Results

Demographic, refractive, and topographic data for one hundered eyes (8 unilateral and 46 bilateral) of fifty-four patients, thirty-four females 62.96% and twenty males 37.04% are presented in table 3 at the end of six months.

The mean age was 30 years (range 21-40ys).

The axial length measurement preoperative was 26.5±2.0mm. Postoperatively, the axial length measurement was 26.3 ± 1.9mm.

The difference between the preoperative and postoperative measurements of the axial length was not statistically significant (P=0.5)

S.E at spectacle plane preoperatively was -7.3 ± 2.42 D (range -2.0 to -12.0 D).

The mean reduction in spherical equivalent of the myopic refractive error at the corneal plane was -6.6 ± 3.9 diopters (D) (range -2 to -10.5 D).

The mean average preoperative corneal refractive power was 44.06 ± 1.8D.

The mean average post-operative corneal refractive power was 39.23±2.1D.

The mean difference between pre-and postoperative corneal power was 4.83 ± 1.69 (rang 1.5 - 9.3D).

The mean average preoperative pachymetry was 565.31± 39.0 μm (range 490 - 650 μm).

The mean average postoperative pachymetry was 482.88 ±41.41 μm (average 400 - 585 μm).

The postoperative corneal power values as calculated using different methods are presented in table 4 (Fig. 18).

- Using historical method, the mean corneal refractive power was 37.94 ±2.9D.
- Using Gaussian optics formula the mean corneal refractive power was 37.6 ± 2.7D.
- The average postoperative corneal power as measured by corneal topography (K_{post})was 39.18±2.1D.
- Using the value of His RP as the standard and comparing the values calculated by other methods with it, it was found that the postoperative corneal refractive power measured by corneal topography (kpost) overestimated the amount of corneal refractive change by 1.24±0.8D, (Fig. 19) whereas the Gaussian optics formula underestimated the amount of corneal refractive change by 0.33 ± 0.58 D (Fig. 20) (all P <0.001) table 5.

However, there was a strong correlation between HisRP and the other postoperative corneal power values, with Pearson correlation coefficient (r) of 0.908 for HisRP and K post and 0.956 for HisRP and Gau RP (all P < 0.001) the overestimation of postoperative corneal refractive power by Kpost increased significantly with increasing operative change in spherical equivalent (r = 0.409) P < 0.001 (Fig. 21).

The regression formula for these comparisons was

$K_{post\text{-}adj} = K_{post} - 0.134\ (SE_{post} - SE_{pre}) - 0.601.$

when the Kpost modified according to this formula the values of Kpost-adj were within 0.1 ± 0.62 of HisRP values (Fig. 22) Table (5).

The difference between HisRP and GauRP decreased slightly with increasing surgically induced refractive change ($r = 0.143$, $P = 0.152$) (Fig. 23).

Table (4): Postoperative corneal refractive power (Diopters) as calculated using different methods

Corneal refractive power	Mean ± SD	Range
His RP	37.944±2.925	34.05-44.95
Gau RP	37.6198±2.701	33.24-44.14
Average Kpost	39.18±2.13	36.52-45
K post-adj	37.84±2.87	34.40-44.82

Fig (18): Postoperative corneal refractive power (Diopters) as calculated using different methods

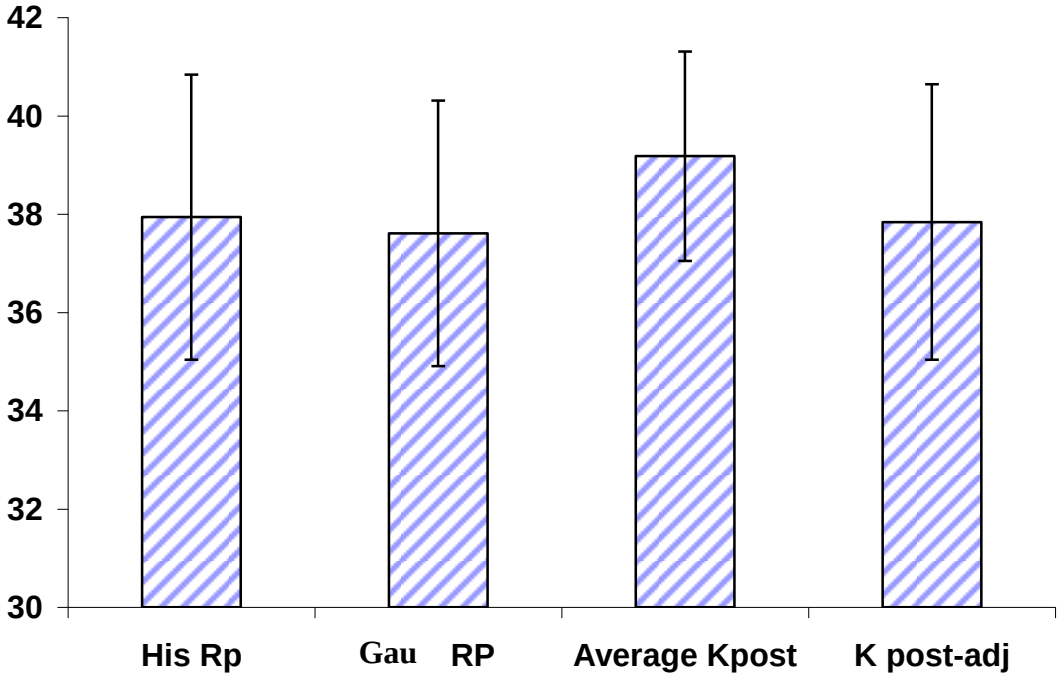


Table (5): Difference between methods used for postoperative corneal power calculation and clinical history method

Difference between methods	Mean ± standard deviation
HisRP –Kpost	-1.24±0.8D
HisRP – Gau RP	0.33±0.58D
His RP – Kpos-adj.	0.10±0.62

His RP = Calculated postoperative refractive power by historical method.

Kpost= postoperative k calculated by CVK.

Gau RP = calculated postoperative refractive power using Gaussian optics formula.

Kpost-adj= adjusted postoperative k.

