

A Novel Wrinkle Evaluation Method for any kinds of still or moving digital images by the Visual illusion-based image feature enhancement System (VIS)


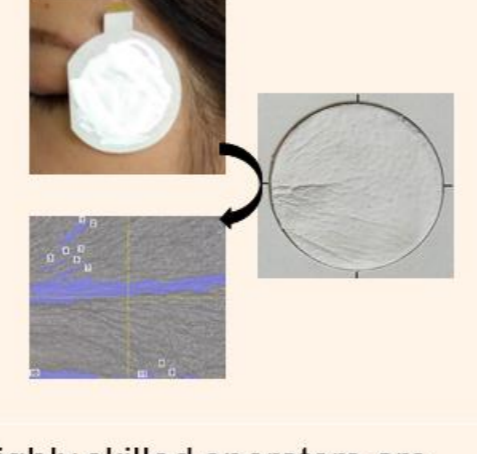
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Yamauchi, Saori¹; Sakamoto, Kazutami²; Kojima, Hirohito²; Iwanaga, Tetsuro¹
¹ Beauty Care Laboratory, Kracie Home Products, Ltd., Kanagawa, Japan;
² Faculty of Science and Technology, Tokyo University of Science, Chiba, Japan

Introduction:

None of the wrinkle evaluation methods in the guideline [1] can evaluate the skin movement accompanied by changing facial expressions in daily life.

Table 1 Wrinkle evaluation methods in the guideline [1]

Method-1	Method-2
Visual or photographic evaluation	2D or 3D instrument analysis of replicas
	
<ul style="list-style-type: none"> Highly skilled operators are required to do. It cannot analyze quantitatively. 	<ul style="list-style-type: none"> Highly skilled operators are required to do. Subjects must keep their faces still in fixed position. It is difficult to analyze shallow wrinkles. Air bubbles or sweat affect the result.

The objectives of this study are:

- To investigate the potential of Visual illusion-based image feature enhancement system (VIS) as a solution to overcome the drawbacks of the current systems.
- To apply VIS to moving images of the skin movement accompanied by changing facial expressions.
- To evaluate the efficacy of anti-wrinkle formulation using VIS.

What is Visual illusion-based image feature enhancement system (VIS) ?

VIS produces Feature Composite Moving images (termed "FCM image") through the following steps [2]:

Step1) Emboss image creation (i.e., shade images) for the texture feature image according to the eight light source directions,

Step2) color composite image production by incorporating each emboss image with the original image corresponding to the three primary colors of red, green, and blue, respectively, and;

Step3) composite image overlaying, thereby animation-like FCM image production.

