Injectable OPF/graphene oxide hydrogels provide mechanical support and enhance cell electrical signaling after implantation into myocardial infarct

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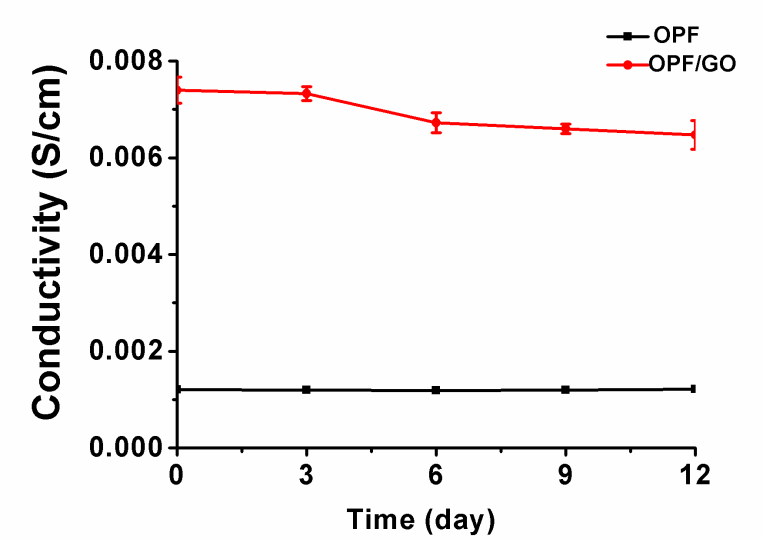

Figure S1. The time-dependent measurement of the electrical conductivity of OPF (black line) and OPF/GO (red line) hydrogel. (n=3/group)

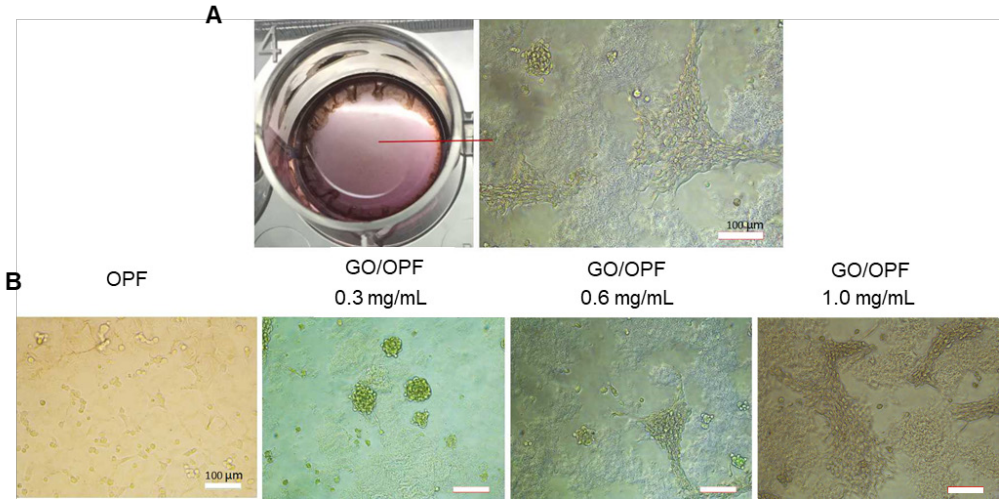

Figure S2. OPF/GO hydrogel supports cell growth *in vitro*.

A. Cardiac fibroblasts were seeded on the surface of OPF/GO hydrogels coated wells. B. Representative morphological images of cardiac fibroblasts cells cultured for 48 h on OPF or different composited OPF/GO (0.3 mg/mL, 0.6 mg/mL, 1.0 mg/mL) coated substrates.

