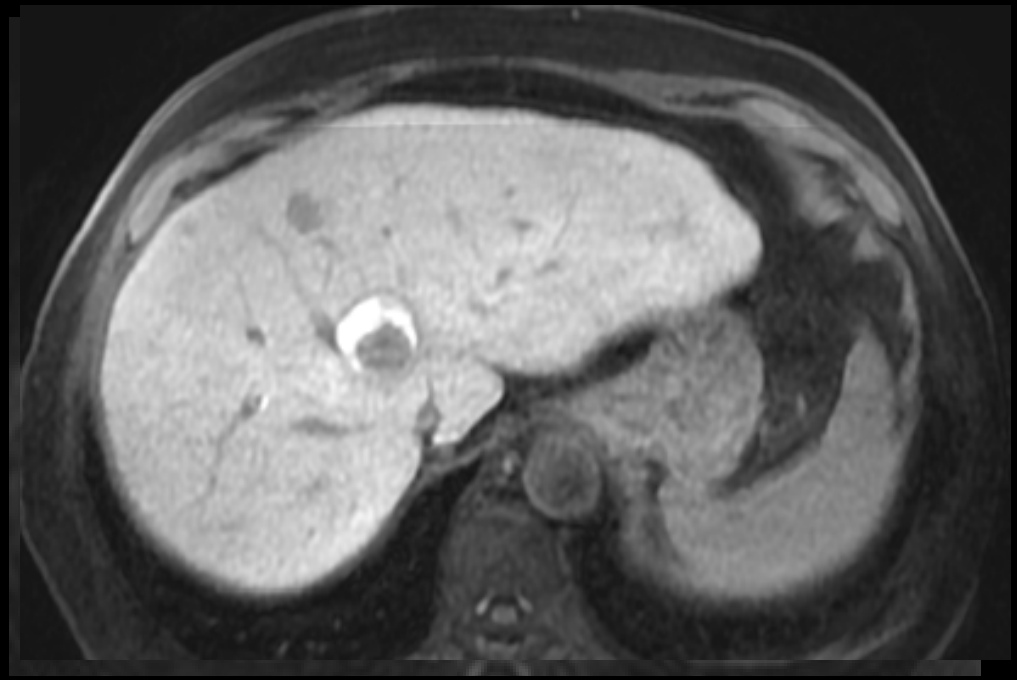
ABDOMINAL IMAGING

REVIEW

Microvascular invasion in hepatocellular carcinoma

GD-EOB-DTPA – HCC – OATP8 HYPERINTENSE (%10)

CTNNB1 – MUTATED BETA CATENIN



Kitao&Matsui. Radiology 2010. Suh JY et lAJR 2011, Choi JW, Lee JM et al. Radiology 2014

HCC CARCINOGENESIS

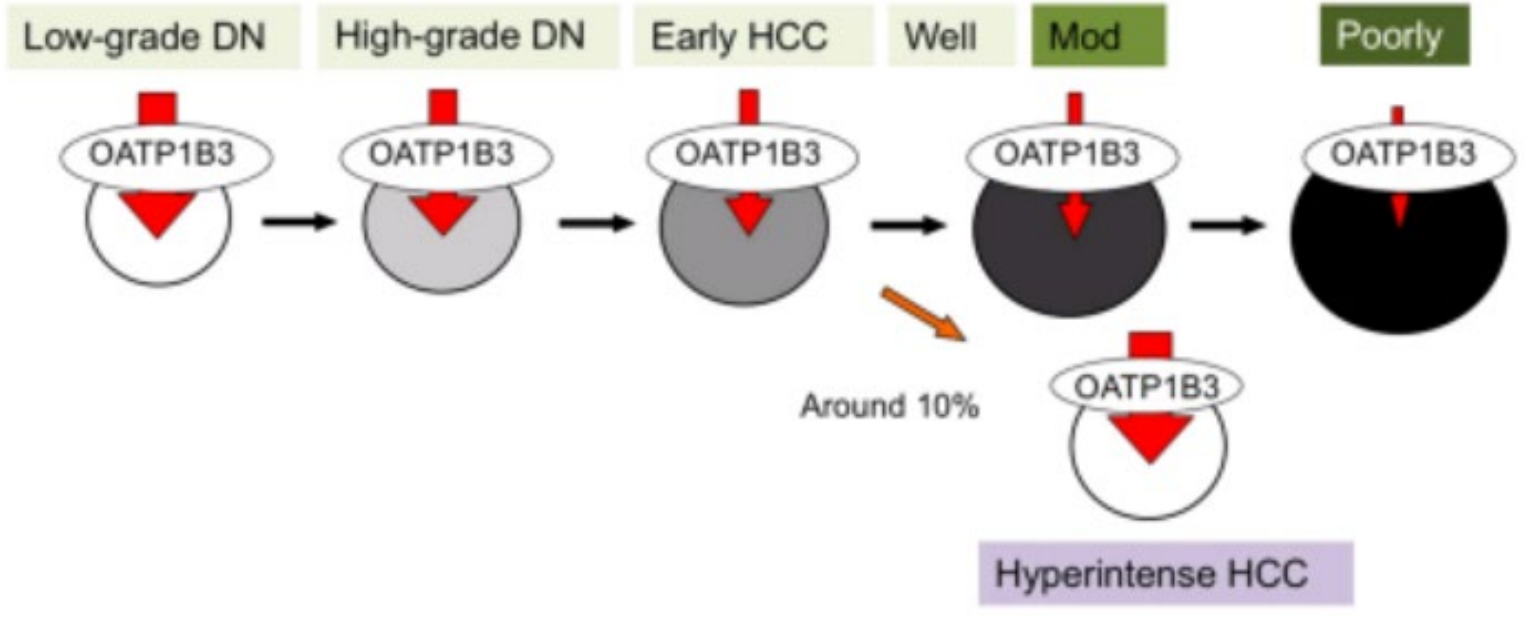
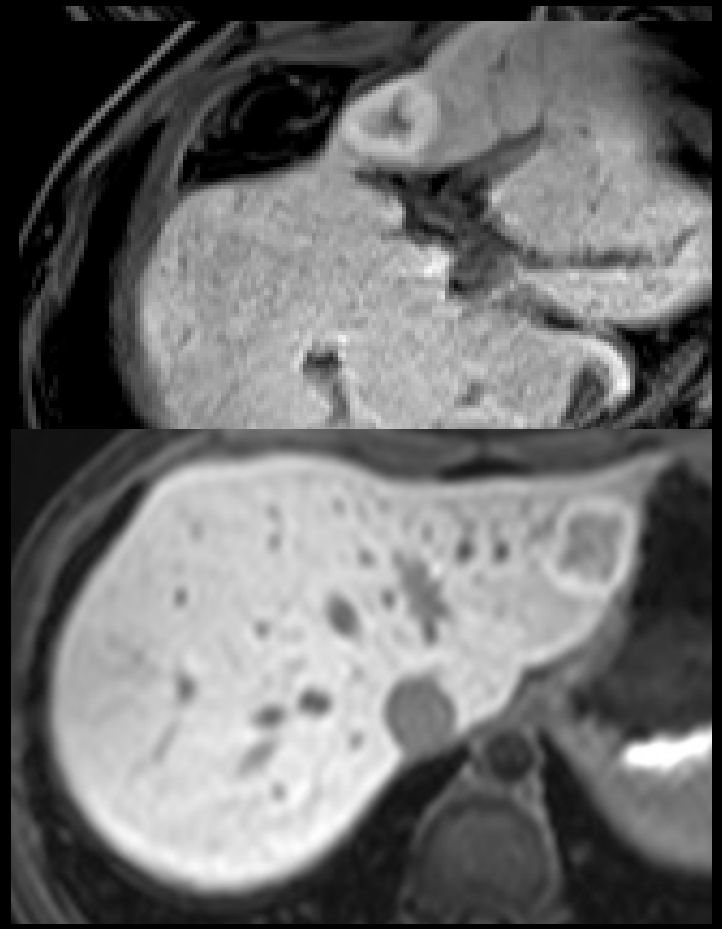


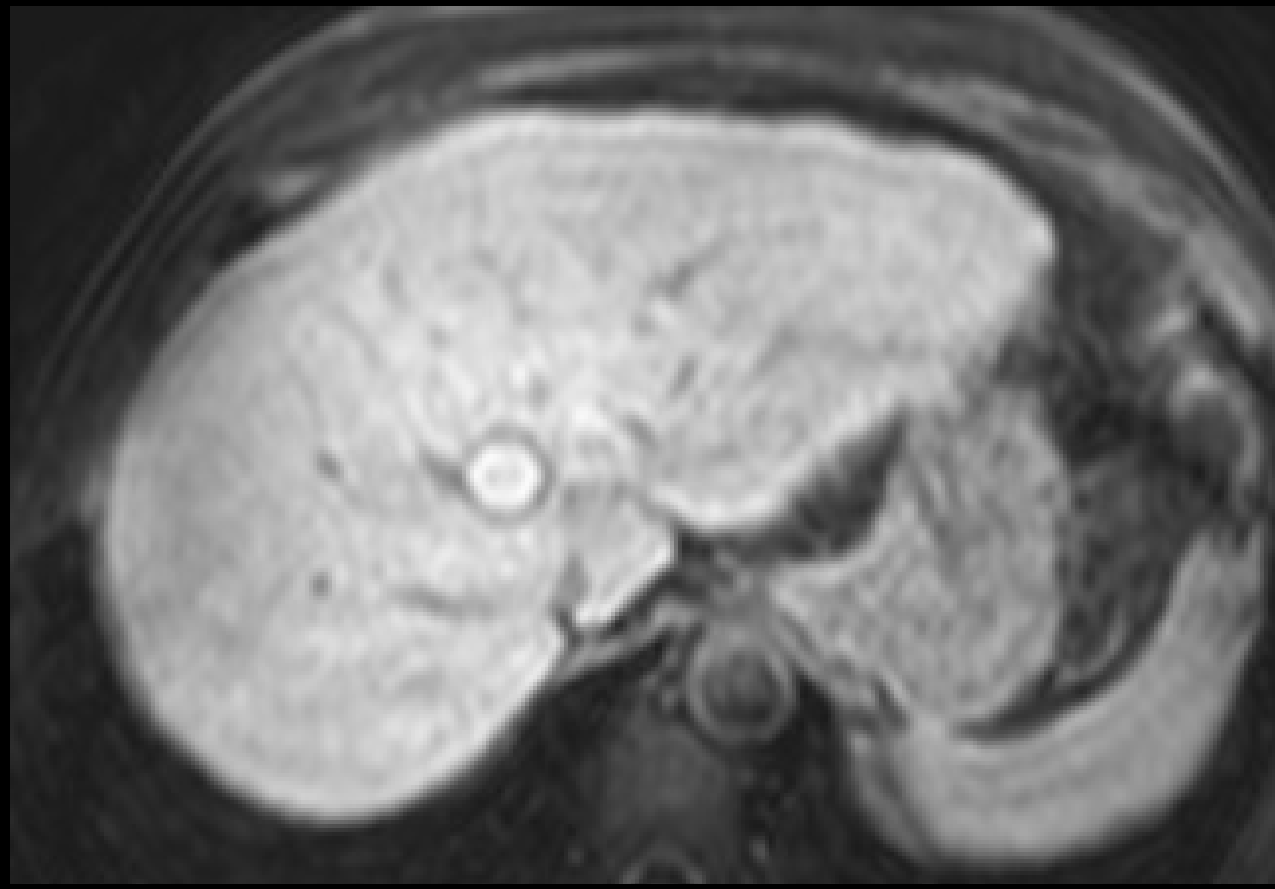
Fig. 5 Grade of gadoxetic acid uptake in HB phase is useful for predicting the grade of differentiation of HCC. The expression of OATP1B3 (main uptake transporter of gadoxetic acid in HCC) is significantly decreased in parallel with increasing grade of malignancy of the nodules. Around 80% of early HCCs already demonstrate decreased but not absent OATP1B3 expression relative to the surrounding liver parenchyma. All of the poorly differentiated HCCs show absent or markedly decreased expression. Well and moderately differentiated HCCs demonstrate an intermediate grade of OATP1B3 expression between early HCC and poorly differentiated HCCs. Around 10% of them show equivalent or increased expression relative to the surrounding liver. Signal intensity of HB phase is useful for predicting the grade of differentiation of HCC. Modified from reference [38]

GD-EOB-DTPA – OATP+

FNH



HCC (%10)



O MATSUI'S GROUP. PROGNOSIS (Lee JM et al .Radiology 2014)

