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Supplementary Materials for

Precise closure of single blood vessels via multiphoton absorption–based photothermolysis

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The PDF file includes:

Other Supplementary Material for this manuscript includes the following:

(available at advances.sciencemag.org/cgi/content/full/5/5/eaan9388/DC1)

Supplementary Materials

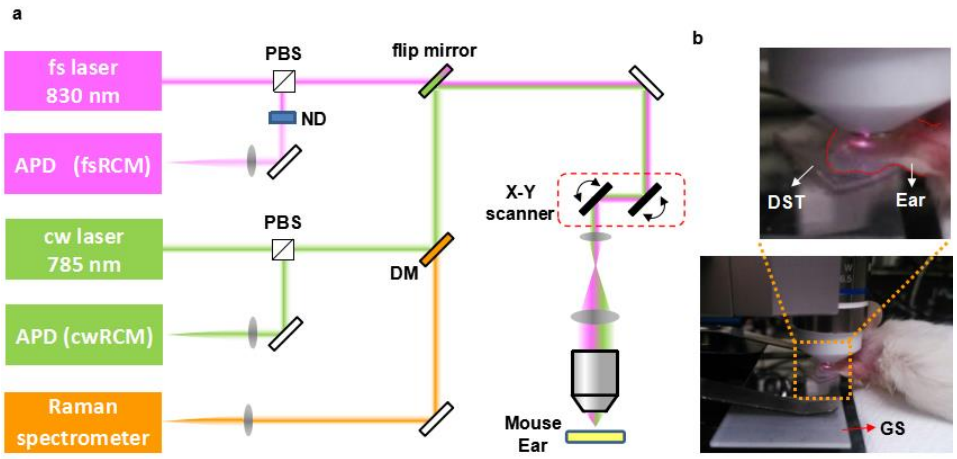

Fig. S1. Optical system for imaging and closing mouse ear blood vessels. (a) optical configuration. A high power 830 nm femtosecond (fs) laser was used to treat blood vessels. A continuous wave (cw) laser (785 nm) was used to image blood vessels and excite Raman scattering. The fs laser and cw laser were switched with a flip mirror. Femtosecond reflectance confocal microscopy (fsRCM) monitored the blood vessel during the closure process. Continuous wave reflectance confocal microscopy (cwRCM) imaged the blood vessels immediately before and after the treatment. APD, avalanche photodiode; PBS, polarized beam splitter; ND, neutral density filter; DM, dichroic mirror. **(b)** mouse ear under multiphoton laser treatment. DST, double-sided tape; GS, glass slide. Photo Credit: Yimei Huang, BC Cancer Agency Research Center.

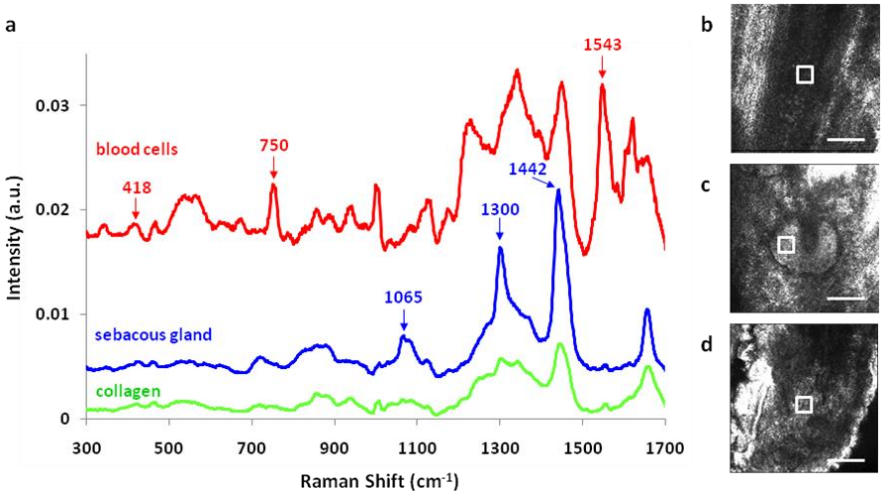

Fig. S2. In vivo confocal Raman spectra of blood cells, sebaceous gland, and collagen. (**a**), Raman spectra; (**b**), image of blood vessel; (**c**), image of sebaceous gland; (**d**), image of collagen. The white squares in **b**-**d** indicate the regions where the Raman signals were obtained. Scale bars, 50 μm.

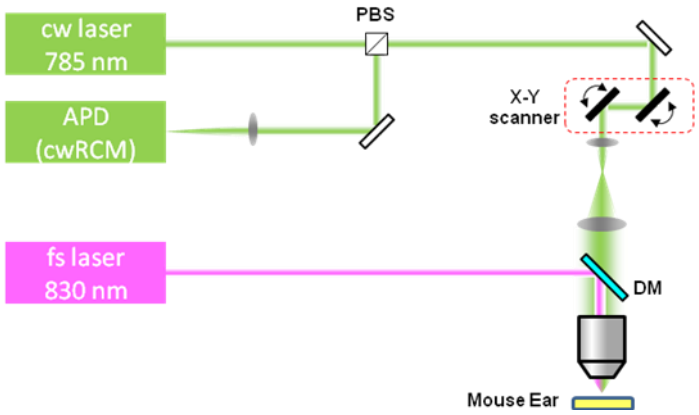

Fig. S3. Schematic of the point treatment system. The fs laser and the cw laser are combined with a dichroic mirror (DM) located before the objective lens. APD, avalanched photodiode; PBS, polarized beam splitter.

Table S1. Tentative assignment of Raman bands.

Wavenumber (cm^{-1})	Assignment	References
377	auto-oxidation marker, such as metHb	[21]
418	δ (Fe-O_2) [Fe-O_2 bend]	[21]
677	ν_7 [ν (pyr deform)$_{sym}$]	[21]
719	C-C-N+ symmetric stretching in phosphatidylcholine (lipid assignment)	[22]
750	ν_{15} [ν (pyr breathing)]	[21]
856	Collagen	[22]
938	Collagen, Proline, Hydroxyproline	[22]
1001	Phenylalanine	[22]
1065	Fatty Acid	[22]
1122	ν_{22} (porphyrin half ring), observed in the spectra of single huaman RBC	[22]
1248	ν_{13} or ν_{42} [$\delta(C_mH)$]	[21]
1300	Fatty Acid	[22]
1311	ν_{21} [$\delta(C_mH)$]	[21]
1342	CH deformation	[22]
1374	ν_4 [ν (pyr half-ring)$_{sym}$]	[21]
1398	ν_{20} [ν (pyr quarter-ring)]	[21]
1442	Fatty Acid	[22]
1444	ν_{28} ($C_\alpha C_m$), observed in the spectra of single human RBC	[22]
1543	ν_{11} [ν ($C_\beta C_\beta$)]	[22]
1582	ν_{37} [ν ($C_\beta C_m$)$_{asym}$]	[21]
1620	ν (C=C), porphyrin	[22]
1656	Amide I (proteins)	[22]

C_α, C_β, C_m represent the carbon atoms at the alpha, beta and meso positions of porphyrins respectively. *pyr* represents the pyrrole ring.