

**Helping patients to see  
the maximum:** balancing the risks  
and benefits of intraocular lens  
options for cataract surgery

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# What is the intraocular lens of choice in a patient with healthy eyes?

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**What factors are key in determining whether a patient's eyes are healthy?**

# Pre-operative assessments

Pre-operative assessment guides IOL selection

## Optical biometry<sup>4</sup>

- Patient's history and physical exam<sup>1</sup>
- Comorbidities
- Lifestyle and visual needs<sup>2,3</sup>

- Axial length measurement
- Non-contact optical biometers
- Ultrasound

- Corneal power assessment
- Direct, e.g. keratometer
- Placido disk-based device
- Indirect, e.g. scanning-slit beams, high-frequency ultrasound

Identifies risks, needs and preferences<sup>2,3</sup>.  
Establishes a good doctor–patient relationship  
to optimize post-operative satisfaction

IOL, intraocular lens.

1. Vestal RA. *J Perioper Med.* 2018;1:2; 2. Salerno C, et al. *Taiwan J Ophthalmol.* 2017;7:179–84; 3. Braga-Mele R, et al. *J Cataract Refract Surg.* 2014;40:313–22.
4. Donaldson K, et al. *J Cataract Refract Surg.* 2018;44:642–53.

The background of the slide features a large, faint globe with a grid of latitude and longitude lines. To the left of the globe, there is a white circular arc that forms part of a larger circle. Along this arc, several orange dots are scattered, some larger than others, creating a path-like effect. The overall color scheme is light gray and white, with orange accents.

**What intraocular lens  
options are available for  
this patient?**

# IOLs available to patients with healthy eyes



## Monofocals<sup>1</sup>

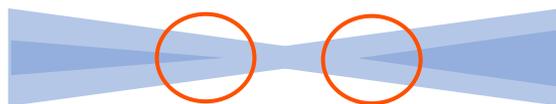


### Distinct single focus

- Optimal vision at one distance
- Spectacles required for uncorrected vision, e.g. reading
- Monovision or mini-monovision (a different monofocal in each eye) can be used to obtain spectacle independence<sup>2</sup>



## Multifocals<sup>1</sup>



### Two or three focus points

- Trifocals have largely replaced bifocals
- Refractive and diffractive designs available
- Allow for spectacle independence



## EDOFs<sup>1</sup>



### Elongated focus

- EDOFs are multifocals that provide a continuous range of vision
- Allow for spectacle independence



## EDOFs with X-WAVE technology<sup>3</sup>

Monofocal-quality distance vision with excellent intermediate VA and good near VA

EDOF, extended depth of focus; IOL, intraocular lens, VA, visual acuity.

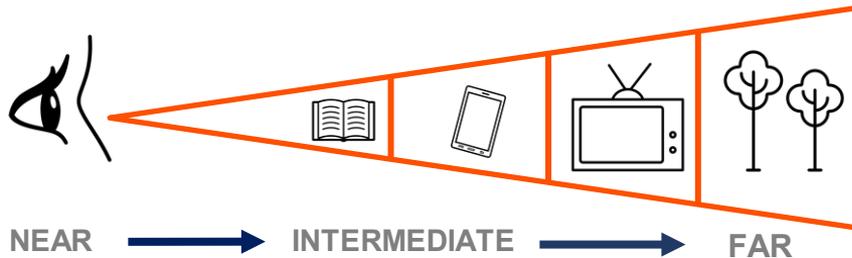
1. Werner L. *Ophthalmology*. 2020;S0161-642030626; 2. Hafez TA, et al. *Clin Ophthalmol (Auckland, NZ)*. 2019;13:2111;

