

# Calculation of IOL power after radial keratotomy

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**NO FINANCIAL INTEREST**

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# Background

- The number of patients with cataract who had previously undergone radial keratotomy is increasing nowadays. The number of refractive operations worldwide makes millions and is increasing annually.
- This explains the timeliness of modern problem associated with calculation of IOL power in the eyes with artificially changed corneal shape.

# Purpose

- To estimate the results of IOL power calculation using Hoffer Q, Best 1.0, ASCRS formulas in patients after radial keratotomy with Oculus Pentacam.
- To develop recommendations on preoperative investigation of patients for more accurate calculation of IOL power.

# Methods

- The investigated group included 58 patients (64 eyes) who had previously undergone radial keratotomy for myopia and myopic astigmatism.
- Mean age of the patients at the time of cataract surgery was  $57.0 \pm 10.0$  years.
- There were 33 males and 25 females.
- Time after radial keratotomy was 20.5 (range, 12 to 27 years) after radial keratotomy.
- Cataract phacoemulsification + IOL was performed in 59 cases, refractive lens exchange in 5 cases.

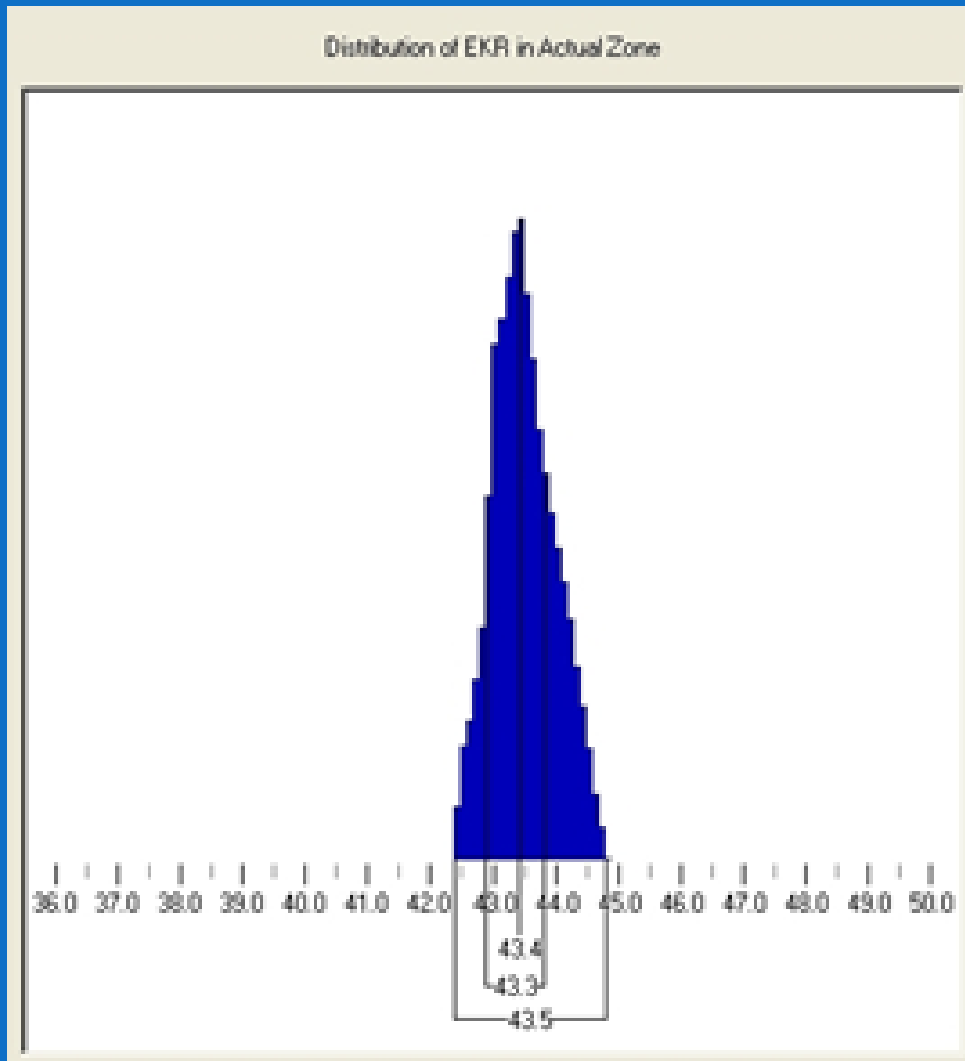
# Methods

- Retrospective analysis of patients' records after lens surgery with IOL implantation was performed.
- On the basis of manifest refraction after surgery recalculation of implanted IOL power for emmetropia was performed.
- Then calculation of IOL power was performed on the basis of preoperative investigation data using HofferQ, Best 1.0, and ASCRS formulas.
- The results calculated with the formulas were compared with the refraction of the “required” IOL.

# Methods

- Calculation with Hoffer Q formula. Axial length, keratometry (Topcon), A-const of the IOL. Also IOL power was calculated using Hoffer Q formula, but instead of Topcon keratometry Pentacam data (from Holladay EKR maps) with K readings in 4.5 and 1.0 mm zones were entered.
- Calculation with Best 1.0 formula. Axial length, A-const of the IOL, and Pentacam data: central corneal thickness, anterior and posterior corneal radius, mean K readings.
- Calculation with ASCRS formula (<http://iolcalc.org> Double-K Holladay 1 formula). Axial length, A-const of the IOL, K readings (Atlas) which were substituted by mean K readings by Pentacam (Holladay EKR map) in 1.0, 2.0, 3.0, and 4.0 zones, mean K readings and corneal thickness.

