

CHAPTER Nursing Care 48 of Clients with Eye and Ear Disorders

LEARNING OUTCOMES

- Relate knowledge of normal anatomy, physiology, and sensory functions of the eye and ear to the effects of disorders of these organs on the cognitive/perceptual functional health pattern.
- Describe the pathophysiology of commonly occurring disorders of the eyes and ears, relating their manifestations to the pathophysiologic process.
- Explain the risk factors for selected disorders of the eyes and ears, identifying the nursing implications for these risk factors.
- Identify diagnostic tests used for specific eye and ear disorders.
- Discuss the effects of and nursing implications for medications prescribed to treat eye and ear disorders.
- Describe surgical and other invasive procedures used to treat eye and ear disorders, identifying their implications for nursing care.
- Discuss the nurse's role in caring for clients with impaired vision or hearing loss.

CLINICAL COMPETENCIES

- Assess vision, hearing, and functional health of clients with eye and ear disorders.
- Using assessed data, determine priority nursing diagnoses and interventions for clients with eye and ear disorders.
- Collaborate with other members of the healthcare team to provide effective care for clients with eye and ear disorders.
- Plan and implement appropriate and individualized evidence-based nursing interventions and teaching for the client with an eye or ear disorder.
- Safely and effectively administer eye and ear medications and prescribed treatments.
- Provide appropriate care and teaching for the client having eye or ear surgery.
- Evaluate the effectiveness of nursing care provided for clients with eye and ear disorders, revising plan of care as indicated.

MEDIALINK



Resources for this chapter can be found on the Prentice Hall Nursing MediaLink DVD-ROM accompanying this textbook, and on the Companion Website at <http://www.prenhall.com/lemone>

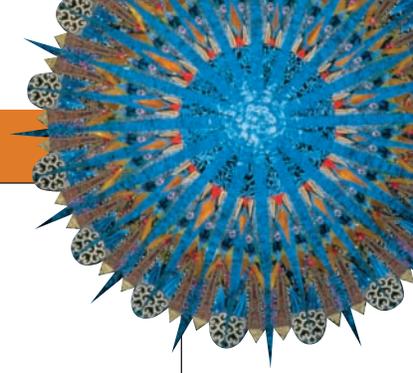


KEY TERMS

acoustic neuroma, 1729
astigmatism, 1696
cataract, 1704
chalazion, 1700
conjunctivitis, 1692
corneal ulcer, 1696
diabetic retinopathy, 1714
enophthalmos, 1702
enucleation, 1718
glaucoma, 1706

hordeolum (sty), 1700
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Vision and hearing provide the primary means of input for much of what we know about the world. The ability to receive and organize information orients us to our surroundings. These senses allow us to communicate easily, gain access to information, and derive pleasure from the sights and sounds of the world around us.

This chapter discusses conditions affecting vision and hearing as the result of eye and ear disorders. Nursing care focuses on clients with vision and hearing deficits that can result from the disorders presented.

EYE DISORDERS

Any portion of the eye and its protective structures may be affected by an acute or chronic condition. While many disorders of the eye are minor and have little or no effect on vision, others can and often do result in permanent vision impairment. Disorders and diseases of the outer, visible portion of the eye often cause discomfort and may have cosmetic effects. With appropriate treatment, vision impairment often can be prevented or reversed. Disorders of the cornea present the greatest risk to vision in this group. The client who has had eye surgery or minor trauma may have either temporary or permanent visual impairment. Disorders affecting the internal structures or the function of the eye are more likely to have adverse effects on vision. These disorders are more likely to affect adults over the age of 40, and older adults in particular. More than 3.4 million adults in the United States have some degree of visual impairment (Prevent Blindness America, 2002).

FAST FACTS

Among adults age 40 and older in the United States:

- Nearly 3.3 million or 2.7% of the population are classified as blind or low vision.
- Refractory errors, including myopia (nearsightedness) and hyperopia (farsightedness), are the most common, affecting 25.4% and 9.9% of people age 40 and older.
- Other conditions affecting the vision of middle and older adults, in order of prevalence, are:
 1. Cataracts—17.2%
 2. Macular degeneration—7.6%
 3. Diabetic retinopathy—3.4%
 4. Glaucoma—1.9%.

Source: All data from *Statistics and Data*, National Eye Institute, National Institutes of Health (2004). Retrieved from http://www.nei.nih.gov/eyedata/pbd_tables.asp.

Although disorders that commonly affect vision often cannot be prevented or cured, some can be controlled and vision cor-

rected to normal or near normal. Regardless of the real threat a disorder poses to vision, the client may experience anxiety related to a perceived threat. The box on the next page discusses major causes of significantly impaired vision and nursing care for the client who is blind. These principles of nursing care may apply to clients with many of the disorders discussed in this chapter.

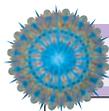
THE CLIENT WITH CONJUNCTIVITIS

The conjunctiva—the thin, transparent membrane that covers the anterior surface of the eye and lines the inner surfaces of the eyelids—is vulnerable to inflammation and infection because of its constant exposure to the environment. **Conjunctivitis**, inflammation of the conjunctiva, is the most common eye disease. Its usual cause is a bacterial or viral infection. These infections can be transmitted to the eye by direct contact (e.g., hands, tissues, towels). Allergens, chemical irritants, and exposure to radiant energy such as ultraviolet light from the sun or tanning devices can also lead to this common condition. Its severity can range from mild irritation with redness and tearing to conjunctival edema, hemorrhage, or a severe necrotizing process with tissue destruction.

Pathophysiology and Manifestations

Acute Conjunctivitis

Infectious conjunctivitis may be bacterial, viral, or fungal in origin. Bacterial conjunctivitis, also known as “pink eye,” is highly contagious, and often is caused by *Staphylococcus* and *Haemophilus*. Adenovirus infection is the leading cause of conjunctivitis in adults. Systemic infections that may affect the eyes include herpes simplex and other viral infections. Contact with genital secretions infected with *Gonococcus* can cause gonococcal conjunctivitis, a medical emergency that can lead to corneal perforation.



NURSING CARE OF THE CLIENT WHO IS BLIND

Visual impairment exists on a continuum from blindness to decreased visual acuity that can be corrected with refractive lenses to normal or near normal. *Visual impairment* is defined as 20/40 vision in the better eye, even with corrective lenses. The legal definition of *blindness* is visual acuity no better than 20/200 in the better eye with optimal correction, or a visual field of less than 20 degrees in diameter (compared to the normal of 180 degrees) (Prevent Blindness America, 2002). Total blindness usually indicates that the client has no light perception at all. In practical terms, a person with a visual deficit sufficient to need assistive devices or aid from other people for normal activities of daily living is considered blind.

Ten to 12 million people in the United States have a visual impairment that cannot be corrected. More than 900,000 Americans are legally blind and an additional 2.3 million are visually impaired (National Eye Institute [NEI], 2004). In the United States, blindness affects more blacks than whites and Hispanics, whereas more Hispanics are visually impaired (Prevent Blindness America, 2002). Worldwide, between 40 and 50 million people have visual impairment significant enough to be considered blind.

Although blindness often can be prevented or cured, it remains a significant problem worldwide because of lack of access to care, fear of surgery or treatment, poor sanitation and nutrition, and ignorance of need. In the United States, cataracts, age-related macular degeneration, glaucoma, and diabetic retinopathy remain significant causes of blindness in adults.

Nursing Care

Blind people need to cope not only with the loss of a major sense but often also with societal attitudes that make them feel inferior, helpless, and inadequate. The idea of losing the ability to see is uniformly feared, leaving sighted people often unable to understand the magnitude and impact of the loss in those who have experienced it. Because of this fear and confusion, sighted people are unsure of what the blind expect from them.

The adjustment of the person who is born blind and raised to become an independent member of society differs from that of the person who has been sighted and becomes blind. The person who has been blind from birth has developed numerous adaptive strategies that the newly blind person has yet to learn.

Although adaptation may be easier for the client who experiences a gradual loss of vision than for someone with an abrupt loss, both must grieve the lost sense. The blind client needs to grieve the lost body part as well as the loss of mobility, self-sufficiency, perhaps economic security, and, to a certain extent, contact with reality as it has been perceived. The client's self-concept and self-esteem are threatened. Anger, denial, remorse, and self-pity are not uncommon in the initial period following loss of sight. Interpersonal relationships and roles are affected. Communication patterns change with the

loss of the ability to perceive many nonverbal cues. Expressions of sexuality may be impaired.

Acceptance of the change from sighted to blind is characterized by releasing the hope that vision will be regained. Self-esteem increases as the client attempts and masters activities of self-sufficiency such as completing ADLs, cooking, and becoming mobile outside the known home environment.

Health professionals often confuse the role of the blind person with the role of the client, seeing the person as helpless, dependent, and lacking in personal identity and control. Although nurses need to take blindness into account in planning care and maintaining client safety, it is vital to give the blind client the same respect and decision-making power that all clients deserve. Nurses who have dealt with their own emotions and responses to vision loss are better prepared to help the client adapt.

Nurses can foster independence in the hospitalized client with a significant vision deficit by doing the following:

- Orient to the environment verbally and physically. Describe the room using a central point such as the bed. Lead the client around the room, identifying chairs, sink, bathroom, and other landmarks. Be sure that objects such as chairs, personal items, and clothing remain in the same place unless moved by the client. Leave doors either fully open or closed as the client wishes, but, to preserve safety, do not leave doors partially open. Keep the room and hallways free of clutter.
- Use verbal communication freely. Describe activities going on around the client. Introduce yourself as you enter the room and let the client know when you are leaving.
- Provide other sensory stimuli such as radio and television as desired by the client.
- Orient to food trays by using the face of a clock to describe the position of food items on the plate and tray (unless the client has always been blind and cannot visualize a clock face).
- When assisting with ambulation, allow the client to hold your arm as you walk slightly ahead. Do not hold the client's arm. Verbally describe the environment, such as "There will be two steps up five feet ahead."
- Do not hesitate to ask what assistance the client desires.

For the client with a new loss of sight, refer to available services. Counseling can help the client cope with and eventually adapt to the loss of sight. People who are blind can receive mobility training, assistance with relearning self-care activities, education in the use of Braille to communicate, and vocational and other forms of rehabilitation. Local, state, and national agencies such as the American Foundation for the Blind, National Braille Association, and National Federation for the Blind coordinate services for the blind. Many assistive devices are available, including guide or pilot dogs, computer services, talking books and tape players, and low-vision aids.

Redness and itching of the affected eye are common manifestations of acute conjunctivitis (Figure 48-1 ■). The client may also complain of a scratchy, burning, or gritty sensation. Pain is not common; however, photophobia may occur. Tearing and discharge accompany the inflammatory process. The discharge may be watery, purulent, or mucoid, depending on the cause of conjunctivitis. The client may have associated

manifestations such as pharyngitis, fever, malaise, and swollen preauricular lymph nodes.

Trachoma

Trachoma, a chronic conjunctivitis caused by *Chlamydia trachomatis*, is a significant preventable cause of blindness worldwide. Trachoma is endemic in sub-Saharan Africa, the Middle

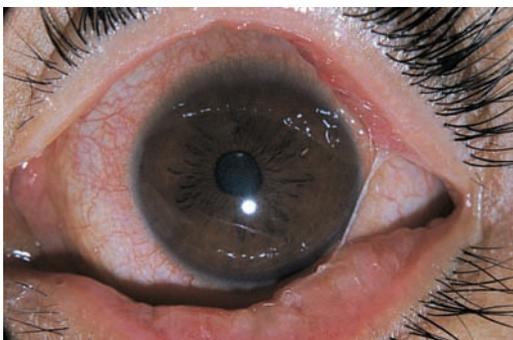


Figure 48–1 ■ The appearance of an eye with conjunctivitis.

Source: Buddy Crofton/Medical Images, Inc.



Figure 48–2 ■ Entropion.

Source: Science Photo Library/Photo Researchers, Inc.

East, and parts of Asia. In the United States, it can be found in Native Americans of the Southwest, but less frequently than in endemic regions. Trachoma is contagious, transmitted primarily by close personal contact (eye-to-eye, hand-to-eye) or by fomites such as towels, handkerchiefs, and flies. Certain forms of trachoma are transmitted during delivery when the newborn is exposed to contaminated genital secretions of the mother (Kasper et al., 2005).

Early manifestations of trachoma include redness, eyelid edema, tearing, and photophobia. Small conjunctival follicles develop on the upper lids. The inflammation also causes superficial corneal vascularization and infiltration with granulation tissue. Scarring of the conjunctival lining of the lid causes entropion (Figure 48–2 ■). The lashes then abrade the cornea, eventually causing ulceration and scarring. The scarred cornea is opaque, resulting in loss of vision.

INTERDISCIPLINARY CARE



Management of the client with conjunctivitis focuses on establishing an accurate diagnosis and prompt treatment.

Diagnosis

Accurate diagnosis of conjunctivitis is especially important, because other potentially vision-threatening conditions, such as acute uveitis or acute angle-closure glaucoma, can also cause a red eye (Table 48–1). Diagnostic procedures may include:

- *Culture and sensitivity* of exudates to determine presence of an infection and identify the infecting organism.
- *Fluorescein stain* with slit-lamp examination to identify possible corneal ulcerations or abrasions, which appear green with staining.
- *Conjunctival scrapings* are examined microscopically or cultured to identify the organisms.

Additional laboratory testing such as blood counts or antibody titers may be used to identify underlying infectious or autoimmune processes.

Medications

Conjunctivitis is treated with antibiotic, antiviral, or anti-inflammatory drugs as appropriate. Topical anti-infectives applied as either eyedrops or ointment may include erythromycin, gentamicin, penicillin, bacitracin, sulfacetamide sodium, amphotericin B, or idoxuridine. For severe infections or cellulitis, anti-infectives may be administered by subconjunctival injection or systemic intravenous infusion. Antihistamines are used to minimize symptoms of conjunctivitis when an allergic response underlies the inflammatory process.

Complementary Therapies

Frequent eye irrigations may be ordered to remove the copious purulent discharge associated with conjunctivitis. Soaking the lids with warm saline compresses prior to cleansing promotes comfort and facilitates the removal of crusts and exudate in conjunctivitis.

TABLE 48–1 Possible Causes of Acute Red Eye

	ACUTE CONJUNCTIVITIS	CORNEAL TRAUMA OR INFECTION	ACUTE UVEITIS	ACUTE ANGLE-CLOSURE GLAUCOMA
Incidence	Very common	Common	Common	Rare
Pain	Mild	Moderate to severe	Moderate	Severe
Vision	Normal	Blurred	Blurred	Markedly blurred
Discharge	May be copious	Watery, may be purulent	None	None
Conjunctival erythema	Diffuse	Primarily around cornea	Primarily around cornea	Primarily around cornea
Cornea	Clear	Depends on cause	Usually clear	Cloudy
Pupils	Normal size, response to light	Normal size, response to light	Small, minimal response to light	Moderately dilated, fixed



NURSING CARE

The nursing role in treating conjunctivitis is primarily one of education to prevent the disorder and to prevent its spread when it does occur.