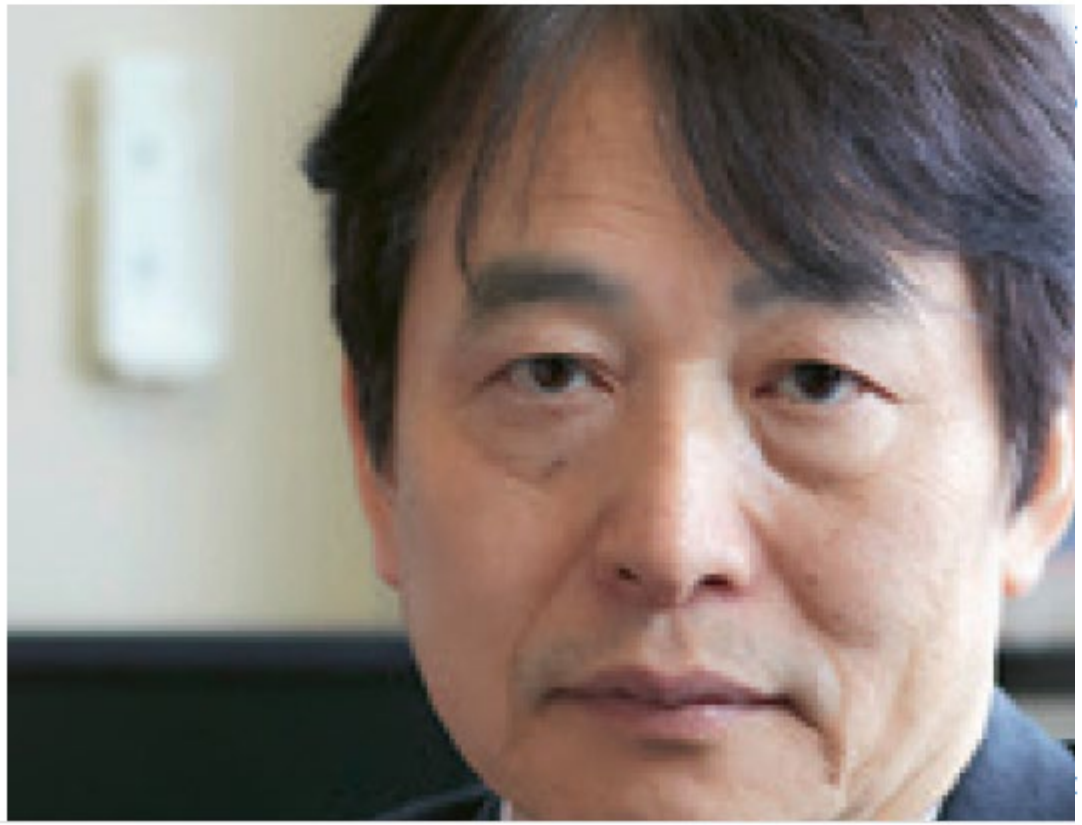
Liver Cancer. 2020 Sep; 9(5): 479–490.
Published online 2020 Aug 20. doi: 10.1159/000509554

Gd-EOB-DTPA-MRI Could Predict WNT/β-Catenin Mutatic Resistance to Immune Checkpoint Inhibitor Therapy in He Carcinoma

Masatoshi Kudo*

▸ Author information ▸ Article notes ▸ Copyright and License information Disclaimer

Introduction



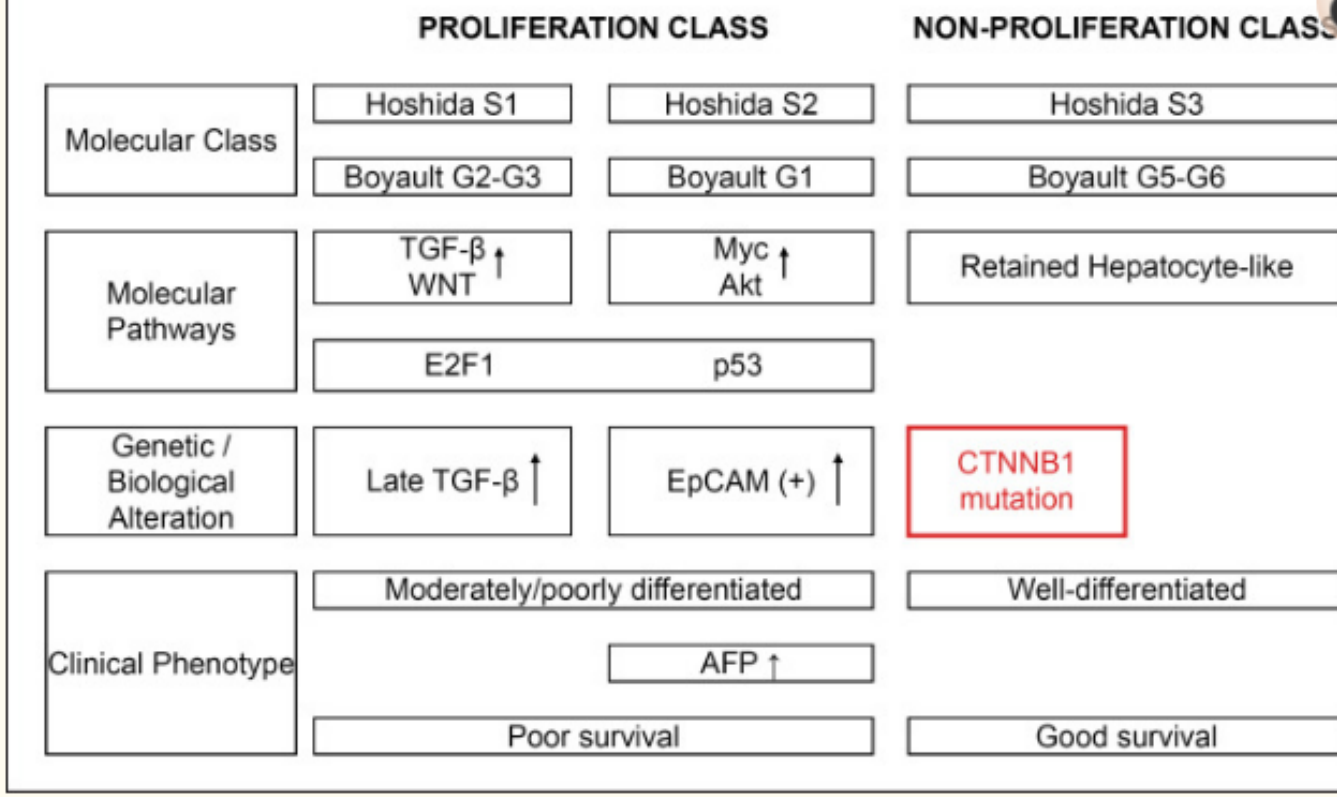


Fig. 1

Molecular classification of HCC. The figure is based on previous studies [2, 3, 4, 5, 6].

The development of immune checkpoint inhibitor (ICI) therapies led to the classification of HCC int immune subclasses according to the tumor microenvironment (TME), which should affect the outcor ICI therapy [7, 8, 9, 10]. For example, Llovet et al. [10] proposed 3 immune-specific subtypes, i.e., a immune class, an immune intermediate class, and an immune exclusion class; 20–30% of HCC belor the immune exclusion class with WNT/β-catenin mutations [11] (Fig. 2). Kurebayashi et al. [8] prop subclasses (immune high, immune-mid, and immune-low subtypes) and showed that infiltration of B and plasma cells, as well as of $CD4^+$ and $CD8^+$ T cells, is responsible for the high antitumor immune response of the immune-high subtype [12]. In any classification system, the subclasses carrying activ

OPTN T STAGING

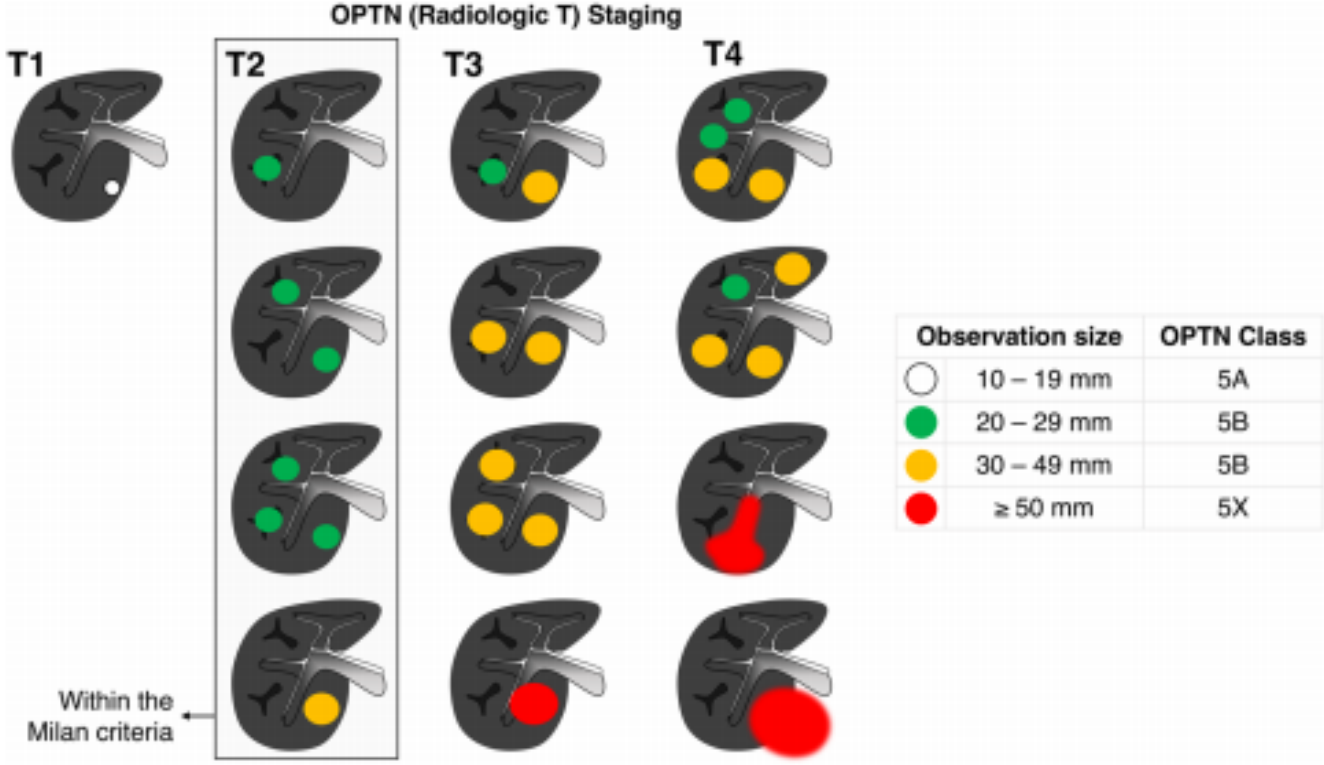


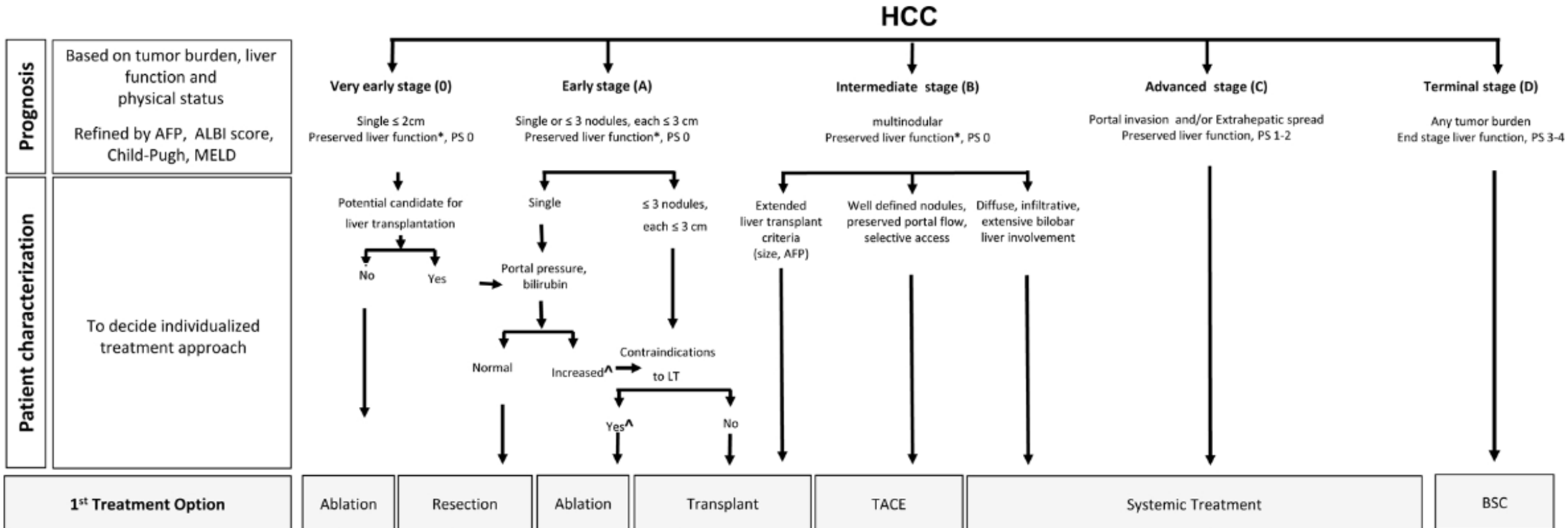
Fig. 1 HCC staging and Milan criteria: OPTN T2 stage criteria to qualify for MELD exception points corresponds to Milan criteria, as follows: Candidates with HCC are eligible for a standardized MELD exception if they have: One lesion greater than or equal to 2 cm and less than or equal to 5 cm in size; *or* two or three lesions each greater than or equal to 1 cm and less than or equal to 3 cm in size. Additionally, alpha-fetoprotein (AFP) level must be less than or equal to 1000 ng/mL. If patients have more or less disease than T2 stage, they do not qualify through the automatic exception point process

BARCELONA CLINICAL STAGING

J Hepatol. 2022 Mar; 76(3): 681–693.
Published online 2021 Nov 19. doi: 10.1016/j.jhep.2021.11.018

<< Prev Fig. 1. Next >>

Fig. 1.



