Thieme

LI-RADS Made Easy

LI-RADS leicht gemacht

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ABSTRACT

Purpose The Liver Imaging Reporting and Data System (LI-RADS v2018) standardizes the interpretation and reporting of MDCT and MRI examinations in patients at risk for hepatocellular carcinoma (HCC).

Materials and Methods For focal liver lesions (called "observations") it assigns categories (LR-1 to 5, LR-M, LR-TIV, LR-TR), which reflect the probability of benignity or malignancy (HCC or other non-HCC malignancies) of the respective observation. The categories assigned are based on major and ancillary image features, which have been developed by the American College of Radiology (ACR), revised several times (now v2018), and validated in many studies. The value of ancillary features to modify LI-RADS categories assigned to observations based on major features is shown.

Results This review summarizes the relevant CT and MRI features and presents a step-by-step approach for readers not familiar with LI-RADS on how to use the system. Relevant imaging features and the value of different modalities (contrast-enhanced CT, MRI with extracellular gadolinium chelates or liver-specific contrast agents) is explained.

Conclusion The widespread adoption of LI-RADS for CT/MRI reporting in high-risk patients would help to reduce inter-reader variability. It could improve communication between radiologists, oncologists, hepatologists, pathologists, and liver surgeons, and lead to better patient management.

Key points:

- LI-RADS has been developed and revised to address the need for improved diagnosis and standardized categorization of findings in chronic liver disease.
- CT/MRI LI-RADS consists of major criteria and ancillary features to classify observations.
- LI-RADS terminology helps to clarify the communication of liver observations between radiologists and referring physicians.

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ZUSAMMENFASSUNG

Ziel Das Liver Imaging Reporting and Data System (LI-RADS) v2018 gibt einen Rahmen für die standardisierte Interpretation von MDCT- und MRT-Untersuchungen von Patienten mit erhöhtem Risiko für das Vorliegen eines hepatozellulären Karzinoms (HCC) vor.

Material und Methode Herdbefunden in der Leber („Observations" genannt) werden Befundkategorien (LR-1 bis LR-5, LR-M, LR-TIV, LR-TR) zugeordnet, welche die Wahrscheinlichkeit des Vorliegens eines HCC oder eines anderen malignen Tumors reflektieren. Die Kategorien basieren auf sogenannten „Major Features" (Hauptkriterien) und „Ancillary Features" (Hilfskriterien), welche von einer Task Force des American College of Radiology (ACR) 2011 entwickelt, in mehreren Auflagen immer wieder angepasst (derzeit aktuell v2018) und in vielen Studien validiert wurden.

Ergebnisse Diese Übersichtsarbeit gibt einen Überblick über die bildgebenden Zeichen in CT und MRT, welche für die Beurteilung eines Herdbefundes relevant sind. Die Anwendung des Algorithmus wird Schritt für Schritt erklärt, um zu einer zuverlässigen und nachvollziehbaren Beurteilung von Herdbefunden zu gelangen. Die Wertigkeit der „Ancillary Features" (Hilfskriterien) in der Modifikation der Befundkategorien wird gezeigt. Die bildgebenden Charakteristika der Herdbefunde in

verschiedenen Modalitäten (MDCT, MRT mit nicht spezifischen Gadolinium-Chelaten oder leberspezifischem Kontrastmittel) werden demonstriert.

Schlussfolgerung Die Verwendung von LI-RADS zur Befundung von CT und MRT bei Patienten mit erhöhtem HCC-Risiko ermöglicht die nachvollziehbare Kategorisierung von Herdbefunden mit geringer Inter-Reader-Variabilität. Das gemeinsame Wissen um LI-RADS und die klinische Bedeutung der Befundkategorien erleichtern die Kommunikation zwischen Radiologen und Hepatologen, Onkologen, Pathologen und Chirurgen. Das Patientenmanagement wird dadurch verbessert.

Introduction

In recent years, great progress has been made in the multimodality treatment of hepatocellular carcinoma (HCC) [1]. However, there was little standardization in the interpretation and reporting of imaging studies. Numerous scientific societies have therefore developed guidelines for the performance of CT/MRI examinations in patients with chronic liver disease and related interpretation [2, 3]. First published in 2011, the Liver Imaging Reporting and Data System (LI-RADS) was created by an expert panel of the American College of Radiology (ACR) and has since undergone several evidence-based revisions [4]. The purpose of LI-RADS is to standardize the performance of ultrasound, contrast-enhanced ultrasound (CEUS), CT and MRI examinations, interpretation of imaging features, and reporting. Published to date are Guidelines Ultrasound (US) LI-RADS v2017, CEUS LI-RADS v2017, and Guideline CT/MRI LI-RADS v2018. The following review deals with the application of CT/MRI LI-RADS v2018 in everyday radiological practice.

Examination method

A multidetector CT scanner (MDCT) with ≥ 8 detector rows is required for a dynamic contrast-enhanced CT scan in arterial, portal-venous and late phases. LI-RADS does not provide more detailed information on contrast quantity, flow rate and scan delay, but refers to the current literature in this regard. A native CT series is recommended in case of previous loco-regional treatment.

