OUTCOME OF PRK IN LOW TO MODERATE MYOPIA USING MEL 80 EXCIMER LASER PLATFORM

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PHOTOREFRACTIVE KERATECTOMY FOR LOW TO MODERATE MYOPIA USING MEL 80 EXCIMER LASER PLATFORM

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CONTENTS

INTRODUCTION

Myopia / short sightedness is a refractive error in which the parallel rays of light from infinity come to focus in front of the retina when the eye is at rest, thus grossly reducing the vision. Myopia could be axial due to elongation of anteroposterior diameter of the eyeball or curvature myopia due to increase in radius of curvature of the cornea; and index myopia due to change in refractive index of lens, cornea, aqueous and vitreous, thus increasing the dioptric power of the eye.

Photorefractive keratectomy (PRK) consists of the application of energy ofthe ultraviolet range generated by an argon fluoride (ArF) excimer laser to the anterior corneal stroma to change its curvature and, thus, to correct a refractive error. The physical process of remodeling the corneal stroma by ultraviolet (193 nm wavelength) high-energy photons is known as photoablation.

History of the Procedure: During the 1980s, several applications of the 193-nm ArF excimer laser were investigated, including its use on human corneas for the correction of refractive errors. In 1988, Munnerlyn, Kroons, and Marshall reported an algorithm relating diameter and depth of the ablation to the required dioptric change.

McDonald performed the first excimer PRK for the correction of myopia on a normally sighted human eye in the United States. That same year, the Food and Drug Administration (FDA) organized a 3-phase trial, the PRK study (which ended in 1996), to demonstrate the safety, predictability, and stability of PRK for the treatment of myopia. At the end of this trial, 2 ophthalmic companies, VISX and Summit, were allowed to manufacture excimer lasers for widespread use in the United States. Since then, Nidek also has obtained approval for the manufacture of excimer

lasers in the United States, and several hundred thousand patients have undergone this procedure throughout the world. The first excimer lasers used to perform PRK in the late 1980s have been improved significantly in terms of size, efficiency, and accuracy.

Pathophysiology:

The mechanism of ablation of the excimer laser appears to be photochemical in nature and is known as photochemical ablation or ablative photodecomposition. This highly localized tissue interaction is based on the fact that each photon produced by the ArF excimer laser has 6.4 eV of energy, enough to break covalent bonds.

The efficacy and success of PRK depends largely on the type of laser platform in use. Current fifth generation systems use a very rapidly repetitive and extremely small spot delivery with automated tracking of the eye movements to ensure precise treatment.

The intramolecular bonds of exposed organic macromolecules are broken when a large number of high-energy 193-nm photons are absorbed in a short time. The resulting fragments rapidly expand and are ejected from the exposed surface at supersonic velocities. This mechanism explains why only the irradiated organic materials are affected, whereas the adjacent areas are not affected.

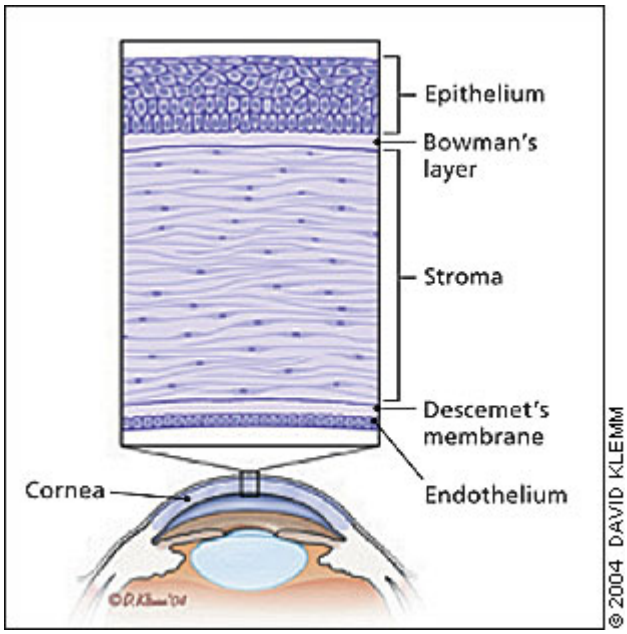
The return of corneal innervation up to 5 years after PRK was measured. Corneal subbasal nerve density does not recover to near preoperative densities until 2 years after PRK, as compared to 5 years after laser in situ keratomileusis (LASIK).

AIM OF THE STUDY

To study the outcome of Photo Refractive keratectomy performed inpatients with low to moderate myopia using Mel 80 Excimer laser System.

REVIEW OF LITERATURE

Corneal Anatomy



Cornea has five layers(3)

Epithelium (30-50)mu

Bowmans Membrane (10-14)mu

Stroma (500-700mu)

Descemets Membrane (3-12)

Endothelium (4-6)

The average corneal diameter is 11.5mm (vertical) and 12mm horizontal.

1. Epithelium is stratified squamous and nonkeratinised and comprises
    - Single layer of columnar cells (basal)
    - 2 to3 round wing cells
    - 2 layers of squamous surface cells

2. Bowman layer is the acellular superficial layer of the stroma, which scars when damaged.(3)
3. The stroma makes up 90% of corneal thickness comprised of regularly oriented layers of collagen fibrils whose spacing is maintained by proteoglycan ground substance (chondroitin sulphate and keratin sulphate) with interspersed modified fibroblasts.
4. Descemet's membrane- fine latticework of collagen fibrils.
5. Endothelium- single layer of hexagonal cells. It plays a vital role in maintaining corneal deturgescence but does not regenerate.

The major optical power of the eye is the air-tear film interface. (1).

The optical power of the eye derives primarily from anterior corneal curvature, which produces 2/3 of eye's refractive power accounting for +48D. By altering corneal shape, keratorefactory status of the eye can be modified.(4)

If the central cornea is steeper than its periphery the cornea shape is ***prolate*** and when the central cornea is flatter than the periphery, the corneal shape is ***oblate***. Prolate cornea reduces spherical aberrations while the oblate shape increases it.(4)

OPTICAL METHODS((4)

1. **Pachymetry:** involves measuring of corneal thickness, which is an indirect indication of the integrity of the corneal endothelium. The thickness of the cornea is greatest at the limbus where it ranges from 0.7 to 0.9mm. Normal central corneal thickness is 0.49 to 0.56mm. Readings of 0.6mm or more are suggestive of endothelial disease.
2. **Specular Microscopy:** involves photography of the corneal endothelium and subsequent analysis of cellular characteristics such as size, shape, density and distribution. The normal endothelium consists of regular hexagonal cells. The normal cell density is 3000 cells per sq.mm. Counts of below 1000 per sq.mm is associated with a significant risk of endothelial decompensation.(4)
3. **Keratometry:** involves measurement of the curvature of the anterior surface of cornea.

   a. Optical Principles:-

   The cornea acts as a convex mirror with fixed curvatures in each meridian. This allows the position of two vertical and two horizontal points projected by the instrument to the reflected of the corneal surface. The radius is then measured in millimeters and converted to diopters.

   b. Limitations:-

   - The assumption that the cornea is a sphero-cylindrical surface with a single radius of curvature in each meridian and with major and minor axes at 90 degrees to each other.

- Keratometry measures only five points approximately 3mm apart and provides no information about the cornea central or peripheral to the points measured.
- Mild corneal surface irregularities can cause more distortion that compromises accuracy. Keratometry is therefore of limited use for measuring corneas that are not spherocylindrical, as frequently occurs in patients seeking refractive surgery, keratoconus and several other corneal abnormalities.

4. **Corneal Topography:** utilising computerized videokeratoscopy, it provides a colour-coded map of the corneal surface. The dioptric powers of the steepest and flattest meridia and their axes are also calculated and displayed.(1)

a) Indications

1. In all patients seeking laser refractive surgery for the corneal curvature and to quantify irregular astigmatism and corneal warpage associated with contact lens wear, if any.
2. To diagnose early keratoconus for the froste KC and other ectactic corneal disorders.
3. To evaluate post operative changes in corneal shape after refractive surgery, corneal grafting or cataract extraction.

b) Scales

1. Absolute scales have fixed end points and each individual colour represents a specific dioptric power interval. Most normal corneas remain within the yellow-green spectrum of scale.

An absolute scale should always be used to facilitate comparison over time and between patients.

2. Relative (normalised) scales are not fixed and vary according to the dioptric range of individual cornea.

c) Interpretation(3)

Can be perfected only through practice. It depends on

1. Reliability of the map.
2. Position of the pupil in relation to curvature pattern display.

ERRORS OF REFRACTION(3)

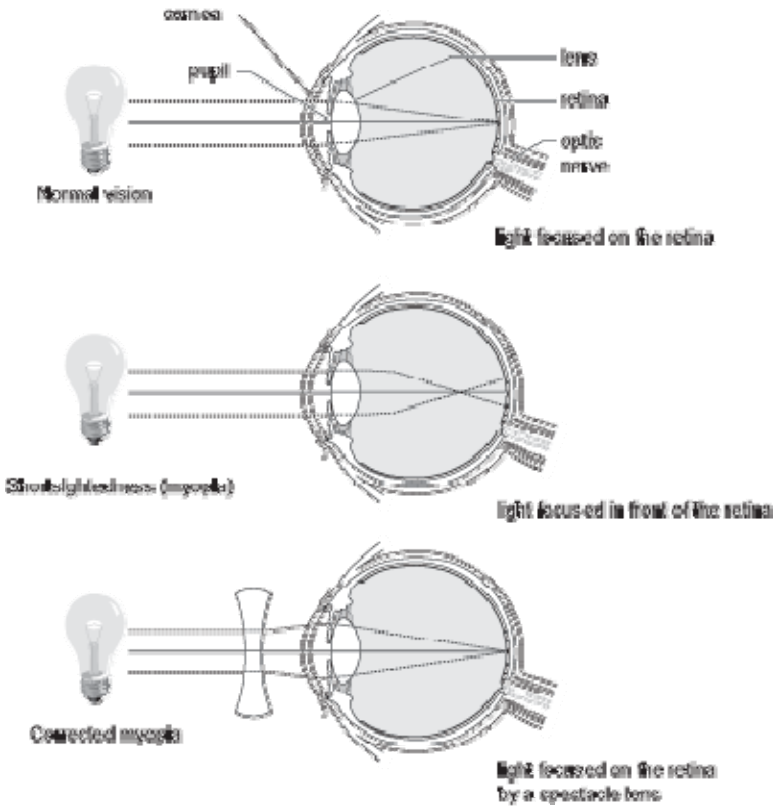
In normal individuals, parallel rays of light are focused on the retina. This state of refraction is called Emmetropia. If in a state of rest, the parallel rays of light from infinity are focused either in front or behind the sensitive layer of the retina in one or both meridian, it is termed ametropia.

Ametropia includes

- Myopia
- Hypermetropia
- Astigmatism

MYOPIA(3)

Short sightedness is a type of refractive error in which parallel rays of light coming from infinity are focused in front of the retina when accommodation is at rest.



MECHANISM OF PRODUCTION(3)

1) Axial myopia results from increase in anteroposterior length of the eyeball. It is the commonest.
2) Curvatural myopia occurs due to increased curvature of the cornea, lens, or both.
3) Positional myopia- anterior placement of crystalline lens in the eye.
4) Index myopia- results increase in RI of crystalline lens associated with nuclear sclerosis.
5) Myopia due to excessive accommodation occurs in patients with spasm of accommodation.

OPTICS OF MYOPIA

In myopes, a near object may be focused without any effort of accommodation if it is situated at the punctum remotum. The image of an object at infinity is made up of circles of diffusion formed by diverging beam. The nodal point in myopes is further away from the retina and image formed is larger in size. Accomodation is of little value to myopes for higher errors. The amplitude of accommodation is small.

CLASSIFICATION OF MYOPIA(3)

1. Congenital Myopia
2. Simple Myopia
3. Pathological Myopia
4. Acquired Myopia

CONGENITAL MYOPIA

- ✓ Is present since birth
- ✓ Diagnosed by the age of 2-3 years
- ✓ Seen in premature children or in various birth defects such as Marfan's syndrome or Homocysteinuria
- ✓ Is unilateral and manifests as anisometropia
- ✓ Error is about 8 to 10 D associated with congenital squint
- ✓ Associated with cataract, microphthalmos, aniridia, megalocornea and congenital separation of retina

SIMPLE MYOPIA

Simple or developmental myopia is the commonest type and considered as a physiological error and not associated with any disease of the eye.

