Brief Report

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Do scleroderma patients look young?: Evaluation by using facial imaging system

Soichiro Sawamura, Masatoshi Jinnin*, Ikko Kajihara, Katsunari Makino, Jun Aoi, Asako Ichihara, Takamitsu Makino, Satoshi Fukushima, Hironobu Ihn

Department of Dermatology and Plastic Surgery, Faculty of life Sciences, Kumamoto University, Kumamoto, Japan.

Summary **These days various collagen supplements have widely been marketed. However, it has not been scientifically proved whether increasing collagen can actually prevent skin aging. Systemic sclerosis (SSc) is an autoimmune disease that is characterized by thickening of the skin caused by accumulation of collagen. In this study, we tried to evaluate facial skin characteristics and skin aging of SSc patients by using digital imaging system. As the result, the severity of wrinkles, texture and pores were significantly lower in SSc patients than control subjects. Among them, wrinkles showed better correlation with skin thickness score. Therefore, increased amount of collagen in scleroderma skin may directly affect wrinkles. In conclusion, attempt on collagen induction itself is reasonable and effective strategy in order to keep young appearance, although oral collagen supplementation may not directly reach to the skin.**

Keywords: Skin aging, collagen, wrinkles

1. Introduction

Nowadays, various collagen supplements have widely been marketed. However, it has not been scientifically proved whether increasing collagen can actually prevent skin aging. The evaluation of skin aging of patients with increased collagen deposition may answer this question. Systemic sclerosis (SSc) is a collagen disease mainly featured by fibrosis of the skin and various internal organs (*1*). Although the pathogenesis of fibrosis in SSc is still poorly understood, it may include inflammation, aberrant immune activation and endothelial cell injury, resulting in the activation of fibroblasts to increase the production of various collagens, mostly type I collagen (*2*).

To note, there is "folklore" that SSc patients look younger due to collagen deposition and the sclerosis of facial skin. Recent studies have indicated the usefulness of objective computer assessment of facial skin (*3,4*). Herein, we tried to evaluate facial skin characteristics and skin aging of SSc patients by using digital imaging system.

2. Methods

2.1. *Clinical assessment and patient material*

Twenty SSc patients (17 females and 3 males; mean age, 64.7 ± 7.7 years) who were hospitalized between March 2016 and April 2017 were enrolled in this study. Patients fulfilled the criteria proposed by the American College of Rheumatology and the European League Against Rheumatism (*5*). Modified Rodnan total skin thickness score (MRSS), semi-quantitative skin sclerosis assessment tool, was obtained at the first visit (*6*). Control data were also collected from the same number of age- and sex-matched control subjects (mean age, 63.1 ± 7.8 years). The control subjects consist of hospitalized patients with other diseases randomly chosen as indicated in Table 1. These patients did not have facial skin lesions.

2.2. *Photographing and facial skin analysis*

Photographing and facial skin analysis were conducted as objective computer assessments by VISIA®-

**Address correspondence to:*
Dr. Masatoshi Jinnin, Department of Dermatology and Plastic Surgery, Faculty of life Sciences, Kumamoto University, 1-1-1 Honjo, Kumamoto 860-8556, Japan.
E-mail: mjin@kumamoto-u.ac.jp

Table 1. list of control subjects

Items	number
Dermatomyositis	5
Malignant melanoma	3
Squamous cell carcinoma/Bowen's disease	3
Basal cell carcinoma	2
Chronic skin ulcer	2
Chronic prurigo	1
Parapsoriasis	1
Neurofibromtosis type 1	1
Non-Langerhans cell histiocytoses	1
Lipoma	1
Total	20

Evolution (Canfield Imaging Systems, Fairfield, NJ). The eight skin characteristics (spots, wrinkles, texture, pores, UV spots, brown spots, red areas, and porphirins) were evaluated by percentiles that were calculated comparing with sex-, age-, and ethnicity-matched healthy subject data: higher percentile scores indicate less severity of each characteristic. Average percentile scores were obtained from two independent analysis.

