Cataracts

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KEYWORDS

• Cataracts • Intraocular lens implant • Surgery • Management • Cataract symptoms

KEY POINTS

- A cataract is the term used to describe the opacification of the crystalline lens inside the eye.
- Primary care providers play a key role in diagnosing cataracts based on symptoms and known risk factors.
- Cataract surgery is one of the most successful of all surgical procedures performed.
- There are currently no medical treatment for cataracts, however, minimizing exposure to known risk factors can slow progression.

INTRODUCTION

A cataract is a clouding of the crystalline lens inside the eye, which leads to a decrease in vision. It is the most prevalent, treatable cause of visual impairment and blindness in the world. Cataract surgery with an intraocular lens (IOL) implant is one of the most common and thought to be the most effective surgical procedure in any field of medicine. Although aging is the most common cause, other factors, including disease, trauma, medications, and genetic predisposition, are also known to be associated with cataract formation.[1] Although cataracts, and the subsequent surgery to correct them, are ultimately the domain of ophthalmology, the primary care physician is frequently the one to whom patients present with vision complaints. Knowledge of cataract symptoms, how to evaluate them, and a basic understanding of the surgery to correct cataracts make primary care physicians an integral part of treating this leading cause of preventable blindness.

Cataract Surgery: A Brief History

Cataract surgery today is defined as the removal of the opacified lens and replacement with a synthetic lens known as an IOL. Up until the 1960s and later, the cataract was simply removed without a replacement. Although the potential of vision was restored, the resulting lack of a lens, or aphakia, resulted in a significant hyperopia caused by the absence of the lens' focusing power. Thus, in order to have focused vision it was

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necessary to wear very thick, heavy glasses. These glasses were inconvenient, unsightly, and induced a lot of prism caused by the thickness of the glass lenses. In 1949 a British ophthalmologist by the name of Harold Ridley noticed that plastic fragments from the cockpit canopies of fighter jets were well tolerated in the anterior chambers of the pilots who had been shot down. The idea was born of replacing the lens with a plastic one after the cataract was removed. In the decades since Dr Ridley's idea, IOLs have evolved in design, style, and material. Most modern IOLs are made of either acrylic or silicone. Current IOLs come in a spectrum of diopter powers. The biggest advantage to cataract surgery is that, in addition to restoring clarity to the eye by removing the cataract, the IOL placed can be optimized to correct much of a patient's refractive error. Thus, even patients who were strongly nearsighted or farsighted before cataract surgery will often have no to minimal correction required after, as the IOL is now correcting that error. The determination of IOL power is made by taking various measurements of the eye, specifically the axial length (the distance from the front of the cornea to fovea) and the curvature of the cornea, and then using regression formulas to calculate a power. Newer formulas also use anterior chamber depth, lens thickness, and corneal diameter to provide even more accurate results and, thus, a better chance of achieving emmetropia.

Prevalence and Epidemiology

Approximately 90% of blindness in developed countries can be attributed to cataracts. Prevalence of cataracts varies by age, race, and sex. In the United States, among the nursing home population, cataracts are a leading cause of low vision (as defined by visual acuity worse than 20/40 in the better-seeing eye), responsible for 37% of low vision among Caucasians and 54% of low vision among African Americans.[2] Among Americans, a visually significant cataract (visual acuity <20/40) is present in approximately 2.5% of those aged 40 to 49 years, 6.8% of those aged 50 to 59 years, 20.0% of those aged 60 to 69 years, 42.8% of those aged 70 to 79 years, and 68.3% of those aged greater than 80 years. The 3 subtypes of age-related cataracts (nuclear, cortical, and posterior subcapsular [PSC]) vary across populations. The term *nuclear cataract* describes the normal yellowing and sclerosis of the lens nucleus associated with aging. Cortical cataracts are wedge-shaped or spokelike opacities in the outer cortical layers of the lens. PSCs are plaquelike opacities along the posterior cortical layers. In the United States, nuclear cataracts are seen more commonly in Caucasians, whereas cortical cataracts are seen more commonly in African Americans; however, PSC cataracts are prevalent at roughly the same rate in both groups. Age-related cataracts may be further classified by the Lens Opacities Classification System III (LOCS III). This system, used at the slit lamp, grades the type and density of cataracts by comparing them with standard photographic color plates. Although LOCS III is a very accurate and reproducible way to grade the severity of cataracts, it is primarily used for research purposes to evaluate progression.[3] Cataracts affect nearly 22 million Americans aged 40 years and older. By 80 years of age, more than half of all Americans have cataracts. Direct medical costs for cataract treatment are estimated at $6.8 billion annually.[4] The prevalence of cataracts has a strong positive relationship with age.

