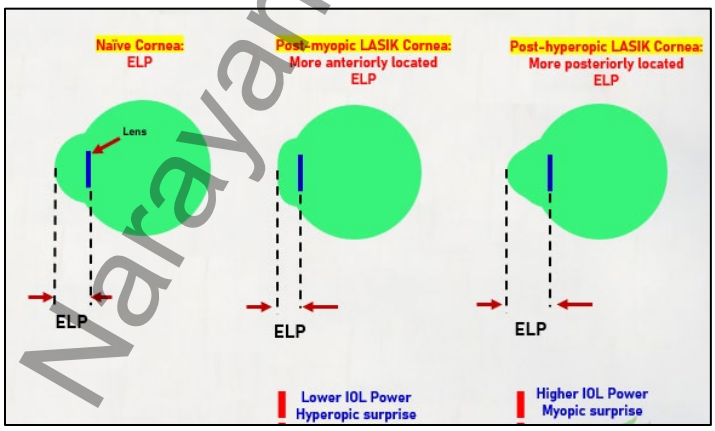
IOL POWER CALCULATION IN POST-REFRACTIVE SURGERY EYES

- **Myopic-LASIK:** laser is fired in the central cornea, thereby flattening the centering (and reducing its power); the peripheral cornea relatively becomes steeper
- **Hyperopic-LASIK:** laser is fired in the mid-peripheral cornea, thereby flattening the periphery consequently, steepening the central cornea (increasing its power)
- 4 major challenges with cataract surgery in post-refractive surgery eyes:
    - Change in corneal refractive index – **D = (n-1)/r** where D is the dioptric power of lens, n is refractive index and r is the radius of curvature
    - Altered K reading due to changes in corneal shape and power
    - Formula error
    - Error in Estimated Lens Position (ELP) prediction

Standard keratometers measure the paracentral cornea and assume the central K readings

- Myopic-LASIK: Overestimation of K reading – underestimation of IOL power – Hyperopic surprise
- Hyperopic LASIK: Underestimation of K reading – overestimation of IOL power – Myopic surprise
- In a naïve eye, there is a constant relationship between the anterior and posterior corneal surfaces which changes after refractive surgery
- Estimated Lens Position (ELP) is the distance from the anterior corneal surface to the principal plane of IOL

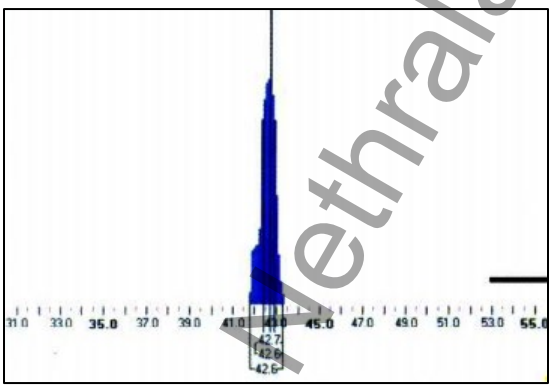


Pre-operative evaluation consists of:

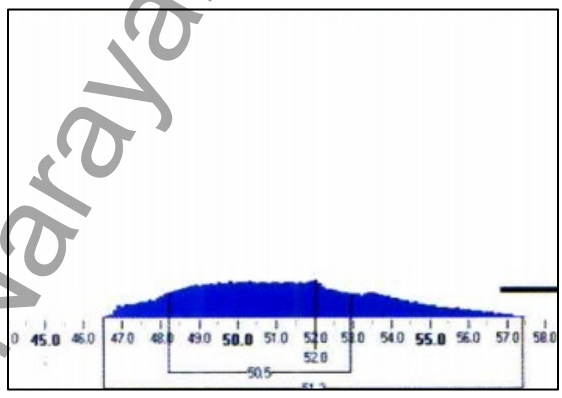
- Routine slit-lamp and fundus examination

- Scheimpflug-based corneal tomography: Pentacam 4 map and Pentacam Equivalent Keratometry Reading (EKR) Map
    - Axial curvature map – gives information about the type of refractive procedure performed
    - EKR Map – provides information about the anterior and posterior corneal surfaces (more reliable in post-refractive surgery eyes). Predicts what K readings might have been there before refractive surgery was performed
- Pentacam Holladay EKR-65 Map: assumes 7 concentric zones centered around corneal apex, and measures the mean of all keratometry readings in every zone individually (EKR65 Mean)

  Good EKR map is where the base is narrower and there is a tall peak, ideally single



  Bad EKR map is one where the base is broader and there are multiple or no peaks



Narrower base = less variation in corneal power therefore, a more REGULAR cornea

Broader base = more variation in corneal power therefore, an IRREGULAR cornea

- **ASCRS online post-refractive surgery IOL power calculator** (www.iolcalc.ascrs.org) has three modules – Myopic LASIK/PRK, Hyperopic LASIK/PRK and RK
  It requires:
  - Preliminary patient data
  - Target refraction: LASIK (zero), RK (depending upon number of incisions)
    - ✓ 8-cut RK: -1.00
    - ✓ 12-cut RK: -1.50
    - ✓ 16-cut RK: -2.00
    - ✓ 32-cut RK: >-2.00

  The more the number of RK incisions, the more is the flattening of central cornea, and the more are the chances of hyperopia (Hence, target myopic refraction depending upon incisions)

  - Pre-refractive surgery refraction (optional)
  - Post-refractive surgery refraction (optional)
  - Atlas ring values – Values ideally used from Atlas 9000 Topographer, Zeiss, but can also be used from EKR Map (EKR65 Mean zonal values in the corresponding slots) – personal experience.
  - Biometry data – either from optical biometer or ultrasound one.
  - IOL A constant – of the IOL to be implanted
  - Gives an average of all powers given by different formulae incorporated and the minimum out of those and maximum out of those
- Meticulous history taking: VERY IMPORTANT!! Some patients forget to give the history of prior refractive surgery, others may not think it's important.
- Which IOL can be chosen in post-refractive surgery eyes?
  - Monofocal – no special considerations per sé
  - Multifocal/Extended depth of focus (EDOF) IOLS, consider additional points:
    - ✓ Angle Alpha <0.5 mm cut-off
    - ✓ Higher-order aberrations (HOAs) <0.5 microns