

Supplementary Materials for
**Injectable photocurable Janus hydrogel delivering hiPSC
cardiomyocyte-derived exosome for post–heart surgery adhesion reduction**

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Other Supplementary Material for this manuscript includes the following:

Movies S1 to S4

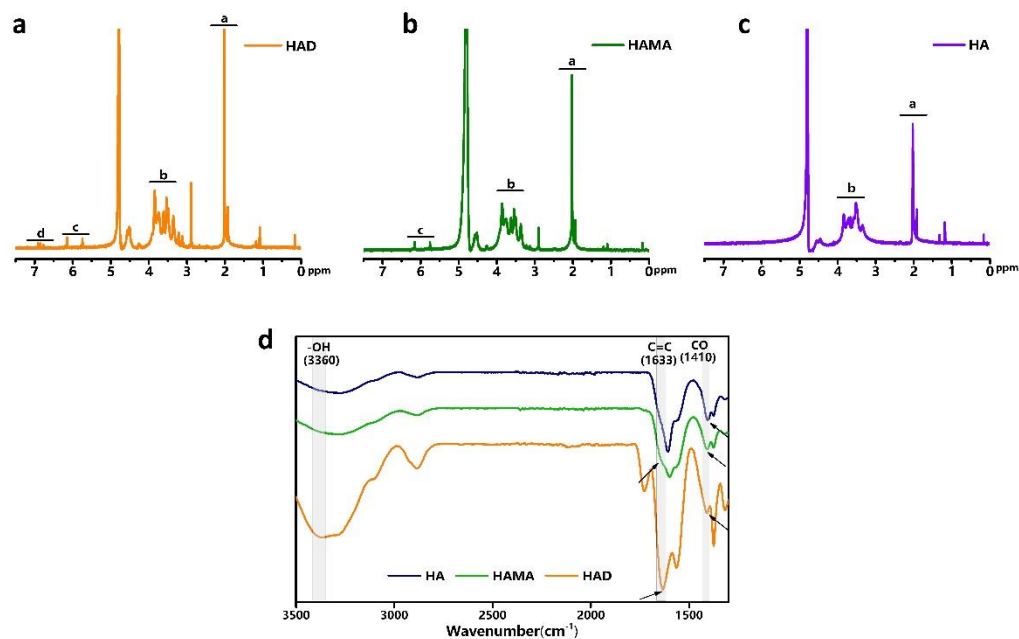


Fig. S1. (a-c) ¹H NMR spectra of HAD (a), HAMA (b) and HA (c) “a” labeled the C(=O)CH₃ in HA (δ =2.1 ppm), “b” labeled protons in the ring structures of HA (δ =4.0 ~3.0 ppm), “c” labeled the C=C of AEMA (δ =5.68 and 6.13 ppm), “d” labeled protons in the catechol ring of DA (δ =6.5~7.2 ppm). (d) FTIR spectra of HA, HAMA, and HAD in the range of 1300–3500 cm⁻¹.

