The eye transmits visual stimuli to the brain for interpretation and, in doing so, functions as the organ of vision. The eyeball is located in the eye orbit, a round, bony hollow formed by several different bones of the skull. In the orbit, the eye is surrounded by a cushion of fat. The bony orbit and fat cushion protect the eyeball.

To perform a thorough assessment of the eye, you need a good understanding of the external structures of the eye, the internal structures of the eye, the visual fields and pathways, and the visual reflexes.

**EXTERNAL STRUCTURES OF THE EYE**

The eyelids (upper and lower) are two movable structures composed of skin and two types of muscle: striated and smooth. Their purpose is to protect the eye from foreign bodies and limit the amount of light entering the eye. In addition, they serve to distribute tears that lubricate the surface of the eye (Fig. 15-1). The upper eyelid is larger, more mobile, and contains tarsal plates made up of connective tissue. These plates contain the meibomian glands, which secrete an oily substance that lubricates the eyelid.

The eyelids join at two points: the lateral (outer) canthus and medial (inner) canthus. The medial canthus contains the puncta, two small openings that allow drainage of tears into the lacrimal system, and the caruncle, a small, fleshy mass that contains sebaceous glands. The white space between open eyelids is called the palpebral fissure. When closed, the eyelids should touch. When open, the upper lid position should be between the upper margin of the iris and the upper margin of the pupil. The lower lid should rest on the lower border of the iris. No sclera should be seen above or below the limbus (the point where the sclera meets the cornea).

Eyelashes are projections of stiff hair curving outward along the margins of the eyelids that filter dust and dirt from air entering the eye.

The conjunctiva is a thin, transparent, continuous membrane that is divided into two portions: a palpebral and a bulbar portion. The palpebral conjunctiva lines the inside of the eyelids, and the bulbar conjunctiva covers most of the anterior eye, merging with the cornea at the limbus. The point at which the palpebral and bulbar conjunctivae meet creates a folded recess that allows movement of the eyeball. This transparent membrane allows for inspection of underlying tissue and serves to protect the eye from foreign bodies.

The lacrimal apparatus consists of glands and ducts that serve to lubricate the eye (Fig. 15-2). The lacrimal gland, located in the upper outer corner of the orbital cavity just above the eye, produces tears. As the lid blinks, tears wash across the eye then drain into the puncta, which are visible on the upper and lower lids at the inner canthus. Tears empty into the lacrimal canals and are then channeled into the nasolacrimal sac through the nasolacrimal duct. They drain into the nasal meatus.

The extraocular muscles are the six muscles attached to the outer surface of each eyeball (Fig. 15-3). These muscles control six different directions of eye movement. Four rectus muscles are responsible for straight movement, and two oblique muscles are responsible for diagonal movement. Each muscle coordinates with a muscle in the opposite eye. This allows for parallel movement of the eyes and thus the binocular vision characteristic of humans. Innervation for these muscles is supplied by three cranial nerves: the oculomotor (III), trochlear (IV), and abducens (VI).

**INTERNAL STRUCTURES OF THE EYE**

The eyeball is composed of three separate coats or layers (Fig. 15-4). The external layer consists of the sclera and cornea. The sclera is a dense, protective, white covering that physically supports the internal structures of the eye. It is continuous anteriorly with the transparent cornea (the “window of the eye”). The cornea permits the entrance of light, which passes through the lens to the retina. It is well supplied with nerve endings, making it responsive to pain and touch.
The lens is a biconvex, transparent, avascular, encapsulated structure located immediately posterior to the iris. Suspensory ligaments attached to the ciliary body support the position of the lens. The lens functions to refract (bend) light rays onto the retina. Adjustments must be made in refraction depending on the distance of the object being viewed. Refractive ability of the lens can be changed by a change in shape of the lens (which is controlled by the ciliary body). The lens bulges to focus on close objects and flattens to focus on far objects.

The chorioid layer contains the vascularity necessary to provide nourishment to the inner aspect of the eye and prevents light from reflecting internally. Anteriorly, it is continuous with the ciliary body and the iris.

The innermost layer, the retina, extends only to the ciliary body anteriorly. It receives visual stimuli and sends it to the brain. The retina consists of numerous layers of nerve cells, including the cells commonly called rods and cones. These specialized nerve cells are often referred to as “photoreceptors” because they are responsive to light. The rods are highly sensitive to light, regulate black and white vision, and function in dim light. The cones function in bright light and are sensitive to color.

The optic disc is a cream-colored, circular area located on the retina toward the medial or nasal side of the eye. It is where the optic nerve enters the eyeball. The optic disc can be seen with the use of an ophthalmoscope and is normally round or oval in shape, with distinct margins. A smaller circular area that appears slightly depressed is referred to as the physiologic cup. This area is approximately one-third the size of the entire optic disc and appears somewhat lighter/whiter than the disc borders.

The retinal vessels can be readily viewed with the aid of an ophthalmoscope. Four sets of arterioles and venules travel through the optic disc, bifurcate, and extend to the periphery of the fundus. Vessels are dark red and grow progressively narrower as they extend out to the peripheral areas. Arterioles carry oxygenated blood and appear brighter red and narrower than the veins. The general background, or fundus (Fig. 15-5),
varies in color, depending on skin color. A retinal depression known as the fovea centralis is located adjacent to the optic disc in the temporal section of the fundus. This area is surrounded by the macula, which appears darker than the rest of the fundus. The fovea centralis and macular area are highly concentrated with cones and form the area of highest visual resolution and color vision.

The eyeball contains several chambers that serve to maintain structure, protect against injury, and transmit light rays. The anterior chamber is located between the cornea and iris, and the posterior chamber is the area between the iris and the lens. These chambers are filled with aqueous humor, a clear liquid substance produced by the ciliary body. Aqueous humor helps to cleanse and nourish the cornea and lens as well as maintain intraocular pressure. The aqueous humor filters out of the eye from the posterior to the anterior chamber then into the canal of Schlemm through a filtering site called the trabecular meshwork. Another chamber, the vitreous chamber, is located in the area behind the lens to the retina. It is the largest of the chambers and is filled with a vitreous humor that’s clear and gelatinous.

VISION

Visual Fields and Visual Pathways

A visual field refers to what a person sees with one eye. The visual field of each eye can be divided into four quadrants: upper temporal, lower temporal, upper nasal, and lower nasal (Fig. 15-6). The temporal quadrants of each visual field extend farther than the nasal quadrants. Thus, each eye sees a slightly different view but their visual fields overlap quite a bit. As a result of this, humans have binocular vision (“two-eyed” vision) in which the visual cortex fuses the two slightly different images and provides depth perception or three-dimensional vision.

Visual perception occurs as light rays strike the retina, where they are transformed into nerve impulses, conducted to the brain through the optic nerve, and interpreted. In the eye, light must pass through transparent media (cornea, aqueous humor, lens, and vitreous body) before reaching the retina.
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Health Assessment

COLLECTING SUBJECTIVE DATA: THE NURSING HEALTH HISTORY

Beginning when the nurse first meets the client, assessment of vision provides important information about the client’s ability to interact with the environment. Changes in vision are often gradual and go unrecognized by clients until a severe problem develops. Therefore, asking the client specific questions about his vision may help with early detection of disorders. With recent advances in medicine and surgery, early detection and intervention are increasingly important.

First gather data from the client about his or her current level of eye health. Also discuss any past and family history problems that are related to the eye. Collecting data concerning environmental influences on vision as well as how any problems are influencing or affecting the client’s usual activities of daily living is also important. Answers to these types of questions help to evaluate a client’s risk for vision loss and, in turn, present ways that the client may modify or reduce the risk of eye problems.

However, convergence of the eyes and constriction of the pupils occur simultaneously and can be seen.