Health Promotion

Education is a vital strategy for preventing conjunctivitis. Teach all clients about proper eye care, including the importance of not sharing towels, makeup, or contact lenses, and avoiding rubbing or scratching the eyes. Instruct to avoid using old eye makeup, which can cause eye infections. Teach contact lens users appropriate care (Box 48–1). Emphasize the need to follow cleaning instructions precisely to avoid bacterial contamination of lenses. If the eyes become red, irritated, or develop discharge, instruct the client to avoid wearing contact lenses until the inflammatory process has cleared.

Assessment

- **Health history:** Presence of redness, discomfort, tearing, photophobia, and drainage; symptom onset; care measures; use of contact lenses; exposure to “pink eye” or recent travel; allergies; previous history of conjunctivitis; presence of any chronic diseases.
- **Physical assessment:** Visual acuity; inspect eyelids, conjunctiva, sclera, and cornea; vital signs including temperature.

Nursing Diagnoses and Interventions

Nursing care focuses primarily on preventing complications from the disorder. The priority nursing diagnoses include risk for infection and risk of altered vision.

Risk for Infection

Acute conjunctivitis is highly contagious. While most clients experience no more than discomfort from the disease, the infection carries a risk for scarring and damage to the delicate cornea of the eye. Preventing the spread of this infection is a vital nursing role.

- Teach to wash hands thoroughly before instilling eye medications. Instruct to avoid touching or rubbing the eyes. Ad-

vised to use a new, clean cotton-tipped swab or cotton ball for cleaning each eye. *Hand washing is the single most important measure to prevent transmission of infection to the eye. Touching or rubbing the eyes increases the risk of infection and corneal trauma. Using a new swab or cotton ball prevents cross-contamination between eyes.*

- Teach to instill prescribed eyedrops as ordered. *Prescribed medications reduce inflammation and eliminate infection.*
- Discuss the importance of avoiding contact lens use until the infectious process has cleared and of completing the prescribed treatment. *Use of contact lenses in the inflamed eyes can lead to further damage and impair healing.*

Risk for Disturbed Sensory Perception: Visual

Conjunctivitis can potentially disrupt the integrity or clarity of the cornea. Because of its vital role in focusing light on the retina, corneal damage can impair visual acuity.

- Assess vision with and without corrective lenses. *Assessment provides a baseline to evaluate possible changes in vision resulting from the infection.*
- Instruct to avoid activities requiring high visual acuity until the infection has cleared. *The inflammatory process, edema of the conjunctiva, and local antibiotic applications can decrease visual acuity and cloud vision.*
- Instruct to use dark sunglasses with appropriate UV protection when out of doors, even on cloudy days. *Photophobia, a common manifestation of conjunctivitis, causes eye pain with increased light intensity.*

Using NANDA, NIC, and NOC

Linkages between nursing diagnoses, nursing interventions, and nursing outcomes for the client with an inflammatory or infectious eye disorder are illustrated in Chart 48–1.

Community-Based Care

Clients with conjunctivitis typically are managed in the community, reinforcing the need for effective teaching for home care. Emphasize to the family ways to prevent transmission of infection. If the client is unable to administer eye medications, involve the family in teaching. Include the following topics:

- Safety and medical asepsis when cleansing the eye
- Instillation of prescribed eyedrops and ointments
- Comfort measures such as reducing lighting intensity and wearing sunglasses
- Avoidance of activities such as excessive reading while eye is inflamed.

BOX 48–1 Contact Lens Care

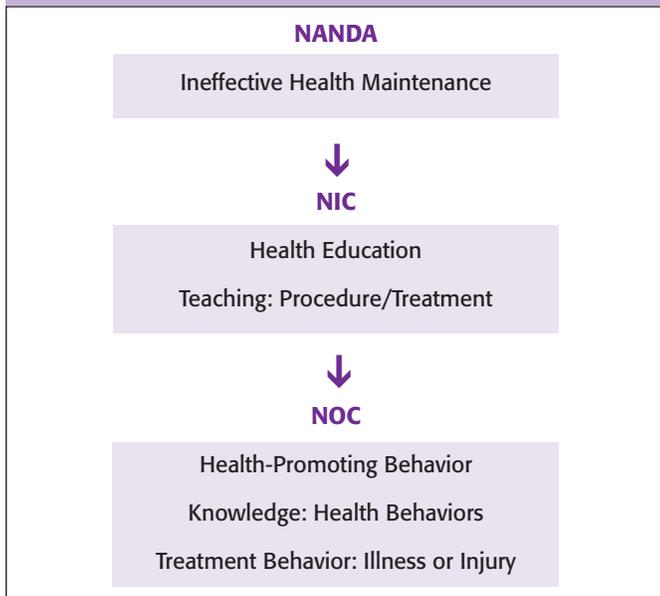
- Wash hands thoroughly before handling contact lenses.
- Keep storage case clean.
- Remove lenses before sleep, cleaning and storing as recommended by manufacturer.
- Use cleaning and wetting solutions recommended by eye care professional or lens manufacturer. Do not use water or homemade solutions for wetting or cleaning lenses.
- If eye redness, tearing, vision loss, or pain occurs, remove lenses and contact eye care professional as soon as possible.
- Do not share contact lenses or allow another person to “try on” lenses.

THE CLIENT WITH A CORNEAL DISORDER

The clear cornea allows light rays to enter the eye and transmits images onto the retina. It helps to focus light on the retina and protects the internal eye structures. The cornea can be affected by a variety of disorders, including infection and trauma. While the cornea heals quickly after minor injuries or

NANDA, NIC, AND NOC LINKAGES

CHART 48–1 The Client with an Eye Infection or Inflammation



Data from NANDA's *Nursing Diagnoses: Definitions & Classification 2005–2006* by NANDA International (2005), Philadelphia; *Nursing Interventions Classification (NIC)* (4th ed.) by J. M. Dochterman & G. M. Bulechek (2004), St. Louis, MO: Mosby; and *Nursing Outcomes Classification (NOC)* (3rd ed.) by S. Moorhead, M. Johnson, and M. Maas (2004), St. Louis, MO: Mosby.

abrasions, injury to its deeper layers can delay healing or result in scarring.

Physiology Review

The cornea has three major layers: the outermost epithelium, which consists of five or six layers of cells that are constantly being renewed; the stroma, which makes up 90% of corneal tissue; and the single-cell thickness endothelium adjacent to the aqueous humor of the anterior chamber. The cornea is avascular tissue; the central cornea is dependent on atmospheric oxygen to meet its metabolic needs. Because there is no blood supply, immune defenses have difficulty fending off infections of the cornea.

Pathophysiology and Manifestations

Light enters the eye through the normally clear cornea. As light passes through the curved cornea, it is bent or *refracted* onto the lens, which then focuses the light on sensory cells of the retina. A change in the curvature of the cornea or in its clarity affects the ability of the eye to clearly focus; as a result, vision is distorted or blurred. Refractive errors such as nearsightedness, farsightedness, and astigmatism are common. Corneal scarring or ulceration are two major causes of blindness worldwide.

Refractive Errors

Refractive errors are the most common problem affecting visual acuity; they result from an abnormal curvature of the cornea or an altered shape of the eyeball. People with *emmetropia* (normal vision) see near and far objects clearly because light rays focus directly on the retina. In **myopia** (near-

sightedness) the curvature of the cornea is excessive or the eyeball is elongated, causing the image to focus in front of the retina instead of on it. Objects in close range are seen clearly and those at a distance are blurred. The eyeball is too short in **hyperopia** (farsightedness), causing the image to focus behind the retina. People with this condition see objects clearer at a distance than those close to them.

FAST FACTS

- The prevalence of myopia decreases with aging, from an estimated 36.4% of Americans ages 40 to 49 affected (15.5 million) to 17.5% of people ages 80 and older (1.6 million).
- In contrast, the prevalence of hyperopia increases with aging, affecting an estimated 3.1% of Americans ages 40 to 49 (1.5 million) and 23.6% of people ages 80 and older (2.2 million) (NEI, 2004).

Astigmatism develops due to an irregular or abnormal curvature of the cornea. Instead of the round, even curvature of the normal cornea, the cornea curves more in one direction than the other in astigmatism, resembling the back of a spoon. As a result, light rays focus on more than one area of the retina, distorting both near and distance vision.

Keratitis

Keratitis is inflammation of the cornea. When the inflammatory process involves both the conjunctiva and the cornea, the term *keratoconjunctivitis* may be used. Keratitis may be caused by infection, hypersensitivity reactions, ischemia, tearing defects, trauma, and impaired innervation of the cornea. Scarring that occurs as a result of keratitis is a leading cause of blindness worldwide (Porth, 2005).

Keratitis is described as either nonulcerative or ulcerative. In *nonulcerative keratitis*, all layers of corneal epithelium are affected, but remain intact. Viral infections, tuberculosis, and autoimmune disorders such as lupus erythematosus may cause nonulcerative keratitis. *Ulcerative keratitis*, in contrast, affects the epithelium and stroma of the cornea, leading to tissue destruction and ulceration. Bacterial conjunctivitis (e.g., *Staphylococcus*, *S. pneumoniae*, *Chlamydia*) may lead to ulcerative keratitis.

Keratitis commonly causes tearing, discomfort ranging from a gritty sensation in the eye to severe pain, decreased visual acuity, and *blepharospasm* (spasm of the eyelid and inability to open the eye). A discharge may be present, especially if the conjunctiva is also inflamed. Corneal ulceration may be visible on direct examination.

Corneal Ulcer

A **corneal ulcer**, local necrosis of the cornea, may be caused by infection, exposure trauma, or the misuse of contact lenses. A frequent cause is bacterial infection following trauma or contact lens overuse. Herpes viruses, including herpes simplex and herpes zoster, are a leading cause of ulcerative corneal disease. Corneal ulcers may also complicate bacterial conjunctivitis, trachoma, gonorrhea, and other acute infections. Clients who are immunosuppressed because of disease or drug therapy are at particular risk for developing corneal ulcers due to infection.

In corneal ulceration, a portion of the epithelium and/or stroma is destroyed. Ulcers may be superficial or deep, penetrating underlying layers and posing a risk of perforation. Fibrous tissue may form during healing, resulting in scarring and opacity of the cornea. Perforation can lead to infection of deeper eye structures or extrusion of eye contents. Partial or total vision loss may result.

Corneal Dystrophies

A corneal dystrophy is accumulation of cloudy material in part or parts of the normally clear cornea, potentially affecting visual acuity. Corneal dystrophies typically are inherited disorders that progress gradually and affect both eyes. *Keratoconus*, progressive thinning of the cornea, is the most common corneal dystrophy. It typically affects teenagers and young adults. In keratoconus, the center of the cornea thins and bulges outward, affecting the shape of the cornea and its ability to focus light on the lens of the eye. In most cases, the thinning stabilizes over time; up to 20% of clients, however, eventually require corneal transplant (NEI, 2005a).

INTERDISCIPLINARY CARE



Management of the client with a disorder of the cornea focuses on establishing an accurate diagnosis and prompt treatment to reduce the risk of permanent vision deficit. The history and physical assessment are key in diagnosing these disorders.

Although many eye disorders can be treated in the community, the client with a severe corneal infection or ulcer may require hospitalization. Corneal ulcers are medical emergencies, requiring prompt referral to an ophthalmologist for treatment. Pressure dressings may be applied to both eyes for comfort and to reduce the risk of perforation and loss of eye contents.

Diagnosis

Visual acuity is tested on all clients presenting with refractory or corneal disorders. See Chapter 47  for more information about testing visual acuity. The following tests may be ordered to identify the cause and extent of eye infections or inflammations:

- *Fluorescein stain* with slit-lamp examination allows visualization of any corneal ulcerations or abrasions, which appear green with staining.
- *Conjunctival or ulcer scrapings* are examined microscopically or cultured to identify the organisms.

Additional laboratory testing such as blood counts or antibody titers may be used to identify any underlying infectious or autoimmune processes.

Medication

Infectious processes are treated with antibiotic or antiviral therapy as appropriate. Topical anti-infectives applied as either eyedrops or ointment may include erythromycin, gentamicin, penicillin, bacitracin, sulfacetamide sodium, amphotericin B, or idoxuridine. For severe infections, central ulcers, or cellulitis, anti-infectives may be administered by subconjunctival injection and/or systemic intravenous infusion. Corticosteroids may be prescribed for keratitis related to systemic inflamma-

tory disorders or trauma; however, it is important to avoid their use with local infections to avoid suppressing the immune and inflammatory responses.

Corrective Lenses

Corrective lenses, either in the form of eyeglasses or contact lenses, generally are prescribed to restore visual acuity for clients with refractive errors such as myopia, hyperopia, and astigmatism. Specially fitted contact lenses to reduce vision distortion are ordered for clients with keratoconus. Because contact lenses are a risk factor for corneal infection and ulcers, teaching appropriate care is vital (see Box 48–1).

Surgery

LASER EYE SURGERY Laser eye surgery is commonly performed to correct refractive errors such as myopia, hyperopia, and astigmatism. In these surgeries, a laser is used to permanently change the shape of the cornea. In most cases, the need to use corrective lenses is reduced or eliminated. Several surgical procedures are available:

- Laser *in situ* keratomileusis (LASIK)
- Photorefractive keratectomy (PRK)
- Laser epithelial keratomileusis (LASEK)
- Laser thermokeratoplasty (LTK).

These procedures reshape the cornea using laser technology to remove a thin layer of epithelial cells or to shrink and reshape the cornea. Candidates for laser vision-correction surgery should be in good health and must have adequate corneal thickness such that perforation is not a risk.

Following surgery, clients may experience a temporary loss of contrast sharpness (images do not appear as crisp as with corrective lenses), over- or undercorrection of visual acuity, dry eyes, or temporarily decreased night vision with halos, glare, and starbursts. Diffuse lamellar keratitis (DLK) is a rare complication of surgery that, while treatable, can lead to vision impairment if not identified and treated early.

Phototherapeutic keratectomy (PTK) provides an alternative to corneal transplant in treating corneal dystrophies, scars, and some infections. In this procedure, diseased corneal tissue is vaporized and surface irregularities corrected with little trauma to surrounding tissue. Healing occurs rapidly.

CORNEAL TRANSPLANT Once the cornea has become scarred and opaque, no treatment can restore its clarity. The first successful corneal transplant (or *keratoplasty*), replacement of diseased cornea by healthy corneal tissue from a donor, was performed in 1906. Current corneal transplant procedures have a success rate of approximately 80% (NEI, 2005a).

Corneas are harvested from the cadavers of uninfected adults who were under the age of 65 and who died as a result of acute trauma or illness. After harvesting, the cornea can be stored in a tissue-culture medium for up to 4 weeks before being used as a graft. Corneal transplantation is usually an elective surgery, although emergency transplantation may be required for perforation of the cornea.

Corneal transplant may be either lamellar or penetrating. In a lamellar keratoplasty, the superficial layer of cornea is removed and replaced with a graft. The anterior chamber remains intact.