Etiology: It results from normal biological variations in development of the eye which may or may not be genetically determined.

AXIAL MYOPIA: results from the increase in the anteroposterior length of the eyeball. It is the commonest form.

CURVATURE MYOPIA: results from increase in the radius of curvature of the cornea, lens or both. A variation of 1 mm of radius of curvature results in a refractive change of 6 D.

INDEX MYOPIA: Here, changes in dioptric system may be due to change in refractive index of lens, cornea, aqueous or vitreous. The dioptric power of the eye is too strong for the axial length of the eye.

Clinical Symptoms:

- Poor vision for distance (short sightedness) is the main symptom of myopia.
- Asthenopic symptoms occur in patients with small degree of myopia. Eyestrain develops due to dissociation between convergence and accommodation.
- Fusion becomes weak and binocular vision is affected.
- Patient starts suppressing one eye and suppressed eye deviates outwards.
- Decreased visual acuity in indoor activities.

Signs:

The eye of simple myopia is large and prominent. Chamber is deep and pupil reaction is sluggish. Macula appears slightly nearer to disc. There may be divergent squint.

PATHOLOGICAL / PROGRESSIVE / DEGENERATIVE MYOPIA(3)

- ❖ It is a rapidly progressive error resulting in high myopia during early adult life, usually associated with degenerative changes in the eye.
- ❖ It results from rapid axial growth of the eyeball outside the normal biological variation of development.
- ❖ It is definitely linked to heredity and general growth process.

Heredity factor: Progressive myopia is familial and more common in races like the Chinese, Japanese, Arabs and Jews.

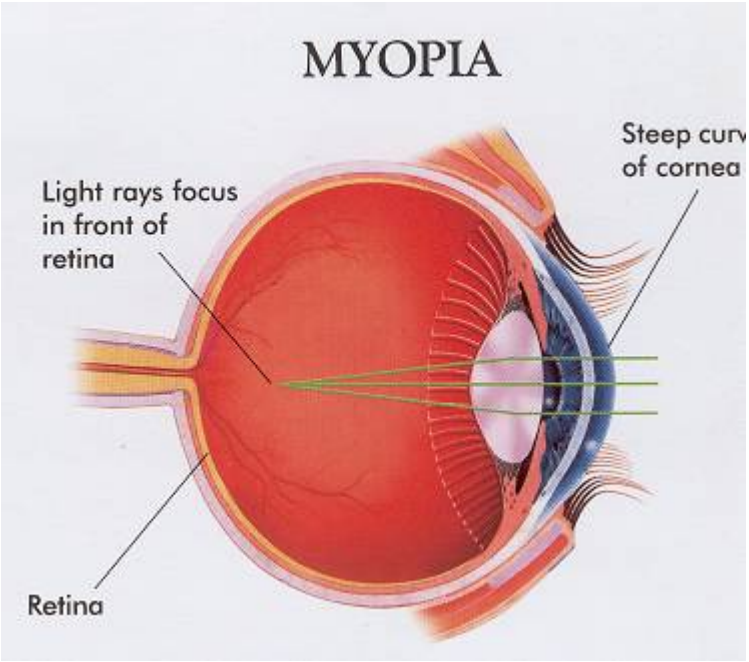
Role of general growth process: Factors like nutritional deficiency, debilitating diseases, endocrinal disturbances and indifferent general health also influence progress of myopia.

CLINICAL PICTURE

- ❑ Defective vision
- ❑ Night blindness
- ❑ Muscae volitantes

SIGNS

- Eyes are more prominent
- Anterior Chamber is deep
- Cornea appears large
- Pupil slightly large and sluggish
- Refractive error increases by as much as 4D yearly and usually stabilizes at the age of 20.



- Optic disc appears large and pale
- Myopic crescent
- Atrophy of retinal pigment epithelium and choriocapillaries- tigroid appearance due to visible prominent large choroidal vessels
- Atrophic patches at macula
- Foster Fuchs spot

- o Cystoid degeneration
- o Posterior staphyloma
- o Posterior vitreous detatchment
- o Contraction of visual fields
- o ERG subnormal

COMPLICATIONS

- ➢ Retinal detachment
- ➢ Complicated cataract
- ➢ Vitreous haemorrhage
- ➢ Choroidal haemorrhage

TREATMENT(5)

NON SURGICAL

- ✓ Spectacle correction with concave lens
- ✓ Contact lens

SURGICAL

- ✓ Radial Keratotomy
- ✓ Photo-Refractive-Keratectomy
- ✓ LASIK
- ✓ Phakic IOLS Refractive Lens Exchange
- ✓ Intra corneal ring implantation for low myopia

HISTORY(3)

Refractive surgery has been used to correct myopia and hypermetropia for more than 40 years. Conceptually, refractive corneal surgery attempts to remove, add or modify the corneal stroma, so that the radius of curvature of the anterior corneal interface is altered as desired.

Based on the fundamental principle that cornea contributes twothirds of refracting power of the eye, Barraquer attempted to alter the tear film/ anterior cornea interface radius of curvature by adding or removing corneal tissue.

Keratomileusis in situ- derived from the Greek word *keras* (horn-like=cornea) *smileusis*- carving. Keratomileusis in situ for myopia was the first to develop in late 1940. The procedure involved raising a corneal flap and removing tissue from residual stromal bed. Barraquer performed a free hand lamellar dissection of the anterior half of the cornea with a keratome. Subsequently, refractive cut was attempted with second pass of the knife to remove stromal bed and cap was replaced with flattening of corneal curvature thus reducing myopia. This procedure was abandoned due to many technical difficulties.

The gateway to Keratophakia opened in 1961, which involved steepening of central corneal curvature by placing a disc of tissue under the lamellar cap derived from alloplastic stromal disc harvested from a donor cornea.

This was seen a possible solution in aphakia, but with advent of IOL, interest in keratophakia subsided.

Freeze myopic Keratomileusis(3)

In an effort to overcome technical difficulties of manual cut, Barraquer used contact lens lathe to sculpture the frozen lamellar cap. Barraquer recognized that the culting speed and the relation between FOP and diameter of resection were factors directly affecting quality and depth of cut. His efforts for more predictable and accurate cuts led to the development of applanator lenses, suction rings of various diameters and various heights of microkeratome tracks. This work constituted the basis of future microkeratome evolution.

Disadvantages:

1. Learning curve was too steep with higher complication rate.
2. Cryolathe was too expensive and complex to maintain.

Epikeratoplasty

Epikeratophakia was introduced in1979 by Kaufmann and Werblin to avoid use of cryolathe. They used preprocessed refractive lenticules. A stromal disc was removed from the donor eye with microkeratome and was frozen and lathed into concave or convex lenses and then lyophilized and stored for later use. It was intended for use in myopia, hypermetropia and keratoconus.

Complications

1. Persistent epithelial defect
2. Epithelial ingrowth
3. Melting, scarring
4. Epithelialisation of donor lenticule

Barraquer-Krumeich Swinger (BKS) technique(17)

An improved microkeratome, a set of dyes and suction stand microkeratome was used to perform a total lamellar cap. The cap was placed epithelial side down on suction rings for microkeratome to perform second cut on stromal aspect of cap. The sculptured lamellar disc was finally sutured back to the bed. The nonfreezing technique has more advantage over freeze techniques with rapid and comfortable recovery, preservation of fibroblasts and epithelium. However, significant astigmatism could not be avoided.

Automated lamellar keratoplasty

Development of automated geared microtome by Ruiz in 1980 introduced Automated lamellar keratoplasty. Speed of the cut could be controlled resulting in more even and consistent cuts.

The second cut was made on the bed. The depth of second cut was adjusted by altering the height of suction ring and corneal cap was sutured back.

Advantages

- ✓ Rapid recovery
- ✓ Efficacy in correcting high myopia
- ✓ Ease of use

Disadvantages

High degree of irregular astigmatism

Photorefractive keratectomy(8)

It is a procedure of photoablation by Excimer laser which has been in use for the treatment of myopia, hypermetropia and astigmatism.

Photorefractive keratectomy has gained maximum success in myopic patients.

Photorefractive keratectomy has become popular after Srinivasan, Braren and Trokel in 1983 thought that excimer laser can be used to cut the cornea.

Photorefractive keratectomy gives good results from –2 to –6 D of myopia.

Indications(7)

1. Superficial scar with myopia
2. basement membrane dystrophy with myopia
3. myopia when unable to use a microkeratome because of high brow or tight lid with narrow palpebral fissures
4. Glaucoma suspects
5. cornea thinner than 500 microns

Photorefractive keratectomy can be satisfactorily performed under topical anesthesia. The center of the pupil is marked; the epithelium is removed by mechanical debridement with a blunt hockey knife followed by followed by ablation of corneal stroma with excimer laser. Reepithelialisation occurs in 3 to 4 days. Improvements in the laser

profile, small spot size, flying spot technology and Gaussian curve in conjunction with mitomycin C have made it possible to treat higher degrees of myopia. Epithelium can also be removed using alcohol or by excimer laser.

Complications are rare which include

1. Corneal haze and regression
2. Night glare and halos
3. Delayed epithelial healing
4. Corneal ulceration
5. Corneal infiltration
6. Central islands
7. Decentration af ablation zone

LASIK(4)

Is a keratorefractive surgery that combines the precision of excimer laser photoablation with advantages of an intrastromal procedure that maintains the integrity of Bowmans layer and overlying epithelium. It was introduced, designed and developed at University of Crete and Verdin Oyannion Eye Institute of Crete in 1988.

Currently, this procedure is being considered the refractive surgery of choice for myopia because of its definite advantages over PRK and RK. LASIK can be used to correct upto –15D of myopia and upto –6D of astigmatism.

PHOTOREFRACTIVE KERATECTOMY(17)

Indications

- Superficial scar with myopia
- Basement membrane dystrophy with myopia
- Myopia when unable to use a microkeratome because of high brow or tight lid with narrow palpebral fissure
- Cornea thinner than 500 microns

Preoperative evaluation

Marguente Mc Donald MD of New Orleans, Louisiana performed the first PRK and has been one of the key surgeons responsible for extensive pioneering work in appropriate approach to PRK.(2)

A thorough preoperative evaluation is of critical importance in achieving a successful outcome following refractive surgery. During this evaluation, the surgeon decides if the patient is or not a good candidate for refractive surgery.(4)

1. **MEDICAL HISTORY:** It should include history of any systemic disease like diabetes, prior surgeries, connective tissue disorders, any immunocompromised states like HIV/ AIDS, drug history- isotretinold, somatripten, amiadarone, hormone replacement therapy.
2. **REALISTIC PATIENT EXPECTATION:** The ophthalmologist should explain in detail about the refractive results. Patients should understand will not prevent possible future ocular problems like cataract, glaucoma or retinal detachment. Patients should be told that PRK is being done to decrease dependence on glasses and not to get rid of glasses.

3. Patient ocular history, blepharitis, recurrent erosion, dry eyes, retinal tears, detachment, use of glasses, stability of current refraction, contact lens history- types of contact lens, duration of contact lens use. Patient should discontinue soft contact lens for at least three days to two weeks prior to surgery. After 40 years, patients who have undergone refractive surgery will need presbyopic correction with glasses and this should be explained to the patient.
4. **Uncorrected visual acuity** for distance and near should be measured to determine the amount of correction to be performed. Full cycloplegic refraction is mandatory. A final subjective refraction using the autorefractometer, Wasca oberrometer values should be done by the ophthalmologist and refined using duochrome test.

Pupil size(18)

Pupillary examination involving evaluating pupil size in bright room light and dim illumination any afferent papillary defect, various techniques to measure the size of the pupil- light amplification pupillometer, infrared pupillometer, Wasca aberrometer.

Large pupil may be one of the risk factors for postoperative glare and halo after refractive surgery. Optical zone should be0.25mmlarger than pupil diameter to prevent glare and haloes.

