

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

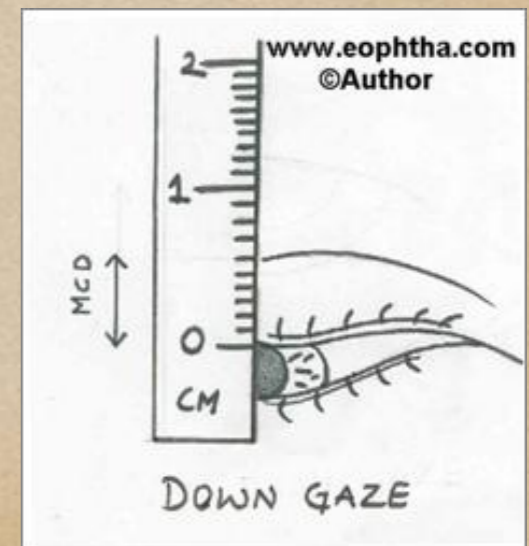
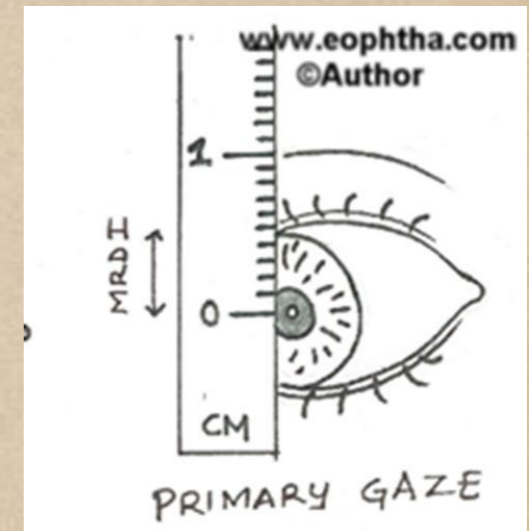
- Vertical dimension of palpebral fissure width

 - : 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 ???



