1. Supplemental Methods

1.1 Measurement of MM and MMP

The cell counts, MM and MMP of the T cells were measured using a *TBNK lymphocyte mitochondrial function test assay kit (20222401162, XIANGYI Biotechnology, Changsha, Hunan, China)* following the manufacturer's instructions: Reagent A (MIgG2a-FITC/MIgG1-PE); Reagent B: CD45-PerCP-Cy5.5; Reagent C: CD3-PE/ CD19-FITC; Reagent D: CD3-PE/ CD4-PE-Cyanine7; Reagent E:CD3-PE/CD8-FITC; Reagent F: CD3-FITC/CD16-PE/CD56-PE; Reagent G: mitotracker deepred; Reagent H: MMP detection probe (JC-1). Multicolor antibody after mixing, 2) taking 20 uL reagent (A-F) added in counterpart tube. Add 1.2μL of reagent G and reagent H, add 100 μL of anticoagulant whole blood to the test tube of each sample, mix thoroughly, and react in the dark at room temperature (20° C-25 °C) for 20-30 min. 2 mL erythrocyte lysate (20°C to 25°C) was added to each tube, thoroughly mixed, and the reaction was carried out in the dark at room temperature for 10-12 min until the liquid was clear. The samples were centrifuged at 1000 rpm for 5min and the supernatant was discarded. Add 2 mL PBS to wash, centrifugation at 1000 rpm for 5 min, discard the supernatant. Sample cells were analyzed by FC. Additionally, quality control products (*lymphocyte quality control products, 20222400515, XIANGYI Biotechnology, Changsha, Hunan, China*) and supporting microspheres (*Absolute Counting Fluorescent Microsphere Kit (Flow Cytometry), 20222400514, XIANGYI Biotechnology, Changsha, Hunan, China*) were used.

Fluorescently labelled antibodies (CD45, CD3, CD4 and CD8) in the detection reagent bind specifically to the surface antigens of peripheral blood monocytes (PBMCs). When using a flow cytometer (*FLOW CYTOMETER DiagCyto, 6C2L, UBBIO Biotechnology, Hangzhou, Zhejiang, China)*, the fluorescently labelled cells pass through the laser-illuminated area, changing the laser light path to produce scattered light, and laser irradiation would stimulate the fluorescent material on the cell surface to fluoresce. The scattered

light and fluorescence were converted into graphs and presented in the control software after conversion by the instrument and processing by the computer system. The size and internal structure of the cell and the corresponding antigen expression could be determined according to the intensity of the scattered light and fluorescence.

A mitochondrial probe, a small-molecule ionic dye, can enter the cell mainly through osmosis. Sulfhydryl-reactive methylene chloride can bind to proteins in the mitochondrial inner membrane to form a stable structure. A decrease in the ability of cells to collect dye reflects a decrease in the MMP. MM was reflected by the median fluorescence intensity after the mitochondrial dye was bound to the mitochondria of living cells. The MM and MMP values were standardized by software (*Human lymphocyte mitochondrial function evaluation data analysis software, XIANGYI Biotechnology, Changsha, Hunan, China*).

1.2 Flow sorting (FS) of T cells and CD8+ T cells

A total of 40 ml of peripheral blood from patients was collected if CD3+ cells were needed for transmission electron microscopy (TEM). A total of 80 ml of peripheral blood from the patient was collected for FS analysis to isolate CD3+CD8+ cells from the TME. Ten millilitres of peripheral blood from patients was collected if CD3+ cells were needed for Western blotting, and 30 ml was collected if CD8+ T cells were present. Three millilitres of peripheral blood from patients was collected if CD3+ cells were needed for ROS examination, and 15 ml was collected if CD8+ T cells were needed.

PBMCs were collected following the manufacturer's instructions (*LTS1077-1, TBD^{TM}, Tianjin, China*). After incubation with the fluorescent antibody, flow sorting (*ABflo® 488 Mouse Anti-Human CD3 mAb (A25188) & ABflo® 647 Rabbit Anti-Human/Monkey CD8a mAb (A23904), ABclonal Technology®, Wuhan, China; flow cytometry/sorter: BD FACS Aria^{TM} III, BD Biosciences, USA*) was performed.

1.3 T-cell mitochondria observed by TEM

The cell-PBS mixture was centrifuged at 700 × g for 10 min, the supernatant was discarded, the cells were fixed with 2.5% glutaraldehyde overnight at 4°C, the cells were fixed with 1% osmium tetrachloride for 25-30 min, and the fixed cell mass was transferred to sterilized penicillin vials. After dehydration, the samples were embedded at room temperature. The labelled embedded blocks were cut into semithin slices approximately 1 μm thick. After drying, the sections were stained and observed.

1.4 Western Blot

Total protein was extracted from the cells, added to 5× SDS loading buffer, and boiled at 100°C for 10 minutes. The separation glue was prepared as needed, ethanol was added, and the mixture was allowed to stand for 20 minutes. The separation glue was allowed to solidify, the ethanol was removed, the remaining ethanol was rinsed with water, and the residual liquid was removed with absorbent paper. The prepared glue was added, the comb was inserted, the mixture was allowed to sit for 20 minutes, and the comb was removed when the glue solidified. The electrophoresis device was installed at 20 V for 20 minutes, 80 V for 20 minutes, and 120 V for 70 minutes. The wet transfer film was a 0.3-A constant-flow film, exposed for 45 minutes. The PVDF membrane was placed in 5% skim milk and blocked for 2 hours. The membrane was washed with TBST 3 times for 10 minutes each. Primary antibodies (anti-*SQSTM1/p62 rabbit mAb, A19700, anti-Parkin rabbit pAb, A0968, anti-PINK1 rabbit pAb, A24745, anti-LC3B rabbit mAb, A19665, ABclonal Technology®, Wuhan, China; anti-VDAC1/porin antibody, ab306581, Abcam, UK;* antibody diluted to the appropriate proportions) were incubated with the membranes overnight on a shaking bed at 4°C. The membrane was washed with TBST 3 times for 10 minutes each. The membranes were incubated with a secondary antibody (*HRP-conjugated rabbit anti-goat IgG (H+L), AS029, ABclonal Technology®, Wuhan, China;* antibody diluent diluted to appropriate proportions) at room temperature for 2 hours. The membrane was washed with TBST 3 times for 10 minutes each. Luminant liquid A and liquid B were added to the kit at a ratio of 1:1, and

the mixture was incubated for 1 minute. After exposure, the cells were observed.

1.5 Measurement of ROS and the markers of inflammation

ROS were detected following the manufacturer's instructions (*Reactive Oxygen Species Assay Kit, S0033S, Beyotime, Beijing, China*). TNF-α levels, IL-6 levels, IL-8 levels and IFN-γ levels were measured following the manufacturer's instructions (*Human TNF-α ELISA Kit, HJ110, Epizyme, Shanghai, China; Human IL-6 ELISA Kit, HJ064, Epizyme, Shanghai, China; Human IL-8 ELISA Kit, HJ066, Epizyme, Shanghai, China; Human IFN-γ ELISA Kit, HJ048, Epizyme, Shanghai, China*).