ANATOMY AND PATHOLOGY

The lens is a transparent biconvex disk that sits behind the iris inside the eye (**Fig. 1**). The functions of the lens are to

1. Maintain its own clarity
2. Focus light
3. Provide accommodation

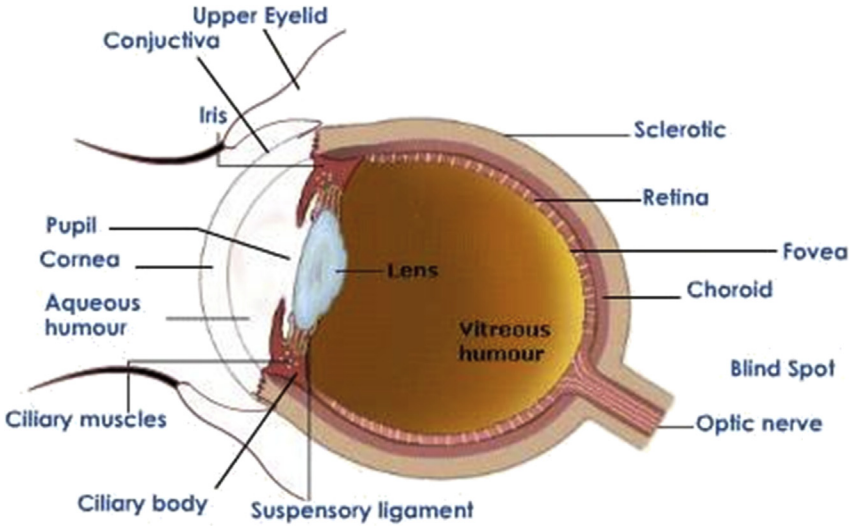

Fig. 1. The human eye.

It is suspended like a trampoline and is attached to the ciliary body, with fibers known as the zonules of Zinn. The developed lens is an avascular structure and is without innervation. Its metabolic needs are met by the adjacent aqueous humor. Histologically, the lens is composed of a single-layer, anterior, cuboidal, inverted epithelium that secretes an overlying thick basement membrane called the lens capsule to which the zonules attach. New cells are formed constantly during life and are laid down externally to the older cells. These newly formed cells differentiate into lens fibers. In doing so they stretch, lose their organelles, and dramatically increase the mass of cellular proteins. It is these changes that impart transparency to the lens. Because the epithelial cells are unable to shed and are instead differentiated into lens fibers, they are compacted centrally, with the oldest being in the center, or nucleus, of the lens. Without organelles these central cells are more susceptible to the photooxidative effects of aging. It is the photooxidative insults to these cells that lead to the discoloration and opacities in the lens known as a cataract. A cataract causes light to scatter when it passes through the lens, which decreases the amount of light to the retina.[5,6]

Types of Cataracts

There are several types of acquired cataracts: age related, secondary, and trauma related. Age related can be classified as nuclear, cortical, or PSC (**Fig. 2**). Secondary cataracts develop as a result of systemic disease or an ocular disease. Congenital cataracts can be genetic or disease related.

Age-related cataracts

- Nuclear: This type of cataract is the most common; it begins with a gradual hardening, yellowing, and sclerosis of the nucleus, which expands to other layers of the lens. This change is a normal aging change, though many factors are known to accelerate its formation.
- Cortical: This type tends to occur more often in persons with diabetes. It begins in the peripheral lens in the outer cortical layers and then slowly moves inward in a spoking pattern.