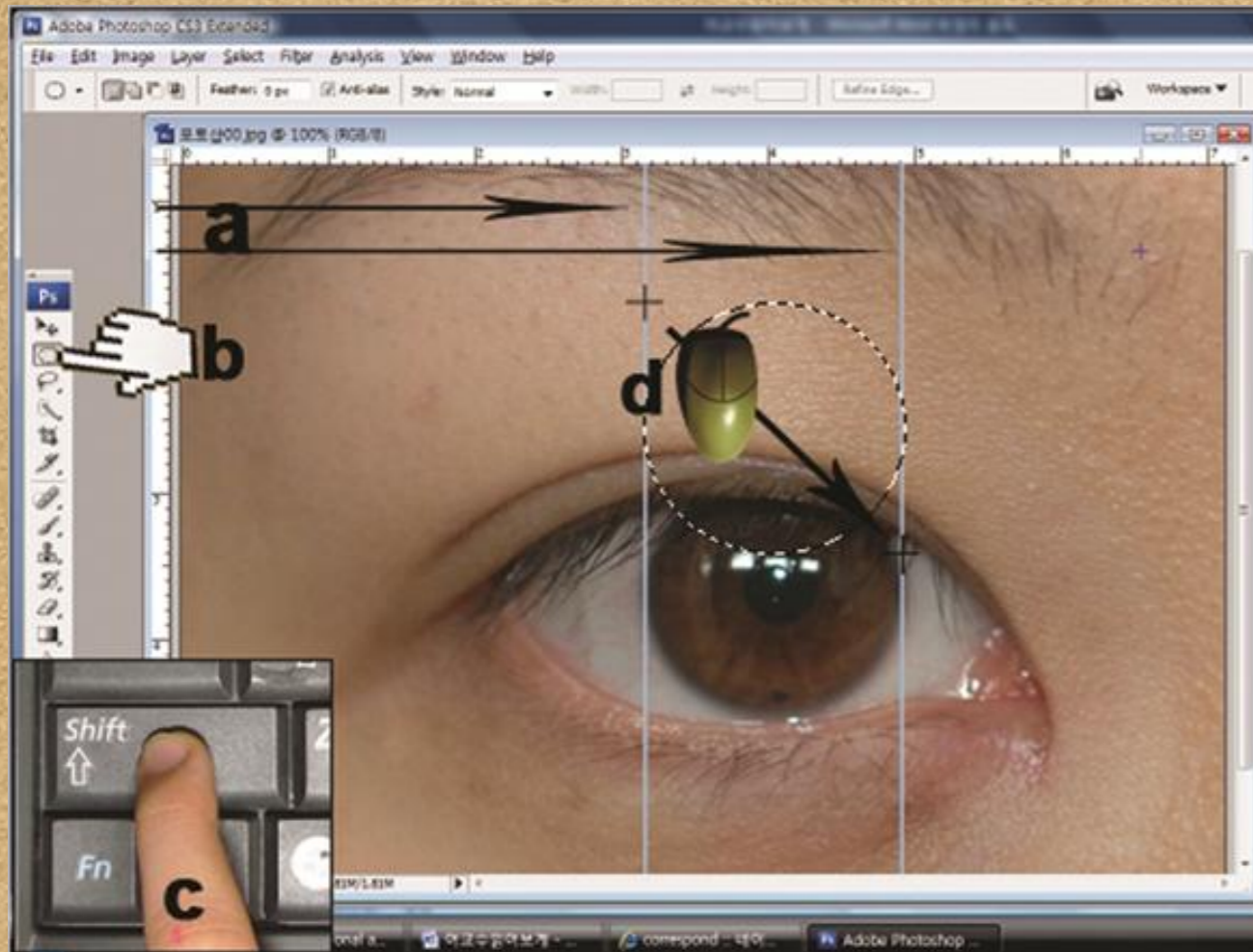
New 2-dimensional scheme

- 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.