Visual Reflexes

The pupillary light reflex causes pupils immediately to constrict when exposed to bright light. This can be seen as a direct reflex, in which constriction occurs in the eye exposed to the light, or as an indirect or consensual reflex, in which exposure to light in one eye results in constriction of the pupil in the opposite eye (Fig. 15-7). These protective reflexes, mediated by the oculomotor nerve, prevent damage to the delicate photoreceptors by excessive light.

Accommodation is a functional reflex allowing the eyes to focus on near objects. This is accomplished through movement of the ciliary muscles causing an increase in the curvature of the lens. This change in shape of the lens is not visible.

The cornea and lens are the main eye components that refract (bend) light rays on the retina. The image projected on the retina is upside down and reversed right to left from the actual image. For example, an image from the lower temporal visual field strikes the upper temporal quadrant of the retina. At the point where the optic nerves from each eyeball cross—the optic chiasma—the nerve fibers from the nasal quadrant of each retina (from both temporal visual fields) cross over to the opposite side. At this point, the right optic tract contains only nerve fibers from the right side of the retina and the left optic tract contains only nerve fibers from the left side of the retina. Therefore, the left side of the brain views the right side of the world.

Health Assessment

COLLECTING SUBJECTIVE DATA: THE NURSING HEALTH HISTORY

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First gather data from the client about his or her current level of eye health. Also discuss any past and family history problems that are related to the eye. Collecting data concerning environmental influences on vision as well as how any problems are influencing or affecting the client’s usual activities of daily living is also important. Answers to these types of questions help to evaluate a client’s risk for vision loss and, in turn, present ways that the client may modify or reduce the risk of eye problems.

(text continues on page 235)
## HISTORY OF PRESENT HEALTH CONCERN

<table>
<thead>
<tr>
<th>Question</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visual Problems</strong></td>
<td></td>
</tr>
<tr>
<td>Describe any recent changes in your vision. Were they sudden or gradual?</td>
<td>Sudden changes in vision are associated with acute problems such as head trauma or increased intracranial pressure. Gradual changes in vision may be related to aging, diabetes, hypertension, or neurologic disorders.</td>
</tr>
<tr>
<td>Do you see spots or floaters in front of your eyes?</td>
<td>Spots or floaters are common among clients with myopia or in clients over age 40. In most cases, they are due to normal physiologic changes in the eye associated with aging and require no intervention.</td>
</tr>
<tr>
<td>Do you experience blind spots? Are they constant or intermittent?</td>
<td>A scotoma is a blind spot that is surrounded by either normal or slightly diminished peripheral vision. It may be from glaucoma. Intermittent blind spots may be associated with vascular spasms (ophthalmic migraines) or pressure on the optic nerve by a tumor or intracranial pressure. Consistent blind spots may indicate retinal detachment. Any report of a blind spot requires immediate attention and referral to a physician.</td>
</tr>
<tr>
<td>Do you see halos or rings around lights?</td>
<td>Seeing halos around lights is associated with narrow-angle glaucoma.</td>
</tr>
<tr>
<td>Do you have trouble seeing at night?</td>
<td>Night blindness is associated with optic atrophy, glaucoma, and vitamin A deficiency.</td>
</tr>
<tr>
<td>Do you experience double vision?</td>
<td>Double vision (diplopia) may indicate increased intracranial pressure due to injury or a tumor.</td>
</tr>
<tr>
<td><strong>Other Symptoms</strong></td>
<td></td>
</tr>
<tr>
<td>Do you have any eye pain or itching? Describe.</td>
<td>Burning or itching pain is usually associated with allergies or superficial irritation. Throbbing, stabbing, or deep, aching pain suggests a foreign body in the eye or changes within the eye. Most common eye disorders are not associated with actual pain; therefore, any reported eye pain should be referred immediately.</td>
</tr>
<tr>
<td>Do you have any redness or swelling in your eyes?</td>
<td>Redness or swelling of the eye is usually related to an inflammatory response caused by allergy, foreign body, or bacterial or viral infection.</td>
</tr>
<tr>
<td>Do you experience excessive watering or tearing of the eye? One eye or both eyes?</td>
<td>Excessive tearing (epiphora) is caused by exposure to irritants or obstruction of the lacrimal apparatus. Unilateral epiphora is often associated with foreign body or obstruction. Bilateral epiphora is often associated with exposure to irritants, such as makeup or facial cleansers, or it may be a systemic response.</td>
</tr>
<tr>
<td>Have you had any eye discharge? Describe.</td>
<td>Discharge other than tears from one or both eyes suggests a bacterial or viral infection.</td>
</tr>
</tbody>
</table>

*continued*
**COLDSPA Example**

Use the COLDSPA mnemonic as a guideline to collect needed information for each symptom the client shares. In addition, the following questions help elicit important information.

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Question</th>
<th>Client Response Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character</td>
<td>Describe the sign or symptom (feeling, appearance, sound, smell, or taste if applicable).</td>
<td>“My right eye really hurts.”</td>
</tr>
<tr>
<td>Onset</td>
<td>When did it begin?</td>
<td>“A couple of hours ago, when I accidentally poked my key in my eye.”</td>
</tr>
<tr>
<td>Location</td>
<td>Where is it? Does it radiate? Does it occur anywhere else?</td>
<td>“Only my right eye.”</td>
</tr>
<tr>
<td>Duration</td>
<td>How long does it last? Does it recur?</td>
<td>“It hurts constantly.”</td>
</tr>
<tr>
<td>Severity</td>
<td>How bad is it? or How much does it bother you?</td>
<td>“It makes it difficult to drive and is quite painful.”</td>
</tr>
<tr>
<td>Pattern</td>
<td>What makes it better or worse?</td>
<td>“It hurts when I blink and feels better if I keep my eye shut.”</td>
</tr>
<tr>
<td>Associated factors/How it Affects the client</td>
<td>What other symptoms occur with it? How does it affect you?</td>
<td>“My right eye is watery and my vision is blurry.”</td>
</tr>
</tbody>
</table>

**PAST HEALTH HISTORY**

**Question**

- Have you ever had problems with your eyes or vision?

**Rationale**

A history of eye problems or changes in vision provides clues to the current health of the eye.

- Have you ever had eye surgery?

**Rationale**

Surgery may alter the appearance of the eye and the results of future examinations.

- Describe any past treatments you have received for eye problems (medication, surgery, laser treatments, corrective lenses). Were these successful? Were you satisfied?

**Rationale**

Client may not be satisfied with past treatments for vision problems.

**FAMILY HISTORY**

**Question**

- Is there a history of eye problems or vision loss in your family?

**Rationale**

Many eye disorders have familial tendencies. Examples include glaucoma, refraction errors, and allergies.

**LIFESTYLE AND HEALTH PRACTICES**

**Question**

- Are you exposed to conditions or substances in the workplace or home that may harm your eyes or vision (e.g., chemicals, fumes, smoke, dust, or flying sparks)? Do you wear safety glasses during exposure to harmful substances?

**Rationale**

Injuries or diseases may be related to exposure in the workplace or home. These problems can be minimized or avoided altogether with hazard identification and implementation of safety measures.

*continued on page 234*
Do you wear sunglasses during exposure to the sun?  
Exposure to ultraviolet radiation puts the client at risk for the development of cataracts (opacities of the lenses of the eyes; see Promote Health—Cataracts, Glaucoma, and Macular Degeneration). Consistent use of sunglasses during exposure minimizes the client’s risk.

What types of medications do you take?  
Some medications have ocular side effects such as corticosteroids, lovastatin, pyridostigmine, quinidine, risperidone, and rifampin.

Has your vision loss affected your ability to care for yourself? To work?  
Vision problems may interfere with the client’s ability to perform usual activities of daily living. The client may be unable to read medication labels or fill insulin syringes. If the vision problem is severe, the client’s ability to perform hygiene practices or prepare food may be affected. Vision problems may affect a client’s ability to work if the job is one that depends on sight, such as pilot or bus driver.

