“Longitudinal assessment of scleroderma skin by optical coherence tomography: preliminary validation of sensitivity to change over-time”

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Presentation title:

“Longitudinal assessment of scleroderma skin by optical coherence tomography: preliminary validation of sensitivity to change over-time”

has no conflicts of interest
Background: Optical Coherence Tomography

“VivoSight” topical OCT probe (Michelson Diagnostics):

• laser wavelength: 1305 nm
• 100 OCT B-scans, inter-frame spacing of 4 µm
• 4 x 0.4 x 2 mm data volume (lateral x lateral x depth)
• depth resolution 5-10 micron
Extended Report

Virtual skin biopsy by optical coherence tomography: the first quantitative imaging biomarker for scleroderma

Background

Background
### Background

**Max**

- Relative OD vs. m depth
- Lines for HC, mRss 0, mRss 1, mRss 2, mRss 3
- DEJ
- Max

**Min**

- Relative OD vs. m depth
- Lines for Max, MIN, OD300
- DEJ
- Min

**OD300**

- Relative OD vs. mRss
- Levels for HC, 0, 1, 2, 3
- Max
- Min

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Pearson’s correlation test; ANOVA, Bonferroni multiple comparison correction and unpaired-t tests; *= p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001

Aim

To evaluate sensitivity to change over-time of Optical Coherence Tomography to assess skin involvement in patients with SSc
Methods

- 17/21 SSc patients available for 24 month follow-up.
- We performed 52 OCT scans of dorsal forearms at 26 sites of analysis from 17 SSc patients at 0 and 24 months.
- Clinical skin involvement was assessed using the modified Rodnan Skin Score (mRSS).
- Minimum and Maximum Optical Density (Min and Max OD) of the mean-A scans were calculated employing Matlab software.
- Comparison of the local mRSS and Min and Max OD at the 2 time-points was performed by two-tailed paired t-test employing GraphPrism software.
## Methods

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Sex (F/M)</td>
<td>15/2</td>
</tr>
<tr>
<td>Age, mean (SD), years</td>
<td>53 (4)</td>
</tr>
<tr>
<td>Disease duration, mean (SD), years</td>
<td>6 (4.5)</td>
</tr>
<tr>
<td>Disease subset (D/L)</td>
<td>9/8</td>
</tr>
<tr>
<td>Autoantibody profile:</td>
<td></td>
</tr>
<tr>
<td>ANA +</td>
<td>16 (94%)</td>
</tr>
<tr>
<td>Anti-topoisomerase I +</td>
<td>1 (5.9%)</td>
</tr>
<tr>
<td>ACA +</td>
<td>5 (29.4%)</td>
</tr>
<tr>
<td>Baseline mRSS, mean (SD)/range</td>
<td>10.1 (11.5)/0–40</td>
</tr>
<tr>
<td>Baseline local mRSS, mean (SD)/range</td>
<td>0.9 (1.2)/0–3</td>
</tr>
</tbody>
</table>

D diffuse cutaneous systemic sclerosis; L limited cutaneous systemic sclerosis; ANA antinuclear antibodies; ACA anticentromere antibodies
## Results

<table>
<thead>
<tr>
<th></th>
<th>Stable (n=14)</th>
<th>Worsened (n=2)</th>
<th>Improved (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total mRSS</td>
<td>Forearm skin score</td>
<td>Total mRSS</td>
</tr>
<tr>
<td><strong>Baseline, mean (SE)</strong></td>
<td>3.79 (0.8)</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td><strong>range</strong></td>
<td>0-10</td>
<td>0-10</td>
<td>0-10</td>
</tr>
<tr>
<td><strong>Δ 24</strong></td>
<td>+1.36</td>
<td>0</td>
<td>+7</td>
</tr>
<tr>
<td><strong>range</strong></td>
<td>0-10</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Results: stable
Results: worsened

Baseline, local mRSS=0

24 months, local mRSS=2

Optical Density

Depth (micron)

Baseline  24 months

Optical Density

0.5 0.6 0.7 0.8

Depth (micron)

0 60 120 180 240 300
Results: improved (-2)

Baseline, local mRSS = 2

24 months, local mRSS = 0

Baseline, local mRSS = 2

24 months, local mRSS = 0

Baseline: 0

24 months: 0

Optical Density

Depth (micron)

p<0.0001
Results: improved (-1)

- At 4 sites of analysis in which mRSS improved by 1 point the quantification of OD showed no significant improvement (p>0.05 for both).

- It is to determine whether the lack of improvement of OCT at sites with mRSS change of 1 is associated with poor accuracy of mRSS or room for improvement in OCT analysis.
Conclusions

- Although a low number of observations, this preliminary study provides the first evidence suggesting that OCT of the skin is sensitive to change over time and it changes consistently with mRSS.

- Studies including a larger number of patients and sites of analysis with different grades of skin involvement and improvement/deterioration of clinical score are needed for more definitive validation.
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