HCC- PROGNOSIS

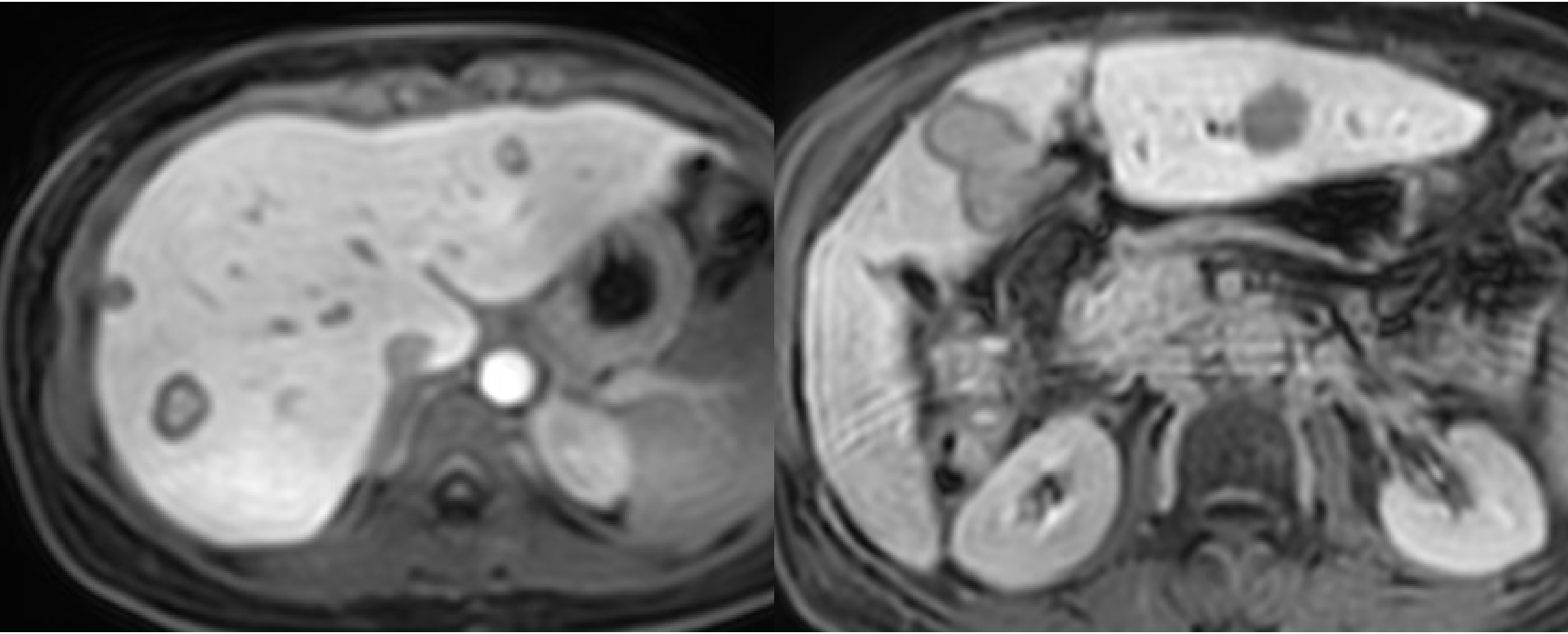
GOOD PROGNOSIS

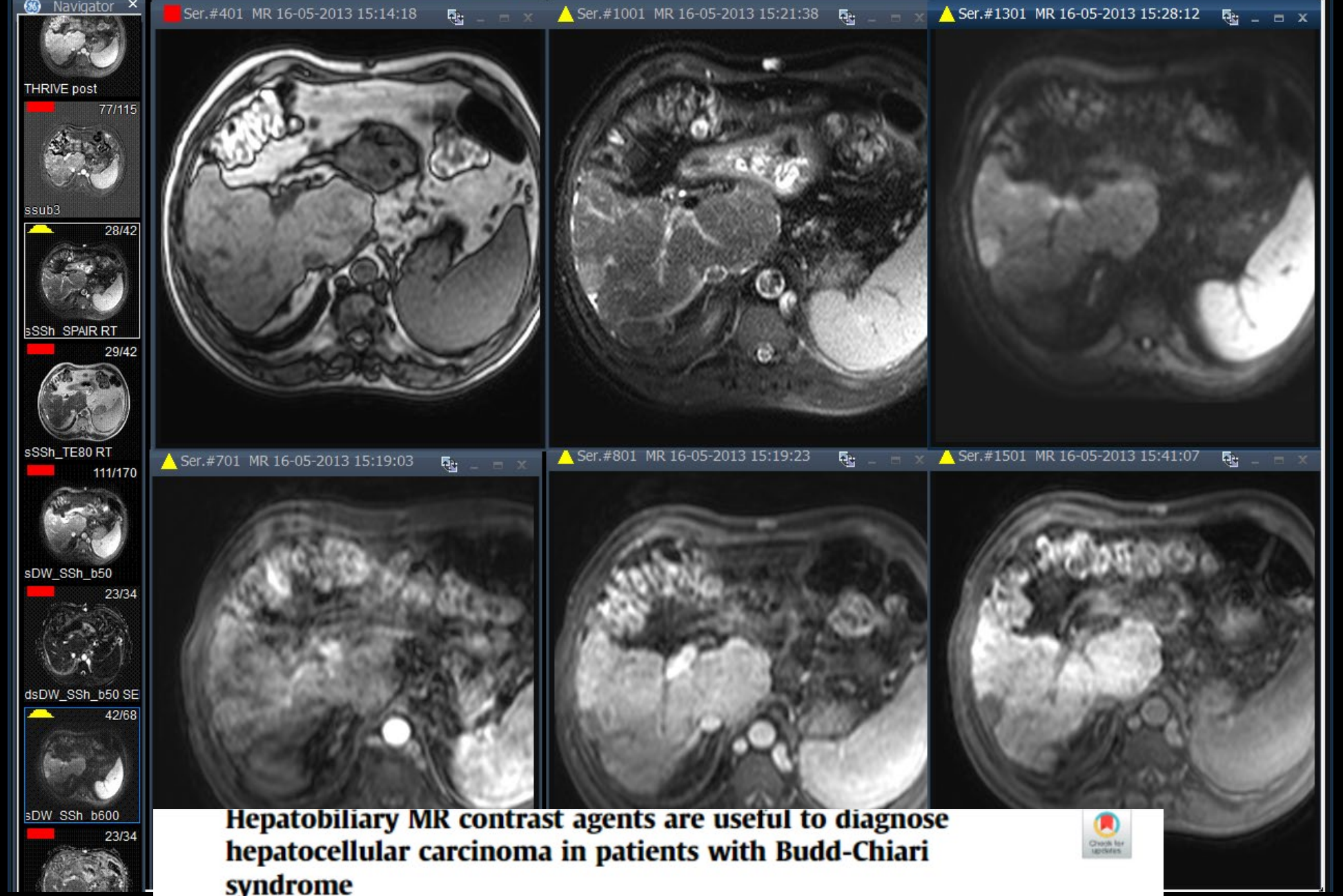
- SMALL LESION
- SOLITARY
- SN-IM / SN-DMC CAPSULE
- CTNNB-1 MUTATION OATP+ (B-CATENİN)
- FAT
- HIGH ADC

BAD PROGNOSIS

- LARGE LESION
- MULTIFOCAL
- SN-EG/CMN/ INFIITRATIVE
- CK19, EpCAM, MTM MUTATIONS
- MACRO/MICROVASCULAR
- LOW ADC, FDG+
- BILIARY INVASION