In a penetrating keratoplasty, a button or full thickness of cornea is removed and replaced by donor tissue (Figure 48–3 ■). The graft is then sutured in place using suture finer than human hair and a continuous or interrupted stitch. Because the cornea is avascular, these sutures remain in place for up to a year to ensure healing.

Most corneal transplants do not require hospitalization. The eye is patched for 24 hours following surgery. Narcotic analgesia may be required initially, because the cornea is extremely sensitive. Corticosteroid eyedrops are ordered to reduce the inflammatory response and prevent edema of the graft. Antibiotic drops may be prescribed to prevent infection.

The risk of transplant rejection is low. Because the cornea is avascular, there is little exposure of the transplanted corneal tissue to the host's immune defenses (Porth, 2005). Research suggests that matching of blood type (not tissue type, as is required for major organ transplants) between the donor and the transplant recipient may reduce the risk of transplant rejection (NEI, 2005a). When rejection does occur, it occurs within 3 weeks of the transplant, beginning with inflammation at the edge of the grafted tissue and spreading to involve the entire graft.

See the accompanying box for nursing care of the client undergoing eye surgery.

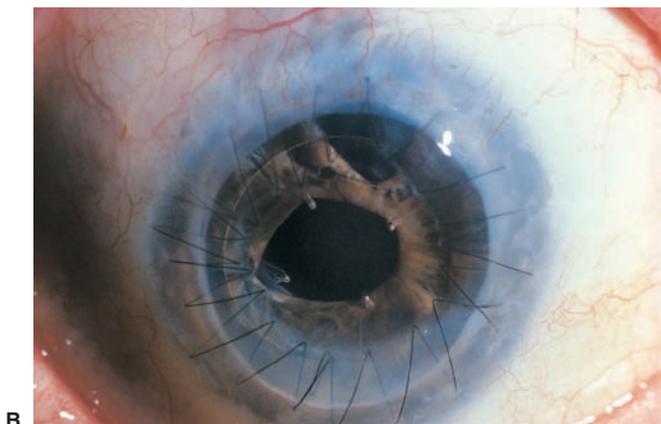
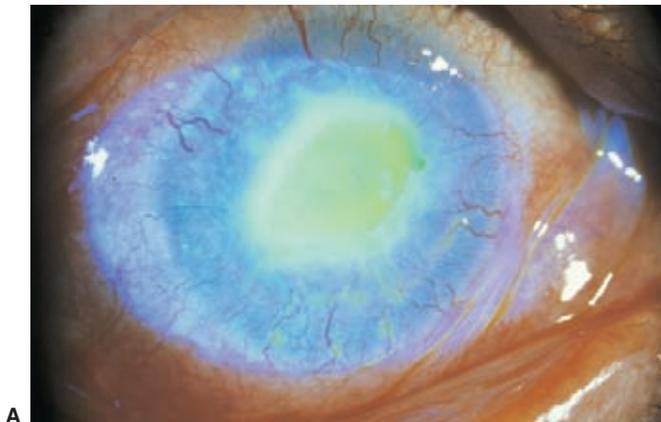


Figure 48–3 ■ Corneal transplant. *A*, The diseased, opaque cornea. *B*, The diseased cornea is removed and a corneal graft is sutured in place using material finer than a human hair.

Source: Custom Medical Stock Photo, Inc.



NURSING CARE

The nursing role in caring for clients with corneal disorders may involve direct care, but more often focuses on prevention and education. Nurses working in clinics and outpatient surgical settings care for clients undergoing corneal transplant and surgeries to correct refractive errors.

Health Promotion

Education is a vital strategy for preventing many corneal disorders. Teach all clients about proper eye care, including the importance of not sharing towels and makeup and avoiding rubbing or scratching the eyes as well as preventing trauma and infection. Teach contact lens users appropriate care and cleaning techniques. Stress the importance of periodic removal of lenses, even extended-wear lenses. In general, lenses should be removed at night, even though manufacturers may claim it is safe to wear them while sleeping. Emphasize the need to follow cleaning instructions precisely to avoid bacterial contamination of lenses and possible corneal infection. If the client experiences a corneal abrasion or keratitis, instruct the client to avoid wearing contact lenses until the cornea has healed completely.

Assessment

Collect the following data through health history and physical examination (see Chapter 47 ∞). Additional focused assessments are described with the interventions below.

- **Health history:** Risk factors; presence of redness, discomfort, tearing, photophobia, edema, and drainage; symptom onset; presence of pain, effect on vision.
- **Physical assessment:** Visual acuity; inspect external eye, including conjunctiva, sclera, and cornea; extraocular movements.

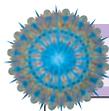
Nursing Diagnoses and Interventions

Nursing care focuses primarily on preventing complications and promoting healing. The priority nursing diagnoses for clients with corneal disorders include risk of altered vision, pain, and risk for injury.

Risk for Disturbed Sensory Perception: Visual

Disorders affecting the cornea may disrupt its integrity or clarity. Because the cornea plays a vital role in focusing light on the retina, corneal damage can affect vision, impairing visual acuity and even causing legal blindness.

- Assess vision with and without corrective lenses. *Assessment provides a baseline to evaluate possible vision changes resulting from the disorder or treatment.*
- Instruct about thorough hand washing before inserting or removing contact lenses or instilling any eye medications. Teach to avoid touching or rubbing the eyes. Instruct to use a new, clean cotton-tipped swab or cotton ball for cleaning each eye. *Hand washing is the single most important measure to prevent transmission of infection to the eye. Touching or rubbing the eyes increases the risk of infection and corneal trauma. Using a new swab or cotton ball prevents cross-contamination between eyes.*
- Emphasize the importance of proper care of contact lenses specific to the type of lens used. *Clients who wear hard con-*



NURSING CARE OF THE CLIENT HAVING Eye Surgery

PREOPERATIVE CARE

- Review Chapter 4  for routine preoperative care.
- Assess visual acuity of the nonoperative eye prior to surgery. *The client with limited vision in the nonoperative eye may need additional attention and ADL assistance postoperatively to ensure safety.*
- Assess the client's support systems and the possible effect of impaired vision on lifestyle and ability to perform ADLs in the postoperative period. *Safety measures such as installing handrails and removing throw rugs from the home can help promote mobility and safety, especially if the client has limited vision in the unaffected eye.*
- Teach measures to prevent eye injury postoperatively: avoid vomiting, straining at stool, coughing, sneezing, lifting more than 5 lb, and bending over at the waist. *These activities temporarily increase intraocular pressure and may lead to postoperative complications.*
- Remove all eye makeup and contact lenses or glasses prior to surgery. Store corrective lenses in a safe place, and make them readily available to the client on return from surgery. *Maintaining visual acuity in the unaffected eye helps reduce fear and maintain safety.*
- Administer preoperative medications and eyedrops or ointments as prescribed. *Mydriatic (pupil-dilating) or cycloplegic (ciliary-paralytic) drops and drops to lower intraocular pressure may be prescribed preoperatively.*

POSTOPERATIVE CARE

- Review Chapter 4  for routine postoperative care.
- Assess eye dressing for bleeding or drainage following surgery. *Bleeding or drainage may indicate a surgical complication.*
- Maintain the eye patch or shield in place. *The eye patch or shield helps prevent inadvertent injury to the operative site.*
- Place in semi-Fowler's or Fowler's position on the unaffected side. *Elevating the head of the bed and lying on the unaffected side reduce intraocular pressure in the affected eye.*
- Remind the client to avoid coughing, sneezing, or straining as needed. *These activities increase intraocular pressure.*
- Assess and medicate as necessary for complaints of pain, aching, or a scratchy sensation in affected eye. Immediately report complaints of sudden, sharp eye pain to the physician. *An abrupt increase in or onset of eye pain may indicate hemorrhage or other ocular emergency requiring immediate intervention to preserve sight.*
- Assess for potential complications:
 - a. Pain in or drainage from the affected eye

- b. Hemorrhage with blood in the anterior chamber of the eye
 - c. Flashes of light, floaters, or the sensation of a curtain being drawn over the eye (indicators of retinal detachment)
 - d. Cloudy appearance to the cornea (corneal edema). *Evidence of complications or unusual complaints should be reported to the physician at once. Early intervention is often necessary to preserve sight.*
- Approach the client on the unaffected side. *This approach facilitates eye contact and communication.*
 - Place personal articles and the call light within easy reach. *These measures prevent stretching and straining by the client.*
 - Administer antibiotic, anti-inflammatory, and other systemic and topical eye medications as prescribed. *Medications are prescribed to prevent infection or inflammation of the operative site, maintain pupil constriction, and control intraocular pressure.*
 - Administer antiemetic medication as needed. *It is important to prevent vomiting to maintain normal intraocular pressures.*

Health Education for the Client and Family

- Teach the client and family about home care:
 - a. How to instill eyedrops
 - b. The name, dosage, schedule, duration, purpose, and side effects of medications
 - c. How and when to use the eye patch and eye shield
 - d. The importance of avoiding scratching, rubbing, touching, or squeezing the affected eye
 - e. Measures to avoid constipation and straining.
 - f. Activity limitations, if ordered
 - g. Symptoms to report, including eye pain or pressure, redness or cloudiness, drainage, decreased vision, floaters or flashes of light, or halos around bright objects
 - h. The need to wear sunglasses with side shields when outdoors to reduce photophobia.
- Remind the client that vision may not stabilize for several weeks following eye surgery. New corrective lenses, if necessary, are not prescribed until vision has stabilized. *Clients may be alarmed that vision seems worse after surgery than before and need reassurance that visual acuity usually improves with time and healing of the affected eye.*
- Emphasize the importance of keeping recommended follow-up appointments. Provide referral to a community home health agency for assistance with home care after discharge as needed.

tact lenses must remove them daily, because the central cornea needs exposure to atmospheric oxygen. Although soft and extended-wear lenses allow the cornea to "breathe," improper cleaning carries a major risk for infection.

- Teach the importance of using eye protection when engaging in potentially dangerous activities. *Trauma increases the risk of infection and scarring of the cornea.*
- If corneal perforation is suspected, place in the supine position, close the eye, and cover it with a dry, sterile dressing.

Notify the physician immediately. *Corneal perforation may occur without warning in clients with corneal ulcers. It places the client at risk for loss of eye contents. Emergency measures are taken to reduce intraocular pressure and maintain eye integrity to preserve vision.*

PRACTICE ALERT

Suspect corneal perforation with complaints of sudden, severe eye pain and photophobia.

Acute Pain

The cornea of the eye is extremely sensitive; therefore, corneal disorders frequently cause significant pain. Pain, in turn, increases the stress response and interferes with rest, potentially impairing healing.

- Assess pain, using verbal and nonverbal cues. *Pain is a subjective experience and can be evaluated only by the client's response and in terms of its effect on the client.*
- Administer prescribed analgesia routinely in the first 12 to 24 hours after corneal surgery. *Routine administration of analgesics prevents pain from reaching a level of severity at which it becomes difficult to relieve.*
- Patch both eyes if necessary. *Patching both eyes reduces eye movement and irritation of the affected eye.*
- Teach to apply warm compresses to reduce inflammation and pain. *Warm compresses for 15 minutes, three to four times a day, promote comfort for clients with keratitis or corneal injury.*
- Instruct to use dark sunglasses with appropriate UV protection when out of doors, even on cloudy days. *True photophobia, often associated with corneal disorders, causes eye pain with increased light intensity.*
- Teach to instill prescribed eyedrops as ordered. *Prescribed medications may reduce inflammation and eliminate infection, reducing discomfort.*

Risk for Injury

The client who has undergone corneal transplantation has an increased risk for injury for several reasons. The eye on which surgery was performed is patched for 24 hours after surgery, changing depth perception and increasing the risk for falls. Increased intraocular pressure or trauma to the eye may damage the graft, resulting in graft rejection.

- Instruct to call for help before getting up or ambulating after surgery. Ensure access to the call light. *It may take time for the client to adjust to changes in depth perception caused by the eye patch. Assistance helps prevent falls that may not only injure the client but also traumatize the operative site.*
- Encourage to deep breathe and use the incentive spirometer to promote lung expansion. *These important postoperative measures help prevent pulmonary complications. Coughing is avoided because it increases intraocular pressure.*
- Teach how to apply an eye shield at night after the eye patch is removed. *An eye shield may be recommended at night to prevent inadvertent rubbing or trauma to the eye during sleep.*
- Instruct not to rub or scratch the eye. *Rubbing or scratching may disrupt suture lines or damage the grafted tissue.*
- Reinforce the importance of using eye protection during hazardous activities. *Following a corneal transplant, the client has the same risk of eye injury as other people who perform hazardous activities.*

PRACTICE ALERT

Administer prescribed antiemetics and stool softeners postoperatively to prevent vomiting and straining at stool, activities that increase intraocular pressure, damaging suture lines.

Community-Based Care

Following treatment, teach clients to manage these conditions at home. Emphasize to the family ways to prevent transmission of infection. If the client is unable to administer eye medications or to perform other eye care techniques, involve the family in the teaching session. The following topics should be included:

- Safety and medical asepsis when cleansing the eye
- Instillation of prescribed eyedrops and ointments
- Application of an eye patch and where to obtain supplies
- Avoidance of activities such as excessive reading while eye is inflamed
- Follow-up appointments after corneal transplant surgery
- Signs of graft rejection
- Avoidance of activities that increase intraocular pressure such as straining, coughing, sneezing, bending over, lifting heavy objects
- Helpful resources:
 - National Eye Institute
 - Lighthouse National Center for Vision and Aging

THE CLIENT WITH A DISORDER AFFECTING THE EYELIDS

The eyelids and eyelashes are constantly exposed to the environment as they protect the eye from damage. When these structures are inflamed, deformed, or their function is impaired, it affects both appearance and their protective functions.

Pathophysiology and Manifestations

The most common disorder affecting the eyelids is *marginal blepharitis*, an inflammation of the glands and lash follicles on the margins of the eyelids. This inflammatory disorder can be caused by a staphylococcal infection or it may be seborrheic in origin; commonly, both types are present. Seborrheic blepharitis is usually associated with seborrhea (dandruff) of the scalp or eyebrows. Irritation, burning, and itching of eyelid margins are common manifestations of blepharitis. The eye appears red rimmed with mucous discharge, and there is crusting or scaling of lid margins. Lid margins may ulcerate, resulting in a loss of eyelashes.

Infection of one or more of the sebaceous glands of the eyelid may cause a **hordeolum (sty)**. Hordeolum is a staphylococcal abscess that may occur on either the external or internal margin of the lid (Figure 48–4 ■). An external hordeolum is characterized initially by acute pain at the lid margin and redness. A small tender raised area is visible. The client may also experience photophobia, tearing, and the sensation of a foreign body in the affected eye. Internal hordeola are seen on the conjunctival side of the lid and may have more severe manifestations.

Chronic inflammation of a meibomian gland may lead to formation of a **chalazion**, a granulomatous cyst or nodule of the lid (Figure 48–5 ■). It presents as a hard swelling on the lid, and surrounding conjunctival tissue is reddened. Chalazion may also follow a hordeolum that was inadequately treated. Unlike a hordeolum, a chalazion is painless. It may



Figure 48-4 ■ Hordeolum.

