

RESEARCH ARTICLE

Personalized 3D-printed TDM/ZrO₂ scaffolds laden with iPSC-derived SOX9⁺ sclerotomal progenitors for functional osteochondral regeneration

Supplementary file

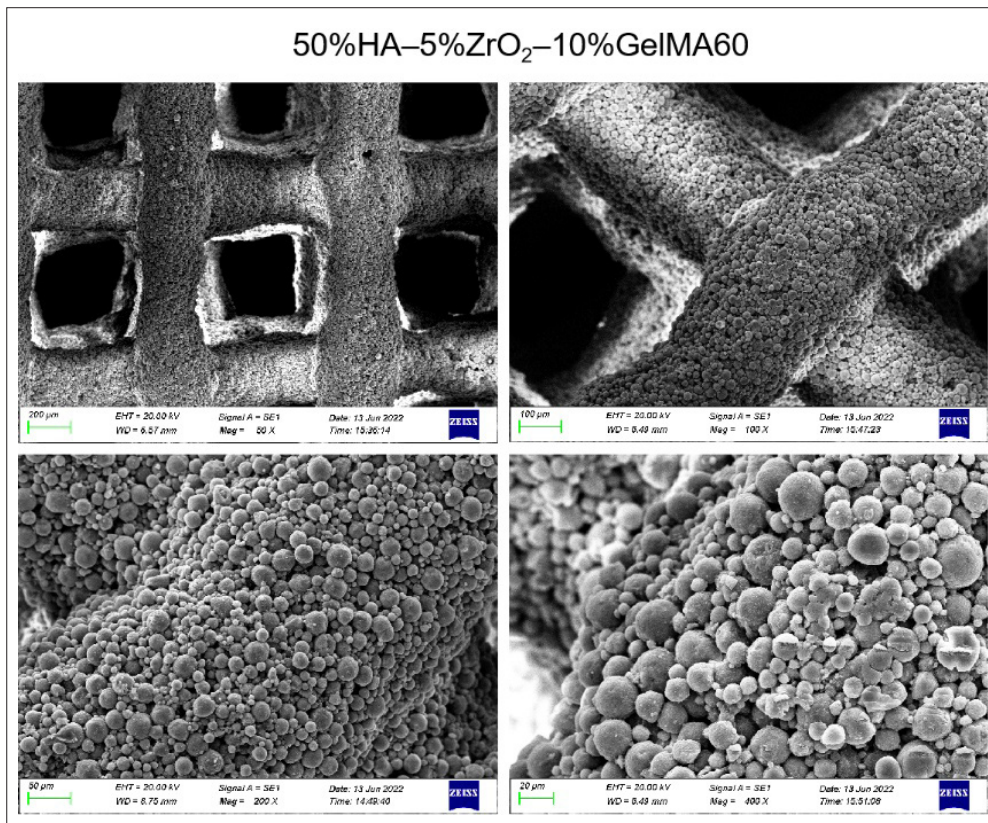


Figure S1. Scanning electron micrographs of three-dimensional-printed HA-based scaffolds (scale bar: 200 μm; magnification: 80×). Abbreviations: GelMA, gethacrylated gelatin; HA, hydroxyapatite; ZrO₂, zirconia.

