

**Table S1** Inclusion and exclusion criteria for HCC patients into the study

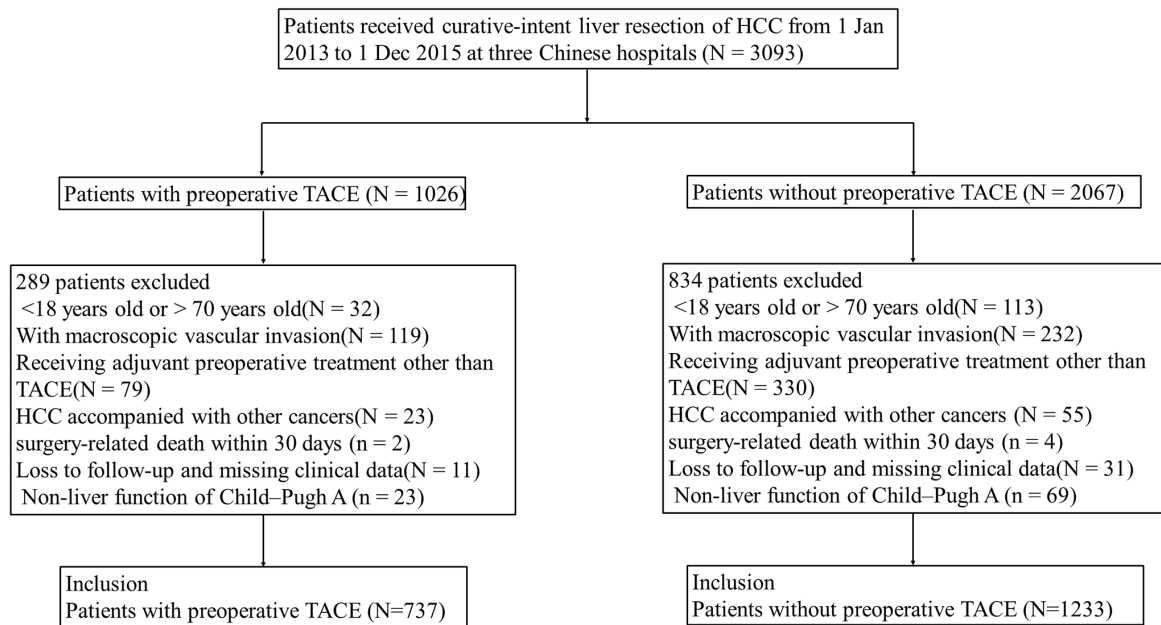
Inclusion criteria

- No macrovascular invasion or extrahepatic metastasis
- Liver function of Child-Pugh A
- R0 liver resection with negative margins
- A histopathological diagnosis of MVI determined by two experienced pathologists
- Complete clinical and follow-up data
- No other anti-cancer treatment prior to surgery except TACE, including percutaneous ethanol injection, percutaneous radiofrequency ablation chemotherapy, radiotherapy, molecular targeted agents or portal vein embolization

Exclusion criteria

- Incomplete clinical and/or follow-up data
- R1/R2 palliative resection
- HCC accompanied with other cancers
- Surgery-related death within 30 days
- Age >70 or <18 years

HCC, hepatocellular carcinoma; MVI, microvascular invasion; TACE, transcatheter arterial chemoembolization.



**Figure S1** Selection of the study population. HCC, hepatocellular carcinoma; TACE, transarterial chemoembolization.

**Table S2** Comparisons of patients' baseline characteristics between patients with and without preoperative TACE before and after PSM