2.3. *Statistical analysis*

The statistical analyses were carried out with Mann-

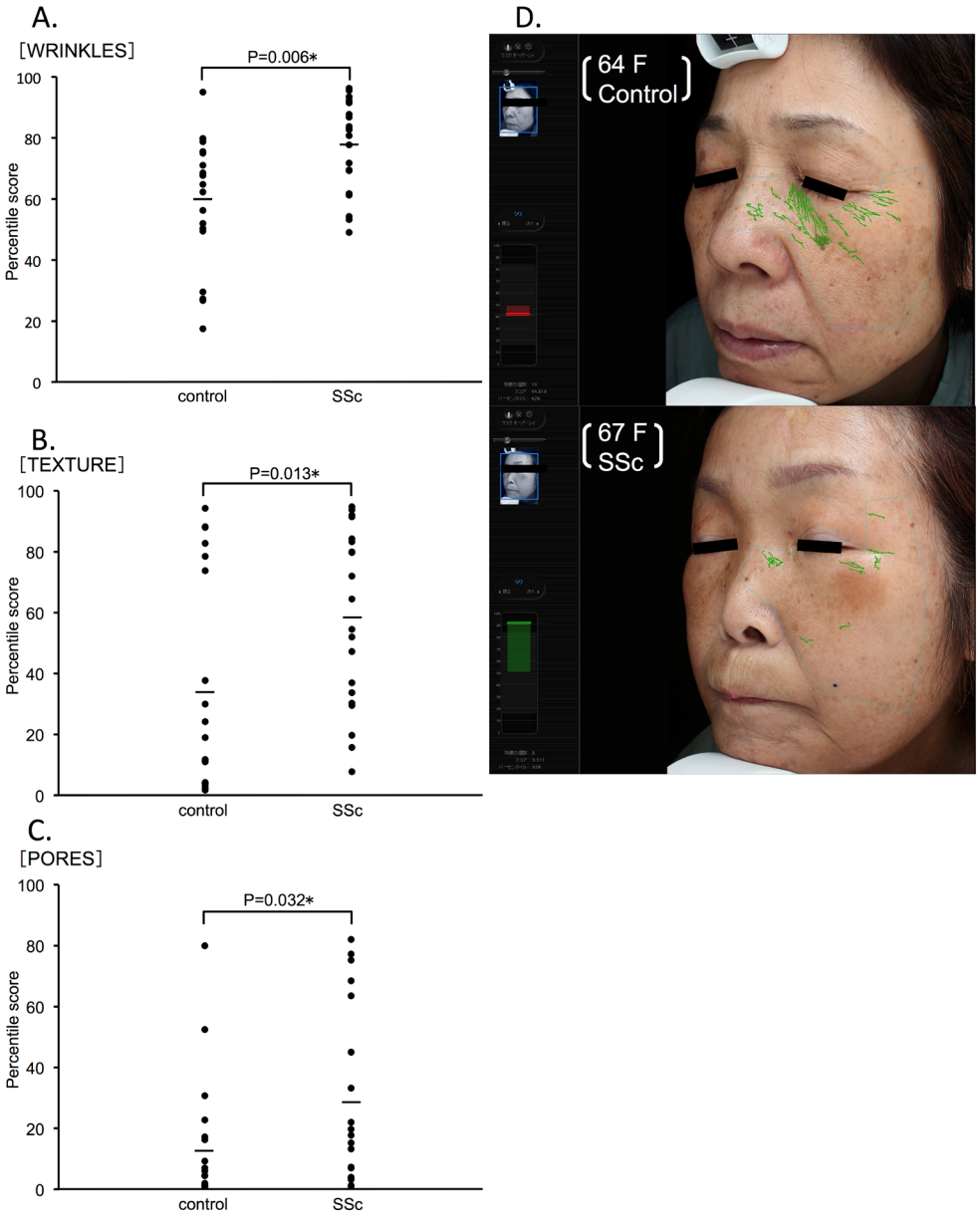

Figure 1. Objective computer assessments of three skin characteristics evaluated using VISIA®-Evolution. (A-C) The percentile scores of wrinkles **(A)**, texture **(B)**, and pores **(C)** in patients with systemic sclerosis (SSc) and in control subjects (Control) are plotted along the ordinate. Bars show their means. P-values are determined by Mann-Whitney *U*-test. **(D)** A representative photograph of comparing an SSc patient with age- and sex-matched control subject. Green lines on the face indicate detected wrinkles.

