Supplementary information

A Microfluidic Circulatory System Integrated with Capillary-Assisted Pressure Sensors

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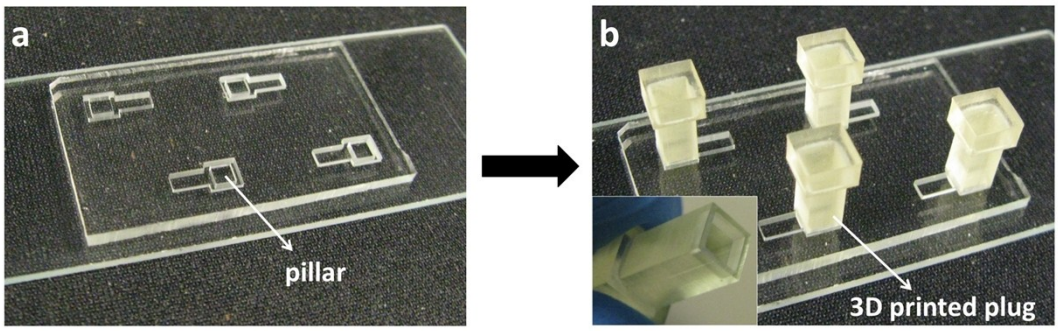

Fig. S1: (a) Photograph of layer 5 shown in Fig. 1d and the white arrow indicates the pillar in a check valve. **(b)** Photograph of layer 5 with plugs inserted to block the top area of pillars and the white arrow indicates a 3D printed plug. Inset shows the bottom of a 3D printed plug.

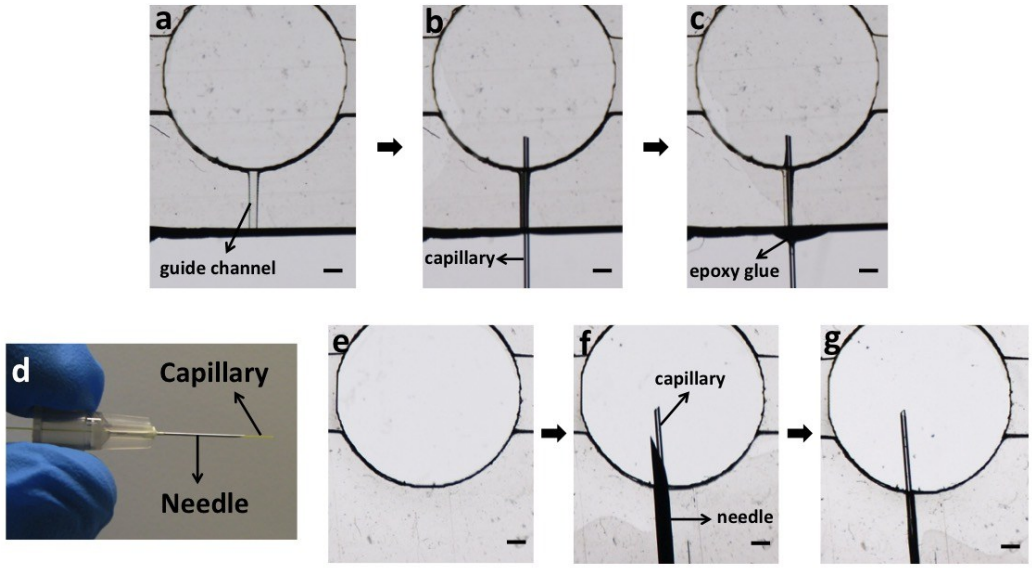

Fig. S2 Insertion of a capillary using a pre-designed guide channel (a-c) or a needle (d-g). In (c), the capillary was fixed by epoxy glue, preventing the leakage. In (d), a needle was used to house the capillary. In (g), the capillary was held tightly against PDMS after withdraw of the needle. Scale bar: 500 μm.