3. Kohonen T, et al. *J Cataract Refract Surg*. 2021; doi: 10.1097/j.jcrs.0000000000000826

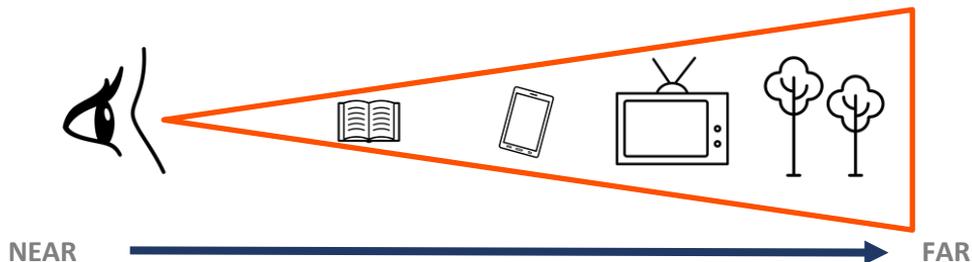


# Visual effects of trifocal and EDOF IOLs

## Trifocal IOLs



## Extended depth of focus IOLs



## Trifocal vs. EDOF

- Trifocal and EDOF IOLs achieve spectacle independence for intermediate and distance vision
- For near vision, trifocals have been shown to outperform EDOLs
- Similar level of patient satisfaction with both lenses



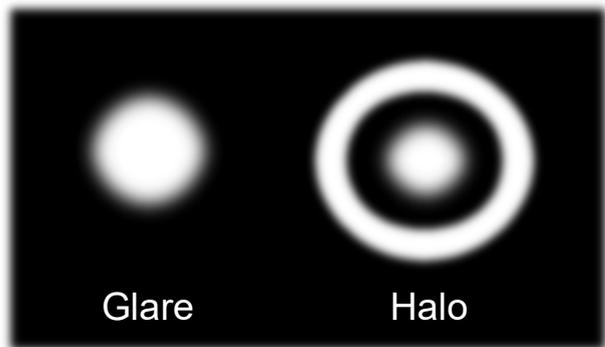
**The patient has an active lifestyle and a perfectionist personality. How will these factors influence IOL selection?**

# Patient selection for multifocal IOL implantation

## Potential issues with multifocal IOLs

Multifocal lenses, especially trifocals, are associated with:

- Glares and halos
- Reduced contrast sensitivity



## Personality

A perfectionist or Type A personality may find it difficult to tolerate less than 'perfect' vision



## Neuroadaptation

Effects may resolve by neuroadaptation but a patient should be counselled regarding the possibility of permanent aberrations

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**How can the best possible  
level of satisfaction be  
achieved for this patient  
post-operatively?**

## MANAGING EXPECTATIONS

### Visual needs

Distance, intermediate and near VA

### Personality

Will they tolerate visual aberrations?

### Neuroadaptation

Is the patient aware that there may be a period of adaptation to an IOL before vision improves?

