National Academy of Opticianry

Continuing Education Course

Approved by the American Board of Opticianry

Ocular Anomalies and Diseases of the Human Eye

National Academy of Opticianry
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Revised and Updated 2019

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PREFACE:

This continuing education course was prepared under the auspices of the National Academy of Opticianry and is designed to be convenient, cost effective and practical for the Optician.

The skills and knowledge required to practice the profession of Opticianry will continue to change in the future as advances in technology are applied to the eye care specialty. Higher rates of obsolescence will result in an increased tempo of change was well as knowledge to meet these changes. The National Academy of Opticianry recognizes the need to provide a Continuing Education Program for all Opticians. This course has been developed as a part of the overall program to enable Opticians to develop and improve their technical knowledge and skills in their chosen profession.

The National Academy of Opticianry

INSTRUCTIONS:

Read and study the material. After you feel that you understand the material thoroughly take the test following the instructions given at the beginning of the test. Upon completion of the test, mail the answer sheet to the National Academy of Opticianry, 8401 Corporate Drive, Suite 605, Landover, Maryland 20785 or fax it to 301-577-3880. Be sure you complete the evaluation form on the answer sheet. Please allow two weeks for the grading and a reply.

CREDITS:

The American Board of Opticianry has approved this course for One (1) Continuing Education Credit toward certification renewal. To earn this credit, you must achieve a grade of 80% or higher on the test. The Academy will notify all test takers of their score and mail the credit certificate to those who pass. You must mail the appropriate section of the credit certificate to the ABO and/or your state licensing board to renew your certification/licensure. One portion is to be retained for your records.

AUTHOR:

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David F. Meldrum, LDO, ABOM, FNAO

INTENDED AUDIENCE:

This course is intended for opticians of all levels.

COURSE DESCRIPTION:

This course will present some of the more common anomalies and diseases of the human eye. While it is by no means a complete listing of all anomalies and diseases of the eye, the learner should have a better understanding of some of them and how they affect their patient's vision. In addition, some medical/health conditions that affect vision will be discussed

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LEARNING OBJECTIVES:

At the completion of this subsection, the student should be able to:

- Have a basic understanding of some anomalies and diseases of the eye
- Discuss how certain anomalies and diseases will affect a patient's vision
- Be able to discuss some medical/health conditions that can have an influence on vision

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Ocular Anomalies and Diseases of the Human Eye

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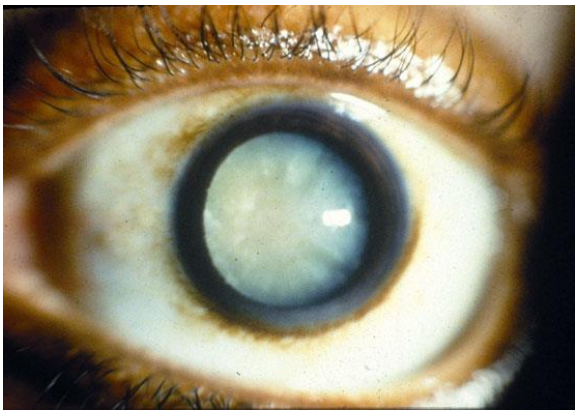
Ocular Anomalies

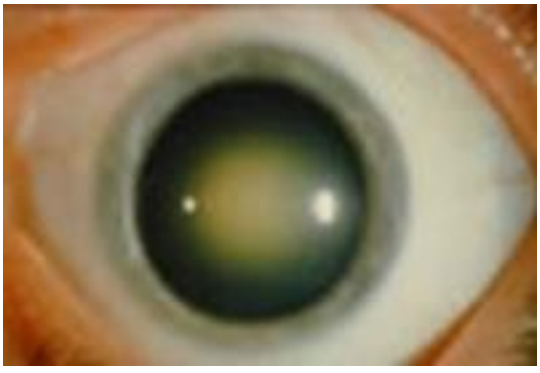
Cataract

A cataract is defined as any opacity of the normally clear crystalline lens or its capsule; partial or complete loss of transparency. Morphologically graded as incipient, immature, mature and hypermature.

A cortical cataract is one with radially arranged opacities or lines at the outer layers of the crystalline lens. A hypermature cataract is a fully developed opacity of the lens with fluid degeneration and swelling of the lens volume. An immature cataract is a partially cloudy crystalline lens that has clear areas remaining. An incipient cataract is an early cataract or partial lens opacity with limited effect on vision. It is common in aging. A mature cataract is a fully opaque lens. The patient is a candidate for surgical removal.



A nuclear sclerotic cataract is an opacification and hardening of the central portion of the crystalline lens. Often requiring additional minus spectacle power to compensate for the thickening and therefore additional plus power of the crystalline lens.



The lens normally undergoes changes with age; it slowly increases in size as new lens fibers develop throughout life; older lens fibers in the depths of the lens become dehydrated, compacted, and "sclerosed"; a yellow-brown pigment accumulates. The increase in the optical density of the nucleus tends to increase the refractive power of the lens so that less hyperopic spectacle correction may be needed in old age. The yellow-brown pigment may become so dense as to constitute nuclear sclerosis and later brunescent cataract. Cortical cataract, however, is the development of vacuoles and water clefts in the lens cortex that tends to increase in extent and in the advanced state give the lens a pear-like appearance. Approximately 60% of humans have some alteration in lens transparency after 65 years of age. Progression of lens changes differs among individuals, and lens opacities can cause visual deficits in a shorter or longer period of time.

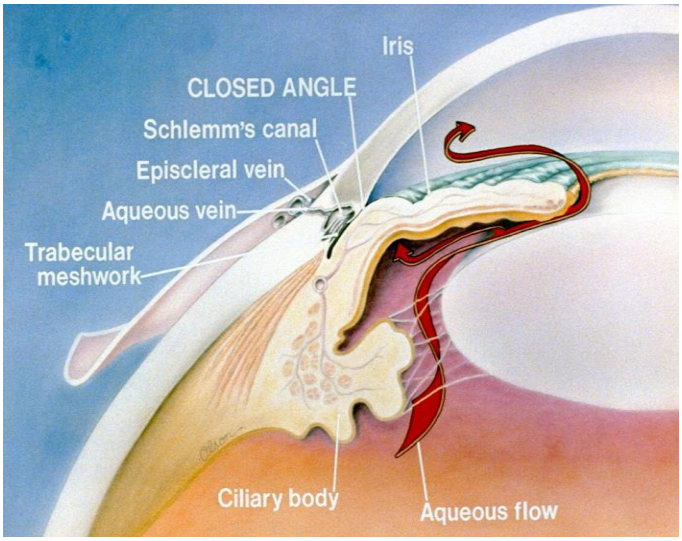
Cataract can be defined in terms of abnormal morphology or biochemistry, decreased light transmission, optical aberrations, decreased visual acuity; or all of these parameters.

Pseudophakia is defined as the condition of an eye containing a surgically implanted artificial lens after cataract extraction.

Aphakia is defined as absence of the crystalline lens. It is commonly a post-surgical condition following cataract extraction. With the absence of the lens, aphakia, approximately +15.00D to +20.00D of refractive power is lost.

Intraocular pressure (IOP)

Intraocular pressure (IOP) is defined as tension within an eyeball occurring as a result of the constant formation and drainage of the aqueous humor; measured with a tonometer. Pressure above 20mm or 25mm Hg (mercury) usually indicates the pathologic condition of glaucoma. Pressures under 9mm or 10mm Hg usually cause fluctuation in acuity, because the optical curvature of the eye is unstable.