Ocular motility, or confrontation fields(6)

Asymptomatic tropia and phoria may develop symptoms after surgery if change of refraction causes the motility status to break down.

Orthoptic evaluation should be done preoperatively. Confrontation fields should be done in all patients.

Intraocular pressure(7)

In patients with glaucoma, refractive surgery elevates the iIOP during the procedure, aggravating optic nerve damage.

Topical corticosteroid use after the proceduremay cause elevation of IOP in corticosteroid responders.

Slit lamp Examination

Complete slit lamp examination of eye, lids, cornea and anterior segment should be performed to check for meibonites, stye, blepharitis, tear film stability, conjunctival scarring, pterygium, epithelial erosions, dystrophies, keratoconus or any opacities.

Depth of anterior chamber, iris, look for cataract.

Detailed Fundus Examination(1)

It is important to be certain that the posterior segment is normal. Special attention is given to the optic nerve (glaucoma, optic nerve drusen), peripheral retina (retinal tear, detachment, retinal holes, peripheral degeneration, high myopia) are at increased risk for retinal detachment.

Corneal Topography

1. Pachymetry
2. wavefront analysis

Informed consent

After evaluation, the surgeon analyses all the information and discusses the findings with the patient. Risks and benefits of various medical and surgical alternatives are discussed.

Discussions with the patient should include

1) Expected uncorrected visual acuity
2) Risk of decreased BCVA, severe visual loss, glare haloes, dry eyes(rare)
3) Patient shouldgivehis informed consent form well before the surgery.

PROCEDURE(5)

In this technique to correct myopia, a central optical zone of anterior corneal stroma is photoablated using Excimer Laser to cause flattening of central cornea.

Surgical steps are:-

1. **ANAESTHESIA:** PRK isperformed under topical anaesthesia.
2. **EPITHELIUM REMOVAL:** Deepithelialisation methods include mechanical debridement with blunthockey knifeunder topical anaesthesia, alcohol and photoablative deepithelialisation. Attempt should be made to deepithelialise 0.5mm to 1mm larger area than

the desired ablative zone. The time lapsed from the removal of corneal epithelium to the application of laser energy should be minimized to prevent extreme drying or wetting of corneal surface. Always avoid leaving any residual islands of epithelium.

3. **ABLATION ZONE DIAMETER:** small ablative zones are known to cause symptomatic haloes while night driving. Increasing experience in PRK has shown that the ideal diameter of ablation zone for myopia is 6mm and for hypermetropia is 9mm.(12)
4. **FIXATION AND CENTRATION OF THE ABLATION ZONE:** some surgeons use hand held suction rings, while others promote the method of self fixation by the patient during ablation. Fixation light on the microscope should be co axial with surgeon's and patient's line of vision.

   Co-axiality of fixation light should be maintained with the laser light also. It should always be explained to the patient that the clarity of fixation target will decline during ablation, but will be visible and that he should try to fix it. It is always better to patch the fellow eye to prevent cross fixation. Laser beam should be aimed at the center of the pupil.(12)

5. **CORNEAL ABLATION:** Multizone and multistep procedures are found advantageous since most cases have a tendency for regression. A 1.5mm white tapered transition zone bordering the refractive zone of 4mm with overall diameter of 6-7mm usually results in better epithelial healing and lesser regression.

6. **FLUENCE AND REPITITION RATE:** change in fluence and repetition rate affect not only the rate at which tissue is removed and the operation time, but also the surface morphology of the ablated corneal tissue.

7. **SCANNING LASER BEAM:** The laser device can be smaller and cheaper if small diameter circular or narrow slit beam is used for scanning the ablated area.(16)

8. **ASPHERIC ABLATIONS:** This is a unique advantage of PRK. Planned aspheric ablations are made in high myopia, which avoid central islands, thereby decreasing postoperative spherical aberrations. Astigmatism may be naturally occurring, post traumatic, post infective and post surgical correction is done by ablating the superficial cornea in a cylindrical fashion known as toric photoablation.

The laser is centered and focused according to the manufacturer's recommendations. Although the excimer laser beam, a 193nm, is invisible to the human eye, a faint fluorescence of deep blue light is sometimes visible during stromal ablation.

The sound of the laser firing is the main feedback signal to the surgeon along with an alteration in light reflex as the stromal ablation progresses.

In mel 80 excimer laser the operating assistant (topass)displays the progress of laser ablation .

In order to attempt to decrease the chance of postoperative corneal haze after enhancement of PRK scar or after PRK is applied to LASIK flap, or in high myopes a soaked pledget usually 0.02mg/ml mitomycin can be placed on the ablated surface for 12 seconds to two minutes at the end of laser exposure. The cornea is then irrigated with balanced salt solution to remove excess mitomycin to avoid damage to limbal stem cells.

Immediate post ablation methods:

After the procedure is completed, drops of antibiotic,BCL is placed an NSAID are instilled in the eye followed by a bandage soft contact lens.

Subsequent postoperative care☹(18)

The patient should be followed closely until the epithelium is completely healed, which usually occurs within 72 hrs. As long as the bandagesoft contact lens is in place, patients are treated with topical broad spectrum antibiotics and NSAID, usually 4 times a day.

The patients are admitted after PRK till BCL is removed / complete epithelial healing .

Studies have shown that corticosteroids are effective in limiting haze and myopic regression after PRK, particularly after higher myopic corrections when used after bandage soft lens removal. Corticosteroid drops are tapered over 3 to 4 months depending on the corneal haze and refractive outcome. Artificial tears are used frequently upto 6 months post PRK .

OUTCOMES(18)

EVOLVING TECHNOLOGY:

As the early broad beam Excimer laser systems improved and as surgeon experience increased, PRK results improved markedly. The ablation zone diameter enlarged because small ablation zones, originally selected to limit depth of tissue removal, produced more haze and regression as well as glare and haloes. The larger treatment diameter used today includes optical zones and aspheric peripheral bald zones improve both optical quality and refractive stability in myopia and hyperopic treatments.

Central islands have become less common with improvement in beam quality and with development of scanning excimer lasers.

TRACKING DEVICES(18)

Two types of tracker technology exists:

1. Closed loop: High speed oscillating infrared beams scan across the edge of fixed dilated pupil. The beams detect the abrupt change in reflected light at the edge of the pupil. This signal then directs rapidly responding mirrors to create a space-stabilised image and the laser beam is located on the cornea on next image.
2. Open loop: Uses video to monitor the location of an infrared image of the pupil and to shift the laser beam accordingly.

COMPLICATIONS:

1. **OVERCORRECTION:** of more than +1.0D at one year occurs in less than 5% of myopes. Myopic or hyperopic PRK undergoes regression for at least 3 to 6 months. Refractive stability must be achieved before deciding whether overcorrection requires retreatment.
2. **UNDERCORRECTION:** occurs much more frequently at higher degree of myopia because of decreased predictability resulting from the greater frequency and severity of regression. Regression is markedly increased with optical zones of less than 6mm diameter.(10)
3. **CENTRAL ISLANDS:** Kreuger RR, McDonnell PJ clinical analysis of steep central islands after excimer laser PRK Arch Ophthalmol 1996 114.377-381 with computer assisted topographic analysis. Corneas show a central region of higher corneal refractive power compared to adjacent paracentral cornea. These are the causes of undercorrection and irregular astigmatism.(8)

   Many theories have been put forward to explain their formation. These include:

   i. Shock wave formation and ejection of plume of gaseous and particulate debris, which interfere with subsequent proper delivery of laser.
   ii. Undesired optics of the laser or variation in beam homogeneity.
   iii. Differential hydration of the corneal tissue postoperatively.
   iv. Healing being non-uniform leads to greater epithelial hyperplasia centrally.

4. **DECENTRATION OF THE ABLATION ZONE:** Usually occurs either due to poor alignment with patient fixation or due to eye movements during surgery. These patients experience degeneration of optical performance. Diplopia, glare haloes and induced astigmatism with loss of BCVA are the problems associated with decentration.(6)

   Larger decentrations may cause complaints of glare, haloes and decreased visual acuity. The patient may experience more symptoms if the decentration zone is more than 1.0mm. Patients with larger pupil may experience symptoms with smaller amounts of decentration, because the edge of the decentered ablation will more easily be perceived within the patient's visual axis. It can be prevented by proper stabilization of the patient's head and by alertness of the surgeon in stopping the ablation if the patient begins to lose fixation.

5. **OPTICAL ABERRATIONS:** Some patients report optical aberrations including glare, ghost images and haloes. These symptoms are more prevalent after treatment with smaller ablation zones and after higher attempted correction. These complaints seem to be exacerbated at night and are more prevalent in young myopic patients with large papillary diameters due to an optical zone that is smaller than entrance pupil under conditions of dim illumination. This problem can be treated with second ablation by increasing diameter to 6mm. sometimes night vision complaints spontaneously resolve
6. **CORNEAL HAZE:** Wound healing patterns after PRK can be separated into three groups. (5)

- Normal healers who have trace to 1+ haze and a refraction of 0 to 1.0D at 1 month.
- Inadequate healers who have no haze and a refraction >+1.0D beyond the target correction at 1 month.
- Aggressive healers, whose have 1+ or greater haze that increases in month 2 and 3 accompanied by regression of the correction.
- Subepithelial corneal haze typically appears several weeks after PRK, peaks in intensity at 1 to 2 months and gradually disappears during the following 6 to 12 months.
- Late onset corneal haze that occurs several months or even 1 year or more postoperatively after a prior period of relatively clear cornea.

Histologic studies in animals with cornea haze after PRK demonstrate abnormal glycosaminoglycans and or nonlamellar collagen deposited in anterior stroma as a consequence of epithelial-stromal wound healing. Topical steroids are useful in resolving the level of haze as well as any refractive regression due to haze. Excimer laser retreatment may be required in cases where have persists beyond 6 months and is associated with regression.(15)

7. **DELAYED EPITHELIAL HEALING:** Keratoconjuctivitis sicca, topical anti-inflammatory drugs, prophylactic antibiotic therapy and bigger debrided area are the commonly known causes for delayed epithelial healing.(10)
8. **RECURRENT EPITHELIAL EROSIONS:** There are known to occurs if epithelial defect made before ablation procedure is larger than the ablation zone.

9. **CORNEAL INFILTRATION:** The sterile corneal infiltrates are usually focal but may be multicentric. There appear days to weeks after surgery. It they are central they may cause reduction in visual acuity.
10. **CORNEAL ULCERATION:** Patients getting bandage soft contact lens after PRK are prone for corneal ulcers.(15)
11. **DECREASED CORNEAL SENSATIONS:** patient with high myopia undergoing larger and deeper ablations show reduced sensitivity more than other.(9)

Corticosteroid induced complication:

A. Raised IOP is thought to be a result of one of postoperative corticosteroids topically. Corticosteroid induced glaucoma occurs in 1.5% to 3% of patients using fluoromethasone. 25% of patient using dexamethasone.
B. Other complication that have been reported after PRK are corticosteroid induced induced herpes simple virus keratitis, corticosteroid induced ptosis and corticosteroid induced cataract.

12. **DRY EYE:** condition occurs after PRK as a result of denervation with less severity and denervation.(10)

PATIENTS AND METHODS

Patients with low myopia (-1D to –6D) and moderate myopia (-6D to –14D) undergoing PRK using the Mel80 Excimer system at the cornea clinic, Institute of Ophthalmology, Joseph Eye Hospital, Trichy, between September 2005 and September 2006.

Inclusion criteria

- ✓ Superficial scar with myopia
- ✓ Basement membrane dystrophy with myopia
- ✓ Myopia when unable to use a microkeratome because of high brow or tight lid with narrow palpebral fissure
- ✓ Cornea thinner than 500 microns
- ✓ Glaucoma suspects

Exclusion criteria

- ✖ Cataract
- ✖ Immunocompromised patients(poor healing,increased risk of infection)
- ✖ strabismus
- ✖ Retinal detatchment

A standard protocol was used to collect and document all the details regarding the cases included in the study.

Detailed information about history, complaints, occupation of the patient was taken. This included type of visual problem, duration of symptoms, duration of wearing glasses/ contact lens, frequency of changing glasses, any prior corneal surgery, trauma, any prolonged use of topical medications and any history of systemic disease.

