

FIGURE 3-9 Glaucomatous optic atrophy.

Optic nerve cupping is increased vertically, with a cup–disc ratio of 0.8. Cupping is apparent at the point where the vessels disappear over the edge of the attenuated rim.

Management or Referral

Table 3-1 provides a convenient method of analyzing a patient's level of glaucoma risk. A moderate or high level of glaucoma risk warrants a nonurgent referral to an ophthalmologist for further evaluation. In addition, any patient who has 1 or more of the following conditions should be referred to an ophthalmologist:

- symptoms of acute glaucoma (Refer urgently; also see Fig 4-10.)
- an optic cup diameter one-half or more of the disc diameter (ie, a cup–disc ratio of 0.5 or greater)
- cup–disc asymmetry of more than 0.1 between the 2 optic nerves (eg, right eye 0.4, left eye 0.2)

For a discussion of systemic side effects of topically administered drugs used in the treatment of glaucoma, see Chapter 10.

Cataract

Cataract may occur as a congenital or genetic anomaly, as a result of various diseases, or with increasing age. Some degree of cataract formation is to be expected in all people over age 70. Cataract is the most common cause of decreased vision (not correctable with glasses) in the United States. However, it is one of the most successfully treated conditions in all of surgery. Approximately 2 million cataract extractions are done each year in the United States, usually with implantation of an intraocular lens. If an implant is not used, visual rehabilitation is still possible with a contact lens or thick (aphakic) eyeglasses. If cataract surgery is considered, it is important to be certain that the degree of vision loss is explained fully by the cataract. If another ocular condition such as glaucoma, macular degeneration, or diabetic retinopathy is also present, assessment of the visual significance of the cataract is more difficult and the patient must understand prior to surgery the

potential for limited visual improvement. Sometimes cataract surgery is performed to facilitate diagnosis or treatment of other ocular diseases.

Overview

This section provides an overview of the lens as well as cataracts and their symptoms.

Lens

The crystalline lens focuses a clear image on the retina. The lens is suspended by thin filamentous zonules from the ciliary body between the iris anteriorly and the vitreous humor posteriorly. Contraction of the ciliary muscle permits focusing of the lens. The lens is enclosed in a capsule of transparent elastic basement membrane. The capsule encloses the cortex and the nucleus of the lens as well as a single anterior layer of cuboidal epithelium. The lens has no innervation or blood supply. Nourishment comes from the aqueous fluid and the vitreous.

The normal lens continues to grow throughout life. The epithelial cells continue to produce new cortical lens fibers, yielding a slow increase in size, weight, and density over the years. The normal lens consists of 35% protein by mass. The percentage of insoluble protein increases as the lens ages and as a cataract develops.

Cataracts

A cataract is any opacity or discoloration of the lens, whether a small, local opacity or the complete loss of transparency. Clinically, the term *cataract* is usually reserved for opacities that affect visual acuity, because many normal lenses have small, visually insignificant opacities.

A cataract is described in terms of the zones of the lens involved in the opacity. These zones of opacity may be subcapsular, cortical, or nuclear and may be anterior or posterior in location. In addition to opacification of the nucleus and cortex, there may be a yellow or amber color change to the lens. A cataract also can be described in terms of its stage of development. A cataract with a clear cortex remaining is immature. A mature cataract (Fig 3-10) has a totally opacified cortex.



FIGURE 3-10 Mature cataract. A cataract is called mature when the lens is totally opacified. A red reflex cannot be obtained; the pupil appears white. The radial spokes in this figure reflect variations in density of the radially arranged fibers in the cortical layers of the lens. Light still reaching the retina is totally diffused and will allow the perception of light but not form.

The most common cause of cataract is age-related change. Other causative factors include trauma, inflammation, metabolic and nutritional defects, and the effects of corticosteroids. Cataracts may develop very slowly over years or may progress rapidly, depending on the cause and type of cataract.

Symptoms of cataract

Patients may first notice image blur as the lens loses its ability to resolve separate and distinct objects. Patients are first aware of a disturbance of vision, then a diminution, and finally a failure of vision. The degree of visual disability caused by a cataract depends on the size and location of the opacity. Axial opacities—affecting the nucleus or central subcapsular areas—cause much more disabling vision loss than do peripheral opacities.