A field strength of 1.5 T or 3.0 T is recommended for an MRI examination. Native T1-weighted gradient echo (GRE) images in-phase and opposed-phase and T2-weighted sequences with or without fat suppression are required. After application of extracellular gadolinium chelates, dynamic sequences should be performed in the (late) arterial, portal venous and late phases. The use of subtraction algorithms to enhance contrast of gadolinium-enhanced sequences is recommended, as well as diffusion-weighted sequence and multiplanar imaging. After application of liver-specific contrast (gadoxetic acid, Primovist, Bayer Healthcare or Gadobenate Dimeglumine, MultiHance, Bracco), perform sequences in the hepato-biliary phase (possibly with a larger flip angle than in the GRE sequences of the dynamic phase to enhance T1 contrast).

In which patients may focal findings (observations) be classified according to LI-RADS?

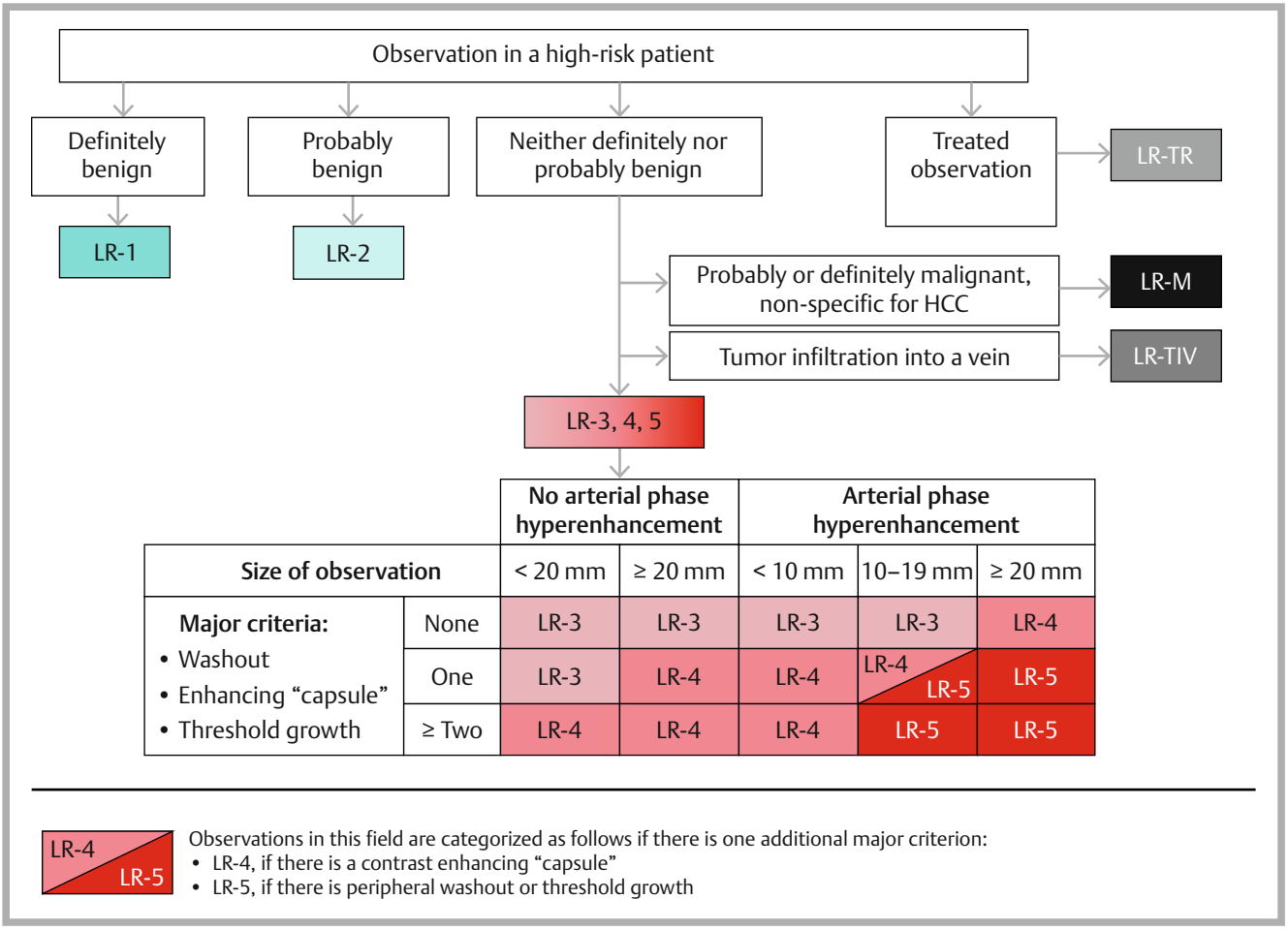
In principle, LI-RADS is indicated in patients ≥ 18 years of age who have liver cirrhosis or chronic hepatitis B infection. It is also used in patients with confirmed HCC or after treatment of HCC. It should not be used for cirrhosis due to vascular disease (e. g., Budd-Chiari syndrome, hereditary hemorrhagic telangiectasia, cardiac congestion, etc.). LI-RADS should also not be used to evaluate focal hepatic lesions in patients without any of the risk factors described above.

How should observations be classified in LI-RADS?