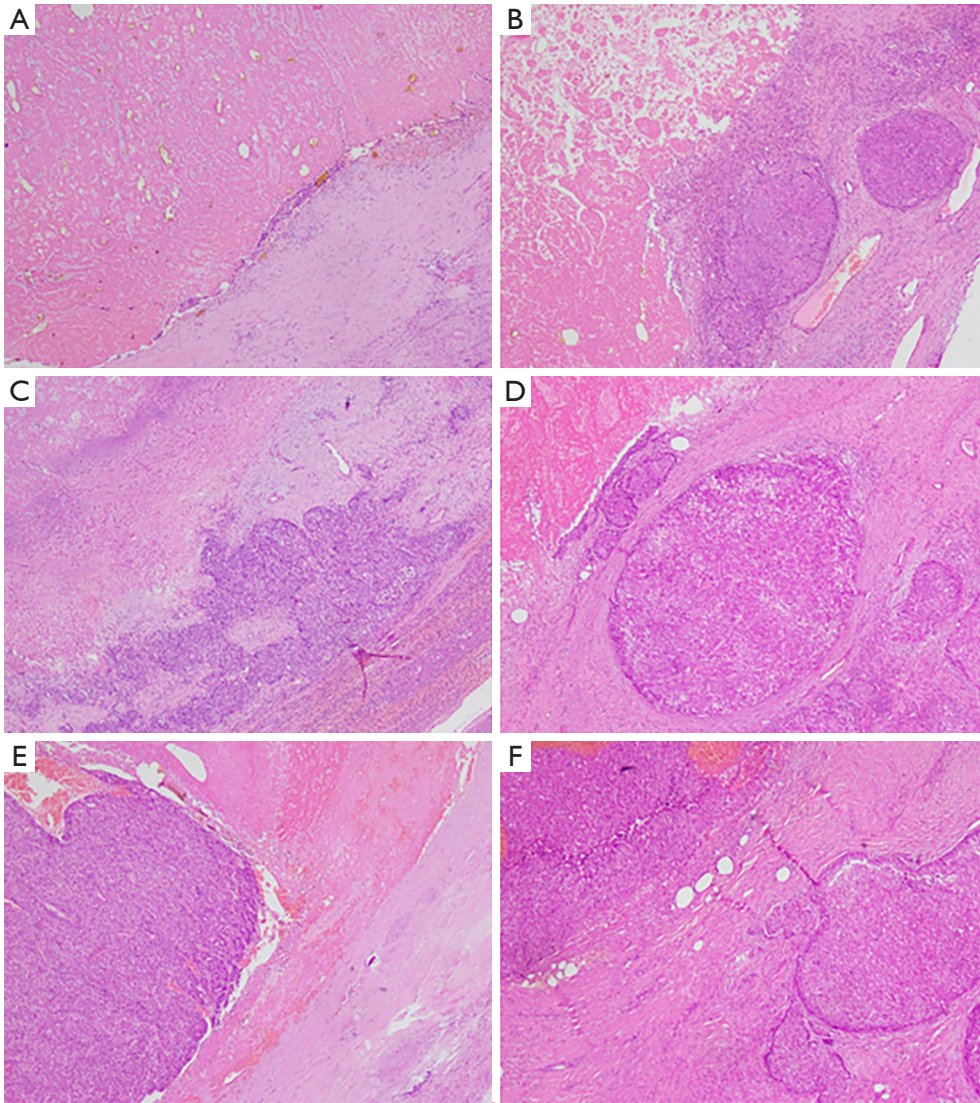
Variables	The entire cohort			The PSM cohort		
	With preoperative TACE (N=737), N (%)	Without preoperative TACE (N=1,233), N (%)	P	With preoperative TACE (N=602), N (%)	Without preoperative TACE (N=602), N (%)	P
Age, years (mean ± SD)	51.2±10.4	52.2±10.3	0.055	51.8±10.5	51.3±10.3	0.425
Gender			0.003			0.609
Male	654 (88.7)	1,035 (83.9)		526 (87.4)	520 (86.4)	
Female	83 (11.3)	198 (16.1)		76 (12.6)	82 (13.6)	
HbsAg			0.035			0.865
+	646 (87.7)	1,038 (84.2)		521 (86.5)	523 (86.9)	
-	91 (12.4)	195 (15.8)		81 (13.5)	79 (13.1)	
HbeAg			0.066			0.652
+	215 (29.2)	313 (25.4)		170 (28.2)	163 (27.1)	
-	522 (70.8)	920 (74.6)		432 (71.8)	439 (72.9)	
HCV Ab			0.306			1.000
+	16 (2.2)	19 (1.5)		12 (2.0)	12 (2.0)	
-	721 (97.8)	1,214 (98.5)		590 (98.0)	590 (98.0)	
HBV DNA			0.001			0.801
≥10,000 IU/mL	197 (26.7)	421 (34.1)		181 (30.1)	177 (29.4)	
<10,000 IU/mL	540 (73.3)	812 (65.9)		421 (69.9)	425 (60.6)	
AFP			0.023			0.768
≥400 ng/mL	299 (40.6)	437 (35.4)		236 (39.2)	231 (38.4)	
<400 ng/mL	438 (59.4)	796 (64.6)		366 (60.8)	371 (61.6)	
TBIL			<0.001			1.000
≥20 μmol/L	219 (29.7)	177 (14.4)		131 (21.8)	131 (21.8)	
<20 μmol/L	518 (70.3)	1,056 (85.6)		471 (78.2)	471 (78.2)	
ALB			<0.001			0.556
≥40 g/L	412 (55.9)	847 (68.7)		357 (59.3)	367 (61.0)	
<40 g/L	325 (44.1)	386 (31.3)		245 (40.7)	235 (39.0)	
ALT			<0.001			0.772
≥40 U/L	353 (47.9)	470 (38.1)		272 (45.2)	277 (46.0)	
<40 U/L	384 (52.1)	763 (61.9)		330 (54.8)	325 (54.0)	
PLT			<0.001			0.731
≥100×10 <sup>9</sup> /L	555 (75.3)	1,012 (82.0)		468 (77.7)	463 (76.9)	
<100×10 <sup>9</sup> /L	182 (24.7)	221 (17.9)		134 (22.3)	139 (23.1)	
Tumor number			<0.001			0.283
Single	530 (71.9)	1,016 (82.4)		463 (76.9)	447 (74.3)	
Multiple	207 (28.1)	217 (17.6)		139 (23.2)	155 (25.8)	
Liver cirrhosis			<0.001			0.103
Yes	376 (51.0)	399 (32.4)		270 (44.9)	242 (40.2)	
No	361 (50.0)	834 (67.6)		332 (55.2)	360 (59.8)	
Max tumor diameter, cm (mean ± SD)	6.9±4.5	6.3±4.1	0.008	6.6±4.3	6.7±4.3	0.971
Tumor capsule			<0.001			0.624
Absent or partial	564 (76.5)	1,034 (83.9)		476 (79.0)	469 (77.8)	
Complete	173 (23.5)	199 (16.1)		126 (21.0)	133 (22.1)	
Tumor margin			0.001			0.610
Smooth	614 (83.3)	947 (76.8)		489 (81.2)	482 (80.1)	
Non-smooth	123 (16.7)	286 (23.2)		113 (18.8)	120 (19.9)	
Edmondson grade			0.818			0.801
I + II	93 (12.6)	160 (13.0)		80 (13.3)	83 (13.8)	
III + IV	644 (87.4)	1,073 (87.0)		522 (86.7)	519 (86.2)	
Satellite nodules			0.020			0.729
Presence	342 (46.4)	639 (51.8)		276 (45.9)	282 (46.8)	
Absence	395 (53.6)	594 (48.2)		326 (54.2)	320 (53.2)	
Surgical margin			0.013			0.588
≥1 cm	153 (20.8)	317 (25.7)		139 (23.1)	147 (24.4)	
<1 cm	584 (79.3)	916 (74.3)		463 (76.9)	455 (75.6)	
Anatomical resection			0.002			0.508
Yes	230 (31.2)	471 (38.2)		220 (36.5)	209 (34.7)	
No	507 (68.8)	762 (61.8)		382 (63.5)	393 (65.3)	
Anti-virus treatment			0.040			0.553
Yes	259 (35.9)	381 (31.4)		161 (27.3)	152 (25.8)	
No	462 (64.1)	833 (68.6)		429 (72.7)	438 (74.2)	

