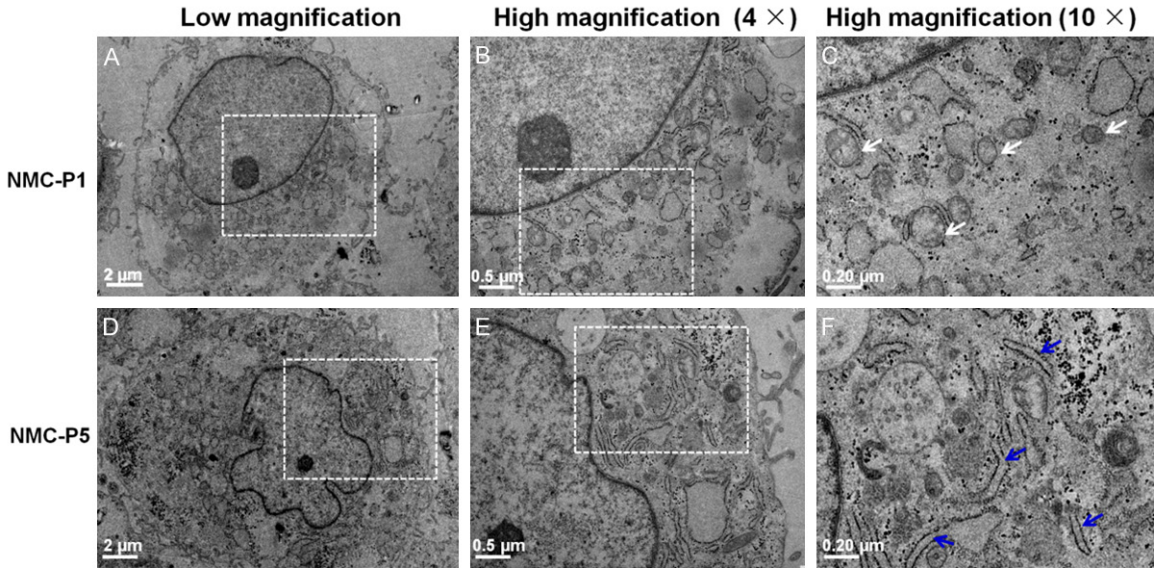
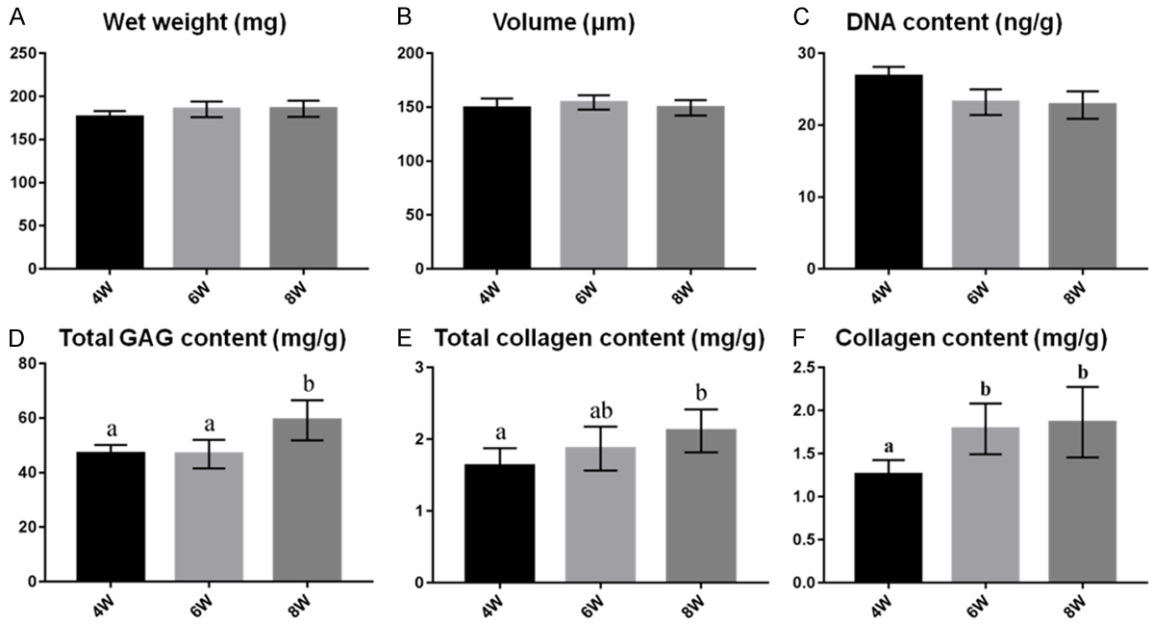
Supplementary Table 1. Primer sequence used for quantitative Real-Time PCR