### Counselling

Surgeon facilitates the patient in making an informed choice

### Photic phenomena

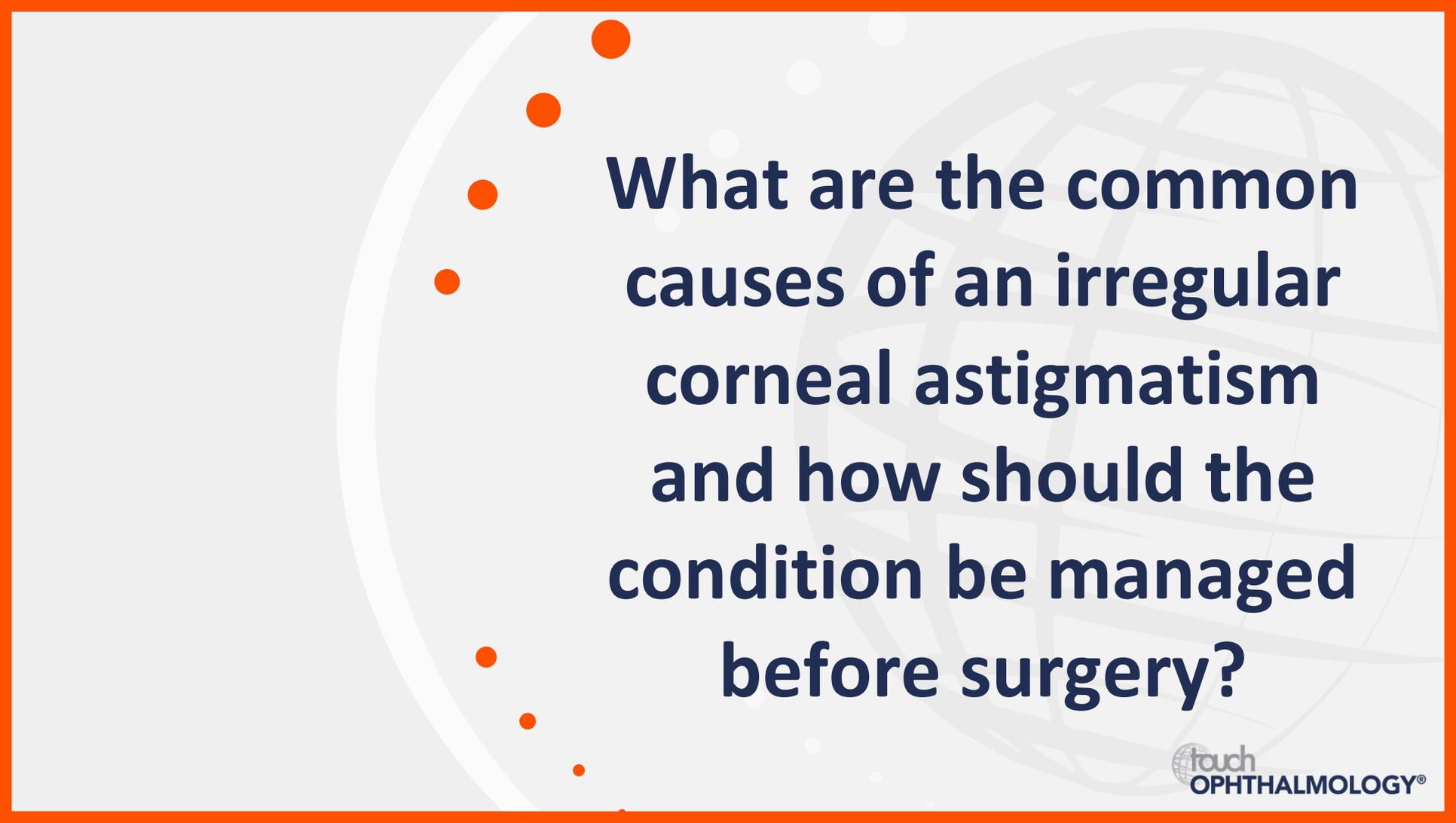
What are the risks of disturbances in vision with each IOL? Is the patient aware of the risk?