When was your last eye examination?  
A thorough eye examination is recommended for healthy clients every 2 years. Clients with eye disorders or vision problems should be examined more frequently according to their physician’s recommendations.

Do you have a prescription for corrective lenses (glasses or contacts)? Do you wear them regularly? If you wear contacts, how long do you wear them? How do you clean them?  
The amount of time the client wears the corrective lenses provides information on the severity of the visual problem. Clients who do not wear the prescribed corrective lenses are susceptible to eye strain. Improper cleaning or prolonged wearing of contact lenses can lead to infection and corneal damage.

PROMOTE HEALTH  
Cataracts, Glaucoma, and Macular Degeneration

Overview  
Cataracts are the leading cause of blindness worldwide, followed by glaucoma. Part of the VISION 2020 Global Initiative of the WHO is devoted to reducing cataract, glaucoma, and macular degeneration which cause approximately 161 million people worldwide to be visually impaired (WHO, 2007). Cataract is the name given to opacity or clouding of the eye’s lens. The opacity can develop in various parts of the lens. Glaucoma is a group of diseases that may begin with no symptoms but lead to vision loss through optic nerve damage. Glaucoma involves loss of retinal ganglion cells causing optic neuropathy. Increased intraocular pressure is often but not always associated with glaucoma. Macular degeneration is a group of diseases characterized by breakdown of the center portion of the retina known as the macula.

Risk Factors—Cataracts  
- Increasing age, especially over age 50  
- Prolonged exposure to ultraviolet B (UV-B) light, especially in latitudes closer to the equator  
- Diabetes mellitus  
- Cigarette smoking  
- Alcohol use  
- Diet low in antioxidants, especially vitamins E and B  
- High blood pressure  
- Eye injuries/surgery  
- Steroid use  
- Female gender  

Risk Factors—Glaucoma  
- Increased intraocular pressure (IOP)  
- Age, usually over age 40  

continued
The purpose of the eye and vision examination is to identify any changes in vision or signs of eye disorders in an effort to initiate early treatment or corrective procedures. Collected objective data should include assessment of eye function through specific vision tests, inspection of the external eye, and inspection of the internal eye using an ophthalmoscope.

For the most part, inspection and palpation of the external eye are straightforward and simple to perform. The vision tests and use of the ophthalmoscope require a great deal of skill, and thus practice, for the examiner to be capable and confident during the examination. It is a good idea for the beginning examiner to practice on friends, family, or classmates to gain experience and to become comfortable performing the examinations.

Preparing the Client

Explain each vision test thoroughly to guarantee accurate results. For the eye examination, position the client so she is seated comfortably. During examination of the internal eye with the ophthalmoscope, you will move very close to the client’s face to view the retina and internal structures. Explain to the client that this may be slightly uncomfortable. To ease any client anxiety, explain in detail what you will be doing and answer any questions the client may have.

Equipment

- Snellen or E chart
- Hand-held Snellen card or near vision screener
- Penlight
- Opaque cards
- Ophthalmoscope
- Disposable gloves (wear as needed to prevent spreading infection or coming in contact with exudate)

Physical Assessment

Before performing eye examination, review and recognize structures and functions of the eyes. While performing the examination, remember these key points:

- Administer vision tests competently and record the results.
- Use the ophthalmoscope correctly and confidently.
- Recognize and distinguish normal variations from abnormal findings.

(text continues on page 259)
Evaluating Vision

Test distant visual acuity. Position the client 20 feet from the Snellen or E chart (see Equipment Spotlight 15-1) and ask her to read each line until she cannot decipher the letters or their direction (Fig. 15-8). Document the results.

➤ Clinical Tip • If the client wears glasses, they should be left on unless they are reading glasses (reading glasses blur distance vision).

During this vision test, note any client behaviors (i.e., leaning forward, head tilting or squinting) that could be unconscious attempts to see better.

Normal distant visual acuity is 20/20 with or without corrective lenses. This means the client can distinguish what the person with normal vision can distinguish from 20 feet away.

Myopia (impaired far vision) is present when the second number in the test result is larger than the first (20/40). The higher the second number, the poorer the vision. A client is considered legally blind when vision in the better eye with corrective lenses is 20/200 or less. Any client with vision worse than 20/30 should be referred for further evaluation.

Visual acuity varies by race in U.S. populations. Japanese and Chinese Americans have the poorest corrected visual acuity (especially myopia) followed by African Americans and Hispanics. Native

Snellen Chart

Used to test distant visual acuity, the Snellen chart consists of lines of different letters stacked one on top of the other. The letters are large at the top and decrease in size from top to bottom. The chart is placed on a wall or door at eye level in a well-lighted area. The client stands 20 feet from the chart and covers one eye with an opaque card (which prevents the client from peeking through the fingers). Then the client reads each line of letters until he or she can no longer distinguish them.

E Chart

If the client cannot read or has a handicap that prevents verbal communication, the E chart is used. The E chart is configured just like the Snellen chart but the characters on it are only Es, which face in all directions. The client is asked to indicate by pointing which way the open side of the Es faces. If the client wears glasses, they should be left on, unless they are reading glasses (reading glasses blur distance vision).

Test Results

Acuity results are recorded somewhat like blood pressure readings—in a manner that resembles a fraction (but in no way is interpreted as a fraction). A common example of an acuity test score is 20/20. The top, or first, number is always 20, indicating the distance from the client to the chart. The bottom, or second, number refers to the last full line the client could read. Usually the last line on the chart is the 20/20 line. The examiner needs to document whether the client wore glasses during the test. If any letters on a line are missed, encourage the client to continue reading until he or she cannot distinguish any letters, but record the number of letters missed by using a minus sign. If the client missed two letters on the 20/30 line, the recorded score would be 20/30 -2.
### Assessment Procedure

#### Test near visual acuity
Use this test for middle-aged clients and others who complain of difficulty reading.

Give the client a hand-held vision chart (e.g., Jaeger reading card, Snellen card, or comparable chart) to hold 14 inches from the eyes. Have the client cover one eye with an opaque card before reading from top (largest print) to bottom (smallest print). Repeat test for other eye.

**Clinical Tip** • The client who wears glasses should keep them on for this test.

#### Test visual fields for gross peripheral vision
To perform the confrontation test, position yourself approximately 2 feet away from the client at eye level. Have the client cover his left eye while you cover your right eye (Fig. 15-9). Look directly at each other with your uncovered eyes. Next fully extend your left arm at midline and slowly move one finger (or a pencil) upward from below until the client sees your finger (or pencil). Test the remaining three visual fields of the client’s right eye (i.e., superior, temporal, and nasal). Repeat the test for the opposite eye.

**Normal near visual acuity is 14/14 (with or without corrective lenses). This means the client can read what the normal eye can read from a distance of 14 inches.**

**With normal peripheral vision, the client should see the examiner’s finger at the same time the examiner sees it. Normal visual field degrees are approximately as follows:**
- Inferior: 70 degrees
- Superior: 50 degrees
- Temporal: 90 degrees
- Nasal: 60 degrees

### Normal Findings

<table>
<thead>
<tr>
<th>Assessment Procedure</th>
<th>Normal Findings</th>
<th>Abnormal Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test near visual acuity</td>
<td>Normal near visual acuity is 14/14 (with or without corrective lenses). This means the client can read what the normal eye can read from a distance of 14 inches.</td>
<td>Americans and Caucasians have the best corrected acuity. Eskimos are undergoing an epidemic of myopia (Overfield, 1995; The Eye Digest, 2006; The Eye Disease Prevalence Group, 2004).</td>
</tr>
<tr>
<td>Test visual fields for gross peripheral vision</td>
<td>With normal peripheral vision, the client should see the examiner’s finger at the same time the examiner sees it. Normal visual field degrees are approximately as follows:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presbyopia (impaired near vision) is indicated when the client moves the chart away from the eyes to focus on the print. It is caused by decreased accommodation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presbyopia is a common condition in clients over age 45.</td>
</tr>
</tbody>
</table>

### Abnormal Findings

A delayed or absent perception of the examiner’s finger indicates reduced peripheral vision (Abnormal Findings 15-1). The client should be referred for further evaluation.