Fig (19) : Scatter gram of calculated postoperative corneal refractive power using historical method (HisRP) versus postoperative keratometry as calculated by corneal topography (K post) the Pearson correlation coefficient was 0.602, P < 0.001

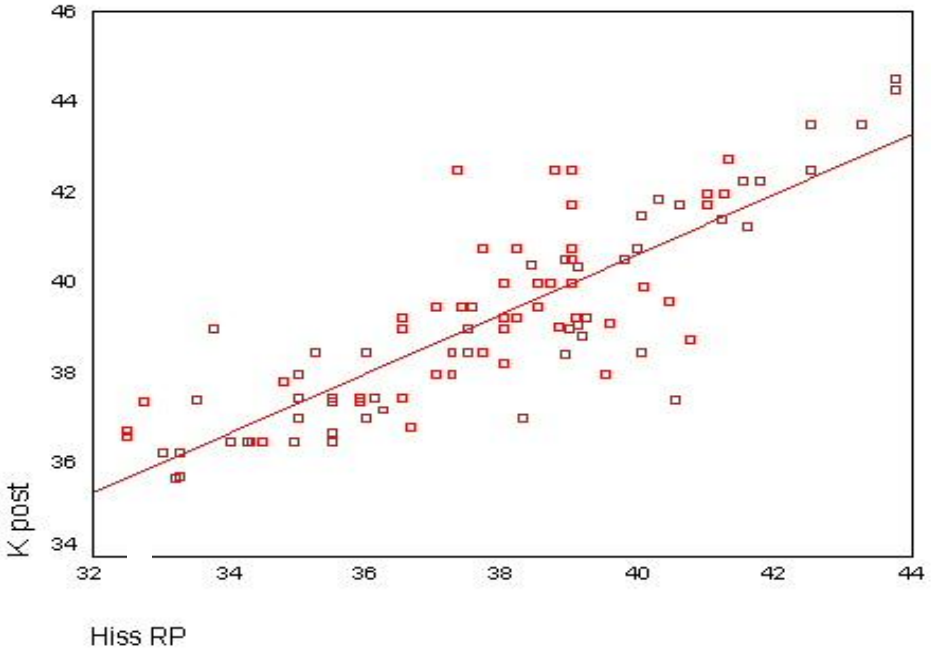


Fig (20) : Scatter gram of calculated postoperative corneal refractive power using historical method (HisRP) versus calculated postoperative corneal refractive power using Gaussian optics formula (Gau RP) the pearson correlation coefficient was 0.684, P < 0.001

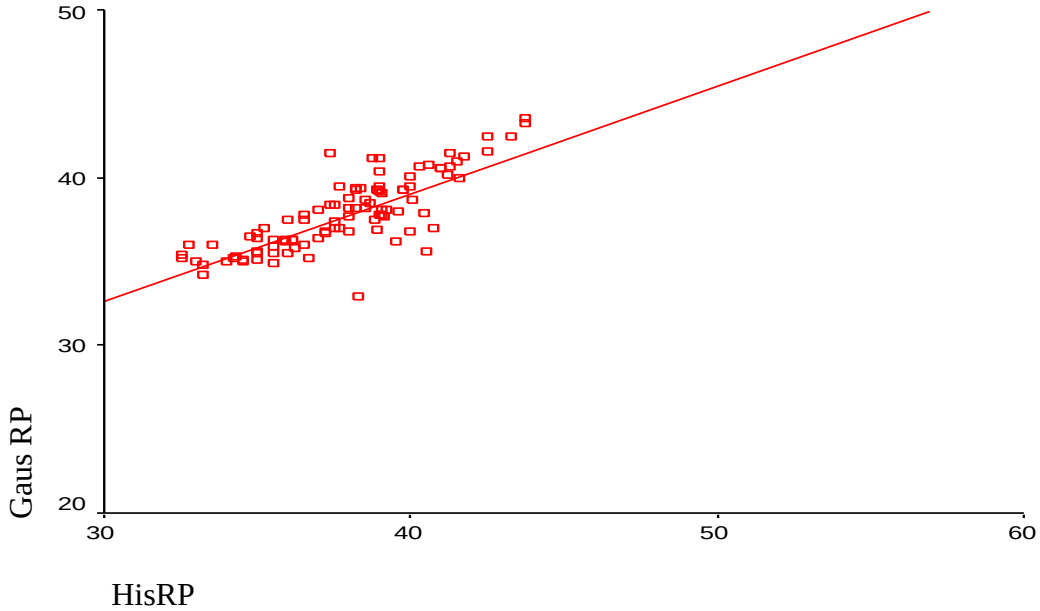


Fig. (21):Difference between average K_{post} and HisRP as a function of refractive correction

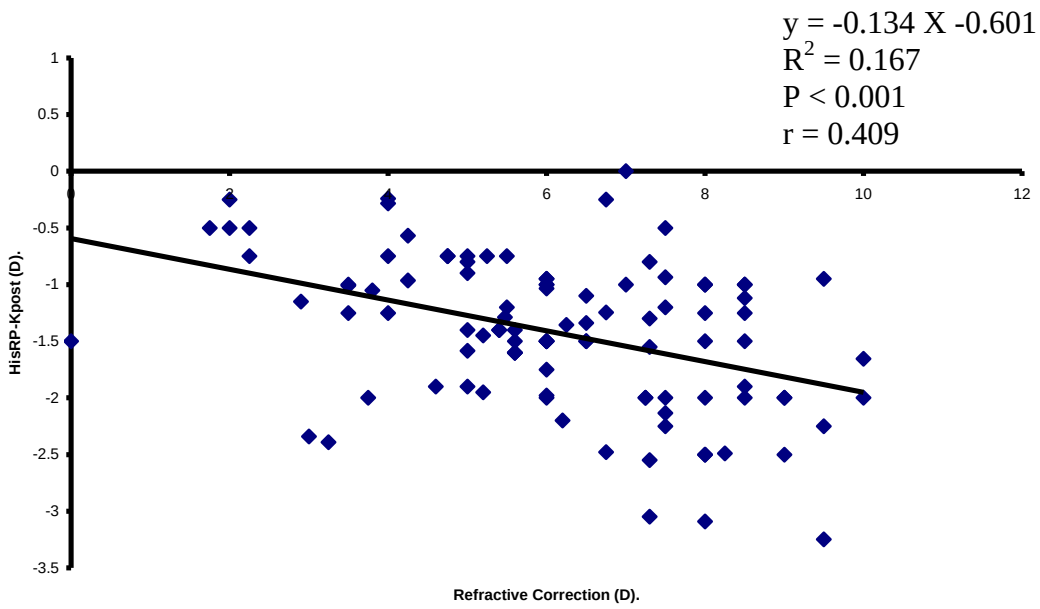


Fig (22): Scatter gram of calculated postoperative corneal refractive power using historical method (HisRP) versus adjusted postoperative k calculated by CVK