Ocular hypertension is an elevation of the pressure in the eye above the range considered normal with no detectable changes in vision or damage to the structures of the eye. The term is used to distinguish patients with above normal pressure from those who have glaucoma, a progressive disease of the eye.

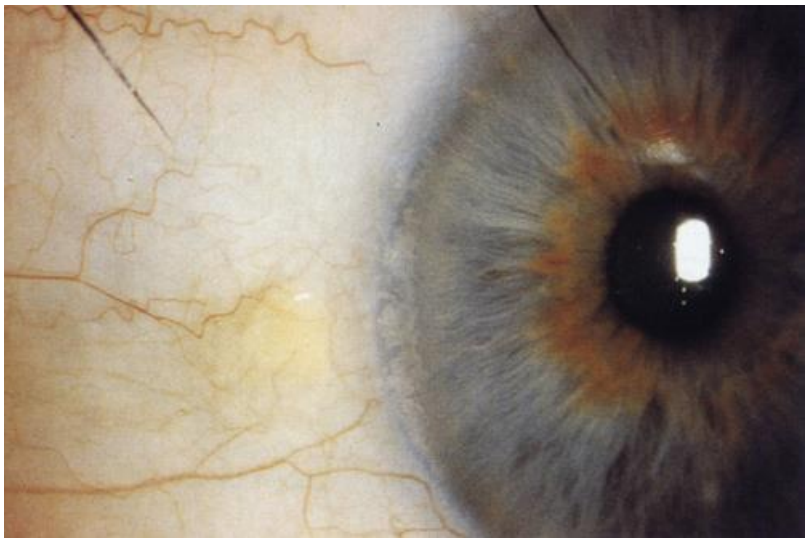
The aqueous humor is a fluid produced by the active transport of electrolytes. It flows through the anterior chamber and is drained away every hour by the venous blood flow. The trabecular meshwork is the spongy, mesh-like tissue surrounding the iris that allows the aqueous fluid (humor) to flow to Schlemm's canal then out of the eye through ocular veins. Intraocular pressure (IOP) is simply the level of pressure within the eye. It is measured using tonometry in millimeters

of mercury (mmHg). The 'normal' upper limit of IOP is 21mmHg but it should be noted that glaucoma can occur at pressures within the normal range (Normal pressure glaucoma or low-tension glaucoma) or may not be present at pressures well above 21mmHg (Ocular hypertension – OH).

Glaucoma is defined as a group of ocular diseases usually marked by abnormally high intraocular pressure, resulting in damage to the optic nerve and loss of visual field. Many types are classified. The existence of the disease in a first-order relative is a strong predisposing factor.

Acute angle closure glaucoma is a sudden and painful elevation of intraocular pressure due to dilation of the pupil or forward displacement of the iris obstructing aqueous drainage from the anterior chamber of the eye. Symptoms include a red eye, marked blurring of vision, rainbows around lights, intense pain, a partially-dilated oval pupil, cloudy cornea and elevated IOP. Immediate attention to this condition is required to prevent permanent vision loss.

Glaucoma is one of the leading causes of blindness in the United States and other industrialized countries. It is estimated that 2 million people in the United States have glaucoma and that 80,000 of these individuals are legally blind from the disease. Among African Americans, glaucoma is now recognized as the leading cause of blindness.

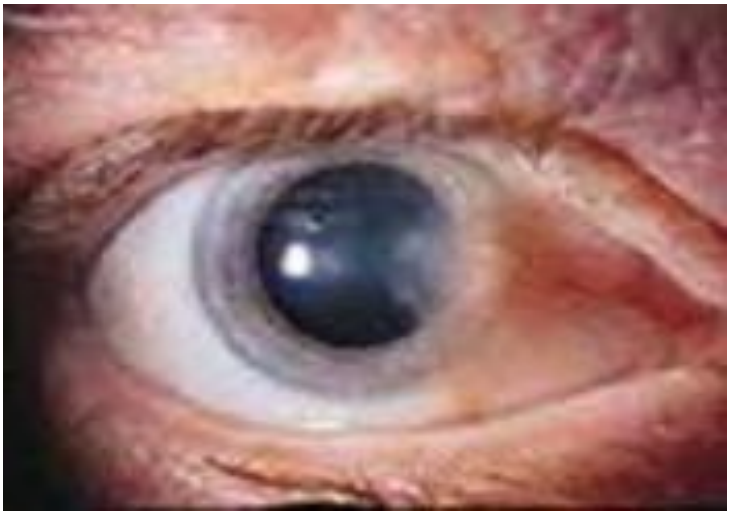


Pinguecula

A Pinguecula is a raised yellowish or yellowish-white discolored tissue of the nasal or temporal bulbar conjunctiva.

They can be caused by environmental factors including solar UV exposure. Contributing factors include wind and dryness.

Pterygium



A Pterygium is a wing-like thickening of fibrovascular connective tissue and blood vessels beneath the bulbar conjunctiva which slowly grows from the inner canthus (rarely from the outer canthus) over the limbus and into the superficial cornea; particularly common among mature adults with chronic exposure to high levels of sunlight or adverse weather conditions. They are more common in dry, windy climates.

As UV light exposure appears to be the most significant factor in the development of a Pterygium, those persons living near the equator and persons spending a large percentage of time outdoors are more prone to develop a Pterygium.

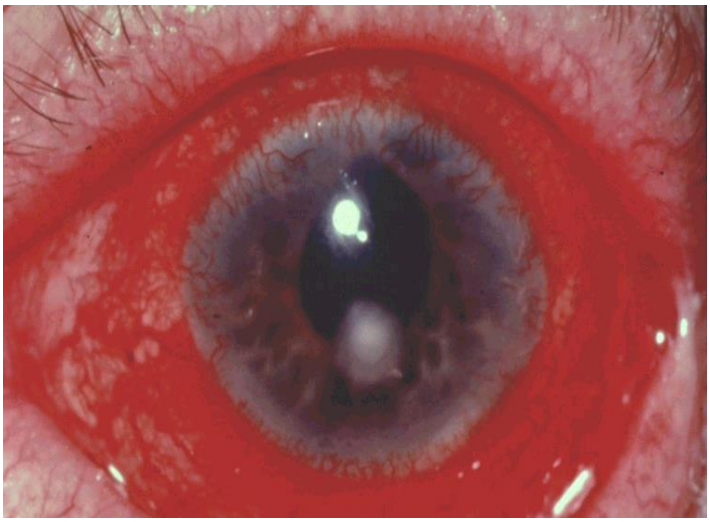
Other agents that may contribute to the formation of pterygia include allergens, noxious chemicals, and irritants (e.g., wind, dirt, dust, air pollution). Heredity may also be a factor. A Pterygium is a benign clinical entity in most cases.

Chalazion

Figure 33

A Chalazion is a chronic swelling or blockage of a meibomian gland. Although there is usually no pain or gross inflammatory signs, it is usually suggested to treat it to avoid complications. Chalazia are often recurrent, especially in cases of poor lid hygiene or concurrent blepharitis. Sometimes the use of intensive steroid therapy is required. Because chalazia are deep under the skin, no topical medications will be able to penetrate sufficiently, however, most resolve spontaneously. Other treatments include the application of a hot compress to open the glands, then to digitally massage the area to break and express the nodule several times a day.