# What are the intraocular lens options for patients with cataracts and irregular corneal astigmatism?

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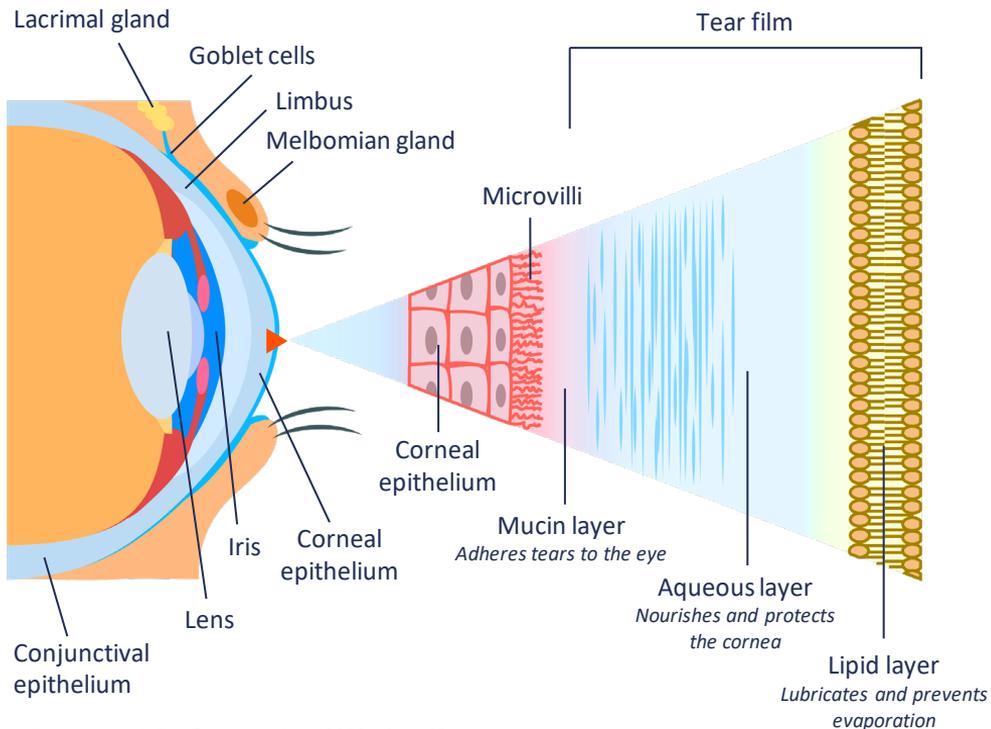




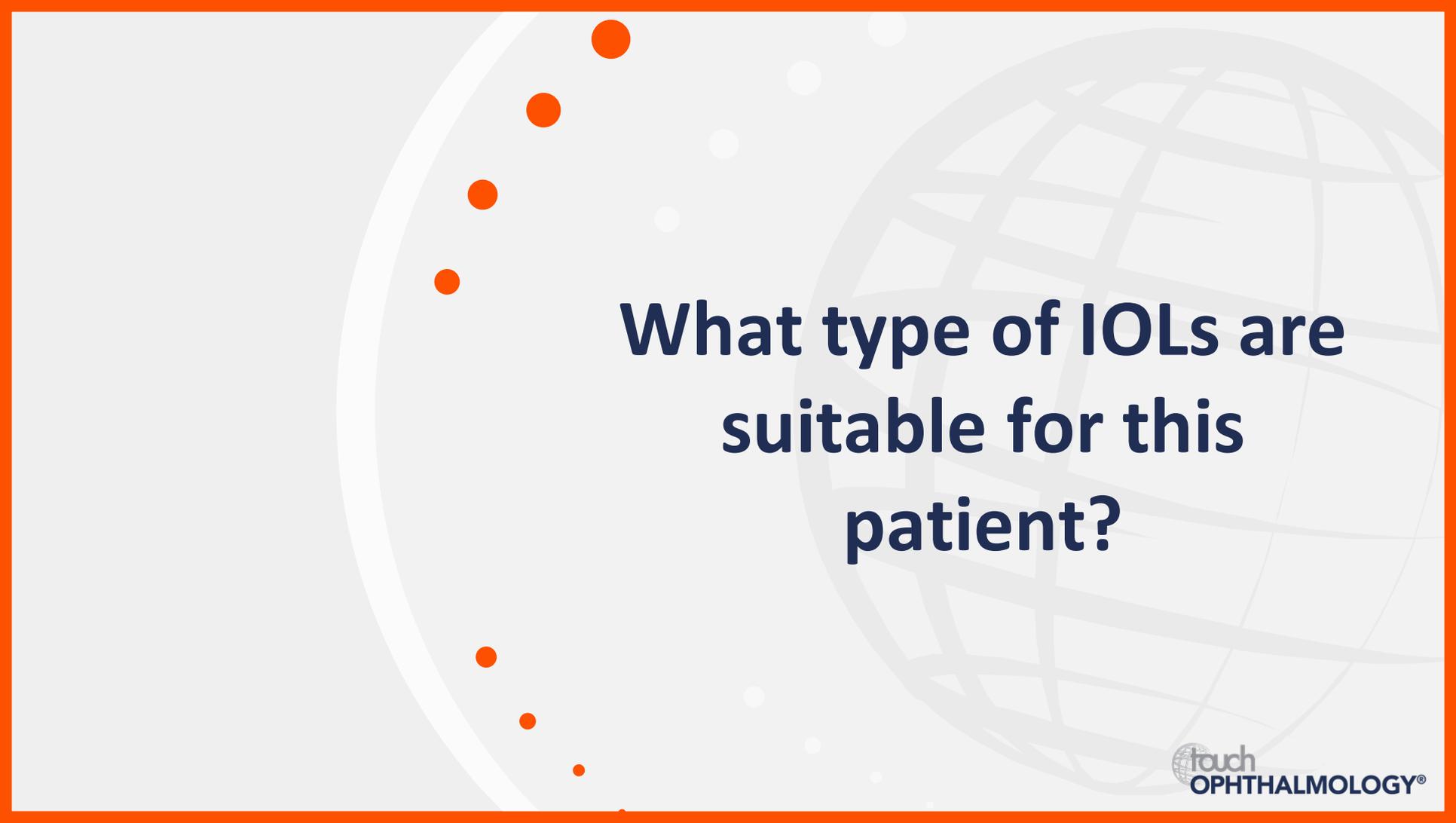
**What are the common causes of an irregular corneal astigmatism and how should the condition be managed before surgery?**