“REVERSE TARGET” SIGN
HEPATOBILIARY PHASE = LIRADS-M

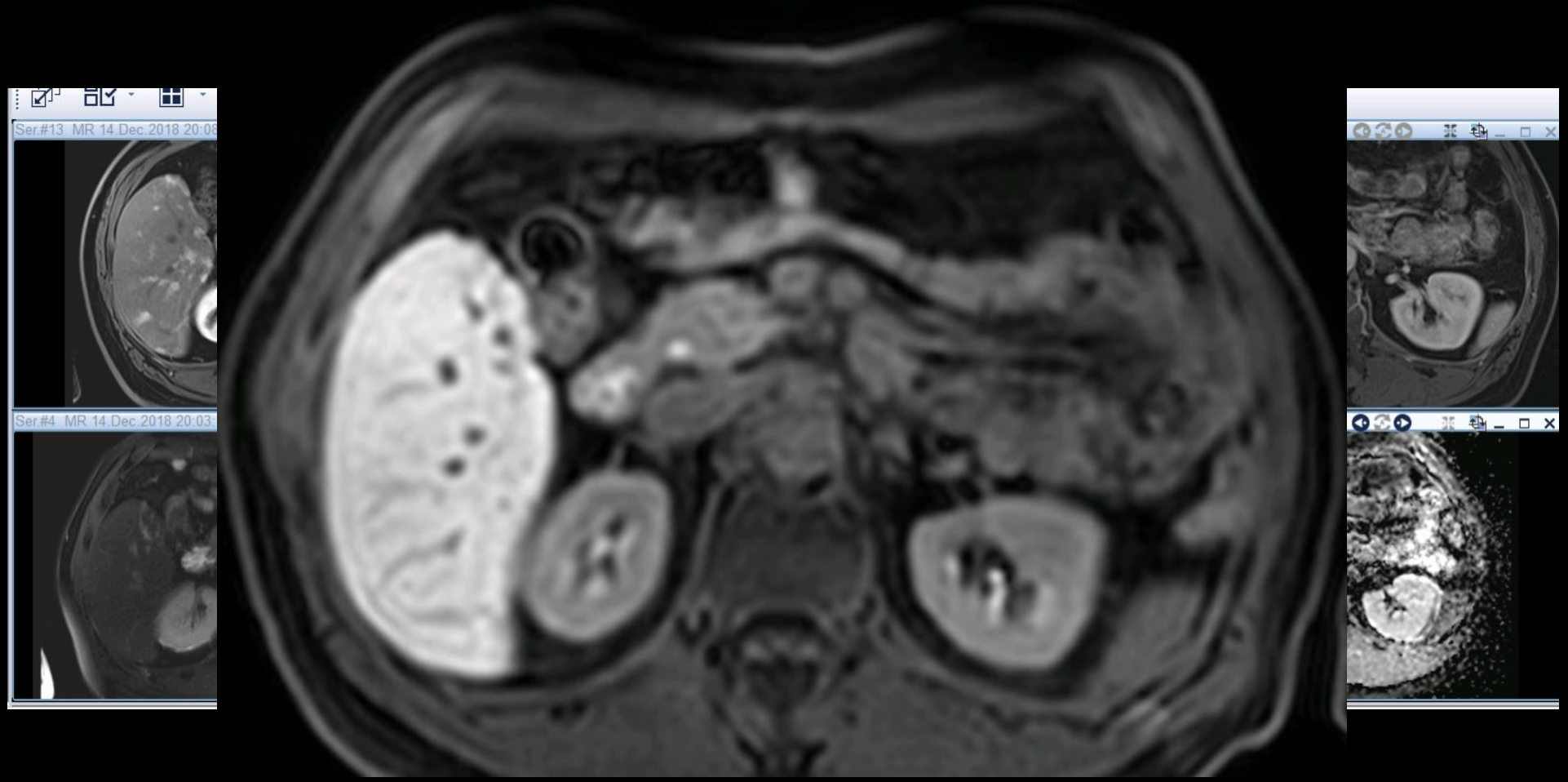




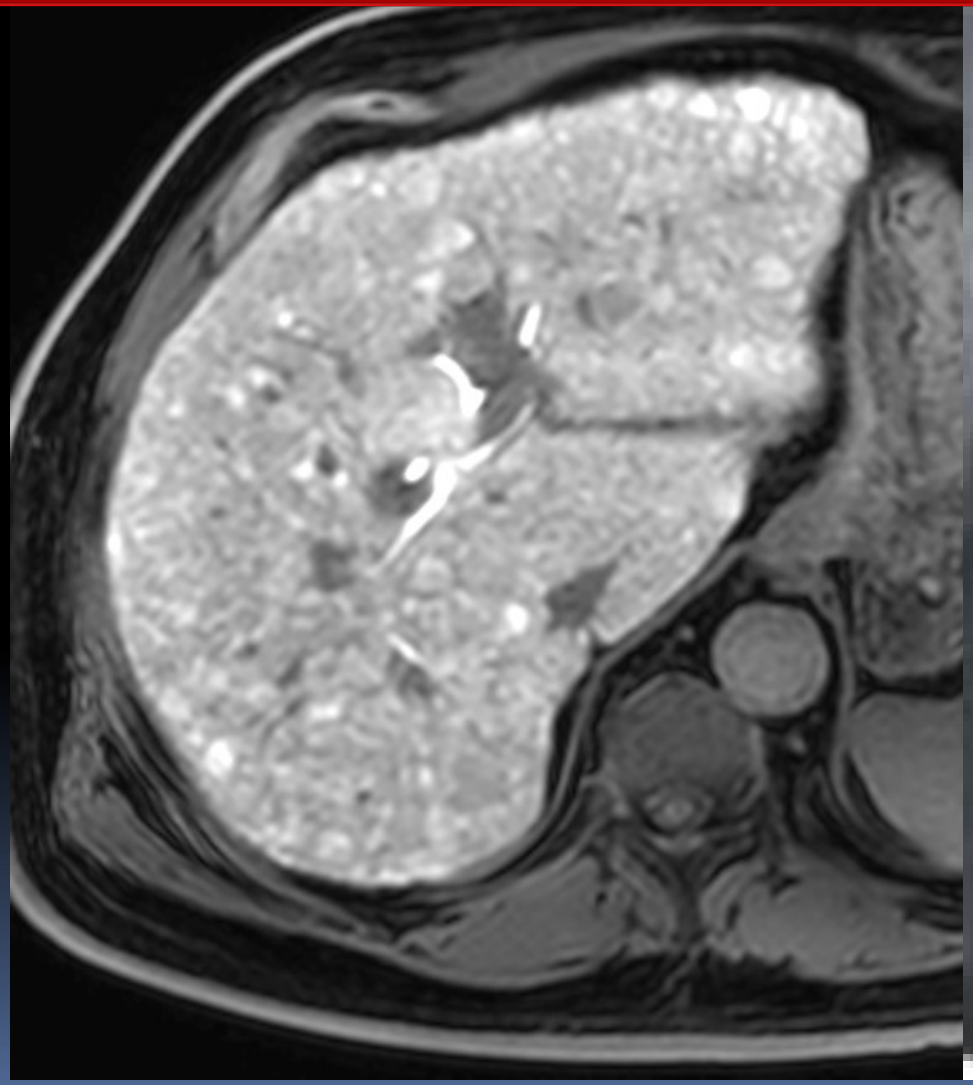
Hepatobiliary MR contrast agents are useful to diagnose hepatocellular carcinoma in patients with Budd-Chiari syndrome

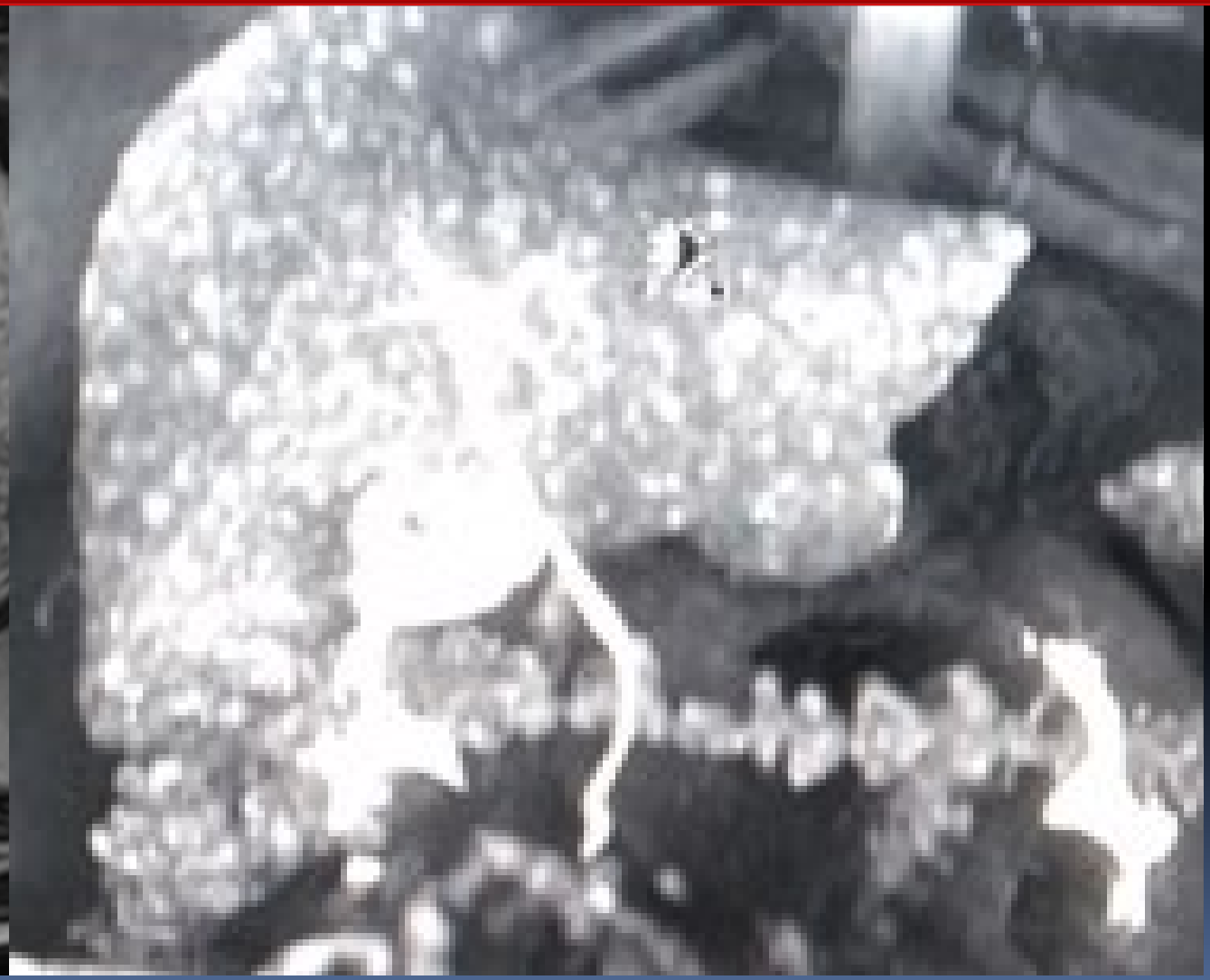
Morgane Van Wettere,[1] Luisa Paulatto,[1] Lucas Raynaud,[1] Onorina Bruno,[1] Audrey Payancé,[2,3] Aurélie Plessier,[2,3] Pierre-Emmanuel Rautou,[2,3,4,5] Valérie Paradis,[3,6] Dominique Cazals-Hatem,[6] Dominique Valla,[2,3,5] Valérie Vilgrain,[1,3,7] Maxime Ronot[1,3,7,*]

