Table S1. Quantitative measurement of the structural parameters of PCL and PCL-Sca-1 Ab grafts

Parameters	PCL	PCL-Sca-1 Ab
Fiber size/μm	7.6 ± 0.5	7.5 ± 0.4
Pore size/μm	18.6 ± 1.4	17.9 ± 1.3
Porosity/%	82.6 ± 2.7	83.6 ± 3.1
Luminal Diameter/μm	1956 ± 41	1964 ± 38
Wall Thickness/μm	542.2 ± 33.8	522.1 ± 22.6

Table S2. The mechanical properties of the electrospun PCL and PCL-Sca-1 Ab grafts

Parameters	PCL	PCL-Sca-1 Ab
Max Stress/MPa	3.74 ± 0.42	3.78 ± 0.37
Elongation at break/%	723.8 ± 15.9	550.5 ± 21.5
Young's modulus/MPa	13.37 ± 0.84	17.53 ± 0.68

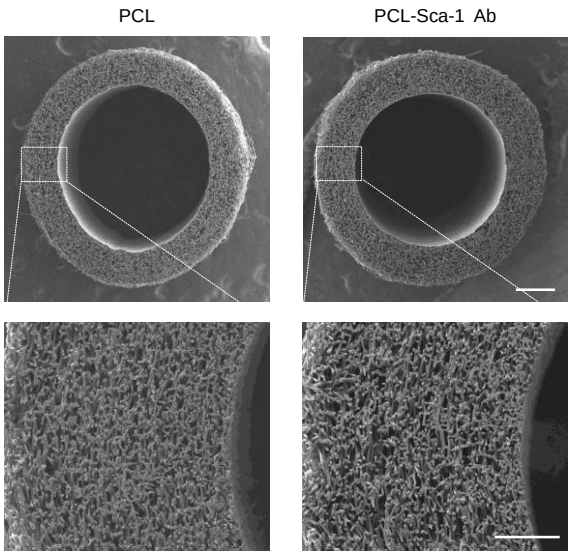

Fig. S1. Representative SEM images of the cross-sections of the PCL and PCL-Sca-1 Ab graft. Scale bars, 500 μm or 200 μm (magnified images).

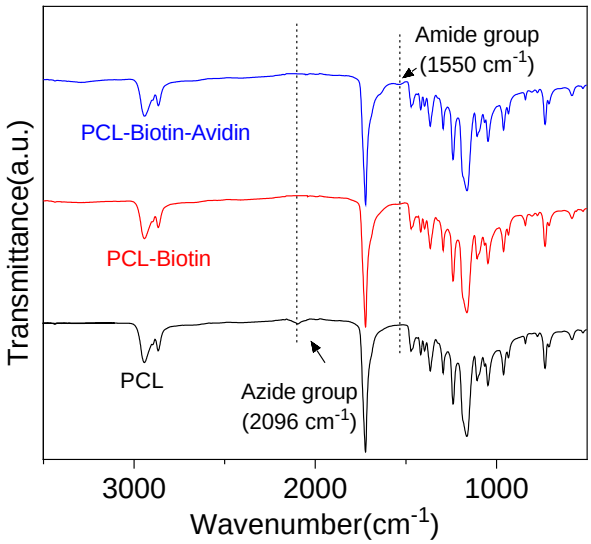

Fig. S2. Fourier transform infrared spectra (ATR-FTIR) of PCL surface before and after reaction with alkynyl-biotin and avidin.

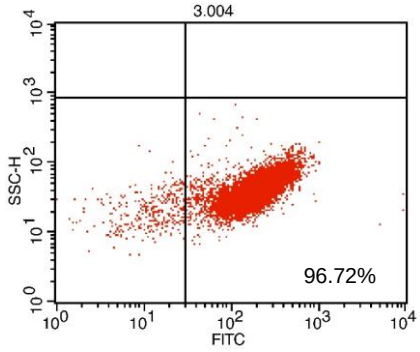

Fig. S3. Flow cytometry image of the cells expressed Sca-1^{+}.