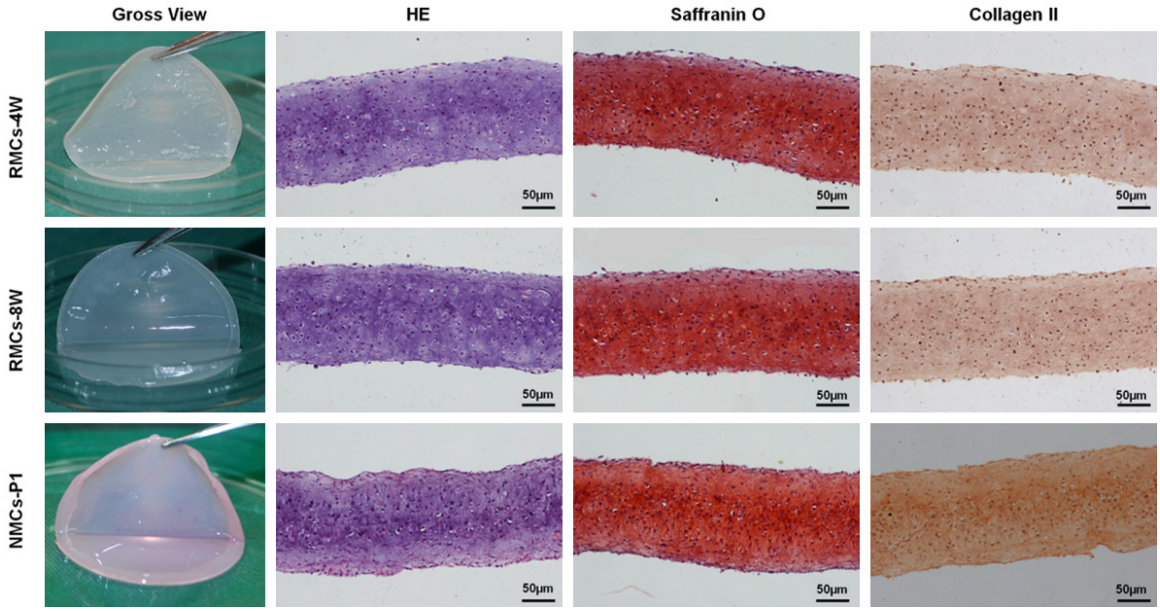
Gene name	Gene symbol	Forward primer	Reverse primer
Glyceraldehyde-3-phosphate dehydrogenase	GAPDH	5-CTGCCCCTTCTGCTGATGC-3	5-TCCACGATGCCGAAGTTGTC-3
Collagen II, type II alpha 1	COL 2A1	5-TCCTGGTGAAGATGGTCGC-3	5-AGCACCTGTCTCGCCATCT-3
Aggrecan	ACAN	5-GAATCTAGCAGGGAGTCATC-3	5-CTGAAAGGCTGAGGTGCTG-3



Supplementary Figure 1. The ultrastructural characteristics of dedifferentiated chondrocytes (NMC P5) and non-dedifferentiated chondrocytes (NMC P1). Dedifferentiated chondrocytes showed segmented nuclei with smaller nucleoli at low power (D), while non-dedifferentiated chondrocytes showed larger nuclei and nucleoli (A). At high magnification, the dedifferentiated chondrocytes have a greater amount of smooth endoplasmic reticulum (blue arrow) but fewer secretory vesicles compared with the non-dedifferentiated chondrocytes (E, F), which contain abundant secretory vesicles (white arrow) with less smooth endoplasmic reticulum (B, C).



Supplementary Figure 2. Biochemical evaluation of chondrocyte-PGA/PLA constructs at various time points. None of the samples exhibited a significant difference in wet weight (A), volume (B), or DNA content (C). However, GAG, total collagen, and collagen II contents (D-F) exhibited an obvious increasing trend with *in vitro* culture time. Columns with different letters indicate statistical significance.



Supplementary Figure 3. Overall appearance and cartilage-specific staining of cell-sheet cartilage formed by RMCs. All chondrocytes from RMC-4W and RMC-8W groups formed ivory-white cartilage sheet tissues after 6 weeks of *in vitro* culture. Moreover, these *in vitro* -engineered cartilages showed typical lacuna structures with strong positive staining of Safranin-O and COL II. Furthermore, none of the engineered cartilage sheets formed by RMCs showed significant differences in overall appearance or histological evaluation compared with those formed by native P1 chondrocytes.