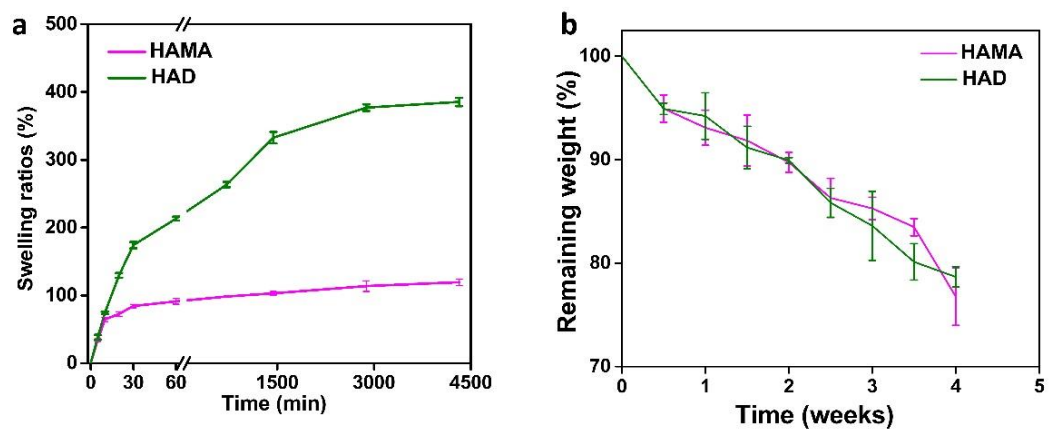


Fig. S2. The swelling behaviors and biodegrade curve of HAD and HAMA hydrogel.

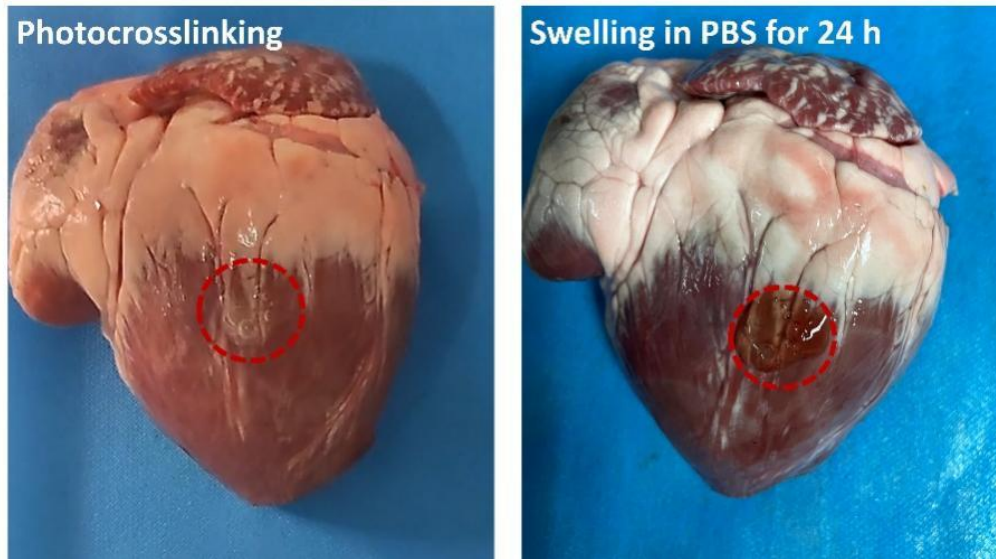


Fig. S3. After swelling in PBS for 24 h, the HAD hydrogel also maintained good adhesion on the heart surface.