All hepatic observations are categorized in LI-RADS as LR-1 (definitely benign) to LR-5 (definitely HCC), LR-M (probably or definitely malignant, not specific for HCC), as LR-TIV (tumor infiltration into the vein), or LR-TR ("treated observation," treated HCC). The major criteria in the diagnostic algorithm (▶ **Fig. 1**) are used to distinguish tumors with intermediate to high probability of HCC (LR-3 to LR-5). For this purpose, various ancillary features are defined, favoring benignity or malignancy (generally malignancy-suspect or specific to HCC). If ancillary features are present, the observation is upgraded or downgraded by one category (e. g., from LR-3 to LR-4). However, an observation may not be upgraded to LR-5, based on the presence of ancillary features.

There are a total of 4 steps to complete to classify an observation:

1. Application of the LI-RADS algorithm (▶ **Fig. 1**) with application of the major criteria (for all observations that were not categorized as LR-1, LR-2, LR-M, or LR-TIV).
2. Application of ancillary features favoring benignity or malignancy (general or specifically HCC).
3. Application of the "Tie-breaking Rule": If there is uncertainty regarding assignment to a category, select the category with the lower degree of certainty (i. e., LR-2 instead of LR-1, LR-4 instead of LR-5).
4. Final Check: A brief final review of whether the assignment of the observation to a particular category is useful and reasonable.

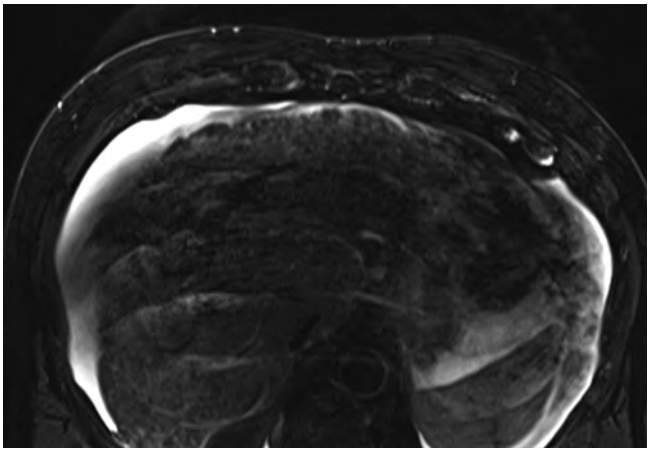


▶ **Fig. 1** LI-RADS® Diagnostic Algorithm and the Major Criteria for categorization of observations as LR-3, LR-4 or LR-5 (Data from [4]).

Step 1: Application of the diagnostic algorithm and major criteria

The diagnostic algorithm is used to primarily assign a lesion (observation) to a category (▶ **Fig. 1**) after image datasets that cannot be assessed or image datasets that are partially missing have been eliminated (= LR-NC, not categorizable) (▶ **Fig. 2**). Observations that are assessed as definitively or probably benign are assigned to categories LR-1 and LR-2. If a distinct tumor is detected in a vein (portal/branch or hepatic vein), then the classification is LR-TIV. Observations judged to be definitely or probably malignant but not specific for HCC are classified as LR-M. All observations after local therapy for HCC fall into the LR-TR category.

All other observations that are judged to be HCC with varying degrees of probability should be classified as LR-3 to LR-5, using the major criteria for differentiation (▶ **Fig. 1**). The primary distinction is whether an observation meets the major criterion arterial phase hyperenhancement (APHE). Irregular rim enhancement does not meet this criterion, as it is much more common in cholangiocellular carcinoma (CCC). Then, the categorization is done according to the size of the mass (< 10 mm, 10–19 mm, ≥ 20 mm). Assignment to categories L-3 to L-5 is according to the presence or absence of the 3 remaining major criteria, a contrast-enhancing capsule, contrast washout (= hypodensity/hypointensity in the portal venous phase on CT/MRI and/or in the late phase after extracellular gadolinium contrast). A major criterion is also the presence of threshold growth (≥ 50 % size growth of a lesion in ≤ 6 months).



▶ **Fig. 2** LR-NC (not categorizable): the T2w TSE pulse sequence shows considerable artifacts, which preclude reliable assessment of observations.

▶ **Table 1** Ancillary features indicating malignancy or benignity [4].

Indicative of malignancy in general, not specifically of HCC	Indicative of benignity
▪ Visualizable in US as a discrete nodule	▪ Size stability > 2 years
▪ Subthreshold growth (less than threshold growth)	▪ Size decrease
▪ Restricted diffusion	▪ Contrast enhancement parallels blood vessels
▪ Low-moderate hyperintensity in T2	▪ Vessels not displaced, deformed
▪ Corona enhancement	▪ Higher iron signal in mass, more than in adjacent parenchyma
▪ Fat sparing in solid node	▪ Pronounced hyperintensity in T2
▪ Absence of iron in solid node	▪ Isointensity in hepatobiliary phase
▪ Hypointensity in transitional phase	
▪ Hypointensity in hepatobiliary phase	
For HCC in particular	
▪ Non-enhancing "capsule"	
▪ Nodule in nodule	
▪ Mosaic architecture	
▪ Blood degradation products in mass	
▪ Fat in mass, more than in adjacent parenchyma	

