In vivo assessment of intrinsic aging and photoaging in human facial skin

in collaboration with Shiseido Co.
Aging decreases the number and declines function of cells, resulting in the decrease of collagen production. UV rays stimulate the secretion of collagen degradation enzyme, resulting in the increase of collagen decomposition.

Photoaging accelerates skin aging and increases the risk of skin cancer. Need for in vivo assessment of skin aging.
Cheek skin
- Thin epidermis
- Daily exposure of UVB
- Susceptible to photoaging

**Measured position**

**Subjects**

<table>
<thead>
<tr>
<th></th>
<th>20’s</th>
<th>30’s</th>
<th>40’s</th>
<th>50’s</th>
<th>60’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Written informed consents were obtained before the measurement
Approved by ethics committees in Osaka Univ. and Shideido Co., Ltd.
Risk evaluation of laser-induced photodamage to human skin under 40-mW laser irradiation

<table>
<thead>
<tr>
<th>Method</th>
<th>Before experiment</th>
<th>Immediately after experiment</th>
<th>One month after experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection by dermatologist</td>
<td>Normal</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Abnormal</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Spectrophotometer</td>
<td>Normal</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Abnormal</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Laser irradiation does not any photodamage to human skin
Decrease of dense distribution of fine collagen fibers
Coarse distribution of thick collagen fiber is still remained!

Reflect intrinsic aging clearly!

Monotone decreasing

Female subjects

Structural change by aging (1)
Structural change by aging (2)

Male subjects

Non-monotone decreasing

20’s
30’s
40’s

50’s
60’s

Similar to female subjects
Mixture of intrinsic aging and photoaging
Influence of UVB exposure (1)

20's male subject

Little structural difference of collagen fiber
Smooth turnover from damaged collagen fiber to renewed one
Influence of UVB exposure (2)

50’s male subject

Fairy-complexioned skin

Dark-complexioned skin

Large structural difference of collagen fiber
Delayed turnover due to declined activity of fibroblast
Influence of UVB exposure (3)

50's female subject

Photoaging is confirmed in fairy-complexioned skin.
2D Fourier-transform analysis of SHG image

Non-aging skin

Aging skin

Dense distribution of fine collagen fiber

2D-FT of ROI

Coarse distribution of thick collagen fiber

2D-FT of ROI
Parameter of skin aging

- Select 5 ROIs (64pixel*64pixel) from each SHG image
- Perform 2D-FT of ROI
- Determine width of FT spectrum