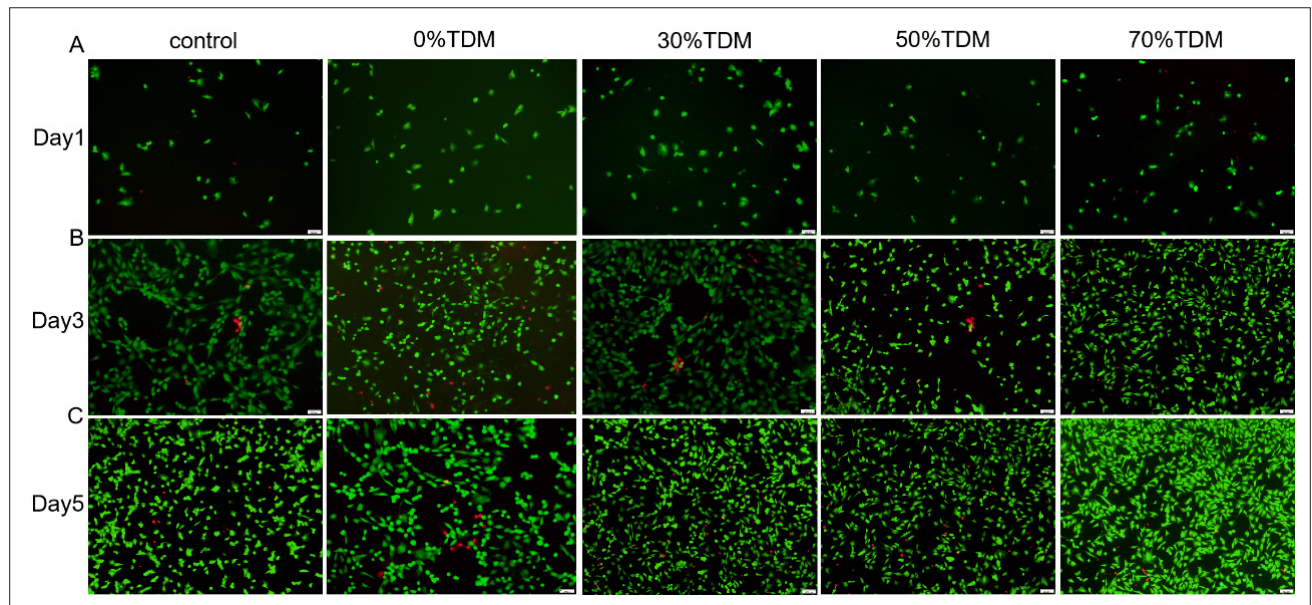


Figure S2. Live/dead staining images of cells co-cultured with the scaffold on (A) day 1, (B) day 3, and (C) day 5. (scale bar: 200 μ M; magnification: 10 \times). Abbreviation: TDM, treated dentin matrix.

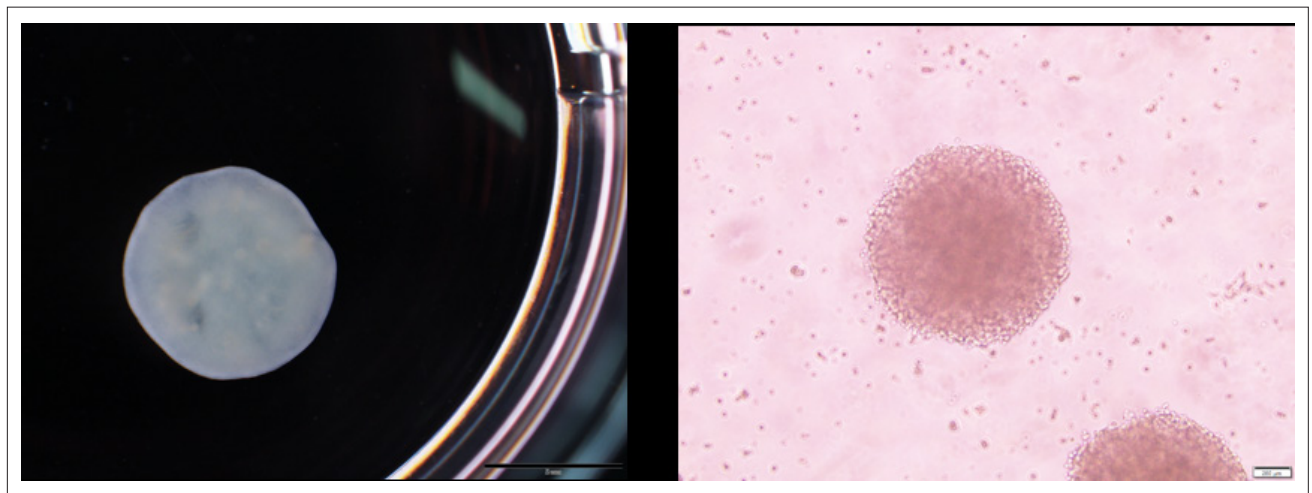


Figure S3. Macroscopic and microscopic morphology of cell spheroids (scale bar: 500 μ M; magnification: 10 \times).