Source: Science Photo Library/Photo Researchers, Inc.

slowly increase in size and eventually require removal, but most resolve within several months.

Entropion, inversion of the lid margin (see Figure 48-2), may be associated with the normal aging process (senile entropion) or result from an infectious process such as trachoma. Entropion can lead to corneal irritation and, potentially, scarring as the lashes rub on the conjunctiva and cornea during blinking and sleep. *Ectropion*, or eversion of the lid margin, occurs primarily as an effect of aging (Figure 48-6 ■). Other conditions may also lead to ectropion, including facial nerve paralysis or palsy (Bell's palsy), scarring, or infection. With ectropion, the eye does not close effectively, increasing the risk for drying and damage to conjunctival membrane and the cornea. Both entropion and ectropion have cosmetic effects as well, altering the appearance of the eye and face.

INTERDISCIPLINARY CARE

Disorders affecting the eyelids typically are managed in the community. Diagnosis is typically made through the history and physical examination. Diagnostic tests are rarely required except to identify corneal or conjunctival damage resulting from the condition.

Topical antibiotics (eyedrops or ointments) may be prescribed for the client with hordeolum and to treat infection resulting from irritation of the eye by a deformed lid. Careful cleansing of the lid



Figure 48-5 ■ Chalazion.

Source: Science Photo Library/Photo Researchers, Inc.



Figure 48-6 ■ Ectropion.

Source: Science Photo Library/Photo Researchers, Inc.

margins using a “no-tears” baby shampoo is often recommended for marginal blepharitis. Soaking the lids with warm saline compresses prior to cleansing facilitates the removal of crusts and exudate in blepharitis. Local heat applications may be used to treat hordeolum or chalazion; excision and drainage may be required if this is not effective. In entropion or ectropion, surgery may be performed to correct the defect, reduce the risk of damage to the eye, and improve cosmetic appearance.



NURSING CARE

The nursing role focuses on education and comfort measures. Teach clients about appropriate eye care, including avoiding rubbing or scratching the eyes. Discuss the importance of not using old eye makeup, which can cause lid infections. Instruct to wash hands well before cleansing the eyelids or instilling any eye medications. Instruct to use a new, clean cotton-tipped swab or cotton ball for cleaning each eye. Teach to instill prescribed eyedrops and apply ointments as ordered. If the client is unable to administer eye medications, involve the family in teaching. Teach to apply warm compresses to reduce inflammation and discomfort.

THE CLIENT WITH EYE TRAUMA

More than 2 million eye injuries occur each year. Many eye injuries are minor, but without timely and appropriate intervention, even a minor injury can threaten vision. For this reason, all eye injuries should be considered medical emergencies requiring immediate evaluation and intervention.

Pathophysiology and Manifestations

Any part of the eye, especially the exposed parts, may be affected by trauma. Foreign bodies, abrasions, and lacerations are the most common types of eye injury. Traumatic injury may also be due to a burn, penetrating objects, or blunt force.

Corneal Abrasion

Corneal abrasion is disruption of the superficial epithelium of the cornea. Objects commonly causing corneal abrasion include contact lenses, eyelashes, small foreign bodies such as dust and dirt, and fingernails. Drying of the eye surface and chemical irritants may also result in a corneal abrasion.

Superficial abrasions of the cornea are extremely painful but generally heal rapidly without complication or scarring. Photophobia and tearing are commonly present. When the stroma is damaged by a deep abrasion or laceration, there is an increased risk of infection, slowed healing, and scar formation.

Burns

The outer surface of the eye may be subjected to burns caused by heat, radiation, or explosion, but chemical burns are the most common. Either acid or alkaline substances may burn the eye. Ammonia, products that contain lye (such as oven and drain cleaners), and acids from car batteries or other sources are often implicated in eye injuries. Burns caused by alkaline substances are particularly serious because tiny particles of the chemical may remain in the conjunctival sac, causing progressive damage. Acid causes rapid damage to the eye, but generally causes less serious burns than alkaline substances.

Explosions and flash burn injuries pose the greatest risk for thermal burns of the eye. Ultraviolet rays can also cause corneal damage ranging in severity from mild to extensive. Depending on the source of the ultraviolet light, these burns may be known by various names such as snowblindness, welder's arc burn, or flash burn.

In addition to giving a history of face and eye contact with a caustic substance or other burning agent, the client complains of eye pain and decreased vision. Eyelids are often swollen. Burns may also affect the face or lids. The appearance of the eye may vary, depending on the type of burn. The conjunctiva is reddened and edematous; sloughing may be seen, particularly with chemical burns. The cornea often appears cloudy or hazy, and ulcerations may be evident.

Penetrating Trauma

Perforation of the eye occurs from a variety of causes. Metal flakes or other particles produced by high-speed drilling or grinding, glass shards, or other substances may penetrate the eye. Gunshots (including BBs), arrows, and knives can penetrate the eye. In a penetrating injury, the layers of the eye spontaneously reapproximate after entry of a sharp-pointed object or small missile into the globe. These injuries may not be readily apparent with inspection of the eye. In a perforating injury, the layers of the eye do not spontaneously reapproximate, resulting in rupture of the globe and potential loss of ocular contents (Way & Doherty, 2003).

Penetrating injuries may be hidden because of tissue swelling or missed when the client has other significant injuries that command attention. When the eyelid is lacerated or has a puncture wound, inspection of the underlying eye tissue for possible damage is vital. Eye perforations cause pain, partial or complete loss of vision, and possibly bleeding or extrusion of eye contents.

Blunt Trauma

Sports injuries are a common cause of blunt trauma to the eye: It may be struck with a ball (baseball, tennis, racquetball, and handball are frequently implicated) or injured in contact sports such as basketball, football, boxing, or wrestling. Motor vehicle crashes, falls, and physical assault are examples of other causes of blunt eye trauma.

Blunt trauma may lead to a minor eye injury such as lid ecchymosis (black eye) or subconjunctival hemorrhage, caused by rupture of a blood vessel in the conjunctiva. A well-defined bright area of erythema appears under the conjunctiva. No pain or discomfort is associated with the hemorrhage and no treatment is necessary. The blood typically reabsorbs within 2 to 3 weeks.

Hyphema, bleeding into the anterior chamber of the eye, is a potential result of blunt eye trauma. When the highly vascular uveal tract of the eye is disrupted by blunt force, hemorrhage may result, filling the anterior chamber. The client complains of eye pain, decreased visual acuity, and seeing a reddish tint. Blood is visible in the anterior chamber.

An orbital blowout fracture is another potential result of blunt eye trauma. Although any part of the eye orbit may be fractured, the ethmoid bone on the orbital floor is the most likely site. Orbital contents, including fat, muscles, and the eye itself, may herniate through the fracture into the underlying maxillary sinus. The client complains of diplopia (double vision), pain with upward movement of the affected eye, and decreased sensation on the affected cheek. The eye appears sunken (**enophthalmos**) and has limited movement on examination.

INTERDISCIPLINARY CARE



When trauma to the eye is known or suspected, a thorough examination is conducted to determine the type and extent of the injury. Unless immediate treatment is indicated, as with a chemical burn, vision is evaluated initially. If the client normally wears corrective lenses, vision assessment is performed while glasses are worn. Eye movement is evaluated unless a penetrating object is present, and the lid and eye are inspected for lacerations. Inspection is performed using strong light and magnification with a headband loupe or slit lamp. Topical anesthesia may be used prior to inspection if eye pain and photophobia make eye opening difficult. Fluorescein staining can help identify foreign bodies and abrasions. Any conjunctival or anterior chamber hemorrhage is noted, as is the presence or absence of the red reflex. Ophthalmoscopic examination is used to detect hemorrhage or trauma to the interior chamber.

Facial x-rays and CT scans are used to identify orbital fractures or foreign bodies within the globe. Ultrasonography may be employed to detect a detached retina or vitreous hemorrhage.

Foreign bodies are removed using irrigation, a sterile cotton-tipped applicator, or a sterile needle or other instrument. Antibiotic ointment—erythromycin or sulfacetamide sodium—is applied after their removal. In clients with corneal abrasions and large foreign bodies in the eye, an eye patch is applied firmly after the antibiotic application to keep the eye closed for approximately 24 hours.

The immediate priority of care for clients with chemical burns is flushing the affected eye with copious amounts of fluid. Normal saline is preferred; however, water may be used if saline is not available. A special contact lens irrigating unit (Morgan lens) or a bottle of irrigant with intravenous tubing held to flush all eye surfaces may be useful. The eyelid is everted to identify and remove material from the conjunctival sac. A topical anesthetic, such as tetracaine drops, helps relieve

pain, making inspection and irrigation easier. During irrigation, fluid is directed from the inner canthus of the eye to the outer. Tipping the client's head slightly to the affected side prevents contamination of the unaffected eye. Irrigation is continued until the pH of the eye is normal (in the range of 7.2 to 7.4). Following irrigation, a topical antibiotic ointment such as gentamicin ophthalmic is applied.

Penetrating wounds of the eye generally require surgical intervention by an ophthalmic surgeon. Immediate care focuses on relieving pain and protecting the eye from further injury. To prevent loss of intraocular contents, do not place pressure on the eye itself, but gently cover with a sterile gauze or an eye pad. If a foreign body is embedded in or sticking out of the eye, no attempt is made to remove it. The object should be immobilized and the eye protected with a metal eye shield until an ophthalmologist can see the client. A paper cup or other protective device may be used if the object is too large to use an eye shield. Patching the unaffected eye as well decreases ocular movement. Pain is managed using narcotic analgesics such as morphine. The client may also require sedation (e.g., diazepam) and antiemetic medications to prevent vomiting. Antibiotics such as intravenous cefazolin (Ancef) or gentamicin (Garamycin) are prescribed to prevent infection.

Interventions for the client with blunt trauma to the eye include placing the client on bed rest in semi-Fowler's position and protecting the eye from further injury with an eye shield. The unaffected eye is also patched to minimize eye movement. A carbonic anhydrase inhibitor such as acetazolamide (Diamox) or dichlorphenamide (Daranide) may be prescribed to reduce intraocular pressure.



NURSING CARE

The nursing role involves educating people about the prevention of eye injuries and providing direct care to clients with eye injuries.

Health Promotion

Teaching related to eye injuries focuses on prevention and first-aid measures. Teaching individuals and groups how to prevent eye injuries is an important nursing role, especially for people involved in hazardous occupations and activities. Teach employees and participants in high-risk sports or activities how and when to use eye protection devices. Stress the importance of using seat belts and air bags to prevent eye injury in automobile crashes. Instruct clients to immediately flush the eye with copious amounts of water if a chemical splash occurs. Loose, visible foreign bodies can be removed using a clean, moistened cotton-tipped swab. If an abrasion, penetrating, or blunt injury is suspected, the eye should be covered loosely with sterile gauze and medical attention sought immediately. Instruct clients not to remove objects that penetrate the eye.

Nursing Diagnoses and Interventions

Ocular injuries require immediate interventions simultaneously with assessment and accurate history collection. The

time, type, and extent of injury and the circumstances under which it occurred are determined. In addition, ask about preexisting visual problems.

Impaired Tissue Integrity: Ocular

All types of eye trauma pose the risk of violating the integrity of the eye, threatening vision. The goals of nursing care, therefore, are preserving vision and the integrity of the eye, and preventing further damage.

- Assess vision in each eye and both eyes, with and without corrective lenses, on entry into the emergency department or primary care setting. *An initial assessment provides valuable information about the effect of the injury on the client's vision and a baseline for future comparisons.*
- Inspect eye(s) carefully for evidence of foreign bodies, burns, penetrating injury, or blunt trauma. Note if lacerations, burns, or other trauma are evident in tissues surrounding the eye. *Eye trauma may be hidden by other injuries and, as a result, remain untreated.*
- If a burn or foreign body is present, anesthetic drops may be instilled and the eye irrigated either before or after the physician evaluates the client. *Blepharism and eye pain may impair assessment of the injured eye. Irrigation to remove the chemical is of higher priority than assessment of the eye.*
- Loose foreign bodies may be removed using a moist, sterile, cotton-tipped applicator. *Prompt removal of foreign bodies may prevent corneal abrasion.*
- For a severe or penetrating injury, promote rest and stabilize the injured eye by applying an eye pad or gauze dressing loosely over both the affected and unaffected eye. Stabilize any penetrating object if possible. *These measures reduce eye movement and can help preserve the client's vision.*
- Following treatment, apply eyedrops or ointment as prescribed and apply an eye pad or shield if ordered. *An eye pad is applied to the affected eye to reduce pain and photophobia and to promote healing.*

Community-Based Care

Following an injury, discuss the following topics with the client and family:

- Prescribed medications and possible adverse effects
- Strategies to prevent further trauma
- Application of the eye pad or shield
- Avoidance of activities that increase intraocular pressure
- Importance of activity restrictions.

THE CLIENT WITH UVEITIS

The middle vascular layer of the eye, including the choroid, the ciliary body, and the iris, is known as the uvea and uveal tract. *Uveitis* is inflammation of all or part of this vascular layer. *Iritis*, inflammation of the iris only, occurs more commonly than uveitis.

Uveitis is usually a disease limited to the eye; it may be idiopathic or caused by an autoimmune process, infection, parasitic disease, or trauma. Many cases can be linked to a systemic

disease, often an arthritic or autoimmune disorder such as ankylosing spondylitis, Reiter's syndrome, rheumatoid arthritis, or sarcoidosis (see Chapter 42 ∞). Uveitis has also been linked with tuberculosis and syphilis. Manifestations of uveitis include pupillary constriction and erythema around the limbus. The client may complain of severe eye pain and photophobia, as well as blurred vision.

Immunosuppressive therapy may be used to suppress the inflammatory response in clients with severe uveitis. Atropine may also be prescribed for associated inflammation of the iris. The client may require analgesics such as acetaminophen and/or codeine for pain management. Nursing care is supportive, focusing on promotion of comfort and teaching about the disorder and its management.

THE CLIENT WITH CATARACTS

A **cataract** is an opacification (clouding) of the lens of the eye. This opacification can significantly interfere with light transmission to the retina and the ability to perceive images clearly.

Incidence and Risk Factors

Cataracts are a common and significant cause of visual deficits, affecting nearly 20.5 million people over age 40 in the United States. By age 80, nearly half of the population is affected. In many cases, however, cataract does not significantly impair vision. Cataract affects slightly more women than men, and more whites than people of color. More than a million cataract removal surgeries are performed annually in the United States, costing an estimated 3.4 billion Medicare dollars (Prevent Blindness America, 2002).

FAST FACTS

The prevalence of cataracts in the United States increases rapidly with aging:

- 2.5% (just over 1 million) of adults ages 40 to 49 are affected.
- This increases to more than 2 million (or 6.8%) of those ages 50 to 59, and nearly doubles to over 4 million or 20% of adults ages 60 to 69.
- 68.3% of adults age 80 and older (over 6 million) are affected by cataract (NEI, 2004).

