Supplementary Information

Table S1. Zero-shear viscosities of different viscous inductive media prepared by different ratios of PEG 35 K and PEG 8 M

Culture medium	PEG 35 K (w/v%)	PEG 8 M (w/v%)	Zero-shear viscosity of adipogenic medium (mPa·s)	Zero-shear viscosity of osteogenic medium (mPa·s)
Normal induction medium without PEG supplementation	0.00	0.00	74.2 ± 23.6	86.4 ± 28.2
Low viscosity	1.00	0.00	88.8 ± 32.1	105.9 ± 23.8
Middle viscosity	0.25	0.75	268.9 ± 46.6	244.6 ± 47.8
High viscosity	0.00	1.00	645.5 ± 74.7	650.8 ± 60.6

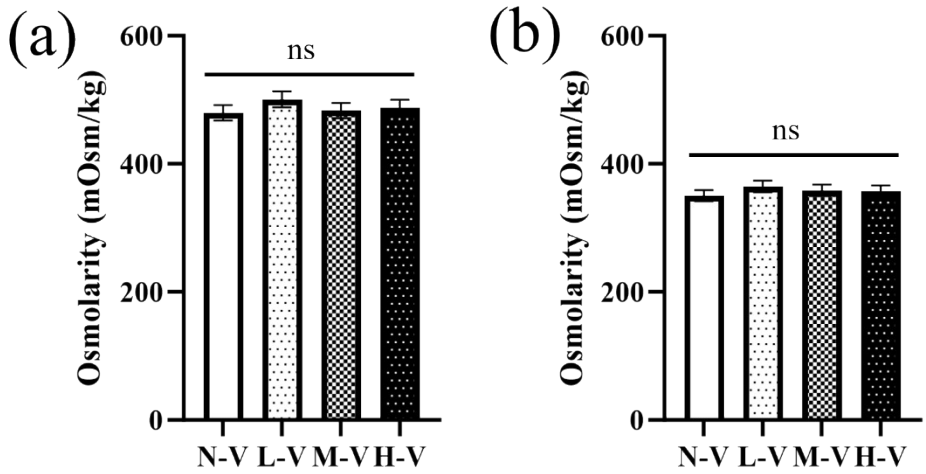

Figure S1. Osmolarity measurement of viscous induction media by the vapour pressure method. (a) Osmolarity measurement of different viscous adipogenic induction media. (b) Osmolarity measurement of different viscous osteogenic induction media. Data represent mean ± SD, n = 4. Significant difference: ns: not significant.

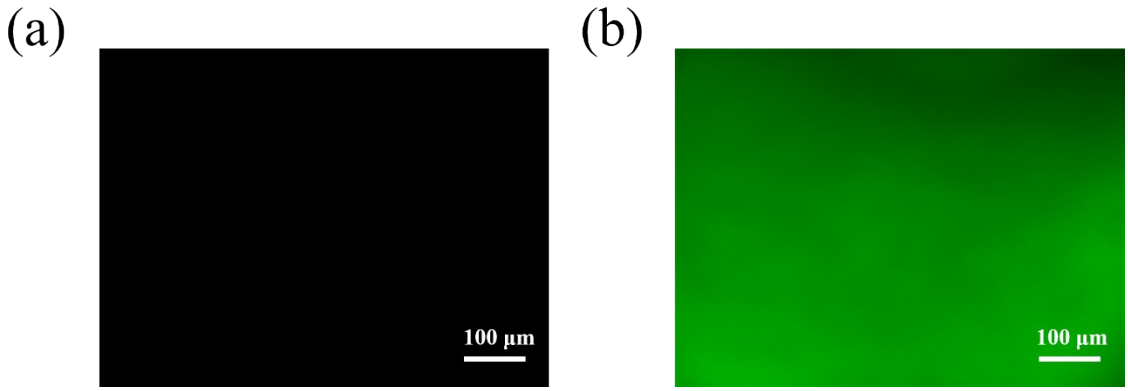

Figure S2. Characterization of fibronectin coating on a 24-well plate. (a) Without fibronectin coating. (b) With fibronectin coating. Scale bar = 100 µm.