A complete ocular examination was done for each patient which included uncorrected visual acuity, best corrected visual acuity following cycloplegic refraction, slit lamp examination, corneal topography, ultrasound pachymetry, papillary size, non contact tonometry, slit lamp biomicroscopy with a +90D, indirect ophthalmoscopy and Wasca aberrometer.

- Antibiotic drops (Ofloxacin/ Gatifloxacin) 4 times a day prescribed 1 day before surgery.
- Patient was advised not to use deodorants, perfumes, flowers on the day of surgery to avoid attenuation of laser energy.
- Patient was asked to wash face with soap and water
- Ofloxacin eye drops and NSAID eye drops applied 3 times at 15 min. intervals
- One drop proparicaine applied 20 min. before scheduled surgery
- Patient was positioned on the laser bed and one more drop of propricaine applied
- Eyelid margins were prepared with betadine (0.5%)
- Head was draped with towel and speculum applied
- Deepithelialisation was done with blunt hockey knife under topical anaesthesia
- 0.5 to 1.0 mm larger area than desired ablative zone was deepithelialised

- Hand held suction rings were used to fix during ablation
- Fixation light on the microscope was coaxial with surgeon's and patient's line of vision
- The fellow eye was fixed to prevent cross fixation
- Laser beam was aimed at the center of the pupil
- In Mel80 excimer laser, the operating assistant (TOPASS) displays the progress of laser ablation
- In order to decrease the chance of postoperative corneal haze, after PRK, a soaked pledget with 0.2mg/ml of mitomycin was placed on the ablated surface for 12 seconds at the end of laser procedure
- The cornea is then irrigated with BSS to remove excess mitomycin to avoid damage to limbal stem cells
- After the procedure is completed, a drop of antibiotic and NSAID is instilled and bandage contact lens is placed
- Patient is followed closely until the epithelium is healed in 72 hrs
- As long as the bandage contact lens is in place, patients are treated with topical broad spectrum antibiotics and NSAIDs usually 4 times a day
- Patients are discharged after removal of the bandage contact lens, after 3 days
- The patient was asked to come for follow up after 6 months, when a thorough slit lamp examination was done and visual acuity and refraction recorded.

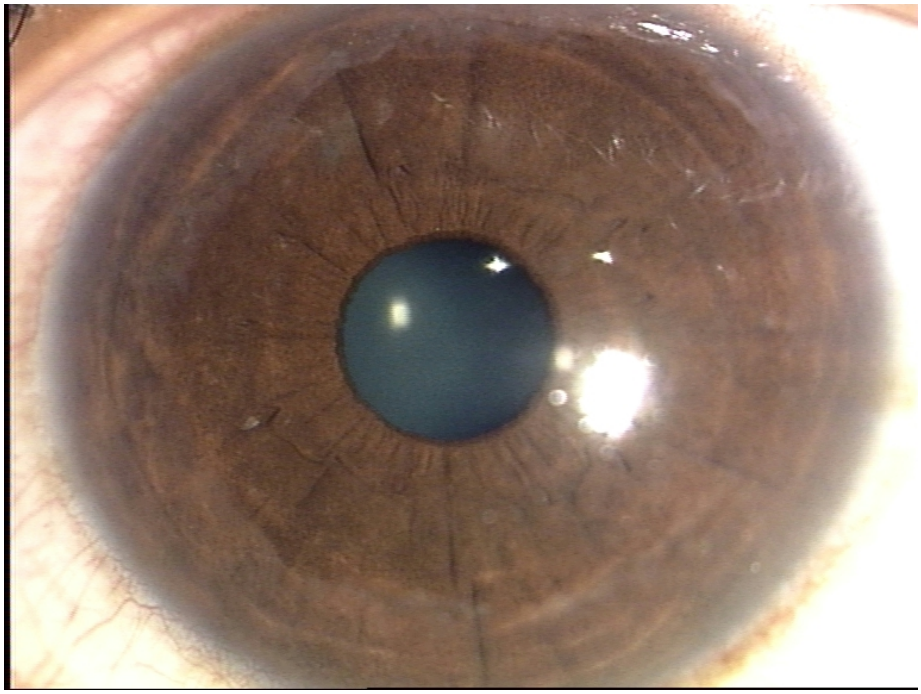
CORNEAL TOPOGRAPHY

PACHYMETRY

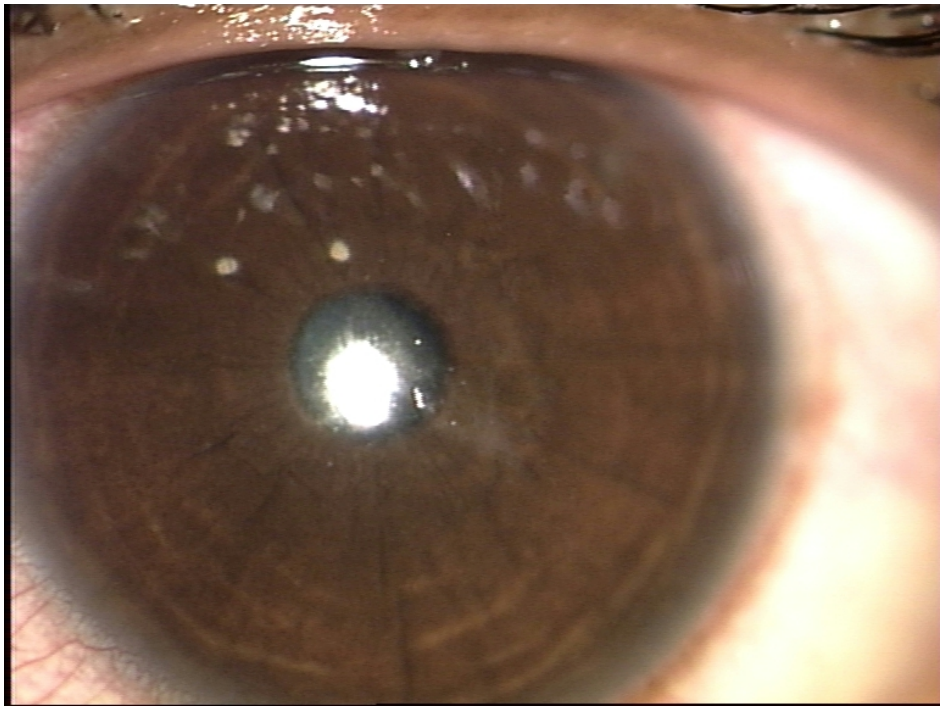
WASCA ABERROMETER

Mel 80 Excimer Laser Platform

PRK



First Day Postoperative Picture



Three Months Postoperative Picture

RESULTS:

In this prospective, randomized study, 46 eyes of 23 patients belonging to the mild myopia group (-1 D to –6D), 44 eyes of 22 patients belonging to moderate group (-6D to –12D) who underwent PRK between the period of September 2005 to September 2006 at the Institute of Ophthalmology, Joseph Eye Hospital, Trichy, were included in the study.

Age:

The mean age was 26.5.

The maximum number of patients were in the age group 18-38.

In mild myopia group, 14 patients were in 18-25 age group.

9 patients were in 25-35 age group

In moderate myopia group, 14 patients were in 18-25 age group.

4 patients were in 25-35 age group.

4 patients were in above 35 age group.

Gender

- In mild myopia group, 10 males and 13 females
- In moderate myopia group, there were 7 males and15 females

Laterality

In 45 patients both eyes underwent the procedure

Indications: The most common complaints of the patients during presentation was defective vision and cosmetic.

Preoperative and postoperative visual acuity:

In mild myopia group, 33 eyes of 17 patients had preoperative uncorrected visual acuity between 6/9 to 6/60 and 13 eyes of 7 patients < 5/60 with a mean of 0.16 and SD +/- 0.12.

The postoperative visual acuity in mild myopia- 40 eyes of 20 patients had UCVA of 6/6 with a mean of 0.95 and SD +/- 0.152.

Paired T test value

P value less than <0.001 is statistically significant.

In moderate myopia group, 4 eyes of 2 patients had preoperative UCVA between 6/9 to 6/60 and 40 eyes of 20 patients had UCVA <5/60 with a mean of 0.076 and SD +/-0.021.

The postoperative visual acuity in moderate myopic groups- 40 eyes of 20 patients had UCVA of 6/6 after 6 months.

5 eyes of 3 patients had UCVA between 6/24 and 6/9which did not improve to 6/6 with refraction. They had a mean of 0.94 with SD +/-0.18.

Paired T test value

P value <0.001 is statistically significant.

The mean preoperative spherical equivalent in low myopes

	MEAN	STANDARD DEVIATION
PREOP	-3.07	+/-2.3
POSTOP	-0.18	+/-0.32

The mean preoperative spherical equivalent in moderate myopes

	MEAN	STANDARD DEVIATION
PREOP	-9.15	+/-3.3
POSTOP	-0.38	+/-0.75

It was found in preoperative and postoperative spherical equivalent in low to moderate myopes, paired T test, p value was <0.0001which was statistically significant.

Pachymetry:

	MEAN CORNEAL THICKNESS	STANDARD DEVIATION
LOW MYOPES	500.52	+/-25.8
MODERATE MYOPES	498.65	+/-31.16

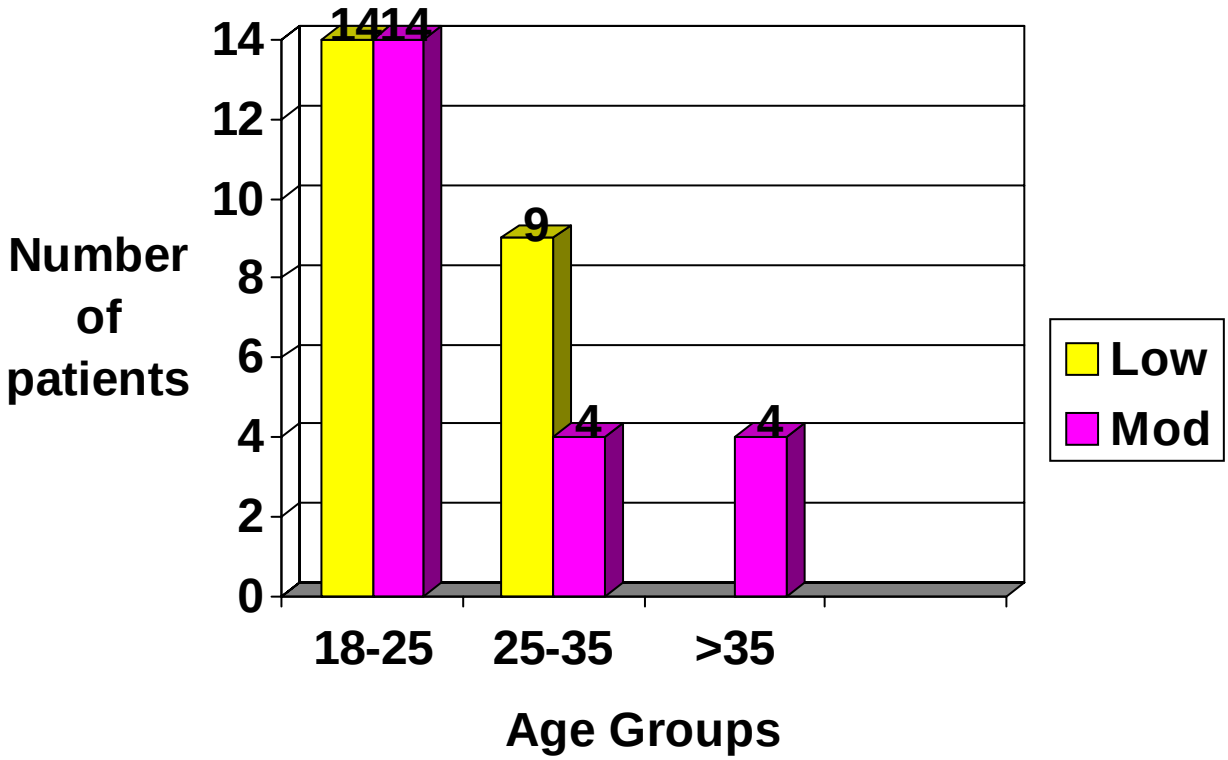
5 eyes of 3 patients in moderate myopic group whose preoperative vision was between 6/36 and 6/9 did not show any improvement after the procedure or with final refraction and were found to be amblyopic.