# Irregular astigmatism

Dry eye syndrome is a leading cause of irregular astigmatism



TEAR FILM	THERAPY AREA
Lipid layer	e.g. Low-dose ophthalmic ointment Diquafosol sodium
Aqueous/ Mucous layer	e.g. Artificial tears Diquafosol sodium Rebamipide
Epithelium	e.g. Diquafosol sodium Rebamipide Autologous serum
Cornea	e.g. Cyclosporin Steroids

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**What type of IOLs are  
suitable for this  
patient?**

# IOL selection for patients with irregular astigmatism

## Toric IOLs<sup>1,2</sup>

- Monofocals and multifocals are available in toric forms to correct for astigmatism
- However, toric IOLs are **not** considered an ideal IOL choice for irregular astigmatisms



## Small-aperture EDOF<sup>3</sup>

- The IC8 IOL has been shown to reduce visual distortion caused by corneal irregularities
- Fewer photic phenomena compared with multifocal and accommodating lenses



## Toric EDOF with X-WAVE technology<sup>4</sup>

- These are non-diffractive, extended-vision, presbyopia- and astigmatism-correcting IOLs
- The use of these IOLs with significant corneal astigmatism is currently being investigated



EDOF, extended depth of focus; IOL, intraocular lens.

1. Braga-Mele R, et al. *J Cataract Refract Surg*. 2014;40:313–22; 2. Kaur M, et al. *Indian J. Ophthalmol*. 2017;65:1301; 3. Ophthalmology Times Europe. Available at: <https://europe.opthalmologytimes.com/view/irregular-corneas-stand-to-benefit-from-small-aperture-iol-design> (Accessed November 2021); 4. ClinicalTrials.gov. NCT04652037. Available at: <https://clinicaltrials.gov/ct2/show/NCT04652037> (Accessed November 2021).

The background consists of a light gray globe with a grid of latitude and longitude lines, positioned on the right side. On the left side, there is a vertical line of seven orange dots of varying sizes, with the largest dot at the top. The entire scene is set against a light gray background with a white circular arc on the left edge.

**What other factors will  
impact IOL choice for  
this patient**

# Balancing expectation with visual needs

## Work and lifestyle<sup>1</sup>

- IOL selection should be made with both the patient's work and lifestyle in mind
- Post-surgery, the patient should be able to engage in all their usual work and leisure activities



## Goals and expectations<sup>1,2</sup>

- A cataract surgeon has to keep in mind a patient's personal desires when it come to their vision
- Are they happy to wear spectacles?
- Do they expect perfect vision at all distance ranges?
- Do they expect to have no complications?

