SIRIRAJ MEDICAL LIBRARY

Refractive Surgery

Sabong Srivannaboon, M.D.

Department of Ophthalmology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

Siriraj Med J 2007; 59: 137-138
E-journal: http://www.sirirajmedj.com

Refractive surgery is one of the most interesting topics in the last decade. It is used to reduce or eliminate the refractive errors of the eyes. It is estimated that the number of people worldwide with refractive error range from about 800 million to 2.3 billion. In Thailand, there is 27.4% of child school reported to have refractive error.[1] Moreover, there are dynamic changes in refractive status and these changes are a function of age as the eye grows in axial length until it stops growing. The simplest method that has been used to correct refractive error for over a century is spectacle glasses. Contact lenses also grow in popularity for several decades. Recently, refractive surgery has been introduced and proposed to permanently correct refractive errors.

Most of the refractive surgery has been done on the corneal plane, known as "Kerato-Refractive Surgery". This surgery attempts to change the curvature of the cornea in order to change the pathway of the light refracting into the eye. There are several methods that pioneer this technique. Among them, excimer laser is one of the most popular methods being currently used worldwide.

Excimer laser is a cool laser beam with 193 nanometers wavelength. The penetration energy of the laser is very low. Therefore, it is used to ablate or sculpt the surface of the cornea in a fraction of microns (1/1,000 millimeter). With this accuracy, the desired curvature of the cornea can be made depending on the refractive error of the eye.



Fig 1. Demonstrate excimer laser machine.

There are several methods of excimer laser ablations.

1. Photorefractive Keratectomy (PRK)

This method uses excimer laser to ablate directly on the outer surface of the cornea. The superficial cells, known as epithelial cells, will be removed before the laser application. The bandage contact lens is required to protect the ablated front surface. The patients may feel some irritation, discomfort or even pain during the recovery period, which might take up to 5-7 days.[2]

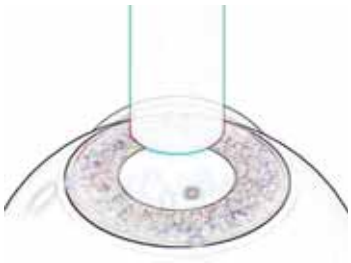


Fig 2A. Demonstrate the PRK method.

2. Laser In Situ Keratomileusis (LASIK)

This method uses excimer laser to ablate inside the cornea. The cornea needs to be inlayer cut (making the flap) by using a special instrument called microkeratome. The laser beam will be applied underneath the flap. The flap will be repositioned. The epithelial cells will be preserved and the ablated surface will be secured inside the cornea. There is no need for bandage contact lens because the flap will act like a protective layer. The patient may feel slight irritation but usually suffers no pain and much more comfortable compared to PRK.[2] The disadvantage of this method is that it requires more cornea tissue to create the flap and sometimes can not be done on thin cornea.

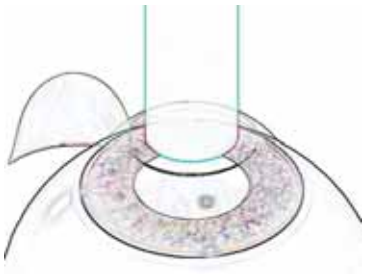


Fig 2B. Demonstrates LASIK method.

3. Laser Assisted Sub-Epithelial Keratomileusis (LASEK) or Epithelial Laser in situ Keratomileusis (Epi-LASIK)

This method is a combination of PRK and LASIK. The epithelial cell layer is sloughed by using either special machine (epithelial microkeratome) or chemical solution (alcohol). The epithelial cell layer is preserved and repositioned to protect the ablated surface. It will act like a thin flap which can relief the discomfort or pain for the patient.[3] The disadvantage of this method is its difficulty in handling the thin epithelial cell layer. If the cells can not be replaced, worst come to worse, it will become PRK.

The result of excimer laser ablation is very impressive. It can accurately correct refractive error up to -10.00 D for nearsightedness and up to +5.00 for farsightedness with astigmatism up to 4.00 D. The major limitation of the laser ablation is the adequateness of the corneal tissue for the amount of the correction. If the cornea is too thin or the correction is too high (-12 D up), the kerato-refractive surgery may not be a good option.

There is an alternative for the patient who is not a candidate for kerato-refractive procedure. The correction has to be done inside the eye (intraocular) and mostly involved in the insertion the special corrective lens, called phakic intraocular lens (phakic IOL) implantation. The lens can be made at any desired refractive error, therefore, it can correct up to -20 D nearsightedness. The disadvantage is the risk is generally higher than the laser ablation method because of the intraocular manner. Moreover, the lens needs to be left inside the eye. If the lens position is improper, sometimes it can cause problems such as glaucoma or cataract.[4]

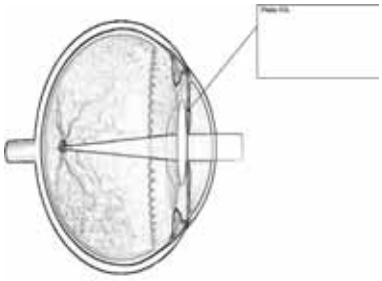


Fig 3. Demonstrates phakic IOL method.

The most important issues for anyone who seeks for refractive surgery is the risks and benefit issues. There is always some risk involved in every surgical procedure and may varies from one patient to another. The benefit of the procedure also differs depending on the lifestyle and necessity for the correction. One must take a full eye examination and medical consultation with the experiences ophthalmologists to establish his/her own risks and benefits. Doing one's own extensive research is one of the effective methods that helps finalizing the decision.

REFERENCES

1. Yenjit W. Epidermiology of Refractive Error in Thailand. In: Royal College of Ophthalmologists of Thailand Annual Meeting: Sub Specialty Day in Optic and Refraction; 2004 July 14; Bangkok, Thailand; 2004.
2. Slade SG. LASIK complications. In: Machat JJ, ed. Excimer Laser Refractive Surgery. Practice and Principles. Thorofare, NJ: SLACK Inc., 1996: 360-8.
3. Chalita MR, Tekwani NH, Krueger RR. Laser epithelial keratomileusis: outcome of initial cases performed by an experienced surgeon. J Refract Surg 2003; 19: 412-5.
4. Lovisolo CF, Reinstein DZ. Phakic intraocular lenses. Surv Ophthalmol 2005; 50: 549-87.