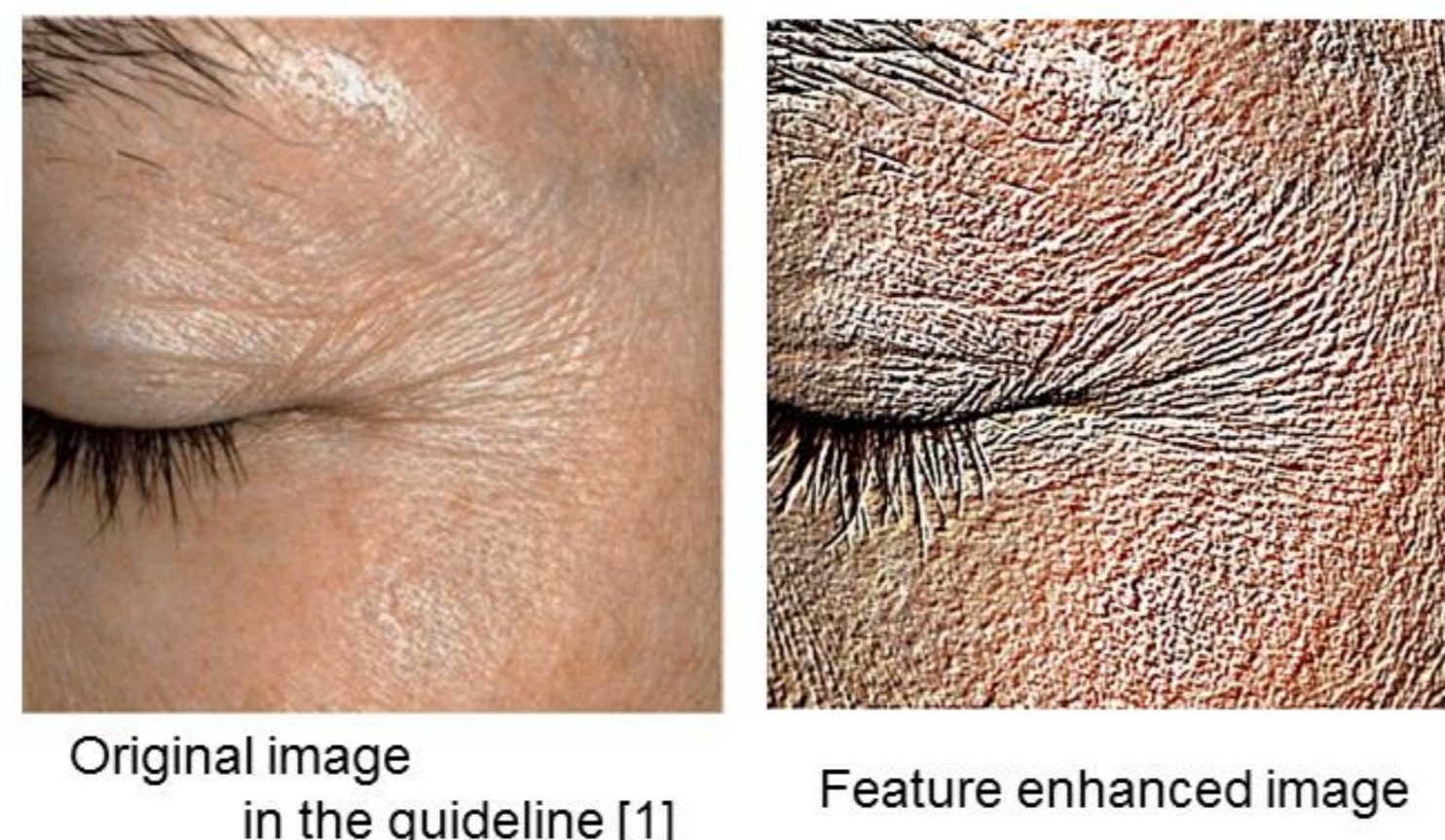
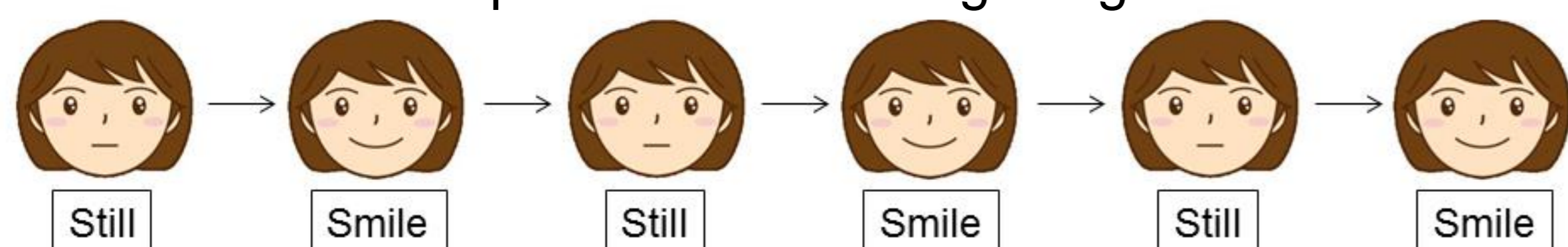


Fig. 1 Feature enhancement effect of VIS

Materials & Methods:

	First clinical study	Second clinical study
Subjects	Sixteen healthy men and women (four 20s; five 30s; three 40s; four 50s)	Ten healthy men and women (six 40s; four 50s)
Target wrinkle area	Corner of eye	Corner of eye
Evaluation methods	VIS applied to photos, replicas, and PRIMOS-CR	VIS applied to moving images* and replicas
Application	-	Anti-wrinkle formulation containing niacinamide, twice daily (morning and evening)
Trial period	-	4 weeks

* Scheme of facial expressions in moving image



Statistical analysis

All data are presented as the mean ± standard deviation.