TACE, transcatheter arterial chemoembolization; PR, pathological response; HCV Ab, hepatitis C virus antibody; HBV, hepatitis B virus; DNA, deoxyribonucleic acid; TBIL, total bilirubin; ALT, alanine aminotransferase; ALB, albumin; PLT, platelet; AFP, serum alpha-fetoprotein; HBeAg, hepatitis B e antigen; HBsAg, hepatitis B surface antigen; PSM, propensity score matching.

**Table S3** Comparisons of patients' baseline characteristics between patients with PR area  $\geq 90\%$  and without preoperative TACE before and after PSM

Variables	The entire cohort			The PSM cohort		
	With preoperative TACE (N=226), N (%)	Without preoperative TACE (N=1,233), N (%)	P	With PR area $\geq 90\%$ (N=222), N (%)	Without preoperative TACE (N=222), N (%)	P
Age, years (mean $\pm$ SD)	51.7 $\pm$ 10.3	52.2 $\pm$ 10.3	0.557	51.6 $\pm$ 10.3	51.7 $\pm$ 9.8	0.925
Gender			0.081			0.101
Male	200 (88.5)	1,035 (83.9)		197 (88.7)	185 (83.3)	
Female	26 (11.5)	198 (16.1)		25 (11.3)	37 (16.7)	
HbsAg			0.253			0.562
+	197 (87.2)	1,038 (84.2)		193 (86.9)	197 (88.7)	
-	29 (12.8)	195 (15.8)		29 (13.1)	25 (11.3)	
HbeAg			0.611			0.517
+	61 (27.0)	313 (25.4)		61 (27.5)	55 (24.8)	
-	165 (73.0)	920 (74.6)		161 (72.5)	167 (75.2)	
HCV Ab			0.466			0.372
+	5 (2.2)	19 (1.5)		4 (1.8)	1 (0.5)	
-	221 (97.8)	1,214 (98.5)		218 (98.2)	221 (99.6)	
HBV DNA			0.018			0.295
$\geq 10,000$ IU/mL	59 (26.1)	421 (34.1)		59 (26.6)	69 (31.1)	
$< 10,000$ IU/mL	167 (73.9)	812 (65.9)		163 (73.4)	153 (68.9)	
AFP			0.888			0.377
$\geq 400$ ng/mL	79 (35.0)	437 (35.4)		78 (35.1)	87 (39.2)	
$< 400$ ng/mL	147 (65.0)	796 (64.6)		144 (64.9)	135 (60.8)	
TBIL			$< 0.001$			0.660
$\geq 20$ $\mu$ mol/L	61 (27.0)	177 (14.4)		57 (25.7)	53 (23.9)	
$< 20$ $\mu$ mol/L	165 (73.0)	1,056 (85.7)		165 (74.3)	169 (76.2)	
ALB			$< 0.001$			0.567
$\geq 40$ g/L	123 (54.4)	847 (68.7)		121 (54.5)	127 (57.2)	
$< 40$ g/L	103 (45.6)	386 (31.3)		101 (45.5)	95 (42.8)	
ALT			0.137			0.391
$\geq 40$ U/L	98 (43.4)	470 (38.1)		96 (43.2)	105 (47.3)	
$< 40$ U/L	128 (56.6)	763 (61.9)		126 (56.8)	117 (52.7)	
PLT			0.010			0.738
$\geq 100 \times 10^9$ /L	169 (74.8)	1,012 (82.1)		168 (75.7)	171 (77.0)	
$< 100 \times 10^9$ /L	57 (25.2)	221 (17.9)		54 (24.3)	51 (23.0)	
Tumor number			0.011			0.367
Single	170 (75.2)	1,016 (82.4)		167 (75.2)	175 (78.8)	
Multiple	56 (24.8)	217 (17.6)		55 (24.8)	47 (21.2)	
Liver cirrhosis			$< 0.001$			0.128
Yes	112 (49.6)	399 (32.4)		109 (49.1)	93 (41.9)	
No	114 (50.4)	834 (67.6)		113 (50.9)	129 (58.1)	
Max tumor diameter, cm (mean $\pm$ SD)	4.6 $\pm$ 1.5	6.3 $\pm$ 4.1	$< 0.001$	4.7 $\pm$ 1.5	5.0 $\pm$ 3.3	0.156
Tumor capsule			$< 0.001$			0.121
Absent or partial	163 (72.1)	1,034 (83.9)		163 (73.4)	148 (66.7)	
Complete	63 (27.9)	199 (16.1)		59 (26.6)	74 (33.3)	
Tumor margin			$< 0.001$			0.772
Smooth	200 (88.5)	947 (76.8)		196 (88.3)	194 (87.4)	
Non-smooth	26 (11.5)	286 (23.2)		26 (11.7)	28 (12.6)	
Edmondson grade			0.193			0.647
I + II	38 (16.8)	160 (13.0)		22 (15.7)	39 (17.6)	
III + IV	188 (83.2)	1,073 (87.0)		118 (84.3)	183 (82.4)	
Satellite nodules			$< 0.001$			0.616
Presence	72 (31.9)	639 (51.9)		72 (32.4)	77 (34.7)	
Absence	154 (68.1)	594 (48.2)		150 (67.6)	145 (65.3)	
Surgical margin			0.317			0.438
$\geq 1$ cm	51 (22.6)	317 (25.7)		50 (22.5)	57 (25.7)	
$< 1$ cm	175 (77.4)	916 (74.3)		172 (77.5)	165 (74.3)	
Anatomical resection			$< 0.001$			0.458
Yes	58 (25.7)	471 (38.2)		58 (26.2)	65 (29.3)	
No	168 (74.4)	762 (61.8)		164 (73.9)	157 (70.7)	
Anti-virus treatment			0.039			0.160
Yes	85 (38.5)	381 (31.4)		83 (38.0)	70 (31.7)	
No	136 (61.5)	833 (68.6)		135 (61.0)	151 (68.3)	

