

# HOW TO INITIATE PRK

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## What is PRK ?

PRK is a type of refractive surgery developed in 1983 and FDA approved in 1996.

PRK corrects mild to moderate myopia, hyperopia and astigmatism with high level of safety and efficacy.

Though PRK recovery takes a bit longer time than LASIK, It is still commonly performed and offers advantages over LASIK for some patients.

Like LASIK, PRK works by reshaping the cornea using excimer laser, allowing light entering the eye to be properly focused onto the retina for clear vision.

However, the use of PRK has been reduced over the past years by the introduction of LASIK, as it provides less pain, inflammation, and faster wound healing and visual recovery.

The main difference between PRK and LASIK is the 1<sup>st</sup> step of the procedure.

In LASIK, a thin flap is created on the cornea with a micro-keratome or a femtosecond laser. This flap is lifted to expose the underlying corneal tissue and is replaced after the cornea is reshaped with the excimer laser.

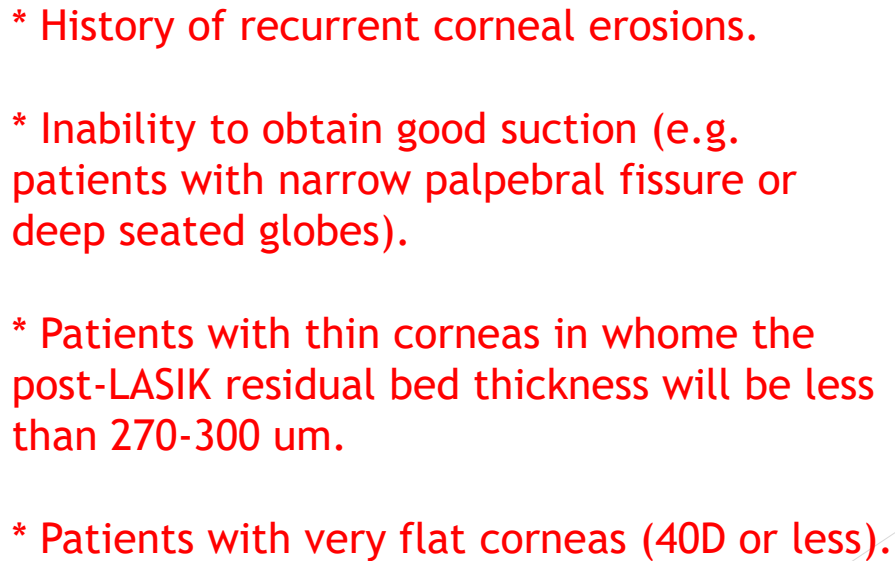
In PRK, the thin outer layer of the cornea (epithelium) is removed and discarded prior to reshaping the underlying corneal tissue. The epithelium repairs itself within a few days after surgery.

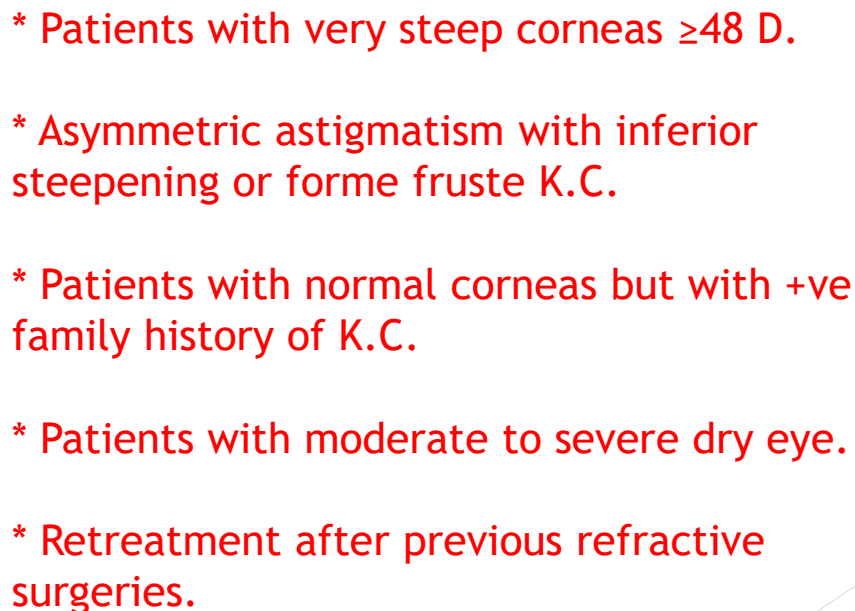
A variation of PRK, called LASEK, in which, instead of removing the outer epithelial layer, it involves lifting the epithelial layer using a trephine, preserving it during surgery and then replacing it on the cornea at the end of the procedure.