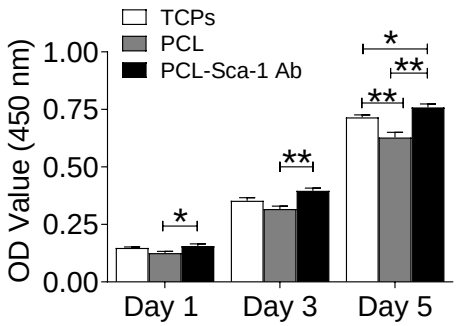

Fig. S4. CCK-8 assay of Sca-1$^+$ SPC proliferation after 1 d, 3 d, and 5 d on TCPs, PCL mats and PCL-Sca-1 Ab mats under static culture. Anti-Sca-1 Ab functional modification had no inhibitory effect on Sca-1$^+$ SPC proliferation. Data were expressed as mean ± s.e.m. for each group: *p < 0.05, **p < 0.01. n = 5 independent experiments.

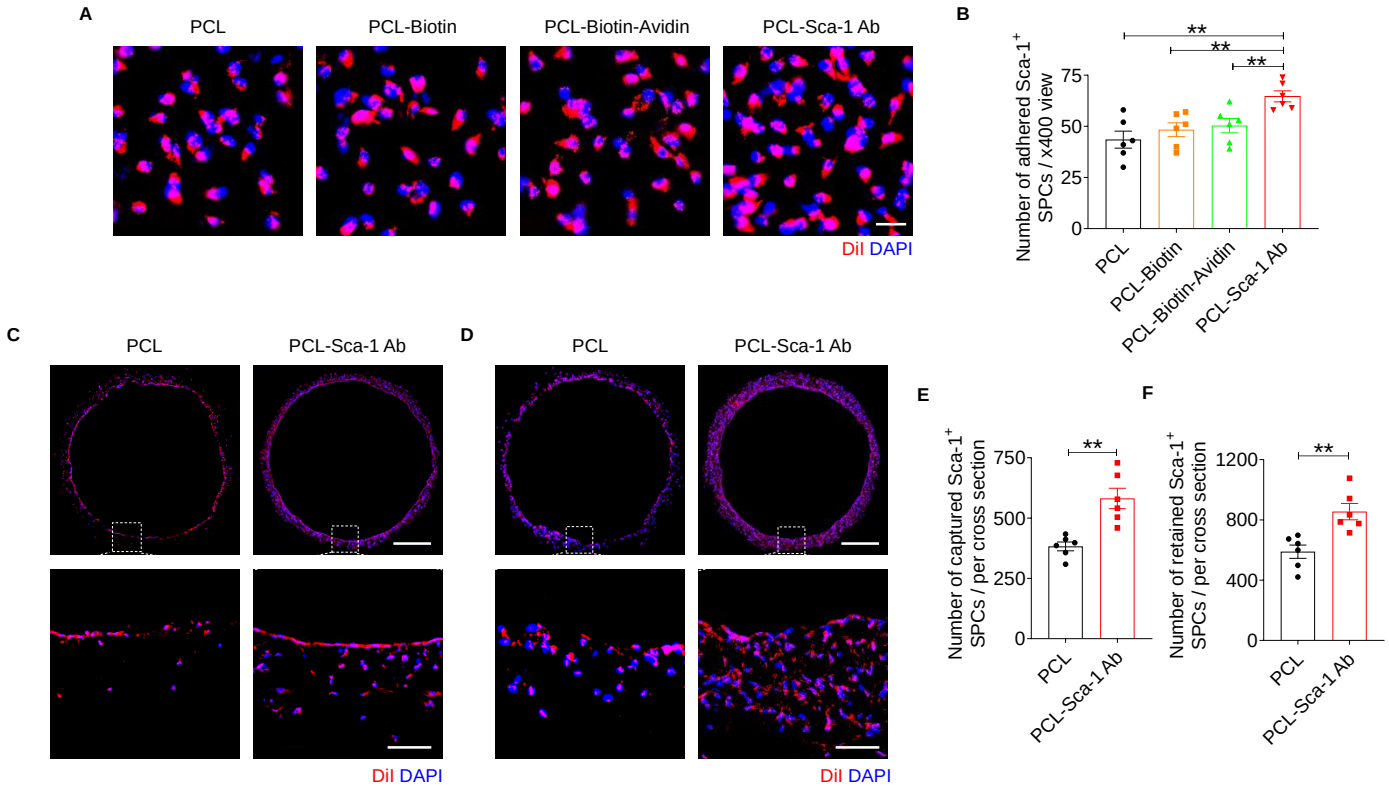

Fig. S5. Anti-Sca-1 antibody modification significantly enhances the recruitment, capture, and retainment of Sca-1⁺ SPCs on PCL vascular grafts in serum-containing medium *in vitro*. (A) Representative CLSM images of the DiI-labeled Sca-1⁺ SPCs attached to different groups of PCL mats under static culture. Scale bar, 50 μm. (B) The number of attached Sca-1⁺ SPCs was quantified. Data were expressed as mean ± s.e.m. for each group: $^{**}p < 0.01$. n=6 images per sample, with a total of 6 samples per group. (C) Representative CLSM images of DiI-labeled Sca-1⁺ SPCs on the PCL and PCL-Sca-1 Ab grafts after dynamic capture (12 dynes/cm^2) for 2 h. Scale bars, 500 μm or 100 μm (magnified images). (D) Representative CLSM images of DiI-labeled Sca-1⁺ SPCs retained on the PCL and PCL-Sca-1 Ab grafts after 6 h of dynamic flow culture (12 dynes/cm^2). Scale bars, 500 μm or 100 μm (magnified images). (E) Quantitative analysis of the number of captured Sca-1⁺ SPCs on different grafts after dynamic flow culture. Data were expressed as mean ± s.e.m. for each group: $^{**}p < 0.01$. n=6 images (different regions of the graft) per sample, with a total of 6 samples per group. (F) Quantitative analysis of the number of retained Sca-1⁺ SPCs on different grafts after dynamic flow culture. Data were expressed as mean ± s.e.m. for each group: $^{**}p < 0.01$. n=6 images (different regions of the graft) per sample, with a total of 6 samples per group.