TACE, transcatheter arterial chemoembolization; PR, pathological response; HCV Ab, hepatitis C virus antibody; HBV, hepatitis B virus; DNA, deoxyribonucleic acid; TBIL, total bilirubin; ALT, alanine aminotransferase; ALB, albumin; PLT, platelet; AFP, serum alpha-fetoprotein; HBeAg, hepatitis B e antigen; HBsAg, hepatitis B surface antigen; PSM, propensity score matching.



**Figure S2** Pathology images of different PR area with or without MVI. (A) Patients with PR  $\geq 90\%$  without MVI; (B) patients with PR  $\geq 90\%$  with MVI; (C) patients with PR between 60–90% without MVI; (D) patients with PR between 60–90% with MVI; (E) patients with PR  $< 60\%$  without MVI; (F) patients with PR  $< 60\%$  with MVI. HE staining,  $\times 100$ . PR, pathological response; MVI, microvascular invasion.

**Table S4** Comparisons of patients' baseline characteristics between patients with PR area between 60–90% and without preoperative TACE before and after PSM

Variables	The entire cohort			The PSM cohort		
	With PR area between 60–90% (N=447), N (%)	Without preoperative TACE (N=1,233), N (%)	P	With PR area between 60–90% (N=420), N (%)	Without preoperative TACE (N=420), N (%)	P
Age, years (mean ± SD)	51.6±10.4	52.1±10.3	0.317	51.8±10.0	51.7±10.5	0.903
Gender			0.033			0.192
Male	394 (88.1)	1,035 (83.9)		369 (87.9)	356 (84.8)	
Female	53 (11.9)	198 (16.1)		51 (12.1)	64 (15.2)	
HbsAg			0.024			0.462
+	396 (88.6)	1,038 (84.2)		372 (88.6)	365 (86.9)	
–	51 (11.4)	195 (15.8)		48 (11.4)	55 (13.1)	
HbeAg			0.012			0.361
+	141 (31.5)	313 (25.4)		127 (30.2)	115 (27.4)	
–	306 (68.5)	920 (74.6)		293 (69.8)	305 (72.6)	
HCV Ab			0.504			0.435
+	9 (2.0)	19 (1.54)		9 (2.1)	6 (1.4)	
–	438 (98.0)	1,214 (98.5)		411 (97.9)	414 (98.6)	
HBV DNA			0.017			0.408
≥10,000 IU/mL	125 (28.0)	421 (34.1)		121 (28.8)	132 (31.4)	
<10,000 IU/mL	322 (72.0)	812 (65.9)		299 (71.2)	288 (68.6)	
AFP			0.039			0.725
≥400 ng/mL	183 (40.9)	437 (35.4)		166 (39.5)	171 (40.7)	
<400 ng/mL	264 (59.1)	796 (64.6)		254 (60.5)	249 (59.3)	
TBIL			<0.001			0.644
≥20 μmol/L	143 (32.0)	177 (14.4)		120 (28.6)	114 (27.1)	
<20 μmol/L	304 (68.0)	1,056 (85.6)		300 (71.4)	306 (72.9)	
ALB			<0.001			0.524
≥40 g/L	260 (58.2)	847 (68.7)		253 (60.2)	262 (62.4)	
<40 g/L	187 (41.8)	386 (31.3)		167 (39.8)	158 (37.6)	
ALT			<0.001			0.836
≥40 U/L	216 (48.3)	470 (38.1)		199 (47.4)	202 (48.1)	
<40 U/L	231 (51.7)	763 (61.9)		221 (52.6)	218 (51.9)	
PLT			<0.001			1.000
≥100×10 <sup>9</sup> /L	332 (74.3)	1,012 (82.1)		317 (75.5)	317 (75.5)	
<100×10 <sup>9</sup> /L	115 (25.7)	221 (17.9)		103 (24.5)	103 (24.5)	
Tumor number			<0.001			0.753
Single	324 (72.5)	1,016 (82.4)		313 (74.5)	309 (73.6)	
Multiple	123 (27.5)	217 (17.6)		107 (25.5)	111 (26.4)	
Liver cirrhosis			<0.001			0.148
Yes	238 (53.2)	399 (32.4)		218 (51.9)	197 (46.9)	
No	209 (46.8)	834 (67.6)		202 (48.1)	223 (53.1)	
Max tumor diameter, cm (mean ± SD)	7.1±4.6	6.3±4.1	0.002	6.7±4.4	6.9±4.5	0.580
Tumor capsule			0.004			0.365
Absent or partial	348 (77.9)	1,034 (83.9)		330 (78.6)	319 (76.0)	
Complete	99 (22.1)	199 (16.1)		90 (21.4)	101 (24.0)	
Tumor margin			0.084			0.447
Smooth	361 (80.8)	947 (76.8)		336 (80.0)	327 (77.9)	
Non-smooth	86 (19.2)	286 (23.2)		84 (20.0)	93 (22.1)	
Edmondson grade			0.627			0.476
I + II	54 (12.1)	160 (13.0)		52 (12.4)	59 (14.0)	
III + IV	393 (87.9)	1,073 (87.0)		368 (87.6)	361 (86.0)	
Satellite nodules			0.829			0.535
Presence	229 (51.2)	639 (51.8)		212 (50.5)	221 (52.6)	
Absence	218 (48.8)	594 (48.2)		208 (49.5)	199 (47.4)	
Surgical margin			0.075			0.680
≥1 cm	96 (21.5)	317 (25.7)		92 (21.9)	97 (23.1)	
<1 cm	351 (78.5)	916 (74.3)		328 (78.1)	323 (76.9)	
Anatomical resection			0.046			0.425
Yes	147 (32.9)	471 (38.2)		140 (33.3)	151 (36.0)	
No	300 (67.1)	762 (61.8)		280 (66.7)	269 (64.0)	
Anti-virus treatment			0.203			0.410
Yes	152 (34.7)	381 (31.4)		132 (32.1)	122 (29.5)	
No	286 (65.3)	833 (68.6)		279 (67.9)	292 (70.5)	

TACE, transcatheter arterial chemoembolization; PR, pathological response; HCV Ab, hepatitis C virus antibody; HBV, hepatitis B virus; DNA, deoxyribonucleic acid; TBIL, total bilirubin; ALT, alanine aminotransferase; ALB, albumin; PLT, platelet; AFP, serum alpha-fetoprotein; HBeAg, hepatitis B e antigen; HBsAg, hepatitis B surface antigen; PSM, propensity score matching.

**Table S5** Comparisons of patients' baseline characteristics between patients with PR area <60% and without preoperative TACE before and after PSM