---

**Figure 15-8** Testing distant visual acuity.

**Figure 15-9** Performing confrontation test to assess visual fields (©B. Proud).
Perform cover test. The cover test detects deviation in alignment or strength and slight deviations in eye movement by interrupting the fusion reflex that normally keeps the eyes parallel. Ask the client to stare straight ahead and focus on a distant object. Cover one of the client’s eyes with an opaque card (Fig. 15-10). As you cover the eye, observe the uncovered eye for movement. Now remove the opaque card and observe the previously covered eye for any movement. Repeat test on the opposite eye.

Perform the positions test assesses eye muscle strength and cranial nerve function. Instruct the client to focus on an object you are holding (approximately 12 inches from the client’s face). Move the object through the six cardinal positions of gaze in a clockwise direction, and observe the client’s eye movements (Fig. 15-11).

Eye movement should be smooth and symmetric throughout all six directions.

<table>
<thead>
<tr>
<th>Assessment Procedure</th>
<th>Normal Findings</th>
<th>Abnormal Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform corneal light reflex test. This test assesses parallel alignment of the eyes. Hold a penlight approximately 12 inches from the client’s face. Shine the light toward the bridge of the nose while the client stares straight ahead. Note the light reflected on the corneas.</td>
<td>The reflection of light on the corneas should be in the exact same spot on each eye, which indicates parallel alignment.</td>
<td>Asymmetric position of the light reflex indicates deviated alignment of the eyes. This may be due to muscle weakness or paralysis (Abnormal Findings 15-2).</td>
</tr>
<tr>
<td>Perform cover test. The cover test detects deviation in alignment or strength and slight deviations in eye movement by interrupting the fusion reflex that normally keeps the eyes parallel.</td>
<td>The uncovered eye should remain fixed straight ahead. The covered eye should remain fixed straight ahead after being uncovered.</td>
<td>The uncovered eye will move to establish focus when the opposite eye is covered. When the covered eye is uncovered, movement to reestablish focus occurs. Either of these findings indicates a deviation in alignment of the eyes and muscle weakness (Abnormal Findings 15-2).</td>
</tr>
</tbody>
</table>

Figure 15-10 Performing cover test with (A) eye covered and (B) eye uncovered (© B. Proud).

Figure 15-11 Performing positions test (© B. Proud).

Physoria is a term used to describe misalignment that occurs only when fusion reflex is blocked.

Strabismus is constant malalignment of the eyes.

Tropia is a specific type of misalignment: esotropia is an inward turn of the eye, and exotropia is an outward turn of the eye.

Nystagmus, an oscillating (shaking) movement of the eye may be associated with an inner ear disorder, multiple sclerosis, brain lesions, or narcotics use.
### External Eye Structures

#### Inspection and Palpation

**Inspect the eyelids and eyelashes.**

Note width and position of palpebral fissures.

- The upper lid margin should be between the upper margin of the iris and the upper margin of the pupil. The lower lid margin rests on the lower border of the iris. No white sclera is seen above or below the iris. Palpebral fissures may be horizontal.

Assess ability of eyelids to close.

- The upper and lower lids close easily and meet completely when closed.

Note the position of the eyelids in comparison with the eyeballs. Also note any unusual

- • Turnings
- • Color
- • Swelling
- • Lesions
- • Discharge

Observe for redness, swelling, discharge, or lesions.

- Skin on both eyelids is without redness, swelling, or lesions.

Observe the position and alignment of the eyeball in the eye socket.

- Eyeballs are symmetrically aligned in sockets without protruding or sinking.

The eyes of African Americans protrude slightly more than those of Caucasians, and African Americans of both sexes may have eyes protruding beyond 21 mm. A difference of more than 2 mm between the two eyes is abnormal (Mercandetti, 2007).

#### Abnormal Findings

Drooping of the upper lid, called *ptosis*, may be attributed to oculomotor nerve damage, myasthenia gravis, weakened muscle or tissue, or a congenital disorder (see Abnormal Findings 15-3). Retracted lid margins, which allow for viewing of the sclera when the eyes are open, suggest hyperthyroidism.

Failure of lids to close completely puts client at risk for corneal damage.

An inverted lower lid is a condition called an *entropion*, which may cause pain and injure the cornea as the eyelash brushes against the conjunctiva and cornea.

*Ectropion*, an everted lower eyelid, results in exposure and drying of the conjunctiva. Both conditions (see Abnormal Findings 15-3) interfere with normal tear drainage.

Though usually abnormal, entropion and ectropion are common in older clients.

Redness and crusting along the lid margins suggest seborrhea or blepharitis, an infection caused by *Staphylococcus aureus*. Hordeolum (stye), a hair follicle infection, causes local redness, swelling, and pain. A chalazion, an infection of the meibomian gland (located in the eyelid), may produce extreme swelling of the lid, moderate redness, but minimal pain (see Abnormal Findings 15-3).

Protrusion of the eyeballs accompanied by retracted eyelid margins is termed *exophthalmos* (see Abnormal Findings 15-3) and is characteristic of Graves’ disease (a type of hyperthyroidism). A sunken appearance of the eyes may be seen with severe dehydration or chronic wasting illnesses.

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**CHAPTER 15**

**EYES**

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Generalized redness of the conjunctiva suggests conjunctivitis (pink eye). Areas of dryness are associated with allergies or trauma. Episcleritis is a local, noninfectious inflammation of the sclera. The condition is usually characterized by either a nodular appearance or by redness with dilated vessels (see Abnormal Findings 15-3).

Cyanosis of the lower lid suggests a heart or lung disorder. A foreign body or lesion may cause irritation, burning, pain and/or swelling of the upper eyelid.

**Inspect the bulbar conjunctiva and sclera.** Have the client keep her head straight while looking from side to side then up toward the ceiling (Fig. 15-12). Observe clarity, color, and texture.

Bulbar conjunctiva is clear, moist, and smooth. Underlying structures are clearly visible. Sclera is white. Yellowish nodules on the bulbar conjunctiva are called pinguecula. These harmless nodules are common in older clients and appear first on the medial side of the iris and then on the lateral side. Darker-skinned clients may have sclera with yellow or pigmented freckles.

**Inspect the palpebral conjunctiva.**

*Clinical Tip • This procedure is stressful and uncomfortable for the client, it is usually only done if the client complains of pain or “something in the eye.”*

Put on gloves for this assessment procedure. First inspect the palpebral conjunctiva of the lower eyelid by placing your thumbs bilaterally at the level of the lower bony orbital rim and gently pulling down to expose the palpebral conjunctiva (Fig. 15-13). Avoid pressing the eye. Ask the client to look up as you observe the exposed areas.

The lower and upper palpebral conjunctivae are clear and free of swelling or lesions.

Palpebral conjunctiva is free of swelling, foreign bodies, or trauma.

Generalized redness of the conjunctiva suggests conjunctivitis (pink eye).

Areas of dryness are associated with allergies or trauma.

Episcleritis is a local, noninfectious inflammation of the sclera. The condition is usually characterized by either a nodular appearance or by redness with dilated vessels (see Abnormal Findings 15-3).

Cyanosis of the lower lid suggests a heart or lung disorder.

A foreign body or lesion may cause irritation, burning, pain and/or swelling of the upper eyelid.