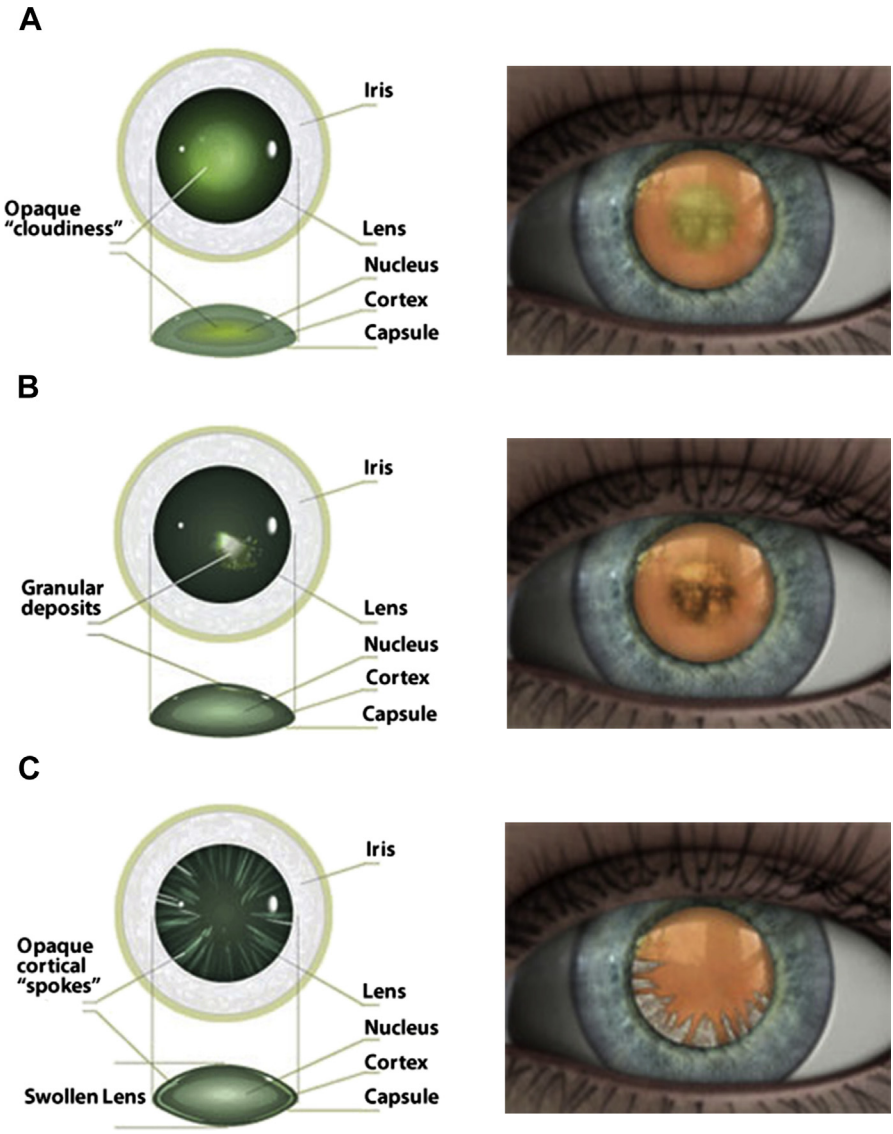

Fig. 2. Types of cataracts. (*A*) Nuclear cataract. (*B*) PSC cataract. (*C*) Cortical cataract.

- PSC: This type of cataract is plaquelike opacity of the back of the lens and can develop rapidly. Significant symptoms may not occur until the cataract is well developed. These cataracts are commonly associated with corticosteroid use.

Secondary cataracts

Several systemic or ocular diseases can predispose individuals to cataracts. Patients with diabetes have a high prevalence of cataracts.[5–7] Cataracts are among the earliest complications of diabetes mellitus. Klein and colleagues[8] demonstrated that patients with diabetes mellitus are 2 to 5 times more likely to develop cataracts than their nondiabetic counterparts; this risk may reach 15 to 25 times in diabetic patients

who are less than 40 years of age.[9] Myotonic dystrophy, atopic dermatitis, neurofibromatosis, hypoparathyroidism, and Down syndrome, among many others, are also associated with cataract formation.

A variety of ocular conditions are also commonly associated with cataracts (**Fig. 3**). Uveitis, an inflammation of the inner eye, is commonly associated with cataracts. These cataracts may be caused both by inflammation and/or the steroids used to treat it.[10] Other ocular syndromes commonly associated with cataracts include acute congestive angle closure, high (pathologic) myopia, and hereditary fundus dystrophies, such as retinitis pigmentosa, Leber congenital amaurosis, gyrate atrophy, and Stickler syndrome.

Congenital

There are a variety of diseases and conditions linked to congenital cataracts. Diseases linked to cataract development include rubella, cytomegalovirus, varicella, syphilis, and toxoplasmosis. Genetic causes include autosomal-dominant congenital cataract, Lowe syndrome, and galactosemia.

Trauma

Both blunt and penetrating trauma are common causes of cataracts. Other types of trauma include electric shock, infrared radiation (eg, occupational exposure), and ionizing radiation (eg, for ocular tumors). These types can develop immediately following the traumatic event or insidiously over time. Because of the potential for injury to the zonules and other parts of the eye with blunt trauma, surgical repair of these cataracts can be more difficult and complications are more common.[11] Obtaining a detailed history of the type and extent of trauma is imperative for surgical planning.

SYMPTOMS

Cataracts most often present slowly and painlessly. Because of the insidious nature of progression many patients are often unaware of, and will not complain of, any dramatic changes in their vision. However, when asked about specific symptoms they will readily admit to difficulty. Thus, when completing a review of systems and questioning patients about their vision, it is important to ask specific closed questions instead of simply asking, how is your vision? Questions specifically designed to gauge the effect on activities of daily living and, thus, determine whether ophthalmic consultation is indicated include the following: Do you see well enough to safely drive at night? Are you able to easily read the print on your medication bottles?

The types of cataracts mentioned previously vary in how they present because of the different ways in which the opacities effect light transmission through the lens.

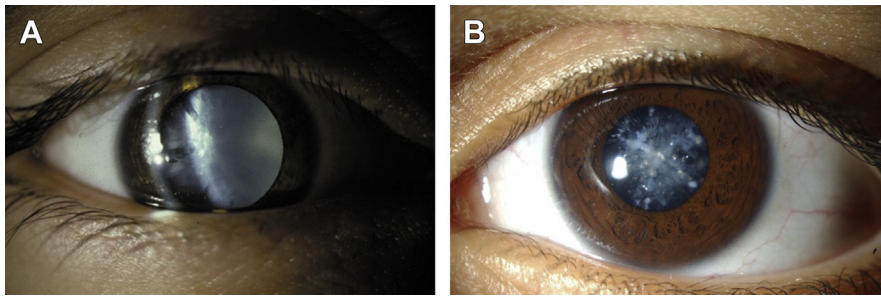

Fig. 3. Cataracts caused by various conditions. (*A*) Advanced diabetic cortical cataract. (*B*) Radiation cataract.