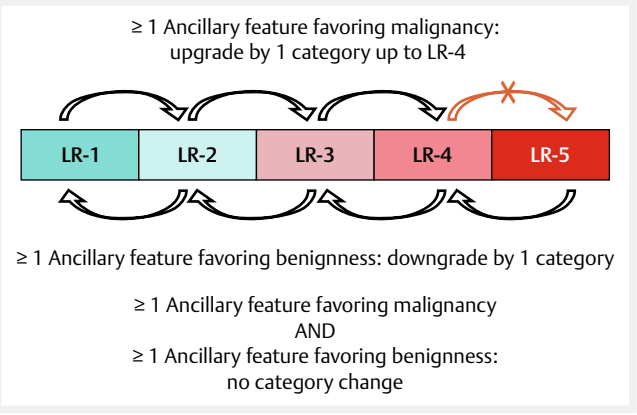
Step 2: Application of ancillary features

In clinical practice, the clinician is more or less inclined to make a benign or malignant diagnosis based on the presence of various other imaging signs on CT or MRI. These ancillary features have been defined in LI-RADS. Their application is optional: they can be used to adjust (upgrade or downgrade) the category after application of the main criteria and is intended to increase the confidence of the assessor. Application of the ancillary features has been formalized. There are those that generally favor a malignant diagnosis, auxiliary criteria that are specific to HCC, as well as criteria that favor a benign diagnosis (▶ **Table 1**). These features are applied for category adjustment in terms of upgrading or downgrading as described below (▶ **Fig. 3**). In the presence of ≥ 1 feature indicative of malignancy in general or HCC, upgrading by one category to LR-4 is called for. However, the presence of ancillary features may not result in an upgrade from LR-4 to LR-5 (▶ **Fig. 3**). The presence of ≥ 1 feature indicative of benignity results in a downgrade by one category. If ancillary features indicative of both malignancy and benignity are present, no category adjustment is made.

Step 3: Application of the Tie-breaking Rule

If the assessor has doubts about the assignment to a category, the one with the lower level of certainty should be selected.

- Lower certainty of benignity: LR-2 is chosen instead of LR-1, LR-3 is chosen instead of LR-2.
- Lower certainty of malignancy: LR-4 is chosen instead of LR-5, LR-3 is chosen instead of LR-4.
- If there is low certainty of hepatocellular origin of a malignant lesion, LR-M is selected rather than LR-4 or LR-5.
- In the case of uncertainty regarding the presence of a tumor in a vein: no categorization as LR-TIV is selected.



▶ **Fig. 3** Application of ancillary features for category adjustment (upgrade or downgrade) (Data from [4]).

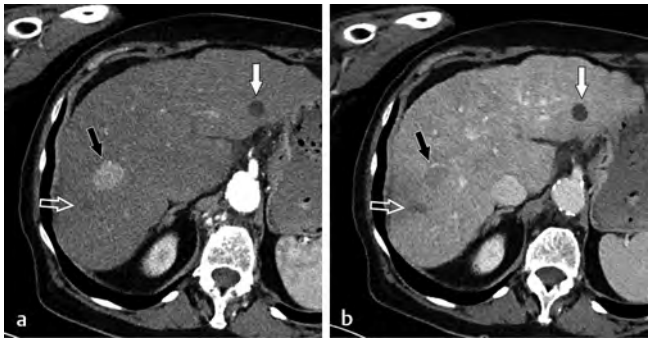
Step 4: Final check

Finally, the assessor should question whether the category assigned based on steps 1–3 seems reasonable and appropriate. If the answer is negative, the lesion should be re-evaluated.

LI-RADS Categories

LR-1

An observation is categorized as LR-1 if it is judged to be definitely benign (▶ **Fig. 4**). Examples include cysts, definite hemangiomas or Transient Hepatic Attenuation Differences (THADs; arterio-portal shunts), focal steatosis or non-steatosis, confluent fibrosis, etc.



▶ **Fig. 4** Three observations: LR-1, LR-3 and LR-5. Contrast-enhanced MDCT in **a** arterial and **b** portal venous phase show a smooth, simple cyst (white arrow) in the left lobe (LR-1). In the right lobe there is an APHE observation with portal-venous phase wash-out (black arrow), typical for HCC (LR-5). Posteriorly there is a third, 12 mm observation without APHE, with wash-out in the portal-venous phase (open white arrow). CT-categorization as LR-3.

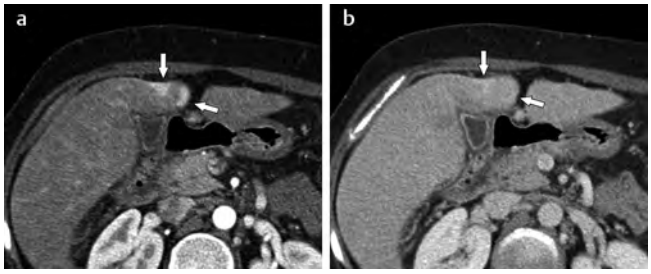
The diagnosis can be made either on the basis of unambiguous imaging criteria or by comparison with previous examinations.

LR-2

Probable (but not definitive) benign foci are categorized as LR-2. The diagnoses described above (cysts, hemangiomas, THAD, focal steatoses, etc.) are categorized as LR-2 unless there is definite certainty (▶ **Fig. 5**). There are also circumscribed regenerative nodules, which do not differ from the surrounding parenchyma with respect to density/signal intensity and contrast medium uptake. In LI-RADS v2018, the prevalence of HCC is assumed to be 16 % in the LR-2 category and 18 % for malignancies in general [4], with a qualifying comment noting that these numbers would likely be overestimated due to selection bias (only histologically verified observations). Two recent studies demonstrated that LR-2 observations showed progression to a malignant diagnosis in only 0–2 % of cases [5, 6].