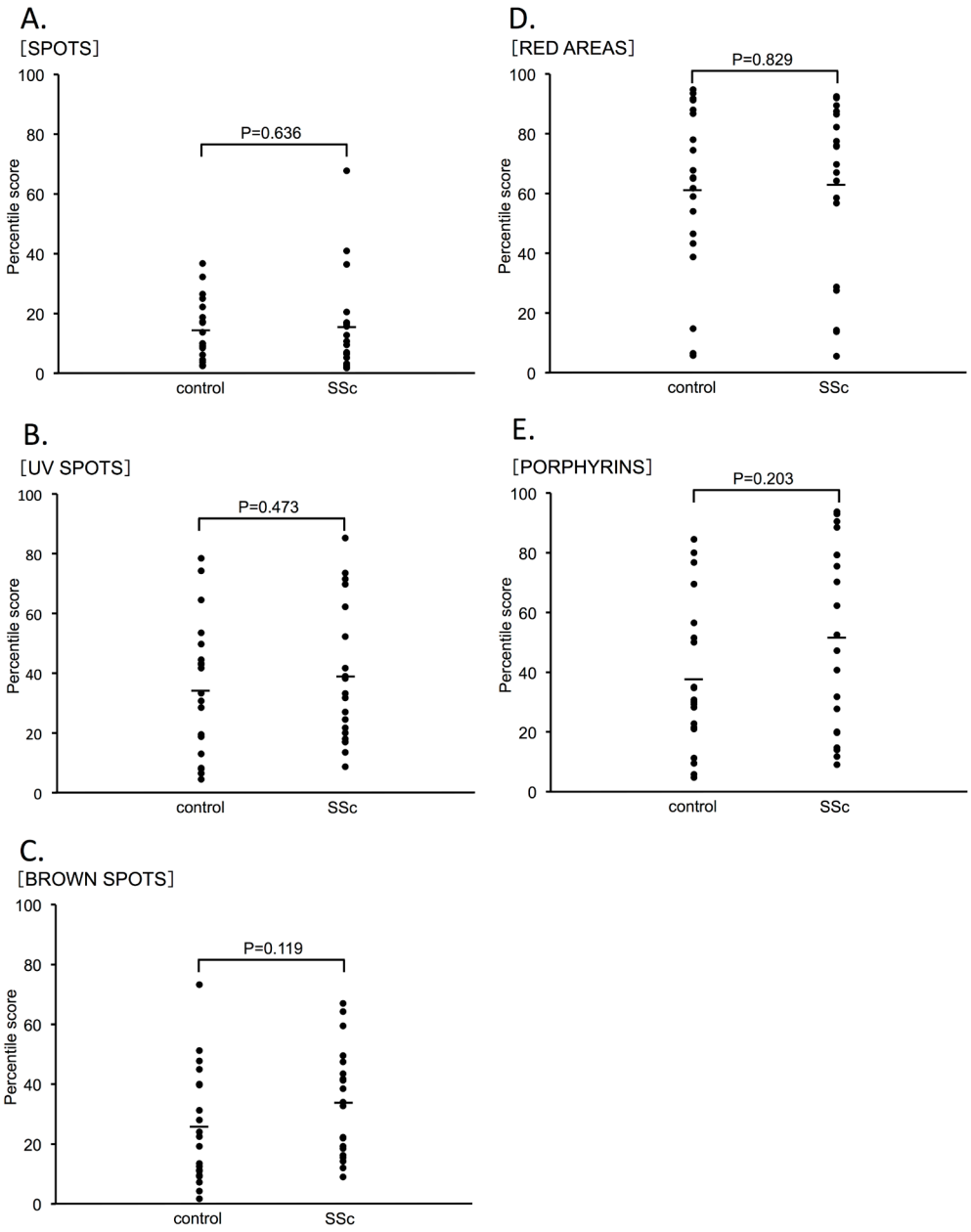

Figure 2. Objective computer assessments of five skin characteristics evaluated using VISIA®-Evolution. The percentile scores of spots **(A)**, UV spots **(B)**, brown spots **(C)**, red areas **(D)**, and porphyrins **(E)** in patients with systemic sclerosis (SSc) and in control subjects (Control) are plotted along the ordinate. Bars show their means.

Whitney *U*-test in the comparison of medians. Correlations were assessed using Pearson's correlation coefficient. All analyses were performed with Statcel4 software (OMS, Saitama, Japan): $p < 0.05$ was considered significant.

3. Results and Discussion

When we compared the percentile scores of SSc patients to control subjects, the scores of wrinkles, texture and pores were significantly higher in SSc patients than control subjects (Figure 1). This indicated that SSc patients have fewer wrinkles/pores and more fine-textured skin, which objectively supported the notion that SSc patients look young. On the other hand, there were no statistically significant differences in the scores of other characteristics between SSc and control subjects (Figure 2): for example, although telangiectasia is also common feature of SSc skin (*7*), the scores of red areas were not significantly different between the two groups.