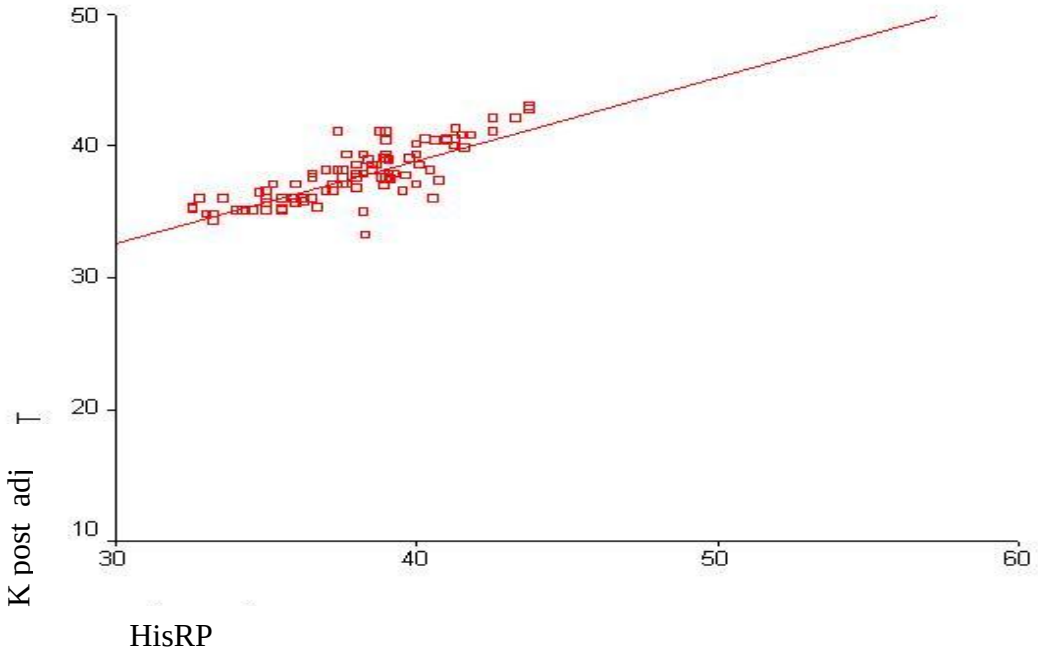
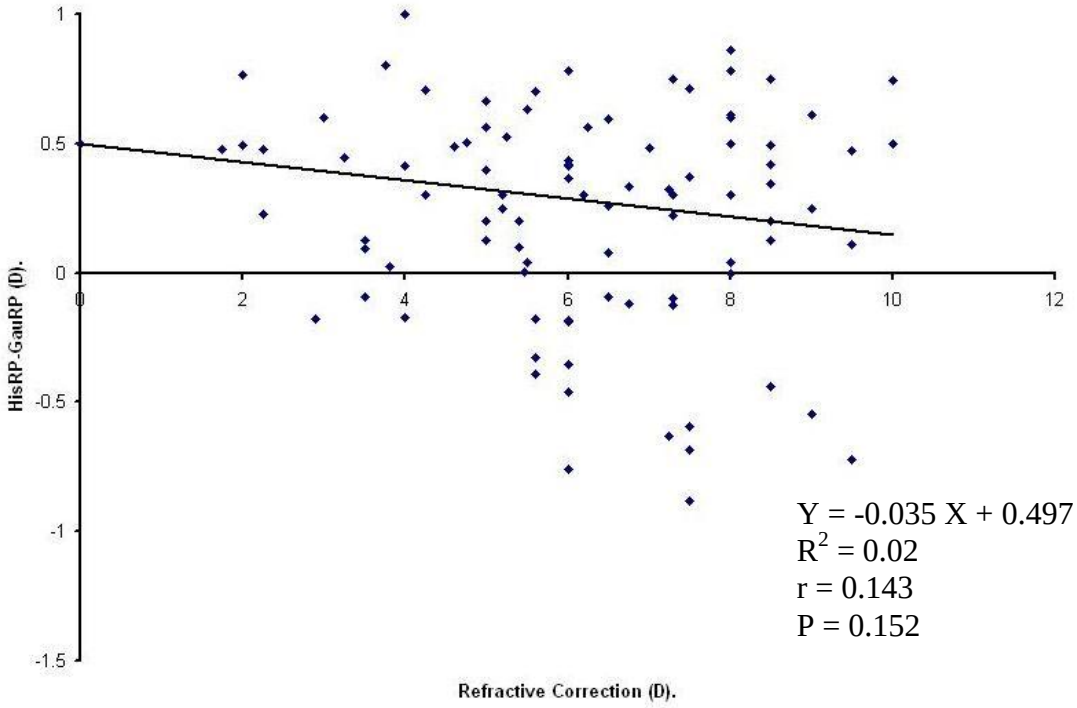


Fig. (23):Difference between Gau RP and HisRP as a function of refractive correction



Estimation of postoperative IOL powers using SRK-11, SRK-T and Holladay with the four different methods calculating the corneal refractive power show that Holladay formula give the highest IOL power with the four different methods, the lowest one was that when K_{post} was used. (Fig. 24).

On comparison of results when using Holladay formula with HisRP, GauRP and $K_{\text{-post-adj}}$, it was found that the highest IOL power was when using GauRP (Fig. 25, 26, 27). (Table 6).

Fig. (24): Mean and standard deviation of IOL power calculated with each formula SRKII, SRKT and Holladay using different methods calculating the corneal refractive power.

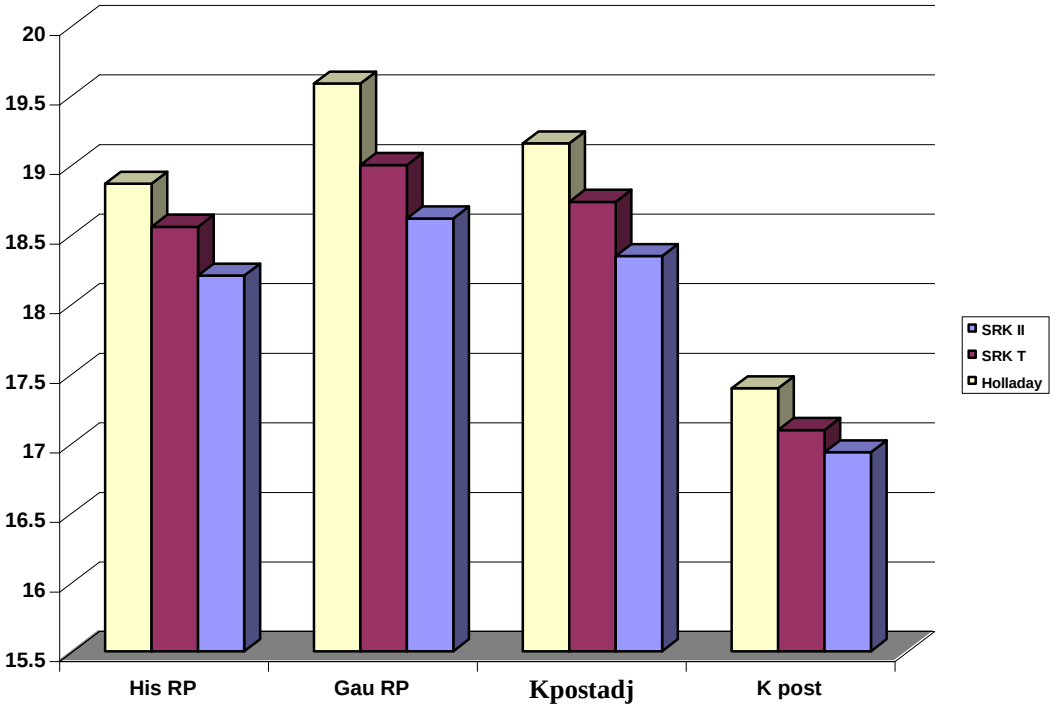


Fig (25): Scatter gram of relationship between GauRP and HisRP with Holladay formula