Results & Discussion:

First clinical study:

Evaluation of the age-dependent wrinkle formations

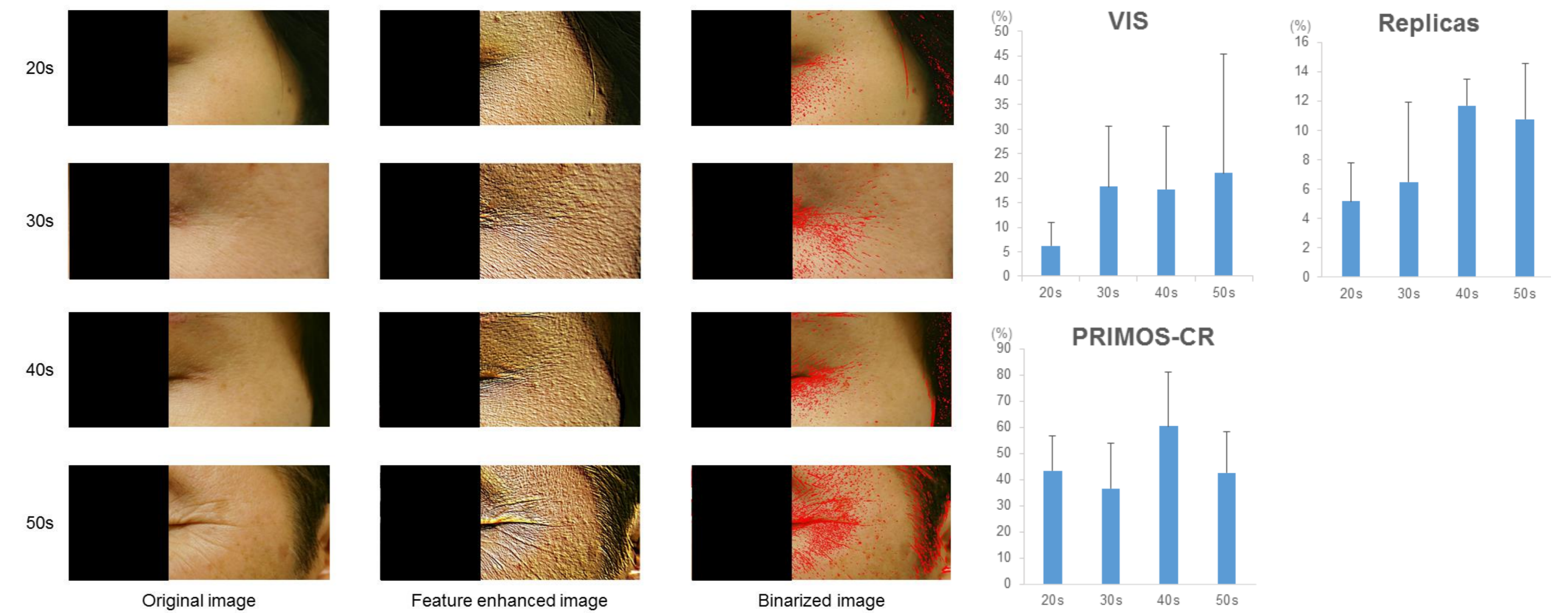


Fig. 2 Crow's feet images using VIS

Fig. 3 Wrinkle area ratio of each method

- VIS detects even the fine wrinkles qualitatively and records it in calculation quantitatively, although it is difficult for the replica and *in vivo* methods.
- VIS does not require any special instruments except digital image data.