Next, we examined the correlation of MRSS with percentile scores of the three characteristics (wrinkles, texture, and pores) in SSc patients. Among them, wrinkles showed better correlation with MRSS (R = 0.234) than the others (Figure 3). Therefore, increased amount of collagen in SSc skin may directly affect wrinkles. Histopathologically, SSc skin shows increased and thickened collagen bundles in the dermis as well

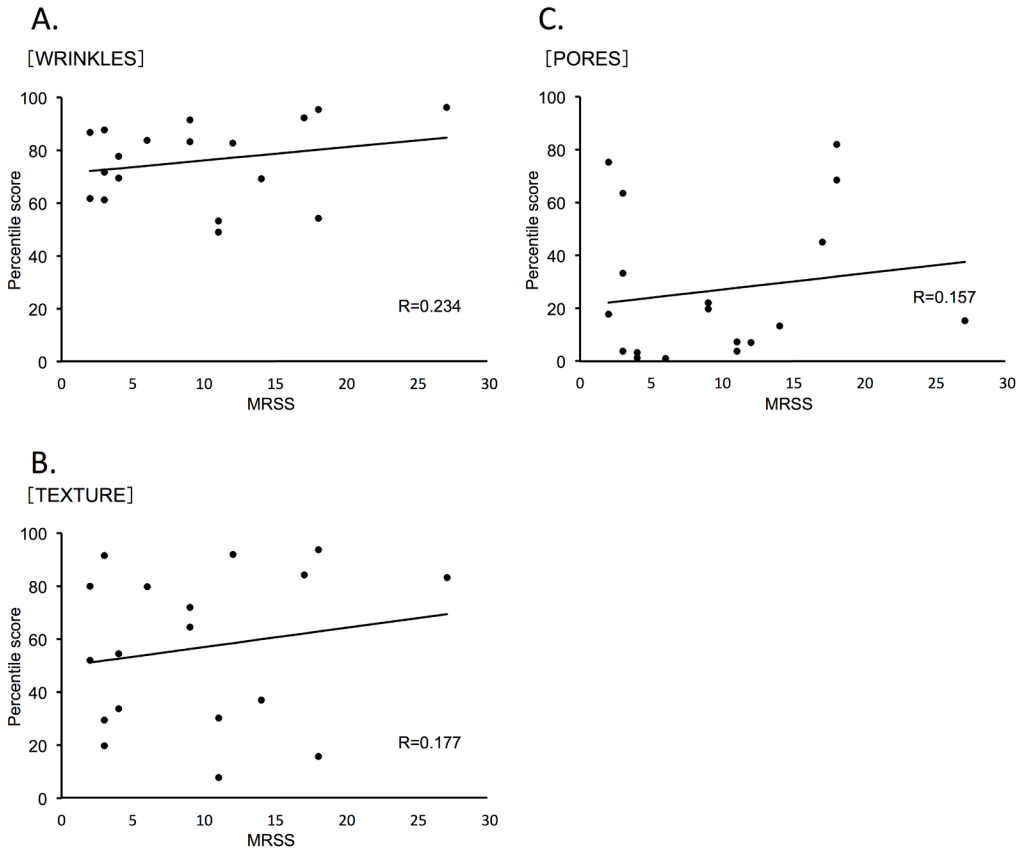

Figure 3. Correlation of MRSS with percentile scores of three characteristics (wrinkles, texture and pores) in SSc patients. Correlations of MRSS with percentile scores of wrinkles **(A)**, texture **(B)** or pores **(C)** were assessed by Pearson's correlation coefficient.

as subsequent atrophic epidermis and appendages. The atrophic epidermis and appendages may result in improved texture or pores, respectively.

As described above, the percentile scores derived from VISIA system were based on the huge database of healthy individuals. A limitation of this study is that control subjects consisted of patients with various diseases, because they were randomly chosen from hospitalized patients. This is a pilot study with a small number of patients and controls, and larger studies with increased and organized controls (*e.g.* 20 patients for each disease listed in Table 1) are needed in the future.

In conclusion, our result supported the notion that SSc patients look young. Therefore, although oral collagen supplementation may not directly reach to the skin, attempt on collagen induction itself is reasonable and effective strategy in order to keep young appearance.

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