Nuclear sclerotic cataracts, with their yellowing and hardening of the central lens and resulting myopic shift, often present with diminished distance vision but few problems with near acuity. Patients may complain about difficulty seeing road signs or following a golf ball but have no problem reading a newspaper. Cortical cataracts, caused by the spoking of the peripheral lens, are more problematic in low light when the pupil naturally dilates to let more light in and involves the peripheral opacified lens in focusing light. This cataract commonly results in complaints of glare, especially when driving at night. PSC cataracts, caused by the opacity being central, are most bothersome in bright light or when the pupil is constricted, such as when reading because all focused light passes through the small pupillary opening and then the opacity immediately behind it. Symptoms tend to improve in low light when the pupil then dilates and light is able to pass around the cataract. Although this is a good rule of thumb, any visual complaint can be found with any type of cataract (**Fig. 4**).[12]

The most common complaints consistent with a worsening cataract are as follows:

- Blurred vision and/or glare, especially when driving at night
- Reduced visual acuity, contrast sensitivity, or color appreciation
- Increasing nearsightedness
- Monocular double vision or ghosting: seeing multiple images of one object

HISTORY

A thorough history is important when you have a patient who presents with symptoms of a cataract. The primary care physician's priority is to establish both the clinical suspicion for a cataract in light of a vision complaint and to determine a patient's suitability

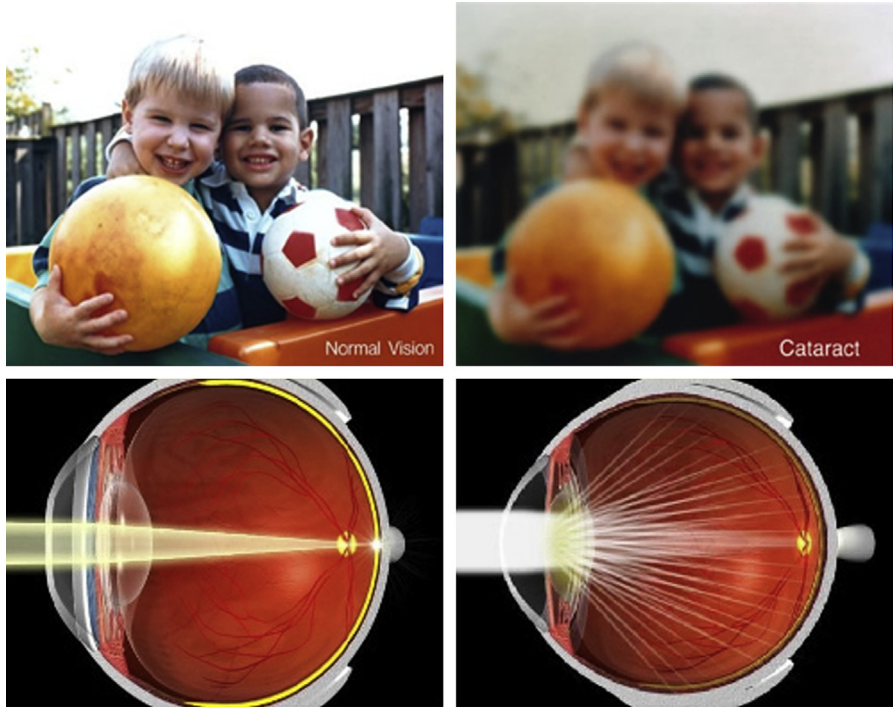

Fig. 4. Impact of cataracts on vision.

for surgery. Relevant aspects of a past medical history include previous eye conditions, previous ocular injuries or surgeries, concurrent ocular diseases, and genetic predispositions.

A history of medication use, specifically alpha-blocker use, such as tamsulosin hydrochloride (Flomax), is of critical importance for the primary care physician to pass onto the ophthalmologist as many patients do not know the medications they take. This class of medications can be very problematic during cataract surgery as they can cause intraoperative floppy iris syndrome (IFIS). This syndrome leads to a loss of tone of the iris causing progressive pupillary constriction during surgery resulting in iris trauma and inadequate visualization. As a result, complication rates are significantly higher in patients with IFIS. Unfortunately, stopping these medications before surgery does not necessarily lessen the chance of IFIS because of the permanent structural changes to the iris. However, the surgical technique can be adjusted to account for these changes as long as the ophthalmologist knows to expect them.[13]

Other conditions, such as obesity, alcohol consumption, smoking, hypertension, and known inflammatory markers, can all have an impact on the safety of and recovery from cataract surgery. The more relevant a history the primary care physician obtains, the more these factors can be taken into account to individualize a surgical plan and optimize the outcome.