CIRRHOSIS – HYPERVASCULAR LESIONS

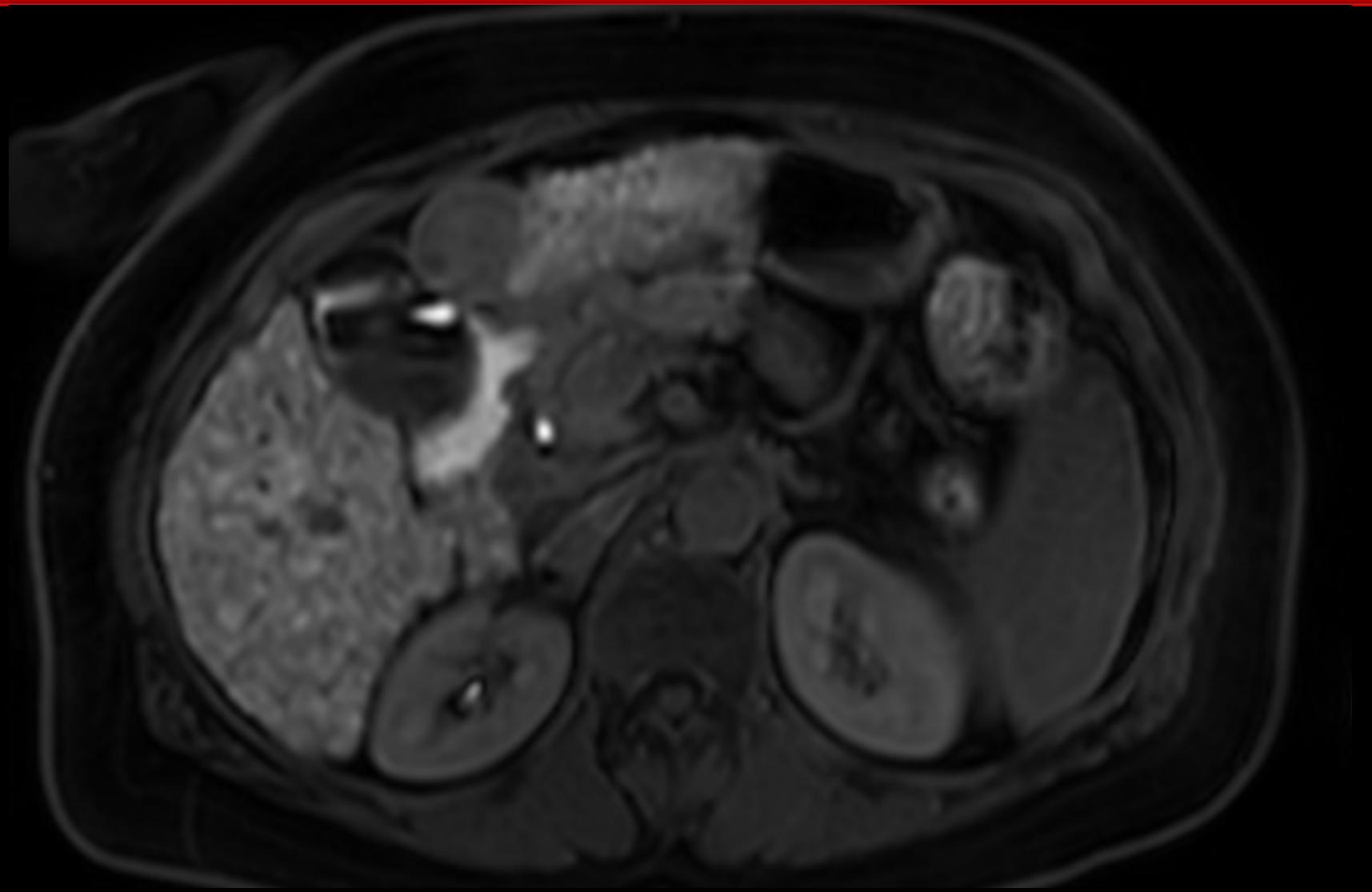


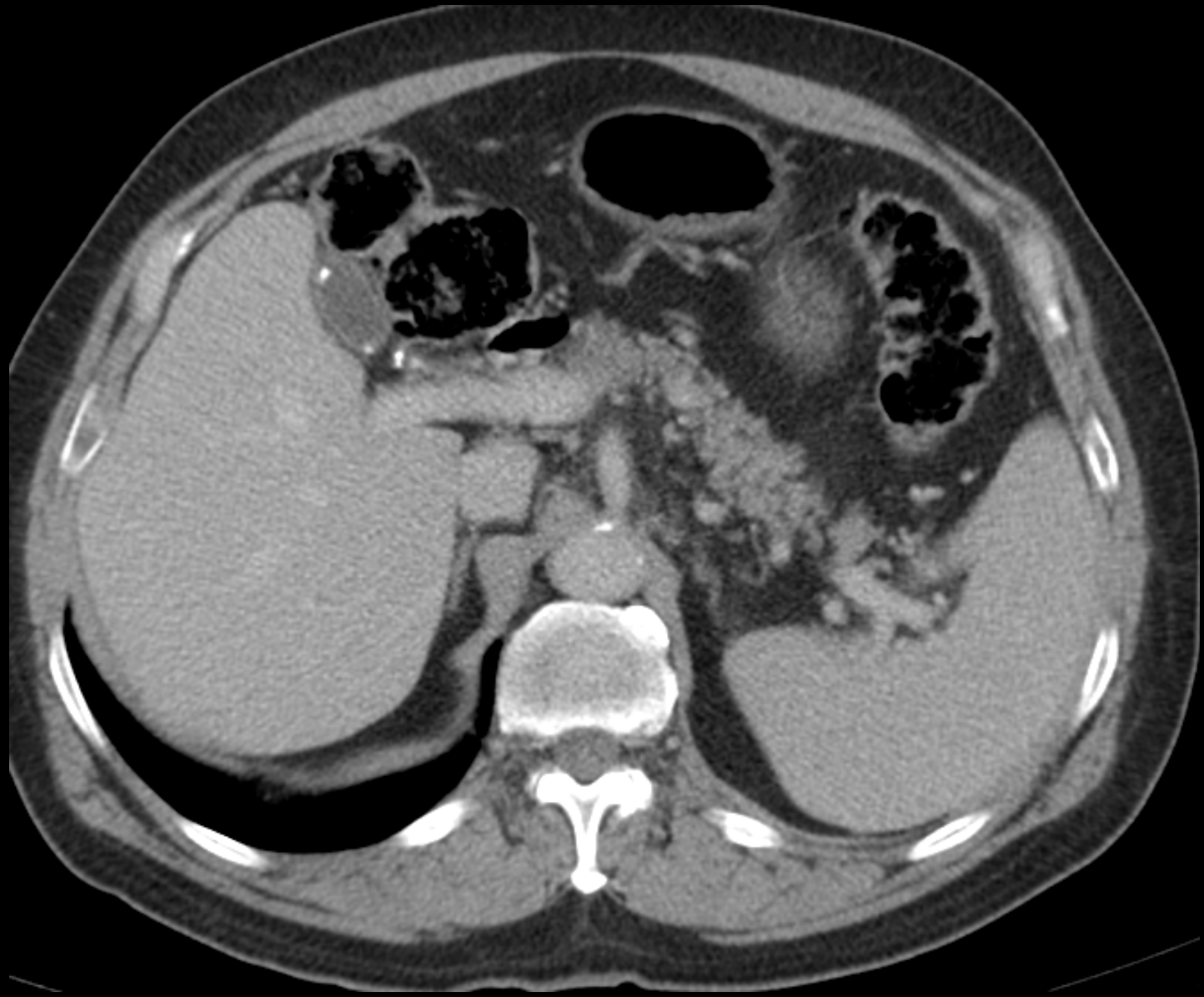
REGENERATIVE NODULES MULTIFOCAL



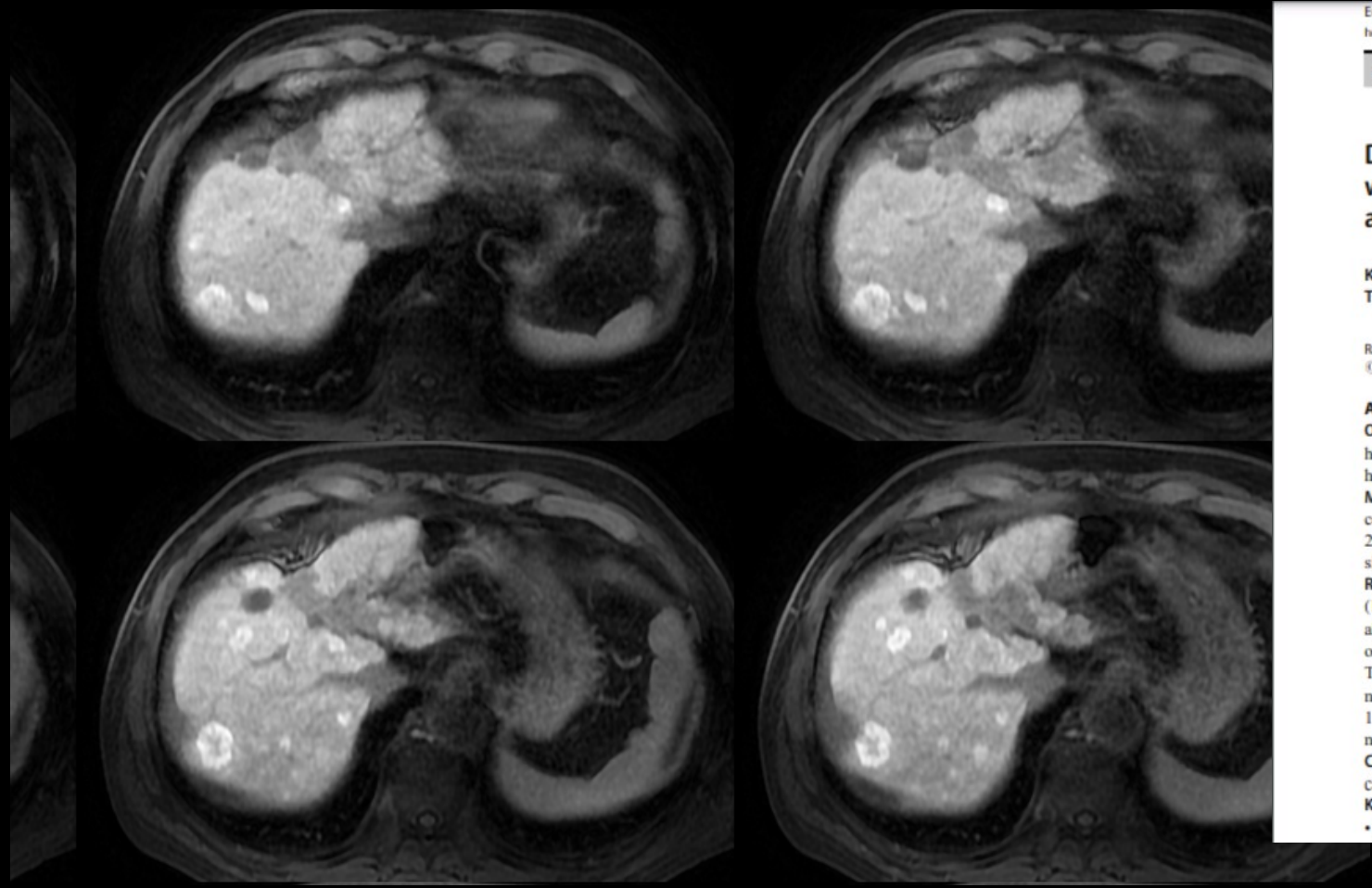


HCC CARCINOGENESIS / AFP
INVISIBLE GORILLA CONCEPT





CIRRHOSIS OATP1(+) MULTIPLE NODULES
SERUM AMYLOID A + NODULES/MULTIACINAR CIRRHOTIC NODULES



European Radiology (2019) 29:6489–6498
https://doi.org/10.1007/s00330-019-06329-y

GASTROINTESTINAL

Check for updates

Doughnut-like hyperintense nodules on hepatobiliary phase without arterial-phase hyperenhancement in cirrhotic liver: imaging and clinicopathological features

Kazuto Kozaka[1] · Satoshi Kobayashi[2] · Norihide Yoneda[1] · Azusa Kitao[1] · Kotaro Yoshida[1] · Dai Inoue[1] · Takahiro Ogi[1] · Wataru Koda[1] · Yasunori Sato[3] · Toshifumi Gabata[1] · Osamu Matsui[1]

Received: 10 April 2019 / Revised: 4 June 2019 / Accepted: 13 June 2019 / Published online: 5 July 2019

Abstract

Objectives To determine the imaging and clinicopathological features of MRI doughnut-like nodules (HBP-doughnut nodules), hyperintense at the hepatobiliary phase (HBP) after injection of gadoxetic acid (EOB) and without arterial-phase hyperenhancement (APHE) in cirrhotic liver.

Methods The Institutional Review Board approved this retrospective study and informed consent was waived. We enrolled 309 consecutive patients with liver cirrhosis who were examined by EOB-MRI, dynamic CT, and angiography-assisted CT between 2008 and 2012 and searched for HBP-doughnut nodules. We evaluated imaging characteristics including haemodynamics and signal intensity of MRI, pathological findings, and frequency of malignant transformation.

Results One hundred and one HBP-doughnut nodules without APHE were identified in 18 patients (6%), including seven of 59 (12%) patients with hepatitis-B-virus-related, nine of 230 (3.9%) with hepatitis-C-virus-related, and two of 33 (6.1%) with alcoholic cirrhosis. All nodules showed enhancement peaks in the portal phase, the same or increased intranodular portal supply on CT during arterial portography, and the same or decreased intranodular arterial supply on CT during hepatic arteriography. On T2-weighted and diffusion-weighted images, 37 (36%) and 24 (24%) nodules, respectively, showed hyperintensity predominantly in the central area. Three nodules were diagnosed by fine needle biopsy as non-neoplastic hepatic nodules. Ninety-three of 101 (92%) nodules in 16 patients were followed up during an observation period of 1163 ± 902 days (range 57–2920 days), and none showed malignant transformation.

Conclusion HBP-doughnut nodules without APHE in cirrhotic liver were not infrequent. None became malignant. We propose calling them 'multiacinar cirrhotic nodules' based on the classification by an International Working Party.

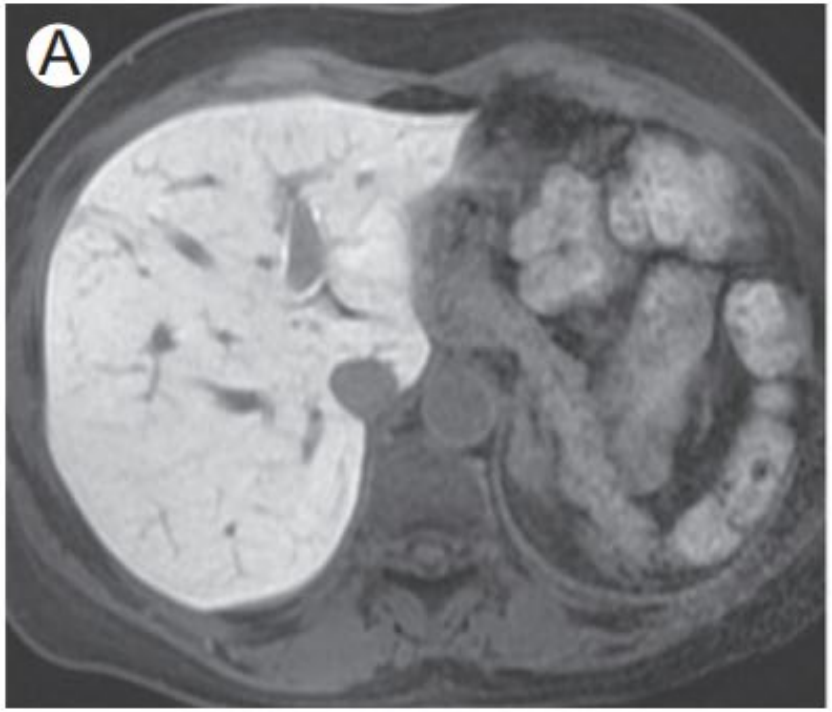
Key Points

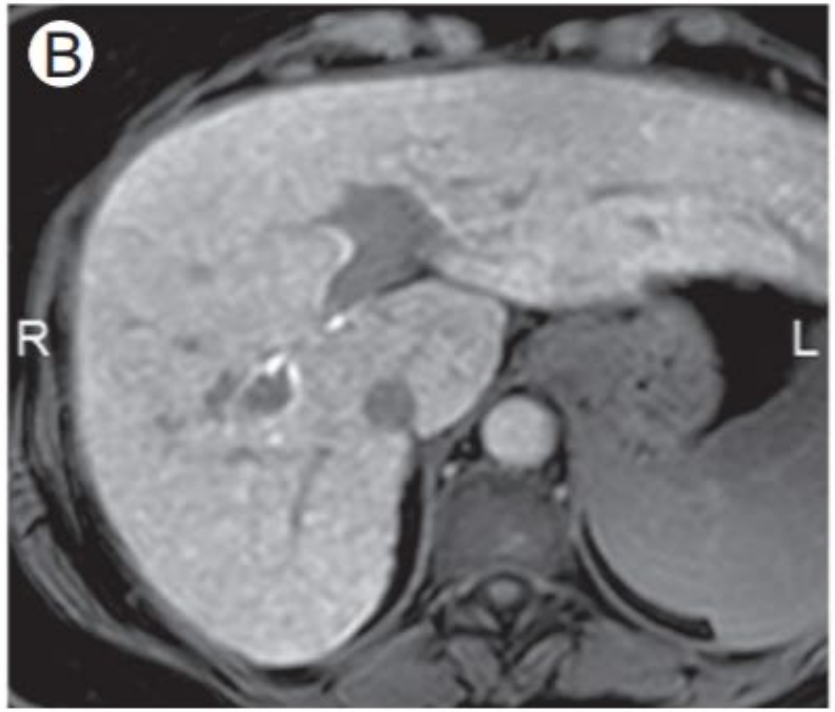
• *HBP-doughnut nodules without APHE were seen in 6% of patients with liver cirrhosis.*

