〔Article〕

Responsibility of dermal elastosis for facial wrinkle formation with special reference to quantitative analysis of solar elastosis

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Abstract

As a result of chronic sun-damage, sun-exposed area causes facial wrinkles with histological change of elastotic degeneration, so called solar elastosis. To understand the relationship between characteristic elastosis of the skin and facial wrinkle formation, quantitative analysis of elastotic area was performed. In bumpy wrinkles of forehead, elevated skin showed rich in elastosis more than flattened or concaved skin, indicating sun-protective effect by elevated skin with rich elastosis. The dermises of outer canthus and cheek portions also showed wide elastotic areas. Non-exposed skin of post-auricular region showed any abnormal elastosis.

Introduction

Facial wrinkle formation is a representative sign of photoaging. Our analyses of the faces of 230 Japanese subjects have shown that there are close relationship between skin phototypes and wrinkle formation1). Higher wrinkle scores were recorded for deep wrinkles in individuals who have sunlight-sensitive skin phototypes than sunlight-tolerant skin phototypes. It was clarified that severity of wrinkles might be depending on skin phototypes. Meanwhile, it is well-known that sun-exposed skin of the face develops dermal elastotic degeneration, namely solar elastosis (SE).

We postulated that levels of facial wrinkle may correlate with an amount of dermal elastosis, and that SE may play a role of sun-protective defense for surrounding skin.

Objective

Our aim was to demonstrate that the closed relationship between visual level of facial wrinkles and histological level of quantitive damage of SE, in addition, to know

the beneficial effect of elevated wrinkles of forehead for sun-protection to the closed skin.

Materials & Methods

Skin samples were obtained from five Japanese subjects aged 54 to 98 who were anatomical bodies and donated to the First Department of Anatomy, Hirosaki University School of Medicine for medical research. Materials were gained from different sites of the face, including forehead (elevated and flattened portions), outer canthus, cheek and postauricular portions. Facial wrinkles were discriminated visually and scored following the scoring method of Shiseido Research Center (Table 1). All specimens were treated with Elastica-van Gieson (VG) and H-E stainings. E-V positive areas in dermis were quantitatively determined by the image analysis equipment using Scion Image System (Scicon Co.Ltd). The wideness of VG positive area was compared with wrinkle scores.

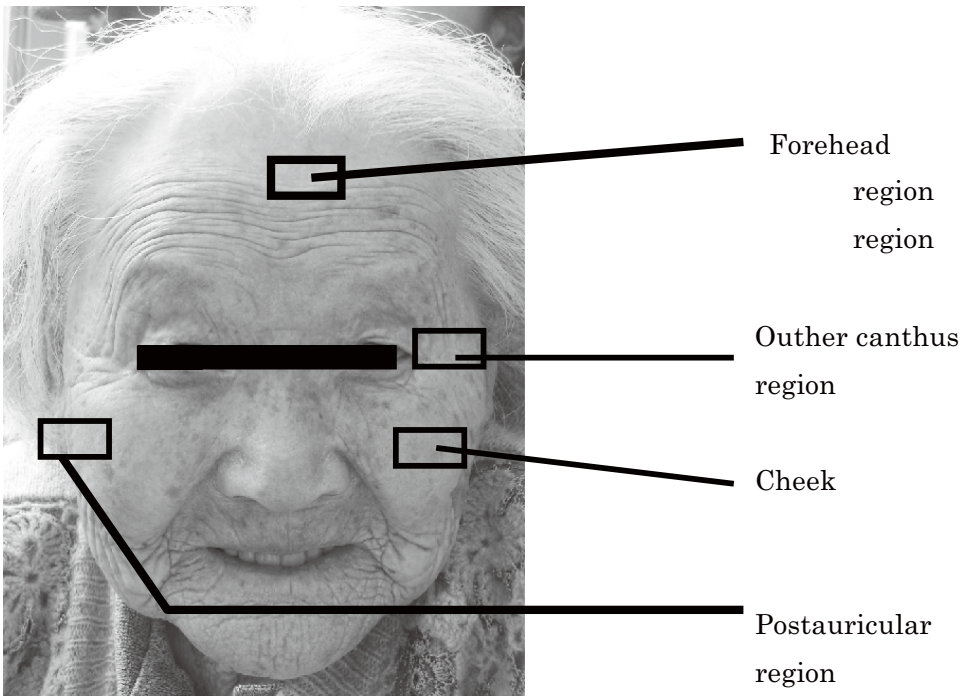

Fig.1. Biopsied sites of the skin

Table 1. Scoring of wrinkles

Score	Definition
1	No deep wrinkle wvident
2	Between 1 to 3
3	Deep wrinkles faintly evident
4	Between 3 and 5
5	More than 2 shallow deep wrinkles evident
6	Between 5 and 7
7	More than 2 deep wrinkles evident
8	Between 7 and 9
9	More than 2 deep wrinkles evident
10	Between 9 and 11
11	More than 2 deep wrinkles evident

