

Table S1 Formulas for the albumin-bilirubin score, aspartate aminotransferase/platelet ratio index, “Model for tumor recurrence after living donor liver transplantation” (MoRAL) score, and high risk of microvascular invasion

ALBI score	$[\log 10 \text{ bilirubin } (\mu\text{mol/L}) \times 0.66] + [\text{albumin (g/L)} \times -0.085]$
APRI	$[\text{AST (IU/L)} / \text{upper limit normal of AST/PLT } (\times 10^9/\text{L})] \times 100$
MoRAL score	$11 \times \sqrt{[\text{PIVKA-II}]} + 2 \times \sqrt{[\text{AFP}]}$

ALBI, albumin-bilirubin; APRI, aspartate aminotransferase/platelet ratio index; MoRAL, Model for tumor recurrence after living donor liver transplantation.

Table S2 Scoring system to predict high risk of microvascular invasion

Serum alpha-fetoprotein level (ng/mL)	Points
<15	0
≥15	1
Serum protein induced by vitamin K absence-II level (mAU/mL)	Points
<48	0
≥48	1
Peritumoral parenchymal enhancement on arterial phase	Points
(-)	0
(+)	1.5
Peritumoral hypointensity on hepatobiliary phase	Points
(-)	0
(+)	2.5
MVI risk group	Total points
MVI-high risk group	≥ 3.5
MVI-low risk group	< 3.5

The MVI prediction score model was calculated by adding the individual points for each of the four factors: α -FP, PIVKA-II, arterial peritumoral enhancement, and peritumoral hypointensity on HBP [1]. This model for predicting the presence of MVI was externally validated with an area under the receiver operating characteristic curve (AUC) of 0.82 (95% confidence interval [CI]:0.74–0.90), and its sensitivity, specificity, and accuracy were 65.2%, 85.9%, and 81.2%, respectively. In this model, one point is given to α -FP if ≥ 15 ng/mL, one point to PIVKA-II if ≥ 48 mAU/mL, 1.5 points if arterial peritumoral enhancement is present, and 2.5 points if peritumoral hypointensity on HBP is present. If the total number of points was ≥ 3.5 , it was regarded as MVI-high risk. The predictive presence of MVI could be estimated based on the total MVI score using the results of the previous study.

AFP, alpha-fetoprotein; PIVKA-II, protein induced by vitamin K absence-II; HBP, hepatobiliary phase; MVI, microvascular invasion.

Table S3 Balance check before and after propensity-score matching for matched variables.

