

# Contact Lens Fitting

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Contact lenses are the smallest, least visible, the finest of all devices for correcting refractive errors of the eye. Prescribing and fitting contact lenses have become an integral part of today's comprehensive ophthalmology practice. Majority of the people are using contact lenses for cosmetic purposes. Other reasons for wearing contact lenses include occupational preferences, sports and therapeutic uses. Their growing importance makes it appropriate to inquire into the origins and development of these valuable ophthalmic resources.

## History

The idea of contact lens was first conceived by Leonardo da Vinci in 1508. He described a glass cup containing water which was placed over the eye, eliminating the cornea as a refractive surface. After, so many attempts made by different scientists, in 1920, zeiss produced, a fitting set used to correct Keratoconus. This was the first set of trial contact lens. In 1929 Heine described a method of fitting Contact Lens by means of a trial set consisting of large number of contact lenses.

Later in 1937, there was a break through, William Feinbloom, an American used plastic in the construction of Contact Lens. A year earlier in 1936 the Rohm and Hass company introduced transparent Methyl Methacrylate. The first plastic corneal contact lens was introduced in 1947 by Kelvin touhy. Then in 1960, wicheitrl discovered the soft contact lens which is made up of hydrophilic material.

## Advantages of contact lenses

There are several advantages of contact lenses over spectacles. Some of them are:

1. Fewer magnification effects
2. Decreased peripheral and chromatic aberrations
3. Increase in the size of visual fields

4. Marked decrease in aniseikonia in monocular aphakia and Anisometropia.
5. Good Cosmetic appearance.
6. Permits better correction for refractive errors that occur with keratoconus and irregular astigmatism.

## Indications

- a) Optical:** Myopia, Hypermetropia, Astigmatism, Presbyopia, Aphakia, Post Keratoplasty, Keratoconus .
- b) Orthoptic uses:** Anisometropia, Amblyopia (Occlusion).
- c) Special Uses:** Albinism, Aniridia, Nystagmus with Refractive error, coloboma, symblepharon.
- d) Therapeutic uses:** Bullous Keratopathy, corneal ulcers, Glaucoma therapy (for Drug Delivery)
- e) Prosthetic uses:** Pthisical eye, corneal opacity, leukoma , corneal scars.
- f) Surgical Uses:** Corneal protection at surgery

## Contra Indications

- (i) There are several contra indications especially Dry eyes, lid problems such as active Blepharitis, sty, chalazion, entropion .
- (ii) Acute and chronic conjunctivitis, corneal abrasions, hyphema, V<sup>th</sup> nerve paralysis, hypopyon, Uveitis and iritis.
- (iii) Some Rare contra indications are allergies, Uncontrolled diabetes, pregnancy period and Pterygium .

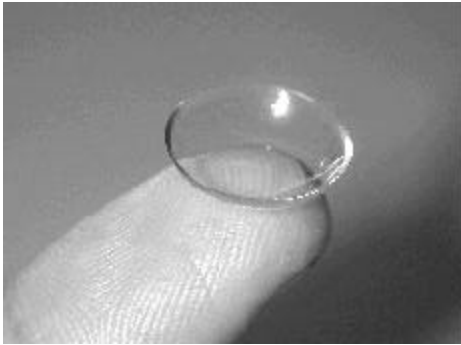
## Types

Modern system classifies contact lens into three major types such as

- (i) Soft
  - (ii) Semi soft and
  - (iii) Hard contact lens
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## Soft Contact Lens

Well flexible contact lenses that are composed of



either hydrogel or silicon material. These soft contact lenses are made up of different polymers but basically Hydroxy ethyl metha acrylate (HEMA) which is a stable, clear, nontoxic, non allergic, and optically desired material. These lenses are usually larger in size than the cornea for optimum centring and stability. It is much more comfortable than rigid lens, because of its soft qualities and its ability to flex on blinking. Its larger size produces a fit with its edge lying under the upper and lower eye lids.

### Advantages

- More comfortable because the lens fits under the eyelid margins, flexes with each blink and the softness permits more oxygen to reach the cornea
- Spectacle blur is uncommon.
- Less chances of lens loss, because of larger size and minimal movement.
- Minimal over wear reaction, because of its soft nature and to create oxygen tear pump mechanism by flexing with each blink.
- Less glare and photophobia.
- Ideal for children because of comfort and less chances of lens loss factor.

