

Assessment of the patient with cataract

In the second of our four-part series, **Kenneth Fong** and **Raman Malhotra** describe the best procedures for assessment of a patient with cataract with a view to referral and surgery (C6014, two standard CET points)

Management of the patient with cataracts is a multi-disciplinary team affair in which optometrists play a key role. Optometrists must take a good patient history to determine if cataracts are actually affecting the patient's quality of life, and whether treatment would be beneficial. They must explain what cataracts are and how they are managed, without causing undue alarm to the patient. The primary purpose in managing a patient with cataract is to improve functional vision and quality of life.

When should a patient be referred for cataract surgery?

Cataracts are often discovered during routine optometric examination and patients are usually asymptomatic. It is imperative to discuss with the patient whether they actually want cataract surgery before referring them to an ophthalmologist. Cataract surgery guidelines by the Royal College of Ophthalmologists (www.rcophth.ac.uk/about/publications/) suggest that patients should be referred for surgery if there is sufficient cataract to account for their visual symptoms and that these limit their quality of life and ability to work or drive, irrespective of Snellen visual acuity. Cataract surgery may be appropriate for a patient who has good Snellen visual acuity, but complains of glare or problems with night driving. Conversely, surgery may be inappropriate for a non-driver with adequate reading vision but poor distance acuity, if they are happy with their current level of vision. Simply put, the risks of cataract surgery should be outweighed by the anticipated benefits.

Once a cataract is diagnosed, the optometrist should first determine the overall effect of cataract on visual function and the well-being of the patient. These assessments will serve as the basis for a decision whether to recommend cataract surgery. A careful

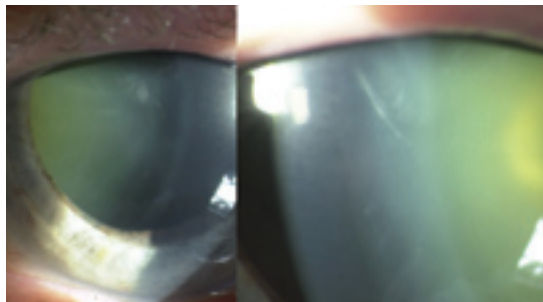


Figure 1 Pseudoexfoliation (PXF). The same eye under greater magnification showing PXF deposits on the anterior lens capsule

inquiry should be made into the patient's daily, occupational, leisure, and social activities and document any cataract-related impairment. If the patient holds a driving licence, then the legal visual requirements for, and symptoms affecting driving should be determined.

The optometrist must also identify co-existing ocular conditions as predictors of poor visual outcome following surgery. These include:

- **Corneal pathology**

This includes corneal opacities, degenerative disorders, hereditary conditions (in particular, Fuch's endothelial dystrophy and corneal oedema) and ectasia.

- **Glaucoma**

Uncontrolled intraocular pressure (IOP) or visual field loss.

- **Uveitis**

- **Pseudoexfoliation**

Most commonly found in the Scandinavian or northern European population, pseudoexfoliation is characterised by a deposition of a white fluffy material (similar to amyloid) on the anterior lens capsule, with a relatively clear zone corresponding to the movement of the iris (Figure 1). In addition, this material is deposited on the zonules, iris pigment epithelium, ciliary epithelium, trabecular meshwork and cornea. The pupil often fails to dilate fully, potentially making cataract surgery more challenging. This condition may lead to glaucoma, as well as weakness of the zonules. Complications may there-

fore also be encountered during cataract surgery due to zonular dialysis.

- **Vitreous opacification**

- **Diabetic retinopathy**

Cataract surgery in diabetic patients has been associated with a higher incidence of post-operative complications, including fibrinous uveitis, posterior capsule opacification, anterior segment neovascularisation, accelerated progression of diabetic retinopathy, and macular oedema. Post-operative visual acuity may therefore be poor. A number of issues relating to cataract surgery in diabetes remain incompletely resolved, including appropriate timing of surgery, determinants of visual outcome, impact of surgery on retinopathy, and optimal management of postoperative macular edema.