## Patient satisfaction<sup>1,2</sup>

- The patient should be involved in the process of IOL selection from the beginning
- The risk and benefits of different IOL types should be fully explained prior to surgery
- Patient expectation and satisfaction are key to achieving good visual outcomes

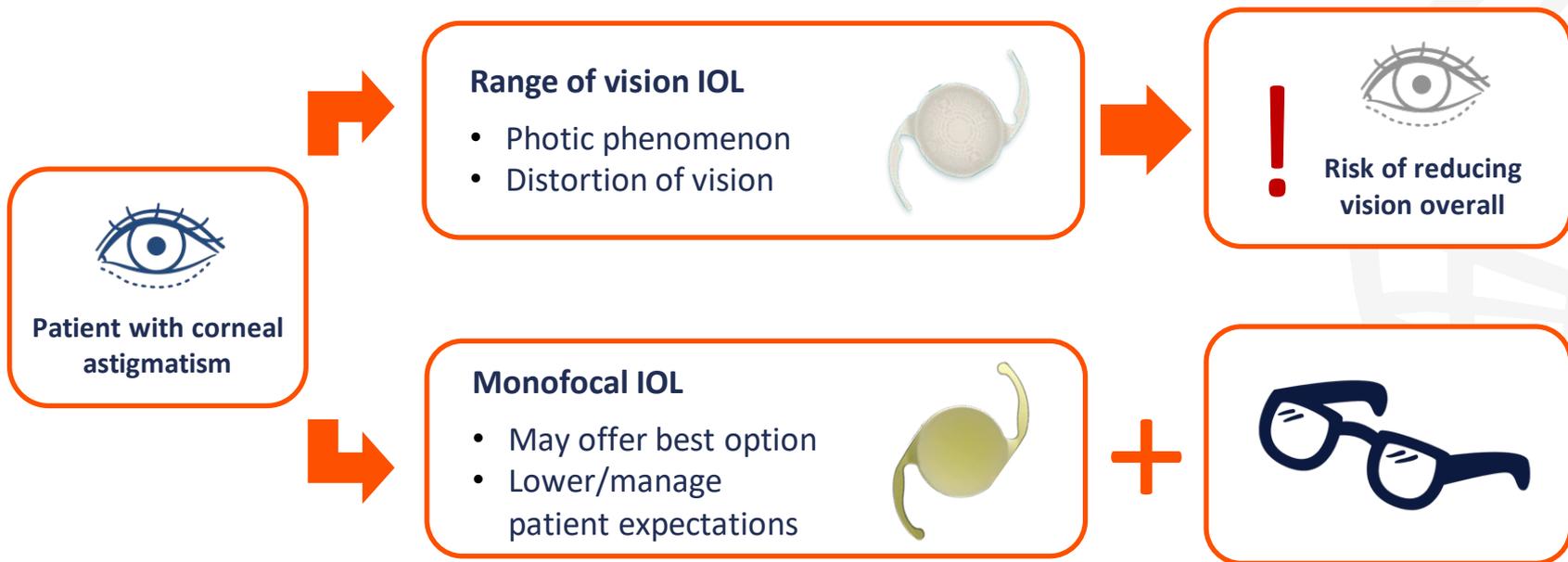
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**What risks should this patient be made aware of in order to manage expectations?**

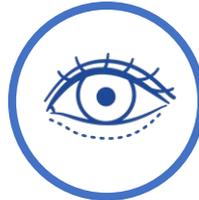
# Risks and expectations in patients with corneal astigmatism



- **How can the best possible level of satisfaction be achieved for this patient post-operatively?**

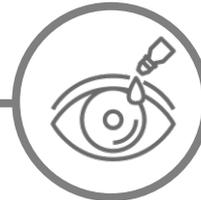
## Visual needs

Distance, intermediate and near VA



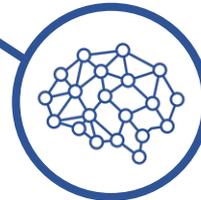
## Personality

Will they tolerate visual aberrations?



