# Wound Measurement Example

## Measurement of a wound on a finger

**We measured the wounded part of the finger using the Hadatomo™ Z photoacoustic microscope. In skin wounds, hemorrhage and inflammation may occur depending on the type and severity of the wound, and the wound changes during the process of healing. Using the Hadatomo™ Z photoacoustic microscope, such time-series variations of blood vessel within the dermis may be measured noninvasively. On this experiment, we measured a laceration on a human finger. The measurement area is 9 mm square, and the scan step is 30 μm. We used two wavelengths of lasers, 532 nm and 556 nm, for measurement. We compared the wounded part and the healthy part, and we evaluated time-series variations starting from the date of the wound.**

Fig. 1 shows external photos of the measurement area. Fig.1 (a1) shows the tip of the index finger on the left hand, with a laceration. In the microscope image (a2), we can observe the laceration within the circle on the picture. As a control, we measured the index finger on the right hand (b1, b2).

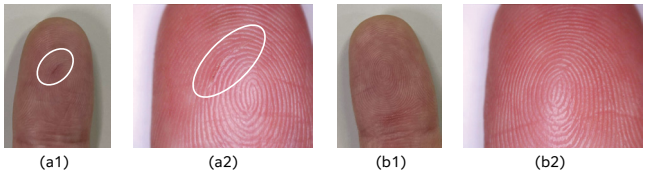


Fig. 1 External photos of measurement part
(a1, a2) Lacerated wound on the left hand, (b1, b2) Healthy part on the right hand, (a1, b1) External photos, (a2, b2) Enlarged images by microscope

Fig. 2 shows measurement results one day after the wounded date. All of them are photoacoustic images utilizing a wavelength of 532 nm. In the photoacoustic 3D image of the laceration, we can observe strong photoacoustic signals at the laceration, and the vascular network within the dermis is observed underneath (a1). On the healthy finger, a strong signal is not observed in the epidermis, and the vascular network within the dermis is observed (b1). In the tomographic image of the laceration, signals thought to be derived from residual blood are observed within the epidermis, and at the upper part of the dermis, signals thought to be derived from blood are observed (a2, arrow). This is thought to be influenced by bleeding or inflammation caused by the laceration. In the tomographic image of the healthy finger, photoacoustic signals are not observed within the epidermis, and nothing unusual is seen in the photoacoustic signal within the dermis (b2).

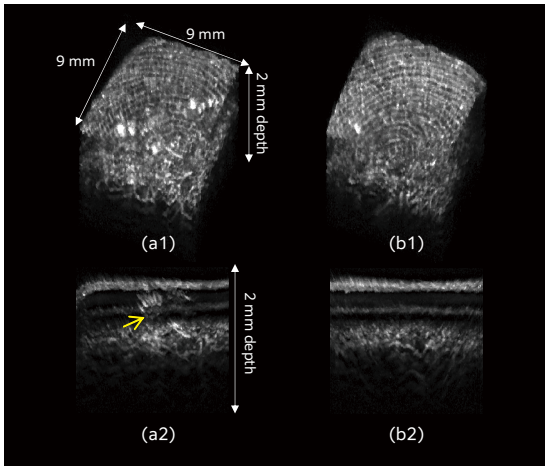


Fig. 2 Measurement results one day after the wound
(a1, b1) Photoacoustic 3D image of laceration (a1) and 3D image of healthy finger (b1), (a2, b2) Photoacoustic tomographic image of laceration (a2), tomographic image of healthy finger (b2)

Fig. 3 shows measurement results of five days after the wounded date. From the external photo of the skin, we can find the lacerated wound is healed (circle in picture a). In the photoacoustic images, we can see strong signals within the epidermis. However, depth of the lacerated wound is shallower, and the photoacoustic signals at the top part of the dermis, observed one day after the wounded date, is no longer seen. It can be considered that time-series variations of the blood vessels during healing period is observed (c).

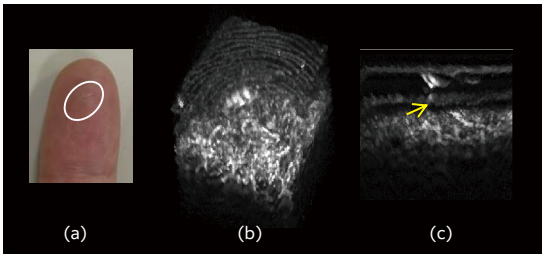


Fig. 3 Measurement results five days after the wound
(a) Outside photo, (b) Photoacoustic 3D image,
(c) Photoacoustic tomographic image

As shown above, we could confirm that the Hadatomo™ Z photoacoustic microscope can visualize time-series variations of blood vessels within a laceration, noninvasively. This method can be used for observation of wounds caused by injury, or evaluation of the healing procedure.

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