LR-3–5

Assignment to categories LR-3 to LR-5 is based on size as well as the presence or absence of hyperenhancement in the arterial phase (APHE), wash-out in the portal venous and/or late phase (on contrast-enhanced CT or MRI with extracellular contrast), a contrast-enhancing pseudocapsule, and the presence of threshold growth (▶ **Fig. 4**). After the corresponding preliminary categorization, the ancillary features, if any, are used for upgrading or downgrading for the final categorization (▶ **Fig. 6**). The most common reason for LR-3 classification is a hypervascularized pseudolesion [7]. Two retrospective studies demonstrated that LR-3 observations had to be reclassified as LR-4 or LR-5 in 9 % at follow-up [5] or were diagnosed as malignant in 7 % at 6-month follow-up [3]. In a recent study [8], progression to LR-5 occurred in as many as 25 % of 212 patients with an LR-3 observation during follow-up (observation period one month–3.6 years). No difference was found between CT and MRI with respect to the probability of progression from LR-3 to LR-5. A lesion classified as LR-4 (▶ **Fig. 7**) should be referred for further clarification, in the case



▶ **Fig. 5** LR-2 contrast-enhanced MDCT in **a** arterial and **b** portal-venous phase demonstrate in segment 4 peripheral, triangular, hypervascular lesions (arrows), which become iso-attenuating in the portal venous phase. Categorization as LR-2, most likely transient hepatic attenuation differences (THADs) according to location and shape. No size increase during follow-up.

of categorization LR-5, the diagnosis of HCC should be assumed due to the very high specificity; it can be treated without histological clarification (▶ **Fig. 8**).

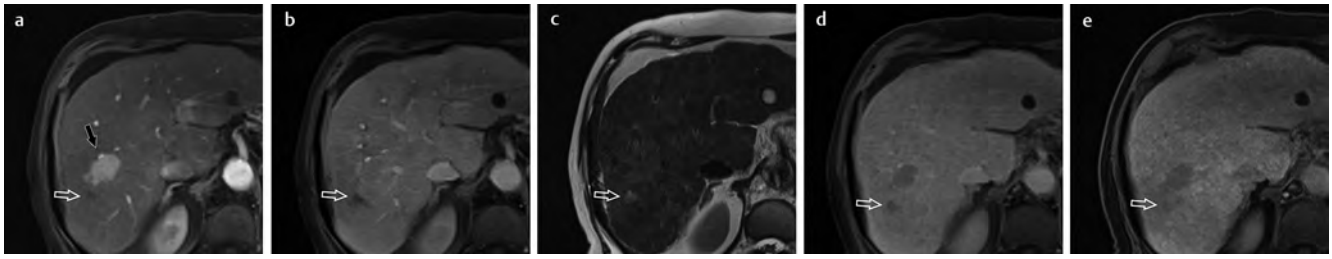
LR-TIV

The LR-TIV category (tumor in vein) is assigned when there is clear contrast enhancement of soft tissue in a vein (portal/branch or hepatic vein), regardless of whether an intraparenchymal mass is detectable (▶ **Fig. 9**). Other imaging signs suggestive but not conclusive of tumor infiltration into the vein include: (1) Occluded vein with blurred vessel wall. (2) Occluded vein with restricted diffusion. (3) Occluded or indistinct vein in close proximity to a malignant parenchymal lesion. (4) Heterogeneous contrast enhancement in a vein (not corresponding to a flow artifact).

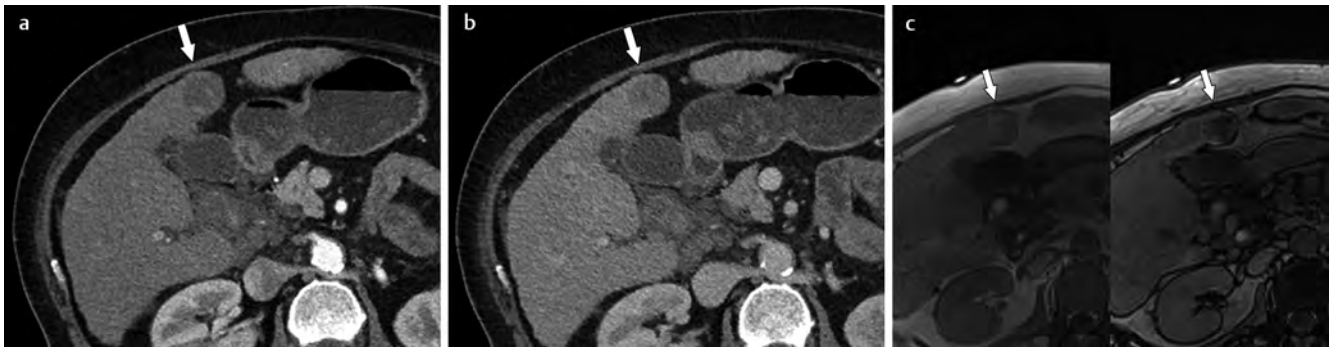
An etiologic assignment regarding tumor entity should also be made in the report. An observation LR-TIV adjacent to a target lesion would be classified as “LR-TIV, likely non-HCC malignancy”. When an observation is in contact with an LR-5 observation, categorization as “LR-TIV, definitely HCC” is appropriate; in all other cases, categorization as “LR-TIV, probably HCC” is appropriate. This revision of LI-RADS (from the Li-RADS v2013 and v2014 versions) became necessary because it has been demonstrated that macroscopic tumor infiltration into veins can also be observed in non-HCC malignancies (intrahepatic cholangiocarcinomas, combined hepato-cholangiocarcinomas, or metastases) [9, 10]. This distinction is significant since the treatment strategies for these different tumors naturally differ.

