

Shiseido Succeeds in World-Leading 3D Visualization of Capillaries for the Whole Face

— Vascular research enters a new phase in the understanding of cutaneous blood vessels, which are essential for healthy and beautiful skin —

Shiseido Company, Limited (“Shiseido”), has succeeded in visualizing the capillaries of the whole face precisely in 3D. This world-leading achievement was made possible by further developing our unique technology that visualizes facial capillaries without needing to excise the skin*¹. It has been very difficult to visualize such a wide range of blood vessels until now, since the face has large three-dimensional irregularities and movements due to breathing and other factors. This groundbreaking new technology was finally made a reality through joint research with Professor Wang of the University of Washington, a world leader in vascular observation technologies. Blood vessels are responsible for circulating oxygen and nutrients throughout the body. We believe that a holistic approach is important in order to fundamentally improve the overall health of the skin, and we have already shown that capillaries have a close relationship with beauty treatments for age spots and skin firmness*².

A part of these research results was presented in the Podium Presentation of the IFSCC*³ Congress 2018 held in Munich, Germany.

*¹ Reference: Shiseido Succeeds in In Vivo Visualization of Dermal Capillaries (2017)

<https://corp.shiseido.com/en/news/detail.html?n=00000000002271>

*² Reference: Related major news releases at the end of this report.

*³ IFSCC (The International Federation of Societies of Cosmetic Chemists): An international organization dedicated to the development of highly functional and safe cosmetic technologies through the worldwide cooperation of cosmetic societies.

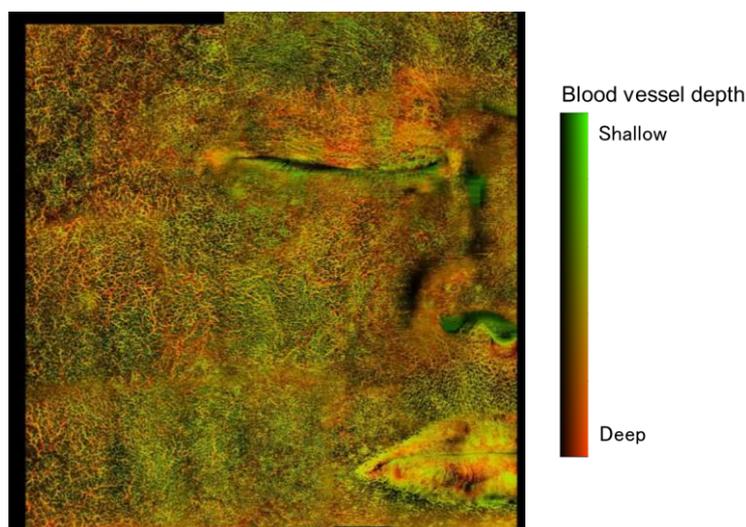


Figure 1. Success in 3D visualizing capillaries of the whole face

Optical coherence tomography angiography (OCTA)

Skin blood vessels have a very fine and complicated network structure. It was previously almost impossible to observe them in a living person precisely using only conventional techniques. In 2017, we developed a unique technology to observe the facial capillaries, which are considered to be particularly difficult to detect, by employing our originally developed version of OCTA*⁴. The technique can capture precise, depth-resolved images of the blood vessel structure inside the skin without any damage. This new

technology is an application of optical coherence tomography, which is already used in the medical field to observe various organs, especially the fundus. Our OCTA visualizes the capillary structure in the skin by capturing the movement of blood and extracting the fluctuations in that movement using uniquely developed algorithms. With this technology, we have successfully uncovered the relationship between skin blood vessels and beautiful skin. However, our previous vascular visualization technology had a limited range of observation (up to 12x12 mm), and in order to develop care solutions for the entire face, it was necessary to develop a wide-field visualization of the facial capillaries.