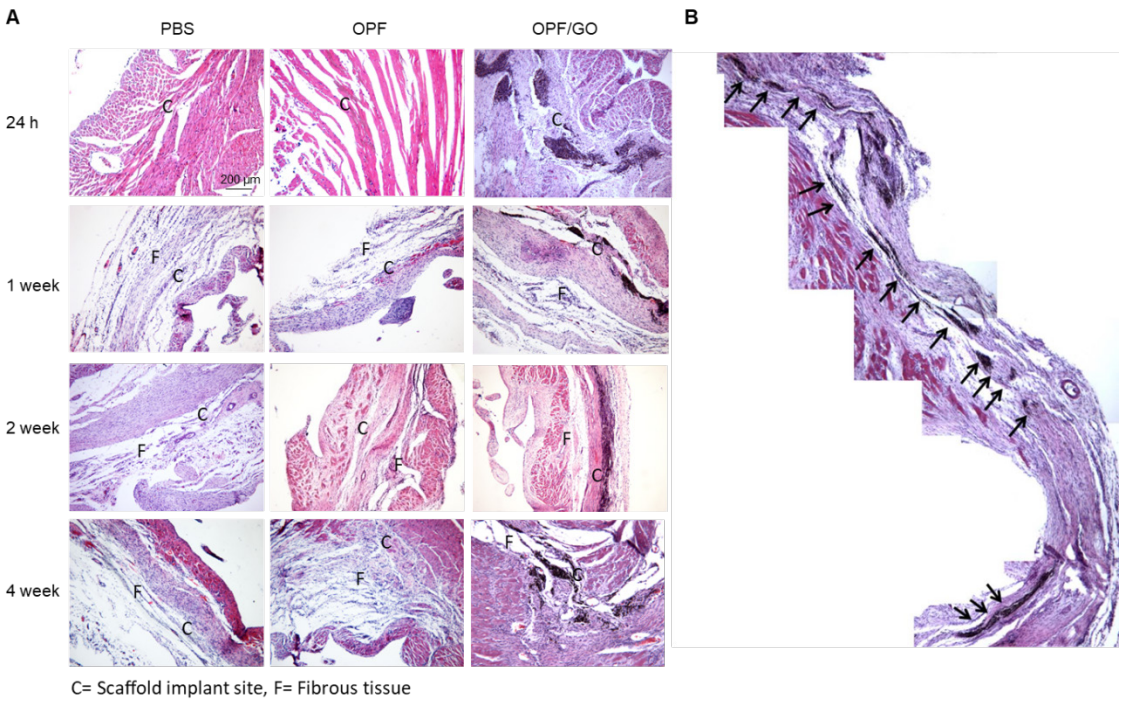

Figure S3. Micrographs of rat infarcted tissue in the left ventricular responses to PBS, OPF and OPF/GO after different implantation time.

A. Micrographs of infarcted tissue in the left ventricular response to PBS, OPF and OPF/GO after different implantation times. OPF/GO hydrogel can be seen in the scar and border zone. B. The maintenance and continuous distribution of OPF/GO along infarcted region. *$p < 0.05$, or **$p < 0.01$.