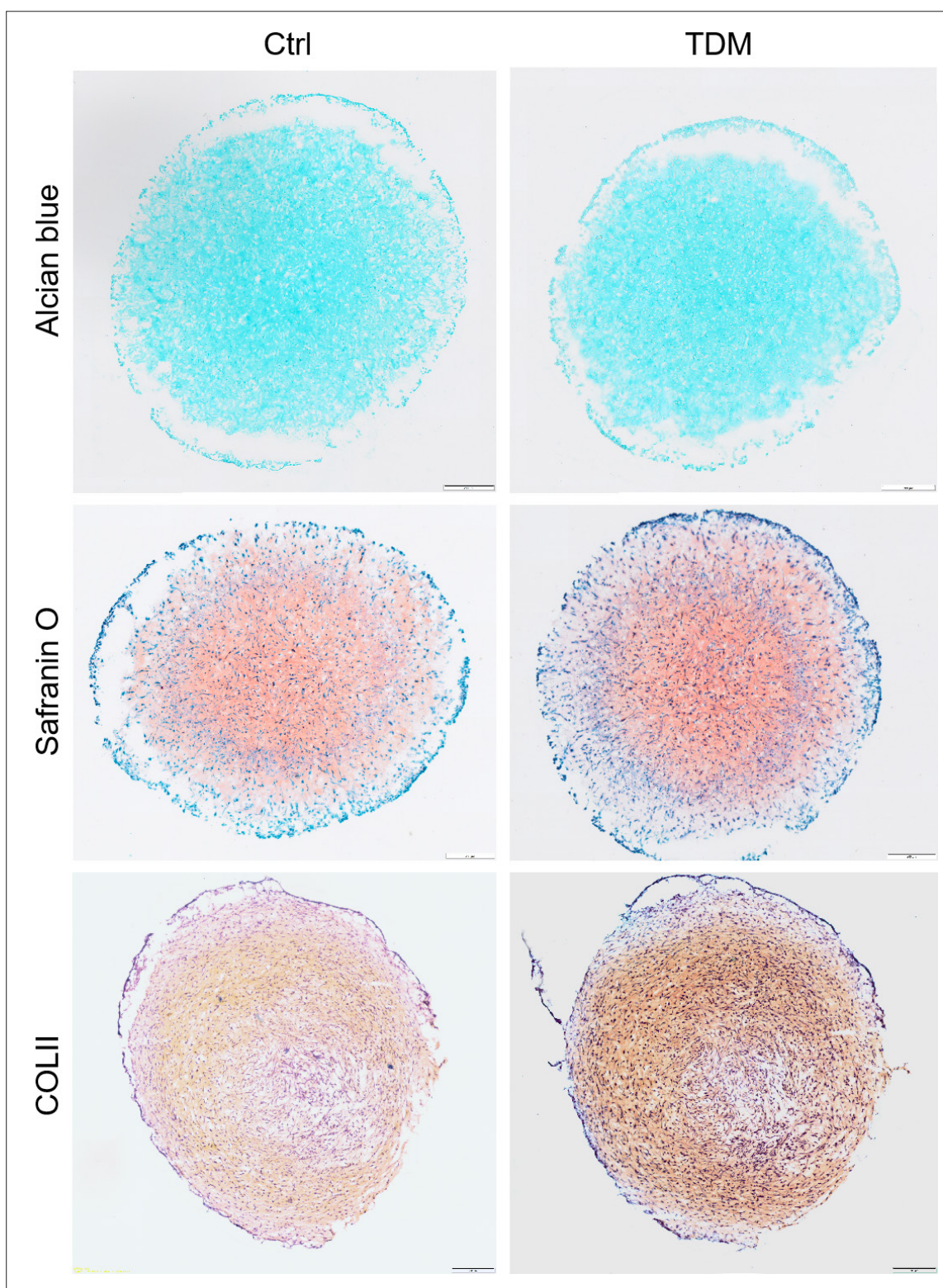


Figure S4. Histological staining of cell spheroids co-cultured with the scaffold for seven days (scale bar: 100 μ M; magnification: 10 \times). Abbreviations: COLII, type II collagen; Ctrl, control; TDM, treated dentin matrix.

Table S1. Primer sequences

Gene	Sequences (5'-3')
<i>OCN-F</i>	AGCAAAGGTGCAGCCTTTGT
<i>OCN-R</i>	GCGCCTGGGTCTCTTCACT
<i>RUNX2-F</i>	CTGTGGCATGCACTTTGACC
<i>RUNX2-R</i>	GACCCTGACTTTTCGGGGAG
<i>COL1-F</i>	CAGGTTCTGGACAATGCTGC
<i>COL1-R</i>	CTGCTGAAGAGGGAAGGAATC
<i>BMP2-F</i>	CTCAAGTCCAGCTGCAAGAG
<i>BMP2-R</i>	ACTCCCATGGCAGTAAAAG
<i>GAPDH-F</i>	ACCCAGAAGACTGTGGATGG
<i>GAPDH-R</i>	CACATTGGGGGTAGGAACAC