Age is the greatest single risk factor for cataract. Genetics may contribute to the risk, although the link is unclear. Environmental and lifestyle factors play a role: long-term exposure to sunlight (UV-B rays) contributes; cigarette smoking and heavy alcohol consumption are associated with earlier cataract development. Although senile cataracts are by far the most common, cataracts also may be congenital or acquired in origin. Eye trauma, including injury to the lens capsule by a foreign body, blunt trauma, or exposure to heat or radiation, can precipitate cataract formation. Diabetes mellitus is associated with earlier development of cataracts, especially when the blood glucose level is not carefully controlled at or near normal levels. Certain drugs such as systemic or inhaled corticosteroids, chlorpromazine (Thorazine), and busulfan (Myleran) also prompt the formation of cataracts.



Figure 48–7 ■ A scene as viewed by a client with cataracts.

Source: Courtesy of National Eye Institute, National Institutes of Health.

Pathophysiology

The majority of cataracts are senile cataracts, formed as a result of the aging process. As the lens ages, its fibers and proteins change and degenerate. The proteins clump, clouding the lens and reducing light transmission to the retina. This process generally begins at the periphery of the lens, gradually spreading to involve the central portion. As the cataract continues to develop, the entire lens may become opaque. When only a portion of the lens is affected, the cataract is called immature. A mature cataract is opacity of the entire lens. In addition to clouding, the lens may discolor over time, affecting the ability to accurately discriminate colors.

Manifestations

Cataracts tend to occur bilaterally unless related to eye trauma. Fortunately, they tend to develop at different rates, and one cataract generally matures more rapidly than the other. As a cataract interferes with light transmission through the lens, visual acuity decreases, affecting both close and distance vision (Figure 48–7 ■). Light rays are scattered as they pass through the lens, causing complaints of glare. Glare affects the ability to adjust between light and dark environments. Color discrimination is impaired, particularly in the blue to purple range. When the cataract is mature, the pupil may appear cloudy gray or white rather than black.

INTERDISCIPLINARY CARE



The diagnosis of a cataract is made based on the history and eye examination. Ophthalmoscopic examination confirms the diagnosis by identifying the location and extent of a cataract. As the cataract matures, ophthalmoscopy reveals a dark area instead of the red reflex.

Surgery

Surgical removal is the only treatment used at this time for cataracts; no medical treatment is available to prevent or treat them. If the client presents with bilateral cataracts, surgery is only performed on one eye at a time. If an intraocular lens (an artificial lens to replace the diseased lens of the eye) is to be implanted during surgery, the corneal curvature and anteroposterior diameter of the eye are measured prior to surgery to determine the lens power needed for the intraocular lens implant.

Surgical removal of the cataract and lens is indicated when the cataract has developed to the point that vision and activities of daily living are affected. A mature cataract may also be removed when it causes a secondary condition such as glaucoma or uveitis.

Cataract surgery is usually done on an outpatient basis, using local anesthesia. If general anesthesia is required, the client may be hospitalized overnight. The entire lens and its surrounding capsule may be removed in a procedure called intracapsular extraction. Intracapsular extraction is rarely used today (Way & Doherty, 2003). Extracapsular extraction, in which the anterior capsule, nucleus, and cortex of the lens are removed leaving the posterior capsule intact, is the procedure of choice (Figure 48–8 ■). Using an operating microscope, the surgeon makes a small incision at the edge of the cornea and extracts the lens intact or via emulsification and aspiration. In the latter technique, ultrasound vibrations are used to break the lens material into fragments (phacoemulsification), which are then suctioned out of the eye. Phacoemulsification lens removal requires a smaller incision and usually is the procedure of choice (Way & Doherty, 2003). The remaining capsule supports the lens implant and protects the retina.

After removal of the lens, the eye can no longer focus light on the retina, and vision is seriously affected. Usually a poly-

methylmethacrylate (PMMA or Plexiglas) intraocular lens is implanted at the time of surgery. This implant rapidly restores binocular vision and depth perception. Following extracapsular lens removal, the intraocular lens is positioned in the posterior capsule behind the iris (see Figure 48–8).

If an intraocular lens cannot be implanted, convex corrective glasses or contact lenses may be used to correct vision after cataract removal. Although contact lenses can provide excellent vision correction following cataract surgery, they may be difficult for some clients to adapt to or manipulate. The client with a preexisting refractive error may continue to require corrective lenses and often needs a prescriptive change after surgery.

Complications of cataract surgery are unusual and occur in less than 1% of the surgeries. Loss of vitreous humor, corneal edema, increased intraocular pressure, hemorrhage, inflammation or infection, retinal detachment, and displacement of the implanted lens are potential complications. Up to 35% of clients who undergo extracapsular extraction may develop opacification of the remaining posterior capsule. Vision can be restored using laser capsulotomy (creating an opening for light to pass through the opacified capsule) or surgical incision into the posterior capsule to allow light to reach the retina (Kasper et al., 2005; Way & Doherty, 2003).



NURSING CARE

Health Promotion

Advise all clients about the importance of protecting the eyes from UVB rays by wearing eye protection during activities such as welding and sunglasses with UVB protection when out of doors. Discuss the link between heavy smoking and cataract development. Provide anti-tobacco use education for young people and resources to stop smoking for people who do smoke.

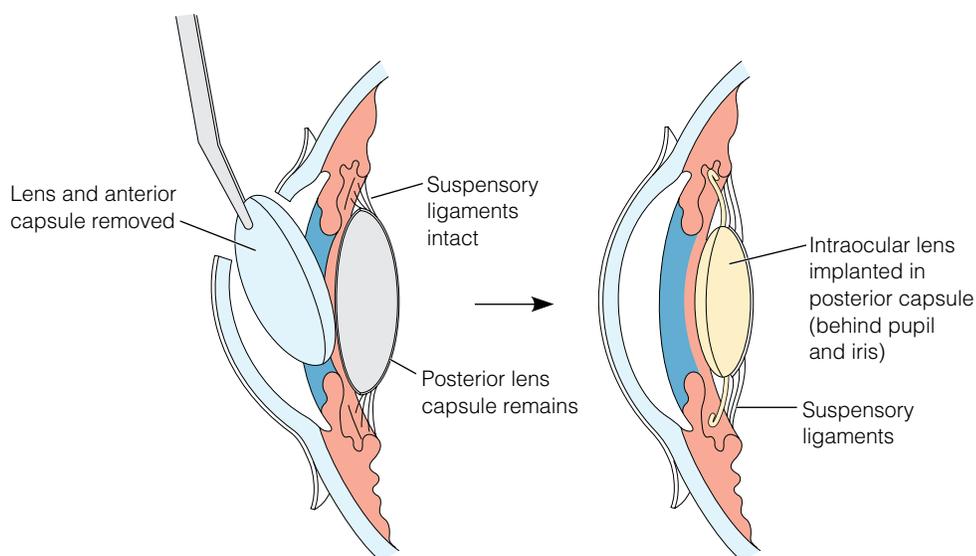


Figure 48–8 ■ Extracapsular cataract extraction with removal of the lens and anterior capsule, leaving the posterior capsule intact. The intraocular lens is implanted within posterior capsule.

Assessment

- **Health history:** Effect of vision changes on lifestyle and activities (e.g., ability to read, watch television, participate in work and recreational activities); history of smoking, diabetes, use of prescription drugs associated with increased risk of cataract.
- **Physical examination:** General health; visual acuity (using corrective lenses and Snellen chart) in each eye; presence of red reflex.

Nursing Diagnoses and Interventions

The client with cataracts has few physical care nursing needs. Patient advocacy, psychologic and emotional support, and teaching/learning needs are typically of higher priority for these clients. Review nursing care of the client having eye surgery as outlined in the box on page 1699.

Decisional Conflict: Cataract Removal

With the initial diagnosis of cataract, the nurse often becomes an important information resource for the client.

- Explain the nonemergent nature of the condition and help the client determine the extent to which the cataract is affecting daily life. *This helps the client decide when to proceed with surgery. Providing information about cataracts and their surgical removal also assists with decision making.*
- Attend to verbalized concerns about surgery and its outcome. Address questions factually and completely. *Fear of blindness is second only to fear of cancer for many clients. Careful listening, teaching, and a caring, understanding attitude can help the client deal with this fear prior to surgery.*

Risk for Ineffective Therapeutic Regimen Management

- Assess for factors that may interfere with the client's ability to provide self-care postoperatively. *A chronic condition such as arthritis that may affect the ability to administer eyedrops may indicate the need to include a family member in teaching.*
- Assess for other care needs that may be impacted by vision changes in the early postoperative period. *Other care needs, such as insulin injections, may suggest the need for home health or nursing care postoperatively.*

Community-Based Care

With the initial diagnosis, teaching focuses on the disorder, indications for surgery, and vision restoration following cataract removal. Teaching adaptive strategies to deal with effects of the cataract on vision and depth perception are also useful. When surgery is scheduled, provide pre- and postoperative teaching, including a significant other in teaching sessions. Reinforce the following information with written instructions:

- Limitations such as avoiding reading, lifting, strenuous activity, and sleeping on operative side
- Importance of not disturbing the eye dressing
- Prescribed medications and side effects
- Importance of follow-up appointments
- Manifestations of postoperative complications such as eye pain, decreased visual acuity or other change in vision, headache, nausea, or itching and redness of the affected eye

- Instillation of eyedrops, and application of eye patch or shield
- Care, insertion, and removal of contact lenses as appropriate
- Visual changes associated with thick-lensed eyeglasses as appropriate.

THE CLIENT WITH GLAUCOMA

Glaucoma is a condition characterized by optic neuropathy with gradual loss of peripheral vision and, usually, increased intraocular pressure of the eye. Glaucoma is a silent thief of vision. The client typically experiences no manifestations other than narrowing of the visual field, which occurs so gradually that it often goes unnoticed until late in the disease process.

Incidence and Risk Factors

Glaucoma affects about 2.2 million people over the age of 40 in the United States; it remains undetected in approximately 25% of these cases. Glaucoma is a leading cause of blindness worldwide and the leading cause of blindness among African Americans. Age and race are the primary identified risk factors; it is more common in blacks and Hispanics than in whites (Prevent Blindness America, 2002).

Glaucoma is usually a primary condition without an identified cause. Primary glaucoma is most common in adults over the age of 60, but may be a congenital condition in infants and children. Secondary glaucoma can develop as a result of infection or inflammation of the eye, cataract, tumor, hemorrhage, or eye trauma.

Pathophysiology

Aqueous humor, a thick fluid, occupies both the anterior and posterior chambers of the eye. The normal intraocular pressure of approximately 12 to 15 mmHg is maintained by a balance between the production of aqueous humor in the ciliary body, its flow through the pupil from the posterior to the anterior chamber of the eye, and its outflow or absorption through the trabecular meshwork and canal of Schlemm (see Figure 47–3). When this balance is disrupted, usually because of a decrease in the outflow or absorption of aqueous humor, the intraocular pressure increases. Although the exact relationship is unclear, it appears that increased intraocular pressure injures the optic nerve. Axons in the periphery of the optic disc are damaged first. As optic fibers are destroyed, the rim of the optic disc shrinks, and the normal depression in its center (the *optic cup*) becomes larger and deeper (called optic “cupping”). These changes to the optic disc are visible before visual field changes can be detected (Porth, 2005). As the disease progresses, there is a painless, progressive narrowing of the visual field (Figure 48–9 ■) and eventual blindness. Vision loss is often significant before the client seeks treatment and glaucoma is diagnosed.

Primary glaucoma in adults has two major forms: open-angle glaucoma and angle-closure glaucoma. Both terms refer to the angle formed at the point where the iris meets the cornea



Figure 48-9 ■ Narrowing of visual fields typical of untreated glaucoma.

Source: Courtesy of National Eye Institute, National Institutes of Health.

in the eye's anterior chamber (Figure 48-10 ■). Forms of primary glaucoma are compared in Table 48-2.

Open-Angle Glaucoma

Open-angle glaucoma, often called chronic simple glaucoma, is the most common form in adults, accounting for approximately 90% of all glaucoma. Its cause is unknown; it is thought to have a hereditary component, but no clear inheritance pattern can be identified. Open-angle glaucoma occurs more frequently and at an earlier age in African Americans than in whites (Tierney et al., 2005).

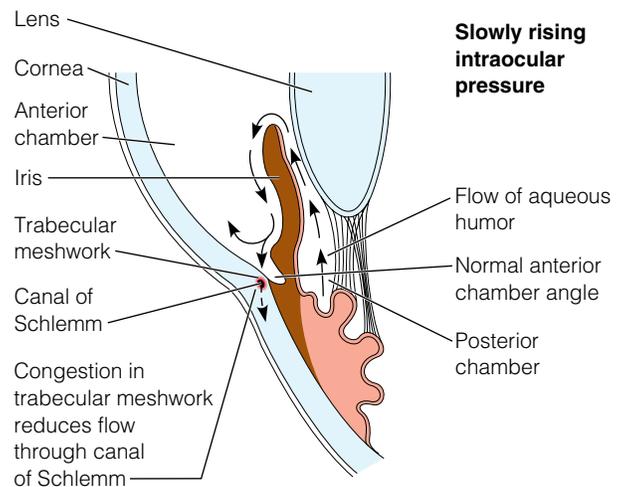
In open-angle glaucoma, the anterior chamber angle between the iris and cornea is normal (Figure 48-10A), hence the term *open angle*. However, the flow of aqueous humor through the trabecular meshwork and into the canal of Schlemm is relatively obstructed; the cause of this obstruction is unknown. Restricted outflow leads to an increased amount of fluid in the eye and increased intraocular pressure. Open-angle glaucoma tends to be a chronic, gradually progressive disease. The trabecular meshwork increasingly inhibits the outflow of aqueous humor, and the intraocular pressure gradually increases. The result is neuronal ischemia and optic nerve degeneration, leading to gradual loss of vision.

Open-angle glaucoma typically affects both eyes, although the pressures and progression may not be symmetric.

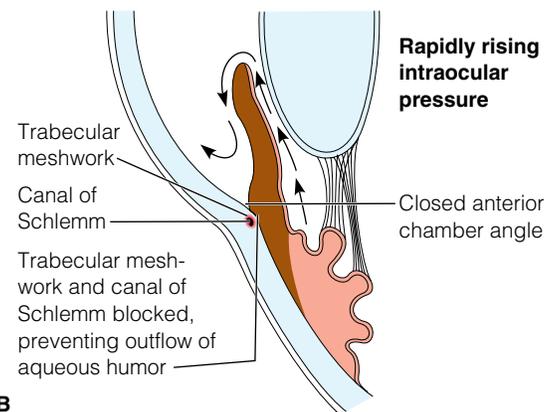
MANIFESTATIONS Open-angle glaucoma is painless, with gradual loss of visual fields. This loss of peripheral vision generally occurs so gradually that the client is often unaware of it and only when it is detected through a comprehensive vision examination is it found. Intraocular pressure usually, but not always, is elevated (Kasper et al., 2005).

