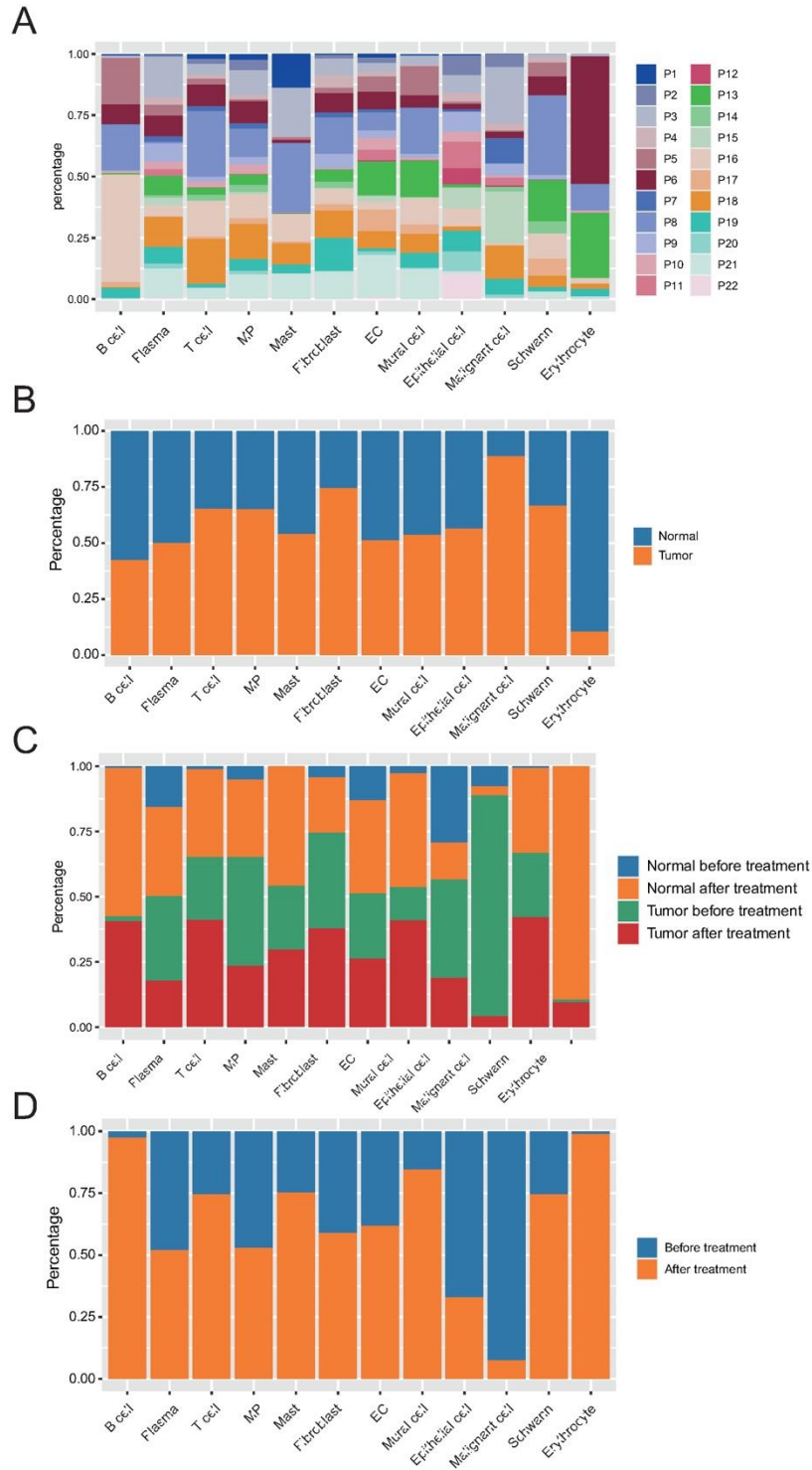


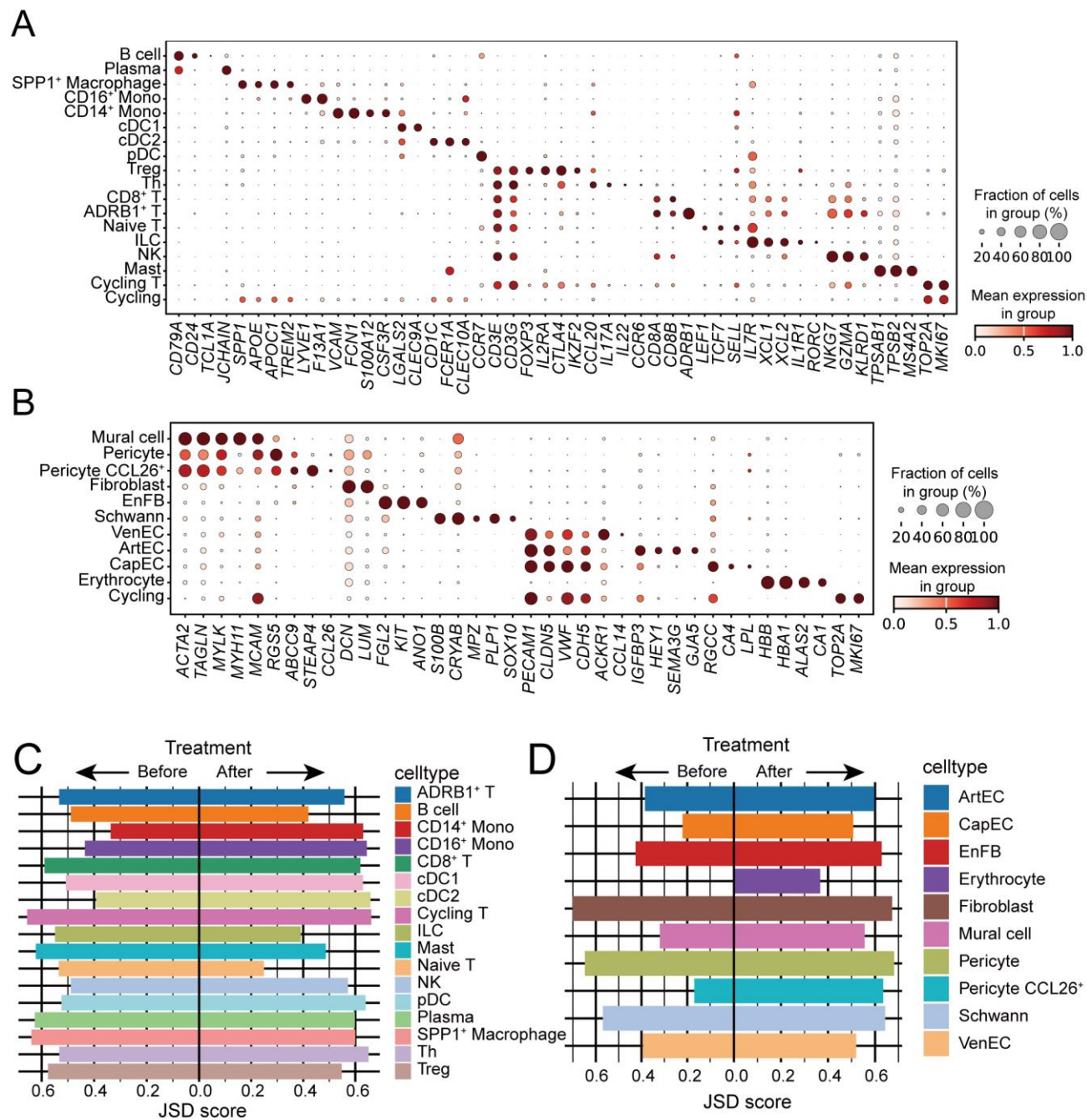
Supplementary Material

1 Supplementary Figures



Supplementary Figure 1. (A) Bar chart showing the composition of samples within each cell population. (B) Bar chart showing the composition of tissue types within each cell population. (C) Bar chart showing the composition of tissue types within each cell population before and after

