Supplementary material

 **Figure S1.**

(A) Associations between CD44 and overall survival in the TISIDB database. (B) Associations between CD44 and cancer stage in the TISIDB database. (C) Associations between CD44 and tumor grade in the TISIDB database. (D) Kaplan–Meier analyses of the correlation between CD44 and overall survival in the German Cancer Research Center (DKFZ) dataset from PrognoScan.

 **Figure S2.**

Correlations between CD44 expression and enrichment of (A) Macrophages, (B) Th2 cells, (C) Th1 cells, and (D) Th17 cells in KIRC. Correlations between CD44 expression and enrichment of cancer associated fibroblasts using different methods in TIMER2.0, including (E) EPIC, (F) MCPCOUNTER, (G) XCELL, and (H) TIDE.

 **Figure S3.**

(A) Correlation between SPP1 expression and enrichment of macrophages. (B) Correlation between the SPP1 expression and enrichment of CD8 T cells. (C) Correlations between the CD44 expression and PDCD1LG2 expression. (D) Correlations between the SPP1 expression and PDCD1LG2 expression.

**Table S1. Baseline characteristics and clinical data of KIRC patients in TCGA.**

| Characteristics | Low expression of CD44 | High expression of CD44 | *p* Value |
| --- | --- | --- | --- |
| n | 270 | 271 |  |
| Age, n (%) |  |  | 0.156 |
| ≤ 60 | 126 (23.3%) | 143 (26.4%) |  |
| > 60 | 144 (26.6%) | 128 (23.7%) |  |
| Sex, n (%) |  |  | 0.305 |
| Female | 99 (18.3%) | 88 (16.3%) |  |
| Male | 171 (31.6%) | 183 (33.8%) |  |
| Pathologic T stage, n (%) |  |  | 0.198 |
| T1 | 143 (26.4%) | 136 (25.1%) |  |
| T2 | 36 (6.7%) | 35 (6.5%) |  |
| T3 | 89 (16.5%) | 91 (16.8%) |  |
| T4 | 2 (0.4%) | 9 (1.7%) |  |
| Pathologic N stage, n (%) |  |  | 0.065 |
| N0 | 118 (45.7%) | 124 (48.1%) |  |
| N1 | 4 (1.6%) | 12 (4.7%) |  |
| Pathologic M stage, n (%) |  |  | 0.382 |
| M0 | 213 (41.9%) | 216 (42.5%) |  |
| M1 | 35 (6.9%) | 44 (8.7%) |  |
| Pathologic stage, n (%) |  |  | 0.851 |
| Stage I | 140 (26%) | 133 (24.7%) |  |
| Stage II | 29 (5.4%) | 30 (5.6%) |  |
| Stage III | 62 (11.5%) | 61 (11.3%) |  |
| Stage IV | 38 (7.1%) | 45 (8.4%) |  |
| Histologic grade, n (%) |  |  | **0.002** |
| G1 | 9 (1.7%) | 5 (0.9%) |  |
| G2 | 123 (23.1%) | 113 (21.2%) |  |
| G3 | 111 (20.8%) | 96 (18%) |  |
| G4 | 23 (4.3%) | 53 (9.9%) |  |
| Primary therapy outcome, n (%) |  |  | 0.074 |
| PD | 8 (5.4%) | 3 (2%) |  |
| SD | 6 (4.1%) | 0 (0%) |  |
| PR | 1 (0.7%) | 1 (0.7%) |  |
| CR | 66 (44.9%) | 62 (42.2%) |  |
| OS event, n (%) |  |  | **0.037** |
| Alive | 194 (35.9%) | 172 (31.8%) |  |
| Dead | 76 (14%) | 99 (18.3%) |  |
| DSS event, n (%) |  |  | **0.015** |
| No | 221 (41.7%) | 200 (37.7%) |  |
| Yes | 43 (8.1%) | 66 (12.5%) |  |
| PFI event, n (%) |  |  | 0.141 |
| No | 197 (36.4%) | 182 (33.6%) |  |
| Yes | 73 (13.5%) | 89 (16.5%) |  |