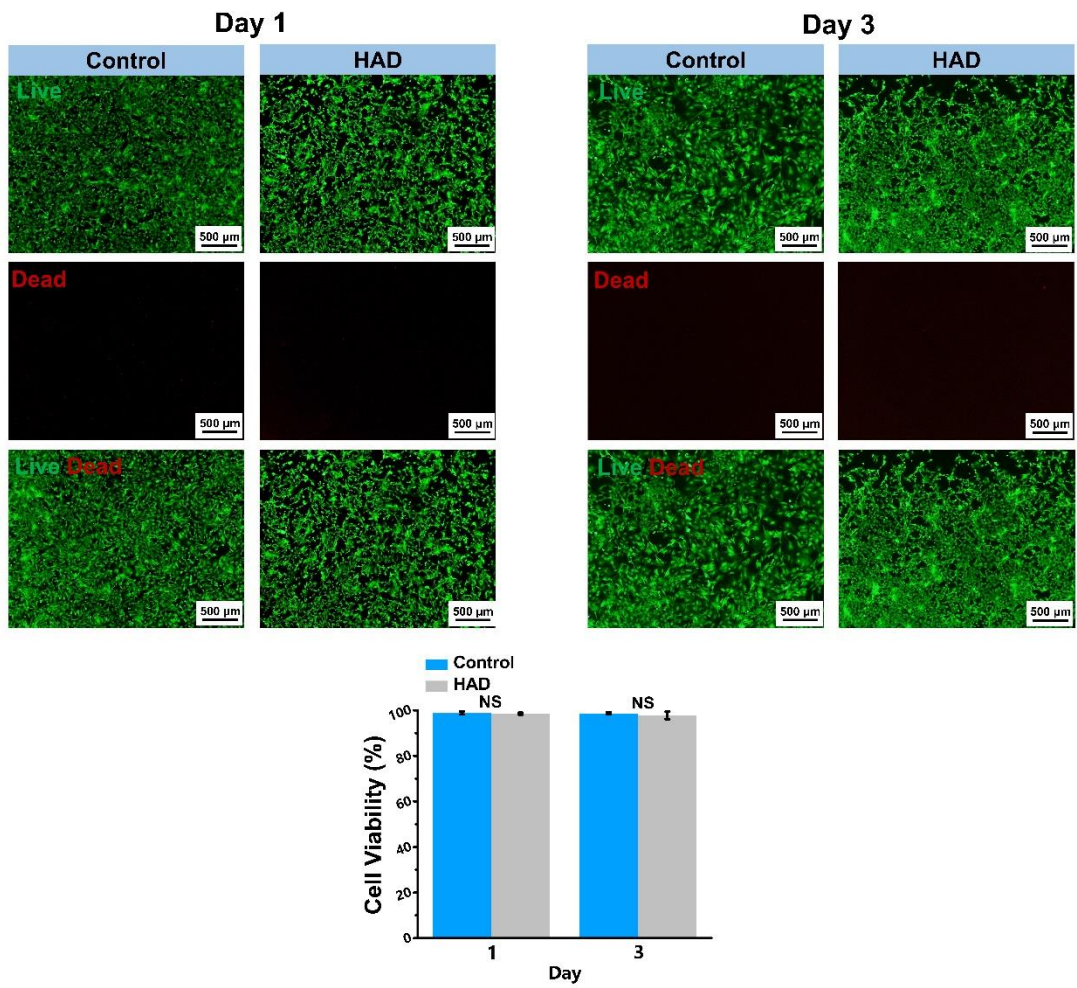


Fig. S4. The cell biocompatibility of HAD hydrogel *in vitro*. ns: no significant difference.



Fig. S5. The gross images of porcine heart tissue were cut into 15 mm × 30 mm × 6 mm pieces for the lap-shear tests.