Second clinical study:

Evaluation of the anti-wrinkle formulation using moving images

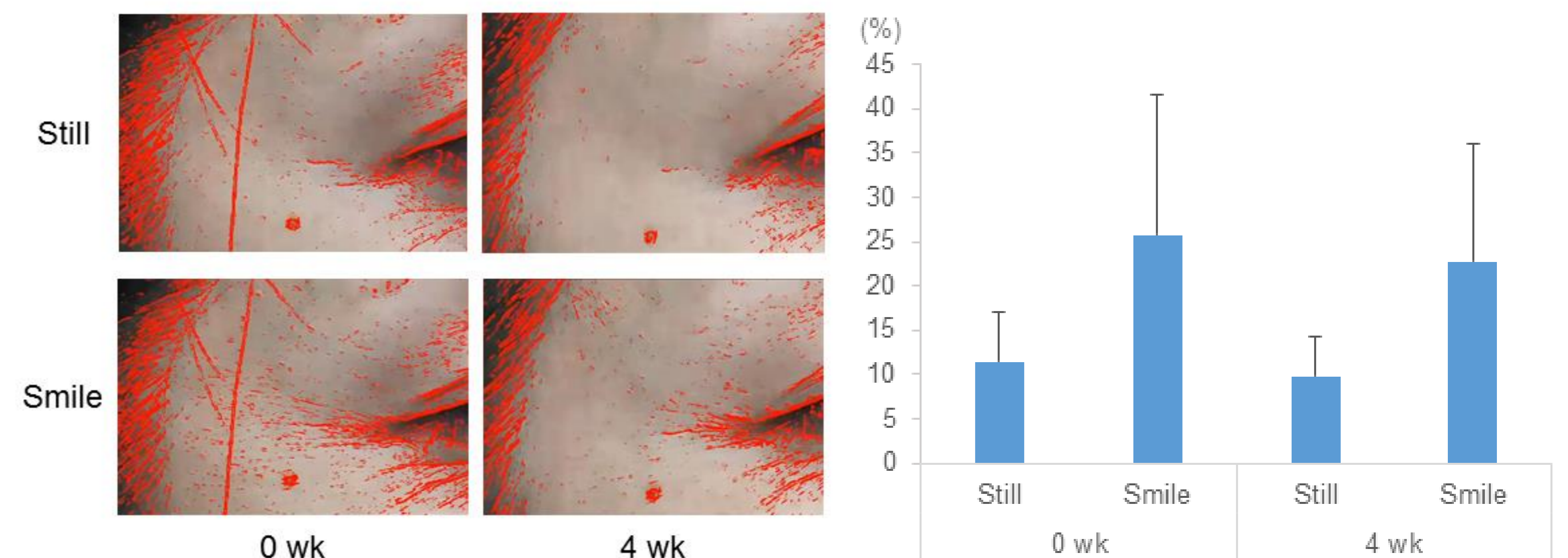


Fig. 4 Moving image evaluation using VIS

Fig. 5 Wrinkle area ratio

- VIS visualizes wrinkles on moving image qualitatively, therefore it enables us to evaluate the effect of the anti-wrinkle formulation even when subjects are smiling.
- The wrinkle area ratio analyzed by VIS couldn't show the significant improvement of wrinkles compared with the qualitative evaluation, hence the quantitative analysis still has room for improvement.

Conclusions:

- VIS is a useful system not only for qualitative evaluation but also quantitative analysis relying solely on digital image data without any special instruments.
- VIS can evaluate even fine wrinkles and be applied to moving images under normal living conditions with facial expressions.
- We will expand our method by adding the wrinkle parameters such as depth, volume, and so on.

VIS would provide an epoch-making wrinkle evaluation system for cosmetic product which fulfill consumer's expectations.

References:

- Task Force Committee for Evaluation of Anti-Aging Function (2006). Guidelines for Evaluation of Anti-Wrinkle Products. *Journal of Japanese Cosmetic Science Society*, Vol. 31, No. 4 Supplement, pp. 411-431.
- Shigeoka T, Hirota K, Kojima H, Kaneko K (2012). A Quantitative Evaluation on Visibility of Feature Composite Moving Image Inducing Visual Illusion. *Journal of Japan Society of Civil Engineers provides access to rigorously refereed innovative research and practical papers across the fields of civil engineering*, F3, 68(II) 1_9-18.