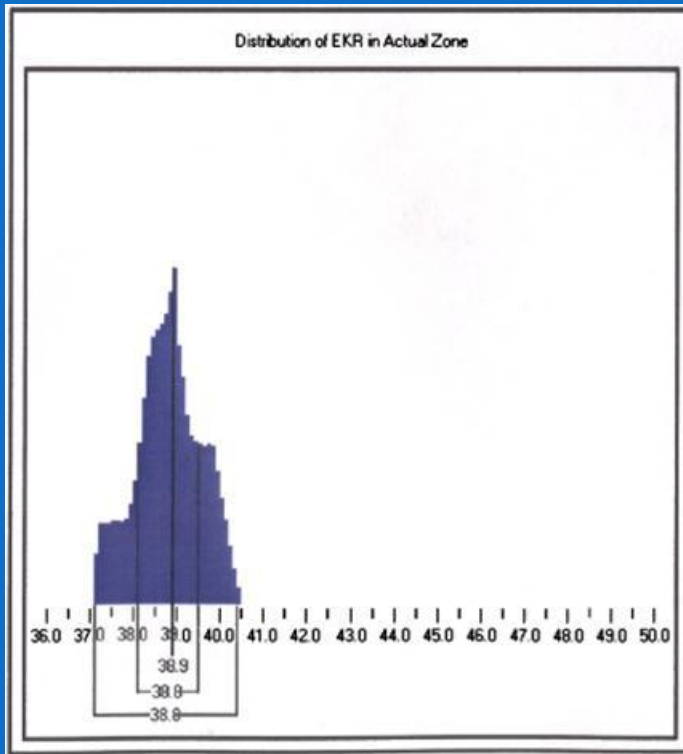
# Normal cornea



Normal cornea without refractive surgery. The graph has a pronounced dominant and range no more than 0.5 D

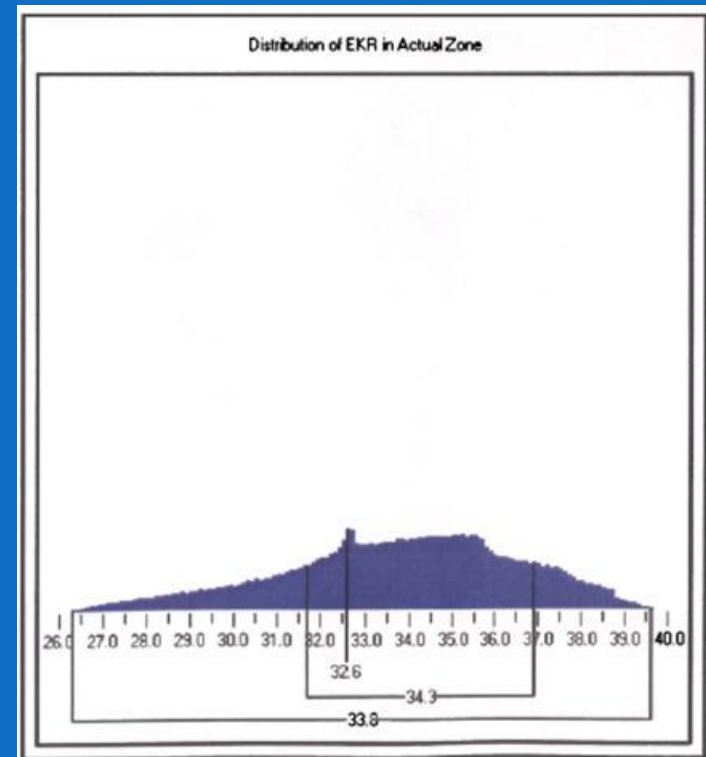
# “Pseudonormal” cornea

Range of corneal refraction in  
4.5 mm zone makes  $0.6 \pm 0.4$  D



# “Pathologic” cornea

Range of corneal refraction in  
4.5 mm zone makes  $1.3 \pm 0.85$  D





## Analyzed groups

- Group 1: “pseudonormal” cornea - 18 eyes. The sample is rather small and there is no parametric distribution profile.
- Group 2: “pathologic” cornea - 46 eyes. This sample is parametric and statistically significant.
- The results of IOL power calculation were analyzed and compared in these two groups.

# Results

- In Group 1 (pseudonormal distribution of refraction in the optic zone) the following results were obtained with ASCRS, Hoffer-Q, Hoffer-Q 1,0, Hoffer-Q 4,5, and Best 1,0 formulas:

Formula	Error	Correction for non-hyperopic refraction
Best 1.0	2,1 ± 1,6	-2,1
Hoffer Q	1,9 ± 1,4	-1,9
Hoffer 1,0	2,0 ± 1,5	-2,0
Hoffer 4,5	2,4 ± 1,7	-2,4
ACRS	0,7 ± 1,9	-1,9

# Results

- In Group 2 (pseudonormal corneas) the following results were obtained with ASCRS, Hoffer-Q, Hoffer-Q 1,0, Hoffer-Q 4,5, and Best 1,0 formulas:

Formula	Error	Correction for non-hyperopic refraction
Best 1.0	1,8 ± 1,4	-1,8
Hoffer	2,0 ± 1,4	-2,0
Hoffer 1,0	1,5 ± 1,1	-1,5
Hoffer 4,5	2,7 ± 1,5	-2,7
ACRS	1,5 ± 1,1	-1,5

# Conclusions

- ❑ In patients with cataract after previous radial keratotomy it is necessary to investigate corneal refraction with Pentacam in 4maps Refractive, Holladay EKR modes.
- ❑ In patients with “pseudonormal” distribution of corneal refraction it is preferable to calculate IOL power using ASCRS formula.
- ❑ In patients with “pathologic” cornea IOL power is calculated individually. The results are unpredictable. The smallest error is achieved with Hoffer Q formula in 1.0 zone and ASCRS formula.