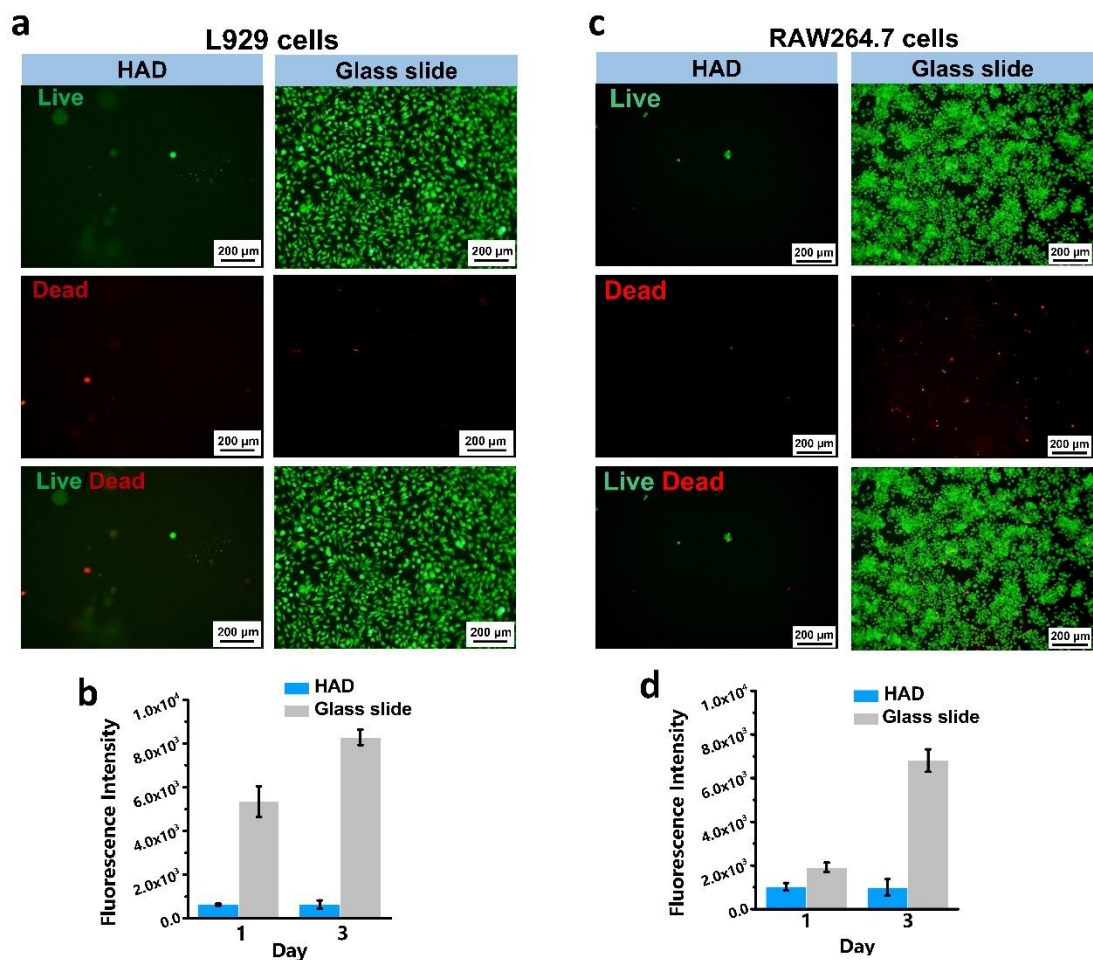


Fig. S6. The cell adhesion results of L929 cells and RAW264.7 cells on HAD hydrogel and glass slides (control). (a) Live/dead staining images of L929 cells seeded on HAD hydrogel and glass slides after 24 h. (b) Cell proliferation results of L929 cells cultured on HAD hydrogel and glass slides for 3 days. (c) Live/dead staining images of RAW264.7 cells seeded on HAD hydrogel and glass slides after 24 h. (d) Cell proliferation results of RAW264.7 cells cultured on HAD hydrogel and glass slides for 3 days.