Angle-Closure Glaucoma

Acute angle-closure (also called narrow-angle or closed-angle) glaucoma is the other, less common form of primary glaucoma in adults. It accounts for approximately 5% to 10% of all cases of glaucoma (Porth, 2005). Approximately 1% of people over the age of 35 have narrowed anterior chamber angles; the incidence is higher in older adults and in people of Far Eastern, Asian, or Inuit (Alaska native) ancestry (Porth, 2005).



A



B

Figure 48-10 ■ Forms of primary adult glaucoma. *A*, In chronic open-angle glaucoma, the anterior chamber angle remains open, but drainage of aqueous humor through the canal of Schlemm is impaired. *B*, In acute angle-closure glaucoma, the angle of the iris and anterior chamber narrows, obstructing the outflow of aqueous humor.

Narrowing of the anterior chamber angle (see Figure 48-10A for an illustration of the normal anterior chamber angle) occurs because of corneal flattening or bulging of the iris into the anterior chamber. When the lens thickens during accommodation or the iris thickens during pupil dilation, this angle can close completely. Closure of the angle blocks the outflow of aqueous humor through the trabecular meshwork and canal of Schlemm, and the intraocular pressure rises abruptly (Figure 48-10B). This abrupt increase in intraocular pressure damages the neurons of the retina and the optic nerve, leading to a rapid and permanent loss of vision if not treated promptly.

Episodes of angle-closure glaucoma are typically unilateral. However, a history of angle-closure glaucoma of one eye increases the risk that it will occur in the other eye.

Because of the effect of pupil dilation on aqueous outflow in angle-closure glaucoma, episodes often occur in association with darkness, emotional upset, or other factors that cause the pupil to dilate. Clients may have intermittent episodes lasting

TABLE 48–2 A Comparison of Open-Angle and Angle-Closure Glaucoma

	OPEN-ANGLE GLAUCOMA	ANGLE-CLOSURE GLAUCOMA
Incidence	<ul style="list-style-type: none"> ■ Common ■ Accounts for 90% of all cases of glaucoma 	<ul style="list-style-type: none"> ■ Uncommon
Risk Factors	<ul style="list-style-type: none"> ■ Over age 35 ■ Genetic link ■ African American ancestry 	<ul style="list-style-type: none"> ■ Narrow anterior chamber angle ■ Aging ■ Asian ancestry
Pathophysiology	<ul style="list-style-type: none"> ■ Impaired aqueous outflow through the canal of Schlemm ■ Cause unknown ■ Gradual, consistent increase in intraocular pressure ■ Usually bilateral 	<ul style="list-style-type: none"> ■ Pupil dilation or lens accommodation causes already narrowed angle to close, blocking aqueous outflow ■ Rapid rise in intraocular pressure ■ Usually unilateral
Manifestations	<ul style="list-style-type: none"> ■ No initial manifestations ■ Frequent lens changes in glasses ■ Impaired dark adaptation ■ Halos around lights ■ Gradual reduction of visual fields with preservation of central vision until late in the disease ■ Mild to severe increased intraocular pressure 	<ul style="list-style-type: none"> ■ Abrupt onset of eye pain, headache ■ Decreased visual acuity ■ Nausea and vomiting ■ Reddened conjunctiva ■ Cloudy cornea ■ Fixed pupil ■ Rapid, significant increase in intraocular pressure
Management	<ul style="list-style-type: none"> ■ Topical medications such as miotics, beta-blockers, prostaglandin analogs ■ Carbonic anhydrase inhibitors ■ Laser trabeculoplasty, trabeculectomy 	<ul style="list-style-type: none"> ■ Topical miotics or beta-blockers ■ Systemic osmotic agents, carbonic anhydrase inhibitors ■ Laser iridotomy or peripheral iridectomy

several hours before having a more typical prolonged attack of angle-closure glaucoma. For clients with a history of the condition, it is vital to avoid medications such as atropine and other anticholinergics, which have a mydriatic or pupil-dilating effect.

MANIFESTATIONS Symptoms such as severe eye and face pain, general malaise, nausea and vomiting, seeing colored halos around lights, and an abrupt decrease in visual acuity are associated with acute episodes of angle-closure glaucoma. The conjunctiva of the affected eye may be reddened and the cornea clouded with corneal edema. The pupil may be fixed (nonreactive to light) at midpoint.

INTERDISCIPLINARY CARE

Although glaucoma cannot be predicted, prevented, or cured, in most cases it can be controlled and vision preserved if diagnosed early. Because the most prevalent type of glaucoma, open-angle glaucoma, has few symptoms, routine eye examinations are recommended for early detection. Measurement of intraocular pressure, funduscopy to assess the optic disc, and visual field testing are used for diagnosis and monitoring of treatment effectiveness.

Diagnosis

The following diagnostic studies are used to detect and evaluate for the presence, severity, type, and effects of glaucoma.

- **Tonometry** indirectly measures intraocular pressure (Figure 48–11 ■). Contact or noncontact tonometry may be used. Routine tonometry screening is recommended for all people over the age of 60. A single elevated pressure reading does not warrant a diagnosis of glaucoma; variations in intraocular pressure

occur throughout the day. See Chapter 47 ∞ for more information about tonometry and related nursing care.

- **Funduscopy** (visual inspection of the optic fundus using an ophthalmoscope) identifies pallor and an increase in the size and depth of the optic cup on the optic disc. These changes are significant for diagnosing glaucoma.
- **Gonioscopy** uses a gonioscope to measure the depth of the anterior chamber. This test differentiates open-angle from angle-closure glaucoma.
- **Visual field testing** (Figure 48–12 ■) identifies the degree of central visual field narrowing and peripheral vision loss. The client with glaucoma may retain 20/20 central vision even though there is severe peripheral vision loss.

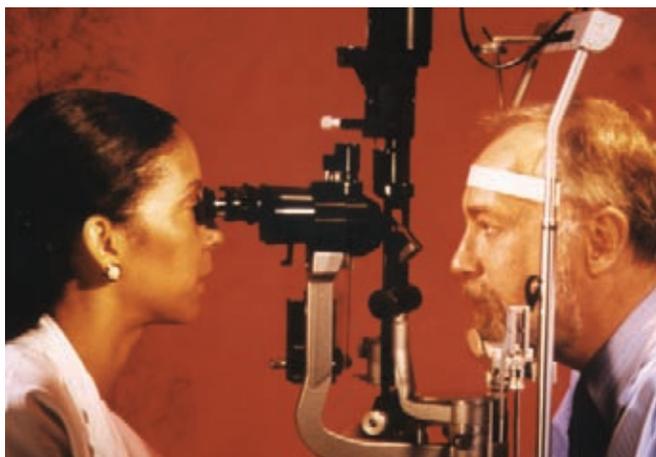


Figure 48–11 ■ An eye professional uses a tonometer to indirectly measure the intraocular pressure of a client's eye.

Source: Courtesy of National Eye Institute, National Institutes of Health.



Figure 48–12 ■ Visual field testing. Peripheral vision or visual fields are assessed by testing the client's ability to detect an object brought into the line of vision from the periphery. The client's peripheral vision is compared to the nurse examiner's. Each eye is tested separately.

Medications

Although medications cannot cure glaucoma, many clients with open-angle glaucoma can control intraocular pressure and preserve vision indefinitely with medications. Medications are used alone or in combination with the timing and dosage individually determined by pressure measurements. The primary pharmacologic agents used to treat glaucoma are topical beta-adrenergic blocking agents, adrenergics (mydriatics), prostaglandin analogs, or carbonic anhydrase inhibitors. An oral carbonic anhydrase inhibitor also may be used.

Topical beta-adrenergic blocking agents decrease the production of aqueous humor in the ciliary body. Beta-adrenergic blockers can be used once or twice a day, depending on the drug and dosage form. When administering beta-blockers or teaching about their use, it is important to remember that ophthalmic preparations can produce systemic effects, including bronchospasm, bradycardia, and heart failure.

Prostaglandin analogs such as latanoprost (Xalatan) are a newer class of ophthalmics prescribed to increase aqueous outflow. They are similar to beta-blockers in their longer duration of action, thus requiring only a daily dose. Although they have fewer systemic effects, these drugs may cause conjunctival hyperemia and permanent changes in the color of the iris and eyebrows.

The adrenergic agonist brimonidine may be prescribed along with a beta-blocker or if beta-blockers are contraindicated (e.g., in a client with heart failure, asthma, or COPD). Another adrenergic agonist, apraclonidine, may be prescribed when other drugs do not sufficiently reduce intraocular pressure, but adverse effects make it inappropriate for long-term use (Tierney et al., 2005).

Dorzolamide (Trusopt), a carbonic anhydrase inhibitor, decreases the production of aqueous humor and reduces intraocular pressure. It is used with other drugs to control pressures and in clients for whom beta-blockers are contraindicated because of heart failure or reactive airway disease. Acetazolamide (Diamox), a systemic carbonic anhydrase inhibitor, also may be used for some clients.

Nursing implications for the medications used to control chronic glaucoma are outlined in the Medication Administration box on the next page.

In acute angle-closure glaucoma, diuretics may be administered intravenously to achieve a rapid decrease in intraocular pressure prior to surgical intervention. Both the carbonic anhydrase inhibitor acetazolamide and osmotic diuretics, such as mannitol, are used. Fast-acting miotic drops, such as acetylcholine, are also administered to constrict the pupil and draw the iris away from the angle and from the canal of Schlemm.

Surgery

Surgical intervention is indicated for clients with acute angle-closure glaucoma and for clients with chronic open-angle glaucoma that is not effectively controlled by medication.

Surgical management of chronic open-angle glaucoma involves improving the drainage of aqueous humor from the anterior chamber of the eye. Trabeculectomy and trabeculectomy filtration surgery are the most commonly used procedures.

In a *laser trabeculectomy*, an argon laser is aimed through a gonioscope to create multiple laser burns spaced evenly around the trabecular meshwork. As the burns heal, the scars they create cause tension, stretching and opening the meshwork. This noninvasive technique is the treatment of choice because it requires no incision and can be performed as an outpatient procedure.

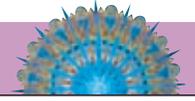
Trabeculectomy is a type of filtration surgery in which a permanent fistula is created to drain aqueous humor from the anterior chamber of the eye. A portion of trabecular meshwork is removed, and a flap of sclera is left unsutured to create a channel or fistula between the anterior chamber and the subconjunctival space. Aqueous humor is able to drain into the space under the conjunctiva, where it can be absorbed into the systemic circulation. A trabeculectomy is usually performed under general anesthesia and requires hospitalization.

If these procedures are not fully effective, either photocoagulation using an argon laser (heat) or cyclocryotherapy using a probe to freeze tissue may be employed to destroy portions of the ciliary body. This tissue destruction reduces the production of aqueous humor, subsequently reducing intraocular pressure. Another surgical procedure involves insertion of a glaucoma drainage device that regulates the outflow of aqueous humor.

Surgical procedures used in the treatment of acute angle-closure glaucoma include goniotomy, laser iridotomy, and peripheral iridectomy. Because of the high risk for a future attack of angle-closure glaucoma in the unaffected eye, these procedures are often performed prophylactically.

In *goniotomy*, the healing and scarring of microscopic lesions created at the periphery of the iris draw the iris away from the cornea, widening the anterior chamber. This widening of the chamber increases the angle and opens drainage channels for aqueous humor.

Laser iridotomy is a noninvasive procedure using a laser to create multiple small perforations in the iris of the eye. These perforations allow aqueous humor to drain from the posterior chamber to the anterior chamber and out through the trabecular meshwork and the canal of Schlemm. During an *iridectomy*, a small segment of the iris is removed to facilitate the flow of aqueous humor



MEDICATION ADMINISTRATION The Client with Glaucoma

ADRENERGIC AGONISTS (MYDRIATICS)

Brimonidine (Alphagan)

Apraclonidine

Adrenergic agonists dilate the pupil, reduce the production of aqueous humor, and increase its absorption, effectively reducing intraocular pressure in open-angle glaucoma.

Nursing Responsibilities

- Assess the client for contraindications and adverse reactions to adrenergic agonists, including acute angle-closure glaucoma, hypertension, cardiac dysrhythmias, and coronary heart disease.
- Assess for central nervous system side effects of anxiety, nervousness, and muscle tremors. If these side effects are severe, notify the physician.
- Assess for a hypersensitivity reaction, including itching, lid edema, and discharge from the eyes. Notify the physician if you notice these signs.

Health Education for the Client and Family

- Report any change in visual acuity or eye pain. (Eye pain may indicate an attack of angle-closure glaucoma and must be reported to the physician immediately.)
- Avoid over-the-counter sinus and cold medications containing pseudoephedrine and phenylephrine. They may accentuate the side effects of this drug.

BETA-ADRENERGIC BLOCKERS

Betaxolol (Betoptic)

Carteolol (Cartrol, Ocupress)

Levobunolol (Betagan)

Metipranolol (OptiPranolol)

Timolol (Timoptic)

Selected beta-adrenergic blockers reduce intraocular pressure by decreasing the production of aqueous humor. Because beta-blockers do not affect pupil size and lens accommodation, they do not have the adverse effects on visual acuity that adrenergic agonists do. Their systemic effects, however, may limit their usefulness for certain clients.

Nursing Responsibilities

- Assess the client for allergies or contraindications to beta-blocker therapy, including asthma, chronic obstructive pulmonary disease (COPD), heart block, and heart failure.
- Maintain pressure over the lacrimal sac after administration to prevent systemic absorption.
- Assess for side effects such as bradycardia, hypotension, and depression.
- Teach about the drug, its dose, administration, and desired and side effects.

Health Education for the Client and Family

- Put pressure on the lacrimal sac, at the corner of the eye near the bridge of the nose, to keep the drug from entering your system.
- Your vision may be blurred during the initial period of therapy, but it will improve as you continue to use the drug.
- Report adverse effects, including worsening vision, difficulty breathing, reduced exercise tolerance, and sweating or flushing, to the physician.

CARBONIC ANHYDRASE INHIBITORS

Dorzolamide (Trusopt)

Brinzolamide (Azopt)

Acetazolamide (Diamox)

The carbonic anhydrase inhibitors lower intraocular pressure and are used primarily as adjunctive therapy. Dorzolamide and brinzolamide are administered as eyedrops, whereas acetazolamide may be given PO, IM, or IV.

Nursing Responsibilities

- Assess for allergies or other contraindications to the use of carbonic anhydrase inhibitors, including known allergy to sulfa, or severe renal or hepatic disease.
- Monitor for increased drug interactions of amphetamines, procainamide, quinidine, tricyclic antidepressants, and ephedrine and pseudoephedrine.
- Assess daily weight, intake and output, serum electrolytes, and vital signs in clients taking oral or parenteral carbonic anhydrase inhibitors.
- Administer PO in the morning to prevent sleep disruption because of the diuretic effect.
- If used with another topical ophthalmic, administer 10 minutes apart.
- Teach the client about the drug, its dose, administration, and desired and side effects.

Health Education for the Client and Family

- For oral medications, maintain a fluid intake of 2 to 3 L per day and rise slowly from lying or sitting positions because you may feel dizzy when you first stand (orthostatic hypotension).
- For topical medications, notify the physician if you have prolonged eye irritation.