<i>SOX9-F</i>	TCTGGAGGCTGCTGAACGA
<i>SOX9-R</i>	TCCGTTCTTACCGACTTCCT
<i>MMP7-F</i>	TCGGAGGAGATGCTCACTTCGA
<i>MMP7-R</i>	GGATCAGAGGAATGTCCATACC
<i>CDC6-F</i>	CAGGTTCTGGACAATGCTGC
<i>CDC6-R</i>	CTGCTGAAGAGGGAAGGAATC
<i>COL11-F</i>	AGAACATCACCTACCACTGTAAGAACA
<i>COL11-R</i>	AGAACATCACCTACCACTGTAAGAACA
<i>KLF15-F</i>	CTTCCAGCCTACCCTGGAGGAG
<i>KLF15-R</i>	TTGGTGTACATCTTGCTGCAGCC
<i>PFKFB3-F</i>	CACGGCGAGAATGAGTACAA
<i>PFKFB3-R</i>	TTCAGCTGACTGGTCCACAC
<i>VEGFA-F</i>	TTCAGCTGACTGGTCCACAC
<i>VEGFA-R</i>	GACCCTGGCTTTACTGCTGTA
<i>GLUT1-F</i>	CTTTTCTGTTGGGGCATGAT
<i>GLUT1-R</i>	CCGCAGTACACCCGATGAT
<i>ACTB-F</i>	AAGTGTGACGTTGACATCCG
<i>ACTB-R</i>	= GATCCACATCTGCTGGAAGG