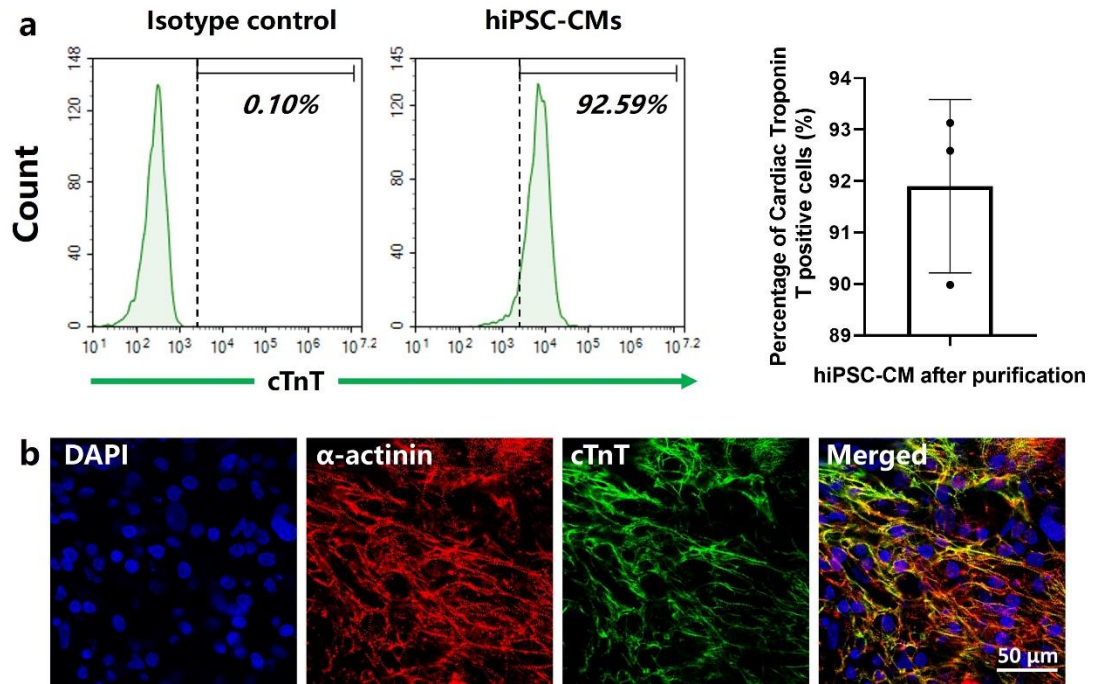


Fig. S7. Identification of hiPS-CMs via flow cytometry and immunofluorescence staining of α -actinin and cTnT.

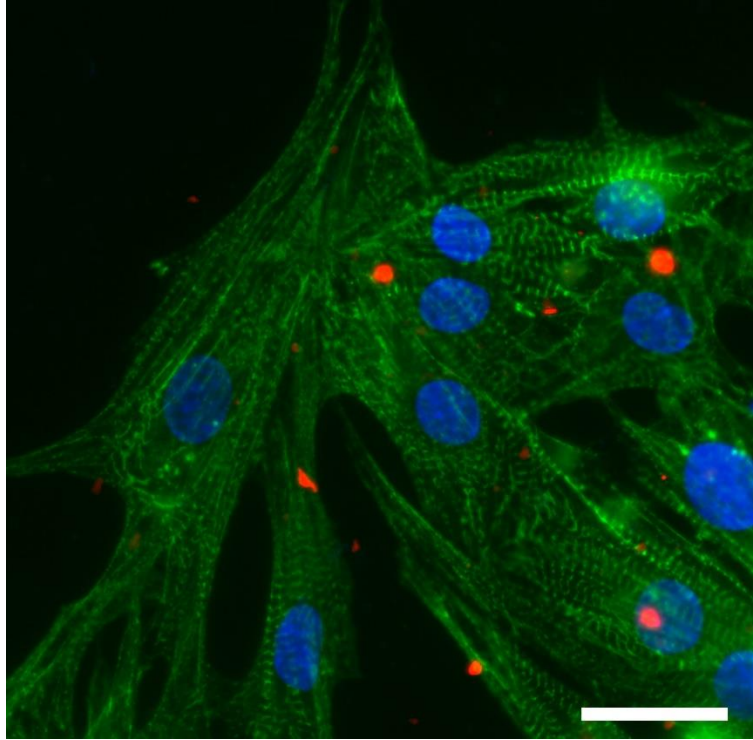


Fig. S8. PKH-26 labeled iCM-EXOs (red) were taken up by primary cardiomyocytes (green) *in vitro*. Bar = 25 μ m.