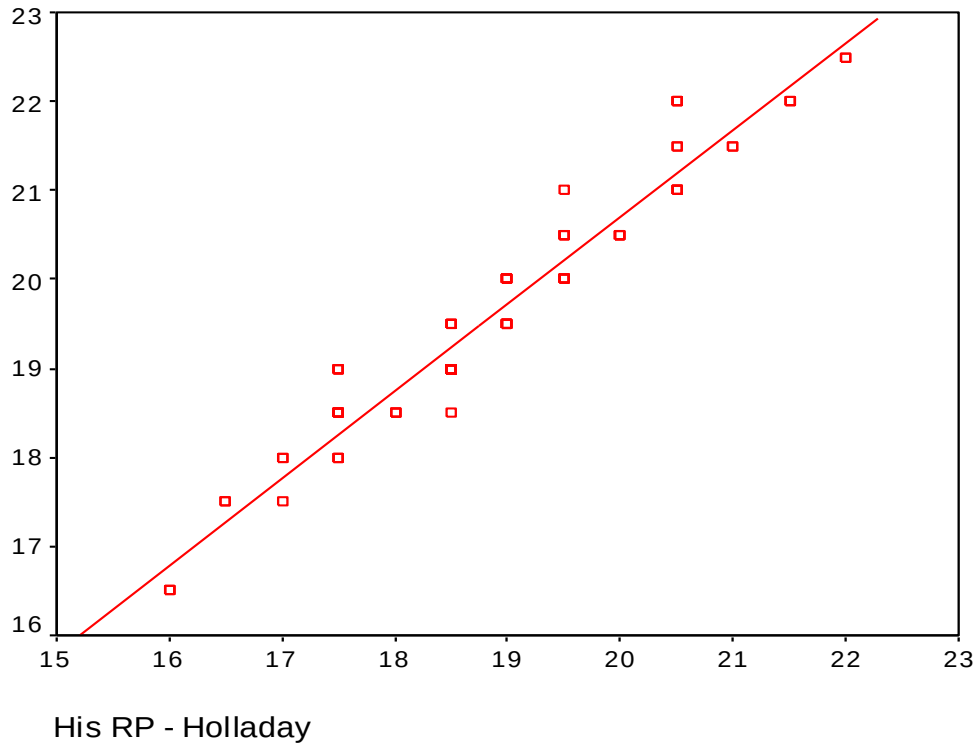


Fig (26): Scatter gram of relationship between $K_{post-adj}$ and HisRP with Holladay formula

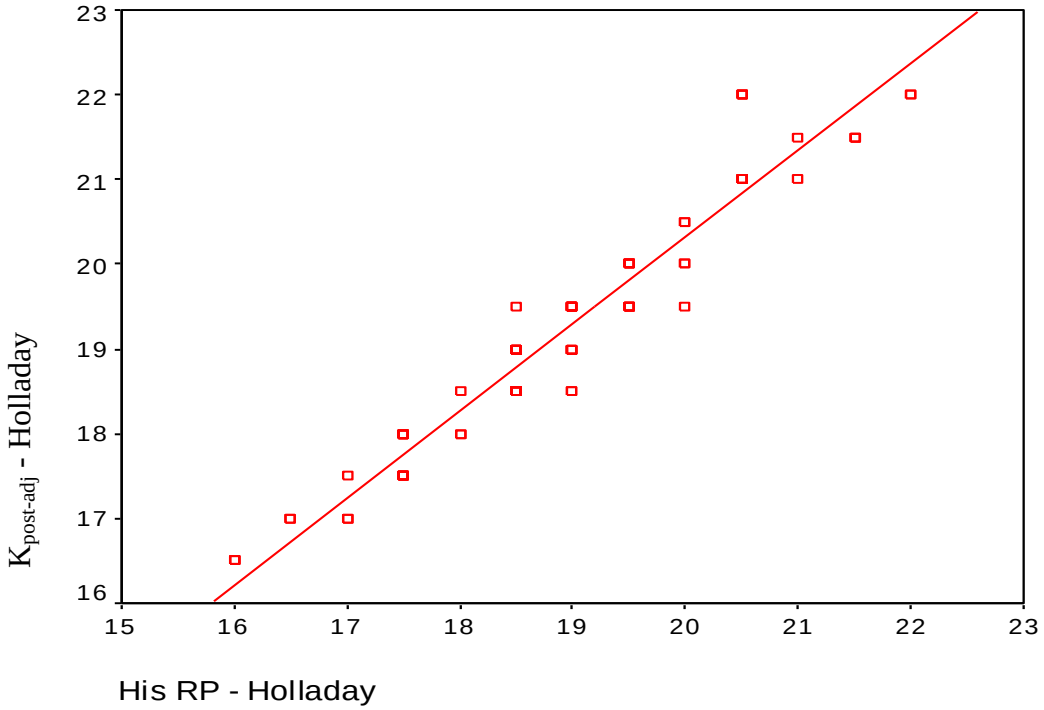


Fig (27): Scatter gram of relationship between K_{post} and HisRP with Holladay formula