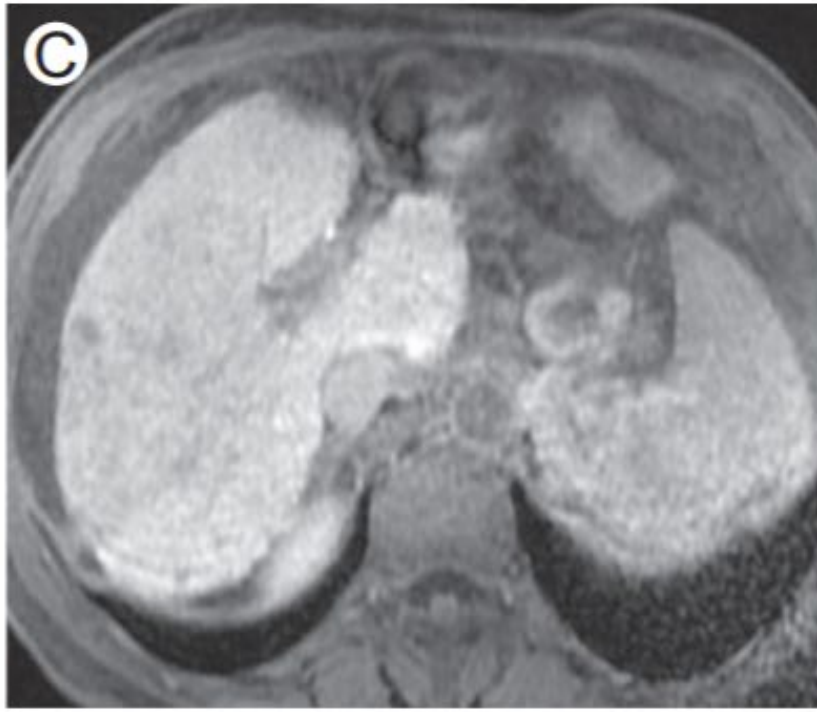
Yoneda N, Matsui O et al. Radiographics 2016

GD-EOB / LIVER FUNCTION & DYSFUNCTION

GOOD	MODERATE	POOR
FLIS 6	FLIS 4	FLIS ≤ 3



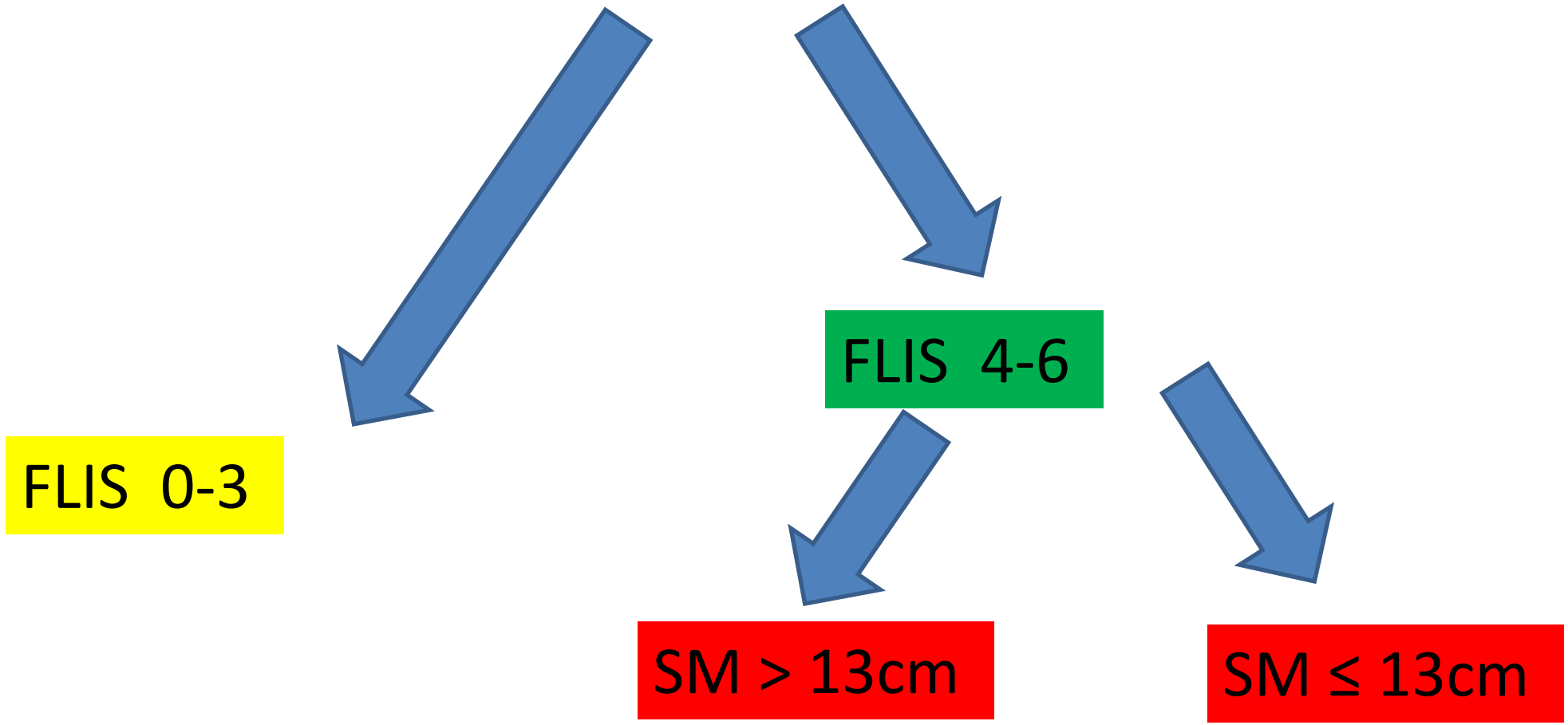




Unal E et al. Liver Function Assessment by MRI. Semin. US, CT, MRI 2016

Ba ssalamah A et al. JMRI 2017

BA-SSALAMAH / FLIS 7 CHRONIC LD



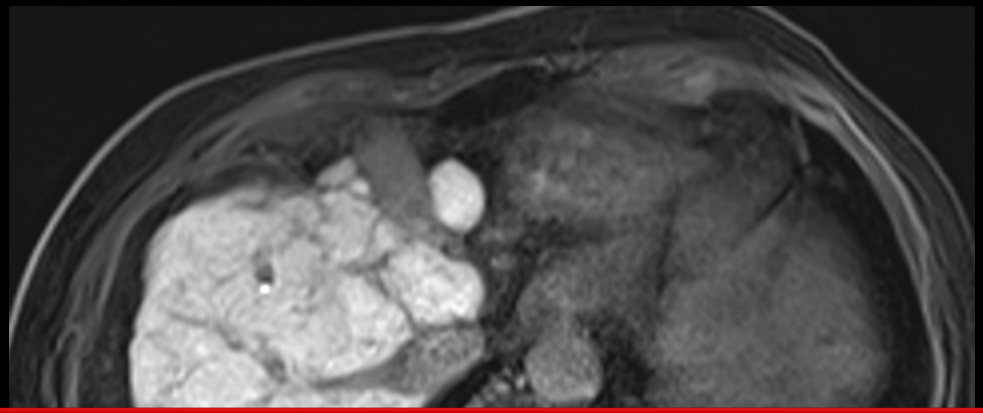
- HIGH RISK

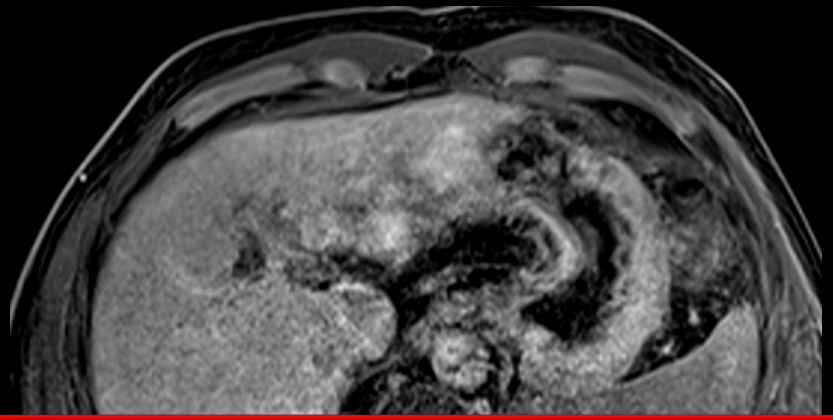
INTERMEDIATE RISK MORTALITY

LOW RISK

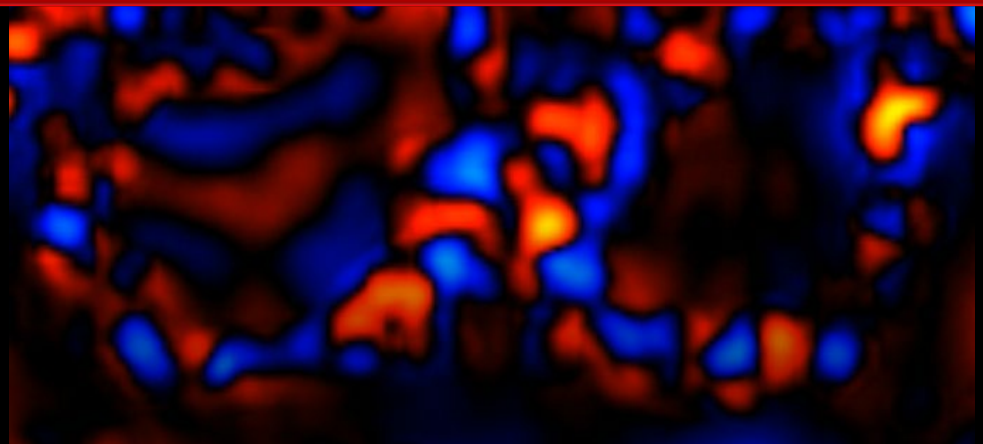
T1_RR : 60%
STIFFNESS : 5.4kPa

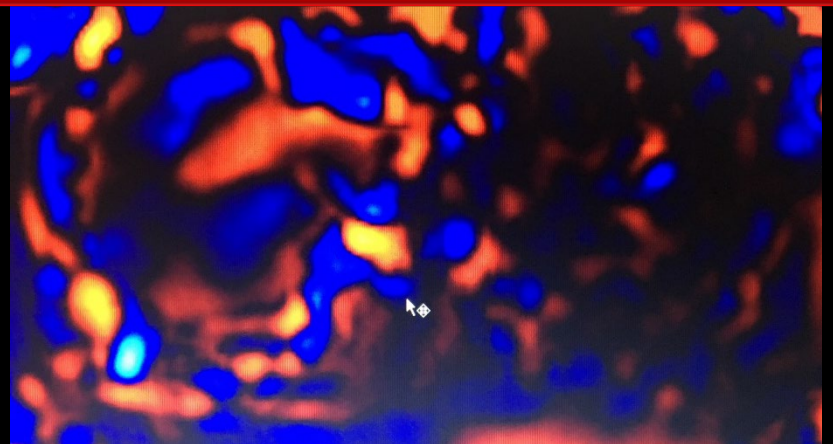
T1_RR : 40%
STIFFNESS : 5.6kPa





FIBROSIS AND EXCRETION NOT ALWAYS CORRELATE





GD-EOB-DTPA/ SORAMIC STUDY

Research article JHEP|Reports

Gadoxetic acid-based hepatobiliary MRI in hepatocellular carcinoma

Jens Ricke,[1,*] Ingo G. Steffen,[1] Irene Bargellini,[2] Thomas Berg,[3] José Ignacio Bilbao Jaureguizar,[4] Bernhard Gebauer,[5] Roberto Iezzi,[6] Christian Loewe,[7] Musturay Karçaaltincaba,[8] Maciej Pech,[9] Christian Sengel,[10] Otto van Delden,[11] Vincent Vandecaveye,[12] Christoph J. Zech,[13] Max Seidensticker[1]

[1]*Department of Radiology, Ludwig-Maximilians-University Munich, Munich, Germany;* [2]*Department of Interventional Radiology, Pisa University Hospital, Pisa, Italy;* [3]*Klinik und Poliklinik für Gastroenterologie, Sektion Hepatologie, Universitätsklinikum Leipzig AöR, Leipzig, Germany;* [4]*Department of Radiology, Clínica Universidad de Navarra, Pamplona, Spain;* [5]*Department of Radiology, Charité-Universitätsmedizin Berlin, Berlin, Germany;* [6]*Dipartimento di Diagnostica per Immagini, Radioterapia Oncologica ed Ematologia, Fondazione Policlinico Universitario A. Gemelli IRCCS, UOC di Radiologia, Rome, Italy;* [7]*Section of Cardiovascular and Interventional Radiology, Department of Bioimaging and Image-Guided Therapy, Medical University of Vienna, Vienna, Austria;* [8]*Department of Radiology, Hacettepe University School of Medicine, Ankara, Turkey;* [9]*Department of Radiology and Nuclear Medicine, University of Magdeburg, Magdeburg, Germany;* [10]*Radiologie interventionnelle vasculaire et percutanée, CHU de Grenoble, Grenoble, France;* [11]*Department of Radiology and Nuclear Medicine, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands;* [12]*Department of Radiology, University Hospitals Leuven, Leuven, Belgium;* [13]*Radiology and Nuclear Medicine, University Hospital Basel, University of Basel, Basel, Switzerland*

JHEP Reports **2020.** https://doi.org/10.1016/j.jhepr.2020.100173

Background & Aims: SORAMIC is a prospective phase II randomised controlled trial in hepatocellular carcinoma (HCC). It consists of 3 parts: a diagnostic study and 2 therapeutic studies with either curative ablation or palliative Yttrium-90 radioembolisation combined with sorafenib. We report the diagnostic cohort study aimed to determine the accuracy of gadoxetic acid-enhanced magnetic resonance imaging (MRI), including hepatobiliary phase (HBP) imaging features compared with contrast-enhanced computed tomography (CT). The primary objective was the accuracy of treatment decisions stratifying patients for curative or palliative (non-ablation) treatment.

