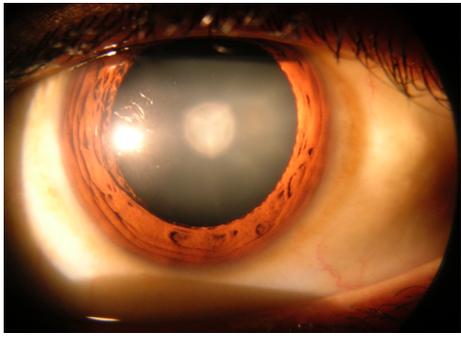


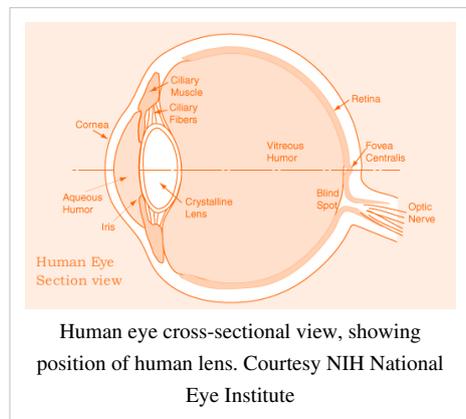
Cataract

Cataract	
<i>Classification and external resources</i>	
	
Magnified view of cataract in human eye, seen on examination with a slit lamp using diffuse illumination	
ICD-10	H 25. ^[1] -H 26. ^[2] , H 28. ^[3] , Q 12.0 ^[4]
ICD-9	366 ^[5]
DiseasesDB	2179 ^[6]
MedlinePlus	001001 ^[7]

A **cataract** is a clouding that develops in the crystalline lens of the eye or in its envelope, varying in degree from slight to complete opacity and obstructing the passage of light. Early in the development of age-related cataract the power of the lens may be increased, causing near-sightedness (myopia), and the gradual yellowing and opacification of the lens may reduce the perception of blue colours. Cataracts typically progress slowly to cause vision loss and are potentially blinding if untreated. The condition usually affects both the eyes, but almost always one eye is affected earlier than the other.^[8]

A **senile cataract**, occurring in the elderly, is characterized by an initial opacity in the lens, subsequent swelling of the lens and final shrinkage with complete loss of transparency.^[9] Moreover, with time the cataract cortex liquefies to form a milky white fluid in a **Morgagnian cataract**, which can cause severe inflammation if the lens capsule ruptures and leaks. Untreated, the cataract can cause phacomorphic glaucoma. Very advanced cataracts with weak zonules are liable to dislocation anteriorly or posteriorly. Such spontaneous posterior dislocations (akin to the historical surgical procedure of couching) in ancient times were regarded as a blessing from the heavens, because some perception of light was restored in the cataractous patients.

Cataract derives from the Latin *cataracta* meaning "waterfall" and the Greek *kataraktes* and *katarrhaktes*, from *katarassein* meaning "to dash down" (*kata-*, "down"; *arassein*, "to strike, dash").^[10] As rapidly running water turns white, the term may later have been used metaphorically to describe the similar appearance of mature ocular opacities. In Latin, *cataracta* had the alternate meaning "portcullis",^[11] so it is also possible that the name came about through the sense of "obstruction". Early Persian physicians called the term *nazul-i-ah*, or "descent of the water"—vulgarised into waterfall disease or cataract—believing such blindness to be caused by an outpouring of



corrupt humour into the eye.^[12] In dialect English a cataract is called a *pearl*, as in "pearl eye" and "pearl-eyed".^[13]

Epidemiology

Age-related cataract is responsible for 48% of world blindness, which represents about 18 million people, according to the World Health Organization (WHO).^[15] In many countries surgical services are inadequate, and cataracts remain the leading cause of blindness. As populations age, the number of people with cataracts is growing. Cataracts are also an important cause of low vision in both developed and developing countries. Even where surgical services are available, low vision associated with cataracts may still be prevalent, as a result of long waits for operations and barriers to surgical uptake, such as cost, lack of information and transportation problems.