Patients with diabetic retinopathy must be carefully examined prior to cataract surgery. The key question is whether the patient has proliferative diabetic retinopathy (PDR) or macular oedema. If either or both cases are present, it is essential to counsel the patient about the guarded prognosis to their vision after cataract surgery.

If the patient has PDR, this needs to be treated as much as possible with pan-retinal laser photocoagulation (PRP) prior to cataract surgery. If the cataract is severe enough to preclude a good view of the retina for adequate PRP, then urgent cataract surgery is warranted. It may be then possible to perform PRP with an indirect viewing system at the time of surgery after the cataract has been removed, or if this is not possible, PRP should be arranged within one week of surgery. If PDR is present, cataract surgery will accelerate its progression and the visual results can be poor if the PDR is not treated aggressively.

Macular oedema may be difficult to detect clinically if a cataract is present. If macular oedema is seen prior to cataract surgery, this should be treated with a focal or grid laser. A pre-operative fundus fluorescein angiogram (FFA) is helpful



in identifying areas of macular oedema and leakage from active new vessels. If macular oedema is present at the time of cataract surgery, it will most likely worsen with time if left untreated.

All patients who have diabetic retinopathy who have had cataract surgery need to be seen within one week after their operation for a dilated retinal examination. Any evidence of PDR or macular oedema should be treated as soon as possible to prevent progression of the disease. Cataract surgery appears to cause progression of diabetic retinopathy but not diabetic maculopathy.

● Age-related macular degeneration (AMD)

Patients with AMD may suffer further deterioration of their visual acuity due to cataract and the majority would experience significant improvements in quality of life as well as visual function following cataract surgery. This is particularly the case with increasing severity of cataract, irrespective of the degree of AMD. Cataracts are known to cause reduced distance and near visual acuity, as well as contrast sensitivity, by reducing the quality and physical contrast in the retinal image. The reduced contrast sensitivity is a consequence of forward scatter of light from the lens producing the effect of veiling glare, which obviously improves when cataracts are removed.

Despite the presence of AMD, daily living activities involving the detection of objects at low physical contrasts are therefore likely to benefit from cataract surgery. Furthermore, peripheral retinal function, particularly that for lower spatial frequencies may improve.

Of concern is the finding by some studies that suggest that eyes with AMD that undergo routine cataract surgery are at a slightly greater risk of progression to wet AMD in comparison to the fellow eye. This implies that cataract surgery may be an important possible risk factor in progression of macular degeneration.

Patients with AMD must decide whether to proceed with cataract surgery in the face of uncertain information about the ultimate result.

● Retinal vascular disorders

Signs of previous branch or central retinal vein, or arterial occlusion may be subtle but should be suspected, particularly if the loss of visual function is not commensurate with the degree of cataract.

● No view of fundus

Lack of a clear retinal view may be due to significant corneal opacity, dense or mature cataract or a vitreous opacity. This influences the ability to assess retinal and

optic nerve function. Most importantly, retinal detachment or intraocular tumour must be excluded and may require the use of a B-scan ultrasound.

Where a significant opacity precludes retinal visualisation, optic nerve and retinal function may be clinically assessed by way of confrontational visual field testing and the ability to detect light in all four quadrants of the uni-ocular visual field.

Furthermore, the response of the pupil to light and the presence of a relative afferent pupillary defect (RAPD) should be determined. Cataract, even if mature, should not cause an RAPD.

● Amblyopia

● Optic nerve or neurological disease

The 'only eye' patient

Patients who only have good vision in one eye will naturally be more concerned about the prospect of surgery. Modern cataract surgery carries much lower risk than before and, in general, the threshold for intervention should not be set at a higher level for such patients. Increased sensitivity in counselling is also required.

Urgent cataract surgery

There are unusual circumstances in which cataract surgery should be expedited. When a cataract is mature, an inflammatory reaction may occur with acutely raised intraocular pressure. Cataract surgery is also expedited in narrow-angle glaucoma, particularly if a significant phacomorphic component exists. Such patients should be referred urgently to an ophthalmologist for surgery.

