



International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

NEW AGE OF REFRACTIVE SURGERIES- A LITERARY STUDY

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ABSTRACT:

Refractive surgery is a surgical procedure performed to correct the refractive error (spectacle power) of the eye. It is usually done to get rid of or reduce dependence on glasses and contact lens. It can be performed in a patient with stable refraction (glass power) after the age of 18 – 21 years.¹ Refractive surgeries along with the complications which can arise during and after the surgery are discussed in this article.

AIM AND OBJECTIVE

To study the various articles and literature available on refractive surgeries.

To study the various types of refractive surgeries and its complications.

INTRODUCTION

Refraction is the bending of light rays as they pass from one transparent medium to another medium of a different density. The transparent cornea is about 0.5 mm thick, with five distinct layers.² Refractive errors are vision problems caused mainly by a cornea that is not shaped perfectly. Refractive surgery refers to any procedure that corrects or minimizes refractive errors. The use of surgical procedures to correct refractive errors of the eye has come a long way. The two main types are corneal procedures and intraocular procedures. Various physicists and ophthalmologists have played a role in this saga. From the idea of using thermal energy to shrink corneal tissue to using femtosecond laser, this article highlights the basics of all the varied refractive surgeries performed nowadays. Refractive surgeries form an ever-growing specialty of ophthalmology with addition of novel techniques with every quantum of time.

MATERIALS AND METHOD

Material has been collected from modern text books, research articles, and electronic database.

TYPES OF REFRACTIVE ERRORS

1. Nearsightedness (myopia).
2. Farsightedness (hypermetropia).
3. Astigmatism.
4. Presbyopia.

TYPES OF REFRACTIVE SURGERIES

LASIK (Laser Assisted In Situ Keratomileusis)

The procedure reshapes the cornea using a computer-controlled excimer laser. It also uses a small blade called a microkeratome. With one of these tools, the surgeon cuts a flap in the centre of the cornea. A thin layer of tissue is removed using the excimer laser. This flattens the cornea. The flap is replaced without stitches. It reattaches to the cornea in minutes. In most cases, recovery from LASIK surgery is fast, with minimal discomfort.³

PRK (Photorefractive Keratectomy)

The epithelium is removed, and the excimer laser sculpts the cornea to correct refractive error. The eye's surface is mapped using a computer, and the amount of tissue to be removed is calculated. The excimer laser beam reshapes the cornea by removing tiny amounts of tissue from the outer surface. This surgery helps to reduce low to high myopia, low to moderate hyperopia, and astigmatism.⁴

RK (Radial Keratotomy)

This was a very common refractive surgery. Tiny cuts (incisions) are made in the cornea with a diamond scalpel. The cuts flatten the centre of the cornea and change its curve. This reduces refraction. Because the cornea is cut, it takes a few weeks to heal. This procedure is no more done due to high complication rates.⁵

SMILE (Small Incision Lenticule Extraction)

In SMILE – a small incision is made in the cornea and a lenticule of the cornea using Femtolaser technology. That lenticule which is removed from the small incision can then be extracted in two ways-

- Through a 4-5mm incision -this is called Femtosecond Lenticule Extraction (FLEX).
- Through a very small 2mm incision – this is known as Small Incision Lenticule Extraction (SMILE)

This surgery does not need Excimer laser, Microkeratome blade or flap hence it is popularly known as blade-less, flap-less refractive surgery.⁶

LENS BASED SURGERIES

ICL (Implantable Collamer Lens)

This surgery involves placing an artificial implantable contact lens in front of the natural crystalline lens in the eye. ICL are made of biocompatible material known as collamer (combination of collagen + polymer).

Refractive lens exchange

In Refractive lens exchange the natural crystalline lens of the eye is removed and is replaced by an artificial intraocular lens (IOL) of the correct power.⁷

PRE-OPERATIVE INVESTIGATIONS

Complete medical history along with detailed eye examination is mandatory in all candidates, special investigations like corneal topography (Pentacam) Anterior segment Optical Coherence Tomography (ASOCT) are performed to evaluate the shape, thickness and curvature of the cornea and other dimensions of the eye. After acquiring all the details, the eye surgeon (ophthalmologist) makes a decision regarding the available options of refractive surgery for the patient.⁸

COMMON COMPLICATIONS

- Overcorrected or under corrected vision or Astigmatism.
- Loss of the corneal flap and need for a corneal graft.
- Scarring, Infection, Vision loss or Glare.

INDICATIONS AND CONTRAINDICATIONS

Superficial procedures (PRK)

Myopia up to –6 dpt

Astigmatism up to 5 dpt

LASIK

Myopia up to –8dpt

Astigmatism up to 5 dpt

Hyperopia up to +3 dpt

Phakic IOL

Myopia of –8 dpt or more

Hyperopia of +4 dpt or more

These techniques are contraindicated in the presence of a symptomatic cataract, glaucoma with marked visual field damage, or exudative macular degeneration. A preoperative corneal thickness of less than 500 microns is a further contraindication for the lamellar surgical procedures.⁹

RESULTS

Refractive errors can be corrected safely, effectively, reliably, and with only rare complications by the methods of refractive surgery. The optimal type of treatment is chosen individually for each patient after an extensive pre-surgical work-up. Above all, LASIK with a femtosecond laser is currently the most advanced technique to correct mild or moderately severe refractive errors. If the preoperative corneal thickness is less than 500 microns, superficial techniques (PRK, LASEK, or epi-LASIK) are preferred for the correction of refractive errors. When LASIK is contraindicated, and if the eye is still able to accommodate, moderately severe ametropias of –5 dpt or more can be alternatively treated with phakic intraocular lenses. This form of treatment has been found to yield a long-lasting good refractive result in studies with up to 10 years of follow-up.¹⁰

DISCUSSION

Refractive surgery encompasses any procedure that corrects refractive error, one of the leading causes of reversible visual impairment in the world. It is now recognized that refractive surgery has significant impact on quality of life and daily work, with benefits extending beyond spectacle independence. Although the risk of complications is decreasing compared to the early days of refractive surgery, there is still a small chance for serious problems. These include vision problems such as halos, glare, diplopia and dry-eye syndrome. With procedures that create a permanent flap in the cornea (such as LASIK), there is also the possibility of accidental traumatic flap displacement years after the surgery, with potentially disastrous results if not given prompt medical attention. For patients with **strabismus**, risks of complications such as **diplopia** and/or increased strabismus angle need to be evaluated carefully.

Providing excellent visual acuity to patients can be one of the most rewarding yet challenging endeavours that refractive surgeons undertake. The next frontier of refractive surgery challenges clinicians and scientists to achieve outcomes superior to the 'traditional 20/20', often used to depict 'perfect' uncorrected distance visual acuity. Technologies have been developed to enhance preoperative assessments and imaging for better patient selection, there are now improved customized treatments to specifically correct ocular aberrations, and novel techniques to adapt to dynamic refractive changes.

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