22 eyes of 11 patients had epithelial defect during the procedure. There was postoperative stromal haze in these patients. However, the stromal haze regressed postoperatively after 6 months when the epithelial defect was completely healed and they attained good visual acuity.

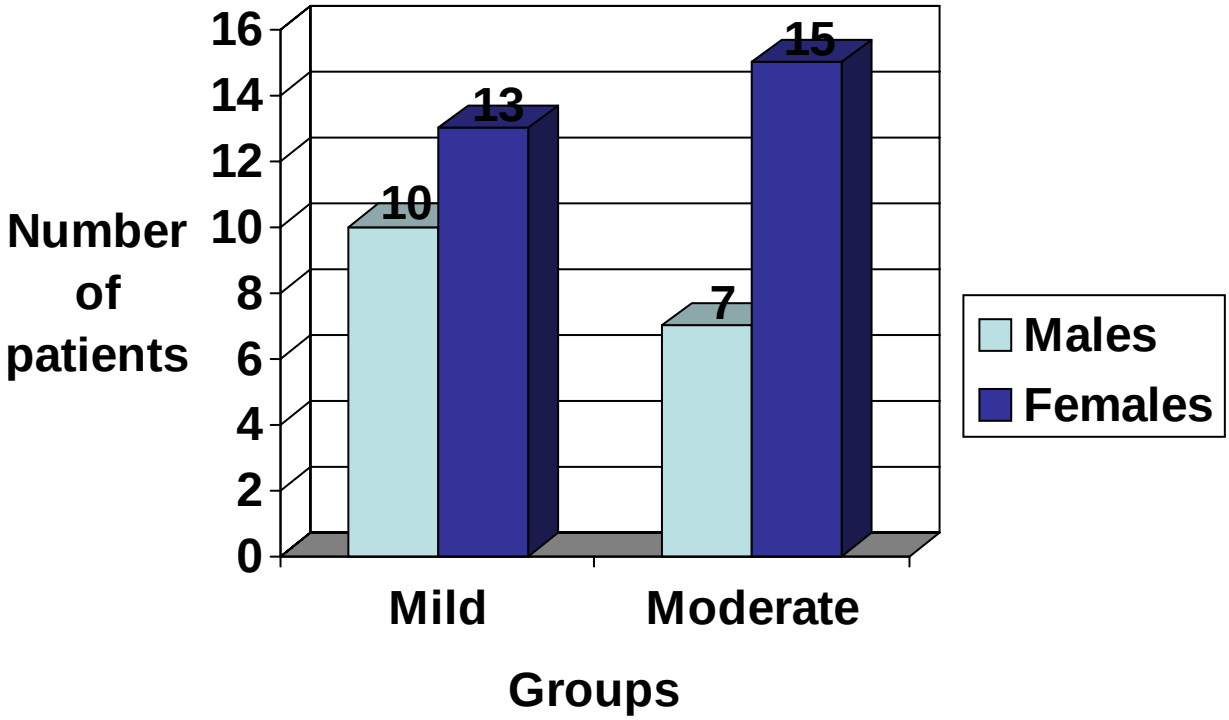
There was no ectasia of cornea seen postoperatively during the 6 months follow up.

There was no deterioration of vision or any late postoperative complication in both the groups.

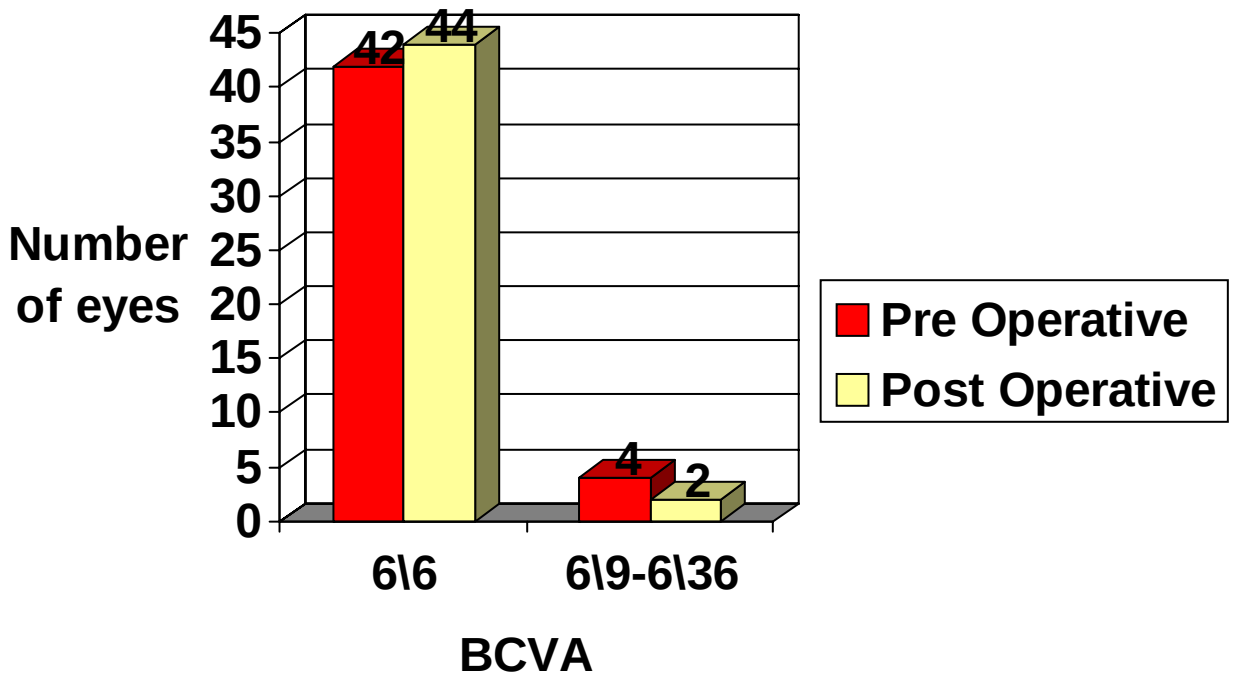
AGE DISTRIBUTION



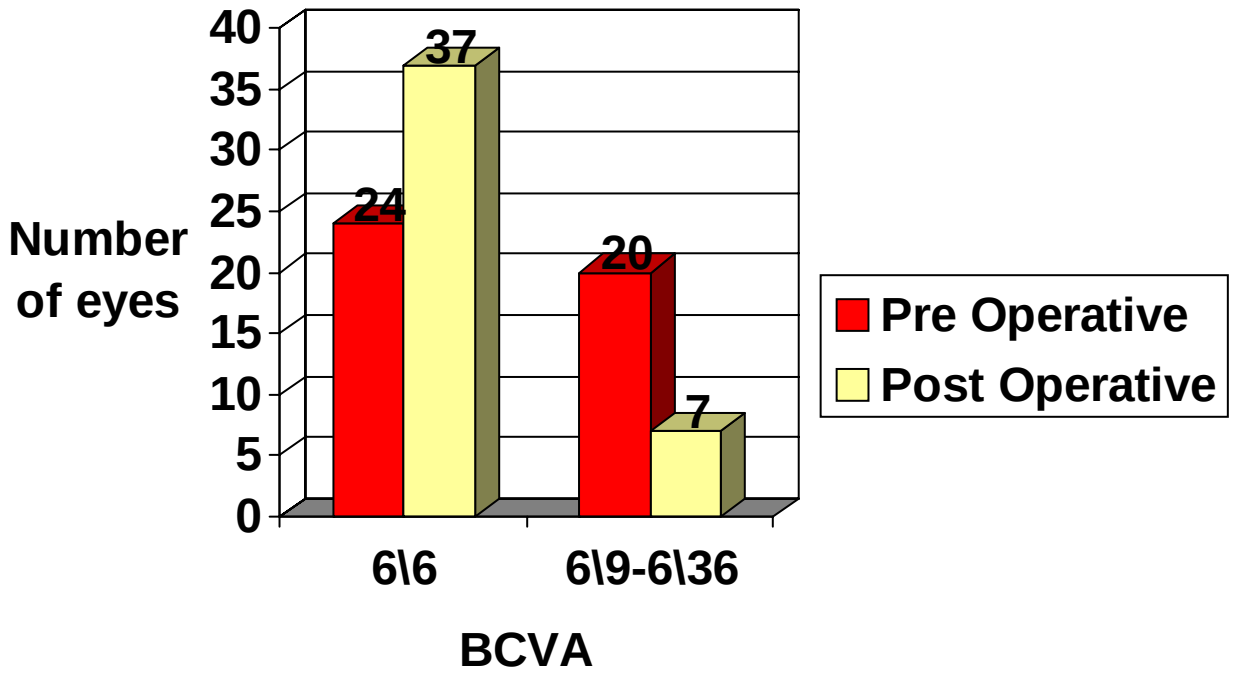
Sex Distribution



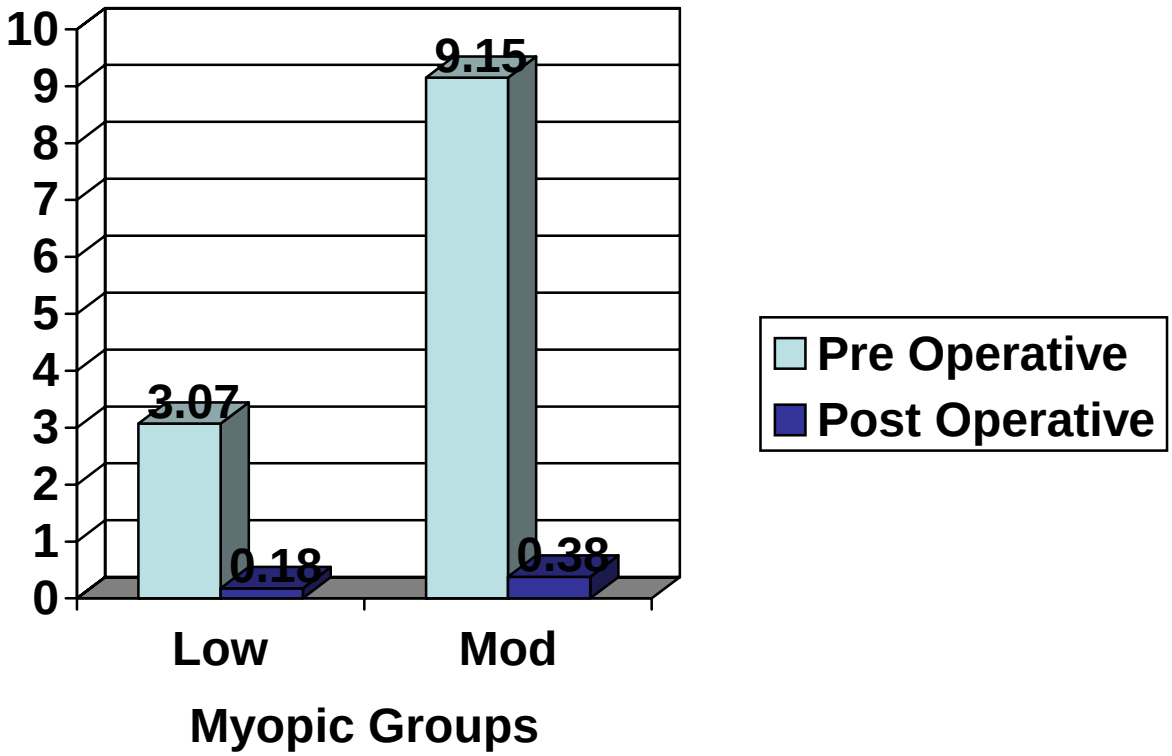
Comparison of Best Corrected Visual Acuity Pre and Post Operatively in the Mild Myopic Group