WORKUP AND EVALUATION

In evaluating patients with visual complaints, the first step in evaluation by the primary care physician is the determination of visual acuity at both distance and near. Vision should be checked with the most current or best pair of glasses, and patients should be pushed to read the smallest line possible on the Snellen chart and near card. It should be noted that 20/20 or near-perfect vision does not preclude the presence of a cataract. Types of cataracts, specifically cortical, can present with a significant reduction in functional vision in glare situations (such as night driving); visual acuity testing alone will not reveal the full degree of visual disability.

If the primary physician is comfortable with a direct ophthalmoscope, it can be a very useful tool in both diagnosing a cataract and discerning other causes of the visual complaint. Depending on the comfort level of the primary physician, dilating the pupils (as long as no known history of narrow angles exists) with 2.5% phenylephrine and 1.0% tropicamide can greatly enhance the view of the lens. With the lens power set to zero, hold the ophthalmoscope approximately 12 inches from the eye. The reflection of light off of the retina will produce a bright red reflex. This reflex should be uniform in color and brightness. Any cataract change in the lens will show up as a dark spot against the red reflex.[12] Specifically, PSC and cortical cataracts are most readily discernable by this method (**Figs. 5** and **6**). Next, the ophthalmoscope should be used to evaluate the optic nerve and fundus, much easier if the pupils are dilated, for any retinal conditions that could also explain the vision complaints. The presence of any drusen, scarring, or hemorrhages should be noted.

A thorough eye examination by the primary care physician should include the following:

- Distance and near visual acuity with by Snellen letter, Tumbling E, or picture charts WITH newest or best glasses
- The external eyes for trauma or deformity
- Extraocular muscle movements
- The presence of an afferent papillary defect

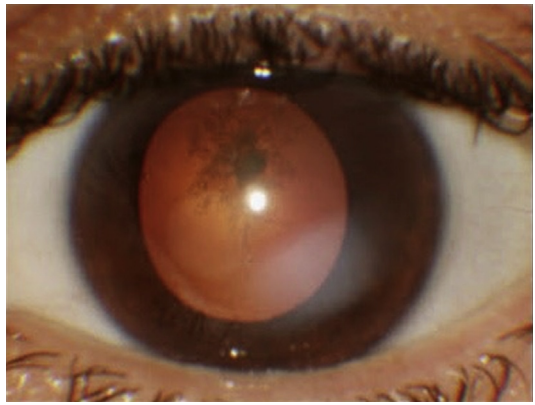

Fig. 5. PSC cataract retroillumination.

- Red reflex bilaterally
- Optic nerve and disk with the ophthalmoscope
- Ability to fixate on and follow or reach for moving object in preverbal patients

If the suspicion of a cataract exists, based on history, demographics, and/or examination findings a referral to ophthalmology should be made for further evaluation and management.

The lens is best examined with a dilated pupil by an ophthalmologist. **Table 1** includes diagnostic methods used by the ophthalmologist to evaluate cataracts.

MANAGEMENT AND TREATMENT

Nonsurgical Management of the Cataract

Although cataracts are ultimately a surgical condition, there are several nonsurgical treatment options that may be temporarily effective in optimizing visual function. First,

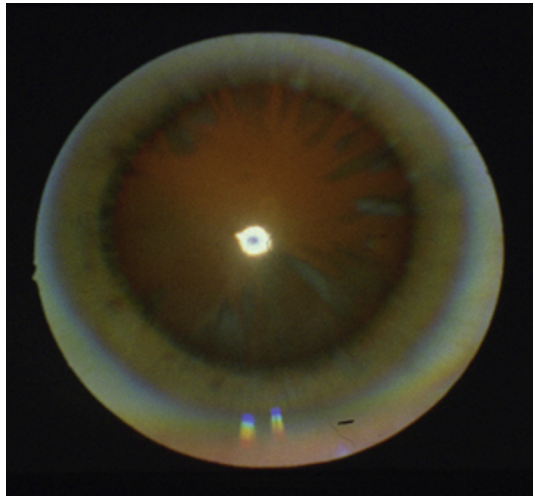

Fig. 6. Cortical cataract retroillumination.

Table 1
Ophthalmologic diagnostic modalities

Slit lamp	A biomicroscope, used to visually examine the eye; used to detect the type and severity of cataract opacity within lens
Potential acuity meter or laser interferometer	Used to assess potential visual acuity with removal of cataract if other forms of ocular pathology exist
B-scan ultrasound	Used to detect retinal detachment or tumors if a cataract is so dense that it prevents retinal examination
Glare testing and contrast sensitivity testing	Used to quantitatively assess functional impact of glare or loss of contrast in cataracts

vision can often by improved with a careful refraction and a new pair of glasses for distance and near vision. For specific complaints of difficulty reading, increasing ambient lighting or increasing the power of the bifocal portion of the glasses can help. Although research is ongoing, there is currently no medical treatment to definitively treat or reverse cataract formation.

Surgical Management of Cataracts

The primary indication for cataract surgery is the patients' desire for improved visual function and the likelihood that cataract surgery will help them achieve that goal. The decision to proceed is not based on a specific level of acuity but on when patients and the physician determine that the diminished acuity from the cataracts interferes with daily activities.