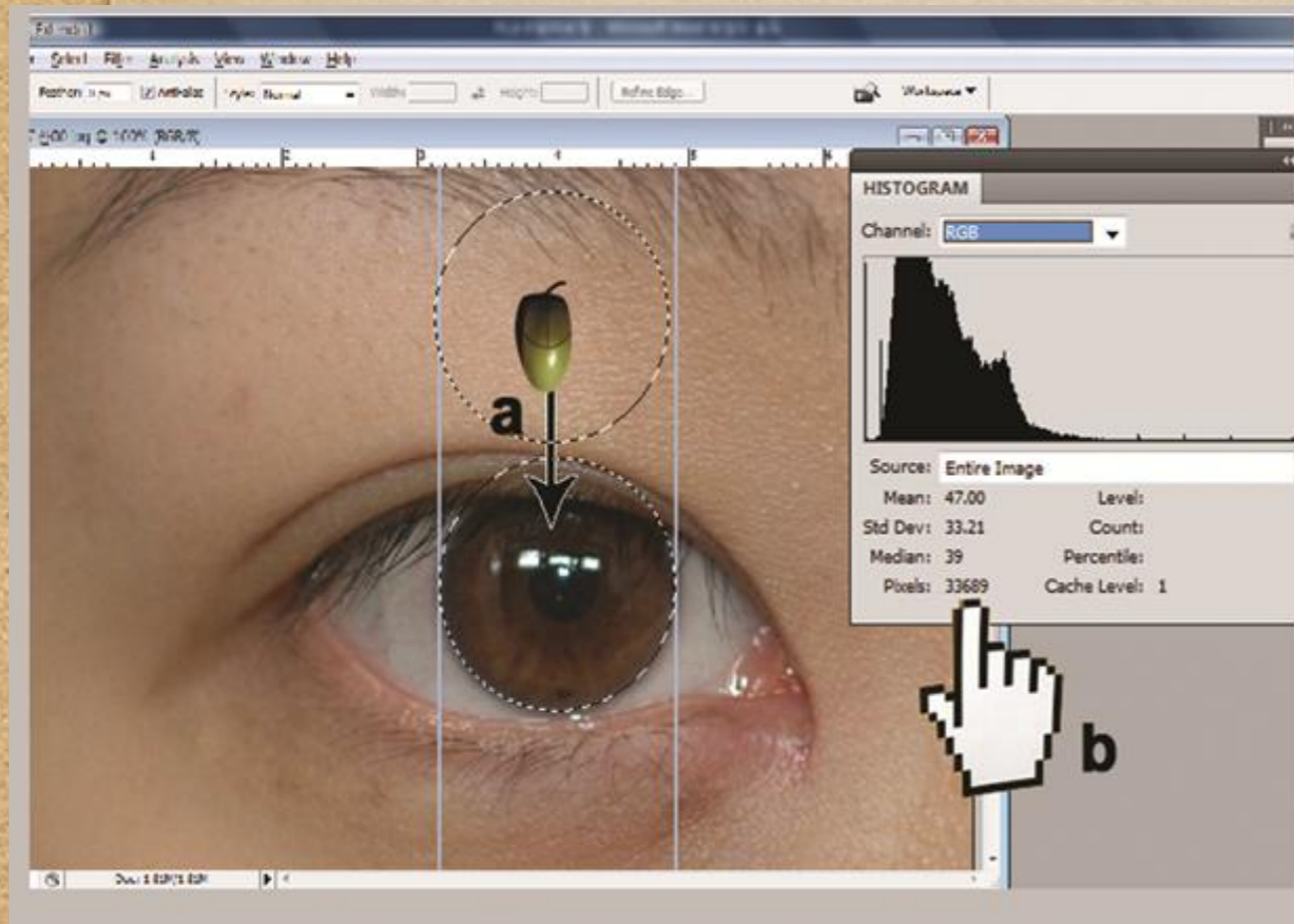
PATIENTS & METHODS

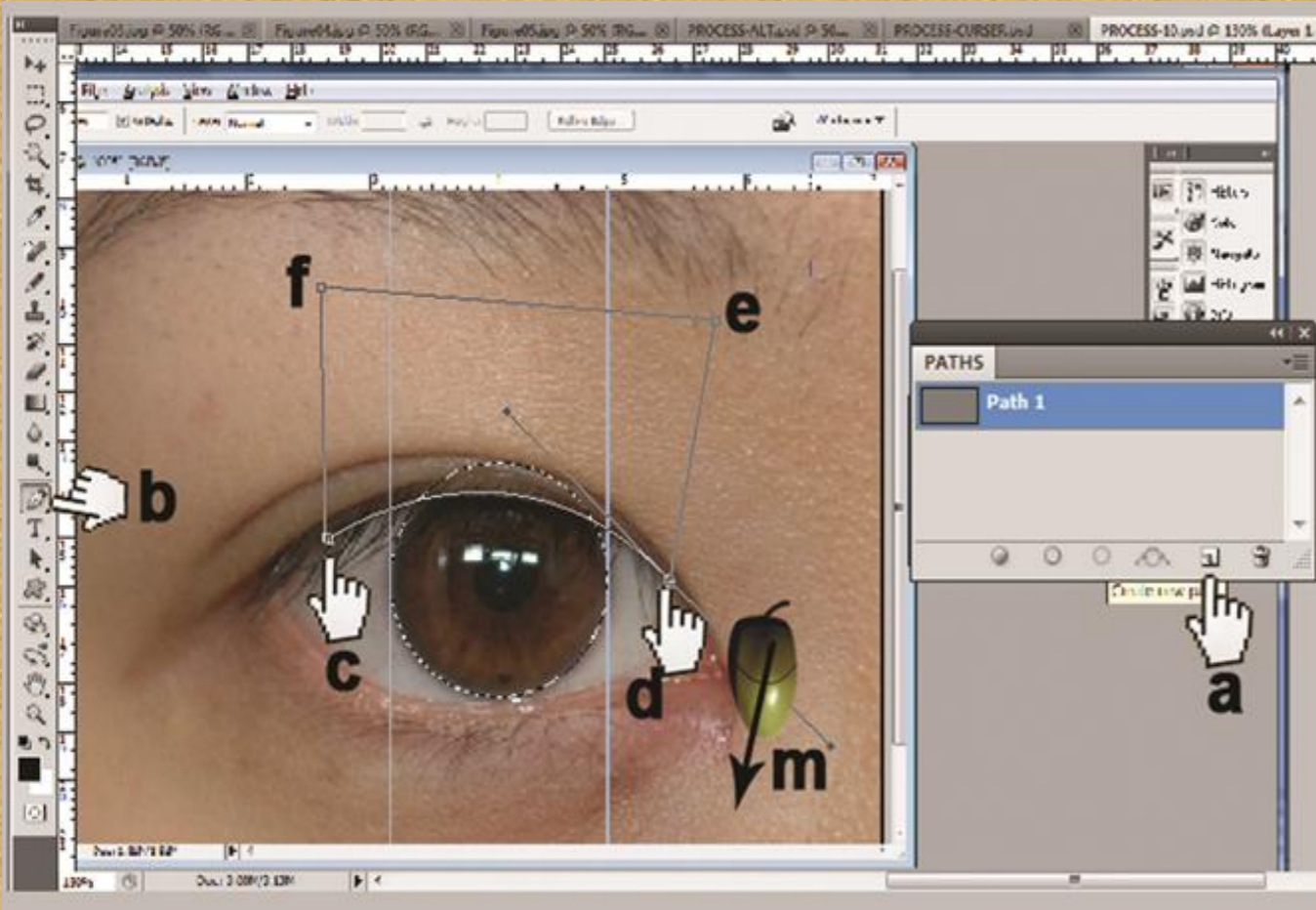
- 2008 ~ 2011 for upper blepharoplasty at ChoiYeop aesthetic clinic
- Reviewed the photos
 - : 1384 eyes of 692 patients (aged 14 ~ 67 years)
 - : 2 plastic surgeons, 2 nurses, and 1 graphic designer
 - : get VIP scores using Adobe Photoshop
- Total 1305 eyes
 - Exclude 79 eyes
 - 50 eyes : non concordant 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).