Recent research has also revealed that in older patients, cataracts may play an important role in the causation of car accidents, falls causing fractures, and functional decline. Hence, earlier visual rehabilitation through modern cataract surgery with intraocular lens implantation is becoming not only an option but the norm.

Visual standards for driving

The following are the minimum visual acuity standards required for driving, as applied by the Driving and Vehicle Licensing Authority. There is also a visual field standard which is not statutory. The visual field standard for ordinary driving is currently defined as 'a field of at least 120° on the horizontal, measured using the Goldmann III4e setting or the equivalent. In addition, there should be no significant defect in the binocular field which encroaches within 20° of fixation either above or below the horizontal meridian.'

Group 1 drivers (car and other light vehicles)

All drivers are required by law to read a standard-sized number plate in good light at 20.5m. In September 2001, the new-format number plate was introduced on all new and replacement plates. The characters are narrower than the current number plate and this new format plate should be read at 20 metres. The number plate test is absolute in law and not open to interpretation. A driver who is unable to satisfy this requirement is guilty of an offence under Section 96 of the Road Traffic Act 1988. The number plate test corresponds to a binocular visual acuity of approximately 6/10 Snellen acuity. However, it is important to stress that visual acuity measurements in a consulting room may not correspond to the ability to read the standard number plate at the roadside.

Group 2 drivers (large goods/passenger carrying vehicles)

All new Group 2 applicants since January 1, 1997 must by law have:

- A visual acuity of at least 6/9 in the better eye, and
- A visual acuity of at least 6/12 in the worse eye, and
- If these are achieved by correction, the uncorrected visual acuity in each eye must be no less than 3/60.

Pre-operative hospital assessment

The minimum ocular examination should include testing for a relative afferent pupillary defect, confrontational visual field examination, assessment of the ocular surface to exclude blepharitis, conjunctivitis, dry eyes or obvious nasolacrimal blockage. During the slit-lamp examination, special attention should be paid to the corneal endothelium and the status of support for the lens. Pre-existing corneal endothelial pathology (for example, Fuch's dystrophy) or zonular weakness (such as pseudoexfoliation) should be highlighted in the referral, as both would increase the risk of complications from cataract surgery. Intraocular pressure should be measured prior to pupillary dilatation. During dilated fundus examination, one should look out for diabetic retinopathy, AMD and optic neuropathy, in particular, glaucoma.

Pre-operative medical investigations

Based on the Royal College of Ophthalmologists' guidelines for local anaesthesia for intraocular surgery, a patient due to undergo cataract surgery with no history of significant systemic disease and no abnormal findings on

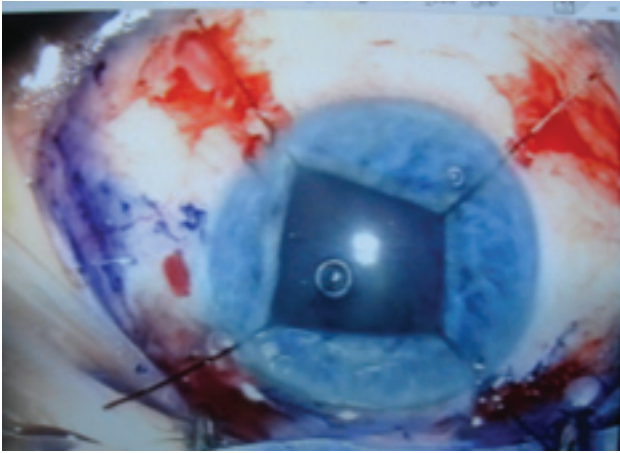


Figure 2
Preoperative photograph during phacoemulsification cataract surgery using iris hooks for retraction and also, Trypan blue (and 'vision blue') to stain the anterior capsule to allow capsulorhexis to be easily performed in the absence of a red reflex during surgery