Indications for Surgery

- Improve vision and overall functionality
- Address medical indications (eg, phacomorphic glaucoma)
- Facilitate management of fundus disease (eg, diabetic retinopathy) when posterior view is too poor to adequately diagnose and follow

Cost-effectiveness of Cataract Surgery

In the United States, each year, almost 1.5 million people have cataract surgery at a total estimated cost of $3.4 billion. However, the cost of not treating a cataract is much greater because of the effects of cataract-related vision loss on the ability to work and to function independently. Therefore, the optimal management of a cataract that is symptomatic and limiting to functionality is surgical removal.

Despite the large amount of money spent annually on cataract surgery, the quality-of-life gain is tremendous. One evaluation showed that monocular cataract surgery conferred a gain of 1.62 quality-adjusted life-years (QALYs), whereas bilateral cataract surgery conferred more than 2.8 QALYs of benefit.[5] Another student demonstrated that initial cataract surgery yielded an extraordinary 4567% financial return on investment to society over the 13-year model. This finding is even more reassuring given other data that cataract surgery is 34.4% less expensive than in 2000 and 85.0% less expensive than in 1985. However, for most ocular interventions, patient value gain occurs primarily because of improvement in quality of life. Cataract surgery in the first eye confers a 20.8% quality-of-life gain, more than double the 6.3% to 9.1% patient value gain in quality of life and length of life conferred by b-adrenergic blockers for the treatment of systemic arterial hypertension.[7]

Preoperative Assessment

A Cochrane review showed that routine preoperative testing does not increase the safety of cataract surgery. The analysis included 3 studies with a sufficient sample size and statistical power to investigate this claim. Reviews of the literature and practice guidelines found that commonly performed preoperative laboratory tests in adults preparing for elective surgeries have generally low predictive value. Before the conduct of this review, surveys of ophthalmologists in the United States and Canada in 1992 indicated that among ophthalmologists, ordering preoperative screening tests was common and that these tests were often ordered despite a lack of belief in their clinical value. Tests were sometimes ordered in the belief that other physicians required the test results or based on medicolegal concerns.

This review reported results for 21,531 total cataract surgeries. Among those, there were 707 total medical adverse events associated with cataract surgeries, including 61 hospitalizations and 3 deaths. Of the 707 medical adverse events reported, 353 occurred in the pretesting group and 354 occurred in the no-testing group. Most events were cardiovascular and occurred during the intraoperative period. Preoperative medical testing did not reduce the rate of intraoperative (odds ratio [OR] 1.02, 95% confidence interval [CI] 0.85–1.22) or postoperative medical adverse events (OR 0.96, 95% CI 0.74–1.24) compared with selective or no testing. Alternatives to routine preoperative medical testing have been proposed, including self-administered health questionnaires. Such avenues may lead to cost-effective means of identifying those at an increased risk of medical adverse events caused by cataract surgery. However, despite the rare occurrence, adverse medical events precipitated by cataract surgery remain a concern because of the multiple medical comorbidities among the age demographic of cataract surgery patients. The studies summarized in this review should assist recommendations for the standard of care of cataract surgery, at least in developed settings.

Currently, the Centers for Medicare and Medicaid Services, which covers most cataract surgeries in the United States, covers preoperative services that assess a beneficiary's fitness for surgery.[14] Although such services are covered, the American Academy of Ophthalmology's practice guidelines recommend testing on indication rather than routine preoperative medical testing.[15] In the United Kingdom, the Royal College of Ophthalmologists' guidelines[16] and National Health Service do not recommend routine preoperative medical testing (ie, blood tests and electrocardiograms) before cataract surgery. Similarly, the American Heart Association recommends against routine testing in patients undergoing low-risk procedures, such as cataract surgery.[17] Thus, although cataract surgery carries very low risks and routine testing is not recommended, preoperative medical evaluation by the primary care physician to determine overall fitness for the procedure is commonly sought based on known comorbidities. Contraindications to surgery include uncontrolled hypertension, hyperglycemia, unstable heart disease, systemic infections, or any respiratory issues. Patients with a variety of complex medical conditions can have cataract surgery performed as long as those conditions are stable. The primary care physician will often be asked to consult with the ophthalmologist and anesthesiologist before surgery if there are any concerns.

In general, patients taking aspirin or other anticoagulant drugs do not need to change their regimen before undergoing cataract extraction as there is generally no bleeding and minimal risk of any. Despite this, measures of control, such as the international normalized ratio, should be within the therapeutic range. However,

retrobulbar and peribulbar anesthesia should be avoided in patients on anticoagulants. The surgeon should also be aware of other drugs patients may be taking, specifically tamsulosin hydrochloride (Flomax) and other alpha-1 antagonists.