**Assessment Procedure**

**Normal Findings**

**Abnormal Findings**

| Bulbar conjunctiva is clear, moist, and smooth. Underlying structures are clearly visible. Sclera is white. | Generalized redness of the conjunctiva suggests conjunctivitis (pink eye). |
| Yellowish nodules on the bulbar conjunctiva are called pinguecula. These harmless nodules are common in older clients and appear first on the medial side of the iris and then on the lateral side. | Areas of dryness are associated with allergies or trauma. |
| Darker-skinned clients may have sclera with yellow or pigmented freckles. | Episcleritis is a local, noninfectious inflammation of the sclera. The condition is usually characterized by either a nodular appearance or by redness with dilated vessels (see Abnormal Findings 15-3). |

| The lower and upper palpebral conjunctivae are clear and free of swelling or lesions. | Cyanosis of the lower lid suggests a heart or lung disorder. |
| Palpebral conjunctiva is free of swelling, foreign bodies, or trauma. | A foreign body or lesion may cause irritation, burning, pain and/or swelling of the upper eyelid. |
Inspect the lacrimal apparatus. Assess the areas over the lacrimal glands (lateral aspect of upper eyelid) and the puncta (medial aspect of lower eyelid).

Palpate the lacrimal apparatus. Put on disposable gloves to palpate the nasolacrimal duct to assess for blockage. Use one finger and palpate just inside the lower orbital rim (Fig. 15-15).

Assessment Procedure | Normal Findings | Abnormal Findings
--- | --- | ---
Inspect the lacrimal apparatus | No swelling or redness should appear over areas of the lacrimal gland. The puncta is visible without swelling or redness and is turned slightly toward the eye. | Swelling of the lacrimal gland may be visible in the lateral aspect of the upper eyelid. This may be caused by blockage, infection, or an inflammatory condition. Redness or swelling around the puncta may indicate an infectious or inflammatory condition. Excessive tearing may indicate a nasolacrimal sac obstruction. Expressed drainage from the puncta on palpation occurs with duct blockage.

Figure 15-12 Inspecting the bulbar conjunctiva.

Figure 15-13 Inspecting palpebral conjunctiva: lower eyelid (© B. Proud).

Figure 15-14 Evert the upper eyelid.
Areas of roughness or dryness on the cornea are often associated with injury or allergic responses. Opacities of the lens are seen with cataracts (Abnormal Findings 15-4).

Typical abnormal findings include irregularly shaped irises, miosis, mydriasis, and anisocoria. (For a description of these abnormalities and their implications, see Abnormal Findings 15-5).

If the difference in pupil size changes throughout pupillary response tests, the inequality of size is abnormal.

Monocular blindness can be detected when light directed to the blind eye results in no response in either pupil. When light is directed into the unaffected eye, both pupils constrict.

---

**PHYSICAL ASSESSMENT**

<table>
<thead>
<tr>
<th>Assessment Procedure</th>
<th>Normal Findings</th>
<th>Abnormal Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inspect the cornea and lens.</strong></td>
<td>The cornea is transparent with no opacities. The oblique view shows a smooth and overall moist surface; the lens is free of opacities.</td>
<td>Areas of roughness or dryness on the cornea are often associated with injury or allergic responses. Opacities of the lens are seen with cataracts (Abnormal Findings 15-4).</td>
</tr>
<tr>
<td><strong>Inspect the iris and pupil.</strong></td>
<td>The iris is typically round, flat, and evenly colored. The pupil, round with a regular border, is centered in the iris. Pupils are normally equal in size (3 to 5 mm). An inequality in pupil size of less than 0.5 mm occurs in 20% of clients. This condition, called anisocoria, is normal.</td>
<td>Typical abnormal findings include irregularly shaped irises, miosis, mydriasis, and anisocoria. (For a description of these abnormalities and their implications, see Abnormal Findings 15-5).</td>
</tr>
<tr>
<td><strong>Test pupillary reaction to light.</strong></td>
<td>The normal direct pupillary response is constriction.</td>
<td>If the difference in pupil size changes throughout pupillary response tests, the inequality of size is abnormal.</td>
</tr>
</tbody>
</table>

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**Figure 15-15** Palpating the lacrimal apparatus (© B. Proud).

**Figure 15-16** Arcus senilis.

**Figure 15-17** Pupillary gauge measures pupils (dilation or constriction) in millimeters (mm).
Assessment Procedure

<table>
<thead>
<tr>
<th>Normal Findings</th>
<th>Abnormal Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils do not react at all to direct and consensual pupillary testing.</td>
<td>Pupils do not react at all to direct and consensual pupillary testing.</td>
</tr>
<tr>
<td>Pupils do not constrict; eyes do not converge.</td>
<td>Pupils do not constrict; eyes do not converge.</td>
</tr>
</tbody>
</table>

Pupillary constriction is a reaction to light and not a near reaction.

➤ **Clinical Tip** • Use a pupillary gauge to measure the constricted pupil. Then, document the finding in a format similar to (but not) a fraction. The top (or first) number indicates the pupil’s eye at rest, and the bottom (or second) number indicates the constricted size; for example, O.S. (left eye, oculus sinister) 3/2; O.D. (right eye, oculus dexter) 3/1.

Assess consensual response at the same time as direct response by shining a light obliquely into one eye and observing the pupillary reaction in the opposite eye.

➤ **Clinical Tip** • When testing for consensual response, place your hand or another barrier to light (e.g., index card) between the client’s eyes to avoid an inaccurate finding.

**Test accommodation of pupils.**

Accommodation occurs when the client moves his focus of vision from a distant point to a near object, causing the pupils to constrict. Hold your finger or a pencil about 12 to 15 inches from the client. Ask the client to focus on your finger or pencil and to remain focused on it as you move it closer in toward the eyes (Fig. 15-18).

The normal consensual pupillary response is constriction.

The normal pupillary response is constriction of the pupils and convergence of the eyes when focusing on a near object (accommodation and convergence).
Assessment Procedure Normal Findings Abnormal Findings

**Internal Eye Structures**

Using an ophthalmoscope (see Equipment Spotlight 15-2), inspect the internal eye. To observe the red reflex, set the diopter at zero and stand 10 to 15 inches from the client’s right side at a 15-degree angle. Place your free hand on the client’s head, which helps limit head movement (Fig. 15-19). Shine the light beam toward the client’s pupil.

**Inspect the optic disc.** Keep the light beam focused on the pupil and move closer to the client from a 15-degree angle. You should be very close to the client’s eye (about 3 to 5 cm), almost touching the eyelashes. Rotate the diopter setting to bring the retinal structures into sharp focus. The diopter should be zero if neither the examiner nor the client has refractive errors. Note shape, color, size, and physiologic cup.

>*Clinical Tip* • The diameter of the optic disc (DD) is used as the standard of measure for the location and size of other structures and any abnormalities or lesions within the ocular fundus. When documenting a structure within the ocular fundus, also note the position of the structure as it relates to numbers on the clock. For example, lesion is at 2:00, 1 DD in size, 2 DD from disc.

**Inspect the retinal vessels.** Remain in the same position as described previously. Inspect the sets of retinal vessels by following them out to the periphery of each section of the eye. Note the number of sets of arterioles and venules.

Also note color and diameter of the arterioles.

**Observe the arteriovenous (AV) ratio.**

**Look at AV crossings.**

The red reflex should be easily visible through the ophthalmoscope. The red area should appear round with regular borders.

The optic disc should be round to oval with sharp, well-defined borders (Fig. 15-20).

The nasal edge of the optic disc may be blurred. The disc is normally creamy, yellow-orange to pink, and approximately 1.5 mm wide.

The physiologic cup, the point at which the optic nerve enters the eyeball, appears on the optic disc as slightly depressed and a lighter color than the disc. The cup occupies less than half of the disc’s diameter. The disc’s border may be surrounded by rings and crescents, consisting of white sclera or black retinal pigment. These normal variations are not considered in the optic disc’s diameter.

Optic nerve discs are larger in blacks, Asians, and Native Americans than in Hispanics and non-Hispanic whites (Girkin, 2005; Overfield, 1995).