Although chalazia are rarely malignant, recurrent episodes should be biopsied to rule that out.

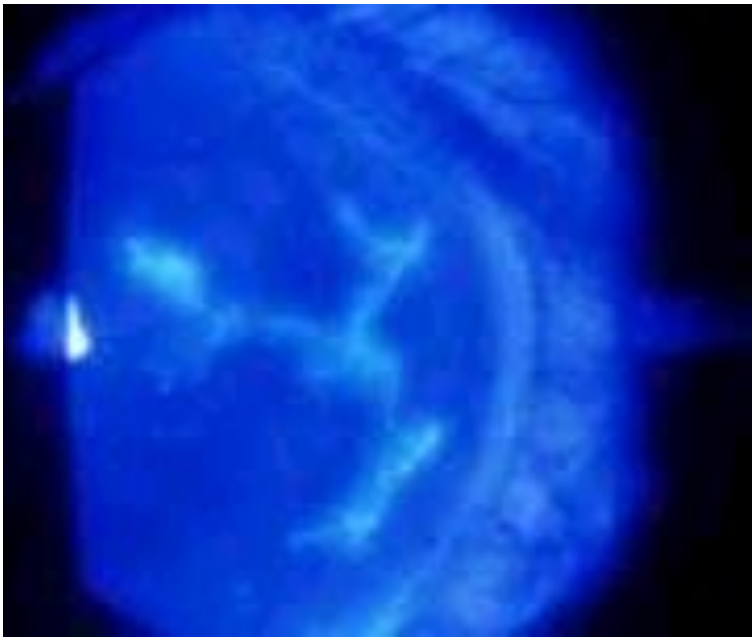


Corneal Ulcers

Corneal ulcers can be bacterial, viral, fungal or sterile. They must be treated quickly and aggressively as they can also be sight threatening. Permanent scarring can result in an opacity that will affect vision. Even worse, a severe ulcer may cause corneal perforation. In the event of a pseudomonas ulcer, the cornea can melt in 24 hours. A viral ulcer is often herpes simplex; fungal, generally caused by vegetative matter. A sterile ulcer may occur without white blood cell infiltration, inflammatory response or infectious nature.

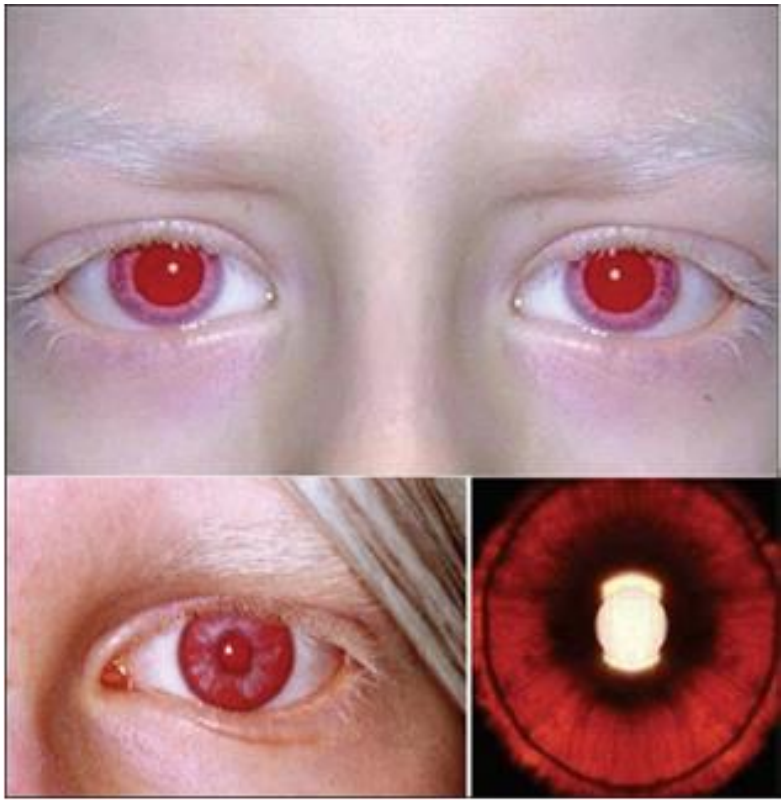
Dendritic Ulcer

A dendritic ulcer is caused by herpes simplex and demonstrates a linear branching pattern that ends with terminal bulbs and has heaped borders that contain live virus.

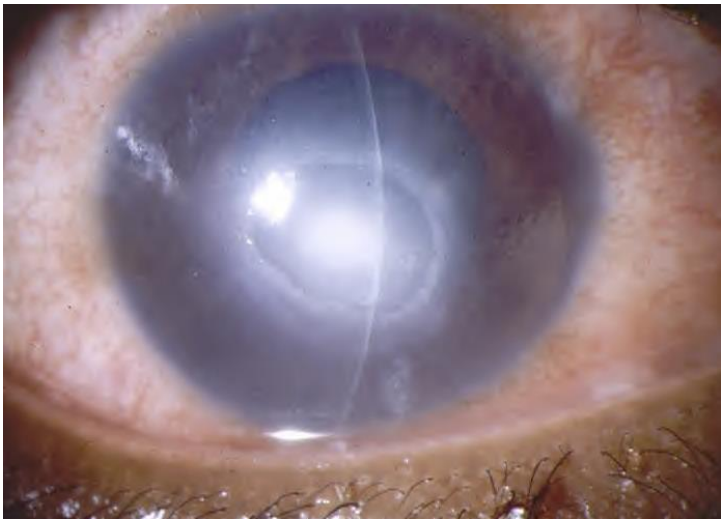


Albinism

Albinism is considered an inherited condition. The condition may include total or partial lack of pigment that will affect the hair, skin, and eyes. In addition, due to the reduced and/or total lack of pigment ocular manifestations may include pink-colored eyes. Since there is little or no pigment in the iris, in some cases it may cause additional light transmission within the eye. Other ocular manifestations in severe cases of albinism may cause the macula to not develop properly, resulting in poor central vision. Other symptoms may include increased photophobia (sensitivity to light), nystagmus, and strabismus. Vision can vary from normal to blindness or anything in between, primarily resulting in worse vision in those patients with less pigment (total albinism). Low vision devices are oftentimes used to maximize a patient's vision. In addition, sometimes surgery is required for misalignment.



Acanthamoeba



Acanthamoeba keratitis is an extremely serious infection caused by a parasite found in water, including swimming pools, lakes, hot tubs, and distilled water used to prepare home-made saline for use with soft contact lenses. Its incidence is low, approximate one in 500,000, and it occurs more often in warmer climates. The patient develops a very painful red eye that does not respond to conventional treatment. A pseudo-dendritic lesion that resembles a herpetic ulcer may appear in the early stages of the disease, causing the condition to be misdiagnosed and mistreated as herpes simplex.

In terms of differential diagnosis, the pseudodendrite seen in acanthamoeba is elevated, while the true dendrite of herpes ulcers is excavated. Any red eye in a contact lens wearer that does not respond to conventional therapy should be considered acanthamoeba until proven otherwise, and the patient referred by the local optometrist or ophthalmologist to one of the university centers that specializes in the diagnosis and treatment of this condition.