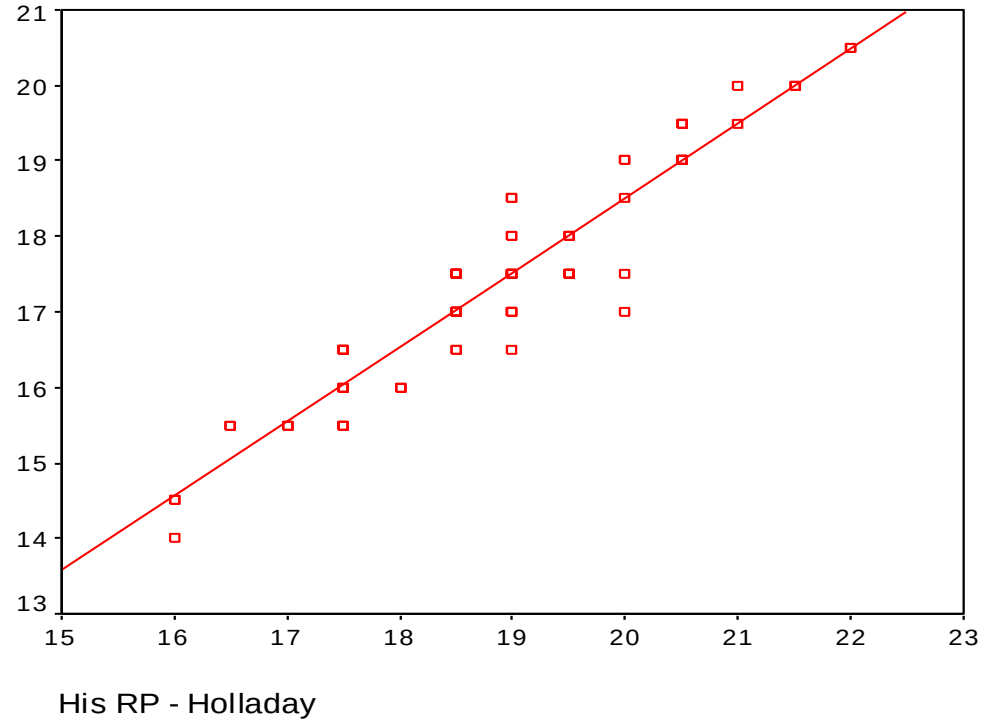


Table (6): Holladay formula with different K-readings.

	Mean ± SD	Range
His RP	18.860 ± 1.28	16.0 – 22.0
Gau RP	19.580 ± 1.30	16.5 – 22.5
$K_{post\text{-}adj}$	19. 150 ± 1.37	16.5 – 22.0
K_{post}	17.385 ± 1.34	14.0 – 20.5

Examples of cases of the study

Case 1:

Female patient aged 30ys.

Pre-operative examination.

(1) Right eye:

- Uncorrected Visual acuity 6/60.
- Spherical equivalent at corneal plane –8.5.
- Pachymetry 541um
- Average K. reading 44.15.
- Anterior corneal radius (r_1) = 7.6mm.
- Axial length 24.40mm.
- Corneal topography: symmetrical regular bow-tie area with the rule,

(2) Left eye:

- Visual acuity 6/36 uncorrected.
- Spherical equivalent at corneal plane = - 4.0.
- Pachumetry 535um.
- Average K.reading 43.79.
- Anterior corneal radius (r_1) = 7.7mm.
- Axial length 24.62mm.

Corneal topography symmetrical regular bow-tie area with the rule.

LASIK was done to treat the patient's myopic astigmatic error.

Postoperative examination after 6 months:

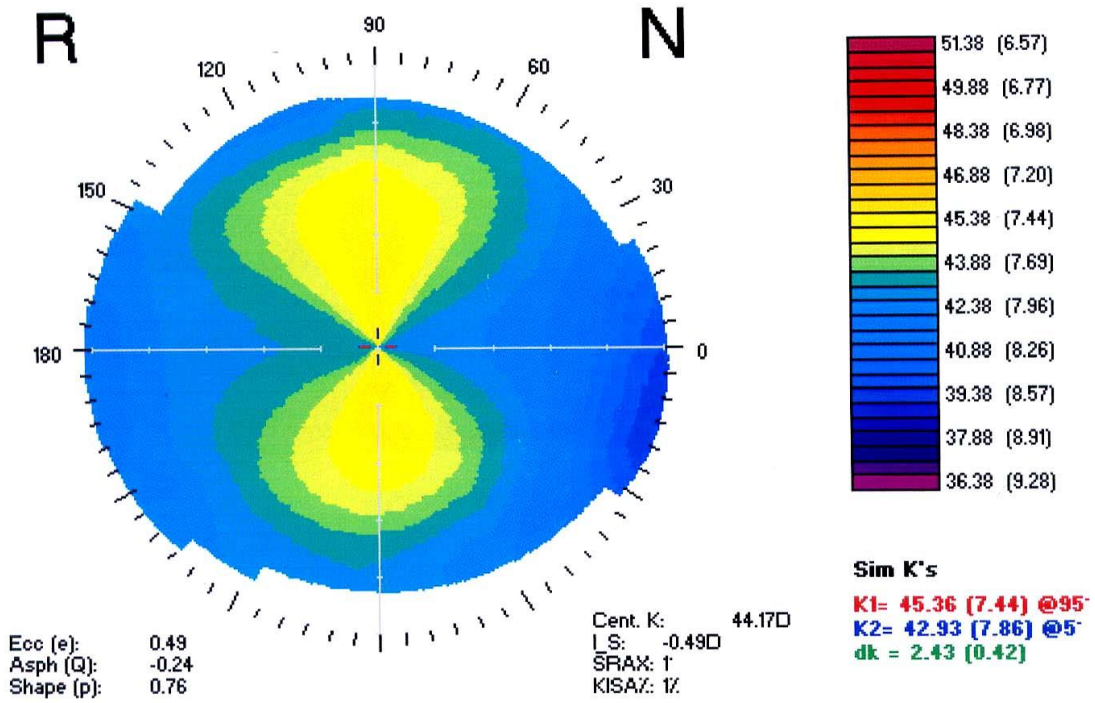
***Right eye:**

- Visual acuity was 6/9.
- Spherical equivalent at corneal plane +0.5.
- Pachymetry 430um.
- Axial length 24.36mm.
- Average k.reading (K_{post})= 36.84.
- Anterior corneal radius (r_1) 9.1mm.
- Posterior corneal radius (r_2) 6.7mm.
- Postoperative corneal refractive power calculated by clinical history method at corneal plane (His RP) = 35.15 .
- Postoperative corneal refractive power calculated by thin lens formula (Gau RP) = 35.0 .
- Adjusted post K ($K_{postadj}$) = 35.033 .
- Corneal topography ⟶ area of central flattening with residual astigmatism = 1.5D.