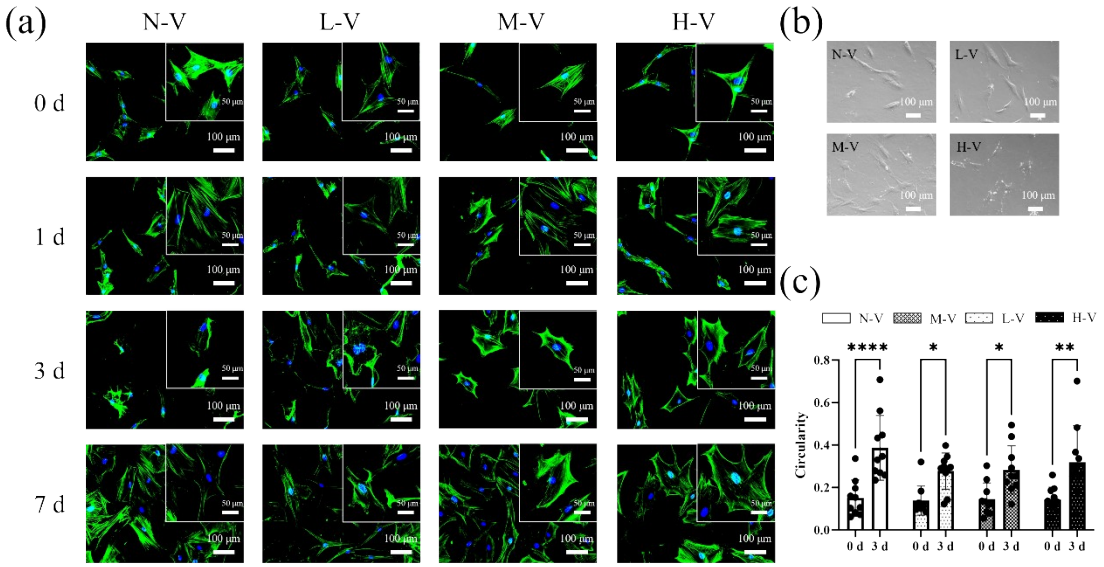

Figure S3. Morphology changes of hMSCs exposed to different viscous media under adipogenic differentiation. (a) F-actin staining of hMSCs under different viscosity exposure during adipogenic differentiation on 0, 1, 3 and 7 d. (b) Phase-contrast photomicrographs of hMSCs exposed to different viscous adipogenic induction media for 3 d. (c) Circularity change during adipogenic differentiation on 0 d and 3 d under different

viscosities (circularity was calculated based on the equation: $Circularity = \frac{4\pi \times Area}{Perimeter^2}$). Data represent mean ± SD. Significant difference: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, ****$p < 0.0001$.