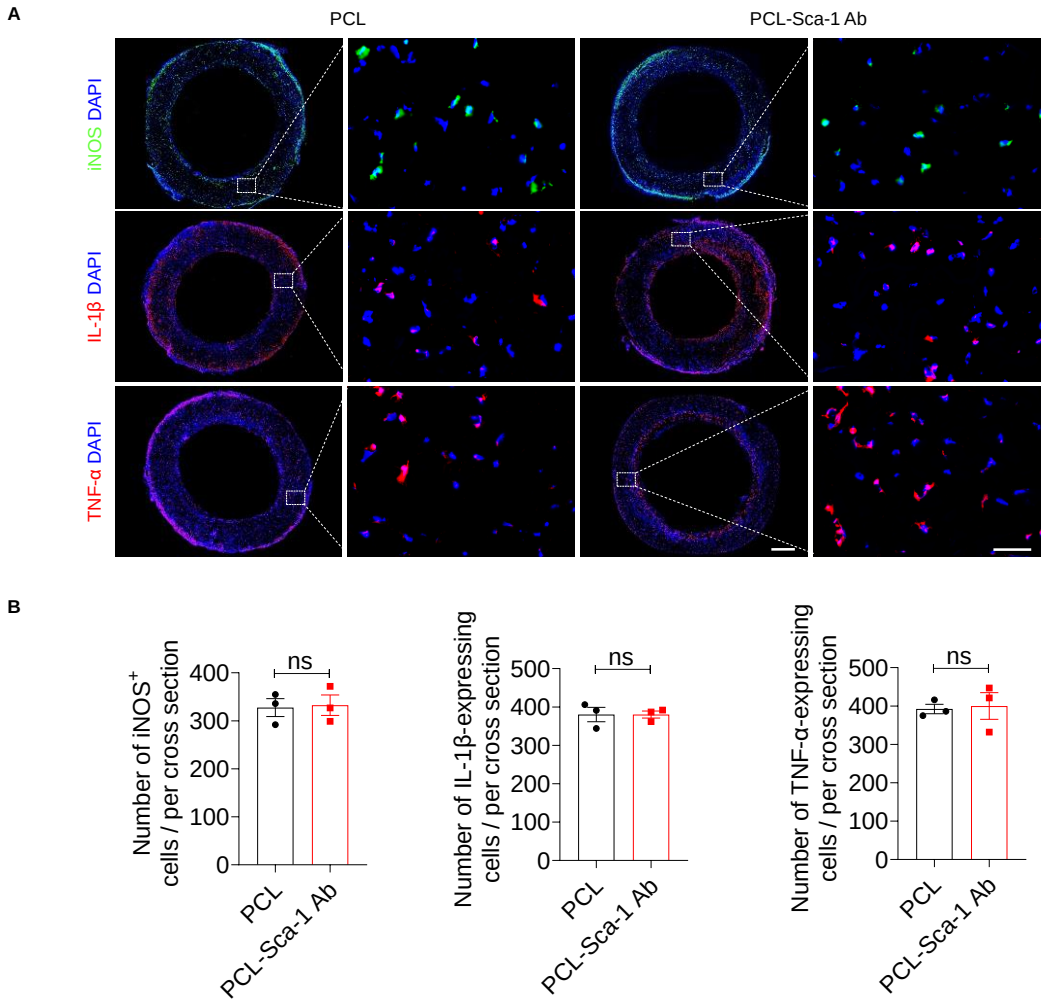

Fig. S6. (A) Representative images of macrophage response and cytokines expression within vascular grafts at early stage (3-days) post-implantation. Scale bars, 500 μm or 50 μm (magnified images). (B) Quantitative analyses of the number of iNOS$^+$ cells, IL-1β- and TNF-α- expressing cells. Data were expressed as mean ± s.e.m. for each group. Images and data are representative of n=3 independent experiments.

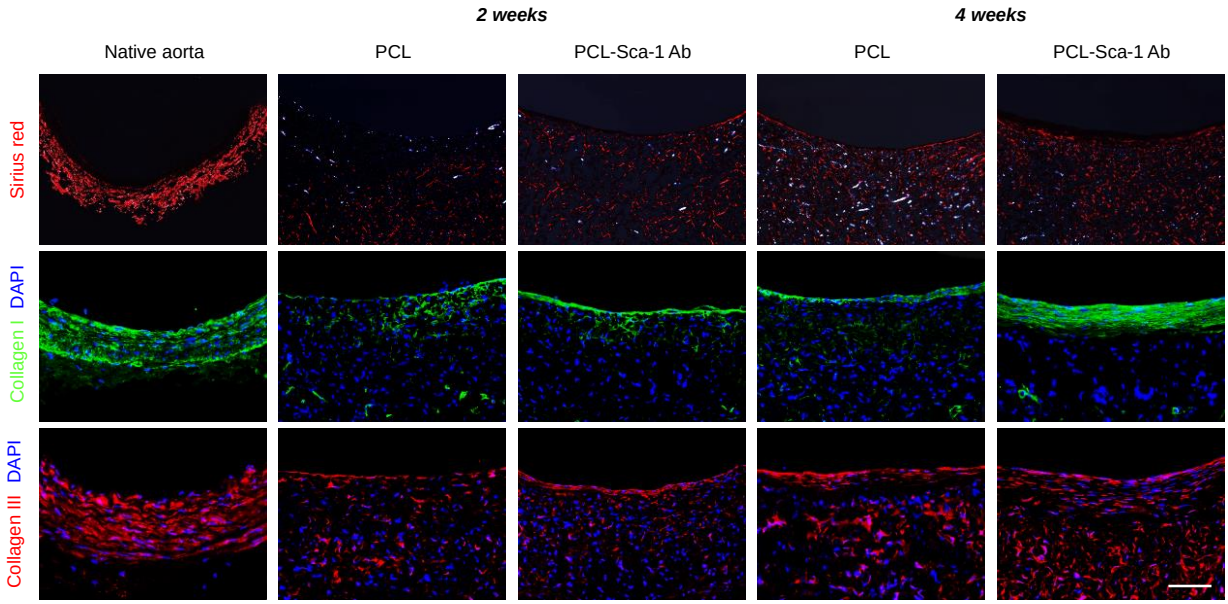

Fig. S7. Sirius red staining and immunofluorescence staining of collagen I and collagen III of vascular grafts at 2- and 4- weeks post-implantation. Images are representative of n=6 independent experiments. Scale bar, 100 μm.