### Fitting procedures (Ref.1)

Soft contact lenses are usually fitted as large as than the corneal diameter to maintain good centration and stability. Fitting steps include

- Record the 'K' reading and convert it to millimeters (mm).
- Measure the corneal diameter in mm
- Diameter : The initial lens diameter selected should be 1.0 – 2.0 mm larger than the corneal diameter.

- Power: Determine the spherical power first, convert the refraction prescription into minus cylinder and use spherical equivalent method. Add to the sphere to determine the lens power and compensate this for vertex distance.
- Base curve : Select the base curve which is 0.4 - 0.6 mm flatter than the flattest 'K' for smaller lenses and 0.6 - 1.0 mm flatter for larger lenses.
- Fit the contact lens to the respected eye and leave the patient to wait for 15-20 minutes to settle the lens well.

### Fitting Evaluation

- Acceptable fitting should show about 0.5 - 1 mm lag as the eye is turned upon to the side. Movements have best been detected by asking the patient to look up and blink. When the lens moves more than 1 mm with each blink, then it is fitted as too flat. If it moves less than 0.5 mm it is steeper and will limit the tear exchange.
- The other factors that should be considered while looking the fitting are:
  - Good centration
  - Adequate movement
  - Stable vision
  - Crisp retinoscopic reflex
  - Clear undistorted Keratometry mires.

### Insertion and removal



- Wash the hands thoroughly with soap and dry.
- Take the lens out, clean and rinse it well
- place the lens on the tip of the index finger
- Look up, and retract the lower lid with the middle finger and while looking upward, gently apply the lens to the lower part of the eye.
- Remove the finger and then slowly release the lid.



6. Close the eye and gently massage the lids.
7. Cover the other eye and focus it to make the correct centration.
8. Repeat the same procedure to the next eye.
9. While removing, Look upward and retract the lower lid with middle finger and place the index finger tip on the lower edge of the lens.
10. Slide the lens down to the white of the eye.
11. Compress the lens between the thumb and the index finger, so that the air breaks the suction under the lens. Remove the lens for cleaning and sterilising.

### Semisoft contact lens

Gas permeable lenses which made up of a unique plastic that has the ability to permit oxygen to diffuse into and Carbon dioxide to diffuse out of the lens.



### Materials

1. CAB (Cellulose Acetyl Butyrate) lenses
2. Silicon Acrylate
3. Butylstyrene

### Advantages

1. Increased comfort
2. Longer wearing time
3. Reduced corneal edema, spectacle blur and over wear syndrome.
4. Rapid adaptation
5. Permeability of more oxygen than other lenses
6. Larger optic zone consequently offers increased visual field and less glare.

7. Gas permeable lenses in a spheric form can cover upto five diopters of astigmatism.

### Fitting procedure

- Record the Keratometry readings
- Select the initial lens based on base curve.
- The base curve of the initial lens should be slightly steeper than the flattest meridian .
- Diameter selection is directly related to base

Power	Diameter
40.0 – 43.0 D	9.4 mm
43.25 – 45.0 D	9.2 mm
Greater than 45.25 D	9.0 mm

curve. The flatter the cornea the larger the lens.

- The following table describes the selection of diameter:
- While fitting the trial, leave the patient for 20 – 30 minutes to attain good centration and settlement of the lens.
- However for best results fit the lens according to its best position and comfort.



### Insertion and Removal

1. Wash your hands thoroughly with oil free soap
2. Take out the lens from the container.
3. Keep at your palm, clean it well with the prescribed solution .
4. Depress the lower lid by the middle finger while the index finger carrying the lens is gently applied on the cornea.
5. Slowly release the lids to avoid accident ejection of the lens. Release the lower lid first and then the upper.

### Removal

1. Look downward, open the lids wide so that the edge of the lid will engage the edge of the lens

2. Draw the lid tight by a lateral pull of the index finger and blink.
3. The lid should dislodge the lens slowly
4. Cup the other hand under the eye to catch the lens.

### Scissors Technique

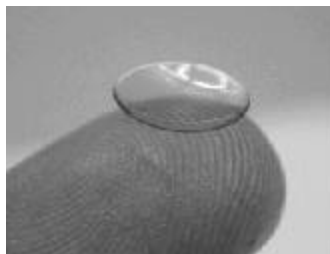
Hold the upper lid by the index finger and the lower by middle finger. Apply lateral traction to the lids and squeeze the lens off by a scissors motion.