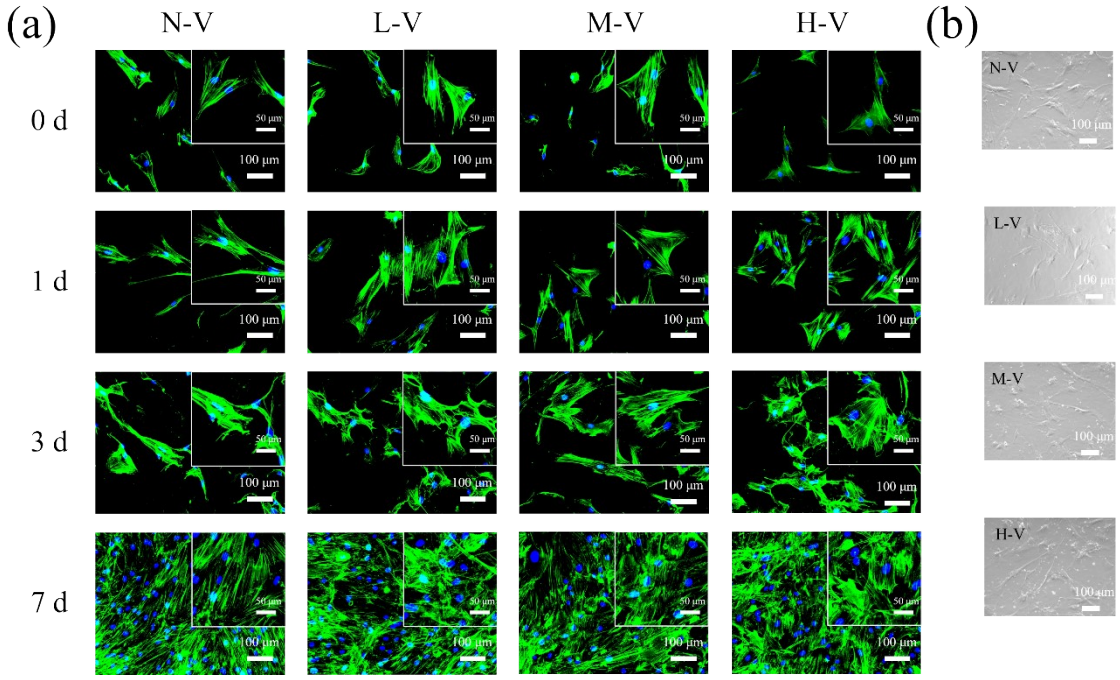

Figure S4. Morphology changes of hMSCs exposed to different viscous media under osteogenic differentiation. (a) F-actin staining of hMSCs under different viscosity exposure during osteogenic differentiation on 0, 1, 3 and 7 d. (b) Phase-contrast photomicrographs of hMSCs exposed to different viscous osteogenic induction media for 3 d.

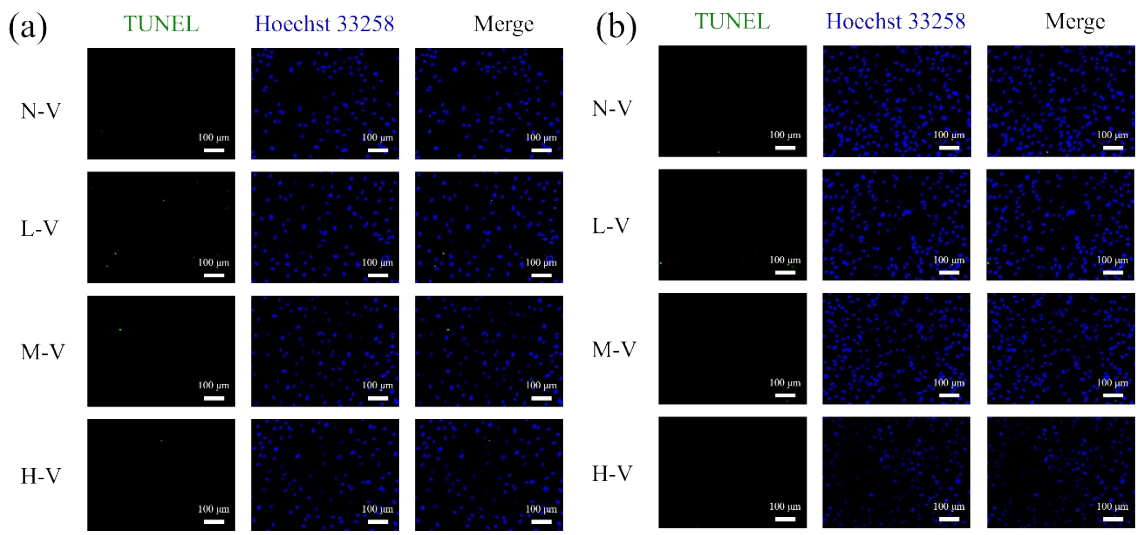

Figure S5. Apoptosis staining of hMSCs cultured in adipogenic viscous media (a) and osteogenic viscous media (b) for 7 d. Scale bar = 100 μm.

