Outcomes of liver lesions categorized using Liver Imaging Reporting and Data System (LI-RADS) in patients who have undergone previous hepatic resection for Hepatocellular Carcinoma.

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Declaration:

- The authors have nothing to declare.

Background (1)

- Hepatocellular Carcinoma (HCC) is the third leading cancer deaths worldwide accounting for nearly 700,000 deaths annually.
- Current guidelines allow diagnosis of HCC non-invasively using cross-sectional imaging without the need for histological confirmation.
- However, characteristic contrast enhancement pattern is only present in around half of all HCC.

Background (2)

- For lesions considered indeterminate, radiologists have no systematic way to convey diagnostic uncertainty.

- Liver Imaging Reporting and Data System (LI-RADS) was introduced to provide a stratified probability of the full spectrum of hepatic lesions and pseudo-lesions and characterised them into several categories.

- However, most studies thus far concentrate on treatment naïve patients and little is known about its diagnostic efficacy patients who had undergone previous resection.

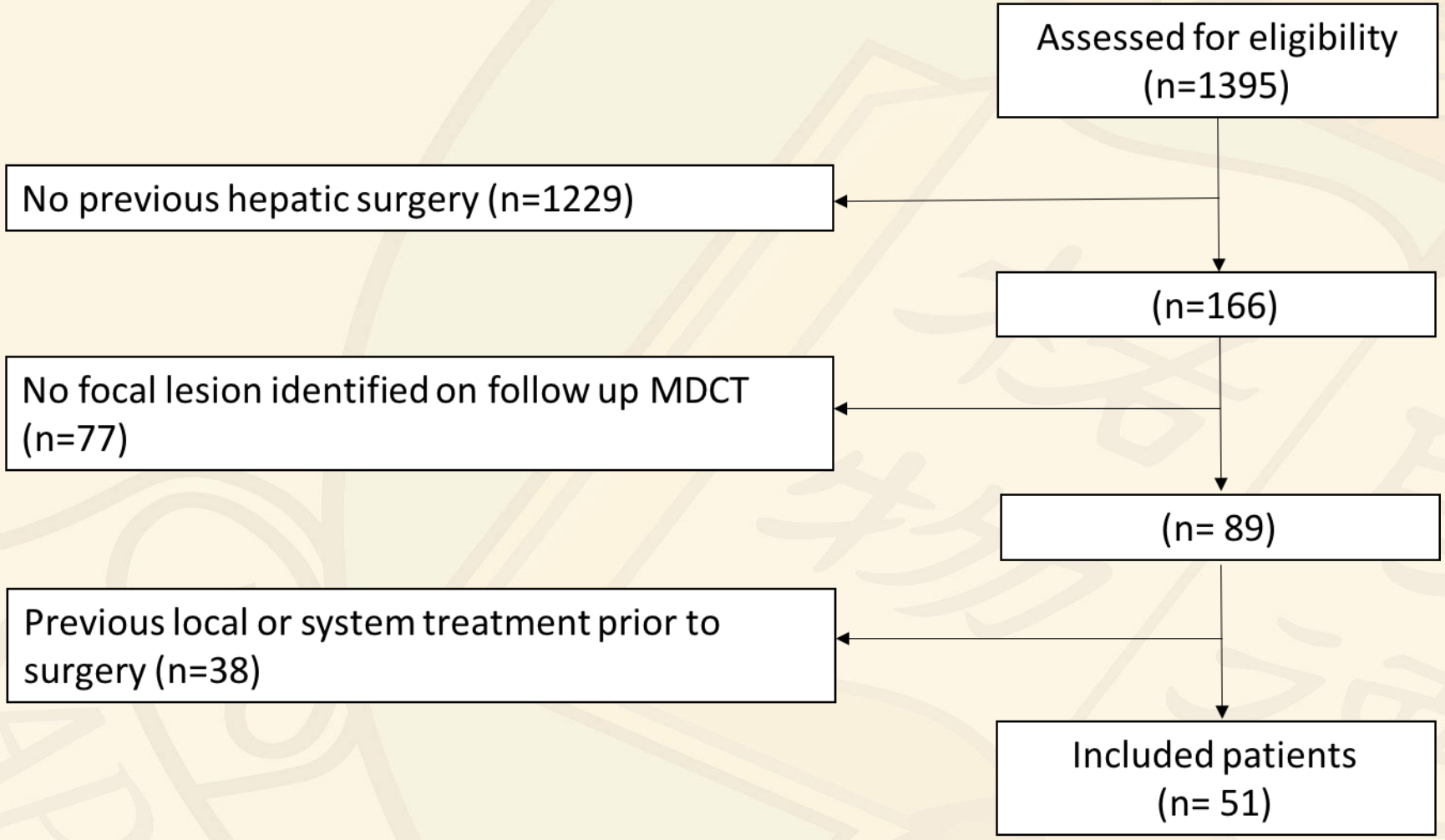
Purpose

- To assess the inter-reader agreement and outcomes of focal liver lesions identified on computed tomography (MDCT) and characterized using LI-RADS verion 2017 in patients who had undergone previous hepatic resection for Hepatocellular Carcinoma (HCC).

Materials and Methods

- Retrospective review of reports from radiological database between 2010-2015