Patients with nuclear sclerosis may develop increasing lenticular (ie, referring to the crystalline lens) myopia because of the increased refractive power of the denser nucleus. As the density and refractive properties of the lens change, patients often become progressively more myopic. Patients may find they can read without the glasses normally required, a phenomenon often called *second sight*. Patients may note monocular double or multiple images, due to irregular refraction within the lens. They frequently complain of “starbursts” around lights and difficulty with night driving. With yellowing of the lens nucleus, objects appear browner or yellower and color discrimination is more difficult.

Patients with posterior subcapsular cataracts (Fig 3-11) may note a relatively rapid decrease in vision, with glare as well as image blur and distortion. In contrast to nuclear

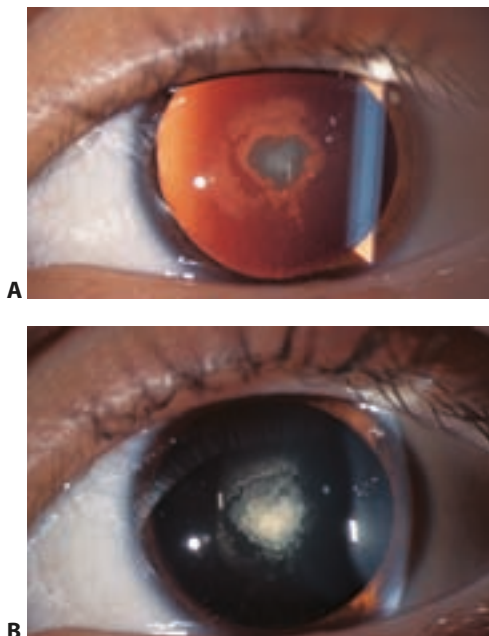


FIGURE 3-11 Posterior subcapsular cataract. **A**, The red reflex has a central dark shadow. **B**, Posterior subcapsular cataracts can be seen in younger patients and may be associated with chronic corticosteroid use. (Courtesy of Cynthia A. Bradford, MD.)

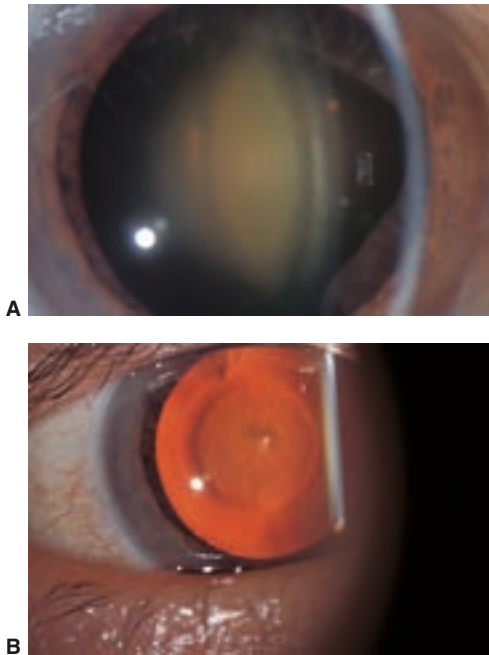


FIGURE 3-12 Nuclear cataract. **A**, Slit-lamp photograph of nuclear sclerotic cataract demonstrates the yellow coloration of the cataract and the central granular opacification. **B**, Red reflex photograph of the same cataract highlights the central distortion of the lens that results in the decreased visual acuity as well as the phenomenon of starbursts around lights. This can easily be seen with the direct ophthalmoscope if the pupil is dilated. (Courtesy of Cynthia A. Bradford, MD.)

cataracts (Fig 3-12), posterior subcapsular cataracts frequently affect near vision. This type of cataract may be associated with metabolic causes such as diabetes mellitus or corticosteroid use.

Over time, cataracts may lead to a generalized impairment of vision. The degree of visual disability often varies depending on lighting and tasks the patient needs to perform.

When to Examine

A patient with decreasing vision requires a complete examination to determine the cause of the visual decline. Evaluation of the visual significance of a cataract includes optic nerve and retinal evaluation to detect coexisting disease that could also affect the visual acuity. Special attention is given to the macula when a patient reports difficulty with near work or metamorphopsia (ie, a wavy distortion of central vision). In the presence of coexisting disease, the ophthalmologist may order special tests to better determine the contribution of the cataract to the decreased visual acuity.