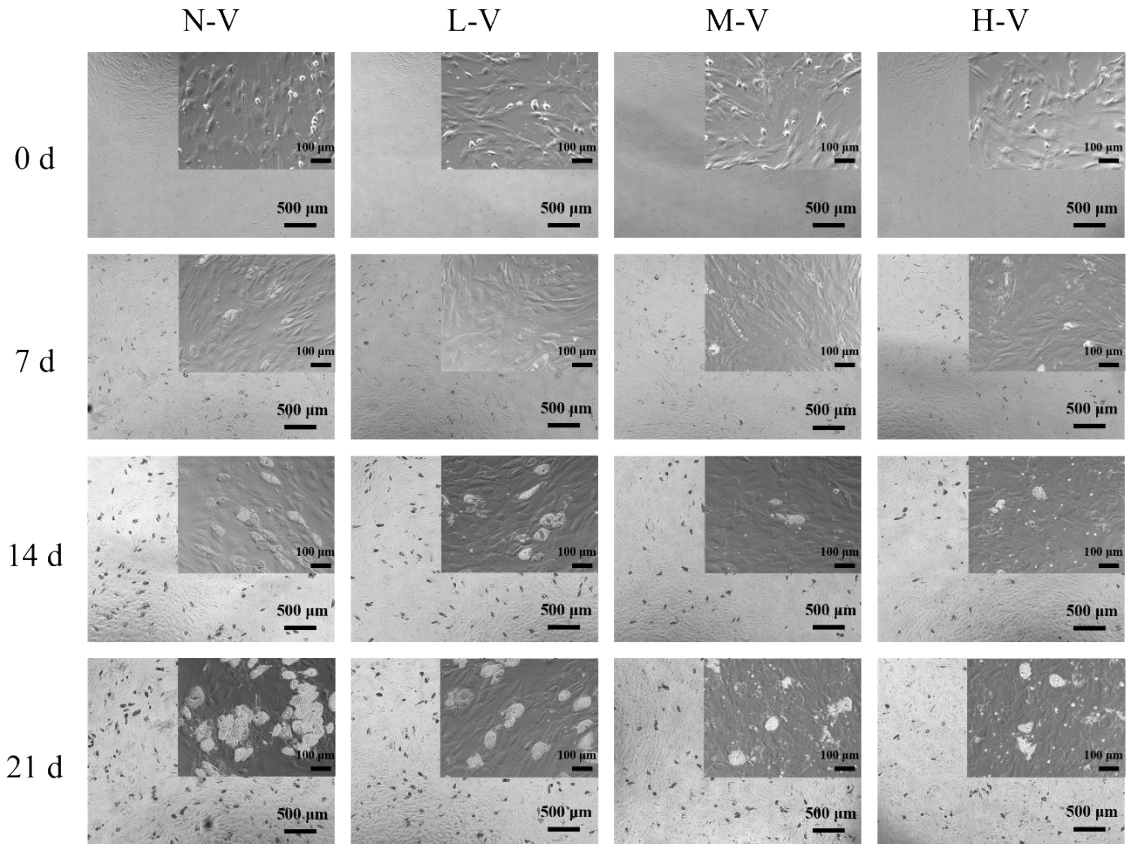

Figure S6. Phase-contrast photomicrographs of hMSCs exposed to different viscous media under adipogenic differentiation on 0, 7, 14 and 21 d. Scale bar = 500 μm, inserted scale bar = 100 μm.