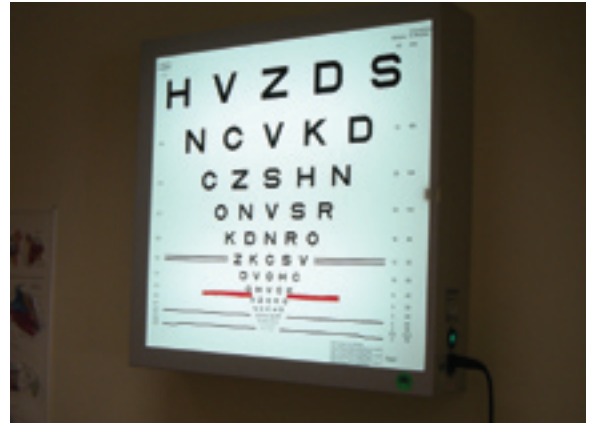


Figure 3 Visual acuity chart based on logMAR scale

examination at a nurse-led assessment does not require special investigations. Any patient requiring special tests may need a medical opinion. Key points to consider are:

- Systemic hypertension should be controlled well before the patient is scheduled for surgery and not lowered immediately prior to surgery
- Angina should be controlled by a patient's usual angina medication which should be available in theatre. Every effort should be made to make the experience as stress-free as possible. Generally, patients should not have surgery within three months of a myocardial infarct
- Diabetic patients should have their blood sugar controlled. If surgery is planned under local anaesthesia, diabetic patients should have their usual medication and oral intake
- Patients with chronic obstructive pulmonary disease may benefit from an open draping system or high flow oxygen-enriched air system below the drapes
- There is no need for antibiotic prophylaxis for intraocular surgery in patients with valvular heart disease
- Those on warfarin should have an INR check (international normalised ratio describes the results of a blood clotting test) prior to surgery (see below).

Medication

Warfarin and cataract surgery

The RCO's guidelines for cataract surgery state that to stop warfarin risks stroke and death. The INR should be checked to ensure that a patient is within their desired therapeutic range set by the treating physician, and if needle local anaesthesia is performed, the risk of orbital haemorrhage is increased by 0.2-1.0 per cent. Either sub-Tenon's or topical anaesthesia is recommended for these patients.

Aspirin

Aspirin is generally not discontinued prior to cataract surgery.

TABLE 1

Preoperative tests required prior to cataract surgery

- Refraction
- Near and distance visual acuity
- Biometry
- B-scan ultrasonography if no fundus view obtainable
- Other optional tests - Corneal topography, specular microscopy

Flomax and intra-operative floppy iris syndrome

A significant proportion of men aged 60 and older with cataracts also have benign prostatic hypertrophy (BPH). The BPH drug Flomax (tamsulosin hydrochloride) causes iris complications during phacoemulsification, known as intraoperative floppy iris syndrome (IFIS). IFIS describes a floppy iris that billows in response to normal intraocular fluid currents, a strong propensity to iris prolapse and progressive miosis intra-operatively. Complications related to IFIS may be reduced (see below). It should be noted that Flomax is prescribed for some women with urinary retention.

- Ask patients before cataract surgery if they're taking Flomax. Discontinuing the drug for two weeks before surgery may lessen the iris's floppiness, though not eliminate it. Any prior history of Flomax use is important because IFIS cases can still occur in those who discontinued the drug, even one to two years earlier

- Common techniques such as mechanical pupil stretching or partial thickness sphincteromies do not appear to work for IFIS

- Disposable iris retractors (Figure 2) or pupil expansion rings are the best way to maintain a larger pupil.

Refraction

An accurate pre-operative subjective refraction is vital to ensure the correct

intraocular lens implant is chosen during cataract surgery. For example, if the patient is highly myopic in both eyes and only has a cataract in one, careful discussion with the patient is needed in selecting the intraocular lens power for the affected eye. If the operated eye is left emmetropic after surgery—as is normally done in most cases—there is a high risk of post-operative anisometropia. As such, aim for post-operative low myopia in the operated eye. If the myopic patient has cataract in both eyes, then emmetropia is a possible option, provided that the second eye is operated on soon after the first eye. Myopic patients often dislike being left even slightly hypermetropic after cataract surgery. As such, practitioners usually aim for their post-operative refraction to be slightly myopic.