In the United States, age-related lenticular changes have been reported in 42% of those between the ages of 52 to 64,^[16] 60% of those between the ages 65 and 74,^[17] and 91% of those between the ages of 75 and 85.^[16]

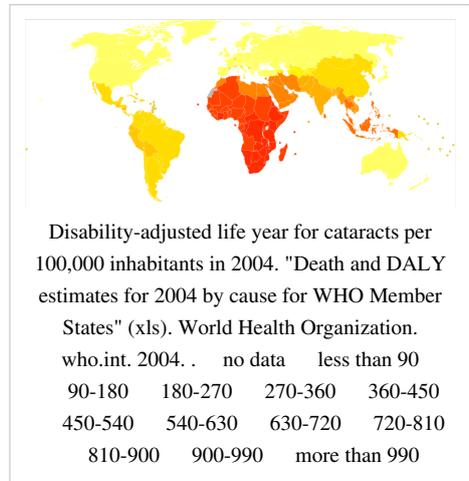
The increase in ultraviolet radiation resulting from depletion of the ozone layer is expected to increase the incidence of cataracts.^[18]

History

The earliest records are from the Bible as well as early Hindu records.^[19] Early cataract surgery was developed by the Indian surgeon, Sushruta (6th century BCE).^[20] The Indian tradition of cataract surgery was performed with a special tool called the *Jabamukhi Salaka*, a curved needle used to loosen the lens and push the cataract out of the field of vision.^[20] The eye would later be soaked with warm butter and then bandaged.^[20] Though this method was successful, Sushruta cautioned that it should only be used when necessary.^[20] Greek physicians and philosophers traveled to India where these surgeries were performed by physicians.^[20] The removal of cataract by surgery was also introduced into China from India.^[21]

The first references to cataract and its treatment in Ancient Rome are found in 29 CE in *De Medicinæ*, the work of the Latin encyclopedist Aulus Cornelius Celsus.^[22] The Romans were pioneers in the health arena—particularly in the area of eye care.^[23]

The Iraqi ophthalmologist Ammar ibn Ali of Mosul performed the first extraction of cataracts through suction. He invented a hollow metallic syringe hypodermic needle, which he applied through the sclerotic and extracted the cataracts using suction.^[24] In his *Choice of Eye Diseases*, written circa 1000 CE, he wrote of his invention of the hypodermic needle and how he discovered the technique of cataract extraction while experimenting with it on a patient.^[25]



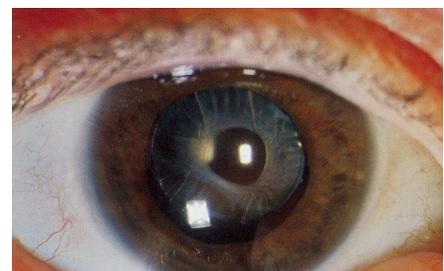
Classification

The following is a classification of the various types of cataracts. This is not comprehensive and other unusual types may be noted.

- Classified by etiology
 - Age-related cataract
 - Cortical Senile Cataract
 - Immature senile cataract (IMSC): partially opaque lens, disc view hazy
 - Mature senile cataract (MSC): Completely opaque lens, no disc view
 - Hypermature senile cataract (HMSC): Liquefied cortical matter: **Morgagnian cataract**
 - Senile Nuclear Cataract
 - Cataracta brunescens
 - cataracta nigra
 - cataracta rubra
 - Congenital cataract
 - Sutural cataract
 - Lamellar cataract
 - Zonular cataract
 - Total cataract
 - Secondary cataract
 - Drug-induced cataract (e.g. corticosteroids)
 - Traumatic cataract
 - Blunt trauma (capsule usually intact)
 - Penetrating trauma (capsular rupture & leakage of lens material—calls for an emergency surgery for extraction of lens and leaked material to minimize further damage)
- Classified by opacities, cataract can be classified by using Lens Opacities Classification System III (LOCS III: Nuclear NC1-5, Cortical C1-5 and Posterior P1-5. By application planning in procedures of phacoemulsification, LCOS III can be converted in newer cataract grading system. Gede Pardianto (2009) introduced Optical Biometry Based Cataract Grading System (OBBCGS) that so helpful in cataract grading due to phacoemulsification planning. LOCS III's NC0, C0 and P0 can be converted as OBBCGS' No cataract (NC), LOCS III's NC1-3, C1-3, P1-4 can be converted to OBBCGS' Optical Biometry Examined Cataract (OBEC) and LOCS III's NC4-5, C4-5, P4-5 can be converted to OBBCGS's Optical Biometry Un-examined Cataract (OBUC); that need examination by Applanation Ultrasound Biometry.^[26]
- Classified by location of opacity within lens structure (However, mixed morphology is quite commonly seen, e.g. PSC with nuclear changes & cortical spokes of cataract)
 - Anterior cortical cataract
 - Anterior polar cataract
 - Anterior subcapsular cataract