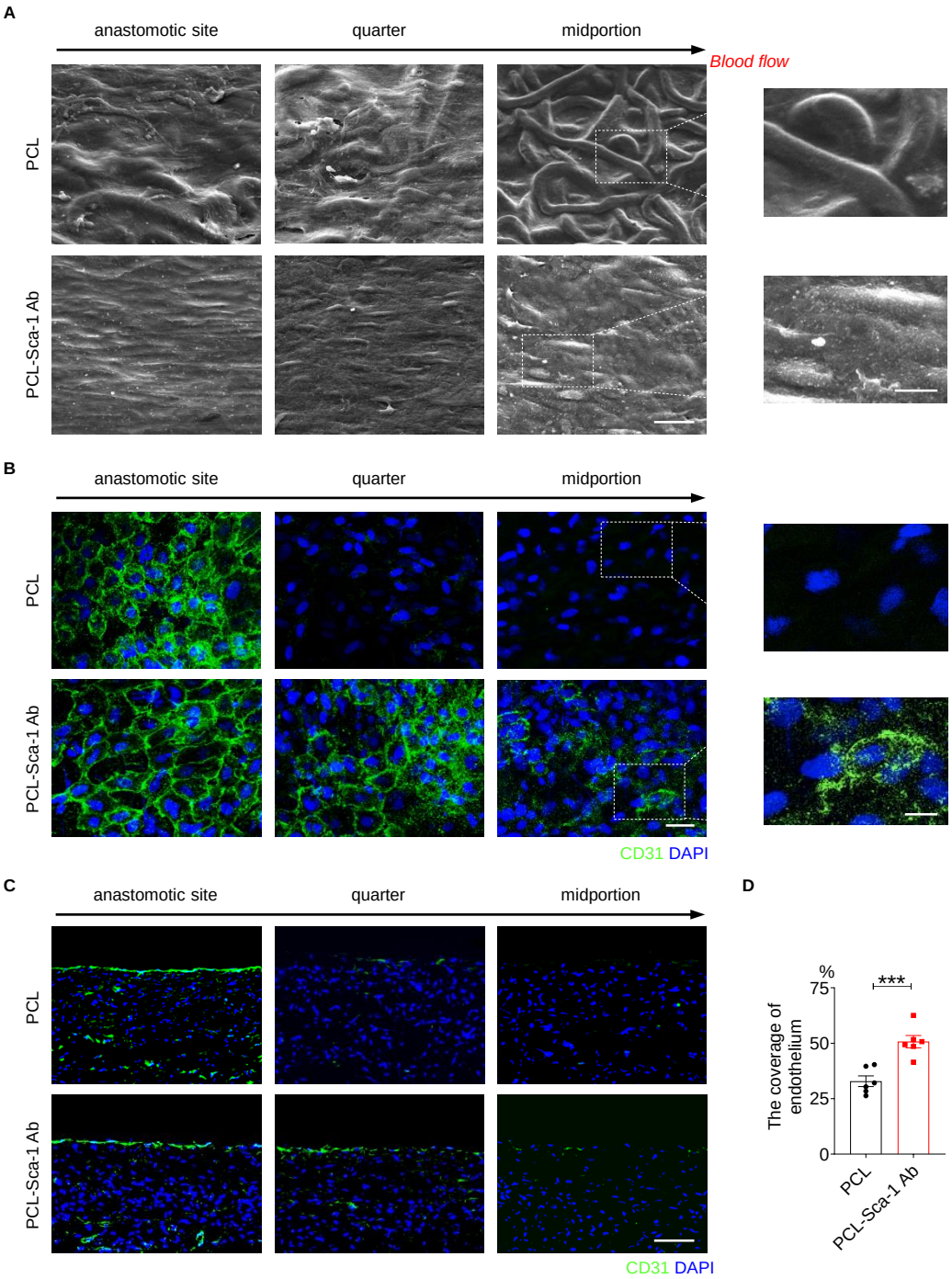

Fig. S8. Anti-Sca-1 antibody modification promotes the endothelialization at 2 weeks post-implantation *in vivo*. (A) SEM and (B) *en face* immunostaining images showed the endothelium distribution and morphology at different (anastomotic, quarter, and midportion) sites of the lumen. The direction of blood flow is indicated by the black arrow above each panel. Images are representative of n=6 independent experiments. Scale bars for SEM images, 20 μm or 10 μm (magnified images). Scale bars for *en face* immunostaining images, 50 μm or 20 μm (magnified images). (C) Immunofluorescence staining with anti-CD31 antibody was performed to assess the endothelialization on longitudinal sections of the implanted grafts, and (D) the corresponding endothelium coverage rate was calculated. Nuclei were counterstained with DAPI. Scale bar, 100 μm. Data were expressed as mean ± s.e.m. for each group: ***$p < 0.001$. Images and data are representative of n=6 independent experiments.