PROSTAGLANDIN ANALOGS

Bimatoprost (Lumigan)

Latanoprost (Xalatan)

Travoprost (Travatan)

The prostaglandin analog drugs relax the ciliary muscle, improving the outflow of aqueous humor and reducing intraocular pressure. These drugs have the advantage of requiring only a single daily dose. They do, however, have some adverse effects such as blurred vision and stinging, and, when used long term, cause permanent darkening of the iris of the eye and eyebrows, increased growth of eyelashes, and conjunctival hyperemia (redness).

Nursing Responsibilities

- Assess and note eye color, presence of inflammation, exudates, or pain.
- Note vital signs and most recent liver function test results because these may be altered by the drug.

Health Education for the Client and Family

- Use once daily at bedtime as directed. This drug may blur vision; use at bedtime minimizes associated safety risks.
- Remove contact lenses before administering this drug.
- Minor eye discomfort, including burning and tearing, may occur with this drug. Notify your doctor if adverse effects are severe or intolerable.
- This drug may cause darkening of your iris, the skin around the eyes, and the eyebrows, as well as increased growth of the eyelashes. These color changes are permanent but will not progress if the drug is discontinued by your doctor.

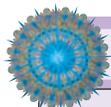
between the posterior and anterior chambers and to open the anterior chamber angle.



NURSING CARE

When planning and providing nursing care for the client with glaucoma, both the specific form of the disease

and its actual or potential effects on the client's vision, lifestyle, safety, and psychosocial well-being must be considered. In the hospitalized client, glaucoma is typically a concurrent diagnosis rather than the primary reason for seeking care, unless the diagnosis is acute angle-closure glaucoma. For additional nursing activities for the client with glaucoma, see the accompanying Nursing Care Plan.



NURSING CARE PLAN A Client with Glaucoma and Cataracts

Lila Rainey is an 80-year-old widow who lives alone in the house she and her late husband built 50 years ago. She has worn glasses for nearsightedness since she was a young girl, and now wears bifocals to correct her near vision as well. She was diagnosed 4 years ago with chronic open-angle glaucoma, for which she takes timolol maleate (Timoptic) 0.5%. Recently she has noticed difficulty reading and watching television despite a new lens prescription. She has stopped driving at night because the glare of oncoming headlights makes it difficult for her to see. Mrs. Rainey's ophthalmologist has told her that she has cataracts but that they do not need to come out until they bother her. Although her glaucoma is still controlled with timolol maleate 0.5%, one drop in each eye twice a day, her intraocular pressure measurements have been gradually increasing. Mrs. Rainey has taken 325 mg of aspirin daily since a transient ischemic attack 8 years ago. She is being admitted to the outpatient surgery unit for a cataract removal and intraocular lens implant in her right eye.

ASSESSMENT

Mrs. Rainey is admitted to the eye surgery unit by Susan Schafer, RN. In her assessment, Ms. Schafer finds Mrs. Rainey to be alert and oriented, though apprehensive about her upcoming surgery. Assessment findings include BP 134/72, P 86, R 18. Mrs. Rainey's neurologic, respiratory, cardiovascular, and abdominal assessments are essentially normal. Her pupils are round and equal, and react briskly to light and accommodation. Her conjunctivae are pink; sclera and corneas, clear. Using the ophthalmoscope, Ms. Schafer notes that the red reflex in Mrs. Rainey's right eye is diminished. Ophthalmic examination shows visual acuity of 20/150 OD (right eye) and 20/50 OS (left eye) with corrective lenses. Her intraocular pressures are 21 mmHg OD and 17 mmHg OS. On fundoscopic exam, no disease of the blood vessels, retina, macula, or disc is found. Ms. Schafer reviews the operative procedure with Mrs. Rainey, answering her questions and telling her what to expect after surgery. Following preoperative protocols, Mrs. Rainey is prepared and transported to surgery.

DIAGNOSES

- *Disturbed Sensory Perception: Visual* related to myopia and lens extraction
- *Anxiety* related to anticipated surgery
- *Deficient Knowledge* related to lack of information regarding postoperative care
- *Impaired Home Maintenance* related to activity restrictions and impaired vision

EXPECTED OUTCOMES

- Regain sufficient visual acuity to maintain ADLs, including reading and watching television for enjoyment.
- Demonstrate a reduced level of anxiety.

- Demonstrate the procedure for instilling eyedrops postoperatively.
- Demonstrate knowledge of the home care she will require after surgery, signs of complications, and actions to take if complications occur.
- Use appropriate resources to assist with home maintenance until vision stabilizes and activity restrictions are lifted.

PLANNING AND IMPLEMENTATION

- Provide a safe environment, placing the call light and personal care items within easy reach.
- Encourage Mrs. Rainey to express her fears about surgery and its potential effect on vision.
- Explain all procedures related to surgery and recovery.
- Instruct her to avoid shutting the eyelids tightly, sneezing, coughing, laughing, bending over, lifting, or straining to have a bowel movement. Teach her to wear glasses during the day and an eye shield at night to prevent injury to the surgical site.
- Explain and demonstrate the procedure for administering eyedrops.
- Provide verbal and written instructions about postoperative care, including a schedule of follow-up examinations, potential complications, and actions to take in response.
- Refer Mrs. Rainey to a discharge planner or social worker to help establish a plan for home maintenance.

EVALUATION

Mrs. Rainey is discharged the morning after her surgery. She is visibly relieved when the eye patch is removed because her vision in the operated eye is better than before surgery, even without her glasses. She is able to relate the recommended activity restrictions. Mrs. Rainey administers her own eyedrops before discharge and relates an understanding of the prescribed postoperative care and safety precautions. Mrs. Rainey's daughter plans to visit her mother two to three times a week to help with laundry and vacuuming until Mrs. Rainey is able to resume all her household activities. Mrs. Rainey says that she won't "be so scared when I need my other eye done." She understands the chronic nature of her glaucoma and says that her vision is too important for her to neglect her timolol drops and routine eye exams.

CRITICAL THINKING IN THE NURSING PROCESS

1. Why did it become more difficult to control Mrs. Rainey's intraocular pressure as her cataract matured?
2. Identify medications that are commonly prescribed following cataract surgery. What are the risks of interactions between these medications and Mrs. Rainey's timolol drops?
3. Develop a care plan for the nursing diagnosis *Self-Care Deficit: Dressing/Grooming*, related to visual impairment and restricted bending.

See Evaluating Your Response in Appendix C.

Health Promotion

Although glaucoma cannot be prevented, its severity and potentially deleterious permanent effects can be limited with early visual screening. The nurse assumes an important role in educating the public about the risk factors for glaucoma such as increased age, and the higher incidence in African Americans and Asians. All people over the age of 40 are encouraged to receive an eye examination every 2 to 4 years, including tonometry screening. Those with a predominant family history should be evaluated more frequently, every 1 to 2 years. After the age of 65, yearly ophthalmologic examinations are recommended.

Assessment

Collect the following data through a health history and physical examination (see Chapter 47 )

- **Health history:** Family history; presence of altered vision, halos, and excessive tearing; sudden, severe eye pain; use of corrective lenses; most recent eye examination.
- **Physical examination:** Distant and near vision, peripheral fields, retina for optic nerve cupping.

Nursing Diagnoses and Interventions

Nursing care planning focuses on problems associated with the temporary or permanent visual impairment, the resultant increased risk for injury, and the psychosocial problems of anxiety and coping.

Disturbed Sensory Perception: Visual

Whether glaucoma and resulting impaired vision is the client's primary problem or a preexisting condition in a client with another disorder, it must be a primary consideration in nursing care planning.

- Address by name and identify yourself with each interaction. Orient to time, place, person, and situation as indicated. State the purpose of your visit. *The client with impaired vision must rely on input from the other senses. A lack of visual cues increases the importance of verbal ones. For example, the client with impaired vision cannot see the nurse checking an intravenous infusion and needs a verbal explanation of who is in the room and why. When the client's normal daily routine is disrupted by illness or hospitalization, additional sensory input such as a radio, television, and explanations of the routine and activities are useful to maintain the client's orientation.*
- Provide any visual aids that are routinely used. Keep them close, making sure that the client knows where they are and can reach them easily. *Easy access encourages the client to use these items and enhances the ability to provide self-care.*
- Orient to the environment. Explain the location of the call bell, personal items, and the furniture in the room. If able, tour client's room, including the bathroom and sink. *Clients with visual impairments are usually very capable of providing self-care in a known environment.*
- Provide other tools or items that can help compensate for diminished vision:
 - a. Bright, nonglare lighting
 - b. Books, magazines, and instructions in large print

- c. Books on tape
 - d. Telephones with oversize pushbuttons
 - e. A clock with numbers and hands that can be felt
- Assist with meals by:
 - a. Reading menu selections and marking choices.
 - b. Describing the position of foods on a meal tray according to the clock system, for example, "On the plate, the peas are at 9 o'clock, the mashed potatoes at 1 o'clock, and the chicken breast at 6 o'clock. The milk glass is at 2 o'clock on the tray above the plate, and coffee is at 11 o'clock."
 - c. Placing the utensils in a readily accessible position.
 - d. Removing lids from containers, buttering the bread, and cutting meat, as needed.
 - e. If the visual impairment is new or temporary, the client may need feeding or continued assistance during the meal.

Providing assistance during eating is important to maintain the client's nutritional status. The client may be ashamed of needing help or embarrassed to request it and may respond by not eating or by claiming not to be hungry.

- Assist with mobility and ambulation as needed:
 - a. Have the client hold your arm or elbow, and walk slightly ahead as a guide. Do not hold the client's arm or elbow.
 - b. Describe the surroundings and progress as you proceed. Warn in advance of potential hazards, turns, and steps.
 - c. Teach to feel the chair, bed, or commode with the hands and the back of the legs before sitting.

These measures help ensure the client's safety while providing for mobility and helping prevent complications associated with immobility.

- If the vision loss is unilateral and recent, provide instructions related to unilateral vision loss and change in depth perception:
 - a. Caution about the loss of depth perception and teach safety precautions, such as reaching slowly for objects and using visual cues as to distance, especially when driving.
 - b. Teach to scan, turning the head fully toward the affected side to identify potential hazards and looking up and down to compensate for the loss of depth perception.

The client with a unilateral vision loss is often unaware of its effect on peripheral vision and depth perception.

Risk for Injury

Whether the client is experiencing a sudden loss of vision due to acute angle-closure glaucoma or significant visual impairment due to inadequately managed chronic glaucoma, both are at an increased risk for injury. Clients who have had surgical interventions for glaucoma are at even greater risk.

- Assess ability to perform ADLs. *Clients may be reluctant to request assistance, believing that they should be able to perform these familiar tasks. Careful assessment and provision of needed assistance help prevent injury and maintain the client's self-esteem.*
- Notify housekeeping and place a sign on the client's door to alert all personnel not to change the arrangement of the client's room. *The client with impaired vision is at high risk for falling when in an unfamiliar environment. It is important to maintain a safe, familiar room when the client is hospitalized.*

- Raise two or three side rails on the client's bed. *Raised rails remind clients to ask for assistance before ambulating in an unfamiliar environment.*
- Discuss possible adaptations in the home to help the client remain as independent as possible and prevent falls or other injuries. *Often minor changes in the home environment, such as removing scatter rugs and small items of furniture, allow the client to navigate safely in this already familiar environment.*

PRACTICE ALERT

Keep traffic area free of clutter to reduce the risk for injury in clients with impaired vision.

Anxiety

The actual or potential loss of sight threatens the client's self-concept, role functioning, patterns of interaction, and, potentially, environment. The client with impaired vision who functions well in a familiar environment will feel anxious in the unfamiliar setting of a hospital or care facility.

- Assess for verbal and nonverbal indications of level of anxiety and for normal coping mechanisms. Repeated expressions of concern or denial that the vision change will affect the client's life indicate anxiety. Nonverbal indicators include tension, difficulty concentrating or thinking, restlessness, poor eye contact, and changes in vocalization (rapid speech, voice quivering). Physical indicators include tachycardia, dilated pupils, cool and clammy skin, and tremors. *The client may not recognize this feeling as anxiety. Identifying and acknowledging the anxiety state can help the client recognize and deal with it.*
- Encourage to verbalize fears, anger, and feelings of anxiety. *Verbalizing helps externalize the anxiety and allows fears to be addressed.*
- Discuss perception of the eye condition and its effects on lifestyle and roles. *Discussion provides an opportunity to correct misperceptions and introduce alternative activities and assistive devices for clients with visual impairments.*
- Introduce yourself when entering the room, explain all procedures fully before and as they are being performed, and use touch to convey proximity and caring. *The client with impaired vision must rely on the other senses to make up for the loss of sight. Because the client cannot see what you are doing, complete explanations of even simple tasks such as refilling a water glass help to relieve anxiety.*
- Identify coping strategies that have been useful in the past and adapt these strategies to the present situation. *Previously successful coping strategies may be employed to increase the client's sense of control.*

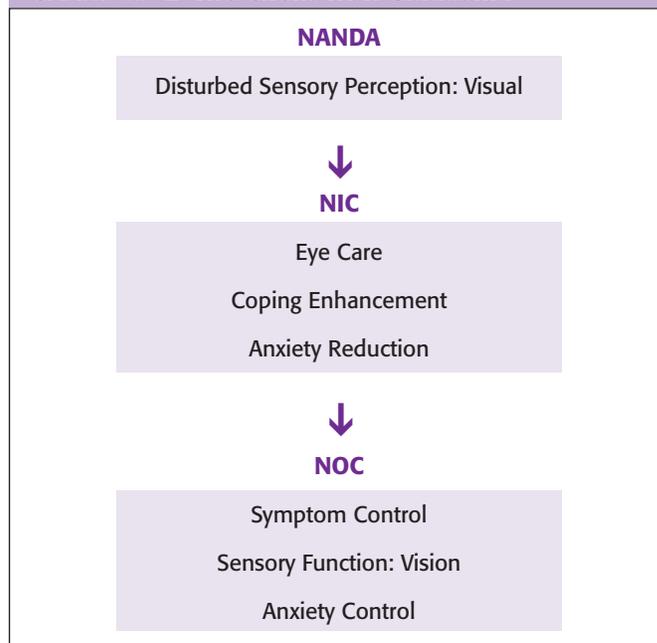
Using NANDA, NIC, and NOC

Chart 48–2 shows links between NANDA nursing diagnoses, NIC, and NOC when caring for the client with glaucoma.