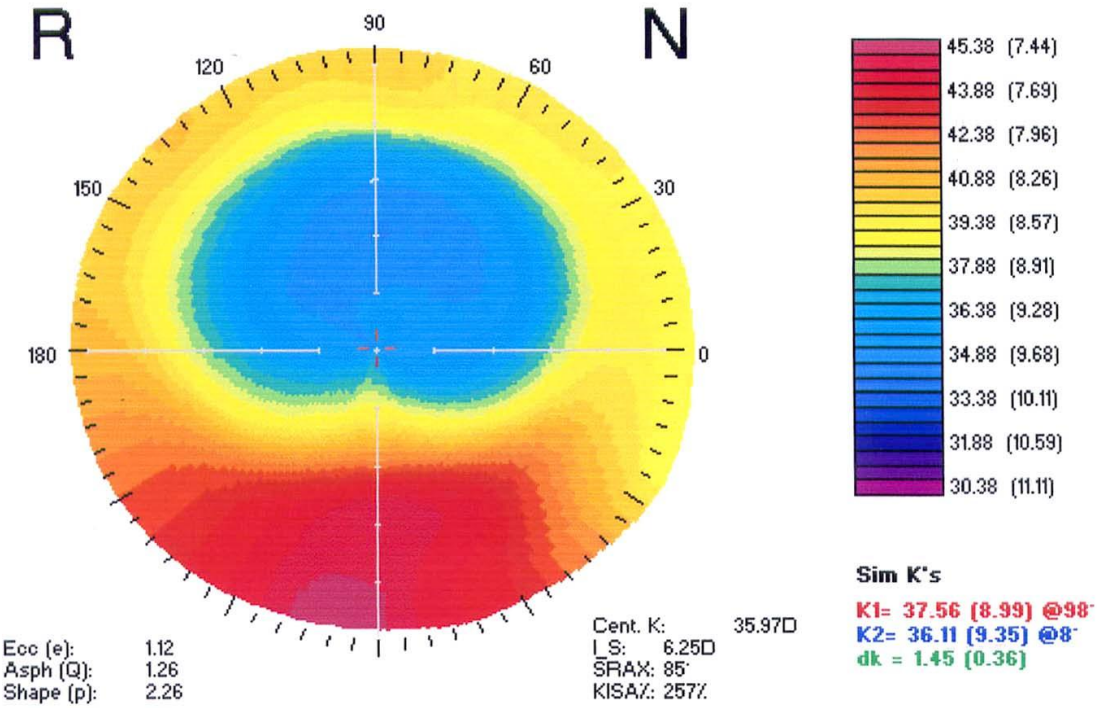
***Left eye:**

- Visual acuity 6/9.
- Spherical equivalent at corneal plane = +0.75.
- Pachymetry = 480um.
- Axial length = 24.60mm.
- Average K-reading (K_{post})= 39.93.
- Anterior corneal radius (r_1) = 8.4mm.
- Posterior corneal radius (r_2) = 6.8.

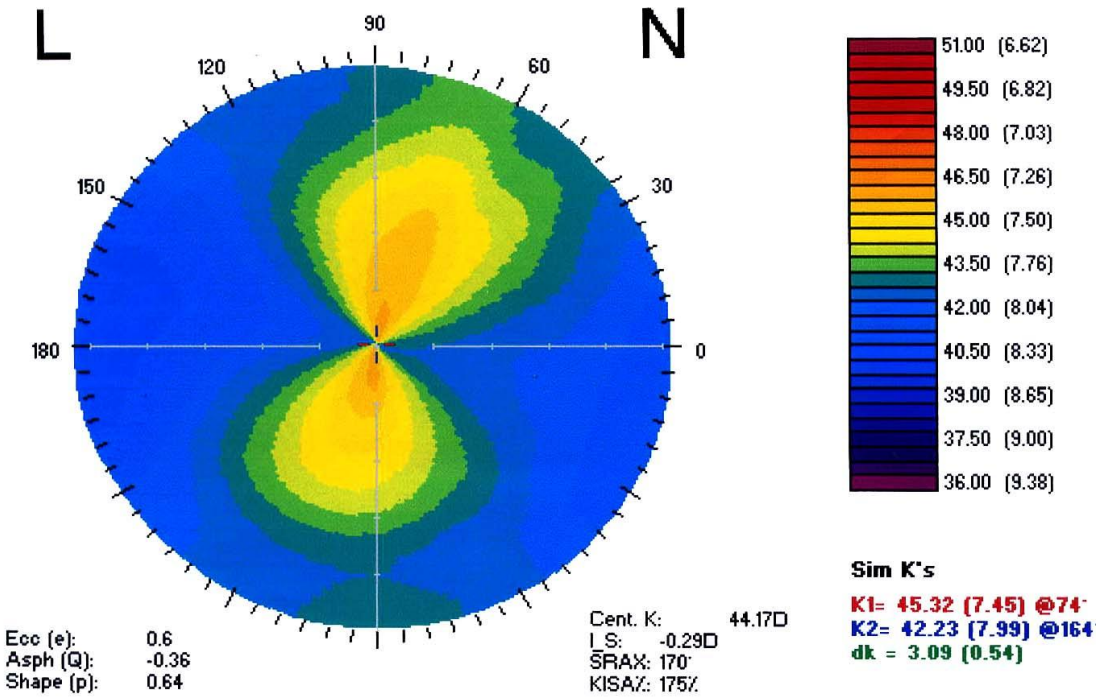
- Postoperative corneal refractive power calculated by clinical history method at corneal plane (His RP) = 39.04.
- Postoperative corneal refractive power calculated by thin lens formula (Gau RP) = 38.5.
- Adjusted post K ($K_{postadj}$) = 38.69
- Corneal topography ⟶ Area of central flattening with residual astigmatism against the rule = 0.64.



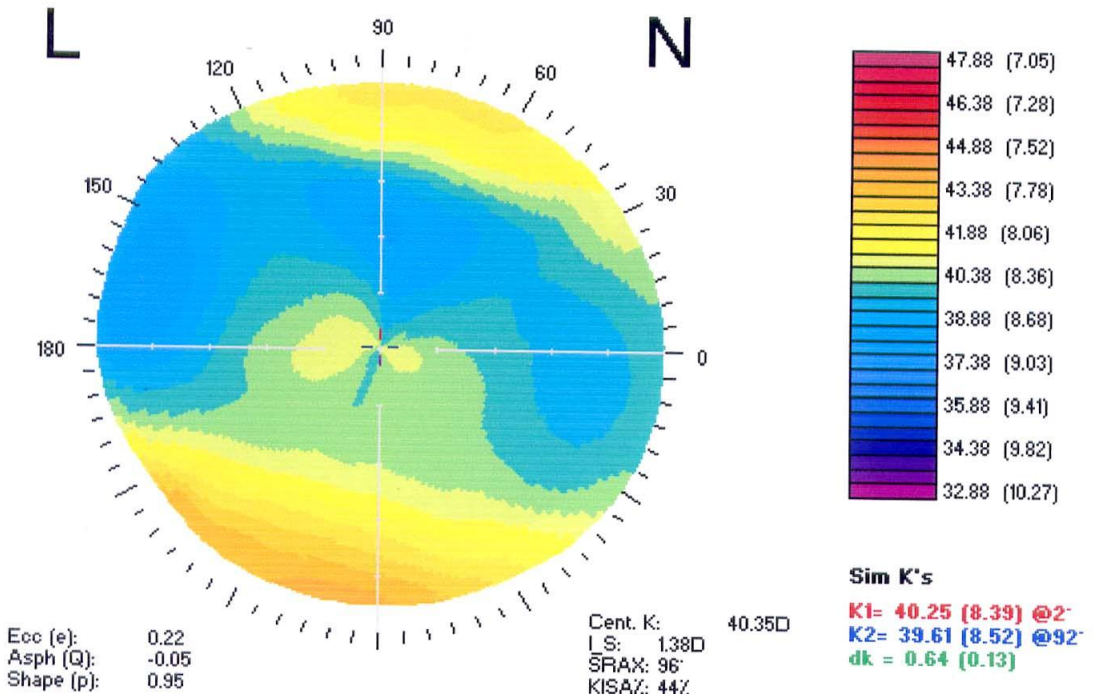
Case (1) : Preoperative Right eye



Case (1) : Postoperative Right eye



Case (1) : Preoperative Left eye



Case (1) : Postoperative Left eye

Case 2:

Male patient aged 35 years.

Preoperative examination.

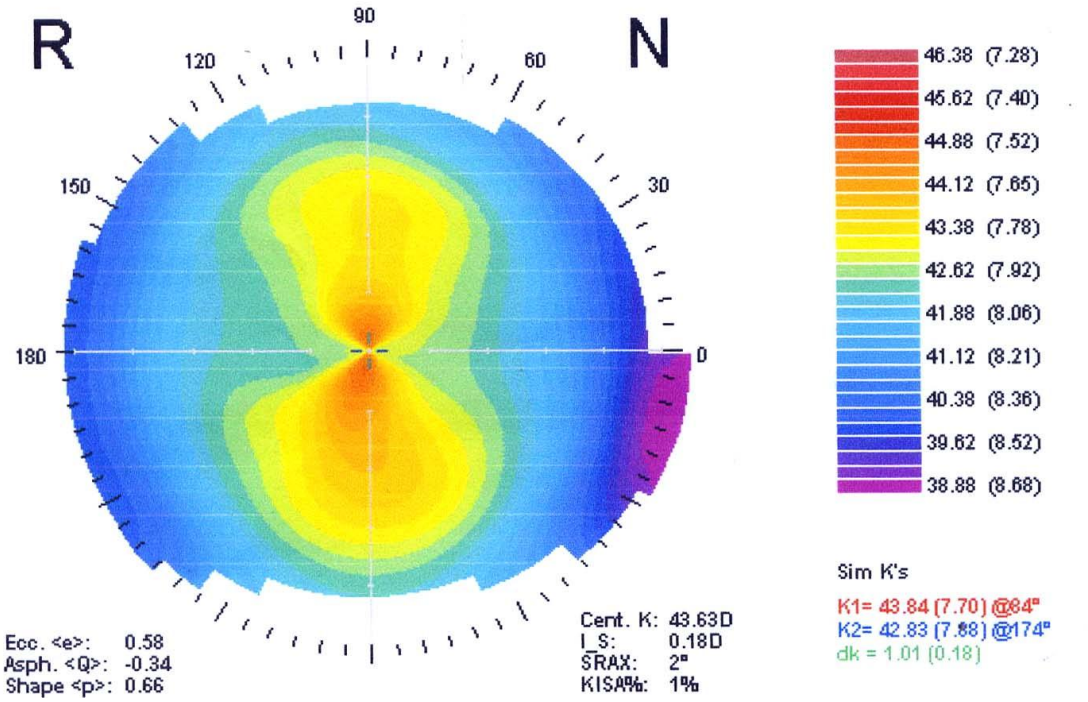
(1) Right eye:

- Visual acuity = 6/36.
- Spherical equivalent at corneal plane = -5.0.
- Pachymetry = 508 um.
- Average K. reading = 43.34.
- Anterior corneal radius (r_1) = 7.8mm.
- Axial length 25.12mm.
- Corneal topography = symmetrical regular bow – tie area with the rule.
- Postoperative examination after 6 months.

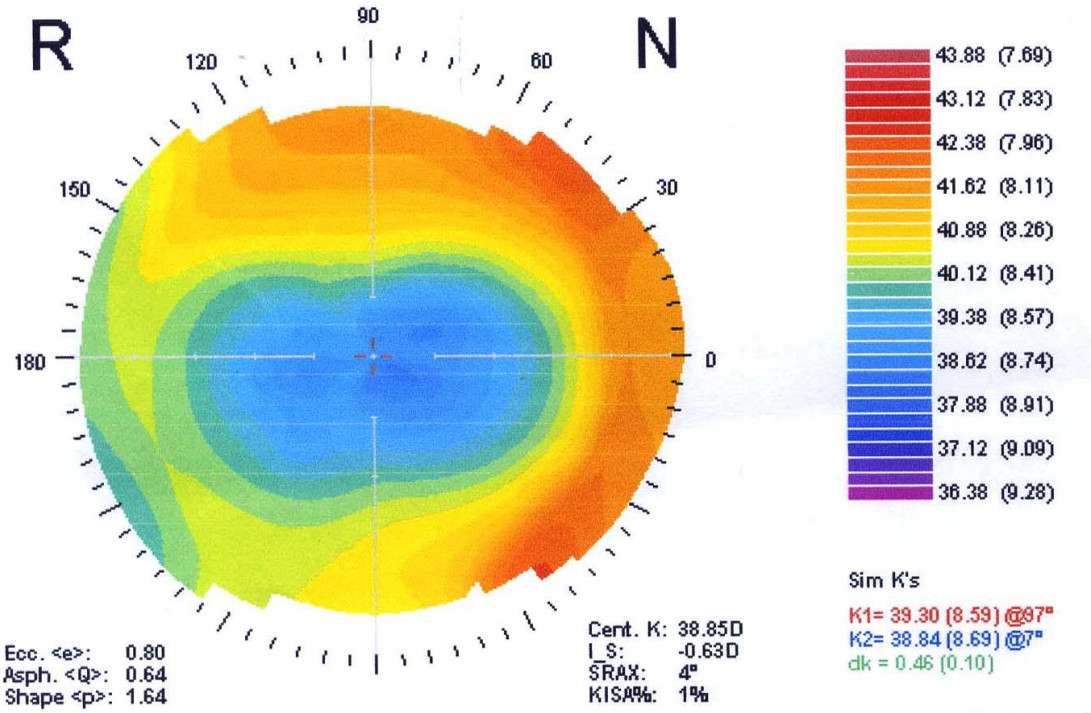
(2) Right eye:

- Visual acuity 6/9.
- Spherical equivalent at corneal plane – 0.5.
- Pachymetry = 460 um.
- Axial length = 25.10mm.
- Average K-reading (K_{post}) = 39.07.
- Anterior corneal radius = 8.6mm.
- Posterior corneal radius = 6.8mm.
- Postoperative refractive corneal power as calculated by clinical history method (His RP) = 38.84.