LR-M

Observations that are definitely or probably malignant but whose morphology is not specific for HCC are classified as LR-M. Imaging criteria include either a target-like morphology (targetoid appearance) or a nontarget lesion with an infiltrative appearance, signs of marked necrosis, or marked diffusion restriction (▶ **Fig. 10**). This morphology is commonly found in cholangiocellular carcinomas, combined hepato-cholangiocarcinomas, and others (e. g., metastases, lymphomas). Rare benign differential diagnoses include sclerosed hemangiomas or abscesses. Exclusive use of LI-RADS major criteria would lead to the diagnosis of HCC in 54.1 % of cases of hepato-cholangiocarcinoma. However, the vast



▶ **Fig. 6** Upgrade of an LR-3 observation to LR-4 after applying the ancillary features (same patient as in ▶ **Fig. 4**). The observation (open arrow) posteriorly of the LR-5 observation (HCC, black arrow) is hypointense in **a** arterial and **b** portal-venous phase (= LR-3 according to major criteria). Ancillary features favoring malignancy are **c** hyperintensity in T2w TSE image as well as hypointensity in the **d** transitional phase and **e** hepatobiliary phase after gadoxetic acid (see ▶ **Table 1**), leading to an upgrade to LR-4.



▶ **Fig. 7** LR-4: probably HCC. **a** arterial and **b** portal-venous phase CT show a 2.7 cm hypovascular mass (arrow), classified as LR-4 according to the major criteria. **c** MRI in-phase (left) and opposed-phase (right) show the ancillary feature fat (arrow). However, upgrade from LR-4 to LR-5 is not possible in the algorithm. Final categorization as LR-4. Biopsy revealed HCC.

majority of these patients (88.5 %) demonstrate the presence of at least one ancillary feature favoring the diagnosis of non-HCC malignancy (e. g., arterial rim enhancement, progressive central enhancement in the late phase, peripheral washout, retraction of the liver capsule) [11]. This underscores the importance of the LI-RADS ancillary features in the differentiation of HCC and non-HCC malignancies.

