

Figure S1 Association between clinicopathologic parameters and survival in patients with ccRCC. OS: (A) Age, $P < 0.001$; (B) Gender, $P = 0.289$; (C) WHO/ISUP grade, $P < 0.001$; (D) T stage, $P < 0.001$; (E) Stage, $P < 0.001$; PFS: (F) Age, $P < 0.001$; (G) Gender, $P = 0.201$; (H) WHO/ISUP grade, $P < 0.001$; (I) T stage, $P < 0.001$; (J) Stage, $P < 0.001$. OS, overall survival. PFS, progression-free survival.

Figure S2 Kaplan Meier survival curves showing PFS for (A) TLS density ($P = 0.03$); (B) TLS maturity ($P = 0.037$); (C) TIL-B density ($P = 0.006$); (D) TIL density ($P < 0.001$). PFS, progression-free survival. TLS, tertiary lymphoid structure. TIL, tumor-infiltrating lymphocyte.

Figure S3 The immune infiltration and clinical characteristics predict PFS of ccRCC patients. (A) Forest plot of the effect of patient characteristics on PFS by subgroup; (B) Nomogram for predicting PFS at 1, 3 or 5 year after surgery; (C) Calibration plots of the nomogram for predicted and actual results of 3-year and 5-year PFS; (D) Kaplan-Meier survival curves of TLS-B cell density ($P = 0.014$) and TLS-TIL density ($P < 0.001$) with clinical outcome. PFS, progression-free survival. ccRCC, clear cell renal cell carcinoma. TLSs, tertiary lymphoid structures. TILs, tumor-infiltrating lymphocytes. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure S4 (A-B) Kaplan Meier survival curves of SSIGN score in combination with TLS density on OS and PFS; (C-D) Kaplan Meier survival curves of Leibovich score in combination with TLS density on OS and PFS; (E-F) Kaplan Meier survival curves showing PFS stratified by SSIGN and Leibovich score in combination with TIL density; (G) Kaplan Meier survival curves showing PFS stratified by T density, B density and TIL density; (H-I) Kaplan Meier survival curves of age-TLS density and age-TLS maturity on PFS. OS, overall survival; PFS, progression-free survival; TLS, tertiary lymphoid structure. TIL, tumor-infiltrating lymphocyte. SSIGN and Leibovich score (including stage, size, grade, and necrosis) were defined as low (0-5) and high (≥ 6). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure S5 Cell doublet detection and removal. (A) tSNE visualization of DoubletFinder doublets; (B) Violin plots showing different feature expressions of the clusters before quality control; (C) Violin plots showing different feature expressions of the clusters after quality control.

Figure S6 Network showing significant interaction events between old and young groups of B cell subsets.

Figure S7 Statistical analyses of senescence scores and pathway activity scores. (A) Senescence scores among different cell subsets ($P < 0.001$); Pathway activity scores between young and old groups; pathways include (B-D) immune response; (E-F) B cell differentiation; (G-H) stem cell differentiation; (I-L) DNA replication. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.