- Patients undergone previous curative resection.
- Two abdominal radiologists independently reviewed lesions reported on follow-up CT scans using LI-RADS version 2017 categorization
- Compared with histological confirmation or long term follow-up.

Results


Assessed for eligibility (n=1395)
No previous hepatic surgery (n=1229)
(n=166)
No focal lesion identified on follow up MDCT (n=77)
(n= 89)
Previous local or system treatment prior to surgery (n=38)
Included patients (n= 51)

Patient Characteristics

	Patients with HCC recurrence in indexed lesions (N=20)	Patients with no recurrence in indexed lesions (N=31*)
M:F	16:4	25:6
Median Age (range)	58 (45-89)	59 (46-78)
Cause of liver disease:		
• **HBV**	17 (85%)	24 (77%)
• **HVC**	2 (10%)	3 (10%)
• **Others**	1 (5%)	4 (13%)
Serum AFP		
• **Median (ng/ml)**	15 (2-26160)	4 (2-212)
• **Raised (>20ng/ml)**	9 (45%)	4 (13%)
2-year overall survival	80%	94%**

*6 patients had HCC recurrence subsequently although the indexed lesions were considered to be benign.

** *p* value = 0.0100

Per lesion comparison of LI-RADS Category, AASLD criteria and final diagnosis

Consensus LI-RADS categorization	No of lesions (N=98)	HCC as per AASLD criteria	HCC as final diagnosis
1	17	0	0
2	5	0	0
3	50	0	13
4	18	8	14
5 / TIV	8	8	8

Number of Observations in Each LI-RADS category between 2 reviewers

		Reviewer 2					
	LR Categorisation	1	2	3	4	5 / TIV	Total
Reviewer 1	1	15	4	0	0	0	19
	2	0	2	0	0	0	2
	3	0	2	47	1	0	50
	4	0	0	6	13	0	19
	5 / TIV	0	0	0	0	8	8
	Total	15	8	53	14	8	98