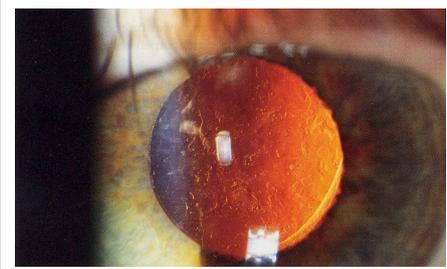


Bilateral cataracts in an infant due to Congenital rubella syndrome



Slit lamp photo of anterior capsular opacification visible a few months after implantation of Intraocular lens in eye, magnified view

- Nuclear cataract—Grading correlates with hardness & difficulty of surgical removal
 - 1: Grey
 - 2: Yellow
 - 3: Amber
 - 4: Brown/Black (Note: "black cataract" translated in some languages (like Hindi) refers to glaucoma, not the color of the lens nucleus)
- Posterior cortical cataract
- Posterior polar cataract (importance lies in higher risk of complication—posterior capsular tears during surgery)
- Posterior subcapsular cataract (PSC) (clinically common)
- After-cataract: posterior capsular opacification (PCO) subsequent to a successful extracapsular cataract surgery (usually within three months to two years) with or without IOL implantation. Requires a quick & painless office procedure with Nd:YAG laser capsulotomy to restore optical clarity.



Slit lamp photo of posterior capsular opacification visible a few months after implantation of Intraocular lens in eye, seen on retroillumination

Signs and symptoms

As a cataract becomes more opaque, clear vision is compromised. A loss of visual acuity is noted. Contrast sensitivity is also lost, so that contours, shadows and color vision are less vivid. Veiling glare can be a problem as light is scattered by the cataract into the eye. The affected eye will have an absent red reflex. A contrast sensitivity test should be performed and if a loss in contrast sensitivity is demonstrated an eye specialist consultation is recommended.

In the developed world, particularly in high-risk groups such as diabetics, it may be advisable to seek medical opinion if a 'halo' is observed around street lights at night, especially if this phenomenon appears to be confined to one eye only.

The symptoms of cataracts are very similar to the symptoms of ocular citrosis.

Causes

Cataracts develop for a variety of reasons, including long-term exposure to ultraviolet light, exposure to radiation, secondary effects of diseases such as diabetes, hypertension and advanced age, or trauma (possibly much earlier); they are usually a result of denaturation of lens protein. Genetic factors are often a cause of congenital cataracts and positive family history may also play a role in predisposing someone to cataracts at an earlier age, a phenomenon of "anticipation" in pre-senile cataracts. Cataracts may also be produced by eye injury or physical trauma. A study among Icelandic pilots showed commercial airline pilots are three times more likely to develop cataracts than people with non-flying jobs. This is thought to be caused by excessive exposure to radiation coming from outer space.^[27] Cataracts are also unusually common in persons exposed to infrared radiation, such as glassblowers who suffer from "exfoliation syndrome". Exposure to microwave radiation can cause cataracts. Atopic or allergic conditions are also known to quicken the progression of cataracts, especially in children.^[28]

Cataracts may be partial or complete, stationary or progressive, hard or soft.

Some drugs can induce cataract development, such as corticosteroids^[29] and Seroquel.

There are various types of cataracts, e.g. nuclear, cortical, mature, and hypermature. Cataracts are also classified by their location, e.g. posterior (classically due to steroid use^[29] ^[30]) and anterior (common (senile) cataract related to aging).

Associations with systemic conditions

- Chromosomal disorders
 - Alport's syndrome
 - Cri-du-chat syndrome
 - Conradi's syndrome
 - Myotonic dystrophy
 - Patau's syndrome
 - Schmid-Fraccaro syndrome
 - Trisomy 18 (Edward's syndrome)
 - Turner's syndrome
 - Disease of the skin and mucous membranes
 - Atopic dermatitis
 - Basal-cell nevus syndrome
 - Ichthyosis
 - Pemphigus
 - Metabolic and nutrition diseases
 - Aminoaciduria (Lowe's syndrome)
 - Diabetes mellitus
 - Fabry's disease
 - Galactosemia / galactosemic cataract
 - Homocystinuria
 - Hyperparathyroidism
 - Hypervitaminosis D
 - Hypothyroidism
 - Mucopolysaccharidoses
 - Wilson's disease
 - Infectious diseases
 - Congenital
 - Congenital herpes simplex
 - Congenital syphilis
 - Cytomegalic inclusion disease
 - Rubella
 - Others
 - Cysticercosis
 - Leprosy
 - Onchocerciasis
 - Toxoplasmosis
 - Toxic substances introduced systemically
 - Corticosteroids
 - Haloperidol
 - Miotics
 - Triparanol
-