	Before matching		After matching	
	TACE+RFA (<i>n</i> = 24), RFA (<i>n</i> = 371)		TACE+RFA (<i>n</i> = 21), RFA (<i>n</i> = 42)	
	SMD	<i>p</i>	SMD	<i>p</i>
*Total bilirubin, mg/dL	0.357	0.123	0.166	0.591
*Prothrombin time, INR	0.376	0.092	−0.090	0.768
*Platelet count, × 10 ⁹ /L	−0.357	0.102	0.017	0.948
*log(AFP)	−0.498	0.001	−0.131	0.727
*Sex	−0.494	0.006	0.000	1.000
*Cause of liver disease (HBV)	−0.533	0.026	−0.047	0.865
*Cause of liver disease (HCV)	0.291	0.230	0.055	0.857
*Cause of liver disease (alcohol)	0.415	0.102	−0.066	0.792
*Cause of liver disease (others)	−0.045	0.827	0.109	0.686
*Periportal vein tumor location	0.452	0.089	−0.066	0.816
*Washout appearance (on PVP)	−0.386	0.073	0.148	0.610
*Enhancing capsule	−0.459	0.025	−0.178	0.560
*LR-3	0.649	0.008	−0.047	0.873
*LR-4	0.043	0.846	−0.118	0.686
*LR-5	−0.419	0.045	0.109	0.686
*LR-M	−0.410	0.011	0.109	0.686
*Non-smooth tumor margin	−0.519	0.004	0.079	0.792
Age	−0.120	0.588	−0.261	0.424
Albumin, g/dL	−0.304	0.159	0.076	0.812
ALBI grade 1	−0.203	0.359	0.191	0.508
ALBI grade 2	0.238	0.287	−0.096	0.742
AST, U/L	−0.141	0.299	−0.269	0.483
APRI	0.195	0.425	0.081	0.722
Child–Pugh classification grade	−0.123	0.521	−0.436	0.153
PIVKA-II, mAU/mL	0.177	0.409	−0.085	0.828
MoRAL score (>68)	−0.108	0.609	0.049	0.865
Tumor size (cm)	0.074	0.743	0.142	0.589
Perihepatic vein tumor location	−0.191	0.294	−0.327	0.425
Non-subphrenic subcapsular location	0.100	0.651	0.000	1.000
Subphrenic location	0.178	0.438	0.436	0.096
Non-subcapsular location	−0.224	0.310	−0.376	0.203
No non-rim APHE	0.203	0.416	−0.109	0.755
Non-rim APHE	0.044	0.833	−0.079	0.792
Rim APHE	−0.243	0.165	0.218	0.318
Peripheral washout appearance	−0.147	0.045	0.000	1.000
Progressive centripetal enhancement	−0.269	0.000	0.000	1.000
Transitional phase targetoid appearance	−0.223	0.003	0.000	1.000
HBP targetoid appearance	−0.258	0.000	0.000	1.000
DWI targetoid appearance	−0.153	0.413	0.109	0.686
Non-targetoid LR-M features	−0.410	0.011	0.109	0.686
Arterial peritumoral hyperenhancement	−0.335	0.068	−0.546	0.178
HBP peritumoral hypointensity	−0.172	0.350	−0.109	0.755
Signal intensity of tumor on HBP	0.282	0.268	−0.133	0.708
MVI-high risk	−0.172	0.350	0.000	1.000

Standardized mean differences indicate very small differences for values less than 0.10; 0.1–0.3, small differences; 0.3–0.5, moderate differences; and values higher than 0.5, large differences.

INR, international normalized ratio; AFP, alpha-fetoprotein; HBV, hepatitis B virus; HCV, hepatitis C virus; PVP, portal venous phase; LR, LI-RADS, Liver Imaging Reporting and Data System category; ALBI grade, albumin-bilirubin grade; AST, aspartate aminotransferase; APRI, AST/platelet ratio index; PIVKA-II, protein induced by vitamin K absence-II; MoRAL score, Model for Tumor Recurrence After Living Donor Liver Transplantation

score; APHE, arterial phase hyperenhancement; DWI, diffusion weighted images; HBP, hepatobiliary phase; MVI, microvascular invasion; SMD, standard mean difference; TACE, transarterial chemoembolization; RFA, radiofrequency ablation.

* Variables used for propensity score matching.

Table S4 Inter-reader agreement of the imaging findings

Variables	Kappa	95% CI
Non-rim arterial hyperenhancement	0.834	0.704–0.964
Washout appearance	0.771	0.710–0.832
Enhancing capsule	0.642	0.566–0.717
LR-M	0.758	0.681–0.835
Peri-tumoral enhancement	0.661	0.570–0.753
Non-smooth margin	0.650	0.566–0.734
Peritumoral hypointensity	0.682	0.557–0.807
Low SI on HBP (reference=iso/high)	0.859	0.736–0.981

A κ value of 0.01–0.20 was interpreted as slight, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1.00 as excellent agreement

REFERENCES

1. Lee, S.; Kang, T.W.; Song, K.D.; Lee, M.W.; Rhim, H.; Lim, H.K.; Kim, S.Y.; Sinn, D.H.; Kim, J.M.; Kim, K.; et al. Effect of Microvascular Invasion Risk on Early Recurrence of Hepatocellular Carcinoma After Surgery and Radiofrequency Ablation. *Ann. Surg.* **2021**, *273*, 564-571.