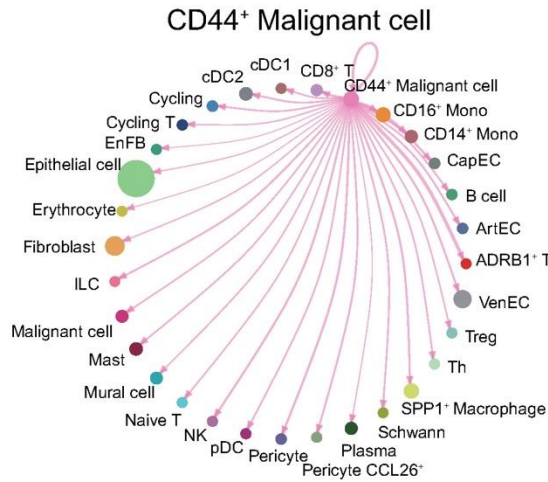
neoadjuvant therapy. (D) Bar chart showing the composition of neoadjuvant therapy status within each cell population.



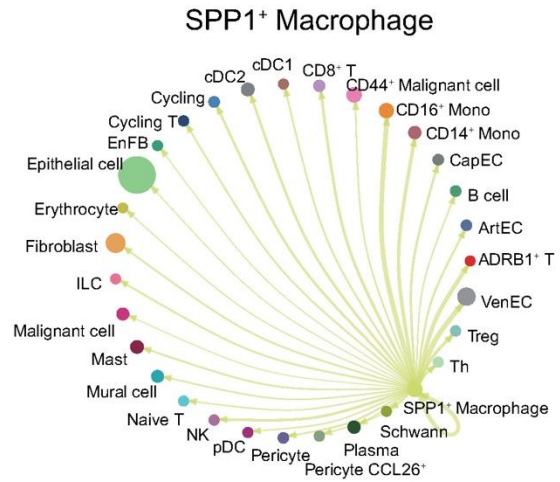
Supplementary Figure 2. (A) Dot plot showing marker genes for immune cell subtypes. The dot size represents the proportion of cells expressing a gene. Color denotes the scaled expression level. (B) Dot plot showing marker genes for stroma cell subtypes. The dot size represents the proportion of cells expressing a gene. Color denotes the scaled expression level. (C) Bar chart showing the Jensen–

Shannon divergence scores of each immune cell subtypes. **(D)** Bar chart showing the Jensen–Shannon divergence scores of each stroma cell subtypes.