### Fitting Evaluation

- a) **Normal fit:** There is a slight vault over the apical zone of the cornea with slight central pooling with an absence of stain in the intermediate area. The peripheral portion of the lens should have a pooling of stain indicating that the edge is standing off from the cornea.
- b) **Flatter fit:** Typically with a flat lens, there is a apical touch with little fluoresceine in the area of contact.
- c) **Steeper Fit:** Tight lens fitting will have a central pooling with an intermediate or peripheral zone of touch.
- d) **Astigmatic Cornea:** There is a band shaped area of touch on the flattest meridian.

### Hard Contact Lens

Hard contact lens is made up of PMMA (Poly methyl metha acrylate) which is a stable, clear, non toxic, non allergic, easily worked and optically desied material. It can be moulded or lathed and the stability of PMMA is more than RGP lenses. The oxygen permeability of hard contact lens is almost nil. It provides oxygen only by means of tear pump.



### Fitting procedure

- Record the Keratometry readings
- Select the initial lens based on base curve.
- The base curve of the initial lens should be slightly

steeper than the flattest meridian .

- Diameter selection is directly related to base curve. The flatter the cornea the larger the lens.
- while fitting the trial, leave the patient for 20-30 minutes to attain good centration and settlement of the lens.
- However for best results fit the lens according to its best position and comfort.

### Insertion and Removal

1. Wash your hands thoroughly.
2. Take out the lens from the container.
  1. Keep at your palm, clean it well with the prescribed solution.
  2. Depress the lower lid by the middle finger while the index finger carrying the lens is gently applied on the cornea.
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### Removal

1. Look downward, open the lids wide so that the edge of the lid will engage the edge of the lens
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### Other Lenses

#### Piggy-back contact lenses

It is basically the wearing of a soft lens against the cornea to provide comfort and a rigid lens over the soft to attain vision.

#### X - chrome Lens

Is a type of contact lens which improves the colour discriminations for the colour blindness people who is partially blind in red-green area.

#### Bandage Contact lens

Is used to protect the cornea from external influences and permit healing of underlying corneal disorders.

#### Prosthetic Contact Lens

Tinted lenses for corneal prosthesis. Prescribed for corneal opacity, leucoma, corneal scars, pthysical eye.

### **Toric contact lens**

Lenses used for astigmatism. It has different radii of curvature in each meridians. ie The principle meridians differ by 90 degrees. Front toric, Back toric and Bi toric lenses are available.

### **Ortho – Keratology**

The technique of flattening the cornea and thus correcting refractive errors by the use of a series of progressively flatter contact lenses.

### **Contact lens care and maintenance**

Contact lens care and maintenance is one of the most crucial aspects of contact lens wear. It can influence the success of contact lens wear and patient's satisfaction.

Lens care and maintenance procedure really have 4 steps ( cleaning, rinsing, disinfecting and storing the lenses )

#### **Cleaning**

The daily cleaners usually contains surfactants and are used to remove most loosely bound foreign bodies on the lens which includes cell debris, mucus, lipid, protein and micro organisms. The mechanical action of rubbing reduces the amount of loose debris and also enhances the efficacy of the solutions surfactant properties.

#### **Rinsing**

After cleaning, the lenses could be rinsed. The rinsing procedure helps to remove the loosened deposits, and some micro organisms.

#### **Disinfecting & Storage**

The process of disinfecting helps to kill or deactivate the microorganisms. Ideally there are two types of disinfecting systems

#### **Thermal disinfection**

The lenses should be placed in the case with saline solution and heated to 70°C - 80 °C for 10 –20 minutes.

#### **Chemical Disinfecting**

Hydrogen peroxide based solutions are used for chemical disinfection. This is reasonably effective with in 10 – 15 minutes.

These disinfecting solutions also used for storage. They are functioning as a hydrating medium which helps to maintain the stability of contact lens parameters and physical parameters.

### **Multi purpose solutions**

The modern lens care systems use one solution to perform the functions of a number of components. For ease of use and patients convenience, multipurpose solutions are formulated to allow cleaning, rinsing, soaking and disinfecting functions to be combined.

To avoid lens contaminations, the lens case should be rinsed after every use and the lenses should be stored in fresh solution. For better lens care, change the lens case monthly.

### **Complications** (Ref.2)

The complications of contact lens in various aspects include:

- Hypoxic related problems such as corneal edema, Superficial punctate keratitis, decreased sensation, superficial and deep infiltrates, vascularisation, superior limbal kerato conjunctivitis, epithelial microcysts.
- Allergic related problems include hyperemia, sterile infiltrates, Giant papillary conjunctivitis.

### **Conclusion**

Thus contact lenses are the ideal choice for refractive errors which give better vision correction without any distortions. At the same time proper lens care and regular followup are very essential to maintain a good ocular health.

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