Variables	The entire cohort			The PSM cohort		
	With PR area <60% (N=64), N (%)	Without preoperative TACE (N=1,233), N (%)	P	With PR area <60% (N=50), N (%)	Without preoperative TACE (N=50), N (%)	P
Age, years (mean ± SD)	47.0±10.7	52.2±10.3	<0.001	48.2±9.9	48.5±11.3	0.895
Gender			0.035			1.000
Male	60 (93.8)	1,035 (83.9)		46 (92.0)	46 (92.0)	
Female	4 (6.3)	198 (16.1)		4 (8.0)	4 (8.0)	
HbsAg			0.770			0.237
+	53 (82.8)	1,038 (84.2)		41 (82.0)	36 (72.0)	
-	11 (17.2)	195 (15.8)		9 (18.0)	14 (28.0)	
HbeAg			0.362			0.491
+	13 (20.3)	313 (25.4)		11 (22.0)	14 (28.0)	
-	51 (79.7)	920 (74.6)		39 (78.0)	36 (72.0)	
HCV Ab			0.620			1.000
+	2 (3.1)	19 (1.5)		2 (4.0)	1 (2.0)	
-	62 (96.9)	1,214 (98.5)		48 (96.0)	49 (98.0)	
HBV DNA			0.022			0.262
≥10,000 IU/mL	13 (20.3)	421 (34.1)		11 (22.0)	16 (32.0)	
<10,000 IU/mL	51 (79.7)	812 (65.9)		39 (78.0)	34 (68.0)	
AFP			<0.001			0.688
≥400 ng/mL	37 (57.8)	437 (35.4)		27 (54.0)	29 (58.0)	
<400 ng/mL	27 (42.2)	796 (64.6)		23 (46.0)	21 (42.0)	
TBIL			0.046			0.464
≥20 μmol/L	15 (23.4)	177 (14.4)		12 (24.0)	9 (18.0)	
<20 μmol/L	49 (76.6)	1,056 (85.6)		38 (76.0)	41 (82.0)	
ALB			<0.001			1.000
≥40 g/L	29 (45.3)	847 (68.7)		27 (54.0)	27 (54.0)	
<40 g/L	35 (54.7)	386 (31.3)		23 (46.0)	23 (46.0)	
ALT			<0.001			0.841
≥40 U/L	39 (60.9)	470 (38.1)		28 (56.0)	27 (54.0)	
<40 U/L	25 (39.1)	763 (61.9)		22 (4.0)	23 (46.0)	
PLT			0.639			0.427
≥100×10 <sup>9</sup> /L	54 (84.4)	1,012 (82.1)		43 (86.0)	40 (80.0)	
<100×10 <sup>9</sup> /L	10 (15.6)	221 (17.9)		7 (14.0)	10 (20.0)	
Tumor number			<0.001			0.670
Single	36 (56.3)	1,016 (82.4)		33 (66.0)	35 (70.0)	
Multiple	28 (43.8)	217 (17.6)		17 (34.0)	15 (30.0)	
Liver cirrhosis			0.170			0.837
Yes	26 (40.6)	399 (32.4)		19 (38.0)	18 (36.0)	
No	38 (59.4)	834 (67.7)		31 (62.0)	32 (64.0)	
Max tumor diameter, cm (mean ± SD)	13.5±4.5	6.3±4.08	<0.001	12.0±3.7	11.3±6.1	0.450
Tumor capsule			0.824			0.098
Absent or partial	53 (82.8)	1,034 (83.9)		42 (84.0)	35 (70.0)	
Complete	11 (17.2)	199 (16.1)		8 (16.0)	15 (30.0)	
Tumor margin			0.265			0.631
Smooth	53 (82.8)	947 (76.8)		40 (80.0)	38 (76.0)	
Non-smooth	11 (17.2)	286 (23.2)		10 (20.0)	12 (24.0)	
Edmondson grade			0.011			0.204
I + II	1 (1.6)	160 (13.0)		1 (2.0)	5 (10.0)	
III + IV	63 (98.4)	1,073 (87.0)		49 (98.0)	45 (90.0)	
Satellite nodules			0.056			0.840
Presence	41 (64.1)	639 (51.8)		29 (58.0)	30 (60.0)	
Absence	23 (35.9)	594 (48.2)		21 (42.0)	20 (40.0)	
Surgical margin			<0.001			0.251
≥1 cm	6 (9.4)	317 (25.7)		5 (10.0)	9 (18.0)	
<1 cm	58 (90.6)	916 (74.3)		45 (90.0)	41 (82.0)	
Anatomical resection			0.890			0.547
Yes	25 (39.1)	471 (38.2)		20 (40.0)	23 (46.0)	
