Two-Dimensional Analysis of Palpebral Opening in Blepharoptosis

Visual Iris-Pupil Complex Percentage by Digital Photography

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- Nothing to disclose -
Assessment of Blepharoptosis

- Margin reflex distance (MRD)
  - MRD1 (4 ~ 4.5 mm)
  - MRD2
- Vertical dimension of palpebral fissure width
  - 9 ~ 11 mm
- Margin limbal distance
- Margin crease distance
- Palpebral fissure width on down gaze
Limits

✓ linear mathematical models using a ruler.
✓ patient overstraining and variable inspector skills
✓ concordant results are not easily obtained
✓ most effective in cases of significant blepharoptosis

✓ Subclinical ???
✓ Children ???
New 2-dimensional scheme

- Digital photography

- Visual Iris-pupil complex Percentage (VIP): a measure of the exposed corneal surface area calculated by subtracting the hidden corneal surface area from the totally estimated corneal surface area in primary gaze.
PATIENTS & METHODS

- 2008 ~ 2011 for upper blepharoplasty at Choi Yeop aesthetic clinic
- Reviewed the photos
  : 1384 eyes of 692 patients (aged 14 ~ 67 years)
  : 2 plastic surgeons, 2 nurses, and 1 graphic designer
  : get VIP scores using Adobe Photoshop
- Total 1305 eyes
  - Exclude 79 eyes
    - 50 eyes: non concordant borderline eyes
    - 29 eyes: retracted upper lids,
      excessive skin hooding,
      overaction of frontalis muscle
Step 1: Calculate the total corneal surface.

1. Open a digital image.
2. Choose view > Select the Rulers tool.
3. From the Vertical Ruler, draw the mouse to make 2 vertical lines; make 2 vertical lines; one on the medial limbus and the other on the lateral limbus (Fig. 1A-a).
4. Choose the Elliptical Marquee tool (Fig. 1A-b).
5. While pressing the Shift key (Fig. 1A-c), click and hold the mouse button and drag the dotted line from the medial limbus to the lateral limbus (Fig. 1A-d). A dotted circle is formed that corresponds closely to the total corneal margin.
6. The circle is moved to fit the corneal surface (Fig. 1B-a).
7. Choose Window > Select Histogram. Note the pixel values (Fig. 1B-b). The value of total corneal surface is now calculated as a pixel value (33,689 in this example).
Step 2: Calculate the exposed corneal surface.

8. Open “Path 1” in the Paths Palette (Fig. 1C-a).
9. Choose the Pen tool (Fig. 1C-b).
10. Click the first anchor point on a lateral eyelid margin (Fig. 1C-c).
11. Click and hold the mouse button on the medial eyelid margin (Fig. 1C-d) and drag the mouse to create curved line to fit the upper lid curvature (Fig. 1C-m).
12. Click the third anchor point above the second point (Fig. 1C-e).
13. Click the fourth anchor point above the first point (Fig. 1C-f).
14. Click the first anchor point to complete a closed path larger than the hidden corneal surface area (Fig. 1C-c).
15. While pressing Alt key (Fig. 1D-a), click “Load Path as Selection” on the Paths Palette (Fig. 1D-b) and open the “Make Selection” window. Choose “Subtract from Selection” from the window (Fig. 1D-c) and select only the exposed corneal surface area. If there is some corneal surface hidden by the lower eyelid, also include it in the corneal show area.

Note the pixel values (29,564 in this example) (Fig. 1E).

The value of exposed corneal surface is now calculated as a pixel value.
(Exposed corneal surface / Total iris-pupil complex surface) × 100

= (29,564/33,689) × 100

VIP = 87.8%
# RESULTS

<table>
<thead>
<tr>
<th>Grade</th>
<th>Degree of Iris-Pupil Complex Exposure</th>
<th>Aesthetic Assessment</th>
<th>Number in Our Series of Total 1305 Eyes in 657 Patients (%)</th>
<th>VIP Scores, %, [Mean (SE)]</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Excellent</td>
<td>Normal</td>
<td>415 (31.80)</td>
<td>85-94 [88.59 (0.12)]</td>
<td>&lt;0.0001</td>
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<tr>
<td>II</td>
<td>Good</td>
<td>Normal</td>
<td>435 (33.33)</td>
<td>78-84 [81.15 (0.09)]</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Mild ptosis</td>
<td>Subclinical ptosis</td>
<td>270 (20.69)</td>
<td>70-77 [74.35 (0.27)]</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Severe ptosis</td>
<td>Prominent ptosis</td>
<td>185 (14.18)</td>
<td>Below 70 [63.76 (0.43)]</td>
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*P value from 1-way analysis of variance; statistically significant. Multiple comparison by Duncan multiple range test, all means are different; I ≠ II, II ≠ III, III ≠ IV, and IV ≠ I.*
VIP Scores

60%

75%

80%

85%
Subclinical Blepharoptosis

70 < VIP < 77

- Frequently neglected
- Frustrated with the unpredicted result
Case 19, F

Blepharoplasty, Epicanthoplasty

VIP 58%
Prominent ptosis

VIP 88%
Case 43, F

Previous blepharoplasty (3 times)
Fat grafting to hollowed upper lid

Epicanthoplasty, Lateral canthoplasty
Levator-Müller muscle flap advancement

VIP 67%
VIP 82% / 86%
**conventional ptosis surgery**

- improvement form the grades IV, to grades II / I

- We sometimes need the **slight correction of the eye appearance** from grades III to II / I.

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Conclusion

VIP

(Visual Iris-pupil complex Percentage)

• 3D \rightarrow 2D
• Simpler, reliable, objective assessment more feasible, more reproducible
• Subclinical ptosis is easy to quantify
• Suggest aesthetic guideline
• help patients understand ptosis status correctly
• Assessment is easy for surgeon and patient.
• Observational and technical errors can be minimized.
• Provide an option for quantifying ptosis in subclinical cases