**Additional file 2:**

**Table S1. The relationship between TRIS and clinicopathological variables (n=352).**

|  |  |  |
| --- | --- | --- |
| Categorical variables | n (%) | *P* value |
| Sex (female) | 60 (17.0%) | 0.02 |
|  | | |
| Continuous variables | *β*-se | *P* value |
| AFP, ng/ml | 9639.061 (3668.562） | 0.009 |
| Tumor numbers, n (%) | -0.379 (0.190) | 0.046 |
| Tumor diameter, cm | 7.617 (3.343) | 0.02 |

**Table S2. Comparison of prognostic performance among postoperative variables and ICPI.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variables | Training (n=352) | | Validation (n=393) | |
| C-index (95%CI) | *P* value | C-index (95%CI) | *P* value |
| ICPI | 0.691 (0.642, 0.739) |  | 0.686 (0.637, 0.735) |  |
| Microvascular invasion | 0.573 (0.535, 0.610) | <0.001 | 0.585 (0.548, 0.622) | <0.001 |
| Lymphoid metastasis | 0.502 (0.497, 0.508) | <0.001 | 0.504 (0.496, 0.512) | <0.001 |
| Tumor differentiation | 0.564 (0.530, 0.598) | <0.001 | 0.547 (0.510, 0.584) | <0.001 |

**Table S3. Comparison of prognostic performance among HCC staging systems and ICPI.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | Training cohort (n=352) | | Validation cohort (n=393) | |
| C-index (95%CI) | *P* value | C-index (95%CI) | *P* value |
| ICPI | 0.691 (0.642, 0.739) |  | 0.686 (0.637, 0.735) |  |
| AJCC 7th for HCC | 0.595 (0.555, 0.635) | 0.008 | 0.519 (0.487, 0.550) | <0.001 |
| AJCC 8th for HCC | 0.589 (0.550, 0.628) | 0.002 | 0.573 (0.535, 0.611) | <0.001 |
| LCSGJ | 0.557 (0.521, 0.592) | <0.001 | 0.553 (0.515, 0.591) | <0.001 |
| BCLC | 0.552 (0.516, 0.589) | <0.001 | 0.544 (0.509, 0.579) | <0.001 |
| JIS | 0.553 (0.518, 0.588) | <0.001 | 0.556 (0.518, 0.594) | <0.001 |
| Okuda | 0.548 (0.522, 0.573) | <0.001 | 0.602 (0.575, 0.630) | <0.001 |
| CLIP | 0.597 (0.555, 0.640) | <0.001 | 0.610 (0.570, 0.650) | 0.01 |

**Table S4. Components of 7 staging systems for hepatocellular carcinoma.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Staging systems | Liver function | Performance status (Symptoms) | AFP | Tumor status | | | |
| Number | Size | Vascular invasion | Metastasis |
| BCLC | CTP class | Performance status | No | Yes | Yes | Yes | Yes |
| CLIP | CTP class | Performance status | Yes | Yes | Yes | Yes | Yes |
| JIS | CTP class | No | No | Yes | Yes | Yes | Yes |
| AJCC 7th | No | No | No | Yes | Yes | Yes | Yes |
| AJCC 8th | No | No | No | Yes | Yes | Yes | Yes |
| LCSGJ | No | No | No | Yes | Yes | Yes | Yes |
| Okuda | Ascites, ALB, TB | No | No | No | Yes | Yes | Yes |

AFP, alpha-fetoprotein; AJCC, American Joint Committee on Cancer; BCLC, Barcelona Clínic Liver Cancer; CLIP, Cancer of the Liver Italian Program; CTP, Child-Turcotte-Pugh; JIS, Japan Integrated Staging; LCSGJ, Liver Cancer Study Group of Japan.

**Table S5. Antibody sources and staining conditions.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Markers | Immune cells | Antibody source | Cellular localization | Species | Antigen Retrieval | Dilution |
| CD3 | pan T cells | DAKO | Membranous | Mouse Monoclonal | Citrate buffer (pH 6.0) | 1:200 |
| CD4 | CD4 T cells | DAKO | Membranous | Mouse Monoclonal | Tris/EDTA buffer (pH 9.0) | 1:400 |
| CD8 | cytotoxic T cells | Abcam | Membranous | Mouse Monoclonal | Tris/EDTA buffer (pH 9.0) | 1:500 |
| CD14 | mononuclear cells | Sigma | Cytoplasmic | Rabbit polyclonal | Citrate buffer (pH 6.0) | 1:500 |
| CD20 | B cells | Abcam | Membranous | Rabbit polyclonal | Tris/EDTA buffer (pH 9.0) | 1:200 |
| CD27 | plasma cells | Abcam | Membranous | Rabbit Monoclonal | Tris/EDTA buffer (pH 9.0) | 1:500 |
| CD45RA | naive T cells | Abcam | Membranous | Mouse Monoclonal | Citrate buffer (pH 6.0) | 1:200 |
| CD45RO | memory T cells | Thermo Fisher Scientific | Membranous | Mouse Monoclonal | Citrate buffer (pH 6.0) | 1:200 |
| CD57 | NK cells | DAKO | Cytoplasmic | Mouse Monoclonal | Citrate buffer (pH 6.0) | 1:200 |
| CD66b | neutrophils | BD | Cytoplasmic | Mouse Monoclonal | Citrate buffer (pH 6.0) | 1:200 |
| CD68 | macrophages | DAKO | Cytoplasmic | Mouse Monoclonal | Citrate buffer (pH 6.0) | 1:200 |
| CD103 | Tregs | Abcam | Cytoplasmic | Rabbit Monoclonal | Tris/EDTA buffer (pH 9.0) | 1:1000 |
| CXCR5 | Tfh cells | CST | Membranous | Rabbit Monoclonal | Citrate buffer (pH 6.0) | 1:200 |
| PD1 | T cells | CST | Membranous | Rabbit Monoclonal | Citrate buffer (pH 6.0) | 1:200 |