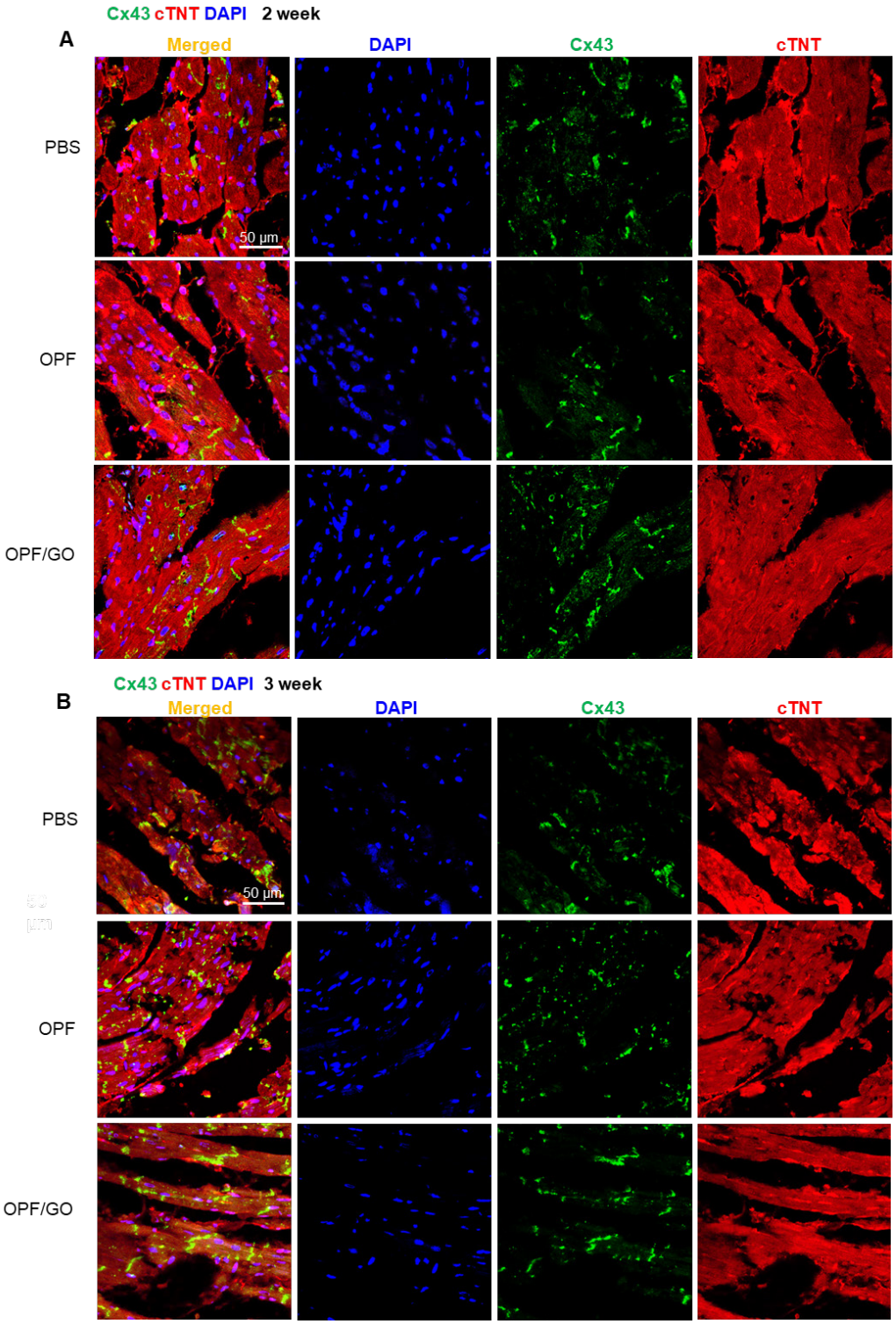

Figure S4. The formation of gap junction associated proteins in the infarcted region of PBS, OPF and OPF/GO injected groups at 2 weeks (A) and 3 weeks (B) post MI. The representative fluorescent images show the specific markers of gap junctions and cardiomyocytes (Cx43 (green), cTNT (red), DAPI (blue)).