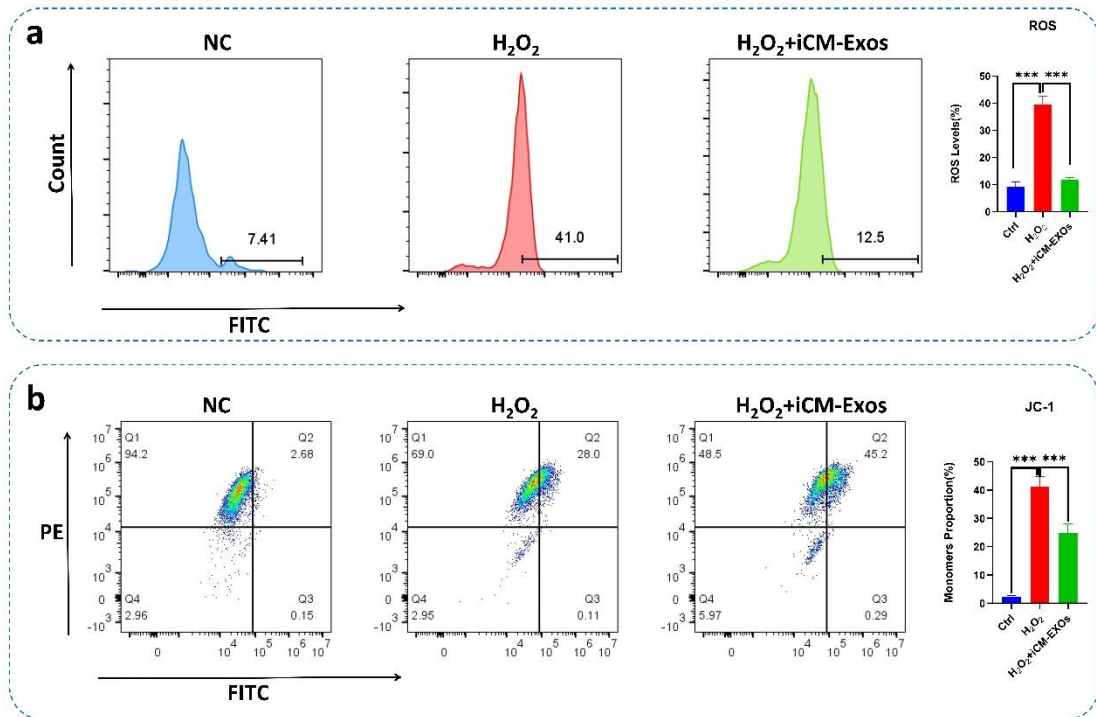


Fig. S9. Flow cytometry of cellular reactive oxygen species (a) and cellular mitochondrial membrane potential (b) in each group.

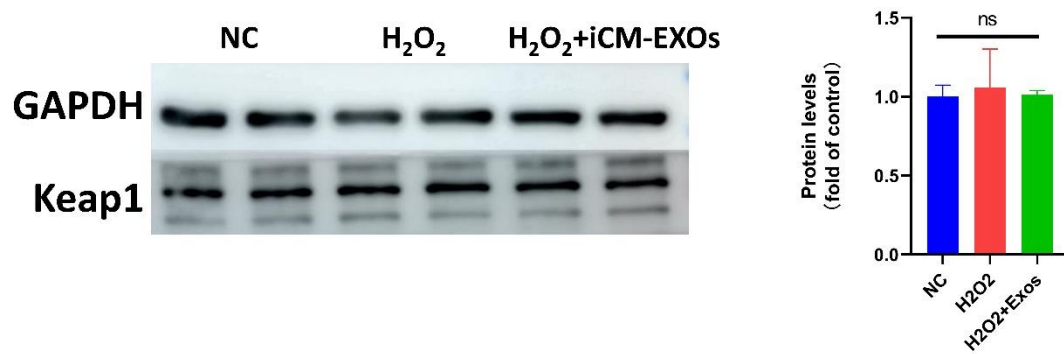


Fig. S10. Western blots and histograms of Keap1 protein in primary cardiomyocytes of each group. ns: no significant difference.