LASEK has decreased in popularity due to the slower vision recovery compared with PRK, as the replaced epithelium takes longer time to recover in LASEK than the growth of a new layer in PRK.

## Indications of PRK:-

- \* Patient and surgeon preference for overall safety.
- \* Low refractive errors myopia  $\leq -4$  D and hyperopia  $\leq +3$  D.
- \* Patients engaged in contact sports.
- \* Anterior basement membrane dystrophy.

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- \* History of recurrent corneal erosions.
  - \* Inability to obtain good suction (e.g. patients with narrow palpebral fissure or deep seated globes).
  - \* Patients with thin corneas in whom the post-LASIK residual bed thickness will be less than 270-300  $\mu\text{m}$ .
  - \* Patients with very flat corneas (40D or less).

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- \* Patients with very steep corneas  $\geq 48$  D.
  - \* Asymmetric astigmatism with inferior steepening or forme fruste K.C.
  - \* Patients with normal corneas but with +ve family history of K.C.
  - \* Patients with moderate to severe dry eye.
  - \* Retreatment after previous refractive surgeries.

## Preoperative medications:-

- \* Topical NSAID.
- \* Topical antibiotic drops.
- \* Mild preoperative sedation with valium.
- \* Topical anesthetic drops.
- \* Irrigation of the cornea by chilled BSS.

## Surgical technique:-

### \* Methods of epithelial removal:-

#### 1- Mechanical removal:

- Scraping by Paton spatula, scalpel blade or Desmarres blade.
- Rotating brush using Pallikaris brush or Amoils' epithelial scrubber.

Better for laser ablations utilizing large areas of treatment.



## 2-Chemical removal:

Application of 18-20% alcohol solution for 20 seconds followed by micro sponge debridement.

Less corneal haze and quicker visual rehabilitation have been reported with this method.

PRK with MEL 80™

### 3-LASEK:

In the epiflap procedure - laser epithelial keratomileusis, or LASEK - 20-30% alcohol is used to detach a hinged epithelial flap. After stromal treatment, the flap is repositioned and a bandage CL is applied.

Compared to regular PRK, LASEK offered increased comfort, good UCVA on day 1, and a little risk of infection.

The epithelium normally regenerates in 7 days.

## 4- Laser removal:

A rapid and consistent method of epithelial removal is the combined laser/scrape, in which the laser in PTK mode removes a fixed depth of epithelium (43-45  $\mu\text{m}$ ) and then a gentle wipe with a spatula removes the remaining cells and fluid.

It offers a precise epithelial edge, which is helpful for centration and faster healing.

This method has also been reported effective for retreatments.

## 5- Trans-epithelial:

The laser alone in PTK mode (trans-epithelial) or Johnson's "no-touch technique" uses the excimer laser to completely remove the corneal epithelium without scraping or wiping prior to PRK.

Good results have been reported but the surgeon must be very familiar with the technique and the nomograms to use this technique.

The "no-touch technique" is associated with less anterior keratocyte apoptosis in rabbits than the laser/scrape technique, and better retreatment results than with PRK alone.



## \* Stromal treatment :-

The patient must be perfectly aligned with stable fixation.

During stromal ablation, excessive illumination should be avoided to prevent drying and a constricted pupil which may shift slightly the centration.

## \* Stromal cooling :-

Chilled BSS can be applied at the end of the procedure to lower the surface temperature, rehydrates the cornea and removes any debris from the surface.