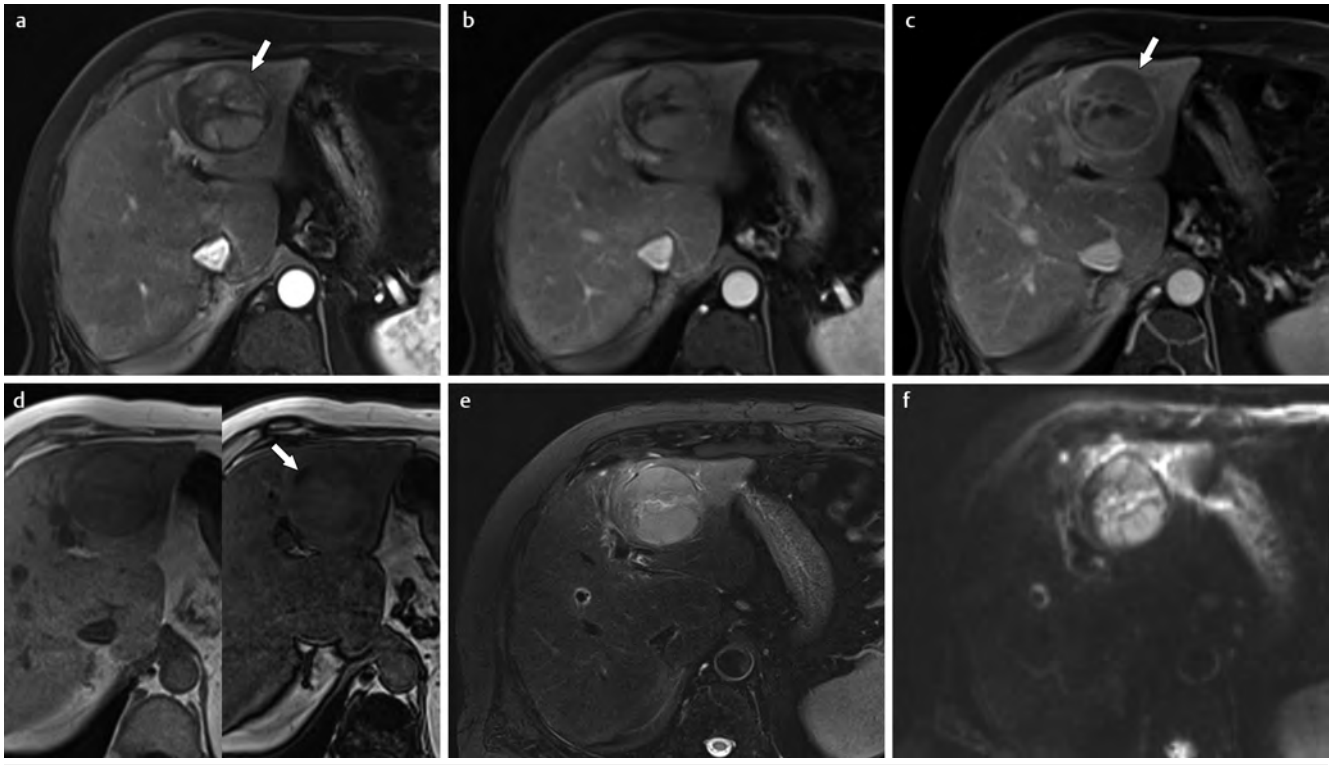
LR-TR

Foci are categorized as "Treatment Response" (TR) after loco-regional therapy (resection, ablation, embolization). The following are subcategories: nonviable (avital), equivocal (unclear), viable (vital), and nonevaluable (not assessable). The LR-TR nonviable category is assigned if there is either no enhancement or an enhancement that can be expected in terms of time and morphology after therapy. If a nodular, mass-like or irregular rim enhancement is found in the arterial phase (with or without wash-out in the portal-venous phase) after therapy, it is classified as LR-TR viable (▶ **Fig. 11**). Enhancement behavior in the early phase after therapy is often ambiguous and is then referred to as LR-TR equivocal (▶ **Fig. 12**). LR-TR nonevaluable is assigned for non-diagnostic examinations.

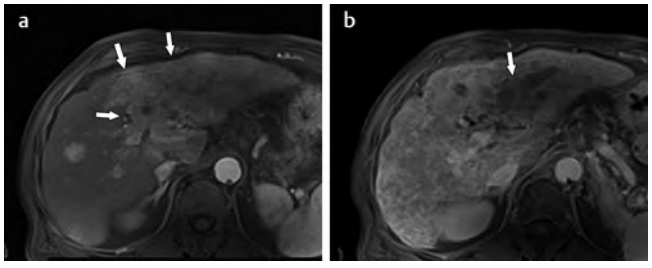
How effective is LI-RADS for diagnosing HCC? How effective are CT and MRI for diagnosing HCC?

Recent meta-analyses that included studies on LI-RADS v2011, v2014, and v2017 demonstrated that the proportion of HCC in the LR-1 category was 0 %, LR-2 was 4–13 %, LR-3 was 34–38 %, LR-4 was 67–74 %, and in LR-5 was 92–94 % [12, 13]. This means that an LR-1 or LR-2 observation can indicate a benign etiology with a very high to high probability (LI-RADS recommendation: continue surveillance in 6 months), whereas in the case of LR-4 or LR-5 observation, HCC is likely to very likely (LI-RADS recommendation: further workup) [4]**.** In category LR-3, repeat imaging or alternative imaging after only 3–6 months is consequently recommended to detect any increase in size (major feature: threshold growth ≥ 50 % in ≤ 6 months) or change in morphology [4]. A study by Darnell et al. shows an HCC prevalence of 68.9 % in foci ≤ 2 cm newly discovered in ultrasound, which were then classified as LR-3 in MRI, which justifies further, also invasive clarification in the case of LR-3 findings [14].

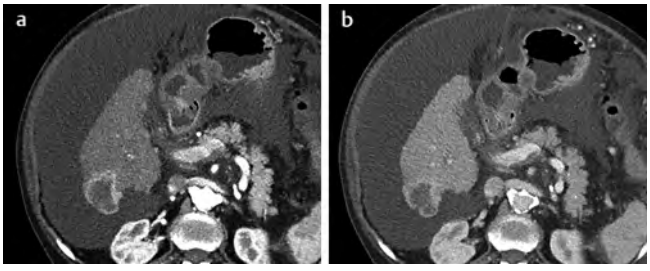
Several recent meta-analyses have shown that contrast-enhanced MRI generally provides a better diagnosis of HCC compared to CT [15, 16]. Contrast-enhanced MRI was superior to CT (analysis of studies started in 2000 or later) in sensitivity in direct comparison (80 % vs. 68 %) [15]. This superiority is particularly evident in the detection of small HCC (< 2 cm), with a sensitivity of 74 % (MRI) and 58 % (CT) [16]. In another meta-analysis, MRI with liver-specific contrast agent was found to have a higher sensitivity



▶ **Fig. 8** LR-5: definitely HCC. Dynamic gadolinium-enhanced MRI in **a** arterial, **b** portal venous and **c** delayed phase show an **a** arterial hyperenhancing (APHE) lesion with **c** wash-out in the delayed phase and an enhancing capsule (arrows). Ancillary features are present (which would not change the category, but increase the reader confidence): **d** T1w in-phase (left) and opposed-phase (right) show fat (arrow), **e** T2w moderate hyperintensity and **f** diffusion restriction.



▶ **Fig. 9** LR-TIV. Dynamic gadolinium-enhanced MRI in **a** arterial phase shows an infiltrative hypervascular tumor in the left lobe (arrows), the left portal vein showing the same enhancement. **b** In the portal venous phase market wash-out of the tumor filling the portal vein. Categorization: LR-TIV, definitely HCC.