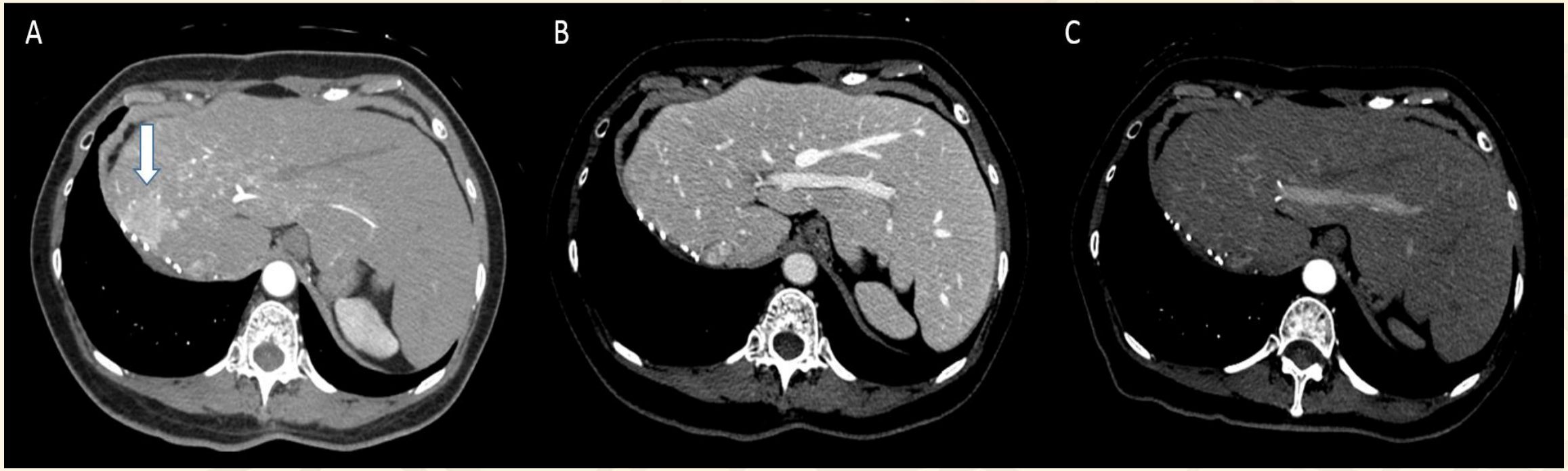
Per lesion analysis

- 35 (35.7%) HCC and 63 (64.3%) non-malignant
- 17/35 (51.4%) HCC have arterial hypervascularity and contrast washout on portovenous or delayed imaging
- 9/35 (25.7%) HCCs <10mm, 14/35 (40.0%) between 10-20 mm and 11/35 (34.3%) >20mm
- Median axial diameters of HCC were larger than those of non-malignant lesions (15 vs 8 mm $p<0.0001$).