The fornices should be wiped for debris if the epithelium was removed manually.

Lastly, a bandage CL is applied for a few days until complete epithelial healing has occurred.

Intra-operative topical MMC application can be used immediately after the laser ablation, in order to avoid or minimize corneal stromal haze production.

Its use is specially indicated in high myopia ( $\geq 6.00$  D) and deeper ablation depth ( $\geq 75$   $\mu\text{m}$ ).

MMC reduces corneal haze compared to corticosteroid treatment and its concentration is more important than the duration of application (0.02% for 15 sec. to 2 min. is the recommended dose).

## Post-operative medications :-

Oral vit. A & C twice daily for a week to promote corneal wound healing and to reduce haze.

An antibiotic - 0.3% moxifloxacin or 0.5% gatifloxacin - should be applied four times daily for 5 to 7 days.

For pain control, a topical NSAID (ketorolac tromethamine or diclofenac) is used four times daily. It should be noted that these NSAIDs are not effective in inhibiting corneal haze formation. Also, the use of a NSAID without concomitant use of steroids may result in sterile corneal infiltrates.

**Topical steroids (dexamethasone or prednisolone)** may be used twice daily from the 1<sup>st</sup> day of surgery till complete epithelial healing and then four times daily for another 2-3 wks.

In some cases, fluorometholone may be used four times daily for a few weeks to 6 months, as necessary, to modulate wound healing and to lessen stromal haze formation and regression.

The patient should be followed up closely for any rise in IOP, which may be falsely low.

**BCL** can protect the epithelium from eyelid rubbing, reduces haze formation, promotes epith. healing, controls pain and prevents epithelial erosions.

Faster re-epithelization reduces discomfort, facilitates visual recovery, and restores the corneal barrier against infection.

The bandage CL should be left in place 3-5 days until complete epithelial healing.

Silicon hydrogel CLs have an O<sub>2</sub> permeability 5-10 folds greater than conventional lenses and are FDA approved for prolonged usage.

0.4% benoxinate hydrochloride can also be used for the 1<sup>st</sup> few days post-operatively for pain control. It has proven helpful in some patients, but NSAIDs may be as effective.

For the first few months post-operatively, non preserved artificial tears should be used every two hours, tapering to every four hours and then as needed.

## Advantages of PRK over LASIK :-

- \* Less depth of laser treatment than LASIK.
- \* Suitable for patients with a thin cornea or with corneal surface irregularity.
- \* All thickness of the corneal stroma is available for treatment.
- \* Reduced risks of compromised corneal thickness

- \* Avoids the risk of corneal flap related complications.
- \* Because there is no flap to heal, there is less scarring and faster healing of the corneal nerves, which can minimize post-operative dryness.
- \* PRK is technically simpler than LASIK and utilizes the same modern laser treatment systems.

## Disadvantages of PRK :-

- \* Slower recovery than LASIK.
- \* More eye discomfort during early PRK recovery that may last several days following the procedure.
- \* Best vision takes longer time to obtain. LASIK, in contrast, provides a more rapid visual recovery.

- \* Increased risk of post-operative infections.
- \* Increased risk of post-operative corneal haze requiring long term use of topical steroids.
- \* The final outcome is not completely predictable due to variation in individual wound healing.

## Potential side effects of PRK :-

- \* Loss of BSCVA after complete healing due to irregular epithelium.
- \* Haloes and glare: More common in patients with large pupils and a small ablation zones.
- \* Irregular astigmatism due to decentered ablation or defferential wound healing

\* Corrections for high hyperopia and astigmatism may be prone to regression after PRK than after LASIK.

\* Corneal reticular stromal haze related to abnormal wound healing and corneal scarring after PRK and occur more in high myopes, dark irides and with small ablation zones and delayed wound healing.

\* Delayed wound healing and mild corneal surface irregularity.

\* Increased risk of post-operative sterile corneal infiltrates and infectious keratitis.

\* Increased IOP and complicated cataract.

- Usually, the long-term quality of vision is as good as that achieved after LASIK.

THANK YOU