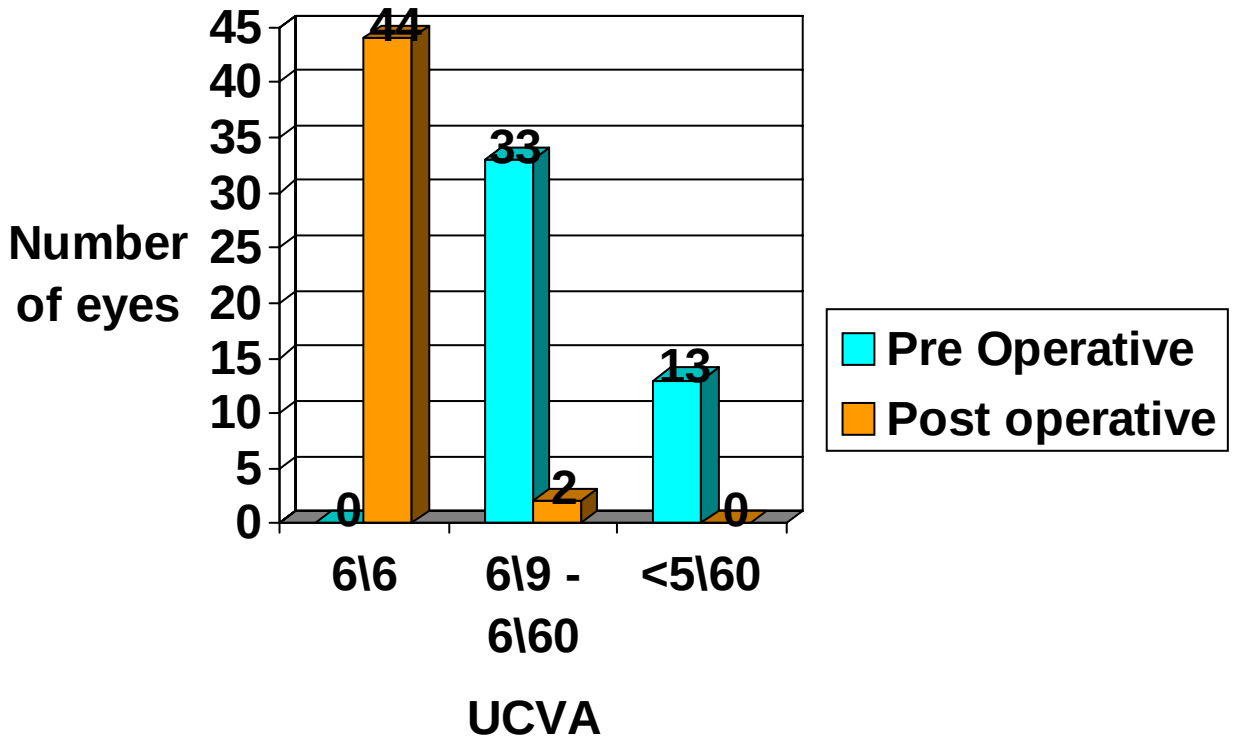
Comparison of Best Corrected Visual Acuity
Pre and Post operatively in the Moderate Myopic group



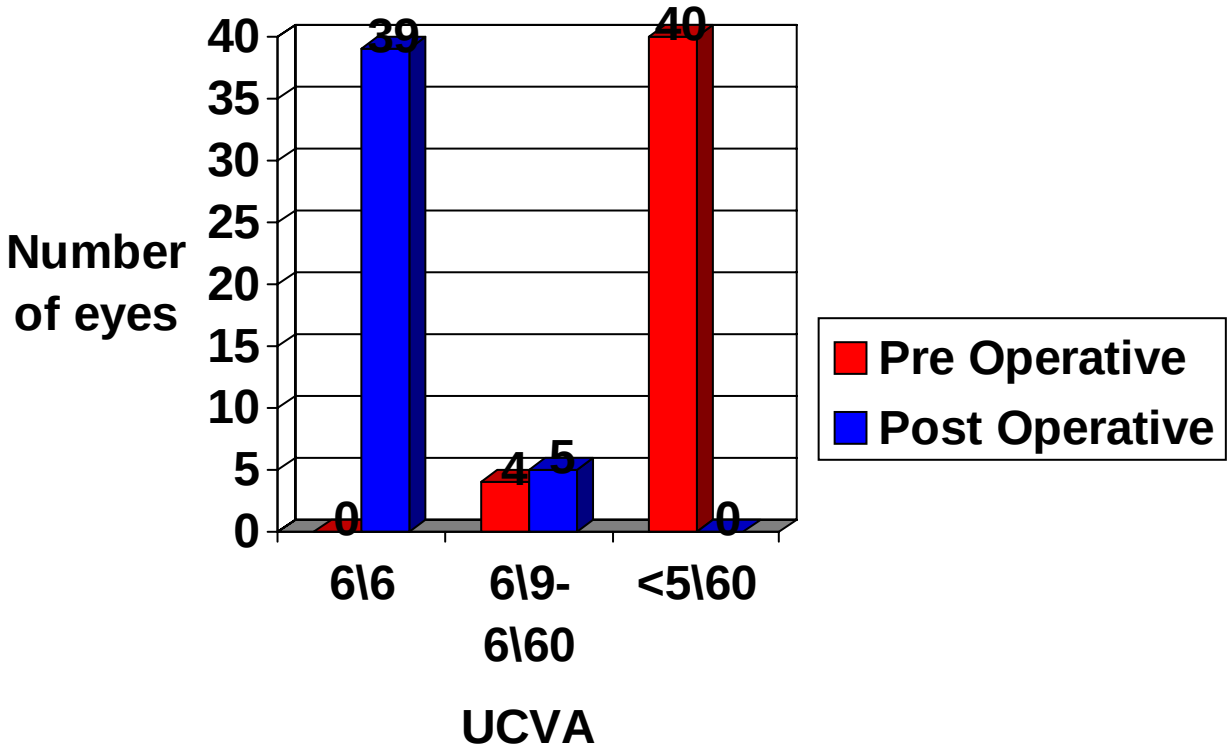
Reduction in the Spherical Equivalent following surgery



Correction of Mild myopia (< -5.00 Sph) after surgery



Correction of Moderate myopia (> -5.00 Sph) after surgery



DISCUSSION

Overall, many reports have shown excellent medical outcome of efficacy, predictability and safety after PRK.

In our study, when comparing the 6 months postsurgical corrected vision with the best presurgical visual performance in two groups, patients described themselves as satisfied, with the mean presurgical BCVA being 0.16 with a SD +/-0.12 and postoperative UCVA 0.95 with a SD +/-0.132 in the low myopia group.

Mean BCVA : 0.76 SD +/-0.021
Postoperative mean UCVA : 0.94 SD +/-0.18

Moderate group:

The overall predictability was 100% in the mild and moderate group

A similar study was done in REMUERA Eye Clinic, Auckland, New Zealand. Uncorrected visual acuity of 20/20 was achieved in 59% of eyes and of 20/40 or better in 94%. The accuracy of correction was ±0.5 D of emmetropia in 77% and ±1.0 D in 94%. In 2 eyes (1.0%), corneal haze was assessed as 2+ and 2 Snellen lines of best corrected visual acuity were lost. The questionnaire revealed that 45% of patients had difficulties with night vision. This was better than before surgery in 35% but worse in 31%. Halos were seen around lights by 52%, but these were less than before surgery in 21% and worse in 26%. There was undue sensitivity to glare in 29%, but this was better than before surgery in 19% and worse in 28%. The overall quality of vision was better than before surgery in 60% and worse in 17%. Seventy-seven percent did not need spectacles. Ninety-eight percent said they would have the surgery again.

In our study, PRK was performed using Mel 80 Excimer laser system. Compared to our results, other studies conducted on other laser systems showed similar results. Ninety-two eyes myopic eyes of 55 patients were treated with a single-step method using an Aesculap-Meditec MEL 60 excimer laser with a 5.0 mm ablation zone. The study was conducted by J. Pietila, P.Makinan, T. Pajari et al. and the results were published online in the Journal of Refractive Surgery in August 2004. Treated groups were divided into three groups according to preoperative refraction: low myopes (≤6.00D), medium myopes (−6.10 to −10.00D), and high myopes (>10.00D). Myopic regressions stabilized in all three groups within 12 months, although there was a small myopic shift of −0.42 ± 0.48D for low myopes, −0.37 ± 0.34D for moderate myopes, and −0.41 ± 0.50D for high myopes between 2 and 8 years after PRK. The percentage of eyes within ±1.00D of emmetropia 8 years after PRK was 78.3% in the low myopia group, 68.8% in the moderate myopia group, and 57.1% in the high myopia group. The percentage of eyes with uncorrected visual acuity of 20/40 or better was 78.3%, 62.5%, and 57.1%, respectively

In our study done using Mel 80 Excimer laser system, the mean spherical equivalent in low myopia was –3.07 with a SD +/-2.3 and the mean postop spherical equivalent was –0.1814 with a SD +/-0.32 after 6 months.

The mean preoperative spherical equivalent in moderate myopes was –9.15 with a SD +/-3.3 and postoperative spherical equivalent was –0.386 SD +/-0.75.

A similar study was done by Hasan Hashemi, Seied Mohammad Reza Taheri et al. published in BMC Ophthalmology 2004 studied 54 eyes of 28 myopic patients in a prospective study. All eyes were operated by PRK followed by 0.02% mitomycin-C application for two minutes and washed with 20 ml of normal saline afterwards. The mean spherical equivalent was –7.08 D with SD +/-1.11 preoperatively. Six months after surgery, 37 eyes (77.1%) achieved a UCVA of 20/40 or better and 45 (93.7%) eyes had SD +/-1.0 D. One month postoperatively, 2 eyes (3.7%) had grade 0.5+ of haze (Hanna grading in the scale of 0 to 4+) while at 3 and 6 months after surgery, no visited eye had haze at all. All eyes had a BCVA of 20/40 or better and there were no lost lines in BCVA by 6 months after surgery similar to our study.

A long term study after PRK- 12 year follow up – done by Madhavan S. Rajan MRCO, FRCS and Philip Jaecock MRCO published in Ophthalmology 2004;111:1813-1824 studied 68 patients (56.6%) of the original cohort of 120 who participated in the first UK Excimer laser clinical trial. They underwent a detatched clinical assessment at 12 years after myopic PRK- myopic PRK was performed using Summit Technology UV2000 Excimer laser with a 4 mm ablation zone. Patients were allocated to one of six treatment groups. Each group received one of the following spherical aberrations -2, -3, -4, -5, -6 or –7 D. The postoperative refraction remains stable at 12 years with no significant change in the spherical equivalent refraction between 1, 6 and 12 years.

75% of patients who underwent a –2 D correction and 65% of patients who received a –3 D correction were within 1 D of intended correction at 12 years.

57% -4D and 50% -5 D were within 1 D of intended correction at 12 years.

Of 25% -6 D and 22% -7 D respectively, 4% had residual corneal haze and 12% had persistent nighttime haloes at 12 years. Dry eyes were encountered in 3% of patients and none of the eyes developed corneal ectasia in long term follow up which was similar to our group.

As long as patients are informed of the limitations of PRK for myopia, the results are acceptable.

STABILITY

The stability of vision was maintained throughout the 6 months follow up in both groups.

In moderate myopia, the preoperative mean UCVA was 0.076 which was comparable to postoperative UCVA of 0.94 which remained stable and is statistically significant.

5 eyes of 3 patients in moderate myopia group whose preoperative visual acuity was between 6/36 and 6/9 did not show any improvement after the procedure or with final refraction and were found to be amblyopic.

24 eyes of 12 patients developed epithelial defect intraoperatively. All 24 developed stromal haze in the immediate postoperative period, but on follow up at 6 months, no visited eye was found to have stromal haze. There was no retreatment done on any of the patients. None of the eyes developed corneal ectasia.

Importantly, the safety profile of PRK using Mel 80 Excimer laser in this study is excellent.

SUMMARY

In this prospective study, 90 eyes of 45 patients underwent PRK with Mel 80 Excimer laser system of which 46 eyes were of low myopia and 44 eyes were of moderate myopia.