Performance of LI-RADS

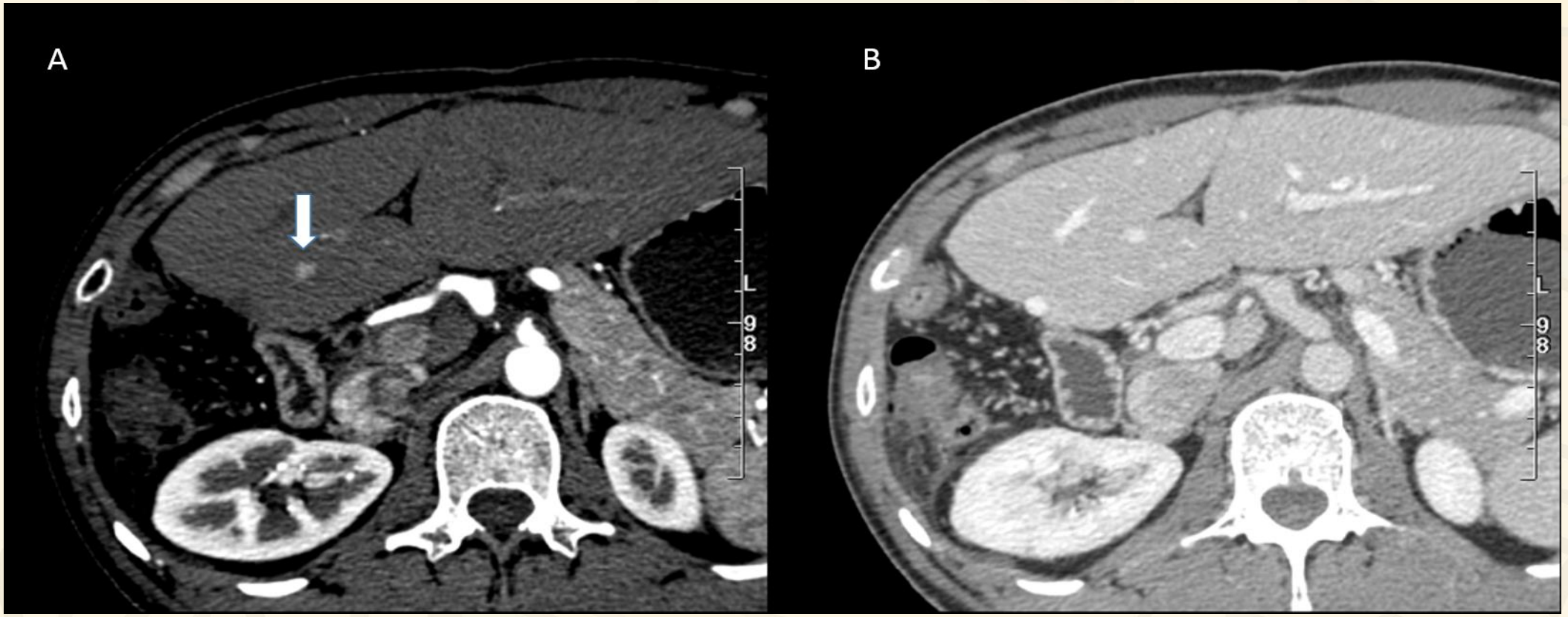
- All 8/8 (100%) LR-TIV & LR-5, 14/18 (77.8%) LR-4, and 13/50 (26.0%) LR-3 were HCC.
- All 22/22 (100%) LR-2 and LR-1 lesions were benign.
- All 13 LR-3 HCC were <20 mm.

LR-4 benign lesion



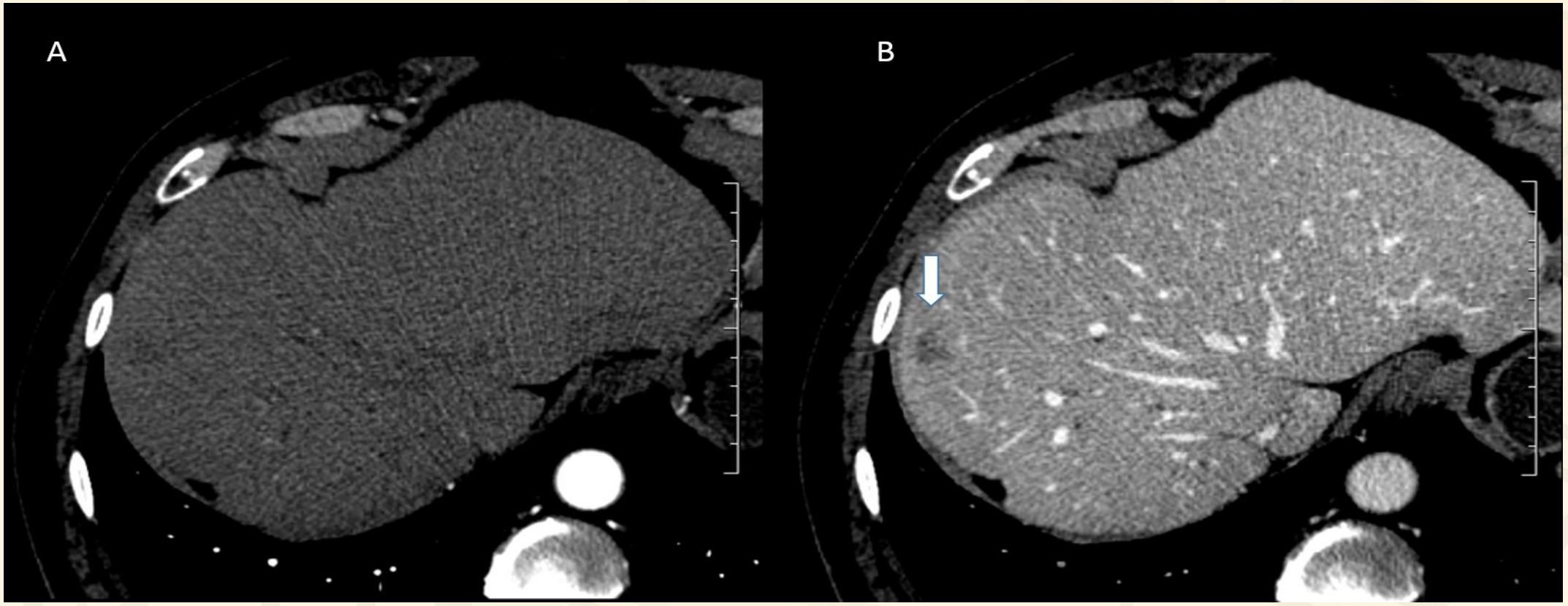
69 year-old woman with hepatitis B who underwent right hepatectomy for HCC. (A) Arterially hyperenhancing observation (40 mm) is seen on arterial phase CT (arrow), but is not noted to washout or have capsule on portovenous (B) or delayed phase CT. Both reviewers considered this lesion to be LR-4 but did not fulfil the AASLD criteria for HCC. (C) This lesion was not seen on follow-up imaging in 12 months.