Near and distance visual acuity

The best corrected visual acuity for near and distance should be obtained. Although Snellen measurements are more commonly used for distance acuity, logMAR visual acuity (Figure 3) measurements provide a better and more accurate means of comparing pre- and post-operative visual acuity. It is important to realise that visual acuity measurements are only one test for visual performance. It does not always relate to vision in environments of variable lighting conditions, in which glare and pupil constriction may reduce the effective visual acuity.

Biometry

Biometry measurements of both eyes are essential prior to cataract surgery. This is normally performed in the hospital by trained nurses, orthoptists or optometrists. Determination of the lens implant power to give any desired postoperative refraction requires measurement of two key variables at a minimum; the anterior corneal curvature in two orthogonal meridians and the axial length of the eye. These measurements are then entered



Figure 4
IOL Master
(Zeiss) used
in biometry
measure-
ments prior
to cataract
surgery

into an appropriate formula.

Keratometers measure anterior corneal curvature over a small annular zone (usually between 2-4mm in diameter) and assume this is spherical. Contact lenses should be removed at least 48 hours prior to keratometry, because their long-term use can induce a reversible corneal flattening. There are a variety of manual, automated and hand-held keratometers available.

The axial length of the eye is measured from the corneal vertex to the fovea and can be measured using either A-mode ultrasound or an optical interferometric

technique. The normal axial length of the eye is between 22.0-24.5mm.

The A-mode transducer is commonly 5mm in diameter and emits short pulses of weakly focused ultrasound at a frequency of 10MHz. In the intervals between these emissions, echoes are received by the same transducer, converted to electric signals, and plotted as spikes on a display. The accuracy of measurements from a skilled operator in a regularly shaped eye is generally within 0.1mm.

An optical interferometer specifically designed for lens implant power calculation is commercially available – IOL Master; Carl Zeiss – (Figure 4). This system is widely used in most ophthalmic units and can measure the axial length, keratometry and anterior chamber depth of the eye. It uses a low coherence Doppler interferometer to measure axial length. In-built formulae allow calculation of lens implant power. Dense cataracts, corneal or vitreous opacities may preclude measurement with this system. The system is a non-contact one and is ideal in terms of patient comfort and compliance. This system has proved to be highly accurate and simple to use in a variety of difficult measurement situations.

B-scan ultrasonography

B-scan ultrasonography is useful in eyes with dense cataracts that preclude a visual assessment of the posterior segment. This is to exclude coincidental pathology (for example, retinal detachment and choroidal tumour) that may be present and which may impact on the post-operative result of cataract surgery.

Other optional tests – corneal topography, specular microscopy

Corneal topography can be a useful investigation to show the true shape of the cornea prior to cataract surgery. This can help the surgeon plan the sites of the incisions in cases of high corneal astigmatism by either operating on the steep corneal meridian or combining the procedure with corneal relaxing incisions at the site of the steep meridian. This will allow a better post-operative refractive result to occur.

As the corneal endothelium is vulnerable to damage during cataract surgery, it is sometimes useful to document the status of the endothelium with specular microscopy. This assessment has a prognostic value for corneal survival after cataract surgery.

In the event that the cornea has a reduced endothelial cell count prior to

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surgery, the surgeon can counsel the patient appropriately regarding the increased risk of corneal decompensation from cataract surgery.

Issues to consider for presbyopic cataract patients

With the increasing improvements in cataract surgery techniques and technologies, the demand for a better post-operative result is increasing (for example, spectacle independence after surgery).

As many of our patients attending for cataract surgery are already in the presbyopic age group, presbyopic lens exchange or 'Prelex' has become a possibility.

This allows the patient to be free of optical correction aids, like spectacles, for near or distance work after cataract surgery.

Prelex is now possible due to a combination of factors:

- Accurate biometry
- Precise and complication-free modern cataract surgery
- Reduction of pre-existing astigmatism at the time of cataract surgery
- The availability of multifocal and accommodative intraocular lenses (IOL).

The ideal patient for Prelex is a hyperopic presbyope who dislikes wearing glasses and has clinically significant lens changes.

The patient must also be able to accept the possible need for glasses even after uneventful cataract surgery.