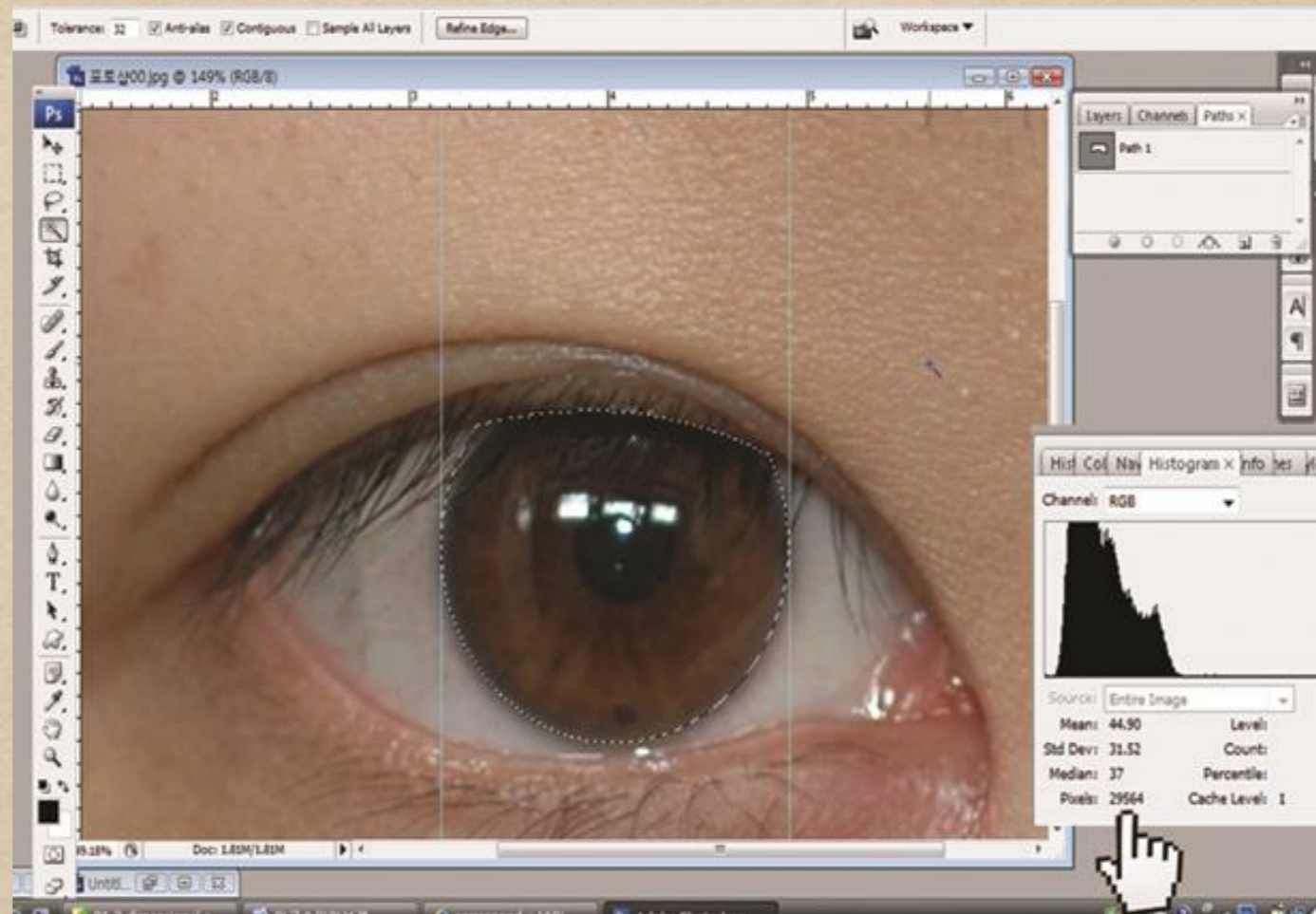


Step 2: Calculate the exposed corneal surface.

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-e).
 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.
 16. Choose Window > Select Histogram.
- Note the pixel values (29,564 in this example) (Fig. 1E).
The value of exposed corneal surface is now calculated as a pixel value.



VIP



$(\text{Exposed corneal surface} / \text{Total iris-pupil complex surface}) \times 100$

