

Description of Additional Supplementary Files

File Name: Supplementary Movie 1

Description: HITS-Bio software operation.

File Name: Supplementary Movie 2

Description: DCNA with non-coated vs. coated nozzles.

File Name: Supplementary Movie 3

Description: DCNA with intra-nozzle distance of 2.8 mm vs. 3.4 mm.

File Name: Supplementary Movie 4

Description: Single nozzle AAB vs. HITS-Bio for bioprinting of 64 spheroids.

File Name: Supplementary Movie 5

Description: Patterning of spheroids. Selectively patterned spheroids stained with DAPI (blue), F-Actin (red), and F-Actin (green) using the DCNA platform with various configurations.

File Name: Supplementary Movie 6

Description: HITS-Bio for bone tissue bioprinting. Video demonstrates bioprinted osteogenic spheroids with low (16 spheroids) and high densities (64 spheroids) using BONink.

File Name: Supplementary Movie 7

Description: HITS-Bio using CARink. Video demonstrates bioprinted spheroids with low (16 spheroids) and high densities (64 spheroids) on a transparent gel (CARTink) for clear visualization.

File Name: Supplementary Movie 8

Description: Intraoperative bioprinting (IOB) of bone tissue into critical-sized rat calvarial defects with BONink only, low-density (16 spheroids) and high-density (64 spheroids) groups. The process included EBB of the BONink, then deposition of miR-(196a-5p + 21) co-transfected osteogenic spheroids followed by another layer of BONink.

File Name: Supplementary Movie 9

Description: HITS-Bio for fabrication of 1 cm³ cartilage constructs. The process took 40 min in total including the EBB of the CARink and HITS-Bio of miR-(140 + 21) co-transfected chondrogenic spheroids.