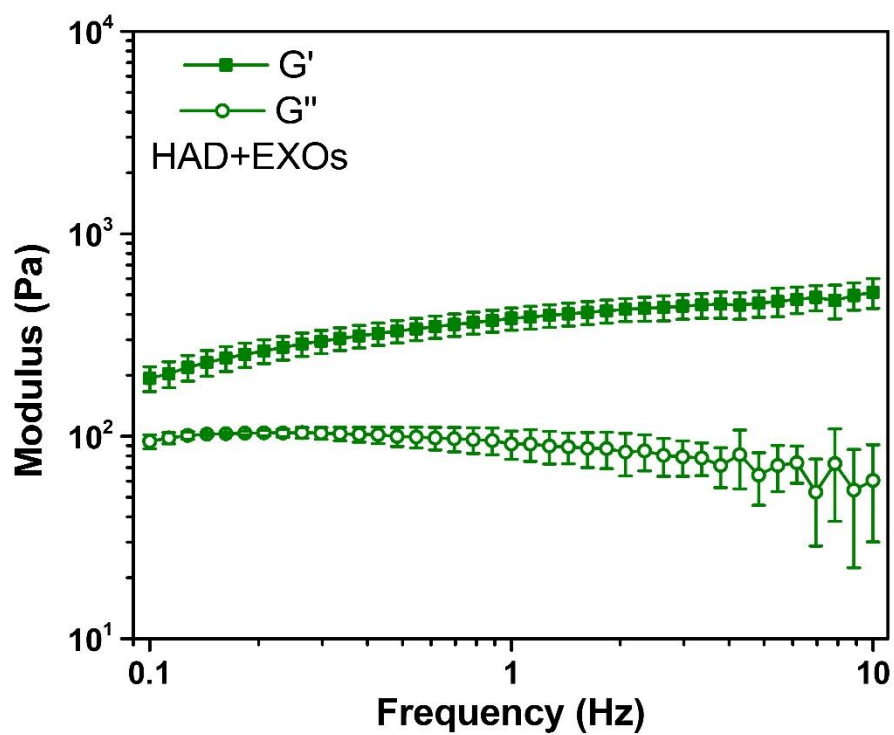


Fig. S11. The mechanical property of HAD+EXOs hydrogel.