Cataract Surgery

Before the surgery

Before cataract surgery, patients undergo a comprehensive ophthalmologic examination, including measurement of refraction, measurement of intraocular pressure, slit lamp examination, and examination of the retinal fundus with the pupils dilated. Other causes of impaired vision must be ruled out or taken into account, such as glaucoma, age-related macular degeneration, diabetic retinopathy, or optic nerve pathology. Glare effect can be measured by determining visual acuity under conditions of increased ambient lighting, which can greatly exacerbate cataract symptoms. In patients with coexisting eye problems, such as age-related macular degeneration, special testing and clinical judgment are needed to assess the potential value of cataract surgery.

Anesthesia for cataract surgery

Nearly all cataract operations in the United States are performed with light sedation along with a topical anesthesia. This technique is currently the most time-efficient and cost-efficient method. Retrobulbar and peribulbar injections have become less common because of a longer visual recovery and a higher risk of serious complications. Also, topical anesthesia does not affect vision and does not cause akinesia (temporary paralysis) of the eye, so many patients have useful and improved vision almost immediately after surgery. Some ophthalmologists are even eliminating intravenous sedation and are just using a small amount of oral sedation along with topical anesthesia. General anesthesia may be appropriate in patients who cannot cooperate because of advanced age, poor mental status, or severe claustrophobia. It is the extensive history provided by the primary care physician that is instrumental in determining the optimum anesthesia technique for each case.

Current surgical techniques

The 3 main techniques for cataract extraction today are intracapsular extraction, extracapsular extraction, and phacoemulsification. More than 99% of cataract surgeries in the United States are done with phacoemulsification.

Intracapsular cataract extraction

Intracapsular cataract extraction is the removal of the entire lens including the capsule, after which patients must wear special (ie, aphakic) eyeglasses because no IOL is implanted. This procedure is no longer used in developed countries except in rare cases, such as a partly dislocated lens. It has a high rate of intraoperative and postoperative complications, and the need for thick glasses or contacts makes it much less desirable.

Extracapsular cataract extraction

Extracapsular cataract extraction involves removing the opacified lens as a whole but leaving the capsule of the lens and its zonular attachments intact. The capsular bag then provides a scaffold for implantation of a synthetic lens. Although this method does allow implantation of an IOL, it requires a large incision at the corneal-scleral junction requiring sutures for closure and a longer recovery. Complication rates are also much higher than with phacoemulsification. This procedure is used for very mature cataracts that are too dense for phacoemulsification.

Phacoemulsification

Phacoemulsification is currently the most commonly used procedure for cataract extraction in the United States. This procedure is a less invasive version of extracapsular cataract extraction, developed by Charles Kelman in 1967, in which the lens nucleus is emulsified within its capsule using an ultrasonic probe inserted through a small (1.8–3.0 mm) incision. When constructed properly, the small wound size is self-sealing and precludes the need for a suture to close it. The advantages of phacoemulsification compared with regular extracapsular extraction are that the incision is smaller; the rates of intraoperative complications, such as vitreous loss and iris prolapse, are lower; the procedure time is shorter; and the time to visual recovery is faster. As with the other extracapsular approach, the capsular bag is maintained, allowing for easy placement of a synthetic lens implant (**Fig. 7**). Despite the rapid healing and rare complications of phacoemulsification, the eyes are generally operated on separately and done 1 to 4 weeks apart.

Postoperative Care

In uneventful phacoemulsification, the patients' vision will often return to normal within a few days. In order to speed visual recovery and prevent complications, patients are usually placed on a combination of drops after surgery. The most common regimen is an antibiotic, a steroid, and a nonsteroidal antiinflammatory drug. These medications are usually used for 3 to 6 weeks postoperatively. In addition, optimal recovery is achieved with a limitation of strenuous activity for a week or so. Activities such as weight lifting, heavy yard work, or impact sports are avoided. Because no sutures are placed, patients are also advised to avoid rubbing the eye and a plastic shield is often placed over the eye when sleeping to avoid inadvertent contact. If needed, a new glasses prescription can be given to patients in 1 to 3 weeks after both eyes are done.

Intraocular lenses

Once the cataract has been removed from the eye, there is the resulting loss of the focusing power (albeit blurry) that the cataractous lens provided. As a result, nearly

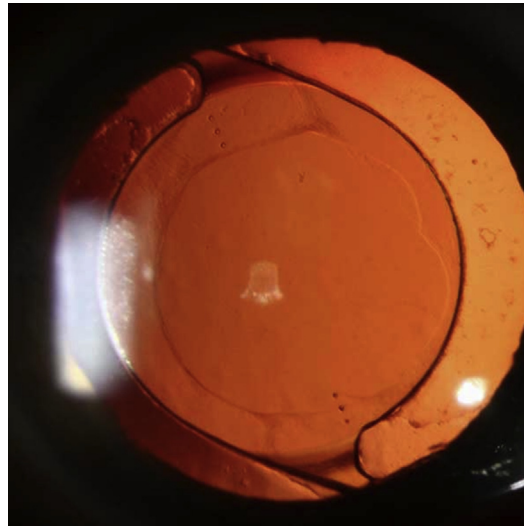

Fig. 7. Retroillumination of IOL after cataract surgery.

all modern cataract surgery involves the placement of an IOL during surgery, which replaces the natural lens and restores focusing power to the eye. These IOLs have evolved significantly since Dr Ridley first developed them. Some of the greatest advances in cataract surgery over the last decade have been in the types of IOLs that can be implanted (Fig. 8). Although a variety of IOL designs exist, they can be divided into three categories: monofocal, toric, and multifocal/pseudo-accomdative.[18] The types of IOLs are summarized in Table 2.