No	39 (60.9)	762 (61.8)		30 (60.0)	27 (54.0)	
Anti-virus treatment			0.498			0.888
Yes	22 (35.5)	381 (31.4)		16 (33.3)	17 (34.7)	
No	40 (64.5)	833 (68.6)		32 (66.7)	32 (65.3)	

TACE, transcatheter arterial chemoembolization; PR, pathological response; HCV Ab, hepatitis C virus antibody; HBV, hepatitis B virus; DNA, deoxyribonucleic acid; TBIL, total bilirubin; ALT, alanine aminotransferase; ALB, albumin; PLT, platelet; AFP, serum alpha-fetoprotein; HBeAg, hepatitis B e antigen; HBsAg, hepatitis B surface antigen; PSM, propensity score matching.

**Table S6** Univariable logistic regression analysis of microvascular invasion presence in patients receiving preoperative TACE treatment and those not receiving preoperative TACE treatment (N=1,970)

Variable	Univariable	
	OR (95% CI)	P
Preoperative TACE (yes vs. no)	0.785 (0.652–0.945)	0.011
Tumor number (multiple vs. single)	1.624 (1.308–2.015)	<0.001
Tumor size ( $\geq 5$ vs. $< 5$ cm)	1.841 (1.535–2.208)	<0.001
Satellite nodules (presence vs. absence)	4.397 (3.628–5.328)	<0.001
Edmondson grade (III + IV vs. I + II)	3.958 (2.828–5.538)	<0.001
Tumor capsule (non-complete vs. complete)	2.527 (1.963–3.255)	<0.001
Liver cirrhosis (yes vs. no)	1.166 (0.972–1.400)	0.098
Age ( $\geq 60$ vs. $< 60$ years)	1.271 (0.934–1.562)	0.223
Gender (male vs. female)	1.059 (0.820–1.369)	0.659
Tumor margin (non-smooth vs. smooth)	9.016 (6.885–11.307)	<0.001
HCV Ab (positive vs. negative)	1.016 (0.517–1.995)	0.964
HBV DNA ( $\geq 10,000$ vs. $< 10,000$ IU/mL)	0.994 (0.820–1.206)	0.955
TBIL ( $\geq 20$ vs. $< 20$ $\mu\text{mol/L}$ )	0.841 (0.672–1.054)	0.132
ALT ( $\geq 40$ vs. $< 40$ U/L)	1.047 (0.873–1.254)	0.622
ALB ( $< 40$ vs. $\geq 40$ g/L)	0.873 (0.724–1.052)	0.152
PLT ( $< 100 \times 10^9/L$ vs. $\geq 100 \times 10^9/L$ )	0.984 (0.789–1.229)	0.890
AFP ( $\geq 400$ vs. $< 400$ ng/mL)	1.815 (1.508–2.184)	<0.001
HbeAg (positive vs. negative)	0.976 (0.797–1.194)	0.810
HbsAg (positive vs. negative)	1.174 (0.909–1.518)	0.219
Surgical margin ( $< 1$ vs. $\geq 1$ cm)	0.946 (0.779–1.148)	0.571
Anatomical resection (no vs. yes)	1.198 (0.998–1.438)	0.053
Anti-virus treatment (yes vs. no)	0.493 (0.432–0.589)	<0.001
Pathological response	1.000	<0.001
PR area $\geq 90\%$ vs. without preoperative TACE	0.120 (0.075–0.193)	<0.001
PR area between 60–90% vs. without preoperative TACE	1.127 (0.907–1.400)	0.281
PR area $< 60\%$ vs. without preoperative TACE	5.964 (3.085–11.527)	<0.001
TACE sessions	1.000	0.302
With single preoperative TACE session vs. without Preoperative TACE	0.891 (0.799–1.132)	0.142
With multiple preoperative TACE sessions vs. without preoperative TACE	0.887 (0.653–1.206)	0.444