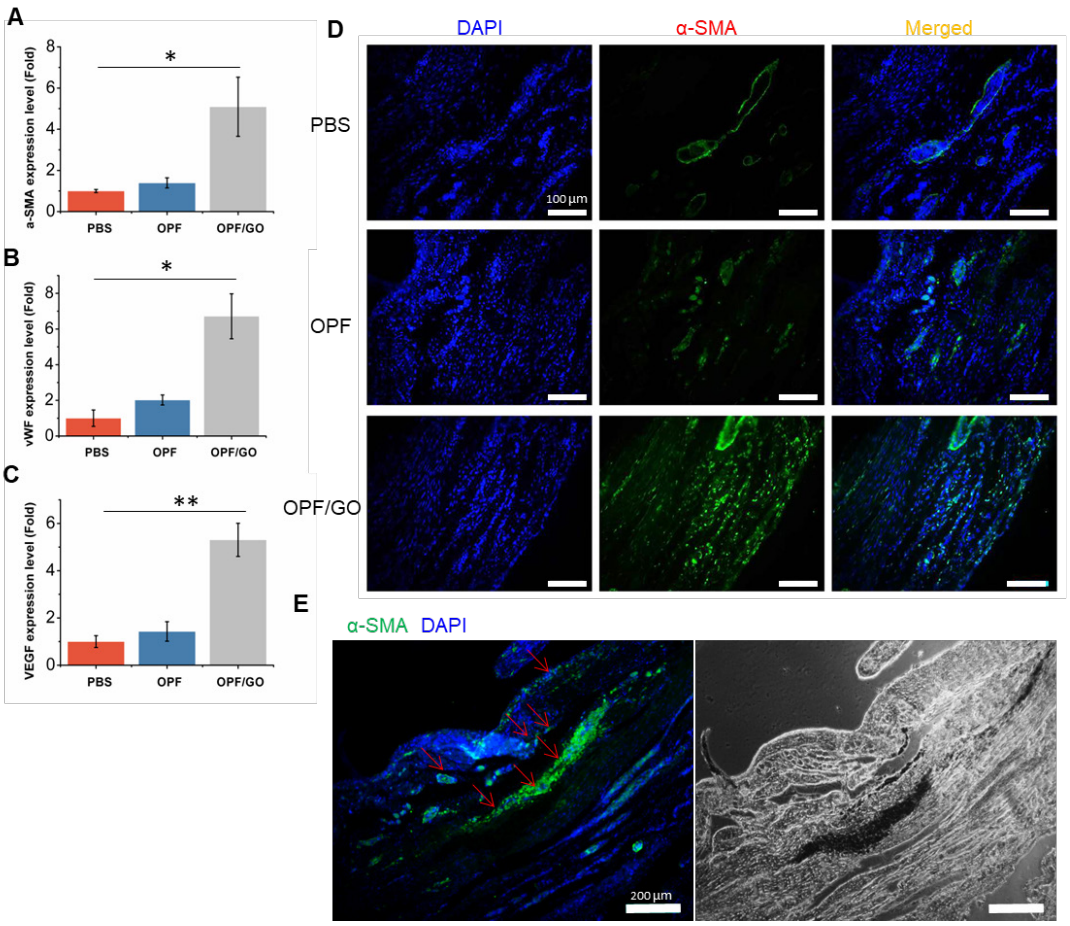

Figure S5. OPF/GO conductive hydrogel promoted the angiogenesis.

The mRNA level of α-SMA (A), vWF (B) and VEGF (C) in PBS, OPF and OPF/GO injected groups 4 weeks after MI. D. Immunoflouresent staining revealed a higher density of α-SMA positive capillaries in the infarcted region of OPF/GO hydrogel treated group compared to OPF and PBS treated group. E. High magnification images of the undegraded OPF/GO hydrogel appeared to distribute in the anterior wall, cells ingrowth was found inside or around the hydrogel area, with some regions of this tissue structure staining positively for a-SMA. *$p < 0.05$, or **$p < 0.01$.

Movie S1

Ex Vivo **Measurement of Skeletomuscular signal propagation through OPF/GO**

Movie S2

Ex Vivo **Measurement of Skeletomuscular signal propagation through OPF**

Movie S3

Calcium transients Signal Conduction of isolated cardiomyocytes in the infarcted area of OPF/GO group

Movie S4

Calcium transients Signal Conduction of isolated cardiomyocytes in the infarcted area of OPF group

Movie S5

Calcium transients Signal Conduction of isolated cardiomyocytes in the infarcted area of PBS group

Supplementary Table 1

q-PCR primers for mRNA expression	
GAPDH Forward	AGTTCAACGGCACAGTCAAG
GAPDH Reverse	TACTCAGCACCAGCATCACC
a-SMA Forward	AGAAGCCCAGCCAGTCGCCATCA
a-SMA Reverse	AGCAAAGCCCGCCTTACAGAGCC
VEGF Forward	TGAACAGCAGCGTATTCG
VEGF Reverse	GACAGAGCCTTCTTCTTCC
Vwf Forward	GCCTGTGGGAGCAGTGCCAG
Vwf Reverse	GGGCGTACTCCAGGAGGGCA
Cx37 Forward	GGGCGCTCATGGGTACCTAT
Cx37 Reverse	GCTCCATGGTCCAGCCATA
Cx40 Forward	GCCTTGGTATGTGCCTTTGGA
Cx40 Reverse	AGGATGACAGCTGGTGGCAAT
Cx45 Forward	AACAAAGCCAATATCGCCCAG
Cx45 Reverse	TGCTAGATCCAAGCGTTCCTG
Cx43 Forward	AGCAAGCTAGCGAGCAAAAC
Cx43 Reverse	GAGTTCATGTCCAGCAGCAA