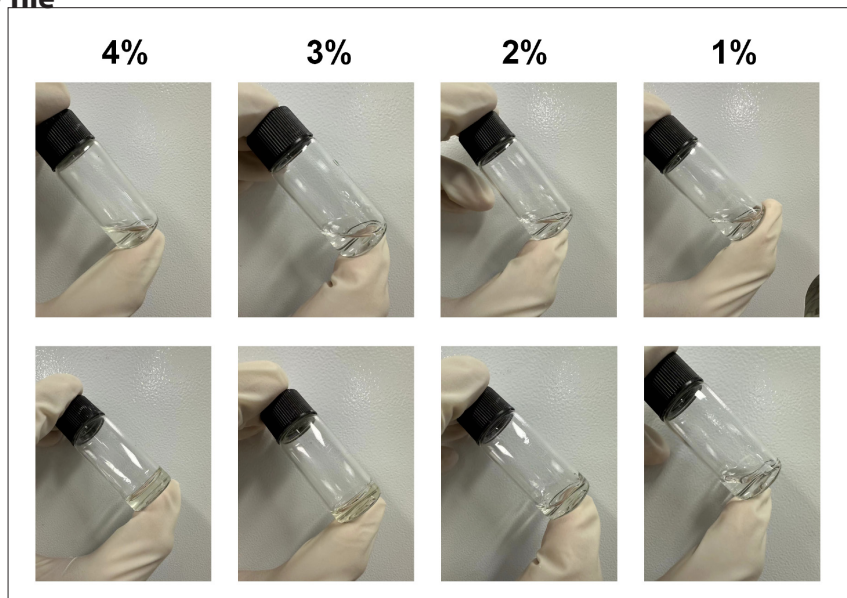


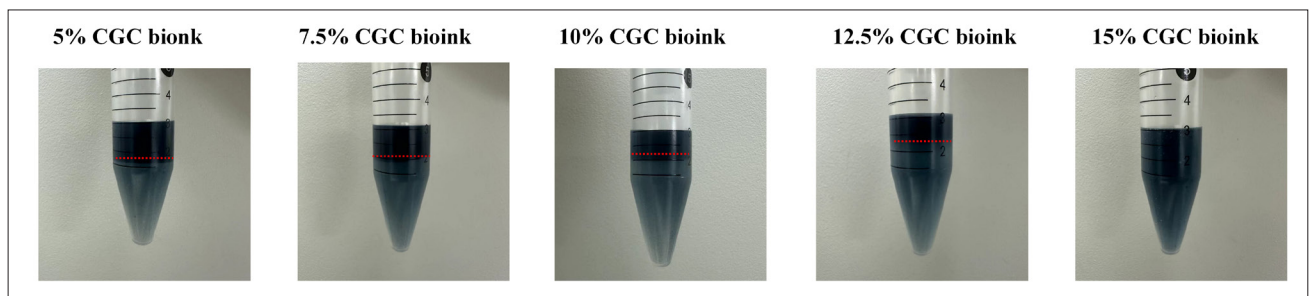
RESEARCH ARTICLE

Treating myocardial infarction with 3D-printed conductive myocardial patch fabricated from granular composite hydrogel

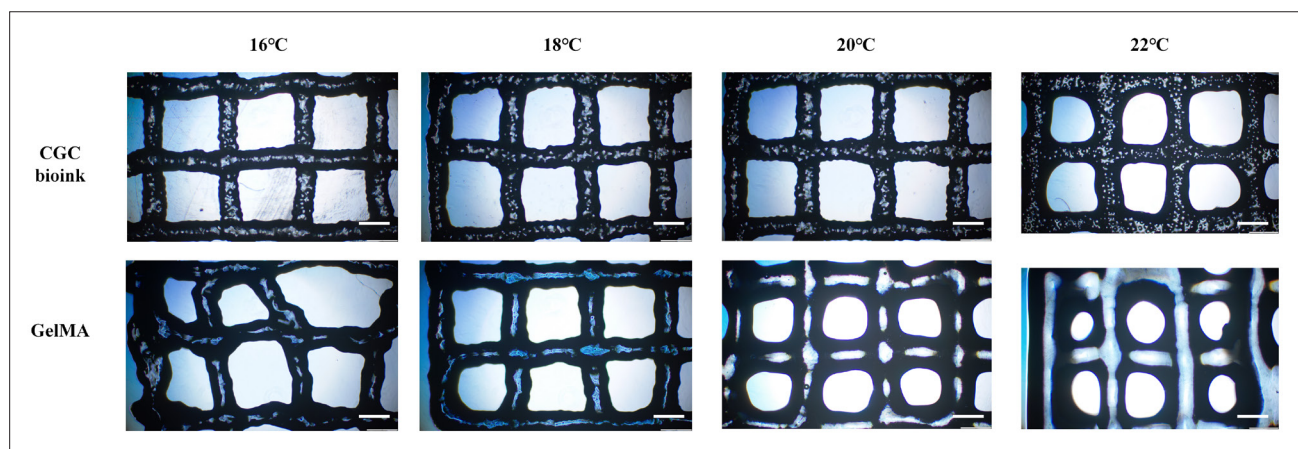
Supplementary file



**Figure S1.** Schematic diagram of GelMA solidification. When the GelMA concentration drops below 3%, the hydrogel fails to achieve sufficient crosslinking quality. Abbreviation: GelMA, Gelatin methacryloyl.



