Supplementary materials

Title: Prediction of Early Recurrence of Solitary Hepatocellular Carcinoma after Orthotopic Liver Transplantation

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Supplemental Table 1: Multicollinearity analysis

Variable	Adjusted R^2	Unstandardized Coefficients		Standardized Coefficients				
		B	*Std.* Error	Beta	t	*P*	Tolerance	VIF
Cirrhosis	0.404	-0.116	0.175	-0.055	-0.667	0.507	0.868	1.153
Macroscopic vascular invasion		0.095	0.111	0.077	0.851	0.397	0.718	1.392
Microscopic vascular invasion		0.142	0.079	0.156	1.793	0.076	0.789	1.268
Histological grading		0.029	0.058	0.045	0.499	0.619	0.738	1.355
CK19/GPC3 sub-typing		0.217	0.067	0.298	3.216	0.002	0.695	1.439
AFP level		0.152	0.085	0.162	1.803	0.075	0.742	1.348

Tumor diameter	0.274	0.088	0.287	3.107	0.003	0.698	1.433

Dependent Variable: recurrence; VIF, variance inflation factor; *Std.* Error, Standard error; CK, cytokeratin; GPC3, glypican 3; AFP, alpha fetoprotein.

A tolerance of less than 0.20 and/or a VIF of 10 and above indicates a multicollinearity problem.

Supplemental Table 2. Comparing the performance of the model with single predictors and other criteria in the two cohorts

Variable	Training cohort				Validation cohort			
	AUC	95% CI(Lower-Upper)		*P*	AUC	95% CI(Lower-Upper)		*P*
CK19 expression	0.612	0.484	0.741	=0.076	0.552	0.371	0.734	=0.560
GPC3 expression	0.716	0.617	0.815	=0.001	0.729	0.592	0.865	=0.011
CK19/GPC3 sub-typing	0.767	0.673	0.861	<0.001	0.750	0.618	0.883	=0.005
Macroscopic vascular invasion	0.641	0.515	0.768	=0.026	0.486	0.300	0.660	=0.874
Microscopic vascular invasion	0.679	0.567	0.791	=0.005	0.762	0.604	0.920	=0.004
Tumor diameter	0.744	0.634	0.855	<0.001	0.633	0.465	0.802	=0.138
AFP level	0.730	0.619	0.842	<0.001	0.719	0.571	0.867	=0.015
Histological grading	0.677	0.567	0.786	=0.005	0.730	0.572	0.887	=0.011
Cirrhosis	0.464	0.338	0.591	=0.570	0.524	0.350	0.697	=0.791
Milan criteria	0.708	0.586	0.829	=0.001	0.595	0.415	0.775	=0.290
UCSF criteria	0.646	0.518	0.773	=0.021	0.624	0.443	0.805	=0.169
Fudan criteria	0.593	0.464	0.722	=0.141	0.619	0.436	0.802	=0.186
Hanzhou criteria	0.569	0.441	0.697	=0.273	0.667	0.485	0.848	=0.064
The novel model	0.844	0.760	0.929	<0.001	0.876	0.759	0.994	<0.001

AUC, area under the curve; CI, confidence interval; CK, cytokeratin; GPC3, glypican 3; AFP, alpha-fetal protein; UCSF, the University of California

Supplemental Table 3. Test the statistical significance of the difference between the AUCs

	The novel model					
	Training cohort			Validation cohort		
Variable	**95% CI (Lower-Upper)**		***P***	**95% CI (Lower-Upper)**		***P***
Milan criteria	-0.001	0.274	=0.052	0.085	0.476	=0.005
UCSF criteria	0.055	0.342	=0.007	0.055	0.450	=0.012
Fudan criteria	0.111	0.392	=0.005	0.053	0.461	=0.014
Hanzhou criteria	0.131	0.420	=0.002	0.005	0.414	=0.045

Supplemental Table 4. Baseline clinical characteristics of patients in the validation cohort

Variable		Recurrence	No
Age, years	Median(range)	53(43-61)	48(35-73)
	mean ±SD	52 ±4.8	50.4 ±8.3
Gender, n (%)			
	male	15(30.0)	28(56.0)
	female	0(0.0)	7(14.0)
Cirrhosis, n (%)			
	yes	14(28.0)	31(62.0)
	no	1(2.0)	4(8.0)
Etiology, n (%)			
	HBV infection	14(28.0)	28(56.0)
	HCV infection	0(0)	4(8.0)

	alcohol abuse	0(0)	0(0)
	Budd-Chiari syndrome	0(0)	0(0)
	schistosome infection	0(0)	0(0)
	HBV infection+ alcohol abuse	0(0)	0(0)
	HBV+HEV infection	0(0)	0(0)
	HBV+HCV infection	1(0)	2(4.0)
	AIH	0(0)	1(2.0)
Child-Pugh score	A	8(16.0)	11(22.0)
	B	4(8.0)	18(36.0)
	C	3(6.0)	6(12.0)
MELD score	Median(range)	8(2-19)	8(3-27)
AFP level			
	≤20 ng/mL	1(2.0)	13(26.0)

	>20 ng/ mL, ≤200 ng/mL	1(2.0)	7(14.0)
	>200 ng/ mL, ≤400 ng/mL	4(8.0)	5(10.0)
	>400 ng/ mL	9(18.0)	10(20.0)
CK19/GPC3 sub-typing, n (%)			
	CK19+/GPC3+	2(4.0)	1(2.0)
	CK19-/GPC3+	13(26.0)	18(36.0)
	CK19-/GPC3-	0(0)	16(32.0)
Histological grading, n (%)			
	poorly	10(20.0)	8(16.0)
	moderately	3(6.0)	14(28.0)
	well	2(4.0)	13(26.0)

Macroscopic vascular invasion, n (%)	yes	0(0)	1(2.0)
	no	15(30.0)	34(68.0)
Microscopic vascular invasion, n (%)	yes	10(20.0)	5(10.0)
	no	5(10.0)	30(60.0)
Tumor diameter, n (%)			
	≤3cm	5(10.0)	19(38.0)
	>3cm, ≤5cm	5(10.0)	11(22.0)
	>5cm	5(10.0)	5(10.0)
Milan criteria, n (%)			
	within	10(20.0)	30(60.0)

	beyond	5(10.0)	5(10.0)
UCSF criteria, n (%)			
	within	10(20.0）	32（64.0）
	beyond	5(10.0)	3(6.0)
Fudan criteria, n (%)			
	within	11(22.0)	34(68.0)
	beyond	4(8.0)	1(2.0)
Hangzhou criteria, n (%)			
	within	10(20.0)	35(70.0)
	beyond	5(10.0)	0(0.0)

SD, standard deviation; HBV, hepatitis C virus; HCV, hepatitis C virus; CK19, cytokeratin 19; GPC3, glypican 3; UCSF, University of California, San Francisco