IOL Types

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Artificial intraocular lenses are used to replace the eye natural lens when it has been removed during cataract surgery.

I. Types

II. Material

III. Design

I. Types:

A) Monofocal

B) Premium

(1) Toric

(2) Multifocal

(3) Accommodating

MONOFOCAL	MULTIFOCAL	ACCOMMODATING	TORIC IOL
Traditional Lens	ACRYSOF® IQ RESTOR®, Tecnis® IOL	Crystalens®	ACRYSOF® IQ Toric aspheric IOL
Provides good vision at one distance (typically far vision)	Correct vision for near, far and intermediate distances	Corrects vision for all ranges of vision using a hinged monofocal lens that moves within the eye like the natural lens of the eye	Corrects for astigmatism after cataract surgery.
Requires reading glasses after surgery	May substantially reduce the need for glasses*	May substantially reduce the need for glasses for distance and intermediate vision*	May substantially reduce astigmatism after cataract surgery

(4) Extended Depth of Focus IOLs

In July 2016, The TECNIS Symfony® IOL and TECNIS Symfony® Toric IOL were the first extended depth of focus lenses to be approved by FDA.

TECNIS Symfony® is a presbyopia-correcting lens.
TECNIS Symfony® Toric IOL addresses both presbyopia and astigmatism (≥1DC).

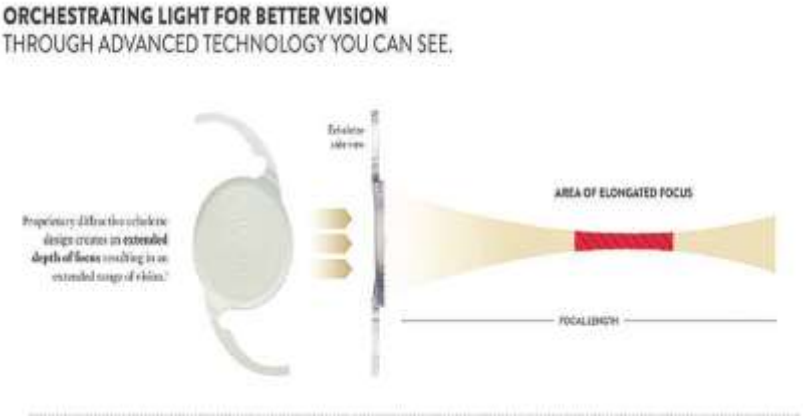
These lenses provide improved intermediate and near visual acuity, while maintaining comparable distance visual acuity.

They are neither multifocal nor accommodative IOLs.

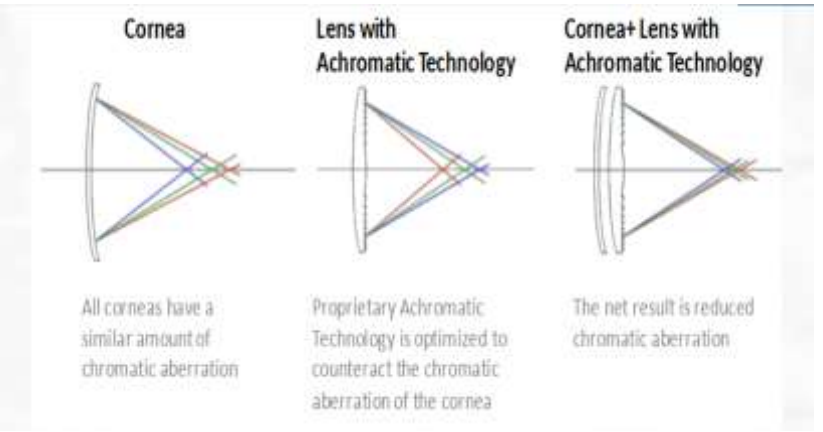
They are intended for capsular bag placement only.

These IOLs incorporate an innovative diffractive design & achromatic technology.

HOW A DIFFRACTIVE ECHELETTE DESIGN CREATES EXTENDED DEPTH OF FOCUS:



HOW ACHROMATIC TECHNOLOGY REDUCES CHROMATIC ABERRATION:

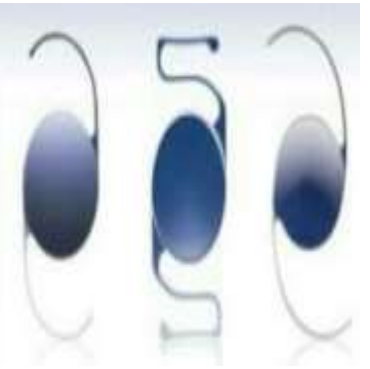


II. Materials:

- **Non foldable: PMMA**
- **Foldable**
  - ❖ **Acrylic**
    - **- Hydrophobic**
    - **- Hydrophilic**
  - ❖ **Silicon**

Materials

PMMA



- Polymethylmethacrylate
- First material used
- Rigid , inert and non autoclave
- Chemically stable compound
- Excellent optical properties
- Ref index 1.4

Drawbacks

Rigid and require larger incision

Materials

Foldable Hydrophobic Acrylic

- Very low water content
- A high refractive index
- Usually a high memory

Drawbacks:

- **Glistenings** (Small water inclusions in the optic material, predominantly seen with the Acrysof material. Over time, the glistenings can increase, but have no effect on visual function).
- **Dysphotopsias**

Materials

Hydrophilic Acrylic

High water content (The water content between IOLs varies widely and can be as high as 38%).

Drawbacks:

They are more prone to develop PCO than hydrophobic acrylic lenses or silicone lenses. This may be due to the high water content being more "inviting" to lens epithelial cells (LEC) ingrowth or the fact that the optic edge of IOLs in this group is not as sharp as with the hydrophobic materials.