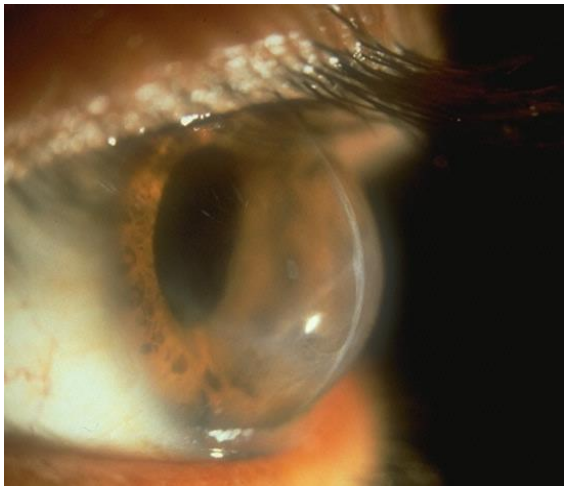
Grave's Disease

Grave's disease or hyperthyroidism may result in protrusion of one or both eyes, dry eye to cornea exposure, convergence insufficiency, and/or hypertropia. The first muscle sign of Grave's disease is usually a convergence insufficiency, which causes eyestrain, fatigue or diplopia. Increased pressure on the optic nerve can cause damage. Papilledema, proptosis, and exophthalmos occur.

Because the cornea is overly exposed, it is important to keep surfaces wet to avoid exposure keratitis. Infrequent, incomplete blink cause drying as well. Severe exposure will lead to frank epithelial cell loss and sometimes persistent epithelial defects. In more advanced cases the muscle thickens and may not work appropriately. The most common muscle involvement is the inferior rectus. This results in a vertical deviation. The mild muscle problems may be treated with vision therapy, while more complex problems require prisms. Rarely, if the hypertropia is too large, surgery (Tarsorrhaphy-partially sewing the eyelids together) may be required. It is important to realize that normalization of the thyroid does not guarantee non-progression of the eye condition.

Photophobia

Photophobia is abnormal light sensitivity. Severe discomfort is commonly a problem. Oftentimes, some persons are more sensitive to light than others, but in many cases, it is a symptom of a more serious complication and should be checked. Persons with conjunctivitis are usually photophobic. In addition, there are many medications, both prescribed and over-the-counter that produce photophobia.



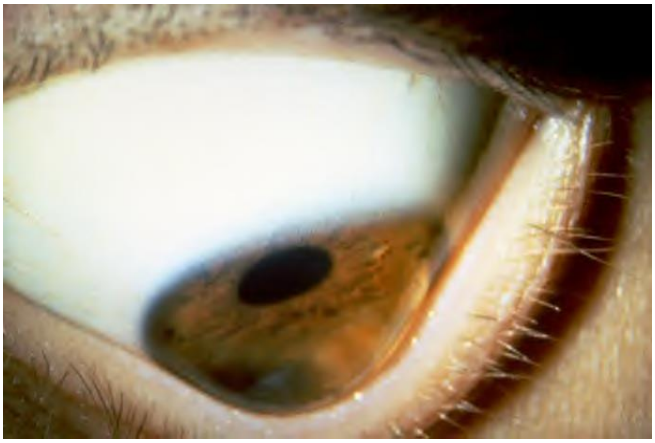
Keratoconus

Keratoconus is defined as a conical protrusion and thinning of the central cornea (conical cornea); usually bilateral and progressive through early adult life. It is a conical protrusion (progressive ectasia – expansion or dilatation) of the central part of the cornea, resulting in an irregular astigmatism. "Kerato" = cornea. "conus"

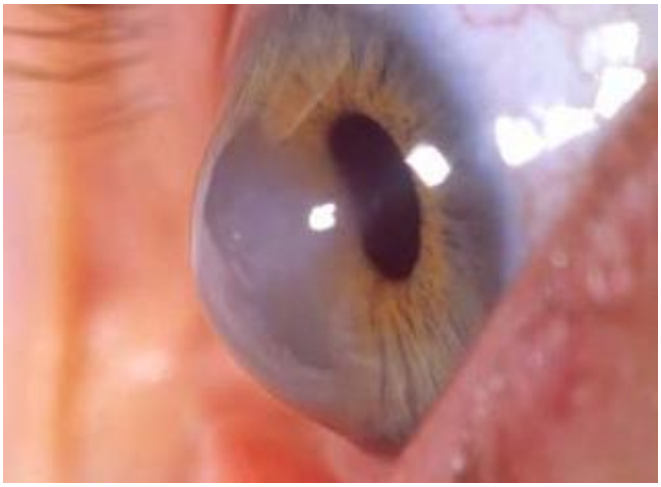
= cone. Keratoconus usually begins between ages 10 and 20. The disorder progresses slowly and occurs in three forms: keratoconus posticus circumscriptus, autosomal dominant keratoconus, and autosomal recessive keratoconus.

In early stages, oftentimes, it can be managed with glasses, but as the condition progresses, the irregular astigmatism makes corrected visual acuity with glasses less successful and contact lenses (primarily rigid, or scleral) are used to manage the condition. Ultimately, the condition may progress until a corneal transplant (penetrating keratoplasty or epikeratoplasty) needs to be performed. For patients with no scarring near the center of the cornea, another option may be surgically grafting a layer of epithelial cells to flatten the cone-shaped cornea in a process called epikeratophakia.

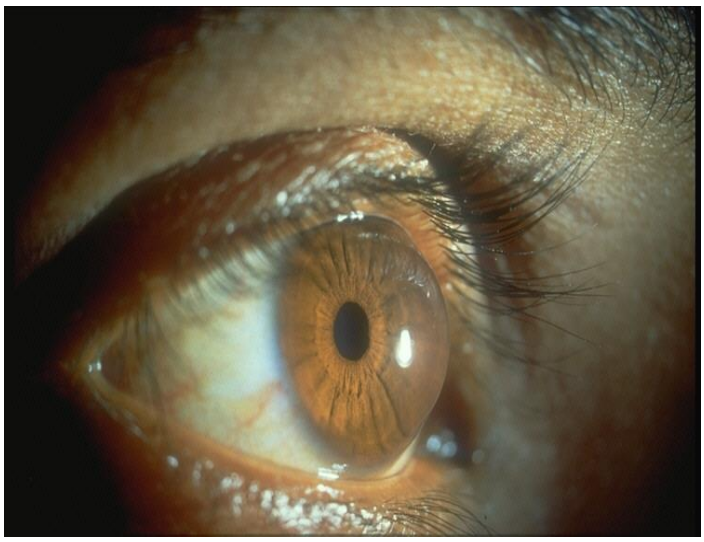
Munson's sign is defined as an abnormal forward bulging of the lower eyelid border observed when a patient looks downward; caused by high curvature of the cornea as deformed by keratoconus.



Corneal hydrops is defined as an abnormal accumulation of watery fluid, presumably aqueous humor, in the stroma and usually the epithelium of the normally clear cornea. It is caused by ruptures in the endothelium and is not uncommon in advanced keratoconus.