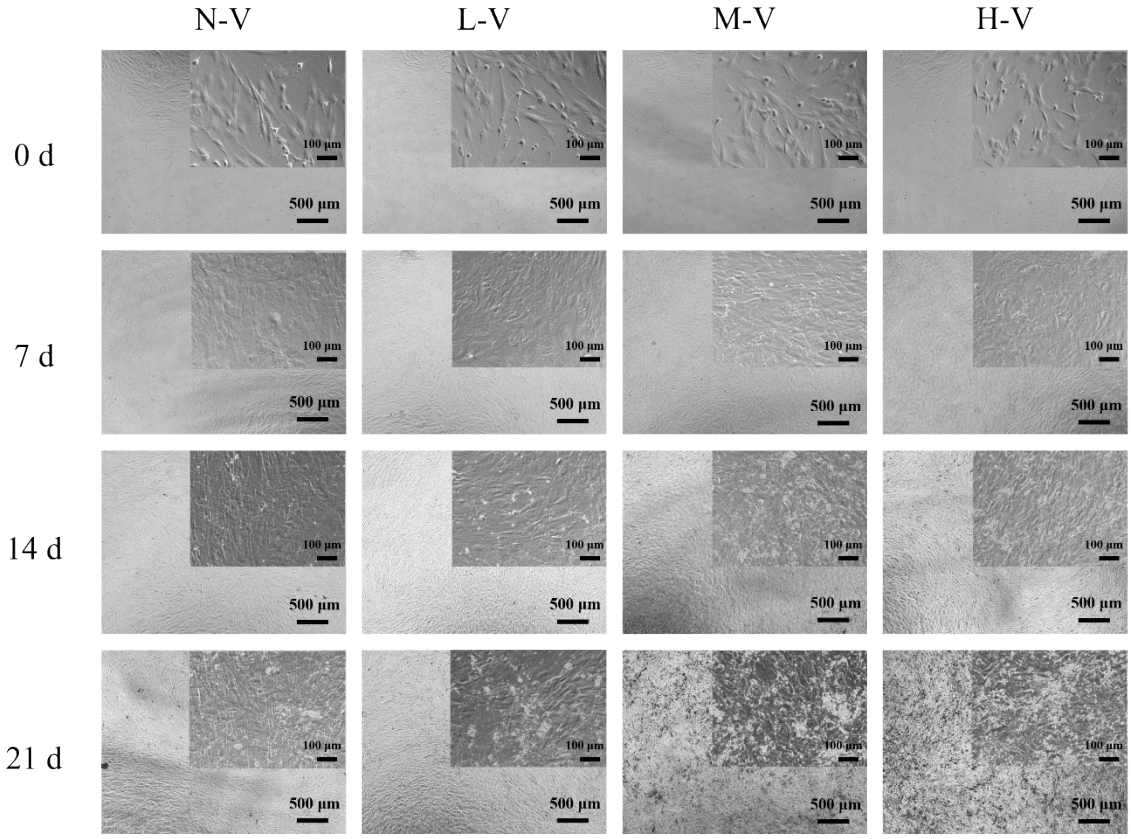

Figure S7. Phase-contrast photomicrographs of hMSCs exposed to different viscous media under osteogenic differentiation on 0, 7, 14 and 21 d. Scale bar = 500 μm, inserted scale bar = 100 μm.

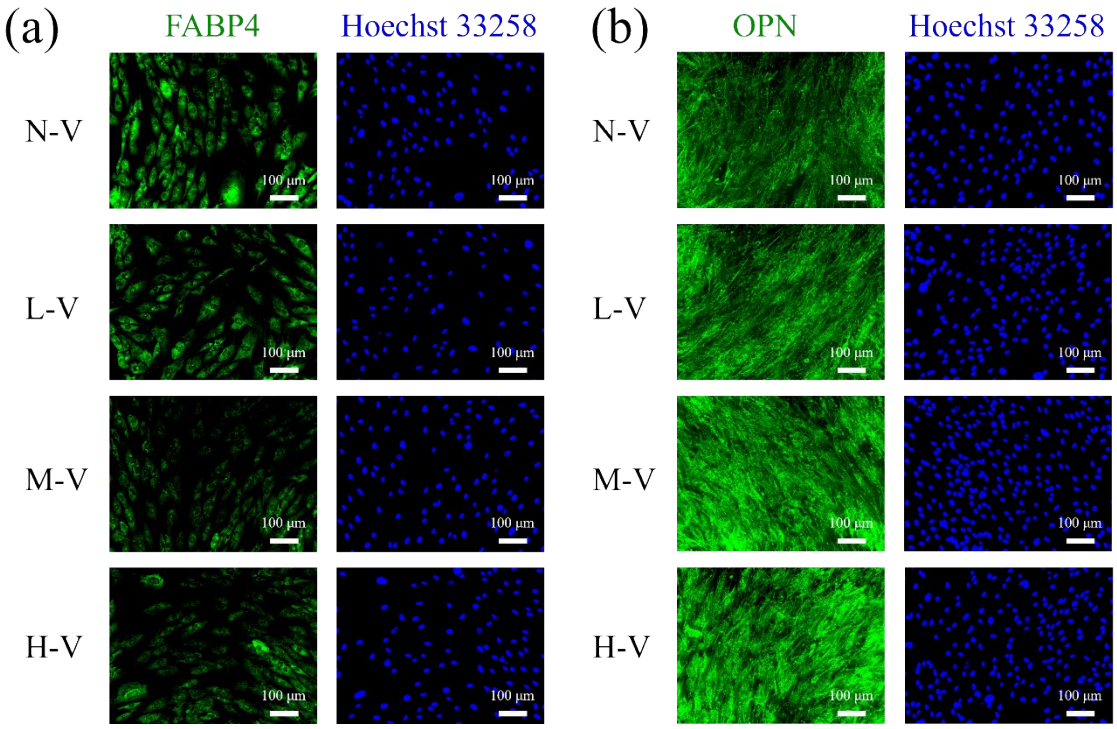

Figure S8. Immunofluorescence staining of FABP4 (a) and OPN (b) for adipogenic and osteogenic differentiation under different viscosity stimuli for 3 d, respectively. Cell nuclei were stained blue, scale bar = 100 μm.