(Shiseido Research Center, Japan 1999, modefied)

Results

In the forehead, dermal distribution of SE showed wider tendency in elevated region than that of flattened region (Fig.2), but not significant. However, the wideness of VG positive areas of forehead was the almost same as that of cheek, moreover, poor than that of outer canthus with low winkle scores. Except in forehead, clinical evaluation of wrinkle levels did not correlate with SE development in cheek portion. As previously reported, SE was not detected in the post-auricular region protected from sunlight by earlobe (Table 2).

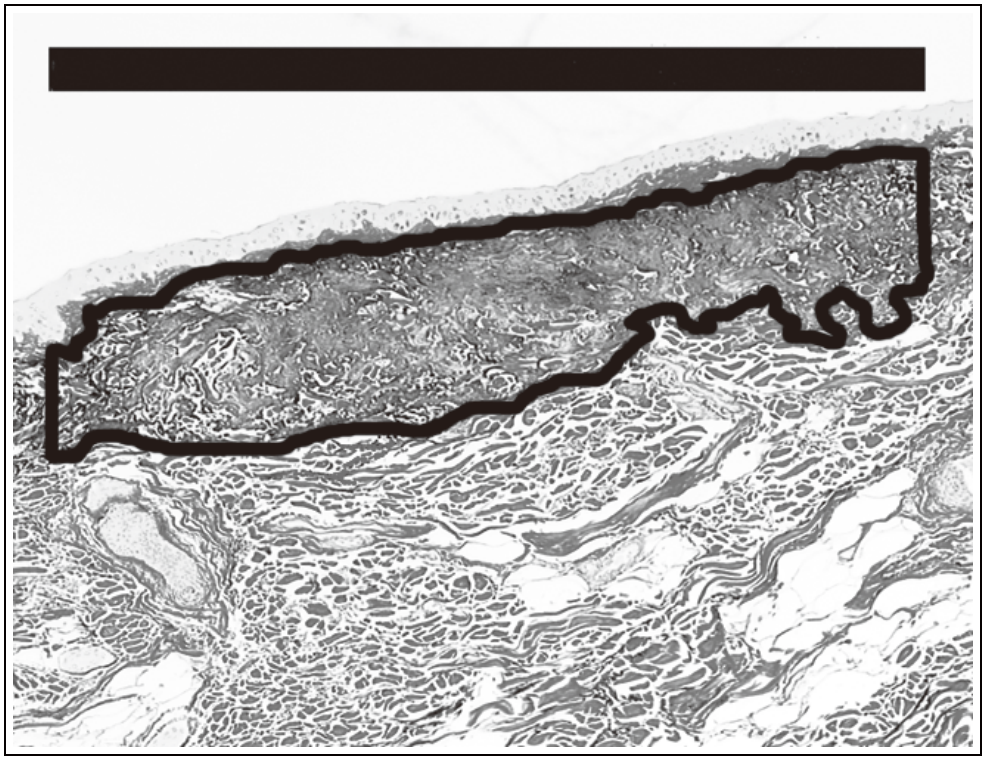

Fig.2. Solar elastosis determination of square measurement (surrounding area) by Scion Image System (mm^2). Black bar: 1mm epidermal length

Table 2. Results of wrincle score and extent areas of solar elastosis

	Wrinkle score	Square of SE (mm^2)
Forehead 凸 portion	7.8	2.3 ± 0.7
凹 portion	6.0	2.0 ± 0.9
Outer Canthus	6.15	2.5 ± 0.5
Cheek	2.4	2.3 ± 0.5
Postauricular portion	0	0

(n=5)

Conclusion

Forehead wrinkles of the face are composed with two types of structure, that is, elevated and flattened regions. The flattened region of forehead wrinkle showed poor SE formation in comparison with elevated region, indicating that SE rich wrinkles might protect the concave portion from solar light. However, the

dermal SE did not correlate with each clinical grade of facial wrinkles in outer canthus and cheek, probably due to structural differences of subcutaneous bed. From the view point of the study, in wrinkle formation, physical protective factor of dermal SE should be considered in addition to various antioxidants of the skin2)-4).

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