*4 OCTA: Optical Coherence Tomography Angiography

Comprehensive visualization of facial capillaries

In order to visualize the blood vessels in the face of a living person in a wide field of view, we needed a system which could detect blood vessels with greater accuracy and speed than ever before. This is necessary to deal with the three-dimensional irregularities of the face and also to exclude the visual noise generated by the body when breathing and from other small movements. In our latest research, in collaboration with Professor Wang of the University of Washington, we succeeded in developing a system that visualizes the blood vessel distribution over the whole face using our novel vessel-detection technology. By capturing the skin blood vessels from such a wide field of view, it becomes possible to accurately understand the characteristics of the blood vessels according to their individual parts. It also makes it possible to detect the partial modulations of blood vessels which are invisible if looking at the skin from the outside. We expect that this new technology will contribute to great leaps forward in vascular research.

It is our hope to use OCTA to extend conventional care to individual concerns, such as age spots and skin firmness. We are also developing a concept that covers comprehensive facial care, where we will be able to predict future skin conditions by observing the face's blood vessels. Going forward, we will continue to pursue research toward the realization of healthy-looking and beautiful skin for consumers while making full use of cutting-edge technologies.

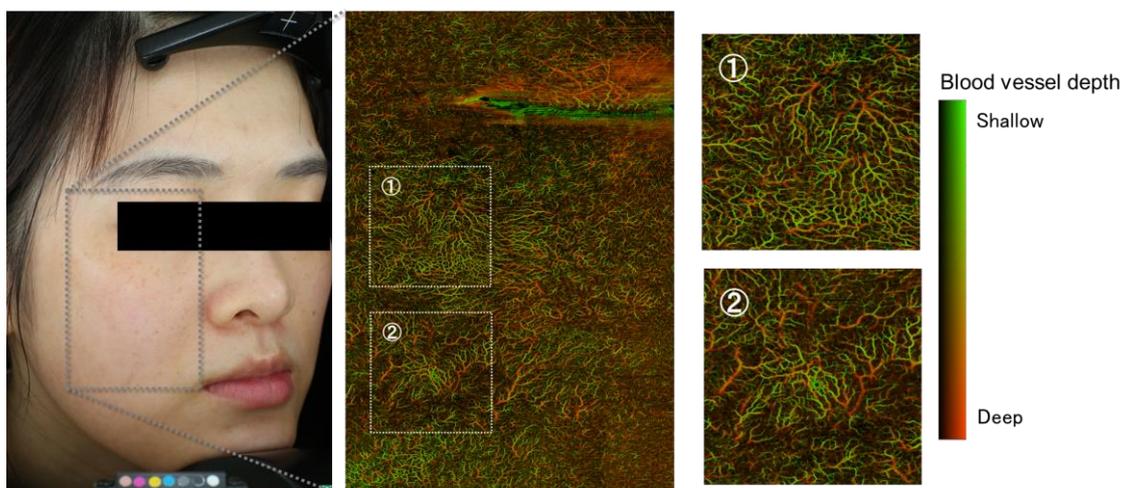


Figure 2. Visualization of blood vessel characteristics by facial area

Reference: Shiseido's blood-vessel-observation technology

In 2018, Shiseido successfully clarified characteristics of the capillary network in detail through the three-dimensional observation of skin tissue using its patented optical clearing technique that makes skin tissue transparent*5. This observation technique uses invasively excised skin tissue samples and allows for simultaneous immunological analysis. Going forward, Shiseido will further promote the analysis and

research of blood vessels from various perspectives in combination with non-invasive analysis technology, such as OCTA, which is now in development.

*⁵ Reference: Shiseido Succeeds in 3D Visualization of Vascular Malformation in Pigmented Skin (2018)

<https://corp.shiseido.com/en/news/detail.html?n=0000000002498>

Reference: Key Related News Releases

• Shiseido developed Cassia Extract as an Ingredient to Restore Impaired Skin Capillary Function(2009)

https://corp.shiseido.com/en/newsimg/archive/0000000001072/1072_s2e08_en.pdf

• Shiseido Discovers Involvement of Vascular Plexus Malformation in Hyperpigmentation(2017)

<https://corp.shiseido.com/en/news/detail.html?n=0000000002270>

• Shiseido Reveals the Relevance of Capillaries in Skin Elasticity(2019) <https://corp.shiseido.com/en/news/detail.html?n=0000000002780>

• Shiseido Elucidates Mechanism by Which Capillaries Maintain Skin Elasticity(2020)

<https://corp.shiseido.com/en/news/detail.html?n=0000000002911>