- Preoperative uncorrected visual acuity, BCVA, spherical equivalent, topography, corneal thickness, keratometry and pupil diameter were recorded for all the patients.
- PRK was done for all the patients in an attempt to achieve the preoperative BCVA.
- Postoperative UCVA was recorded for all the patients on Day 1, 3day and six months
- Pre-operative and post-operative BCVA was compared which was found to be statistically significant.
- There was no postoperative decrease in vision during the 6 months followup.
- There was no retreatment in this study
- Importantly, the safety profile of PRK was found to be excellent.

CONCLUSION

The findings in this study are significant, showing good unaided postoperative visual acuity with excellent safety profile. Overall patient satisfaction with this procedure is high with Mel 80 laser system, which is comparable to other 5^{th} generation laser systems. The emergence of better laser nomograms, larger optical zones and improved understanding of aberrations and their significance will lead to improvements in patient outcome in future.

PRK can be considered an alternative treatment procedure for myopic patient whose corneal thickness is inadequate for laser in situ keratomileusis (LASIK).

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PROFORMA

VISUAL OUTCOME OF PRK IN LOW TO MODERATE MYOPIA

NAME OF PATIENT: AGE: SEX:

OCCUPATION: IP No.:

DATE OF ADMISSION:

DATE OF OPERATION:

DATE OF DISCHARGE:

HISTORY:

COMPLAINTS

History of:

1. Wearing spectacles- Duration, last change of glasses
2. Wearing contact lens- Duration, type (soft/rigid/gas permeable PMMA)
3. Previous refractive surgery
4. Disease of the eye
5. Any allergy
6. Previous squint surgery, RD surgery, Laser for retinal holes
7. Pregnancy/ Lactation
8. Social history- Occupation
9. Medical History

OCULAR EXAMINATION

1. Uncorrected Visual Acuity- Distant Vision: Aided

   Unaided

   Refraction
2. Lids and Adnexa- Chalazion, Blepharitis, Stye
3. Palpebral fissure- Deep socket, Prominent eyes
4. Squint, Nystagmus
5. Conjunctiva- Scarring, Pterygium, Papillae
6. Cornea- Size of the cornea, Clarity, Vascularisation
7. Anterior Chamber
8. Pupil- Size, Shape, Reaction
9. Lens- Opacities,Subluxation

INVESTIGATIONS:

1. Slit lamp examination- including IOP measurement
2. Corneal Topography- irregular astigmatism
3. Ultrasound pachymetry
4. Indirect Ophthalmoscopy
5. Tear film Stability
6. WASCA aberrometry- 3^{rd}, 4^{th} aberrations pupil size in dark

VISION **RE** **LE**

Distant vision- unaided

with pinhole

Refraction - with correction

AR

BCVA

Near vision- unaided

With correction

PROCEDURE

POST OPERATIVE EVALUATION

1 hour after PRK – VA, refraction, SL Examination

3 days

3 months

6 months

Mild Myopia (-1 D - -5 D)

S.NO	NAME		AGE	SEX	PREOPRISION		BEST CORRECTED VISUAL ACUITY						TOPOGRAHY								IMMEDIATE	POST OP	FOLLOWUP VISION						POST OP BCVA	
							RETINOSCOPY		SPHERICAL		VISION		RE		LE		PREOP PACHYMETRY		PUPIL SIZE		INTRA OP	POST OP VA	COMP.	1 HOUR		3 DAYS		6 MONTHS		RE	LE
					RE	LE	RE		RE				K 1	K 2	K 1	K 2	RE	LE	RE	LE	COMP	RE	LE									
1	Abirami	477847	28	F	6\60	6\60	-4.5	-4.5	-4.5	-4.5	6\6	6\6	43.75	43.75	43.87	43.37	459	456	6.77	6.27		6\9	6\9		6\9	6\9	6\9	6\9	6\6	6\6	0	6\6	0	6\6
2	Samyukta	477617	24	F	6\36	6\60	4.75\.5cyl80	-4,5.5cyl160	-5	-5	6\6	6\6	46.75	45.62	46.62	45.87	499	490	4.82		epithelial	6\9	6\9	stromal	6\9	6\9	6\9	6\9	6\6	6\6	0	6\6	0	6\6
3	Muthamil	49779	33	F	5\60	6\60	-4,00\'-0.75 cyl 30	-2.25\'-1cyl70	-4.25	-2.75	6\6	6\6	40.12	39.37	45.37	45.37	433	500	5.68	5.34	epithelial	6\8	6\9	stromal	6\8	6\9	6\8	6\9	6\9	6\6	-1	6\6	-0.5	6\6
4	Hemalatha	513102	22	F	6\60	6\60	-2	-1.5	-2	-1.5	6\6	6\6	44	44	43.87	43.5	549	564	6.53	6.58		6\6	6\6		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
5	Jarvis	53527	18	M	5\60	5\60	-4.75\'-0.5cyl 180	-4.75\'-0.74cyl 180	-5	-5	6\6	6\6	45.12	43.75	45.12	43.87	487	505	6.76	6.71	epithelial	6\6	6\6	stromal	6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
6	Chindanaiselvi	493216	20	F	6\24	6\9	-2.25	-2.25	-2.25	-2.25	6\6	6\6	45	44	45.37	44.75	474	500	5.68	5.93	epithelial	6\12	6\6	stromal	6\12	6\6	6\9	6\6	6\6	6\6	0	6\6	0	6\6
7	Sujata	494223	30	F	5\60	5\60	-4.50\'-0.50 cyl 10	-4.50	-4.75	-4.5	6\6	6\6	43.12	43.12	43.75	43.62	476	493	5.2	4.93	epithelial	6\18	6\24	stromal	6\18	6\24	6\9	6\12	6\6	6\6	0	6\6	0	6\6
8	Arun Kumar	583575	29	M	5\60	5\60	-3.0\ '-1.5 cyl 180	-3.0\ '-1.5 cyl 180	-3.75	-3.75	6\6	6\6	43.87	42.87	44	42.75	503	499	5.33	5.69	epithelial	6\6p	6\6p	stromal	6\6	6\6p	6\6	6\6p	6\6	6\6p	0	6\6	-0.5	6\6p
9	Manivannan	584571	17	M	4\60	4\60	-3.5\'-0.25 cyl 180	-3.5\'-0.25 cyl 180	-3.5	-3.5	6\9	6\9	43.65	4.62	43.25	41.75	505	502	6.85	7.01	epithelial	6\9	6\9	stromal	6\9	6\9	6\9	6\9	6\9	6\9	-0.5	6\9	-0.5	6\9
10	Karthickeyan	590407	20	M	6\60	6\60	-3.0\'-0.50 cyl 30	-3	-3.25	-3	6\6	6\6	45	43.62	44.62	43.01	531	524	6.01	6.64	epithelial	6'6p	6\6p	stromal	6\9	6\9	6\9	6\9	6\9	6\9	-0.5	6\6	-0.5	6\6
11	Senthil Kumar	596781	29	M	6\36p	6\36p	-1.50\ '-3.0 cyl 90	-2.0\'2.5 cyl 90	-3	-3.5	6\12	6\12	46.62	43.25	45.27	43.75	490	493	6.08	5.4	epithelial	6\18p	6\18p	stromal	6\18p	6\18p	6\18p	6\18p	6\18p	6\18p	-1	6\18	-1	6\18
12	Ventketesan	600117	26	m	6\24	6\24	-3.00\-.5 cyl 90	-3	-3.25	-3	6\6	6\6	44.62	44.62	44.87	44.75	480	473	6.99	6.86		6\6	6\6		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
13	Mathankumar	5940118	22	M	6\24	6\24	-2.5\-.5 cyl 90	-2.5\-.5 cyl 50	-3	-3.5	6\6	6\6	43.62	43.25	44.25	43.5	547	536	6.82	6.71		6\6	6\6		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
14	Subashini	570862	25	F	6\36	5\60	-3\-1.5 cyl 180	-4.5\-2 cyl 180	-4.25	-5.25	6\6P	6\6P	45.62	43.25	45.12	43.62	520	518	7.41	7.08	epithelial	6\9	6\9	stromal	6\9	6\9	6\9	6\9	6\9	6\9	-0.5	6\6	-0.5	6\6
15	Shoba	573408	21	f	6\60	6\60	-4.5	-4.5	-4.5	-4.5	6\6	6\6	44	43.37	44	43.12	467	455	6.42	6.56	epithelial	6\6p	6\6	stromal	6\6p	6\6	6\6p	6\6	6\6p	6\6	-0.5	6\6p	0	6\6
16	Amutharani	569010	28	f	3\60	3\60	-4.75\-1.5 cyl 170	-6.5	5.5	6.5	6\6	6\6	47.87	46.12	47.75	46.5	510	513	5.32	5.49		6\6	6\6		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
17	Bilal Mohammed	519910	23	m	6\24	6\24	-2.5	-2.5\-.5 cyl 100	-2.5	-2.75	6\6	6\6	43.75	43.37	43.37	43.12	480	481	5.87	6.72		6\6	6\6		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
18	Sheela	532156	23	f	6\60	6\60	-3.25	-2\-3 cyl 15	-3.25	-3.5	6\6	6\6	48.12	45.12	48.37	44.37	479	492	5.9	5.68	epithelial	6\12	6\9	stromal	6\12	6\6	6\9	6\6	6\9	6\6	-1	6\6p	0	6\6
19	Jeyakanth	561467	23	m	6\24	6\12	-1.25\-.75 cyl 180	-.75\-1 cyl 180	-1.5	-1.25	6\6	6\6	42.37	42.12	43.37	42.25	579	582	7.21	7.35		6\6	6\6		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
20	Ramesh	558502	19	M	5\60	5\60	-5\-.5 cyl 180	-5\-.5 cyl 180	-5.25	-5.75	6\6	6\6	48	47	47.5	46.62	517	500	6.36	6.07	epithelial	6\6	6\6		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
21	Saranya	5901102	27	F	6\60	6\60	-1.75\-1.25 cyl 180	-1.75\-1.25 cyl 180	-225	-2.25	6\6	6\6	46.75	44.5	46.25	44.75	472	480	6.36	4.88		6\6P	6\6P		6\6P	6\6P	6\6P	6\6P	6\6	6\6	0	6\6	0	6\6
22	Saranya Madhavan	580013	20	f	6\18	6\18	-2.5 cyl 180	-2.5 cyl 180	-1.25	-1.25	6\6	6\6	45.37	43.62	44.75	42.87	479	482	5.7	5.88	epithelial	6\12	6\12	stromal	6\12	6\12	6\12	6\12	6\6	6\6	0	6\6	0	6\6
23	Uma Maheshwari	602419	24	f	6\24	6\24	-3\-.75 cyl 90	-4	-4.25	-4	6\6	6\6	46.11	46.87	46.87	46.62	479	485	6.66	6.99		6\6	6\6		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6

Moderate Myopia (-5 D - -12 D)