$$= (29,564 / 33,689) \times 100$$

$$\text{VIP} = 87.8\%$$

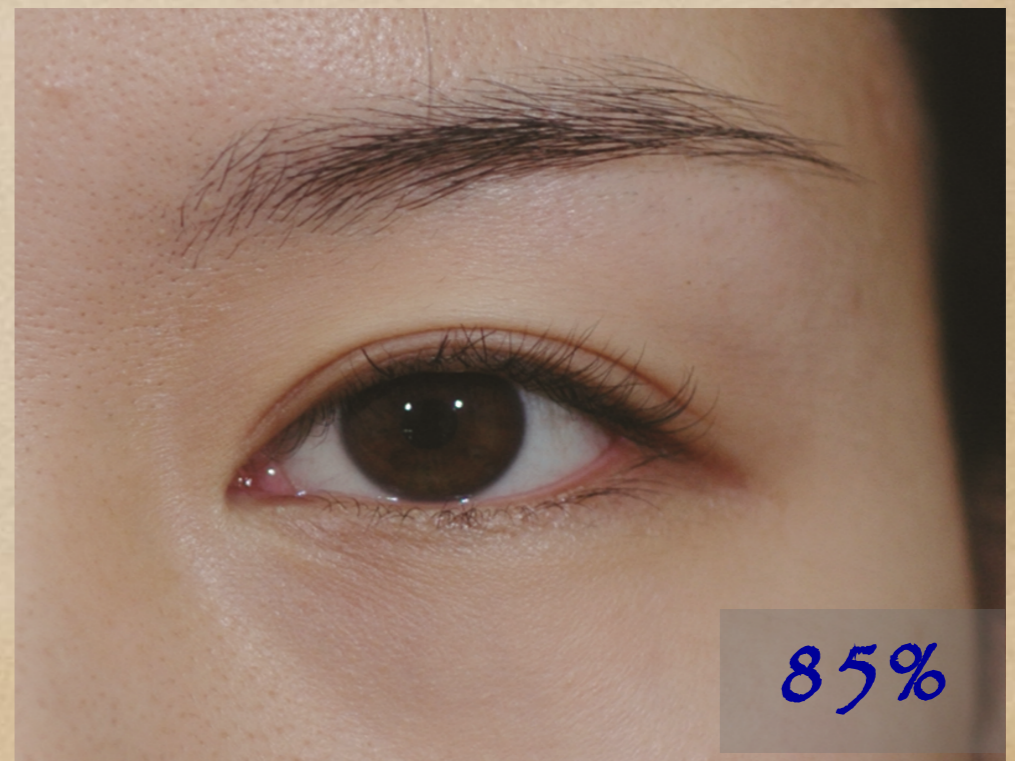