Because cataract surgery is only done one time, the determination of which type of IOL to implant is an important one. This decision is made by the surgeon and the patients together. Factors that play into this decision are the desired level of spectacle independence, amount of preexisting astigmatism, budget, and preexisting ocular comorbidities that may have an impact on final best-corrected vision after surgery.

PREVENTION

Prevention of cataracts primarily involves reducing risks. Significant research continues to be done on ways to slow the progression of cataracts. It is known that oxidative stress plays a large role on the cellular level in the formation cataracts. However, a large randomized study found that supplementation with vitamins C and E and beta-carotene had no impact on cataract formation.[19,20] Similar studies looking at aspirin, lutein, zeaxanthin, and glutathione found that they did not have any effect on slowing cataract formation either.[21] Although it is known that these antioxidant supplements have benefits to other systems, there are currently no data suggesting that their use should be predicated on a desire to prevent cataracts. However, research is ongoing.

More relevant to preventing cataracts is what exposures can be reduced. There is a well-established link between oral, topical, and ocular corticosteroid use and the development of PSC cataracts. The link between inhaled corticosteroids and PSC development is less certain.[22] Although cataracts are a correctable side effect of these medications, reducing the dose, duration, and strength can slow their development

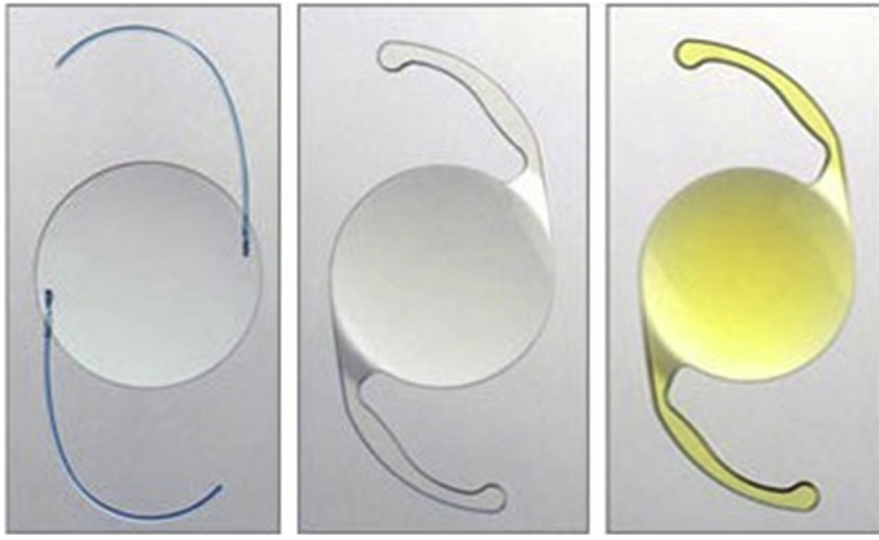

Fig. 8. Examples of IOLs.

Table 2 Types of IOLs	
Monofocal IOL	It is one focal length, usually targeting distance vision. Patients often still need reading glasses or bifocals for near activities. This type is the only type of IOL that insurance companies will reimburse for.
Toric IOL	It is astigmatism correcting. It can reduce/eliminate varying levels of preexisting corneal astigmatism reducing dependence on glasses or contacts after surgery for distance activities. It is not considered medically necessary and, therefore, not covered by insurance.
Multifocal and pseudoaccommodative IOLs	These IOLs are designed to minimize dependence of glasses after surgery at a variety of focal lengths by providing both distance and near vision. They do not correct astigmatism. They are not considered medically necessary and, therefore, not covered by insurance. They may have increased side effects, such as glare, haloes, and loss of contrast.

precluding the need for surgery, especially in younger patients. UV light has also been a well-established contributor to cataract development. There is evidence that reducing cumulative lifelong exposure to UV-B light can reduce cataract development, which is most easily achieved by wearing a hat and sunglasses with UV-B protection.[23] Smoking has been linked as a risk factor for the development of nuclear cataracts.[24] The Physicians' Health Study I showed, based on the first 5 years of follow-up, that current smokers of 20 or more cigarettes per day, compared with never smokers, had a 2-fold increased risk of cataract. Past smokers had a 15% increased risk of cataract development that was not found to be statistically significant.[25]

There are lifestyle factors that have been linked to decreased cataract formation. Increased physical activity, lower body mass index, and increased cardiorespiratory fitness have been found to have a preventative effect on cataract formation in men.[26] Among postmenopausal women, there is evidence that estrogen may play a protective role in reducing the incidence of age-related cataracts.[27]

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