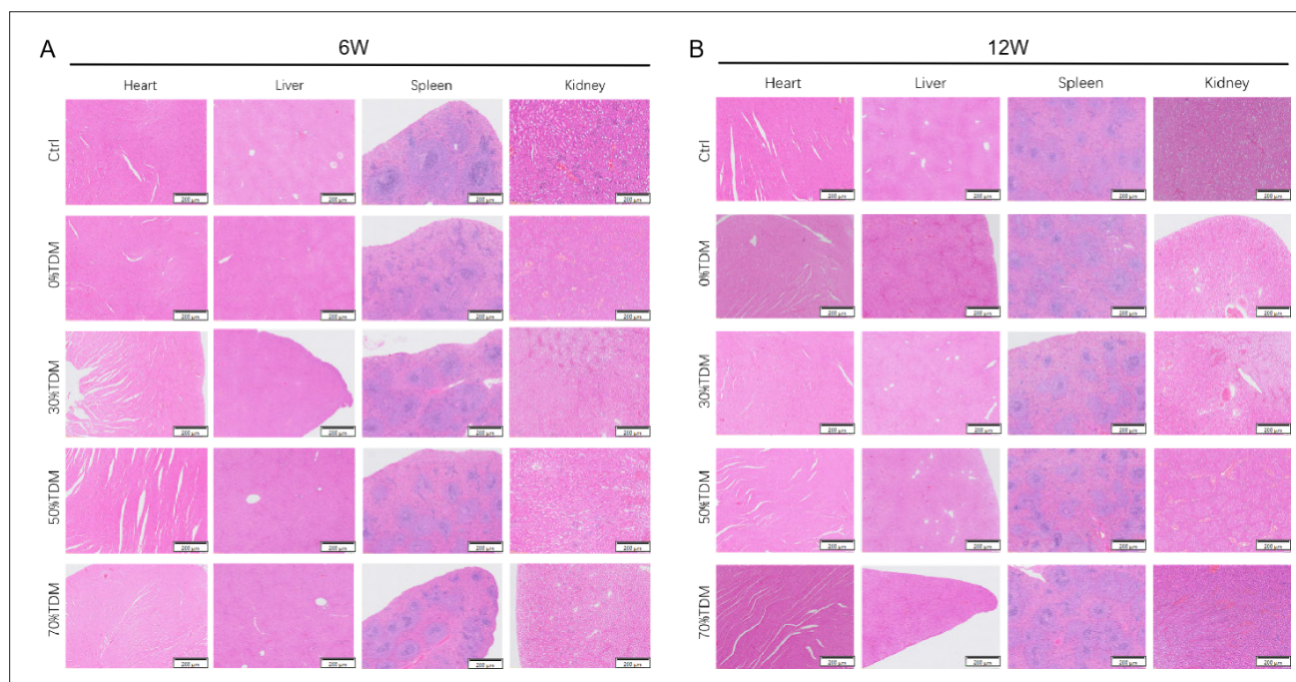


Figure S5. Hematoxylin and eosin staining of internal organs harvested from nude rats at (A) week 6 and (B) week 12 (scale bar: 200 μm; magnification: 10×). Abbreviations: Ctrl, control; TDM, treated dentin matrix.