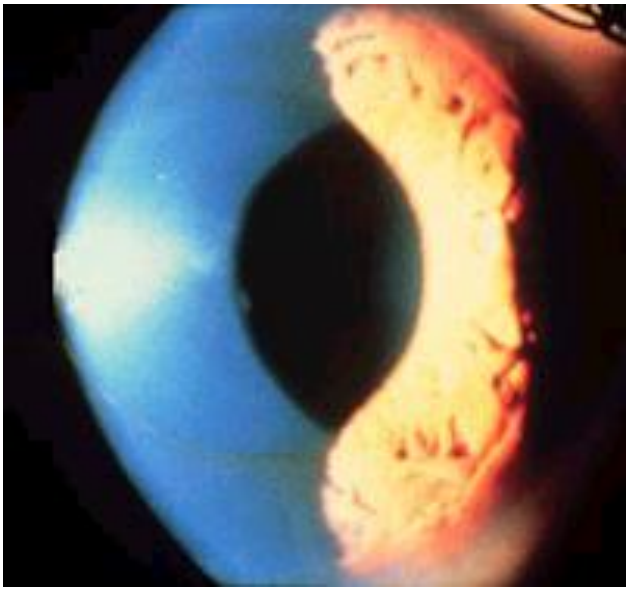


Keratoglobus



Keratoglobus is defined as a congenital enlargement of the cornea, usually bilateral and hereditary; megalocornea; macrocornea. Kerato = Cornea + Globus = Ball. It is a congenital anomaly consisting of an enlarged anterior segment of the eye. Anterior megalophthalmos, megalocornea.

Keratoglobus is a rare clinical condition characterized by limbus-to-limbus corneal thinning and a tendency to corneal perforation either spontaneously or after mild trauma. Total epikeratoplasty can be used for this condition to support the thin cornea and prepare it for penetrating keratoplasty.



One of the earlier signs of keratoconus is Fleisher's Ring. It is defined as superficial iron-containing deposits (called hemosiderin), usually brownish in color, found in an incomplete circular pattern around the conical base in about 50% of keratoconic eyes. This is a ring of pigment which is deposited at the base of the cone in the deep layers of the cornea's epithelium. Fleisher's Ring is best seen using one of the slit lamp's special filters; the cobalt filter, which appears as a deep blue light. One must look very closely to see this ring of pigment. It is reported that *Fleisher's Ring* is faint and broad in early keratoconus and becomes thinner and more discrete as the condition advances.

Retinitis Pigmentosa

Retinitis pigmentosa (RP) is defined as pigmentary degeneration of the retina. It is a hereditary degeneration of the retina with migration of pigmentation, resulting in contraction of the visual field and night blindness. It may be primary in the eye or secondary to single-or multiple-organ system disease; rod-cone or cone-rod dystrophy hereditary patterns vary in different families; a three-generation history is desirable to establish genetic type. The incident seems to be about one in every 4,000.

Symptoms start with decreased night vision and later progress to a diminishing of peripheral vision. The rate of decline varies depending on the genetic makeup of the disorder and also varies

somewhat in individuals. Progressive loss of visual fields or tunnel vision is a symptom of RP. The visual field loss often begins as a donut-like ring in mid-periphery. As it progresses both centrally and peripherally, the resultant tunnel vision begins to affect the patient's activities, driving, and mobility.

Another complication of RP is night blindness. As a matter of fact, it may be the first presenting sign. Our rod cells are sensitive to low light levels and these are the first cells to degenerate in RP patients, therefore, at night, the RP patient's functional field becomes much worse and problems in mobility increase.

Another concern is light and glare problems. Many patients experience a "white-out" situation because of debilitating glare. Some help is offered with the use of dark plum and amber filters used often with side shields. Indoor glare is a problem as well. Many find a light amber filter in their general wear eyeglasses improves their tolerance. A variety of filters are available. The most well known are the Corning CPF lenses.

Double vision is also a problem with many RP patients as tunnel vision interferes with the brain's ability to accurately control alignment of the eyes. To treat the resultant double vision, prisms and orthoptic therapy may be used.

Some patients develop cataracts early, which decreases visual acuity and increases problems with glare. Removal of the cataract improves this minimally.

Many patients with RP also have a decrease in central vision as well as peripheral vision. Use of low vision aids helps with managing this problem.

Occasionally, there is also a condition called Usher's Syndrome that creates a hearing impairment in RP patients.

Other symptoms include low light-to-dark adaptation times and poor contrast sensitivity. This inability to differentiate weak contrast affects adults as well as children in the classroom. Writing on the blackboard and on the overhead projector is difficult to read. The contrast sensitivity problem produces difficulty in determining depth and makes it difficult to negotiate steps without edge markings.

Diabetic Retinopathy

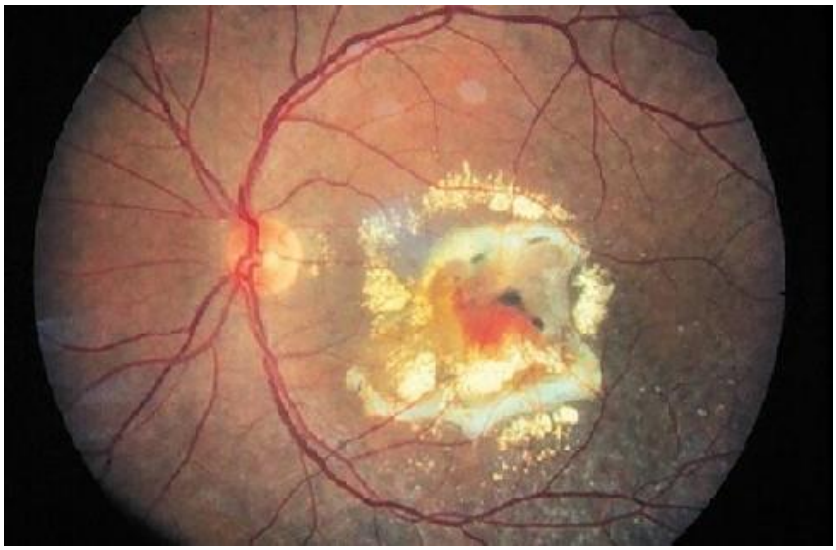
Diabetic Retinopathy: Retinal changes caused by Diabetes Mellitus, is a condition caused by a lack of insulin in the bloodstream. It creates premature aging of the blood vessels. Hemorrhages, new vessel growth, and fibrous tissue growth can create retinal detachments and visual field losses. Laser beams are used to seal off the hemorrhages.

Retinal Detachment

A retinal detachment is identified as a hole or tear that occurs in the retina. Since the retina derives its nutrition from the blood vessels in the choroid, immediate repair is crucial. Symptoms of a

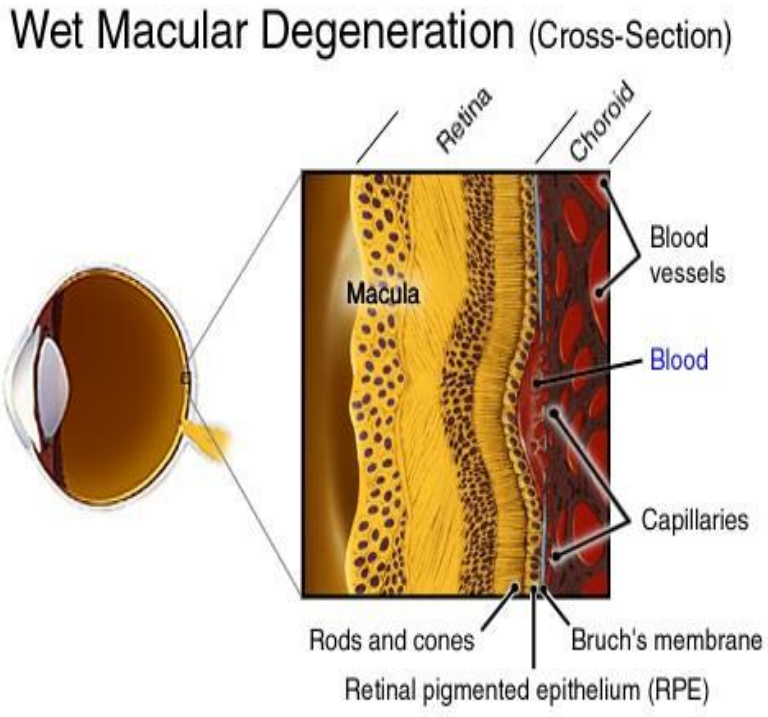
retinal detachment include flashes of light, shower of spots (floaters), and common complaints of veiling of vision (like a curtain coming down). Similar symptoms of flashes and floaters can be symptoms of a vitreous detachment as well; however, there would be no veiling effect. Vitreous separation is the major cause of retinal tears and usually occurs spontaneously. Trauma to the eye may cause vitreous separation but is not usually the most common cause of retinal detachment.