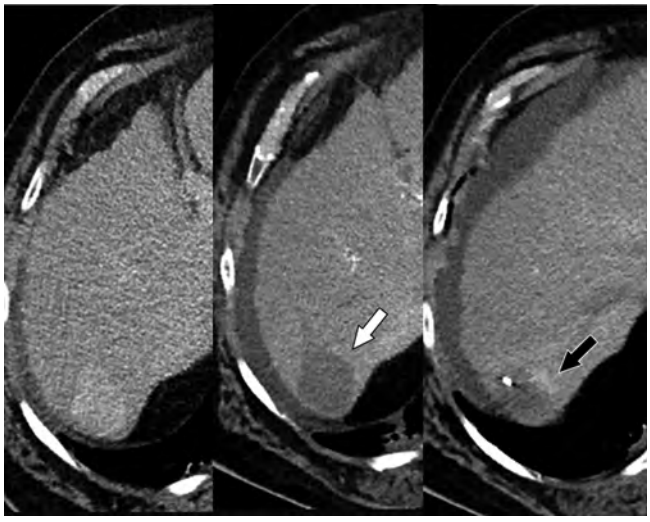


▶ **Fig. 10** LR-M. MDCT in a arterial and b portal venous phase demonstrate a mass with irregular rim enhancement and central necrosis atypical for HCC. Biopsy revealed CCC.

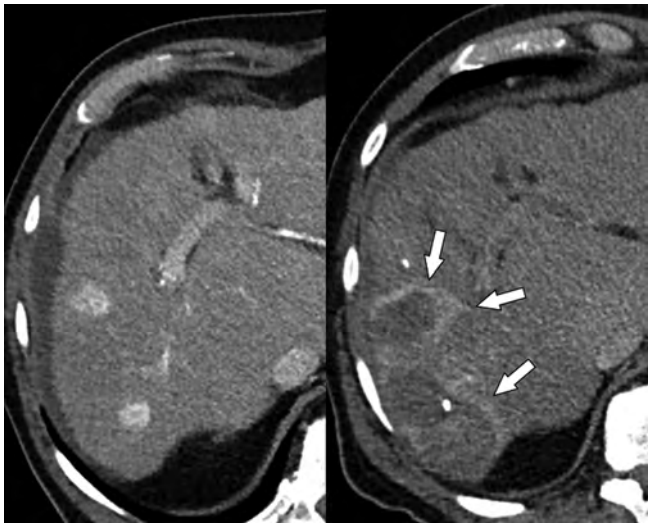
than MRI with extracellular contrast agent (87 % vs. 74 %), although there were no direct comparative studies [15]. In the meta-analysis by Roberts et al. [16] the data regarding the comparison of extracellular gadolinium chelates with liver-specific contrast agent were assessed as insufficient for a general assessment.

Some meta-analyses in recent years have also considered the performance of CT and MRI using LI-RADS [12, 13, 17, 18]. Subgroup analyzes confirmed that contrast-enhanced MRI is also better than CT for LI-RADS (sensitivity 82 % vs. 73 %) [19]; MRI with extracellular gadolinium chelates was superior to MRI with liver-specific contrast agent (sensitivity 76 % vs. 66 %) [12]. In recent years, several intraindividual comparative studies have been published showing that MRI with extracellular gadolinium chelates is at least equivalent or superior to MRI with liver-specific contrast agent, mainly because of better visualization of the LI-RADS major features wash-out and contrast-enhancing pseudocapsule in the dynamic phase [19–25].

Likewise, the major features for HCC diagnosis were subjected to evaluation: the sensitivity and specificity of arterial phase hyperenhancement were 91 % and 47 %, of wash-out 77 % and 48 %, and of enhancing pseudocapsule 48 % and 88 % [26]. This means that the hyperenhancement arterial phase is most sensitive in detecting HCC, and enhancing pseudocapsule is very specific for it (few false-positive diagnoses). These results were essentially con-



▶ **Fig. 11** LR-TR viable. Hyperenhancing HCC pre-therapy (left). After tumor ablation (middle and right) there is an avascular defect (white arrow) with an enhancing peripheral nodule (black arrow), suspicious for residual tumor. Hyperattenuating clip marker (right).



▶ **Fig. 12** LR-equivocal. Two hyperenhancing HCC pre-therapy (left). After tumor ablation (right) there is a slightly irregular rim of hyperenhancing parenchyma (arrows) around the necrosis. Two clip markers are seen (right). Follow-up imaging (not shown) excluded tumor recurrence.

firmed by the study of van der Pol et al. that analyzed the diagnostic value of each major feature: arterial phase hyperenhancement, wash-out, contrast-absorbing pseudocapsule, and size ≥ 20 mm were significantly associated with the diagnosis of HCC, with the exception of the major feature threshold growth [27].

Limitations and Future Developments

LI-RADS is regularly revised by an international panel of experts, taking into account scientific data [28]. One of the challenges is the epidemic development of increased Non-alcoholic Fatty Liver Disease (NAFLD) in the western world. NAFLD-associated HCC may arise before the development of cirrhosis and is then not currently assessable by the LI-RADS algorithm. Moreover, the system of ancillary features is complex. Simplification of the criteria without sacrificing detection rate or specificity would facilitate application. The trend is certainly moving away from MDCT toward MRI, based on the widely-confirmed higher accuracy of MRI in HCC diagnosis [17, 18].

A recent survey in Germany showed that although the majority of hospital radiologists surveyed had heard of LI-RADS, only 26 % used it in routine practice [29]. It is thus important for the scientific societies in German-speaking countries to propagate and support the trend towards systematic and evidence-based reporting according to LI-RADS in everyday clinical practice as well.

Conflict of Interest

The authors declare that they have no conflict of interest.

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