If the lens is densely cataractous, the ophthalmoscope will not provide a view of the fundus through the opacity. In this situation, retinal and optic nerve pathology cannot be adequately assessed. For example, if the patient has diabetic retinopathy in the contralateral eye, there is increased risk for a portion of the vision loss in the eye with cataract to be related to diabetic retinopathy. Removal of the cataract would allow evaluation and possible treatment of the retinal pathology. The patient should understand the expected visual outcome of surgery.

How to Examine

The following examination methods are helpful in obtaining an accurate history of visual decline and determining whether vision loss is attributable to cataract, to some other cause, or to a combination of causes.

Visual acuity testing

The first step in any evaluation of visual decrease is the measurement of visual acuity. Refer to Chapter 1 for details.

Pupillary reaction testing

Chapter 7 describes how to perform a basic pupillary examination and provides details on the neurologic implications of pupillary responses. Even an advanced cataract would not produce a relative afferent pupillary defect.

Slit-lamp examination

The examination at the slit lamp provides a magnified view of the lens, aiding in the description of the type, severity, and location of the cataract. Assessment of the red reflex can also assist with identification of posterior subcapsular cataracts and other axial opacities. The integrity of the zonular support of the lens can also be determined by slit-lamp examination (Video 3-1).



VIDEO 3-1 Slit-Lamp Examination (03:17)

(Courtesy of Richard C. Allen, MD, PhD, FACS)



Ophthalmoscopy

Although it is difficult to accurately predict the effect of the cataract on the patient's visual acuity and function, the view of the fundus is usually obscured to some extent by very dense opacities, especially with the direct ophthalmoscope and slit-lamp biomicroscopy. Funduscopy examination is required to evaluate the macula and optic nerve for disease that could be contributing to the vision loss. If the cataract completely obscures the fundus view, ultrasonography may be required to evaluate the posterior segment of the eye.

How to Interpret the Findings

An early cataract is not visible to the unaided eye. If the cataract becomes very dense, it may appear as a white pupil, or leukocoria. The lens can be evaluated with the ophthalmoscope

using a plus-lens setting. The lens opacification with a partial cataract will appear black against the red reflex of the fundus. Generally, the denser the cataract, the poorer the red reflex and the worse the visual acuity. It is important not to assign vision loss to cataract before ensuring that other, more serious causes of vision loss have not been overlooked.

Management or Referral

The degree of visual disability should guide the primary care provider in the recommendation for treatment. Referral for cataract evaluation is nonurgent. A cataract can interfere with patients' activities of daily living by limiting their ability to drive safely, read, or participate in sports or other hobbies.

Patients with cataract-associated vision loss that negatively affects their daily living may choose to undergo a surgical procedure of cataract extraction with intraocular lens implantation. Multiple studies have demonstrated the association of cataract surgery with improved quality of life, reduced risk of falling, and fewer car crashes.

The operating surgeon should preoperatively examine all patients who are contemplating cataract surgery. A discussion with the surgeon of the risks, benefits, and alternatives to the surgery, as well as planning for postoperative care, is imperative.

Macular Degeneration

In the United States, age-related macular degeneration (AMD) is the leading cause of irreversible central vision loss (20/200 or worse) among people age 50 or older. Because certain types of macular degeneration can be effectively treated, it is important to recognize this entity and to refer for appropriate care.

Overview

This section introduces macular anatomy and macular changes due to aging.

Macular anatomy

The macula is situated between the temporal vascular arcades. The center of the macula, the fovea, is an oval area situated about 2 disc diameters temporal and slightly inferior to the optic disc. (See Fig 1-17 for a depiction of the normal fundus). The macula is composed of both rods and cones and is the area responsible for detailed, fine central vision. The fovea (Fig 3-13) is partly avascular and appears darker than the surrounding retina. The foveola is the pit-like depression in the center of the macula. Here, there is a high density of cones but no rods are present. The central depression of the fovea may act like a concave mirror during ophthalmoscopy, producing a light reflection (ie, foveal reflex).