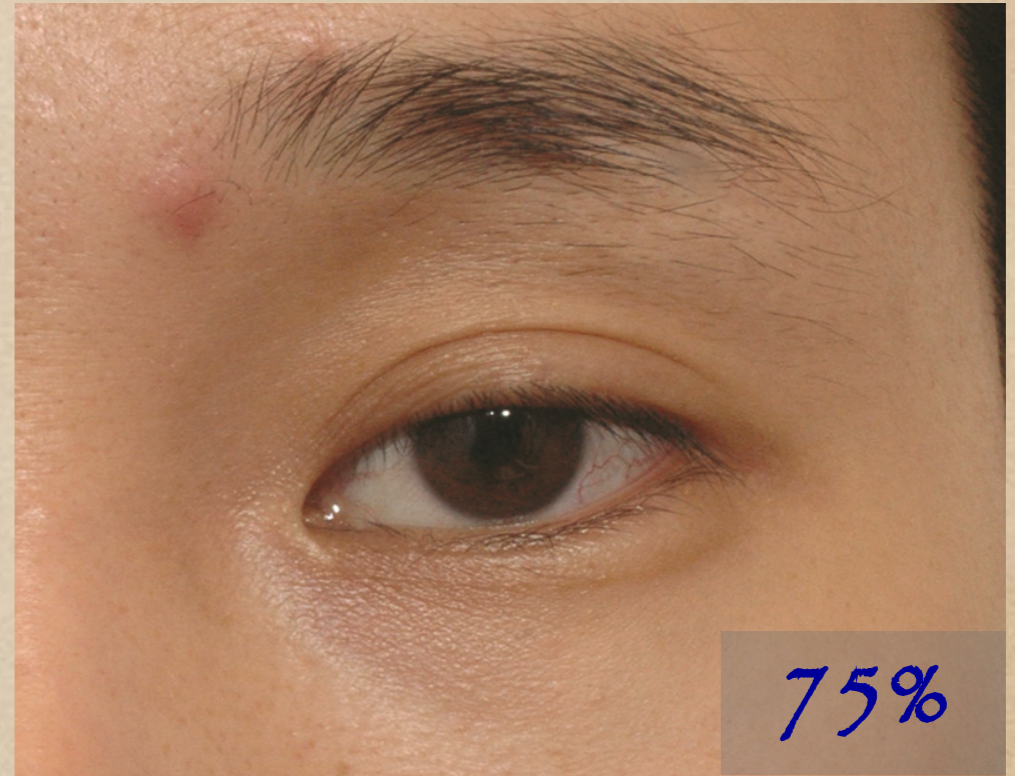
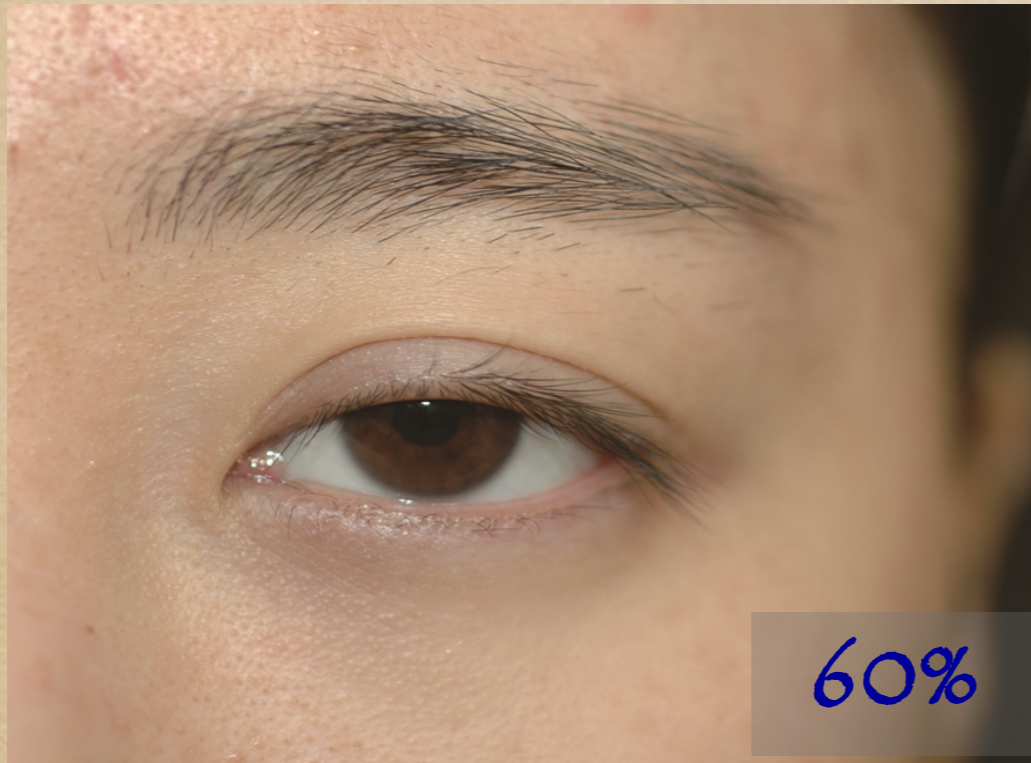
RESULTS