Materials

Silicon IOL

- **Polymers of silicon and oxygen**
- **Hydrophobic**
- **Heat resistant , autoclavable**
- **Highly transparent to visible light**

Drawbacks:

•Low ref. index

•Can be pitted

•Slippery and cause glistenings

•Silicon oil adheres to IOL and become opaque.

Materials

Lens material	Advantages	Disadvantages
PMMA	Time tested Cheapest Little inflammation	Wound size > optic diameter
Acrylic	Injectable Least inflammation	Cost Dysphotopsia
Silicone	Cost Injectable	More inflammation Silicon oil (for RD repair) adheres to IOL and becomes opaque

III Design:

1-Haptic design

-Plate haptic

-Loop haptic

- C loop
- J loop
- Modified J Loop

- Plate loop

- Special design

(AC IOL, iris fixated, sulcus IOl).

Design

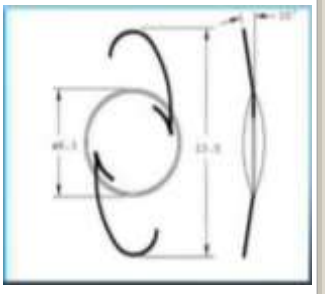
2-It may be single piece or multipieces

	Advantages	*Disadvantages*
Single piece	-smaller incision -easy to insert	-not good in sulcus -haptics too thick -more PCO
3 pieces	-Ok for sulcus - less PCO	-larger incision -take care with haptics when inserting

Design

3- Haptic angulation

Haptic angulation reduces the incidence of PCO by maximizing the barrier effect to migrate LECs at the posterior optic edge by pushing the IOL backward against the posterior capsule .



For posterior chamber IOL:

10 degree anterior angulation to keep the optic part away from the pupil .

For anterior chamber IOL:

Posteriorly angulated lens to keep it away from the pupil

Design

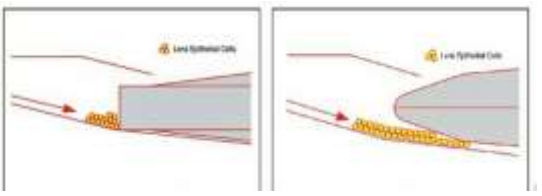
4-Optic design

- Edge design
- Optic geometry
- Special optic

Edge design

Optic Design

- Rounded edge
- Sharp edge
- half rounded edge



	PCO	glare
Rounded edge	more	less
Sharp edge	less	more
Half rounded edge	less	less

Design

Optic Design

- **Optic Geometry**

i. **Biconvexity**

ii. **Optical zone**

Design | Optic Design | Optic geometry

i. Biconvexity

Most IOLs have a symmetrically biconvex optic, meaning that the radius of curvature of the front and back surface are identical, so they could be implanted front to back without a change in optical power.

Some manufacturers have an asymmetric biconvex optic, where the back surface curvature is relatively flat and constant throughout most of the power range and the anterior curvature is varied for IOL power. This causes a slight shift of the principal optical plane of the IOL and also implies that the lens should not be implanted front to back.

Design | Optic Design | Optic geometry

ii. Optical Zone

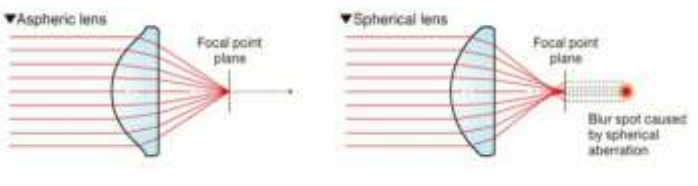
Most IOLs have a full-size effective optical zone of 6 mm in the main range of IOL powers. Therefore, the higher powered IOLs will have a thicker optic than the lower powers.

Design | Optic Design

➢ Special optic

Aspheric Intraocular Lenses

Traditional IOLs are spherical whereas aspheric IOLs are slightly flatter at the edge to provide better contrast sensitivity, this allows images in a similar colour to their background to be more clearly defined.



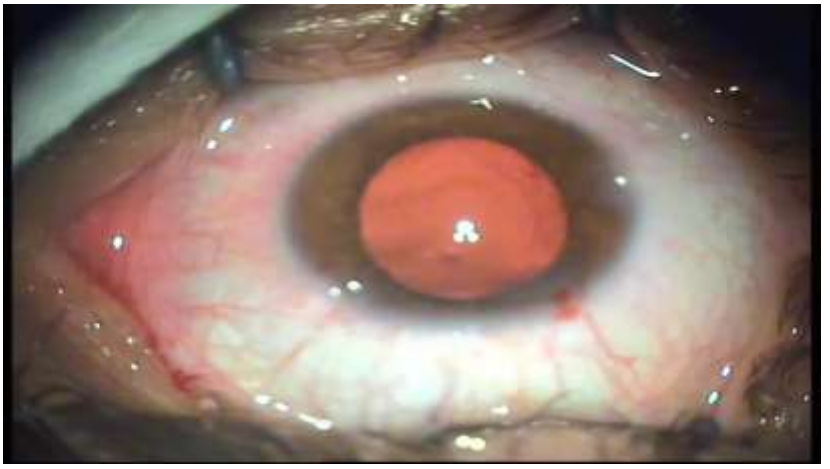
Design

5- Overall Length

The capsule bag has a diameter ranging from 9.8 to 10.9 mm.

Most IOLs are oversized for the bag (usually have an overall length of 13 mm).

The main reason for such oversizing is the need for the IOL to be suitable for sulcus placement.




Thank You