TACE, transcatheter arterial chemoembolization; HCV Ab, hepatitis C virus antibody; HBV, hepatitis B virus; DNA, deoxyribonucleic acid; TBIL, total bilirubin; ALT, alanine aminotransferase; ALB, albumin; PLT, platelet; AFP, serum alpha-fetoprotein; HBeAg, hepatitis B e antigen; HBSAg, hepatitis B surface antigen; PR, pathological response; 95% CI, 95% confidence interval; OR, odds ratio.

**Table S7** Univariable cox regression analysis of early tumor recurrences (N=1,970)

Variable	Univariable	
	HR (95% CI)	P
Preoperative TACE (yes vs. no)	1.009 (0.876–1.162)	0.900
Tumor number (multiple vs. single)	1.658 (1.422–1.933)	<0.001
Tumor size ( $\geq 5$ vs. $< 5$ cm)	2.243 (1.938–2.597)	<0.001
Satellite nodules (presence vs. absence)	1.718 (1.493–1.977)	<0.001
Edmondson grade (III + IV vs. I + II)	1.715 (1.355–2.169)	<0.001
Tumor capsule (non-complete vs. complete)	1.463 (1.211–1.766)	<0.001
Liver cirrhosis (yes vs. no)	1.004 (0.872–1.156)	0.956
Age ( $\geq 60$ vs. $< 60$ years)	1.266 (1.073–1.494)	0.005
Gender (male vs. female)	1.074 (0.875–1.317)	0.495
Tumor margin (non-smooth vs. smooth)	1.758 (1.504–2.055)	<0.001
HCV Ab (positive vs. negative)	0.816 (0.461–1.443)	0.484
HBV DNA ( $\geq 10,000$ vs. $< 10,000$ IU/mL)	1.1.04 (0.953–1.279)	0.186
TBIL ( $\geq 20$ vs. $< 20$ $\mu\text{mol/L}$ )	0.965 (0.813–1.146)	0.965
ALT ( $\geq 40$ vs. $< 40$ U/L)	1.084 (0.943–1.245)	0.258
ALB ( $< 40$ vs. $\geq 40$ g/L)	1.082 (0.938–1.247)	0.279
PLT ( $< 100 \times 10^9/\text{L}$ vs. $\geq 100 \times 10^9/\text{L}$ )	0.924 (0.777–1.100)	0.375
AFP ( $\geq 400$ vs. $< 400$ ng/mL)	1.626 (1.416–1.868)	<0.001
HbeAg (positive vs. negative)	1.163 (0.999–1.355)	0.051
HbsAg (positive vs. negative)	1.043 (0.855–1.272)	0.678
Microvascular invasion (presence vs. absence)	2.398 (2.084–2.758)	<0.001
Surgical margin ( $< 1$ vs. $\geq 1$ cm)	1.243 (1.064–1.451)	0.006
Anatomical resection (no vs. yes)	1.158 (1.007–1.333)	0.040
Anti-virus treatment (yes vs. no)	0.651 (0.517–0.813)	<0.001
Pathological response	1.000	<0.001
PR area $\geq 90\%$ vs. without preoperative TACE	0.553 (0.424–0.720)	<0.001
PR area between 60–90% vs. without preoperative TACE	1.095 (0.930–1.289)	0.276
PR area $< 60\%$ vs. without preoperative TACE	2.917 (2.196–3.876)	<0.001
TACE sessions	1.000	0.514
With single preoperative TACE session vs. without preoperative TACE	1.048 (0.899–1.222)	0.551
With multiple preoperative TACE sessions vs. without preoperative TACE	0.902 (0.708–1.148)	0.402

TACE, transcatheter arterial chemoembolization; HCV Ab, hepatitis C virus antibody; HBV, hepatitis B virus; DNA, deoxyribonucleic acid; TBIL, total bilirubin; ALT, alanine aminotransferase; ALB, albumin; PLT, platelet; AFP, serum alpha-fetoprotein; HBeAg, hepatitis B e antigen; HbsAg, hepatitis B surface antigen; PR, pathological response; 95% CI, 95 Percent confidence interval; HR, hazard ratio.