Macular Degeneration



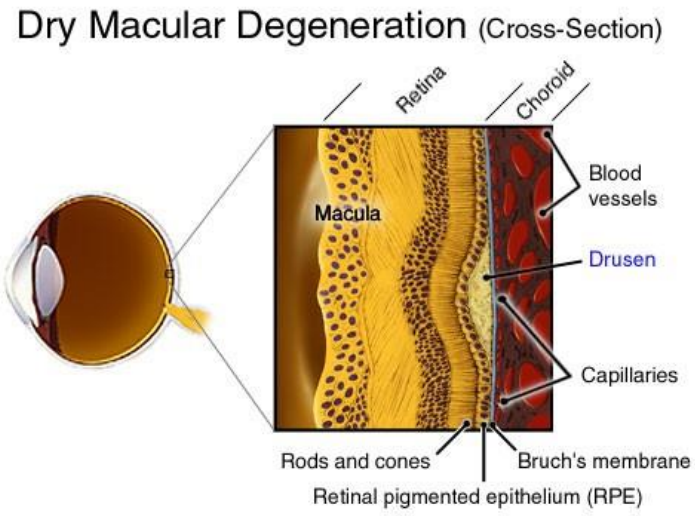
Macular degeneration is defined as partial or total loss of central vision, most commonly age-related; generally classified as wet (edematous) or dry (ischemic); involution of the macula may be accompanied by hemorrhage or the development of a sub-retinal neovascular network; macular involution. Macular Degeneration is a leading cause of blindness among people over 55, although young people can be affected by the disease as well.

Macular degeneration is caused by the deterioration of the central portion of the retina, the inside back layer of the eye that records the images we see and sends them via the optic nerve from the eye to the brain. The retina's central portion, known as the macula (containing the fovea), is responsible for focusing central vision in the eye, and it controls our ability to read, drive a car, recognize faces or colors, and see objects in fine detail. *Central scotomas* (holes in vision) may result.



"Wet" AMD results from the growth of new blood vessels in the choroid, causing an accumulation of fluid in the macula which leads to retinal damage. This type of degeneration can often be successfully arrested by laser surgery.

"Dry" AMD represents at least 80% of all AMD cases and results in atrophy of the retina. Usually yellowish-white round spots called drusen first appear in a scattered pattern deep in the macula. Later degeneration of both the Pigment Epithelium and the cones begins.



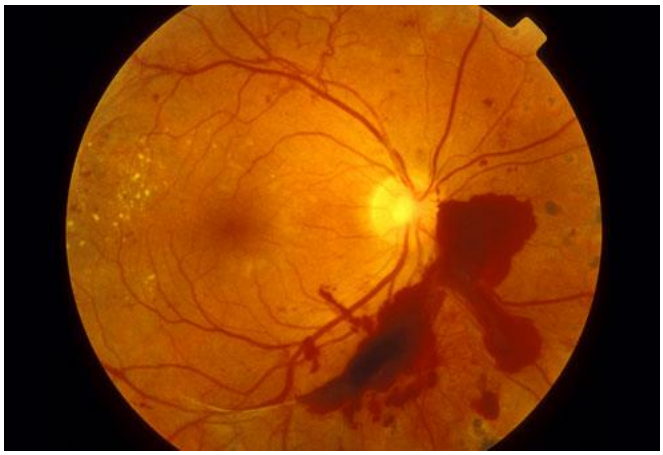
Diabetes

Diabetes mellitus is a condition in which the pancreas no longer produces enough insulin or when cells stop responding to the insulin that is produced so that glucose in the blood cannot be absorbed into the cells of the body. The treatment includes changes in diet, oral medications, and in some cases, daily injections of insulin. Insulin is the hormone responsible for the absorption of glucose into cells for their energy needs and into the liver and fat cells for storage. As a result, the level of glucose in the blood becomes abnormally high, causing excessive urination and constant thirst and hunger. The body's inability to store or use glucose causes weight loss and fatigue.

Type I diabetes is sometimes called juvenile diabetes and usually begins in childhood or adolescence. In this type of diabetes, the body produces little or no insulin. It is usually characterized by a sudden onset and is also called insulin-dependent diabetes because people who develop this type need to have daily injections of insulin. In the United States, approximately three people in 1,000 develop Type I diabetes. Without regular injections of insulin, the sufferer lapses into a coma and dies.

Type II diabetes is more common and occurs in approximately 3-5% of Americans under 50 years of age and increases to 10-15% in those over 50. More than 90% of the diabetics in the United States are Type II diabetics. Sometimes called age-onset or adult-onset diabetes, this form of diabetes occurs most often in people who are overweight and who do not exercise. It is non-insulin dependent and oftentimes is controlled by diet and exercise.

Ocular complications include diabetic retinopathy, vision fluctuations because of changes in glucose levels, and poor wound healing. There is a higher risk of corneal complications because of decreased corneal sensitivity, as well.

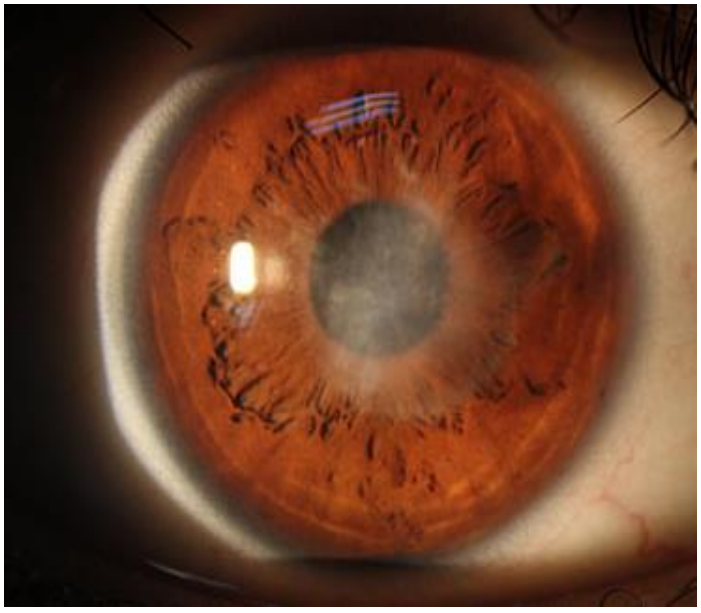


Diabetic retinopathy is damage to the retina and is caused by fluid leakage, tiny aneurysms of the capillaries and hemorrhage into the retina. It includes a growth of new, fragile blood vessels on the surface of the retina. These vessels readily hemorrhage. Bleeding into the vitreous along with fibrous tissue can grow forward (proliferative retinopathy). This is a major cause of permanent loss of vision. Fluorescein angiogram is a method of highlighting the details of blood circulation in the retina. This includes an injection in a vein and then observed with blue light and green filter on the camera. Vision fluctuations due to blood sugar level changes also occur. Consider diabetes in otherwise unexplained fluctuations in refractive error.