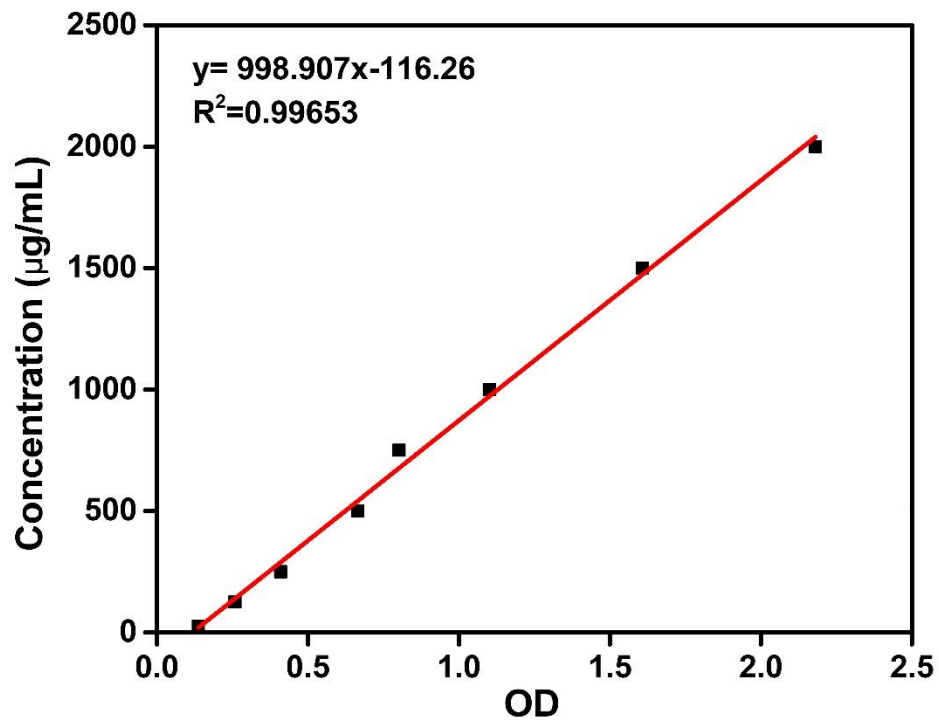


Fig. S12. The standard curve of iCM-EXOs was detected by a micro-BCA protein assay kit.

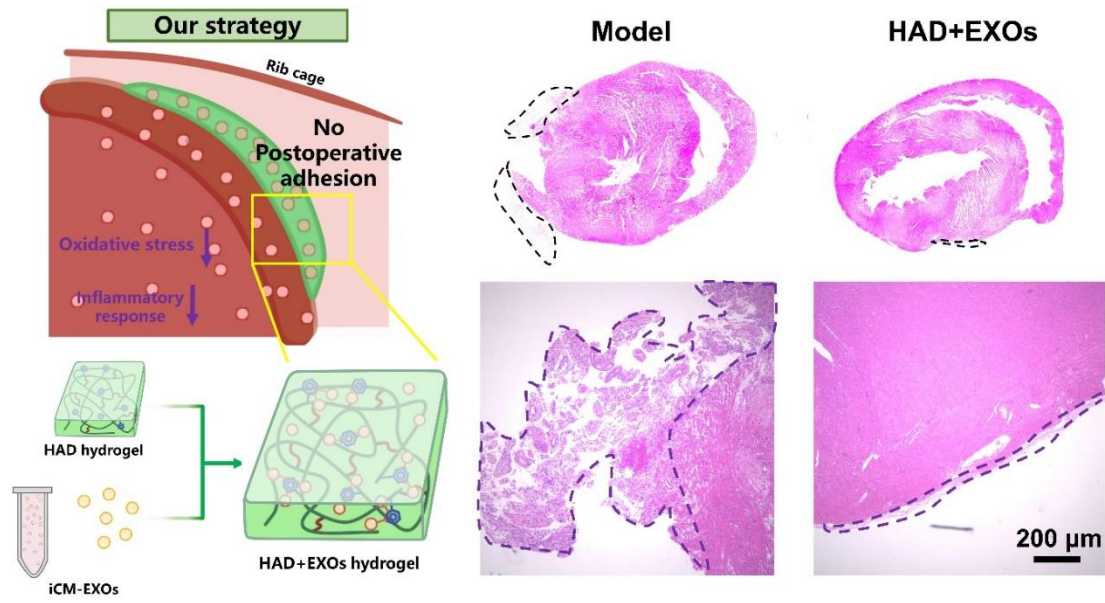


Fig. S13. Our strategy for post-heart surgery adhesion reduction.

Table 1. PCR primers List for qRT-PCR

Gene	Primers	
	Forward	Reverse
GAPDH	ACGGCAAGTTCAACGGCACAG	CGACATACTCAGCACCAGCATCAC
IL-1 β	AATCTCACAGCAGCATCTCGACAAG	TCCACGGGCAAGACATAGGTAGC
IL-6	ACTTCCAGCCAGTTGCCTTCTTG	TGGTCTGTTGTGGGTGGTATCCTC
TNF- α	CACCACGCTCTTCTGTCTACTGAAC	TGGGCTACGGGCTTGTCACTC

Movie S1. HAD hydrogel adhered on the porcine heart

Movie S2. HAD hydrogel effectively sealed the blood leakage from the crack on the porcine heart

Movie S3. The adhesive strength between HAD or HAMA hydrogel and porcine heart following the "sol-adhesive" process

Movie S4. The procedure of establishing a precardiac adhesion rat model