Four sets of arterioles and venules should pass through the optic disc.

Arterioles are bright red and progressively narrow as they move away from the optic disc. Arterioles have a light reflex that appears as a thin, white line in the center of the arteriole. Venules are darker red and larger than arterioles. They also progressively narrow as they move away from the optic disc.

The ratio of arteriole diameter to vein diameter (AV ratio) is 2:3 or 4:5.

In a normal AV crossing, the vein passing underneath the arteriole is seen right up to the column of blood on either side of the arteriole (the arteriole wall itself is normally transparent).

Abnormalities of the red reflex most often result from cataracts. These usually appear as black spots against the background of the red light reflex. Two types of age-related cataracts are nuclear cataracts and peripheral cataracts (Abnormal Findings 15-4).

Papilledema, or swelling of the optic disc, appears as a swollen disc with blurred margins, a hyperemic (blood-filled) appearance, more visible and more numerous disc vessels, and lack of visible physiologic cup. The condition may result from hypertension or increased intracranial pressure (Abnormal Findings 15-6).

The intraocular pressure associated with glaucoma interferes with the blood supply to optic structures and results in the following characteristics: an enlarged physiologic cup that occupies more than half of the disc’s diameter, pale base of enlarged physiologic cup, and obscured or displaced retinal vessels.

Optic atrophy is evidenced by the disc being white in color and a lack of disc vessels. This condition is caused by the death of optic nerve fibers.

Changes in the blood supply to the retina may be observed in constricted arterioles, dilated veins, or absence of major vessels (Abnormal Findings 15-7).

Initially hypertension may cause a widening of the arterioles’ light reflex and the arterioles take on a copper color. With long-standing hypertension, arteriole walls thicken and appear opaque or silver.

Arterial nicking, tapering, and banking are abnormal AV crossings caused by hypertension or arteriosclerosis (Abnormal Findings 15-7).

Continued on page 246
The ophthalmoscope is a hand-held instrument that allows the examiner to view the fundus of the eye by the projection of light through a prism that bends the light 90 degrees. There are several lenses arranged on a wheel that affect the focus on objects in the eye. The examiner can rotate the lenses with his or her index finger. Each lens is labeled with a negative or positive number, a unit of strength called a diopter. Red numbers indicate a negative diopter and are used for myopic (nearsighted) clients. Black numbers indicate a positive diopter and are used for hyperopic (farsighted) clients. The zero lens is used if neither the examiner nor the client has refractive errors.

**Basics of Operation**

1. Turn the ophthalmoscope “on” and select the aperture with the large round beam of white light. The small round beam of white light may be used if the client has smaller pupils. There are other apertures but they are not typically used for basic ophthalmologic screening.
2. Ask the client to remove eyeglasses but keep contact lenses in place. You should also remove your glasses. Any refractive errors can be accommodated for by rotating the lenses (if errors are severe, glasses should be left on). Removing glasses enables you to get closer to the client’s eye, allowing for a more accurate inspection. Keep your contact lenses in place.
3. Ask the client to fix his or her gaze on an object that is straight ahead and slightly upward.
4. Darken the room to allow pupils to dilate (for a more thorough examination, eyedrops are used to dilate pupils).
5. Hold the ophthalmoscope in your right hand with your index finger on the lens wheel and place it to your right eye (braced between the eyebrow and the nose) if you are examining the client’s right eye. Use your left hand and left eye if you are examining the client’s left eye. This allows you to get as close to the client’s eye as possible without bumping noses with the client.

**Some Do’s and Don’ts**

*Do*
- Begin about 10 to 15 inches from the client at a 15-degree angle to the client’s side.
- Pretend that the ophthalmoscope is an extension of your eye. Keep focused on the red reflex as you move in closer, then rotate the diopter setting to see the optic disk.

*Don’t*
- Do not use your right eye to examine the client’s left eye or your left eye to examine the client’s right eye (your noses will bump).
- Do not move the ophthalmoscope around; ask the client to look into light to view the fovea and macula.
- Do not get frustrated—the ophthalmologic examination requires practice.
Assessment Procedure | Normal Findings | Abnormal Findings
--- | --- | ---
Inspect retinal background. | General background appears consistent in texture. The red-orange color of the background is lighter near the optic disc. | Cotton-wool patches (soft exudates) and hard exudates from diabetes and hypertension appear as light-colored spots on the retinal background. Hemorrhages and microaneurysms appear as red spots and streaks on the retinal background (Abnormal Findings 15-7).

Inspect fovea (sharpest area of vision) and macula. | The macula is the darker area, one disc diameter in size, located to the temporal side of the optic disc. Within this area is a starlike light reflex called the fovea. | Excessive clumped pigment appears with detached retinas or retinal injuries. Macular degeneration may be due to hemorrhages, exudates, or cysts.

Inspect anterior chamber. | The anterior chamber is transparent. | Hyphemia occurs when injury causes red blood cells to collect in the lower half of the anterior chamber (Fig. 15-21).

Hypopyon usually results from an inflammatory response in which white blood cells accumulate in the anterior chamber and produce cloudiness in front of the iris (Fig. 15-22).
### Visual Field Defects

When a client reports losing full or partial vision in one or both eyes, the nurse can usually anticipate a lesion as the cause. Some abnormal findings associated with visual field defects are illustrated here. The darker areas signify vision loss.

#### Finding

<table>
<thead>
<tr>
<th>Finding</th>
<th>Possible Source</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral blindness (eg, blind right eye)</td>
<td>Lesion in (right) eye or (right) optic nerve</td>
<td>Left Eye (solid) Right Eye (open)</td>
</tr>
<tr>
<td>Bitemporal hemianopia (loss of vision in both temporal fields)</td>
<td>Lesion of optic chiasm</td>
<td>Left Eye (open) Right Eye (solid)</td>
</tr>
<tr>
<td>Left superior quadrant anopia or similar loss of vision (homonymous) in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>quadrant of each field</td>
<td>Partial lesion of temporal loop (optic radiation)</td>
<td>Left Eye (solid) Right Eye (open)</td>
</tr>
<tr>
<td>Right visual field loss—right homonymous hemianopia or similar loss of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vision in half of each field</td>
<td>Lesion in right optic tract or lesion in temporal loop (optic radiation)</td>
<td>Left Eye (open) Right Eye (solid)</td>
</tr>
</tbody>
</table>
Abnormal Findings 15-2  Extraocular Muscle Dysfunction

Abnormalities found during an assessment of extraocular muscle function are described below:

**Corneal Light Reflex Test Abnormalities**

*Pseudostrabismus*

Normal in young children, the pupils will appear at the inner canthus (due to the epicanthic fold).

![Pseudostrabismus Image]

*Strabismus (or Tropia)*

A constant malalignment of the eye axis, strabismus is defined according to the direction toward which the eye drifts and may cause amblyopia.

![Strabismus Image]

*Esotropia* (eye turns inward).

*Exotropia* (eye turns outward).

continued
Abnormal Findings 15-2

Extraocular Muscle Dysfunction Continued

Cover Test Abnormalities

**Phoria (Mild Weakness)**

Noticeable only with the cover test, phoria is less likely to cause amblyopia than strabismus. Esophoria is an inward drift and exophoria an outward drift of the eye.

The uncovered eye is weaker; when the stronger eye is covered, the weaker eye moves to refocus.

When the weaker eye is covered, it will drift to a relaxed position.

Once the eye is uncovered, it will quickly move back to reestablish fixation.

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Abnormal Findings 15-2  Extraocular Muscle Dysfunction *Continued*

**Positions Test Abnormalities**

*Paralytic Strabismus*

Noticeable with the positions test, paralytic strabismus is usually the result of weakness or paralysis of one or more extraocular muscles. The nerve affected will be on the same side as the eye affected (for instance, a right eye paralysis is related to a right-side cranial nerve). The position in which the maximum deviation appears indicates the nerve involved.