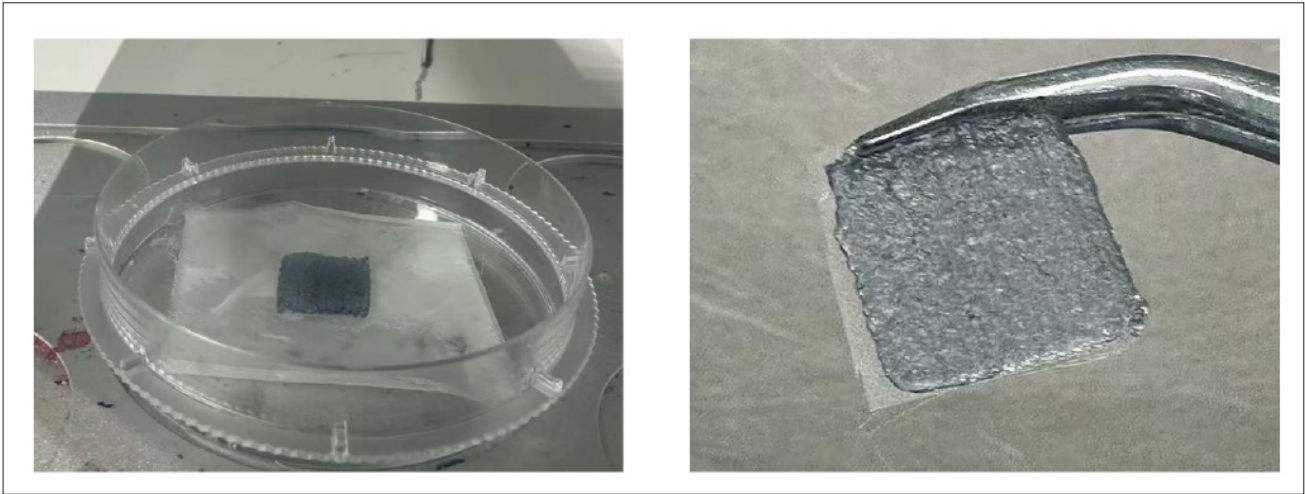
**Figure S2.** The effects of bioink formulation are shown in the figure above. When the concentration of GelMA in the conductive matrix exceeds 12.5%, it was impossible to obtain a stable and uniform CGC bioink through centrifugation. Abbreviations: CGC, conductive granular composite; GelMA, gelatin methacryloyl.



**Figure S3.** Scaffolds printed at different temperatures using CGC bioink and GelMA bioink. Two types of bioinks are printed at four temperatures in the range of 16–22 °C. The 7.5% CGC bioink had a wider temperature forming range and could be stably formed into scaffold structures at 16–20 °C. In contrast, the GelMA bioink deformed at low temperatures due to excessive gelation, and when the temperature exceeded 20°C, it melted, which also leading to deformation. Scale bar: 1 mm. Abbreviations: CGC, conductive granular composite; GelMA, gelatin methacryloyl.



**Figure S4.** CGC bioink can also be utilized to print patches with intricate-curved surfaces within a suspended medium. Abbreviation: CGC: Conductive granular composite.



**Figure S5.** PCL substrate. A substrate structure of PCL (Mn = 8000, Sigma) was constructed using a melt electrospinning writing (MEW) nozzle, based on our previously reported work. The air pressure, nozzle diameter, distance between the nozzle and platform, and moving speed of the platform, were adjusted to 15 kPa, 300  $\mu$ m, 3 mm, and 5 mm/s, respectively. A high voltage (3.5 kV) was applied between the nozzle and the platform. After printing and curing, we cut off the edge portions of the substrate. Abbreviation: PCL, polycaprolactone.

### Supplementary videos

**Videos S1 and S2.** Calcium transients of myocardial cell-laden microgels: 3% GelMA (S1) and 4% GelMA (S2).

**Video S3.** The process of the spontaneous beating of myocardial microgels. Myocardial microgels were started with spontaneous beating on about 3 days post-preparation. Due to the low hydrogel concentration, the microgels would gradually degrade after 7–10 days.