Methods: Patients with clinically suspected HCC underwent gadoxetic acid-enhanced MRI (HBP MRI, including dynamic MRI) and contrast-enhanced CT. Blinded read of the image data was performed by 2 reader groups (radiologists, R1 and R2). A truth panel with access to all clinical data and follow-up imaging served as reference. Imaging criteria for curative ablation were defined as up to 4 lesions <5 cm and absence of macrovascular invasion. The primary endpoint was non-inferiority of HBP MRI *vs.* CT in a first step and superiority in a second step.

Results: The intent-to-treat population comprised 538 patients. Treatment decisions matched the truth panel assessment in 83.3% and 81.2% for HBP MRI (R1 and R2), and 73.4% and 70.8% for CT. Non-inferiority and superiority (second step) of HBP MRI *vs.* CT were demonstrated (odds ratio 1.14 [1.09–1.19]). HBP MRI identified patients with >4 lesions significantly more frequently than CT.

Conclusions: In HCC, HBP MRI provided a more accurate decision than CT for a curative *vs.* palliative treatment strategy.

SORAMIC DIAGNOSTIC TRIAL: HBP MRI VERSUS CT IN HCC

METHODS

STUDY DESIGN

- Multicentre, randomized, phase II
- 538 patients

IMAGING TECHNIQUES

- Gadoxetic acid-enhanced HBP MRI
- Contrast-enhanced multislice CT

DIAGNOSTIC ACCURACY

Truth panel assessment

RESULTS

ACCURACY OF TREATMENT DECISIONS

- HBP MRI: 83.3% (R1), 81.2% (R2)
- CT: 73.4% (R1), 70.8% (R2)

CONCLUSION

Gadoxetic acid-enhanced HBP MRI provides more accurate treatment decisions than CT in HCC

CT, computed tomography; HBP, hepatobiliary phase; HCC, hepatocellular carcinoma; MRI, magnetic resonance imaging; R, reader grou

HCC- PROGNOSIS

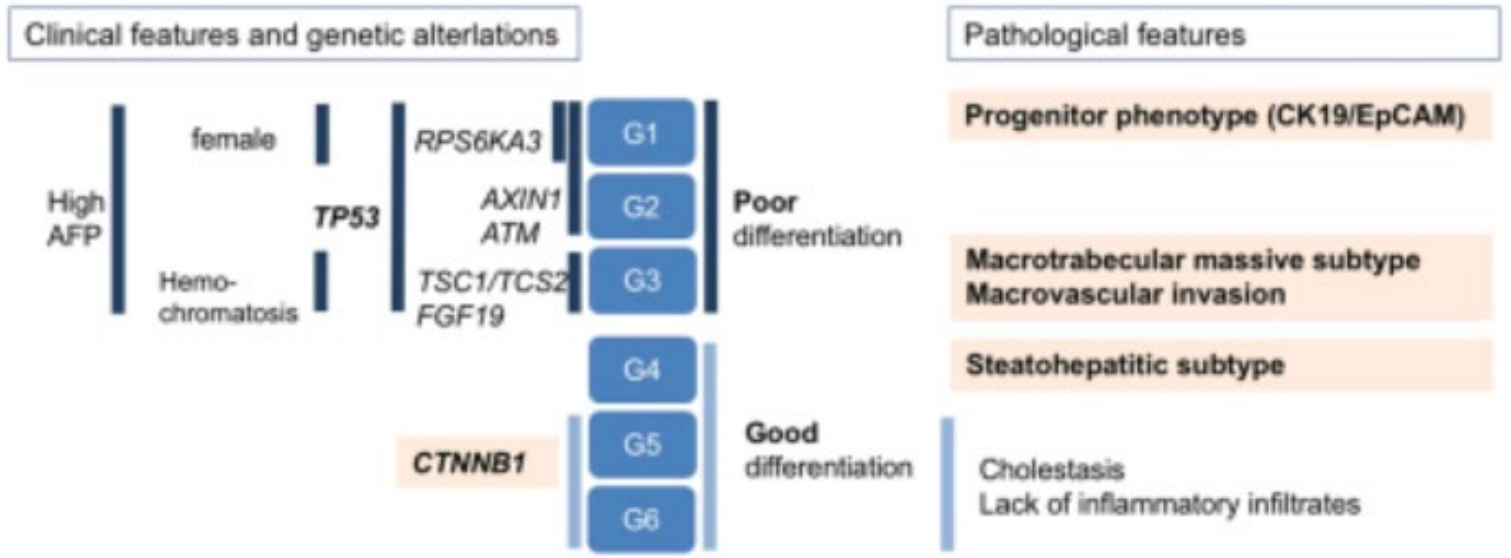
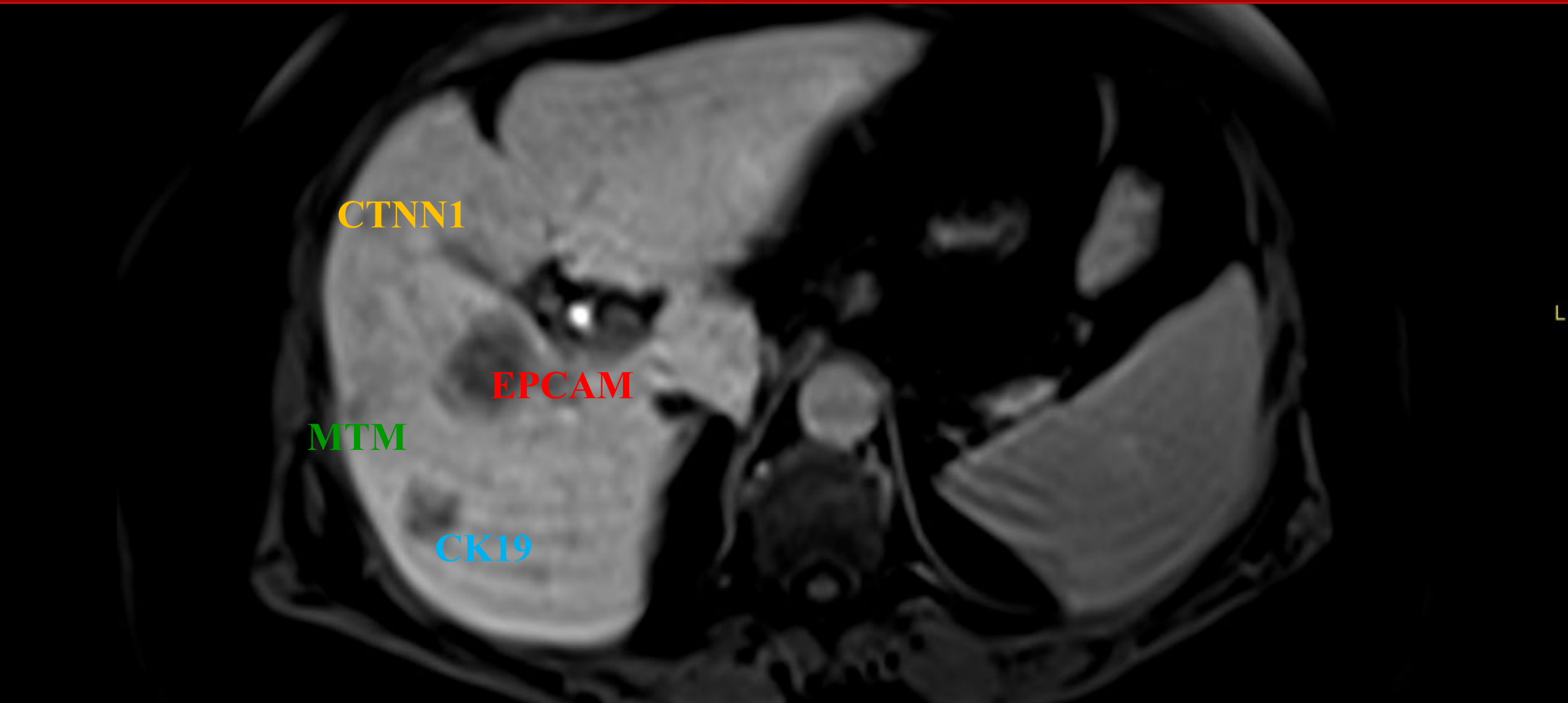
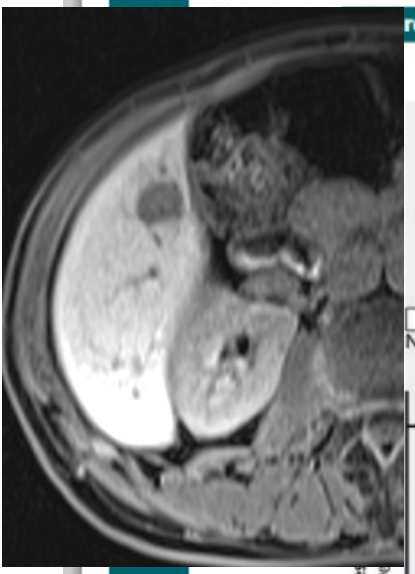


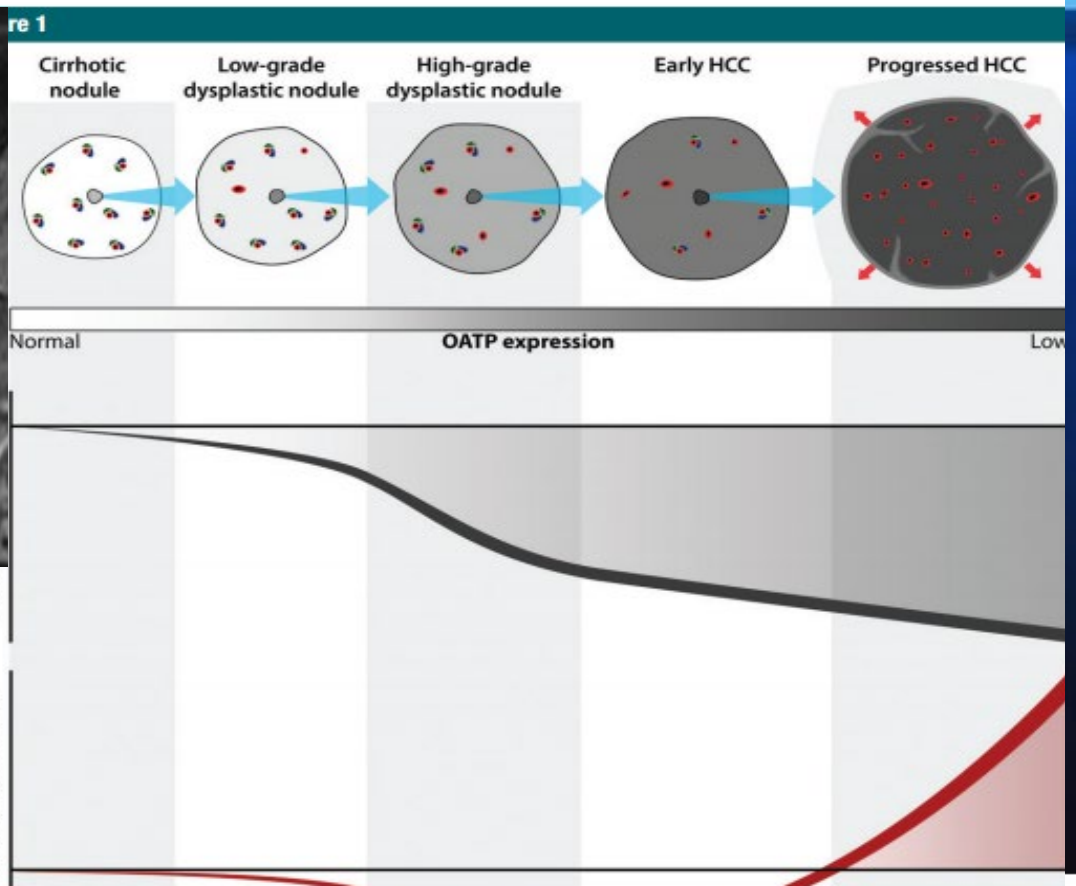
Fig. 9 Genome-based molecular classification of HCC. Recent study proposed six subclasses (G1–G6) of HCC molecular based classification associated with the clinical and histological features. Modified from reference [16]