- Postoperative corneal refractive power as calculated by thin lens formula (Gau RP) = 38.70.
- Adjusted post K ($K_{postadj}$) = 37.866.
- Corneal topography = area of central flattening with residual astigmatism 0.46.



Case (2) : Preoperative Right eye



Case (2) : Postoperative Right eye

Case 3:

Left eye:

- Preoperative examination.
- Uncorrected visual acuity 6/60.
- Spherical equivalent at corneal plane –5.5.
- Pachymetry 537um.
- Axial length = 23.45.
- Preoperative average k = 45.30.
- Preoperative anterior corneal radius = 7.4mm.
- Corneal topography: symmetrical regular bow-tie area with the rule.

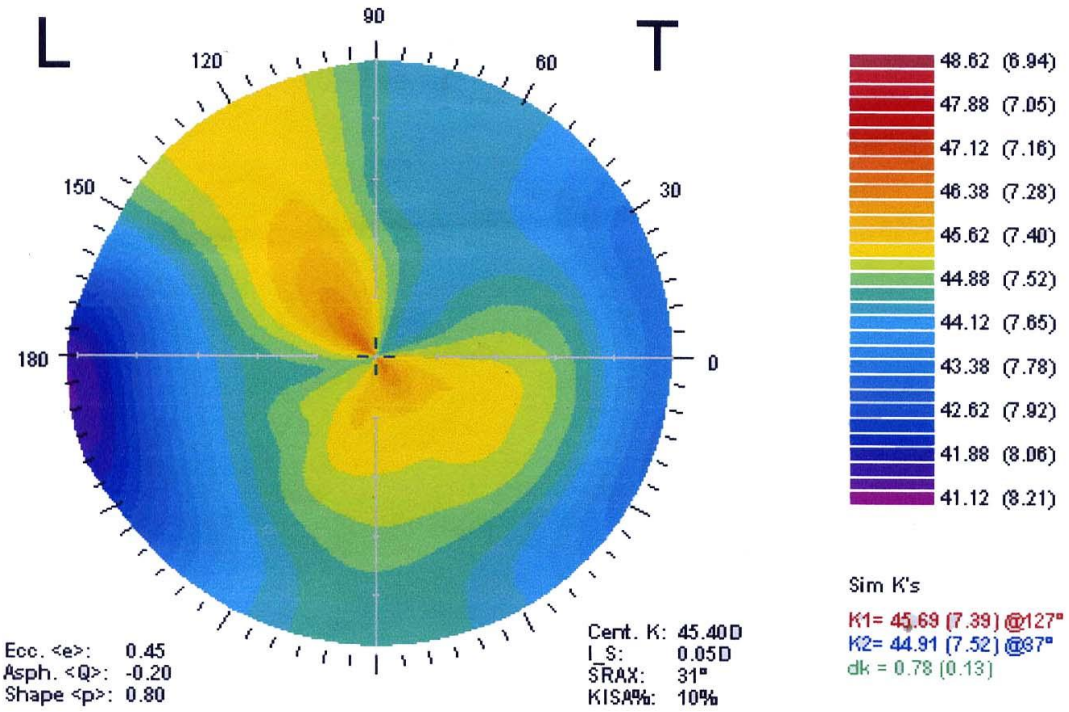
LASIK was done to treat the patient's myopic astigmatic error.

Postoperative examination after 6-months:

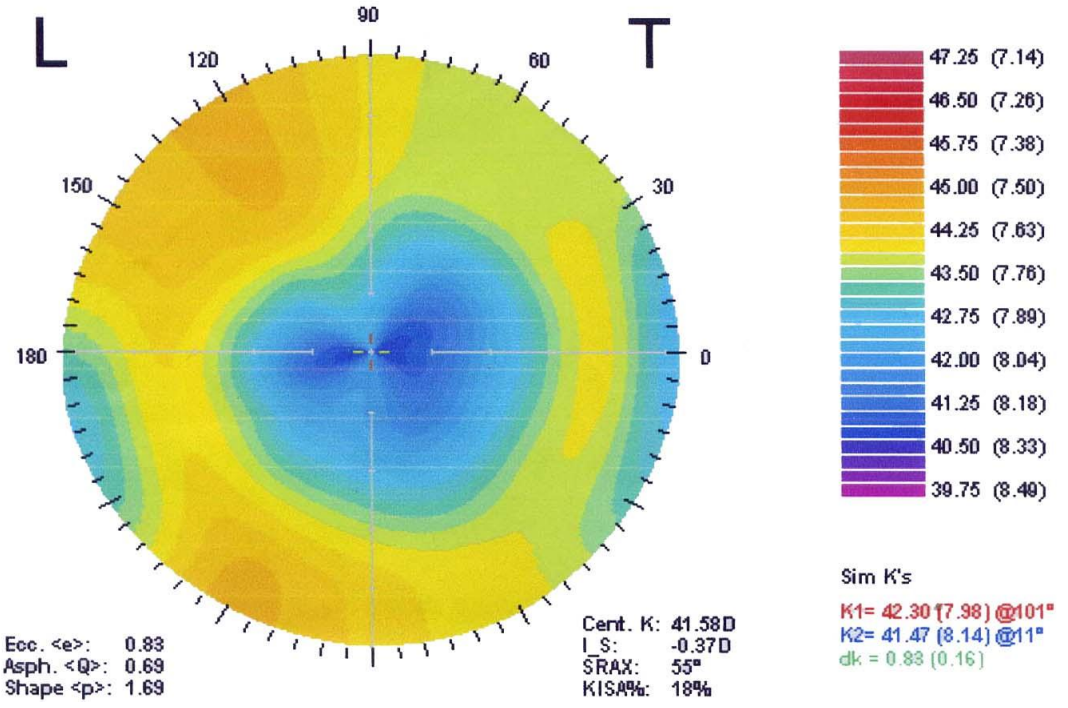
Left eye:

- Visual acuity 6/6.
- Spherical equivalent et corneal plane = nil.
- Pachymetry = 465um.
- Average K-reading (K_{post}) = 41.88
- Axial length = 24.32mm.
- Anterior corneal radius = 8.0mm.
- Posterior corneal radius = 6.5mm.
- Postoperative corneal power calculated by clinical history method at corneal plane (His RP) = 39.8.

- Postoperative corneal power calculated by thin lens formula (Gau RP) = 39.45.
- Adjusted post K ($K_{postadj}$) = 40.542.
- Corneal topography: area of central flattening residual astigmatism against the rule = 0.83.



Case (3) : Preoperative Left eye



Case (3) : Postoperative Left eye