## Presurgical treatments

Are there any treatments required before surgery, e.g. for dry eye?



## Neuroadaptation

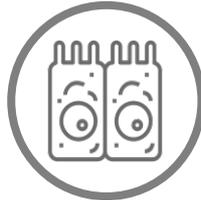
Is the patient aware that there may be a period of adaptation to an IOL before vision improves?

# MANAGING EXPECTATIONS



## Counselling

Surgeon facilitates the patient in making an informed choice



## Adverse events

Is the patient aware of risks such as PCO and ACO?



## Photic phenomena

What are the risks of disturbances in vision with each IOL? Is the patient aware of the risk?

# How does pre-existing retinal pathology impact intraocular lens choice?

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**How should patients  
with age-related  
macular degeneration  
be managed  
pre-operatively?**

# Pre-operative considerations for patients with AMD

## Screening

Optical coherence tomography is recommended in patients with suspected macular disease

## Benefit assessment

QoL benefits of surgery for visually significant cataract in patients with all stages of AMD

## Pre-treatment for neovascular AMD

Intravitreal anti-VEGF therapy for neovascular AMD in the month before cataract surgery is compatible with good long-term outcomes

## Delay surgery with neovascular AMD

Cataract surgery within 6 months of starting treatment for neovascular AMD should be avoided

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**What types of IOLs  
are suitable for  
a patient with AMD?**

# IOL selection for patients with AMD

## Considerations

Patients with AMD can choose from a range of IOL including:

- **Monofocals**
- **EDOF IOLs**
- **Aspheric IOLs**
- **Toric IOLs**

Patients with advanced AMD often require additional magnification, especially for reading tasks. Magnifying IOLs are used to address this issue

## Magnifying IOLs

### Galilean-type telescope

- Examples: Implantable miniature telescope lenses, the IOL-VIP System and iolAMD
- Two optical elements with high positive and negative power should be used in combination with the cornea

### Cassegrain configuration

- Example: Lipshitz macular implant
- Magnification using mirrors

### Magnification in the central optic

- Example: Scharioth Macula Lens
- Limiting magnification to the central optic improves the loss in the patient's field of view

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# **Can multifocal lenses be used in patients with retinal diseases?**

# Multifocal IOLs in patients with retinal disease

Multifocal IOLs tend not to be used in patients with retinal disease such as AMD because they are associated with reduced contrast sensitivity and higher-order aberrations compared with monofocals<sup>1</sup>

A recent review focused on CS with MIOLs found no evidence to suggest that patients with macular diseases should be advised against their use<sup>2</sup>

## Assessing CS outcomes

- Difficult to compare between studies
- Depends on tests used and illumination levels

## Outcomes

Studies in patients with retinal diseases including AMD found that patients benefitted from MIOLs and reported greater subjective satisfaction compared with monofocals

**Post-operatively, what  
can be done for these  
patients if they  
experience errors in  
their vision?**

# Enhancements after cataract surgery

Enhancement procedures can reduce or eliminate residual refractive error

## Enhancements

Procedures reduce residual refractive error or presbyopia, and sometimes impact higher-order aberrations or binocularity

## Prior to enhancement

Important to counsel the patient on visual expectations and incidence of adverse events

## OPTIONS

### Laser keratorefractive surgery e.g. LASIK or PRK

High probability of success in achieving the targeted refractions. However, should be used with caution in those with ocular surface disease, e.g. dry eye

### Piggyback IOLs

A piggyback IOL can be a good choice for a patient with dry eye, odd corneal topography or a purely spherical refractive error

### Intraocular manipulations

Manipulations of the capsule and iris can improve the effectiveness of IOLs, e.g. a YAG posterior capsulotomy or selective posterior capsulotomy