HCC FUTURE / AI

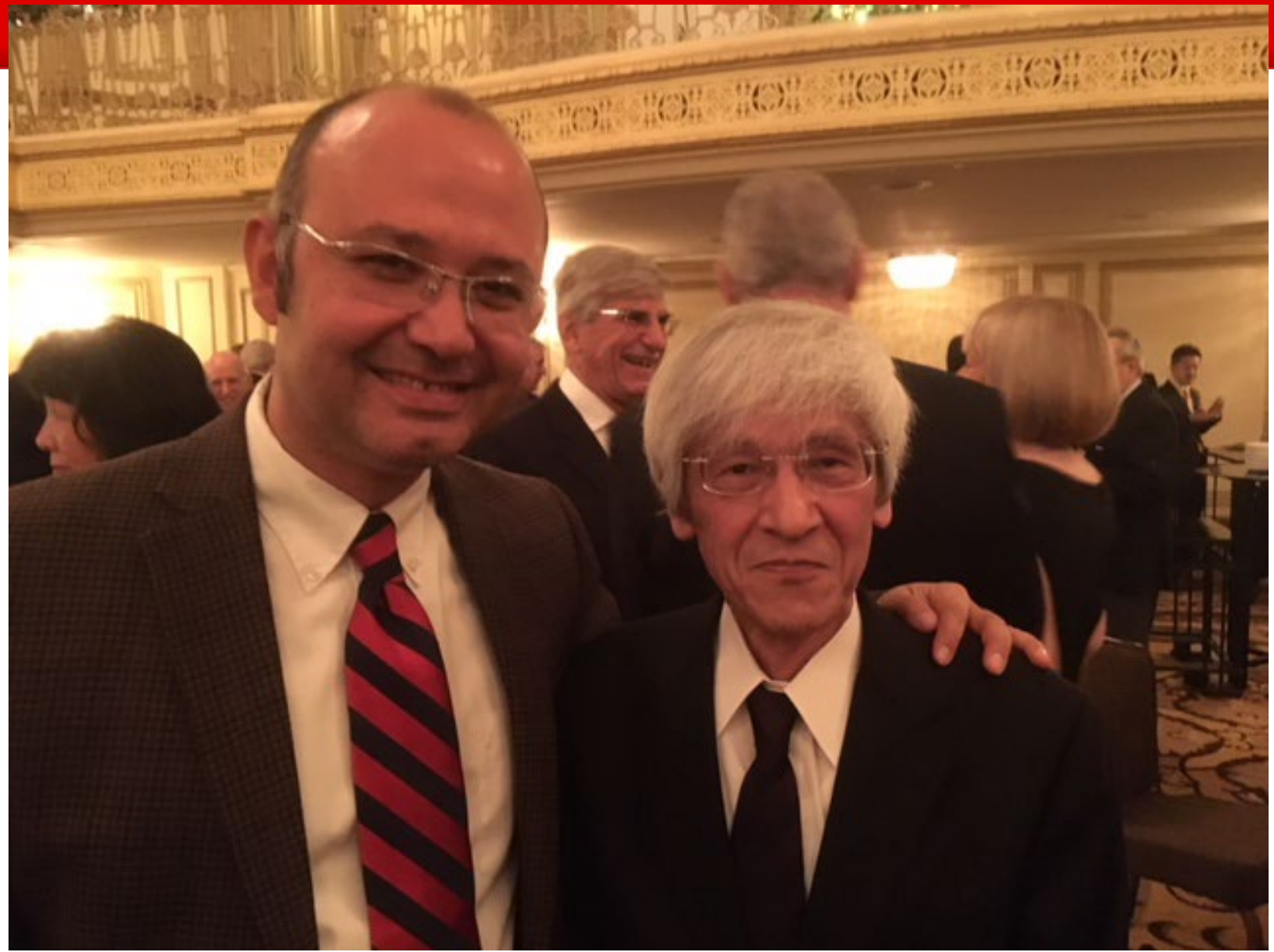


EARLY HCC / GD-EOB / BIOMARKER





HCC GD-EOB BIOMARKER



HCC SUMMARY

https://doi.org/10.1007/s00330-019-06458-4

HEPATOBILIARY-PANCREAS

Hepatocellular carcinoma det
performance of contrast-enha
contrast vs. gadoxetic acid

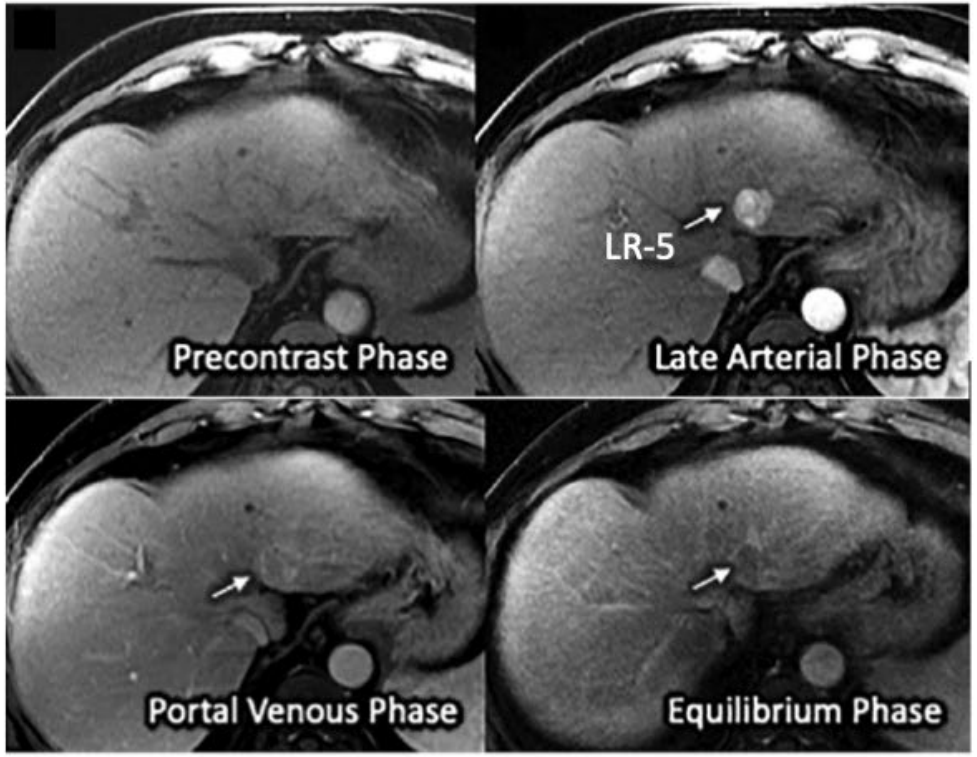
Sahar Semaan[1,2] · Naik Vietti Violi[2,3] · Sara L
James S. Babb[5] · M. Isabel Fiel[6] · Myron Sch

Received: 14 June 2019 / Revised: 7 August 2019 / Accepte

Abstract

Objectives To evaluate the diagnostic performa
MRI) vs. MRI with gadoxetic acid (EOB-MRI
reference. The additional value of hepatobiliary
Methods Two-hundred seventy-seven consec
and imaging within 90 days of were retros
and EOB-MRI (n = 100), the latter subdivi
radiologists retrospectively categorized lesio
re-evaluated with the addition of HBP. Res
Results Pathology demonstrated 265 HCCs
86.3% for CT, 89.5% for EC-MRI, 92.8%
data), with a significant difference between
and full EOB-MRI ($p = 0.047$). Per-lesion se
59.5%,78.5%,69.7% and 76.8%, respect
(p-range:0.001–0.04), and no difference
1–1.9 cm, sensitivities were 34.4%, 64.6
superior to CT ($p \leq 0.01$) and full EOB-MR
Conclusions EOB-MRI outperforms CT and EC
per-lesion sensitivity. MRI methods outperform

Multicenter Validation of Abbreviated MRI for Detecting Early-Stage Hepatocellular Carcinoma



Pathologic examination confirmed poorly differentiated HCC.

- Multicenter retrospective cross-sectional study of 161 patients with cirrhosis who underwent liver MRI followed by liver resection or transplant with early-stage hepatocellular carcinoma (HCC) and 138 patients without HCC
- Dynamic abbreviated MRI had patient-level sensitivity of 88% and specificity of 89% for detection of early-stage HCC.
- Patient-level sensitivity was lower in Child-Pug class B or C cirrhosis than in class A (64% vs 94%; $P < .001$).

Yokoo T et al. Published Online: January 24, 2023
https://doi.org/10.1148/radiol.220917

Radiology

SANDWICH PROTOCOL

- BEFORE YOU START SCREENING
- MAKE SURE LIVER IS TOTALLY NORMAL
- PRIMOVIST-MRI IS THE BEST AVAILABLE TOOL
- CAN REPEAT IN 2-3 YEARS

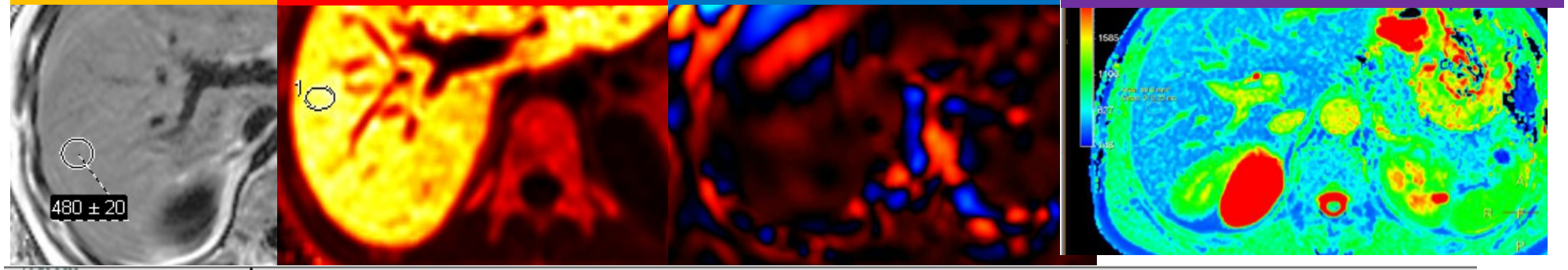
OUR GOALS IN LIVER IMAGING

- WE SHOULD NOT DIAGNOSE A BENIGN LESION AS A HCC
- WE HAVE TO SEE MORE (EARLY HCC)
- WE HAVE TO SEE THE UNSEEN
- WE HAVE TO SOLVE CLINICAL PROBLEMS
- WE HAVE TO PREDICT MORE - PROGNOSIS
- SUMMARY

MULTIPARAMETRIC LIVER MRI

LIVER MRI LAB VALUES

PDFF% | IRON- T2* | STIFFNESS | T1FUNCTION



REVIEW
OF GASTROENTEROLOGY & HEPATOLOGY

Expert Review of Gastroenterology & Hepatology

Multiparametric or practical quantitative liver MRI: towards millisecond, fat fraction, kilopascal and function era

Emre Unal, Ilkay Sedakat Idilman & Muşturay Karçaaltıncaba

IN SUMMARY: BLACK & WHITE

- **NORMAL PATIENTS**
  - FNH (WHITE) vs ADENOMA (BLACK)
  - NORMAL LIVER
- **CIRRHOTIC PATIENTS**
  - EARLY – TYPICAL HCC, MVI, DEAD LIVER (BLACK)
  - MULTIPLE BENIGN NODULES (WHITE)
- **HEPATOBILIARY PHASE**