**6th nerve paralysis**: The eye cannot look to the outer side.

In left 6th nerve paralysis, the client tries to look to the left. The right eye moves left, but the left eye cannot move left.

**4th nerve paralysis**: The eye cannot look down when turned inward.

A client with left 4th nerve paralysis looks down and to the right.

**3rd nerve paralysis**: Upward, downward, and inward movements are lost. Ptosis and pupillary dilation may also occur.

A client with left 3rd nerve paralysis looks straight ahead.
Some easily recognized abnormalities that affect the external eye are illustrated below.

- **Ptosis** (drooping eye)
- **Exophthalmos** (protruding eyeballs and retracted eyelids)
- **Entropion** (inwardly turned lower eyelid)
- **Ectropion** (outwardly turned lower lid)
- **Chalazion** (infected meibomian gland)
- **Blepharitis** (staphylococcal infection of the eyelid)

continued on page 252
Abnormal Findings 15-3  Abnormalities of the External Eye Continued

Conjunctivitis (generalized inflammation of the conjunctiva). (© 1995 Dr. P. Marazzi/Science photo Library/CMSP)

Hordeolum (stye).

Abnormal Findings 15-4

Abnormalities of the Cornea and Lens

Representative abnormalities of the cornea are illustrated below as a corneal scar and a pterygium. Lens abnormalities are represented by a nuclear cataract and a peripheral cataract. Usually, cataracts are most easily seen by the naked eye.

Corneal Abnormalities

A corneal scar, which appears grayish white, usually is due to an old injury or inflammation.

Early pterygium, a thickening of the bulbar conjunctiva that extends across the nasal side. (Tasman, W., & Jaeger, E. [Eds.], [2001]. The Wills Eye Hospital atlas of clinical ophthalmology [2nd ed.]. Philadelphia: Lippincott Williams & Wilkins.)

Lens Abnormalities

Nuclear cataracts appear gray when seen with a flashlight; they appear as a black spot against the red reflex when seen through an ophthalmoscope.

Peripheral cataracts look like gray spokes that point inward when seen with a flashlight; they look like black spokes that point inward against the red reflex when seen through an ophthalmoscope. (Tasman, W., & Jaeger, E. [Eds.], [2001]. The Wills Eye Hospital atlas of clinical ophthalmology [2nd ed.]. Philadelphia: Lippincott Williams & Wilkins.)
Abnormal Findings 15-5

Abnormalities of the Iris and Pupils

Irregularly Shaped Iris
An irregularly shaped iris causes a shallow anterior chamber, which may increase the risk for narrow-angle (closed-angle) glaucoma.

Miosis
Also known as pinpoint pupils, miosis is characterized by constricted and fixed pupils—possibly a result of narcotic drugs or brain damage.

Anisocoria
Anisocoria is pupils of unequal size. In some cases, the condition is normal; in other cases, it is abnormal. For example, if anisocoria is greater in bright light compared with dim light, the cause may be trauma, tonic pupil (caused by impaired parasympathetic nerve supply to iris), and oculomotor nerve paralysis. If anisocoria is greater in dim light compared with bright light, the cause may be Horner's syndrome (caused by paralysis of the cervical sympathetic nerves and characterized by ptosis, sunken eyeball, flushing of the affected side of the face, and narrowing of the palpebral fissure).

Mydriasis
Dilated and fixed pupils, typically resulting from central nervous system injury, circulatory collapse, or deep anesthesia.
Abnormalities of the Optic Disc

Characteristic abnormal findings during an ophthalmoscopic examination include signs and symptoms of papilledema, glaucoma, and optic atrophy as described below.

**Papilledema**
- Swollen optic disc
- Blurred margins
- Hyperemic appearance from accumulation of excess blood
- Visible and numerous disc vessels
- Lack of visible physiologic cup

**Glaucoma**
- Enlarged physiologic cup occupying more than half of the disc’s diameter
- Pale base of enlarged physiologic cup
- Obscured and/or displaced retinal vessels

**Optic Atrophy**
- White optic disc
- Lack of disc vessels
### Abnormalities of the Retinal Vessels and Background

Characteristic abnormal findings during an ophthalmoscopic examination of the retinal vessels include constricted arterioles, copper wire arterioles, silver wire arteriole, arteriovenous (AV) nicking, AV tapering, and AV banking. Signs and symptoms are described below.

#### Constricted Arteriole
- Narrowing of the arteriole
- Occurs with hypertension

#### Copper Wire Arteriole
- Widening of the light reflex and a coppery color
- Occurs with hypertension

#### Silver Wire Arteriole
- Opaque or silver appearance caused by thickening of arteriole wall
- Occurs with long-standing hypertension

#### Arteriovenous Nicking
- Arteriovenous crossing abnormality characterized by vein appearing to stop short on either side of arteriole
- Caused by loss of arteriole wall transparency from hypertension

#### Arteriovenous Tapering
- Arteriovenous crossing abnormality characterized by vein appearing to taper to a point on either side of the arteriole
- Caused by loss of arteriole wall transparency from hypertension

*continued*
Abnormal Findings 15-7

Abnormalities of the Retinal Vessels and Background Continued

Arteriovenous Banking
- Arteriovenous crossing abnormality characterized by twisting of the vein on the arteriole’s distal side and formation of a dark, knuckle-like structure
- Caused by loss of arteriole wall transparency from hypertension

Cotton Wool Patches
- Also known as soft exudates, cotton wool patches have a fluffy cotton ball appearance with irregular edges
- Appear as white or gray moderately sized spots on retinal background
- Caused by arteriole microinfarction
- Associated with diabetes mellitus and hypertension

Hard Exudate
- Solid, smooth surface and well-defined edges
- Creamy yellow-white, small, round spots typically clustered in circular, linear, or star pattern
- Associated with diabetes mellitus and hypertension

Abnormal Findings 15-7

Abnormalities of the Retinal Vessels and Background Continued

Superficial (Flame-Shaped) Retinal Hemorrhages
- Appear as small, flame-shaped, linear red streaks on retinal background
- Hypertension and papilledema are common causes

Deep (Dot-Shaped) Retinal Hemorrhages
- Appear as small, irregular red spots with blurred edges on retinal background
- Lie deeper in retina than superficial retinal hemorrhages
- Associated with diabetes mellitus

Microaneurysms
- Round, tiny red dots with smooth edges on retinal background
- Localized dilations of small vessels in retina, but vessels are too small to see
- Associated with diabetic retinopathy

VALIDATING AND DOCUMENTING FINDINGS

Validate the eye assessment data that you have collected. This is necessary to verify that the data are reliable and accurate. Document the assessment data following the healthcare facility or agency policy.

Sample of Subjective Data

Client denies recent changes in vision. Denies excessive tearing, redness, swelling, or pain of eyes. Denies spots, floaters, or blind spots. States no problem with seeing at night. No previous eye surgeries. No family history of eye problems. Denies exposure to conditions or substances that harm the eyes. Wears sunglasses regularly. Does not wear corrective lenses. Last eye examination was 1 year ago.

Sample of Objective Data

Acuity tested by Snellen chart: O.D. (right eye) 20/20, O.S. (left eye) 20/20. Visual fields full by confrontation. Corneal light reflex shows equal position of reflection. Eyes remain fixed throughout cover test. Extraocular movements smooth and symmetric with no nystagmus. Eyelids in normal position with no abnormal widening or ptosis. No redness, discharge, or crusting noted on lid margins. Conjunctiva and sclera appear moist and smooth. Sclera white with no lesions or redness. No swelling or redness over lacrimal gland; puncta is visible without swelling or redness; no drainage noted when nasolacrimal duct is palpated. Cornea is transparent, smooth, and moist with no opacities; lens is free of opacities. Irises are round, flat, and evenly colored. Pupils are equal in size and reactive to light and accommodation. Pupils converge evenly. Red reflex present bilaterally. Both optic discs visualized easily, creamy white in color, with distinct margins and vessels noted with no crossing defects. Retinal background free of lesions and orange-red in color. Macula visualized within normal limits. Anterior chamber is transparent.

