OCTA Setup and Experimental Protocol.

The schematic of the swept-source OCTA system setup is depicted in Fig. 1A. The MEMS-VCSEL swept source (SL131090, Thorlabs, Inc.) provided a k-linear sampling clock and a center wavelength trigger signal. The output was fed into a fiber interferometer via Coupler 1 (TW1300, Thorlabs, Inc.). Circulator 1 (Cir-3-131, Optowaves) received 80% of the power and was directed to the sample arm. Meanwhile, the remaining 20% of the power was sent to Circulator 2 (Cir-3-131, Optowaves), which was directed to the reference arm. The sample arm consisted of an X-Y galvanometer scanner (GVS002, Thorlabs, Inc.) controlled by a 12-bit high-speed analog output board (PCI-6713, National Instruments). A telecentric flat-field scan lens (LSM03, Thorlabs, Inc.) with an effective focal length of 36 mm focused the output beam from the galvo to the human finger. An adjustable free-space reference arm matched the optical delay with the sample arm. A dispersion compensating block (LSM03DC, Thorlabs, Inc.) is inserted between the collimator and the reference mirror. The backscattered light from the two arms was interfered in Coupler 2 (TW1300, Thorlabs, Inc.) and delivered to a balanced detector (PDB470C, Thorlabs, Inc.) with a 1.6 GHz bandwidth. The spectral interferogram was recorded by a high-speed digitizer (ATS9350, AlazarTech, Inc.) and transmitted to the host processor via a PCI Express interface.

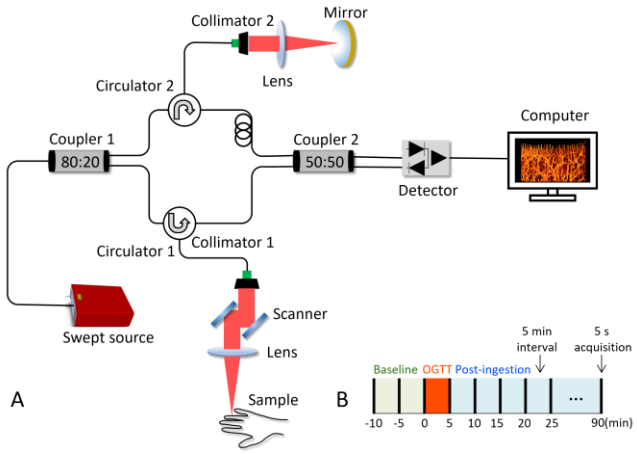

Fig. 1. A: Schematic of the OCTA system. B: Diagram of the imaging protocol.

A total of 10 healthy volunteers (6 men and 4 women) were enrolled, with an average age of 25 years old. All volunteers were in good health and did not take any medications. This study was approved by the Ethics Committee of Zhejiang University, and signed informed consent was obtained from all volunteers before the experiment.

A diagram of the imaging protocol is shown in Fig. 1B. Standard oral glucose tolerance tests (OGTT) were conducted after an overnight fast at 9:00 A.M. Each trial consisted of a 10-minute baseline, 5-minute glucose ingestion, and 85-minute post-drink period. OCTA imaging was performed at the same region of interest (ROI) on the finger every 5 minutes during the trial. A fingertip blood sample was taken every 10 minutes, using a portable blood glucose meter (OneTouch Ultra, Johnson & Johnson, USA) to measure the BGC, which served as the reference value (G_r). Participants were allowed to take a break during the 5-minute intervals. After a rest of more than 2 days, similar experiments were conducted with the glucose solution replaced by water to serve as the control group. During the study, volunteers were not permitted to eat or drink, and the room temperature was maintained at 27℃ to avoid temperature fluctuations.