S.no	Name	MR no.	Age	Sex	Pre op Vn		Best corrected visual acuity						Topography				Pre op Pachymetry		Pupil Size		Intra op	Immediate Post op.	P. Comp.	Follow up Visual acuity						Post Op. BCVA	
					RE	LE	Retinoscopy value		Spherical Equiv		Visual Acuity		RE		LE		RE	LE	RE	LE	Comp	RE	LE	1 hr		3 days		6 months		RE	LE
							RE	LE	RE	LE	RE	LE	K1	K2	K1	K2																
1	Vigneshwaralu	469882	19	M	4\60	5\60	-8	-5	-8	-5	6\6	6\6	46.12	44.87	45.62	44.75	464	437	7.27	7.54	epithelial	6\18	6\18	stromal	6\18	6\18	6\9	6\9	6\6	6\6	0	6\6	0	6\6
2	Diana Joseph	484506	23	F	5\60	5\60	-12\' -1.5 cyl 180	-20\'-2 cyl 180	-12.75	-21	6\6	6\36	45.12	43	46.12	44.12	474	485	6.82	6.3	epithelial	6\9	6\36	stromal	6\9	6\36	6\9	6\24	6\6	6\24	-1	6\6	-4	6\24
3	Caroline	476061	26	F	5\60	5\60	-5\'-2.5 cyl 180	-7\'-2 cyl 180	-6.25	-9	6\6	6\6	44.62	42.87	44.75	42.87	527	520	4.87	5.71		6\6p	6\6p		6\6	6\6	6\6	6\6	6\6	6\6	0	6\6	0	6\6
4	Srisakthi	446990	22	F	5\60	5\60	-5.5	-5.5\-0.5 cyl 170	-5.5	-6	6\6	6\6	46.5	45.62	46.37	46	488	489	7.21	7.58		6\18	6\18	stromal	6\12	6\12	6\6	6\6	6\6	6\6	0	6\6	0	6\6
5	Pankajavalli	552952	43	F	`5\60	5\60	-10/'-1.0 cyl 180	-9	-10.5	-9	6\6p	6\6p	44.62	43.87	45.25	44.37	513	500	6.88	6.43	-	6\24	6\9		6\18	6\9	6\12	6\9	6\12	6\9	-1	6\6	-0.5	6\6
6	Balamurugan	550234	38	M	5\60	5\60	-8\'-1.5 cyl 180	-11\ '0.75 cyl 80	-8.75	-11.25	6\9	6\12	44.25	43.25	43.62	42.75	570	567	3.48	3.68	epithelial	6\12p	6\12p	stromal	6\12	6\12	6\9	6\9	6\9	6\9	-0.5	6\6	-0.5	6\6
7	Manonmani	546101	19	F	5\60	5\60	-4.75\-1 cyl 180	-6	-5.25	-6	6\6	6\6	44.37	43.12	44.37	43.87	496	502	6.5	6.62	epithelial	6\6p	6\6p	-	6\6p	6\6p	6\6	6\6	6\6	6\6	0	6\6	0	6\6
8	Priya	543135	19	F	5\60	5\60	-6\-0.75 cyl 90	-6\-0.5 cyl 90	-6.25	-6.25	6\6	6\6	47.37	46.62	47.87	47.62	529	527	5.4	6.15	epithelial	6\6p	6\6p	stromal	6\6p	6\6p	6\6	6\6	6\6	6\6	0	6\6	0	6\6
9	Deepa	542204	23	F	5\60	5\60	-7\-3 cyl 180	-8\-1.5 cyl 180	-8.5	-9.25	6\9	6\9	47.5	45.37	47	45.75	460	459	5.86	5.86		6\9	6\9		6\9	6\9	6\9	6\9	6\9	6\6p	6\6p	-0.5	6\6	-0.5	6\6
10	Punitha	534126	25	F	4\60	6\60	-11\-3 cyl 180	-7.5\-3 cyl 160	-12.5	-9	6\9	6\9	44.45	41.37	44	41.5	520	506	5.7	5.6		6\9	6\9		6\9	6\9	6\9	6\9	6\6	6\6	0	6\6	0	6\6
11	Surendar	521775	24	M	5\60	5\60	-7\-0.75 cyl 90	-6.5	-7.5	-6.5	6\6p	6\6p	44.5	44	44.62	44.37	485	481	6.51	6.24		6\12p	6\6p		6\6p	6\12p	6\6p	6\12p	6\6	6\6	0	6\6	0	6\6
12	Franklin	523629	24	M	5\60	5\60	-10\-0.75 cyl 75	-7\-0.5 cyl 120	-10.25	-7.25	6\9p	6\6p	42.87	42.87	43.12	42.5	487	482	5.67	4.86	epithelial	6\6p	6\6p		6\6p	6\6p	6\6	6\6	6\6	6\6	0	6\6	0	6\6
13	Reshmi	519533	22	F	5\60	5\60	-7\-1.5 cyl 170	-5\-0.75 cyl 30	-8.75	-5.25	6\6	6\6	51	48.87	50	48.7	520	516	6.54	6.42	epithelial	6\9	6\9	stromal	6\9	6\9	6\9	6\9	6\6	6\6	0	6\6	0	6\6
14	Karthickeyan	556781	21	M	2\60	2\60	-13\-1 cyl 40	-12	-14	-12	6\6	6\9	45.25	45	45.62	44.37	517	520	5.4	5.5	epithelial	6\9	6\18	stromal	6\9	6\18	6\9	6\18	6\9	6\18	-0.5	6\6	-1	6\6
15	Thilakavathy	596450	22	F	5\60	5\60	-6\-0.75 cyl 170	-6\-0.75 cyl 170	-6.25	-6.25	6\9	6\9	45.75	44.87	45.5	44.62	491	489	5.7	5.71	epithelial	6\9	6\9	stromal	6\9	6\9	6\6	6\6	6\6	6\6	0	6\6	0	6\6
16	Vijayalakshmi	596708	43	F	5\60	5\60	-5\-1 cyl 90	-6\-0,5 cyl 90	-5.5	-6.25	6\6p	6\6p	46.12	44.5	45.62	45.12	478	482	6	6.14	-	6\6p	6\6p	-	6\6p	6\6p	6\6p	6\6p	6\6p	6\6p	-0.5	6\6p	-0.5	6\6p
17	Dhanalakshmi	573866	24	F	5\60	5\60	-12\-2 cyl 90	-14\-2 cyl 90	-13	-15	6\9	6\9	45	43.5	45	43.62	518	516	6.25	6.15	epithelial	6\12	6\12	stromal	6\12	6\12	6\9	6\9	6\9	6\9	-1	6\9	-1.5	6\9
18	Sembharathy	589801	20	M	5\60	5\60	-9	-8\-1 cyl 180	-9	-8.5	6\6	6\6	45	44	44.5	45.75	44.6	514	522	6.71	6.81	6\6p	6\6p		6\6p	6\6p	6\6	6\6	6\6	6\6	0	6\6	0	6\6
19	Bharathi	582434	38	F	3\60	5\60	-8.5\-2 cyl 180	-6\-2 cyl 180	-9.5	-7	6\6p	6\6p	44.62	42.87	44.12	42.5	498	491	6.19	6.06		6\6p	6\6p		6\6p	6\6p	6\6	6\6	6\6	6\6	0	6\6	0	6\6
20	Rani	581929	32	F	6\60	6\60	-13\-0.5 cyl 180	-9.5\-1.25 cyl 90	-14	-10.25	6\12	6\9	44.75	44.62	46	44.5	480	479	5.17	5.09	epithelial	6\18	6\12	stromal	6\18	6\12	6\18	6\12	6\18	6\12	-2	6\18	-1.5	6\12
21	Parimala	576659	33	F	6/60	0.1 6\60	-9.5	-9.5	-9.5	-9.5	6\6	6\6	48	47.5	48.62	47.37	492	511	5.54	5.62		6\9	6\9		6\9	6\9	6\6	6\6	6\6	6\6	0	6\6	0	6\6
22	Rajesh	582192	23	M	2\60	2\60	-13\-1.5 cyl 40	-11\-1 cyl 60	-13.75	-12	6\9	6\9	47.5	46	47.12	46.25	519	502	7.56	7.35	epithelial	6\12	6\12	stromal	6\12	6\12	6\12\	6\12	6\6p	6\6p	0	6\6	0	6\6

LASIK CENTRE INSITUTE OF OPHTHALMOLOGY JOSEPH EYE HOSPITAL INFORMED CONSENT FOR EXCIMER LASER SURGERY

Patient Name

The information detailed in this "CONSENT FORM" is provided so that a person interested in Excimer laser surgery can make an informed decision .Please read the form carefully and clarify all doubts that's you may have before undergoing the procedure.

What is LASIK

Lasik (or laser assisted in situ keratomilueusis) reshapes the cornea the clear front surface of the eye. Using the precision of computer controlled excimer laser, Lasik alters the shape of the cornea and improves the focus of image by the eye. This technique is very safe and excellent results. The aim of Lasik surgery is to bring down dependency over spectacles or contact lens. Lasik is an elective procedure.

Lasik Procedure

This is performed under optical anaesthesia. A thin flap of corneal tissue is made using a specialized microkeratome. Laser spots are applied on the corneal surface under the flap and the flap and the flap is placed back after the procedure. Patient's co-operation is very important for the success of this surgery and the patient will, be required to his/her gaze at a blinking light to ensure proper centration. Patient may feel some pressure, but no pain on his/her eye just before the microkeratome

Flap is raised .A clicking sound is heard during the procedure

PATIENT CONSENT

In giving permission for using the microkeratome and excimer laser, you have received no guarantee as to success of your particular case. You should be aware that few risks though uncommon are associated with the procedure.

1. Malfunction of the microkeratome or excimer laser unit may require the procedure to be stopped before completion.
2. If the flap rose is not to the required precision levels surgery may have to be postponed and results and rescheduled after 2-3 months.
3. If the patient co-operation is inadequate, surgery may have to be postponed
4. Rare possibility of sight threatening infection as with all other surgical procedures is present.
5. Glares haloes and fluckation in sharpness of vision may be experienced for the 2-3 months by some
6. Calculations used in this surgery are based on previous experience on large numbers of patient thus depending on individual variation in response to the procedure there might be some under correction.
7. I understand that as I get older (40 years or older), I may require reading glasses which is normal eye related change.
8. Very rare complication of this procedure include serve corneal edema, loss of corneal flap which may require appropriate management such as corneal transplant or in exceedingly rare cases lead to partial or complete loss of vision in the eye.
9. As this technique has been in practice for less than two decades, long term affects of this procedure are not known.

I under stand that although an attempt has been made to give a complete list in this list does not include every possible side effect, risk and complication Lasik /Excimer PRK /PTK.

I here by consent to release / publish medical data of the procedure are the subsequent treatment for purpose of research and advancement of medical knowledge.

In signing this consent for Lasik / Excimer PRK, / PTK I state to have read the form and understand the nature purpose and possible side effects, risks and complication of Lasik / Excimer, PRK / PTK. Also I have had all my queries answered to my satisfaction. I give permission to Dr. To perform Lasik Excimer PRK PTK. Procedure on my

Date Patient Signature

Name: Witness Signature

Date Witness Signature

Name:

Date of Surgery Signature of surgeon.

LASIK CENTRE

INSITUTE OF OPHTHALMOLOGY

JOSEPH EYE HOSPITAL

PATIENT INSTRUCTION FOR LASIK

DATE TIME

Patient's Name

Prior to surgery:

Discontinue contact lens wear in the to be treated for at least 10 days for the soft lenses and 21days for gas permeable rigid contact lenses or hard lenses.

Do not use Mascara o r eyeliner for 3 days prior to surgrey

Confirm the data and time of surgery and arrange payment for your surgical fee before the procedure.

The surgical fees for Lasik inclusive of investigation will be Rs.15000/- for both eyes and Rs 8000/- for one eye.

Arrange for transport on the day of surgery if residing in Trichy or come prepared for one day in patient stay

THE DAY OF YOUR TREATMENT

Please arrive on time.

Wear comfortable clothing. Please do not wear perfume, cologne, flowers, and after shave as these may interfere with laser.
Please do not wear eye makeup on the treatment.

Eat a light meal before your appointment.

Please bring the following items: a copy of these instructions.

AFTER SURGERY

You can go home and relax on the day of treatment.

You should come for follow up the next day to LASIK CENTER at 2.00 pm.

Avoid going to dusty place for a period of one week.

You can read, work on computes or watch television after 2or 3 days.

You can take head bath after a week.

DO NOT RUB YOUR EYES FOR ONE MONTH AFTER SURGERY

The following medicine must be used as directed.

FML drops for 4 times for 5 days.
Ocucin drops for 4times for 5 days.
Refresh tears for 3 times for 1 month.

It is advisable to wear eye protective sun glasses for a month when you go out.

Do not use Mascara or eye liner for week after surgery.

It is normal experience any of following the redness, light sensitivity irritation, fluctuating pain for several day after treatment.

Vision begins to improve with in 24 hours after surgery, but may fluctuate for several weeks. Glare and haloes may be present at night but these usually diminish over weeks to month

If there is any unbearable pain, redness or defective vision, kindly contact.

LASIK CENTRE
JOSEPH EYE HOSPITAL
TIRUCHIRAPPALLI 620001 Ph 2460622, 2462862

The exact refractive status will be assessed one month after surgery

Patient has to come for Is' month post – op. preferably on Friday or Saturday after 2.00pm