A

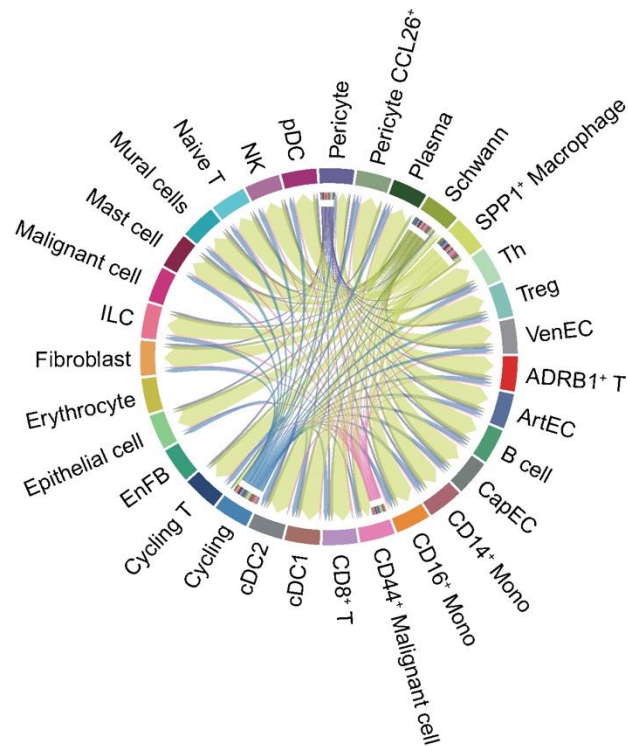


B

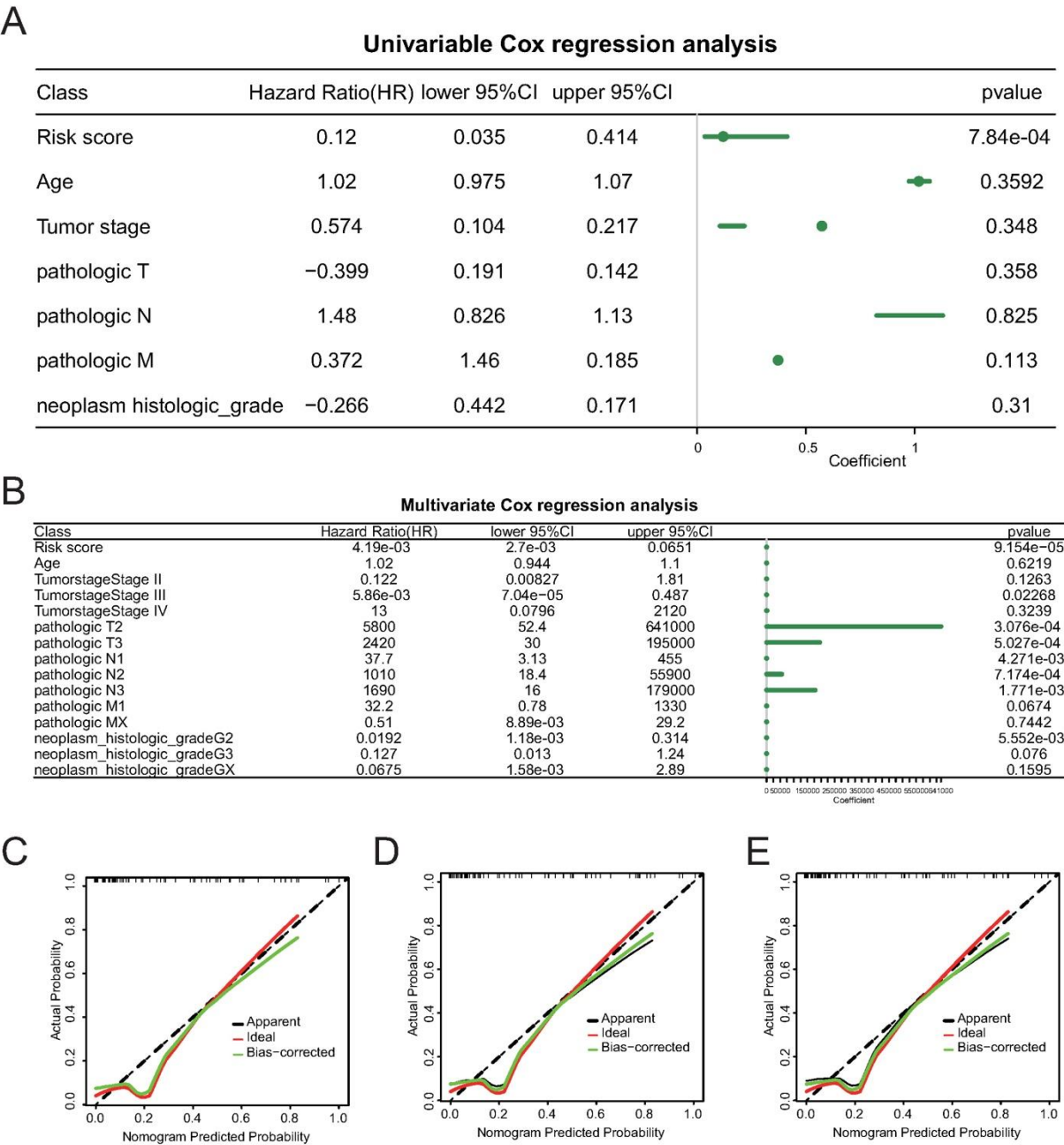


C

SPP1 signaling pathway network



Supplementary Figure 3. (A) Screening of cellular interactions circle plots with CD44⁺ Malignant cells as the source and tumor cells as the target. (B) Screening of cellular interactions circle plots with SPP1⁺ macrophages as the source and tumor cells as the target. (C) Circle plot showing the strength of cellular interactions between SPP1⁺ macrophages and other tumor cells on SPP1 signaling pathway.



Supplementary Figure 4. (A, B) Univariate and multivariate Cox analyses evaluate the independent prognostic value of *ADRB1* risk signature in the training cohort. (C-E) Calibration graphs of the TCGA cohort's 1-year, 3-year and 5-year survival probabilities.