Poor wound healing, with decreased corneal sensitivity similar to EBMD, is an abnormality of the epithelial basement membrane. However, there is no real increased incidence of spontaneous epithelial erosions. Post-operative (vitrectomy) shows slow re-epithelialization and lack of adhesion between basement membrane and stroma. The new tissue can peel off in sheets between stroma and basement, not basement and basal cells. It is important to watch the cornea on contact lens wearers to make certain they are not running risks with contact lenses.

Corneal Scar

A corneal scar may be due to injury or disease. A Nebula of the cornea is described as a slight corneal opacity or scar that is on the cornea. It is difficult to see unless you are looking at the eye with an ophthalmoscope which will illuminate the cornea at an oblique angle. It rarely interferes with vision. A macula scar is a circumscribed opacity of the cornea that is translucent but well defined. A Leukoma scar is dense and opaque.



If centrally located, corneal transplantation may be necessary. The location and density of a corneal scar can have a dramatic effect on acuity. A small scar on the visual axis can have a huge effect while a large scar in the periphery may be barely noticeable to the patient.

Sjogren's Syndrome

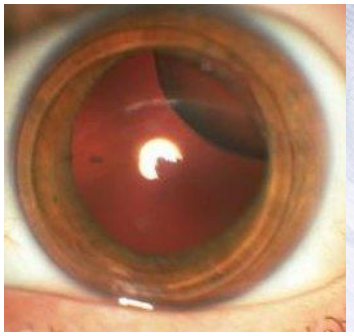
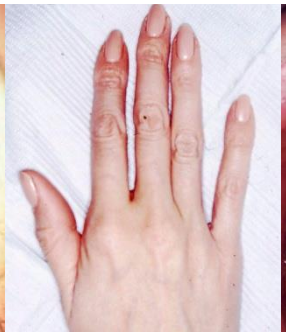
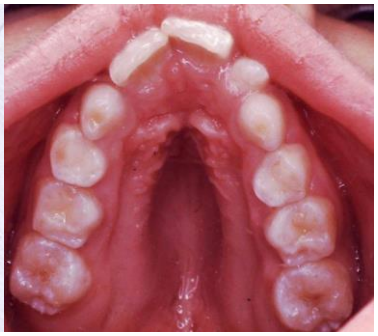
Sjogren's Syndrome is a chronic autoimmune disorder with multi-system abnormalities. It is characterized by mononuclear infiltration of the lacrimal and salivary glands leading to destruction of the ductal and acinar structures and resulting in a deficiency of tears and saliva. Sjogren's Syndrome affects women 9:1. It is a classic clinical triad consisting of KCS (Keratoconjunctivitis Sicca), Xerostomia (dryness of mouth) and connective tissue diseases (usually rheumatoid arthritis). Patients complain of redness, pain, and photophobia. Infiltrates of the cornea are common. If the epithelium breaks down, ulcers can occur. A decrease in lysozyme levels predisposes this due to infections. Patients with Sjogren's suffer from dry eye syndrome.

Rheumatoid Arthritis

Rheumatoid arthritis is the most severe type of inflammatory joint disease. This is an autoimmune disorder in which the body's immune system acts against and damages joints and surrounding soft tissues. Episcleritis and scleritis commonly occur in patients who suffer from rheumatoid arthritis. The particular form of scleritis occurring in patients with rheumatoid arthritis has been described under the name of scleromalacia perforans. Iritis and uveitis also frequently occur. Relapses are common throughout the patient's lifetime. These patients are also predisposed to keratitis sicca. This is due to an alteration of the secretions of the lacrimal gland. There is also a close association with Sjogren's syndrome.

Marfan Syndrome

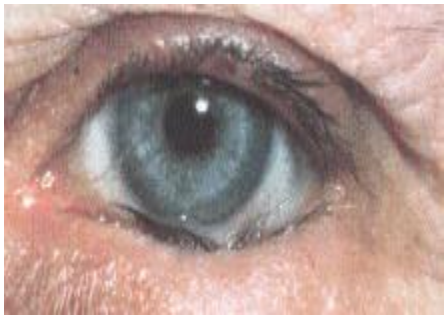
According to the National Marfan Foundation, the ophthalmologic problems associated with Marfan syndrome include, high refractive error, flattened corneal curvature, dislocated lenses, early onset cataracts, glaucoma, and strabismus. Due to the increased axial length of most patients with Marfan syndrome, there is a higher risk of retinal detachment, and therefore should be educated as to the early signs of detachment. In addition, most people with Marfan syndrome are myopic and have astigmatism. Approximately 65 percent of people with the disorder have dislocated lenses (ectopia lentis). The lens may be markedly off center or so subtly dislocated that an ophthalmologist might miss the dislocation without fully dilating the pupils. Other common characteristics may include high arch palate and long extremities.

Since most of the Marfan myopic patients also have flattened corneas, the myopia is induced by lenticular and axial myopia. Because of the flat cornea, corneal refractive surgery is contraindicated in most Marfan patients. Glasses or contact lenses result in the best correction.

Cataracts are more common and often occur earlier. IOL's produce good results, but due to the surgical complications likely to occur in people with the Marfan syndrome; that is, vitreous loss, rupture of the residual zonules and extension of the capsulotomy, they should be treated by an ophthalmologist familiar with the syndrome.

Ectropion, Entropion, Ptosis

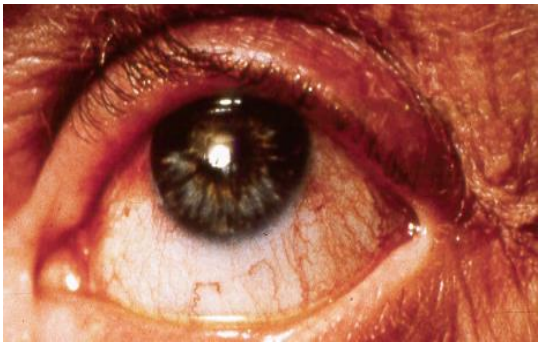


Changes in position of the margins of the eyelids with respect to their apposition to the globe are important. The margins of the eyelids normally remain closely applied to the globe as the eye moves in various directions or as the lids open and close. Changes from the normal could include numerous pathologic states which cause the eyelid margins to lose normal contact with the globe. If they eyelid turns toward the globe, it is referred to as Entropion. In this case, the cilia (eyelashes) rub on the eye, which is quite painful.

If the eyelid turns away from the globe the condition is called Ectropion.

Ectropion of the lower lid is a common consequence of seventh nerve paralysis (for example Bell's palsy).