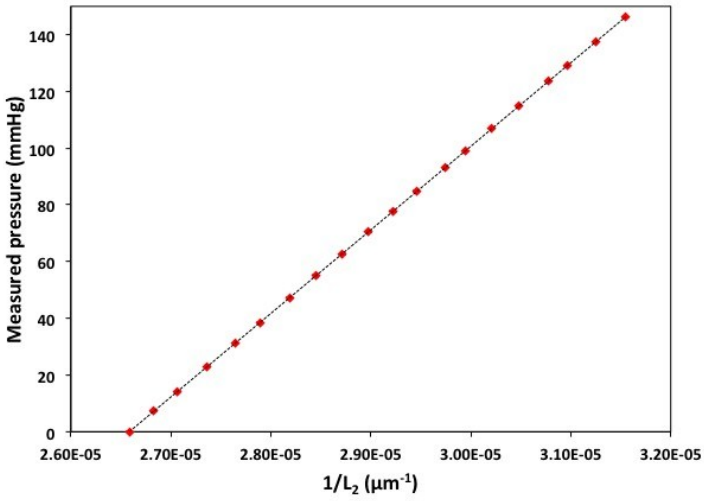

Fig. S3 The linear regression showing high linearity ($R^2 > 0.99$) between measured pressure ($P_{measured}$) and $1/L_2$.

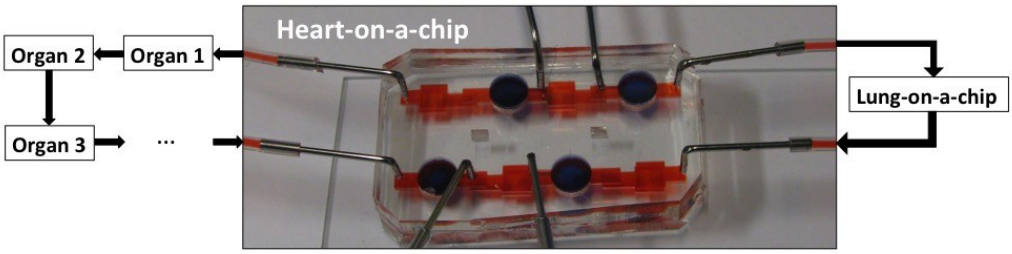

Fig. S4 The illustration of integrating the biomimetic on-chip pumping system as a heart-on-a-chip module on a "body-on-a-chip" platform.

Table S1 Comparison between normal and mimicked physiological pressure

Pressure (mmHg)	Normal[1]	Mimicked
LVP peak pressure	100 - 140	123
LVP end diastolic pressure	3 - 12	10
Systolic AP	90 - 119	115
Diastolic AP	60 - 79	69

Reference

1 M. E. Klingensmith, L. E. Chen, S. C. Glasgow, T. A. Goers and S. J. Melby, *The Washington Manual of Surgery*, Washington University, 5th edn., 2008.

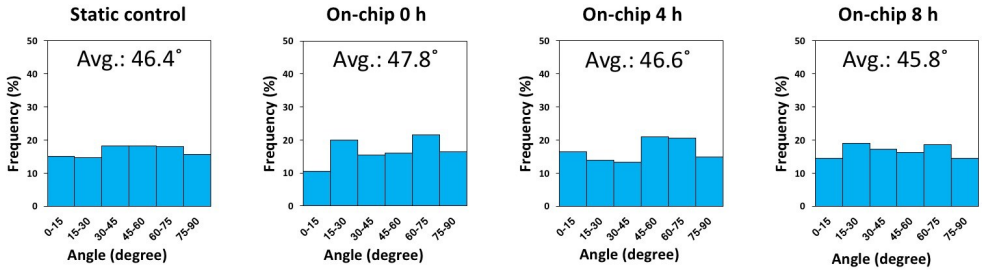

Fig. S5 Histograms showing the distributions of orientation angles. The flow direction is defined as 0˚.

Video S1 A demonstration of one-way loop in a simplified circulatory device. At first, the device was filled with clear water and ports 1 and 8 were blocked (Fig. 1b). Next, inlet 4 was connected to a reservoir containing red ink while outlet 5 was connected to a waste container. By sequentially actuating the four pumping units, red ink was extracted into the device and show the fluidic one-way loop. Red arrows show the direction of flow.