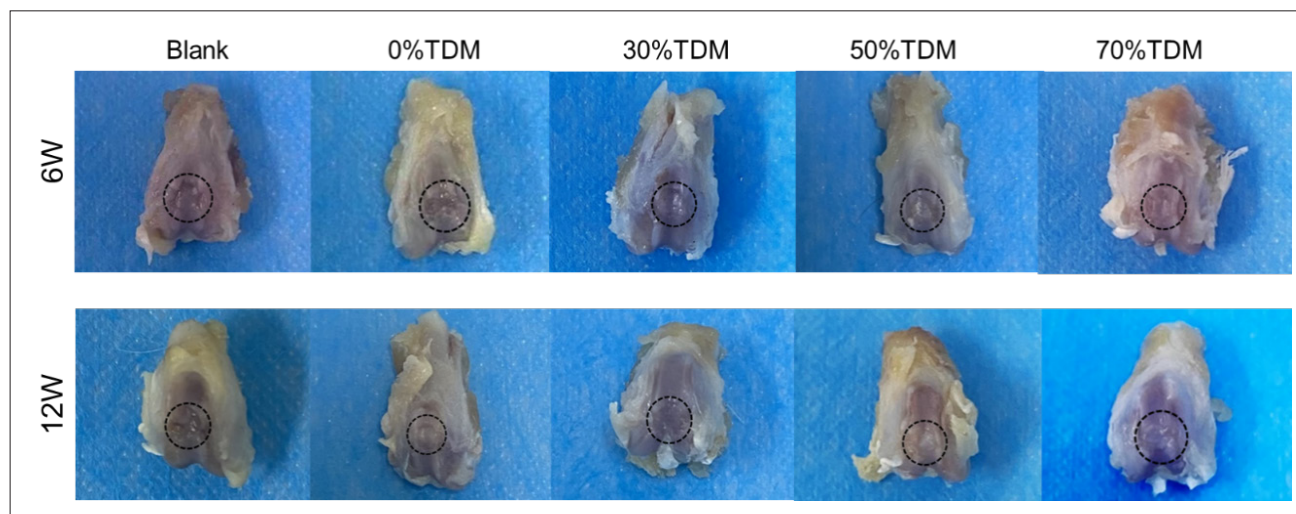


Figure S6. Macroscopic observation of knee joint specimens at weeks 6 and 12 (scale bar: 500 μm; magnification: 5×). Abbreviation: TDM, treated dentin matrix.

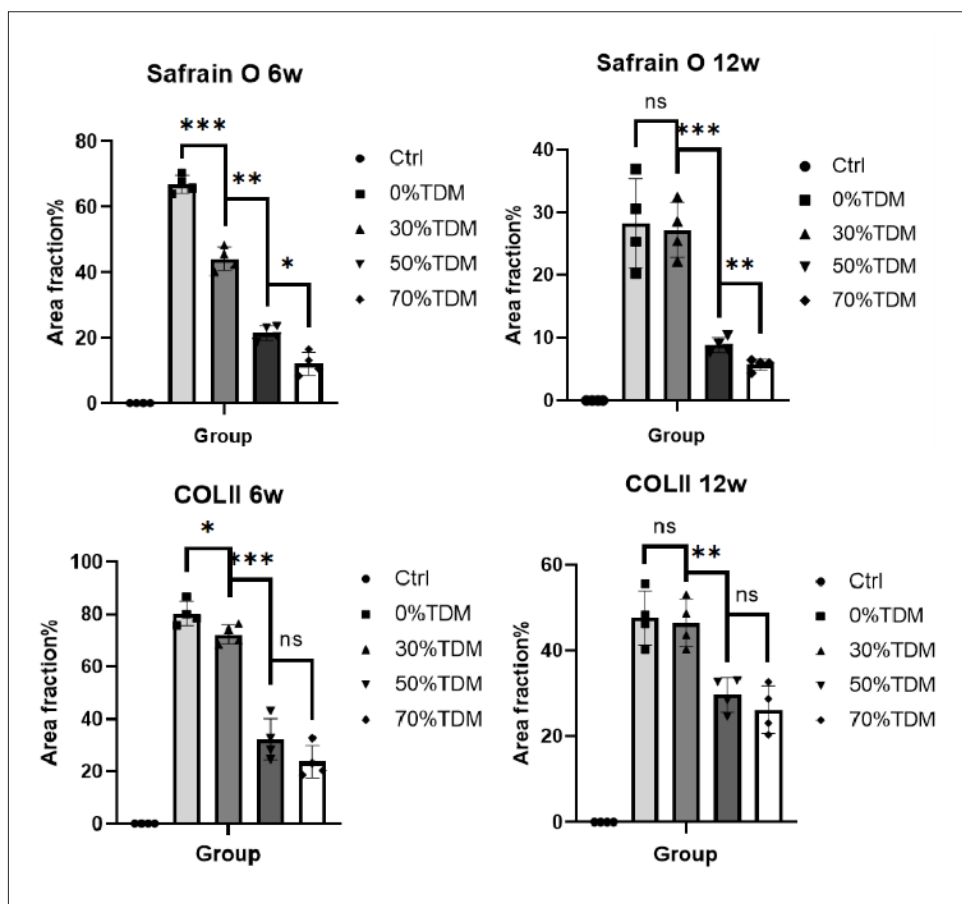


Figure S7. Quantitative analysis of Safranin O and COLII staining ($n = 4$) at weeks 6 and 12. *, **, and *** indicate statistically significant differences at $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively. “ns” denotes no statistical significance. Abbreviations: Ctrl, control; TDM, treated dentin matrix.