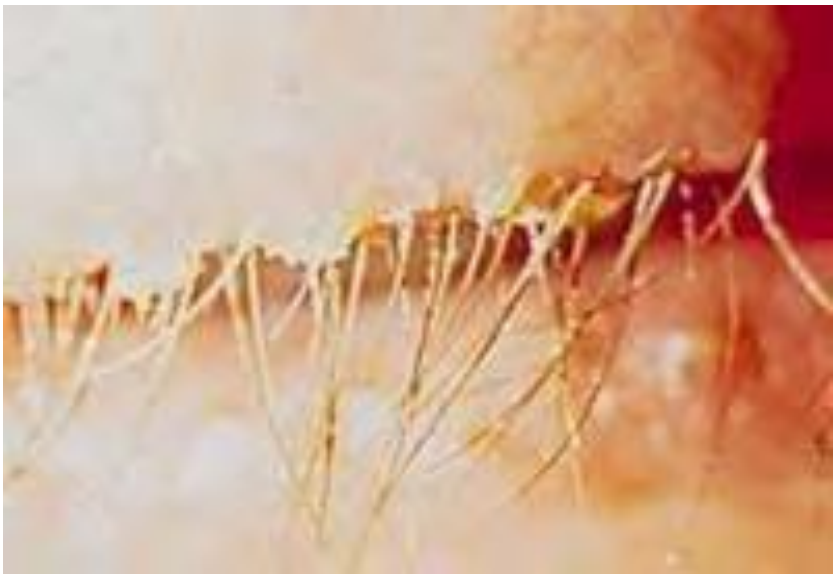
Since the tear meniscus rests on the lower lid margin, if the eyelid is everted, there is no place for the tears to rest and they run out of the eye, causing dry eye.



Another lid anomaly is Ptosis where the upper lid droops below its normal position, which is commonly associated with fatigue, orbital fat herniation, epicanthus, and similar lid defects. A Ptosis may be present at birth or develop later in life. As a person ages, a Ptosis may also develop as a result of stroke, trauma or loss of tonicity of muscle. Surgery to shorten the muscle will not only improve cosmesis but also improve overall vision, as Ptosis may limit not only superior vision but also side and central vision. In addition, it may cause eyestrain or eye fatigue.

Blepharitis

Blepharitis is an inflammation of the eyelids. The margin of the lid becomes inflamed along the eyelash line. Redness, scaling, and sometimes an infection can develop in the skin between the eyelashes. Often, you will identify that the meibomian glands may be clogged, not allowing lipids from being excreted, and the aqueous will evaporate more quickly. In some cases, the lipids are not cleaned off the lid margin and will harden. In this case, it may be partially controlled through proper lid hygiene. Ocular lid scrubs are beneficial in cleansing the lids. In the case of infection, the doctor may prescribe antibiotics to clear up the infection.



Refractive Surgeries

Before we begin on the actual refractive surgeries, let's discuss some things to keep in mind before any *elective* alteration of the cornea. Things to be mindful of includes that any potential refractive surgery patient, needs to have good ocular structures, good corneal thickness, sufficient tear film and an understanding of potential outcomes. Some of the procedures that we may not be discussing here would also be identified as refractive surgeries, but we will be discussing ELECTIVE surgeries. Corneal Pachymetry (measures thickness of cornea) must be done prior to any procedure that will reduce the thickness of the cornea. Measuring intra-ocular pressure is also required. The average corneal thickness is 560 microns. If the cornea is abnormally thin prior to surgery, it may create an abnormal bulging of the cornea as a side effect known as ectasia similar to keratoconus sometimes referred to as Keratectasia. A pentacam is an instrument that quickly measures corneal topography, measures corneal thickness, structural integrity and strength. Many refractive surgery centers depend on this instrument for in-depth information. Measuring intra-ocular pressure is also required. Too much pressure and a bulge are more possible, too little and the cornea may flatten too much.

Laser procedures can include flap surgeries and surface surgeries. Flap surgeries include LASIK. Surface surgeries include LASEK, PRK, EPI-LASIK and previously RK. We will discuss each of these in the following paragraphs.

Beginning in the early 1980's refractive surgery became a procedure chosen by many patients to correct their myopic refractive error. *Radial keratotomy (RK)* was the first procedure and consisted of flattening the cornea by using a series of radial incisions in the peripheral cornea. Negative results include an increase of significant glare, starburst patterns around lights at night, and a

theoretic risk of wound rupture with blunt trauma to the eye. This procedure is rarely used today, due to the advancement of other procedures that produce better results.

LASIK (Laser-assisted in-situ keratomileusis) has the capability to correct patients with nearsightedness, farsightedness, and astigmatism. The procedure is done by the ophthalmologist. Two types can be used. In traditional LASIK, an instrument known as a microkeratome creating a thin surface flap on the cornea, exposing the stromal bed. Then with the use of an Excimer laser beam, the stromal cells are ablated, flattening the central cornea of a myopic eye or steepening it by removing tissue from the peripheral cornea of a hyperopic eye. The flap is then placed back in place for relatively quick healing. The flaps may be complete flaps or partial flaps depending upon the method used. Another system used in the US is a bladeless flap-making system. It is called IntraLase. The procedure is now marketed as iLASIK. While IntraLase is a trade name, there are now other "bladeless" systems on the market.

Photorefractive keratectomy (PRK) differs from LASIK in that the laser is applied directly to the surface of the cornea, rather than under a flap, in order to achieve the desired vision correction. PRK is preferred for people with thin corneas or other corneal abnormalities where creating a flap would not be the best choice, and it may be preferred for those in the United States military where PRK is the approved procedure for those in active combat since there is no risk of flap complications. A greater length of time is needed for the cornea to heal and for the best vision to be achieved.

*LASEK (*laser epithelial keratomileusis), is a lot like PRK although a flap is created. Alcohol solution is used to loosen the tissue and a laser is used to reshape the cornea. It can treat nearsightedness, farsightedness, and astigmatism.

Intacs (Intracorneal rings) are arcuate-shaped plastic inserts that are inserted in the corneal stroma to correct low degrees of myopia. The procedure involves making a small incision in the upper cornea, creating a 180-degree tunnel on each side of the cornea, and slipping in a semicircular Intacs on each side of the cornea. Intacs are also being used to flatten the cornea in some patients with keratoconus.

Limbal relaxing incisions (LRI) are a modification of *astigmatic keratotomy (AK)*. AK is similar to RK but is used for treating astigmatism and involves different placement of the incisions. LRI's are incisions that are placed on the far peripheral aspect of the cornea resulting in a cornea that is rounder.

Implantable contact lenses, known as *phakic intraocular lenses (IOL's)* are being used for refractive error correction. With almost unlimited potential for correction, these lenses are available in powers of -3.00D to -20.00D. While the IOL's are not approved by the FDA for patients with hyperopia, we don't know what the future holds. The future seems very promising.

The last refractive surgery that will be presented here is *Clear Lens Replacement (CLR)*. It can also be referred to as RLE (refractive lens exchange). This procedure is more invasive than other refractive surgeries and is usually only recommended for those patients over 40 years of age. The procedure is basically the same as for cataract removal, by removing the crystalline lens and replacing it with an intraocular lens implant.

Some common side-effects for some of the refractive surgeries may include but not be limited to the following:

- Glare
- Seeing halos around images
- Difficulty driving at night
- Fluctuating vision
- Dry eyes
- Light sensitivity

It is important to remember that any of the refractive surgeries can have some more complicated side-effects that can include but not be limited to the following:

- Infection
- Loss of vision
- Under correction
- Over correction
- Reduced vision
- Corneal haze (corneal edema)
- Halo effect
- In the case of flaps – Flap damage or loss
- In the case of the patient wishing to be an eye donor, it usually cannot be done

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