

ADHERENCE TO CRITERIA FOR LIVER IMAGING REPORTING AND DATA SYSTEM CATEGORY 5 IN CLINICAL PRACTICE

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Liver Imaging Reporting And Data Systems

LI-RADS

- Created to standardize an algorithm and lexicon for interpretation and reporting of CT and MRI in patients at risk for hepatocellular carcinoma (HCC)
- Employs consistent terminology to reduce interpretation variability and error
- Enhance communication with referring clinicians
- Diagnostic algorithm based on a set of defined major and ancillary imaging features, which are combined to assign a category which reflects probability that an observation is HCC, non-HCC malignancy or a benign lesion
- Major Features:
 - Arterial Phase Hyperenhancement (APHE)
 - “Washout” (WO)
 - “Capsule”
 - Diameter
 - Threshold Growth (TG)

Observation in high-risk patient

Treated observation

LR-Treated

Untreated observation

Definitely benign

LR-1

Probably benign

LR-2

Neither definite nor probable benign

Probable malignancy, not specific for HCC

LR-M

Tumor in vein

LR-5V

		Arterial phase hypo- or iso-enhancement		Arterial phase hyper-enhancement		
		< 20	≥ 20	< 10	10-19	≥ 20
Diameter(mm):		< 20	≥ 20	< 10	10-19	≥ 20
<ul style="list-style-type: none"> •"Washout" •"Capsule" •Threshold growth 	None:	LR-3	LR-3	LR-3	LR-3	LR-4
	One:	LR-3	LR-4	LR-4	LR-4 / LR-5	LR-5
	≥ Two:	LR-4	LR-4	LR-4	LR-5	LR-5

Apply ancillary features and then tie-breaking rules to adjust category

LI-RADS 5 (LR-5)

- Observation with imaging features diagnostic of HCC
- Nearly 100% specificity that observation is HCC, no biopsy is needed
- In order to be compliant with United Network for Organ Sharing (UNOS) and maintain the desired high specificity, criteria for LR-5 must be met upfront and no ancillary features can be used to upgrade an observation to LR-5
- LR-5 lesions proceed to treatment (including liver) without biopsy confirmation
- Criteria
 - ❖ 10-19mm mass
 - HAPE
 - ≥ 2 of the following: WO, “capsule”, TG
 - ❖ ≥ 20 mm mass
 - HAPE
 - ≥ 1 of the following: WO, “capsule”, TG

GOAL



- Assess adherence to LR5 criteria in clinical practice

MATERIALS & METHODS

- Reviewed all clinical MR and CT reports with standardized LI-RADS template 4/15-2/17

Observation #1:

Location: Segment III

Size: 2.0 x 1.9 cm (image #47, series 501)

HAP Hyperenhancement: Yes (image #142, series 206)

Threshold Growth: Yes, measured 12 mm 6 months ago

PV/Delayed Phase Washout: Yes (image #340, series 206)

Capsule Appearance: Absent

Ancillary Features:

* **Favoring benignity:** N/A

* **Favoring malignancy:** Slight restricted diffusion (image 360, series 1105)

Overall Assessment: LI-RADS 5 (Definite HCC)

MATERIALS AND METHODS

- Presence of all described major features, AF and reported LR category (LR-Report) were recorded
- LR category (LR-Assign) was assigned based on described major features and AF using LI-RADS v 2014 algorithm
- Agreement between LR-Report and LR-Assign was assessed by weighted k statistics:
 - ❖ Moderated agreement 0.41-0.6
 - ❖ Substantial agreement 0.61-0.8
 - ❖ Almost perfect agreement 0.81-0.99

RESULTS: PATIENTS AND OBSERVATIONS

Patients	
Total number	265
Male	172 (65%)
Mean Age	63 years (SD 10)
Observations	
Number of observations	487
Median Diameter	14 mm (IQR 10-20mm)
APHE	344 (71%)
WO	306 (63%)
“Capsule”	86 (18%)
TG	71 (15%)
≥1 AF favoring malignancy	333 (68%)
≥1 AF favoring benignity	31 (6%)

RESULTS

	LR-Report	LR-Assign
LR-3	200/487 (41%)	213/487 (44%)
LR-4	144/487 (29%)	129/487 (27%)
LR-5	143/487 (29%)	145/487 (30%)

- Agreement between LR-Assign and LR-Report was substantial ($\kappa = 0.807$, 95% CI 0.80-0.83)
- Of 143 LR-5 LR-Report observations, 12 (8%) were categorized as LR-4 LR-Assign
 - ❖ 3 (25%) had no APHE
 - ❖ 8 (78%) had diameter of 10-19mm, APHE and one additional major feature other than TG
 - ❖ 1 (11%) had diameter of 10-19mm, APHE and TG other than what is required for LR-5g ($\geq 50\%$ growth in ≤ 6 months)

DISCUSSION

- Our results demonstrated that overall agreement between the reported LI-RADS category and the LI-RADS category assigned based on the reported major and ancillary features was substantial.
- Of 143 observations reported to be LR-5, 8% did not meet the criteria for LR-5.
 - These 8% of observations met criteria for LR-4 based on the reported features.
- While 8% is a relatively small number, erroneous assignment of LR-5 category potentially can have profound effect on management:
 - Specificity of LR-4 category for HCC is less than 100%, and therefore patients with LR-4 may require either close follow-up or biopsy prior to treatment.
 - Particularly, unlike patients with LR-5 observations, patients with LR-4 observations are not eligible to receive HCC exception points for liver transplantation without biopsy confirmation.
- While overall performance of radiologists is good, further educational and outreach efforts are required to improve adherence to LR-5 criteria in clinical practice.

LIMITATIONS

- Retrospective, single center
 - Information was extracted from the clinical reports; the studies were not reviewed to determine whether the interpretations were accurate
 - Did not assess the impact on patient management or outcomes
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CONCLUSION

- While agreement between reported and assigned LI-RADS categories was substantial, 8% of reported LR-5 observations did not meet criteria for LR-5 based on the described imaging features
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