They must also be aware of the need to adjust to a new visual system and to accept that the ability to have good unaided near vision may take a period of time to develop.

Summary

Cataract is the leading cause of age-related visual loss and will become more common with society's increasing life expectancy.

Given the magnitude of the associated healthcare burden, an expanded role for the optometrist in patient assessment, preparation and aftercare for cataract surgery is inevitable. As such, it is essential for optometrists to have good knowledge of the condition and surgery as integration between ophthalmic healthcare professionals continues. ●

● **Kenneth Fong** is a specialist registrar in ophthalmology based in London. **Raman Malhotra** is a consultant ophthalmic and oculoplastic surgeon at The Queen Victoria Hospital, East Grinstead, West Sussex

This article is based on a chapter in *Cataract* by Raman Malhotra, a forthcoming book in the Elsevier Science Eye Essentials series

MULTIPLE-CHOICE QUESTIONS

1 Which of the following would least merit cataract surgery?

- A Driver with good high contrast acuity but complaining of glare
- B Diabetic whose fundus view is obscured by cataract
- C Housebound patient with significantly reduced acuity but able to carry out all visual tasks to their satisfaction
- D Driver unable to read the new number plate format at 20m

2 Which of the following corneal changes is unlikely to lead to poor post-cataract surgery visual outcome?

- A Fuch's endothelial dystrophy
- B Corneal ectasia
- C Corneal opacification
- D Corneal astigmatism

3 Which of the following statements is NOT true about pseudoexfoliation?

- A It presents with white deposition on the anterior lens capsule
- B It may cause a secondary open-angle glaucoma
- C It may lead to zonular dialysis
- D It is most prevalent among Afro-Caribbeans

4 Which of the following is true concerning diabetes and cataract?

- A Patients with diabetic retinopathy should be assessed within 3 months of cataract surgery
- B Cataract surgery appears to cause a progression of diabetic retinopathy
- C Macular oedema is best treated post-cataract extraction
- D Cataract extraction causes progression of maculopathy

5 Which of the following is true concerning AMD and cataract?

- A Cataract extraction increases the risk of wet AMD compared with the fellow eye
- B Cataract extraction will not enhance the vision of a patient with established AMD
- C Cataract extraction will increase glare in an AMD patient
- D Cataract extraction will improve peripheral vision in AMD, particularly higher spatial frequencies

6 Which of the following is NOT true regarding the visual field standard for driving?

- A There must be at least 120 degrees of horizontal field
- B It is a statutory requirement

- C Measurements should be by a Goldmann IIIe setting or equivalent
- D There should be no significant binocular field defect within the central 20 degree field

7 Which of the following is true regarding Flomax?

- A It is primarily used by women
- B Patients using Flomax are never able to have cataract surgery
- C It leads to intraoperative floppy iris syndrome
- D Mechanical pupil stretching is unlikely to help treat IFIS

8 Which of the following postoperative refractive states is preferred by most practitioners?

- A Slight myopia
- B Emmetropia
- C Slight hyperopia
- D A monovision state

9 Which of the following is NOT true regarding the IOL Master instrument?

- A It is an ultrasound interferometer
- B It might not be useful in cases of dense cataract
- C It uses low coherence Doppler interferometry
- D It automatically calculates lens implant power

10 Why might a B-scan ultrasound scan be useful prior to cataract surgery?

- A It predicts axial length accurately
- B It allows calculation of IOL power
- C It may detect significant retinal disease behind an optically dense cataract
- D The technique is no longer used in relation to cataract surgery

11 Which of the following patients is ideal for Prelex?

- A Young myope with traumatic cataract
- B Hypermetropic presbyope who does not want spectacles
- C Patient with established maculopathy prior to cataract extraction
- D Myopic presbyope

12 Why might topography be useful prior to cataract surgery?

- A It helps predict the IOL power
- B It allows correct ordering of any contact lens that may be needed post-surgery
- C It will screen for any pre-surgical corneal opacities
- D It allows the surgeon the possibility of correcting corneal cylinder as part of the extraction procedure

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