Prevention

Although cataracts have no scientifically proven prevention, it is sometimes said that wearing ultraviolet-protecting sunglasses may slow the development of cataracts.^{[31] [32]} Regular intake of antioxidants (such as vitamin A, C and E) is theoretically helpful, but taking them as a supplement has been shown to have no benefit.^[33] The less well known antioxidant N-acetylcarnosine has been shown in randomized controlled clinical trials to treat cataracts, and can be expected to prevent their formation by similar mechanisms.^[34] N-acetylcarnosine is a proposed treatment for other ocular disorders that are instigated, or exacerbated by oxidative stress including glaucoma, retinal degeneration, corneal disorders, and ocular inflammation.^[35]

Treatment

When a cataract is sufficiently developed to be removed by surgery, the most effective and common treatment is to make an incision (*capsulotomy*) into the capsule of the cloudy lens in order to surgically remove the lens. There are two types of eye surgery that can be used to remove cataracts: extra-capsular (extracapsular cataract extraction, or ECCE) and intra-capsular (intracapsular cataract extraction, or ICCE).

Extra-capsular (ECCE) surgery consists of removing the lens but leaving the majority of the lens capsule intact. High frequency sound waves (phacoemulsification) are sometimes used to break up the lens before extraction.

Intra-capsular (ICCE) surgery involves removing the entire lens of the eye, including the lens capsule, but it is rarely performed in modern practice.

In either extra-capsular surgery or intra-capsular surgery, the cataractous lens is removed and replaced with a plastic lens (an intraocular lens implant) which stays in the eye permanently.

Cataract operations are usually performed using a local anaesthetic and the patient is allowed to go home the same day. Recent improvements in intraocular technology now allow cataract patients to choose a multifocal lens to create a visual environment in which they are less dependent on glasses. Under some medical systems multifocal lenses cost extra. Traditional intraocular lenses are monofocal.

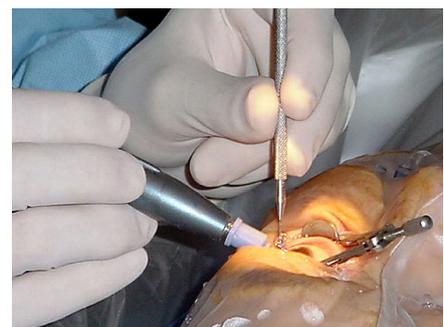
Complications are possible after cataract surgery, including endophthalmitis, posterior capsular opacification and retinal detachment.

Research

Research is scant and mixed but weakly positive for the nutrients lutein and zeaxanthin.^{[36] [37] [38] [39]} Bilberry extract shows promise in rat models^{[40] [41]} and in clinical studies.^[42]

Investigational Treatments

In the past few years, eye drops containing acetyl-carnosine have been used by several thousands cataract patients across the world. The drops are believed to work by reducing oxidation and glycation damage in the lens, particularly reducing crystallin cross-linking.^{[43] [44]} Randomized controlled trials indicate the drops may be especially appropriate for seniors, or others where surgery is not advised.^[45]



Cataract surgery, using a temporal approach phacoemulsification probe (in right hand) and "chopper" (in left hand) being done under operating microscope at a Navy medical center

Investigational preventives

Although statins are known for their ability to lower lipids, they are also believed to have antioxidant qualities. It is believed that oxidative stress plays a role in the development of nuclear cataracts, which are the most common type of age-related cataract. To explore the relationship between nuclear cataracts and statin use, a group of researchers took a group of 1299 patients who were at risk of developing nuclear cataracts and gave some of them statins. Their results suggest that statin use in an at-risk population may be associated with a lower risk of developing nuclear cataract disease.^[46]

See also

- List of eye diseases
- List of eye diseases and disorders
- List of systemic diseases with ocular manifestations

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- [3] <http://apps.who.int/classifications/apps/icd/icd10online/?gh25.htm+h28>
- [4] <http://apps.who.int/classifications/apps/icd/icd10online/?gq12.htm+q120>
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External links

- Cataract (http://www.nei.nih.gov/health/ataract/ataract_facts.asp) Resource Guide from the National Eye Institute (NEI), [nei.nih.gov](http://www.nei.nih.gov)
- eMedicine Health (<http://www.emedicinehealth.com/articles/14319-1.asp>), [emedicinehealth.com](http://www.emedicinehealth.com)
- The Childhood Cataract Network (<http://www.childhoodcataracts.org.uk>), [childhoodcataracts.org.uk](http://www.childhoodcataracts.org.uk)
- Pediatric Glaucoma and Cataract Family Association (<http://www.pgcf.org>), [pgcf.org](http://www.pgcf.org)
- Online Eye Info (<http://www.online-eye-info.com/ataract-definition.html>)

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