Grade	Degree of Iris-Pupil Complex Exposure	Aesthetic Assessment	Number in Our Series of Total 1305 Eyes in 657 Patients (%)	VIP Scores, %, [Mean (SE)]	<i>P</i>
I	Excellent	Normal	415(31.80)	85-94[88.59(0.12)]	<0.0001
II	Good	Normal	435(33.33)	78-84[81.15(0.09)]	
III	Mild ptosis	<i>Subclinical ptosis</i>	270(20.69)	70-77[74.35(0.27)]	
IV	Severe ptosis	Prominent ptosis	185(14.18)	Below 70[63.76(0.43)]	

P value from 1-way analysis of variance; statistically significant.

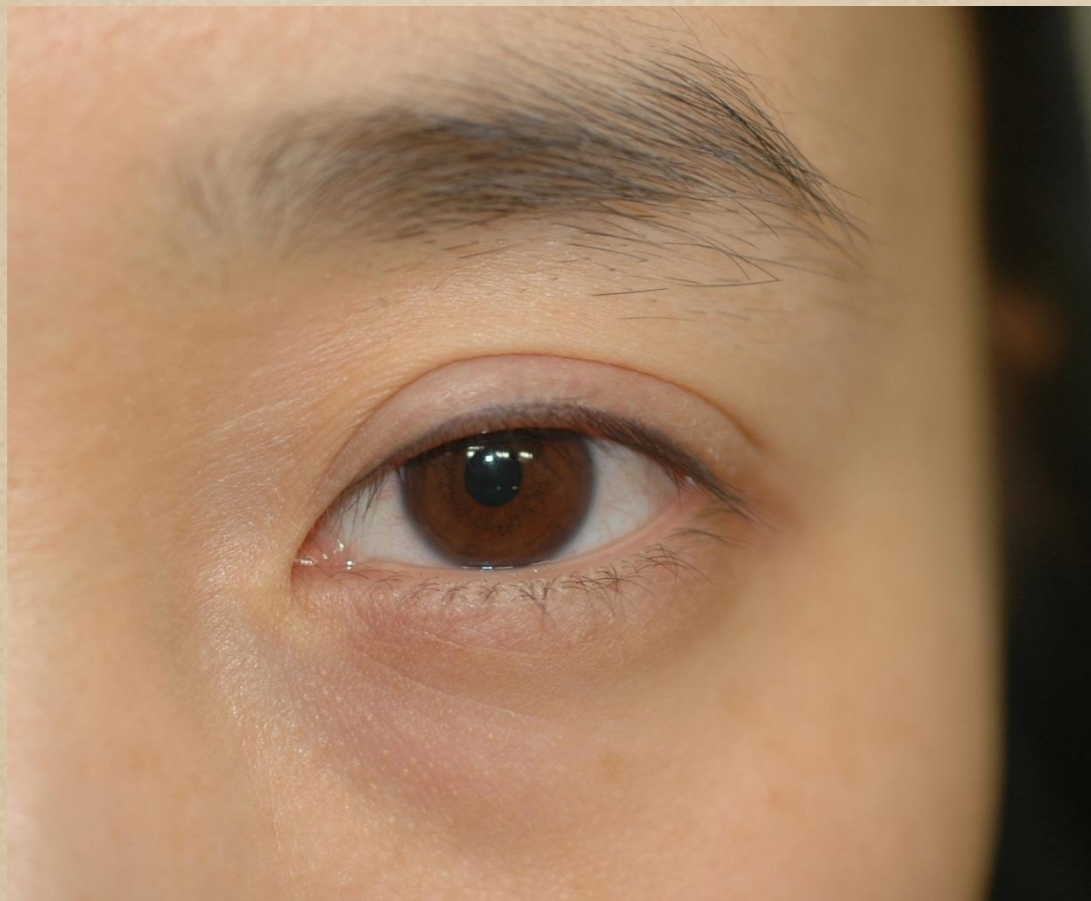
Multiple comparison by Duncan multiple range test, all means are different; I ≠ II, II ≠ III, III ≠ IV, and IV ≠ I.

VIP Scores



Subclinical Blepharoptosis

$$70 < \mathbf{VIP} < 77$$



74%

- Frequently neglected
- Frustrated with the unpredicted result

Case 19, F

Blepharoplasty, Epicanthoplasty



VIP 58%
Prominent ptosis

VIP 88%

Case 43, F

Scleral eye type

Previous blepharoplasty (3 times)

Fat grafting to hollowed upper lid

Epicanthoplasty, Lateral canthoplasty
Levator-Müller muscle flap advancement



VIP 67%

VIP 82% / 86%

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- **conventional ptosis surgery**
 ~improvement from the grades IV, to grades II/I

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

Conclusion

VIP

(Visual Iris-pupil complex Percentage)

- 3D → 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