Analysis of Data

DIAGNOSTIC REASONING:
POSSIBLE CONCLUSIONS

After collecting subjective and objective data pertaining to the eyes, identify abnormal findings and client strengths. Then cluster the data to reveal any significant patterns or abnormalities.

Listed below are some possible conclusions that the nurse may make after assessing a client’s eyes.

Selected Nursing Diagnoses

The following is a list of selected nursing diagnoses that may be identified when analyzing data from eye assessment.

Wellness Diagnoses

• Readiness for enhanced visual integrity

Risk Diagnoses

• Risk for Eye Injury related to hazardous work area or participation in high-level contact sports
• Risk for Injury related to impaired vision secondary to the aging process
• Risk for Eye Injury related to decreased tear production secondary to the aging process
• Risk for Self-Care Deficit (specify) related to vision loss

Actual Diagnoses

• Ineffective Health Maintenance related to lack of knowledge of necessity for eye examinations
• Self-Care Deficit (specify) related to poor vision
• Acute Pain related to injury from eye trauma, abrasion, or exposure to chemical irritant
• Social Isolation related to inability to interact effectively with others second to vision loss

Selected Collaborative Problems

After grouping the data, it may become apparent that certain collaborative problems emerge. Remember that collaborative problems differ from nursing diagnoses in that they cannot be prevented by nursing interventions. However, these physiologic complications of medical conditions can be detected and monitored by the nurse. In addition, the nurse can use physician- and nurse-prescribed interventions to minimize the complications of these problems. The nurse may also have to refer the client in such situations for further treatment of the problem. Following is a list of collaborative problems that may be identified when assessing the eye. These problems are worded as Risk for Complications (or RC), followed by the problem.

• RC: Increased intraocular pressure
• RC: Corneal ulceration or abrasion

Medical Problems

After grouping the data, it may become apparent that the client has signs and symptoms that require medical diagnosis and treatment. Referral to a primary care provider is necessary.
CASE STUDY

The case study demonstrates how to analyze eye data for a specific client. The critical thinking exercises included in the study guide/lab manual and interactive products that complement this text also offer opportunities to assess the data.

You are preparing to discharge Mr. Luther Johnson (LJ), a 68-year-old African American man, after a 2-day hospital stay for management of an acute asthma attack. His history indicates that he has been taking oral and inhaled corticosteroids intermittently for the last 17 years for asthma. You ask him if he has any other concerns he wants to discuss before he leaves. “Yes,” he says, “I have noticed some strange things that are happening with my vision. I’m concerned, although my doctor says it’s nothing to worry about—but I am worried.” When you ask for an example of what is unusual about his vision, he tells you that he doesn’t always see stairs in front of him (“I trip a lot lately,”) and when he is reading, words on the page seem to be missing sometimes. “At first I thought I was just distracted, but then I almost hit another car when I made a left turn—I didn’t see it at all. I got more concerned after that. My wife says that she has noticed more problems with my driving but didn’t want to upset me by saying something.” He indicates he does a lot of driving for his work as a computer hardware trouble-shooter. “I have to work to pay the rent and support my wife.”

When you examine his eyes, you note the following: conjugate gaze without ptosis; slight protrusion of eyeballs and firm to touch; pupils are small, equal, round and constrict with both direct and consensual illumination 2/1 OU (each eye). Corneas appear smooth with normal corneal light reflex and spontaneous blink reflex; sclera slightly yellow (appropriate for ethnicity), iris dark brown without defect; EOMs—parallel tracking through six cardinal positions of gaze; with confrontation, defects noted in left, right, and inferior peripheral visual fields; central and superior visual fields appear intact; visual acuity 20/30 OU (using a vision screener). Negative for pain, redness, discharge, swelling.

The following concept map illustrates the diagnostic reasoning process.

<table>
<thead>
<tr>
<th>Applying COLDSPA</th>
<th>Applying COLDSPA for client symptoms: “vision changes.”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mnemonic</strong></td>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>Character</td>
<td>Describe the sign or symptom (feeling, appearance, sound, smell, or taste if applicable).</td>
</tr>
<tr>
<td>Onset</td>
<td>When did it begin?</td>
</tr>
<tr>
<td>Location</td>
<td>Where is it? Does it radiate? Does it occur anywhere else?</td>
</tr>
<tr>
<td>Duration</td>
<td>How long does it last? Does it recur?</td>
</tr>
<tr>
<td>Severity</td>
<td>How bad is it? or How much does it bother you?</td>
</tr>
<tr>
<td>Pattern</td>
<td>What makes it better or worse?</td>
</tr>
<tr>
<td>Associated factors/How it Affects the client</td>
<td>What other symptoms occur with it? How does it affect you?</td>
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</tbody>
</table>
CHAPTER 15

1) Identify abnormal findings and client strengths

Subjective Data
- "Strange things are happening with my vision"
- Can't always see stairs in front of him
- "Trip a lot lately"
- Words missing on page when reading
- Almost hit a car making a left turn—didn't see car
- Wife noticed problems with his driving
- Worried about vision has mentioned to doctor
- Work involves much driving—trouble-shooting computer hardware
- Financial support for wife and home

Objective Data
- African American man, 68 years old
- Recently hospitalized with acute asthma attack
- On oral and inhaled corticosteroids for almost 20 years
- Visual acuity 20/30 OU with gross screening
- PERRL 2/1 OU
- Conjunctive eye, parallel tracking
- Intact corneal light and blink reflexes
- Sclera slightly yellow, iris dark brown
- Visual field defects in right, left, and inferior peripheral fields
- Intact central and superior visual fields
- Slight protrusion of eyeballs, firm to touch

2) Identify cue clusters

Has risk factors for and late symptoms of primary open-angle glaucoma. Should be referred to ophthalmologist before discharge

3) Draw inferences

Solitary visual changes put client at risk for accidents. Implied concern about safety

4) List possible nursing diagnoses

Fear r/t unknown progression of visual impairment
Risk for Injury r/t lack of awareness of potential dangers due to changes in vision
Ineffective Individual Coping r/t perceived loss of ability to work
Disturbed Self-Concept r/t potential altered role performance secondary to visual loss

5) Check for defining characteristics

Major Feelings of apprehension
Minor: Verbal report of worry
Not needed with risk diagnosis
Major: None noted
Minor: Worry
Not defined for this diagnosis

6) Confirm or rule out diagnoses

Confirm: Meets major and minor defining characteristics
Confirm, but need to evaluate the degree of understanding of danger to self and others
Rule out, but collect more data
Confirm diagnosis but collect more data regarding actual impact on client and family if glaucoma diagnosis is confirmed

7) Document conclusions

Nursing diagnoses that are appropriate for this client include:
- Fear r/t unknown progression of visual impairment
- Risk for Injury r/t lack of awareness of potential dangers due to changes in vision
- Disturbed Self-Concept r/t potential altered role performance secondary to visual loss

Potential collaborative problems include the following:
- RC: Blindness
- RC: Increased intraocular pressure
Medical diagnosis is yet to be made. Client should be referred to an ophthalmologist for further examination.

African American 68 y/o
Nearly 20-year corticosteroid use
Peripheral vision loss
Can't see stairs; "Trip a lot"
Missing words when reading
Problems with driving
Eyeballs firm to touch

Drives a lot for work
Computer hardware trouble-shooter
Financial support for wife and home

Worried about vision
Near accidents—didn't see other car
Wife notes driving problems
Some problems with reading, seeing stairs

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References and Selected Readings


Promote Health—Cataracts, Glaucoma, and Macular Degeneration


Websites