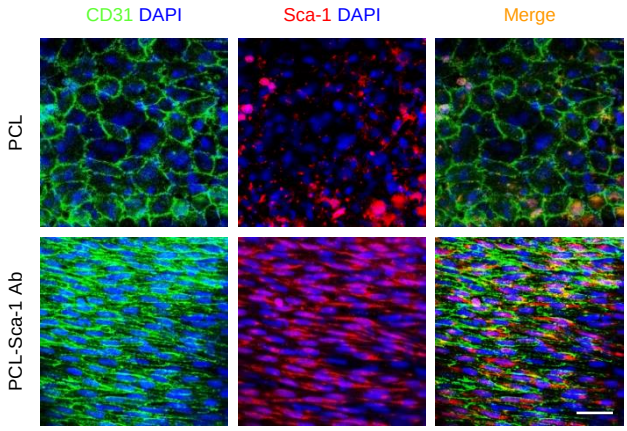

Fig. S9. *En face* double immunofluorescence staining of Sca-1 and CD31 in vascular grafts at 4 weeks post-implantation. Scale bar, 20 μm.

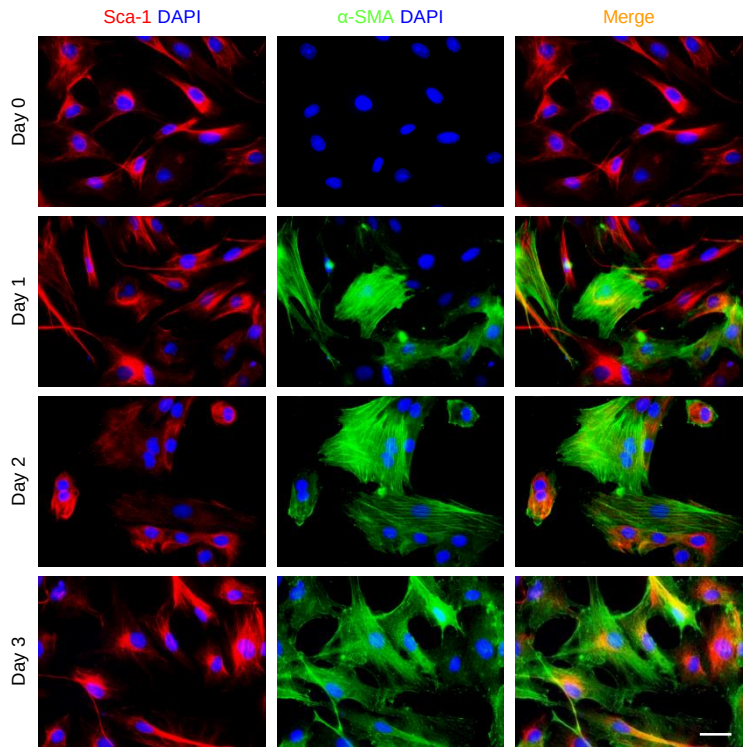

Fig. S10. *In vitro* differentiation of Sca-1^{+} SPCs into smooth muscle cell linages in culture medium in the absence of Lif at different timepoints. Scale bar, 50 μm.

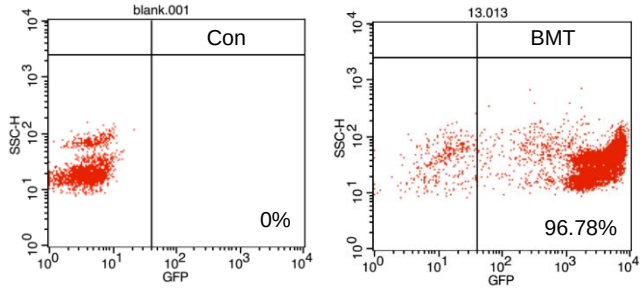

Fig. S11. Flow cytometry images demonstrated the successful blood reconstruction after bone marrow transplantation.