The entire cohort				The PSM cohort			
	Patients with PR area ≥90% (N=226), N (%)	Patients without preoperative TACE (N=1,233), N (%)	P		Patients with PR area ≥90% (N=222), N (%)	Patients without preoperative TACE (N=222), N (%)	P
Type of recurrence			0.265	Type of recurrence			0.205
Intrahepatic recurrence	59 (89.4)	455 (93.6)		Intrahepatic recurrence	58 (92.1)	79 (85.0)	
Extrahepatic metastasis	3 (4.6)	14 (2.9)		Extrahepatic metastasis	2 (3.2)	7 (7.5)	
Synchronous intrahepatic and extrahepatic recurrences	4 (6.1)	17 (3.5)		Synchronous intrahepatic and extrahepatic recurrences	3 (4.8)	7 (7.5)	
Number of intrahepatic recurrence			0.030	Number of intrahepatic recurrence			0.031
Single	50 (84.8)	325 (71.4)		Single	49 (84.5)	54 (68.4)	
Multiple	9 (15.3)	130 (28.6)		Multiple	9 (15.5)	25 (31.6)	
Site of intrahepatic recurrence			0.033	Site of intrahepatic recurrence			0.025
Local	6 (10.2)	162 (35.6)		Local	5 (8.6)	19 (24.1)	
Adjacent segment	21 (35.6)	131 (28.8)		Adjacent segment	21 (36.2)	10 (12.7)	
Distal segment	27 (45.8)	36 (7.9)		Distal segment	27 (46.6)	12 (15.2)	
Multisegment	5 (8.5)	126 (27.7)		Multisegment	5 (8.6)	38 (48.1)	
	Patients with PR area between 60–90% (N=447), N (%)	Patients without preoperative TACE (N=1,233), N (%)	P		Patients with PR area between 60–90% (N=420), N (%)	Patients without preoperative TACE (N=420), N (%)	P
Type of recurrence			0.001	Type of recurrence			0.417
Intrahepatic recurrence	181 (85.4)	455 (93.6)		Intrahepatic recurrence	177 (90.8)	166 (88.3)	
Extrahepatic metastasis	18 (8.5)	14 (2.9)		Extrahepatic metastasis	11 (5.7)	12 (6.4)	
Synchronous intrahepatic and extrahepatic recurrences	13 (6.1)	17 (3.5)		Synchronous intrahepatic and extrahepatic recurrences	7 (3.6)	10 (5.3)	
Number of intrahepatic recurrence			0.019	Number of intrahepatic recurrence			0.427
Single	112 (61.9)	325 (71.4)		Single	110 (62.2)	110 (66.3)	
Multiple	69 (38.1)	130 (28.6)		Multiple	67 (37.9)	56 (33.7)	
Site of intrahepatic recurrence			0.684	Site of intrahepatic recurrence			0.630
Local	71 (39.2)	162 (35.6)		Local	71 (40.1)	64 (38.6)	
Adjacent segment	31 (17.1)	131 (28.8)		Adjacent segment	30 (17.0)	26 (15.7)	
Distal segment	22 (12.2)	36 (7.9)		Distal segment	21 (11.9)	20 (12.1)	
Multisegment	57 (31.5)	126 (27.7)		Multisegment	55 (31.1)	56 (33.7)	
	Patients with PR area <60% (N=64), N (%)	Patients without preoperative TACE (N=1,233), N (%)	P		Patients with PR area <60% (N=50), N (%)	Patients without preoperative TACE (N=50), N (%)	P
Type of recurrence			<0.001	Type of recurrence			0.726
Intrahepatic recurrence	45 (77.9)	455 (93.6)		Intrahepatic recurrence	34 (77.3)	22 (73.4)	
Extrahepatic metastasis	7 (12.1)	14 (2.9)		Extrahepatic metastasis	5 (11.4)	4 (13.3)	
Synchronous intrahepatic and extrahepatic recurrences	6 (10.4)	17 (3.5)		Synchronous intrahepatic and extrahepatic recurrences	5 (11.4)	4 (13.3)	
Number of intrahepatic recurrence			0.001	Number of intrahepatic recurrence			0.029
Single	21 (46.7)	325 (71.4)		Single	10 (29.4)	13 (59.1)	
Multiple	24 (53.3)	130 (28.6)		Multiple	24 (70.6)	9 (40.9)	
Site of intrahepatic recurrence			0.041	Site of intrahepatic recurrence			0.024
Local	15 (33.3)	162 (35.6)		Local	8 (23.5)	6 (27.3)	
Adjacent segment	3 (6.7)	131 (28.8)		Adjacent segment	2 (5.9)	8 (36.4)	
Distal segment	9 (20.0)	36 (7.9)		Distal segment	8 (23.5)	5 (22.7)	
Multisegment	18 (40.0)	126 (27.7)		Multisegment	16 (47.1)	3 (13.6)	

**Figure S3** Comparisons of patients' early tumor recurrence patterns between patients with and without TACE based on the PR area before and after PSM. TACE, transcatheter arterial chemoembolization; PR, pathological response; PSM, propensity score matching.