LR-3 HCC (1)



43 year-old man with hepatitis B and previous right hepatectomy for HCC. (A) Arterially hyperenhancing observation (6 mm) is seen on arterial phase CT (arrow), with no contrast washout on portovenous (B) and delayed phase CT. The lesion was resected and histologically confirmed as a HCC. Both reviewers assigned this lesion as LR-3 and non-diagnostic of HCC based on AASLD criteria.

LR-3 HCC (2)



59 year-old man with hepatitis B and previous wedge resection for HCC. (A) The lesions (14 mm) is isodense / faintly hypodense on arterial phase CT, but is noted to have contrast washout on portovenous (B) and delayed phase CT. The lesion was considered to be LR-3 and not diagnostic of HCC by AASLD criteria. The lesion was resected and histologically confirmed to be a HCC.

Inter-rater agreement

- Very good agreement between the two reviewers using the AASLD criteria, k = 0.851 (95%CI 0.708-0.994 p<0.0001) and good agreement using LI-RADS categorization, k = 0.799 (95%CI 0.699-0.899 p<0.0001).

- 13 discordance using LI-RADS categorization, 4 between LR-1 and 2, 2 between LR-2 and 3, 7 between LR-3 and 4. None were more than one categorization.

Discussion (1)

- Our results shows that both the AASLD criteria and LR-5 categorization have high specificity in diagnosing HCC
- However, the sensitivities of both were low due to their restricting diagnostic criteria.
- By not distinguishing LR-4 and LR-5, significantly higher sensitivities for diagnosing HCC can be achieved while maintaining excellent specificities

Discussion (2)

- 26% (13/50) LR-3 lesions in our cohort were HCC, higher than other published studies. This could be due to the very high risks patient cohort in our study compared to the general population.

- 31% (13/42) LR-3 lesions in our cohort were not consistently visualized on follow-up imaging (psuedolesions).

Conclusion

- LI-RADS categorization has good inter-reader agreement although LR-5 alone is too restrictive for diagnosis of HCC.
- Sensitivity can be significantly increased when LR-4 and LR-5 categorization were combined.
- A significant proportion of LR-3 lesions were HCC and accelerated follow-up for these lesions is necessary to distinguish them from benign aetiology.

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