Community-Based Care

Clients with glaucoma require teaching about lifetime strategies for managing the disease at home. They need to under-

NANDA, NIC, AND NOC LINKAGES CHART 48–2 The Client with Glaucoma



Data from NANDA's *Nursing Diagnoses: Definitions & Classification 2005–2006* by NANDA International (2005), Philadelphia; *Nursing Interventions Classification (NIC)* (4th ed.) by J. M. Dochterman & G. M. Bulechek (2004), St. Louis, MO: Mosby; and *Nursing Outcomes Classification (NOC)* (3rd ed.) by S. Moorhead, M. Johnson, and M. Maas (2004), St. Louis, MO: Mosby.

stand the importance of lifetime therapy to control the disease and prevent blindness. If a permanent visual impairment has resulted, the client needs information on achieving the maximum possible independence while maintaining safety. The following topics should be discussed with the client and family:

- Prescribed medications including proper way to instill eyedrops
- Importance of not taking certain prescription and over-the-counter medications without consulting a physician
- Periodic eye examinations with intraocular pressure measurement
- Risks, warning signs, and management of acute angle-closure glaucoma
- Possible surgical options
- Community resources, such as Visually Impaired Society, local library, and transportation services
- Helpful resources:
 - National Glaucoma Foundation
 - Young and Under Pressure Glaucoma Foundation
 - Glaucoma Research Foundation
 - Prevention of Blindness Society.

THE CLIENT WITH AGE-RELATED MACULAR DEGENERATION

The leading cause of legal blindness and impaired vision in people over the age of 65 is age-related **macular degeneration** (AMD) (Prevent Blindness America, 2002).

FAST FACTS

- Only 2.1% of people ages 40 to 49 have intermediate or advanced age-related macular degeneration.
- The incidence and prevalence of AMD increases rapidly with aging, affecting over 7% of people ages 60 to 69, more than 14% of people ages 70 to 79, and 35% of those ages 80 and older (NEI, 2004).

Although the exact cause of AMD is unknown, factors associated with it include aging, smoking, race, and, possibly, genetic factors. Whites have a significantly higher risk of developing AMD than blacks, Hispanics, or people of Asian ancestry. The destructive changes in the macula occur most often as a response to the aging process. It affects males and females equally. Evidence suggests that the risk for developing AMD may be reduced by consumption of certain antioxidant nutrients, including vitamin C, vitamin E, beta-carotene, and zinc (NEI, 2005b).

Pathophysiology

The macula is the area of the retina that provides sharp central vision, receiving light from the center of the visual field. Two forms of age-related macular degeneration are identified, a nonexudative (dry) form and an exudative (wet) form. Although both are progressive disorders, their manifestations and management differ.

Nonexudative, or dry, *macular degeneration* is the more common form of AMD. It is a gradual process that begins with accumulation of deposits called *drusen* beneath the pigment epithelium of the retina. Over time, these deposits enlarge and become more numerous. The pigment epithelium detaches in small areas, and becomes atrophic, interfering with sensory function of the macula. Vision loss typically is not significant, and the disorder progresses slowly. There is, however, a risk that the disorder will progress to an exudative stage of the disease.

Exudative macular degeneration is characterized by the formation of new, weak blood vessels in the potential space between the choroid (vascular layer of the eye) and the retina (neurosensory layer). These new vessels are prone to leak, elevating the retina from the choroid and distorting vision. Although exudative macular degeneration typically is a gradual process, bleeding can lead to acute vision loss in some cases. With significant or repeated bleeding episodes, scar tissue forms, and central vision is permanently lost (Kasper et al., 2005).

Manifestations

When the macula is damaged, central vision becomes blurred and distorted, but peripheral vision remains intact. Distortion of vision in one eye is a common initial manifestation; straight lines appear wavy or distorted. With the loss of central vision, activities that require close central vision, such as reading and sewing, are particularly affected (Figure 48–13 ■).

INTERDISCIPLINARY CARE

AMD is diagnosed through vision and retinal examination. The Amsler grid (see Figure 47–5) may be used to identify distortions



Figure 48–13 ■ Loss of central vision with advanced age-related macular degeneration.

Source: Courtesy of National Eye Institute, National Institutes of Health.

of central vision caused by AMD. If treatment for wet AMD is planned, a *fluorescein angiogram* may be done. Pictures are taken as the dye passes through the blood vessels of the retina, allowing detection of leaks.

In its early or intermediate stages, the progress of dry AMD can be slowed through the use of high-dose antioxidants and zinc. Research demonstrated a benefit when vitamin C, vitamin E, beta-carotene (vitamin A), zinc, and copper were administered daily.

Wet AMD is treated with laser surgery or photodynamic therapy. Although these treatments do not cure the disease, they may slow the rate of vision loss. In laser surgery, fragile blood vessels are destroyed, preventing bleeding. There is a risk, however, of damage to surrounding healthy tissue, some vision loss, and continued growth of new vessels. In photodynamic therapy, verteporfin, a drug that tends to adhere to the surface of new blood vessels, is injected systemically. Light is then shined into the affected eye, activating the drug and destroying new blood vessels. This treatment is relatively fast and painless, but does require avoidance of exposure to direct sunlight or bright indoor light for 5 days following treatment (NEI, 2003a).

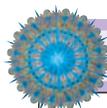
Large-print books and magazines, the use of a magnifying glass, and high-intensity lighting can help the client to cope with the reduced vision of macular degeneration.

**NURSING CARE**

Nurses should be alert for clients demonstrating new and rapid onset manifestations of macular degeneration and promptly refer these clients for ophthalmologic evaluation. Early intervention may preserve a greater degree of vision and slow the progress of the disease. For clients with slowly progressive manifestations, the nursing focus is on helping the client and family members adapt to the gradual decline in vision by recommending visual aids and other coping strategies. Client education materials should be in a large-print format. See also the accompanying Nursing Research box.

THE CLIENT WITH DIABETIC RETINOPATHY

Diabetic retinopathy is a vascular disorder affecting the capillaries of the retina. The capillaries become sclerotic and



NURSING RESEARCH Evidence-Based Practice: The Client with Impaired Vision

Age-related macular degeneration is the leading cause of significant visual impairment among older adults. However, little research has been done to study the effect of visual impairment on the lives of older adults. Moore and Miller (2003) studied the lived experience of severe visual impairment for a group of older, community-dwelling men with AMD. While the lives of the men in the study tended to be somewhat defined by what they could and could not do, these men tended to express hope and optimism, focusing on remaining abilities and developing strategies to cope with vision loss. However, in contrast to the results of a similar study of older women with AMD, the men in this study expressed skepticism about their disorder and its prognosis, critically questioning treatment and consistency of the care received.

IMPLICATIONS FOR NURSING

Older adults with significant vision deficit continue to cherish their independence and focus on their remaining abilities (as opposed to their disabilities). While it is important to present clear, accurate, and realistic information to clients with irreversible vision impairment, maintenance of hope and optimism also is important to the older adult. Many clients faced with impaired vision make

conscious choices to maintain a positive attitude and lifestyle, developing strategies that allow them to continue with activities that are important to them or provide pleasure. The nurse can help support and encourage these choices and selection of positive behaviors to maintain independence and self-worth.

CRITICAL THINKING IN CLIENT CARE

1. The men in this study cherished their freedom and found many ways to maintain it despite impaired vision. Discuss ideas to suggest for a client with impaired vision to continue to engage in activities such as shopping, attending cultural events, and playing golf or participating in other sports.
2. The men participating in this study expressed more skepticism about their diagnosis and prognosis and criticism of their treatment than did older women with AMD who had participated in an earlier study. What factors might account for this difference? What implications could this difference have for nursing assessment and care?
3. Develop a teaching plan for a client with newly diagnosed AMD using the nursing diagnosis *Deficient Diversional Activity* related to recent change in visual acuity.

lose their ability to transport sufficient oxygen and nutrients to the retina.

FAST FACTS

- In the United States, diabetic retinopathy is the leading cause of new blindness in people ages 20 to 74.
- People with diabetes are 25 times more likely to become legally blind than people unaffected by the disease (Kasper et al., 2005).

The risk of developing diabetic retinopathy is related to the duration of the diabetes and the degree of glycemic control. Hypertension also is a risk factor (Kasper et al., 2005). Retinopathy is seen in both type 1 and type 2 diabetes. Nursing care of the client with diabetes is discussed in Chapter 20 ∞.

Pathophysiology and Manifestations

Diabetic retinopathy progresses through four stages: (1) mild *nonproliferative* or background retinopathy, (2) moderate nonproliferative retinopathy, (3) severe nonproliferative retinopathy, and (4) *proliferative* retinopathy (NEI, 2003c). Nonproliferative retinopathy is typically the initial form seen. The venous capillaries of the eye dilate and develop microaneurysms that may then leak, causing retinal edema, or they may rupture, causing small hemorrhages into the retina. On ophthalmoscopic examination, yellow exudates, cotton-wool patches indicative of retinal ischemia, and red-dot hemorrhages are observed (Figure 48–14 ■). When the peripheral retina is involved, the client may experience few symptoms other than light glare. Edema of the macula or a large hemorrhage may cause vision loss.

Diabetic retinopathy may progress to the proliferative form. This disease is marked by large areas of retinal ischemia and the



Figure 48–14 ■ Appearance of the ocular fundus in diabetic retinopathy.

Source: Courtesy of National Eye Institute, National Institutes of Health.

formation of new blood vessels (neovascularization) spreading over the inner surface of the retina and into the vitreous body. These vessels are fine and fragile, making them permeable and easily ruptured. Blood and blood protein leakage contribute to retinal edema, and hemorrhage into the vitreous body may occur. The vessels gradually become fibrous and firmly attached to the vitreous body, increasing the risk of retinal detachment.

INTERDISCIPLINARY CARE



Clients with diabetes should be examined yearly by an ophthalmologist. The development of any new visual manifestation is an additional indication for prompt ophthalmologic examination and possibly retinal angiography.

Laser photocoagulation is used to treat both the nonproliferative and proliferative forms of diabetic retinopathy. Leaking microaneurysms are sealed and proliferating vessels destroyed, reducing the risk of hemorrhage, retinal edema, and retinal detachment. This treatment also slows the progress of aneurysms and new vessel formation; however, it does not cure the disorder. Clients with severe proliferative retinopathy may undergo vitrectomy to remove vitreous hemorrhage or treat associated retinal detachments (Tierney et al., 2005). Although conclusive research is lacking, the diabetic client with retinopathy may be advised to avoid physical activity associated with the Valsalva maneuver (e.g., weight training) (Kasper et al., 2005).



NURSING CARE

As with many other eye disorders, the nursing care focus for diabetic retinopathy is primarily educational. The newly diagnosed diabetic client needs to understand the importance of regular eye examinations beginning approximately 5 years after the onset of type 1 diabetes and at the time of onset of type 2 diabetes. Changes of diabetic retinopathy may already be present when type 2 diabetes is diagnosed.

Teach the client to report promptly any new visual manifestation, including blurred vision; black spots (floaters), cobwebs, or flashing lights in the visual field; or a sudden loss of vision in one or both eyes. Emphasize to the client that careful blood glucose control may help prevent diabetic retinopathy from developing; it may also slow its progress. The client's blood pressure should also be maintained within normal limits to prevent further damage to retinal vessels. Although diabetic retinopathy cannot be halted or cured, its progress can be slowed with aggressive management. Much of the burden for this management falls on the client, increasing the importance of good teaching.

THE CLIENT WITH A RETINAL DETACHMENT

The retina contains the photoreceptors of the eye, which allow the perception of light and initial processing of images and stimuli for transmission to the optic center of the brain. Disruption of this neural layer of the eye by trauma or disease interferes with light perception and image transmission, potentially resulting in blindness.

Both primary eye conditions and systemic diseases can affect the retina and interfere with vision. Retinal tears or detachments can occur either spontaneously or as a result of trauma.

Pathophysiology and Manifestations

Separation of the retina or sensory portion of the eye from the choroid, the pigmented vascular layer, is known as a **retinal detachment**. Although retinal detachment may be precipitated by trauma, it usually occurs spontaneously. The vitreous humor normally adheres to the retina at the optic disc, the macula, and the periphery of the eye. With aging, the vitreous humor shrinks and may pull the retina away from the choroid. Aging therefore is a common risk factor, as are myopia and aphakia, absence of

the lens (e.g., following lens removal for cataracts) (Porth, 2005; Tierney et al., 2005).

The retina may actually tear and fold back on itself, or the retina may remain intact but no longer adhere to the choroid. A break or tear in the retina allows fluid from the vitreous cavity to enter the defect. This, along with fluid that escapes from choroid vessels, the pull of gravity, and traction exerted by the vitreous humor, separates the retina from the choroid. The detached area may rapidly increase in size, increasing loss of vision. Unless contact between the retina and choroid is reestablished, the neurons of the retina become ischemic and die, causing permanent vision loss. For this reason, retinal detachment is a true medical emergency, requiring prompt ophthalmologic referral and treatment.

When the retina detaches, the client experiences floaters, or “spots,” and lines or flashes of light in the visual field. Often the client describes the sensation of having a curtain drawn across the vision, much like a curtain being drawn over a window. The area of the visual field affected is directly related to the area of detachment. For example, because light rays cross as they pass through the lens, a retinal tear in the superior portion of the eye results in a deficit in the lower part of the visual field. The client feels no pain, and the eye appears normal to visual inspection. Common manifestations of retinal detachment are listed in the box below.

INTERDISCIPLINARY CARE



Retinal detachment is a medical emergency; prompt treatment is necessary to preserve vision. The manifestations and examination of the ocular fundus by ophthalmoscopy establish the diagnosis of retinal detachment. Early diagnosis and intervention are vital. If the condition is left untreated, the detached portion will become necrotic because of separation from the vascular supply of the choroid. The result is permanent blindness in that portion of the eye. If an ophthalmologist is not readily available, the client's head is positioned so that gravity pulls the detached portion of the retina into closer contact with the choroid.

Interventions are directed toward bringing the retina and choroid back into contact and reestablishing the blood and nutrient supply to the retina. Either cryotherapy, using a super-cooled probe, or laser photocoagulation may be used to create an area of inflammation and adhesion to “weld” the layers together.

A surgical procedure called *scleral buckling* also may be used. In this procedure, an indentation or fold is created in the



MANIFESTATIONS of Retinal Detachment

- Floaters: irregular, dark lines or spots in the field of vision
- Flashes of light
- Blurred vision
- Progressive deterioration of vision
- Sensation of a curtain or veil being drawn across the field of vision
- If the macula is involved, loss of central vision

sclera, bringing the choroid into contact with the retina. Contact is maintained with a local implant on the sclera or an encircling strap or “buckle.” Air may also be injected into the vitreous cavity, a procedure called pneumatic retinopexy. The client is positioned so that the air bubble pushes the detached portion of the retina into contact with the choroid.

With a retinal tear, it may be necessary to use surgical instruments to manipulate the detached section of retina into place. Air or a liquid is then injected into the vitreous to maintain retinal contact with the choroid, or laser therapy is used to create a bond.



NURSING CARE

The nursing focus for the client with a detached retina is on early identification and treatment. Because early intervention is vital to preserve the client’s sight, nurses must recognize early manifestations of retinal detachment and intervene appropriately to obtain definitive treatment for the client. Retinal detachment can be successfully treated on an outpatient basis, often in an ophthalmologist’s office. For these clients, the nursing focus is on education.

Ineffective Tissue Perfusion: Retinal

Restoring contact between the retina and choroid is a priority of nursing and medical care for the client with retinal detachment. Vitreous humor may leak through a retinal tear, and fluid exudate may collect behind the tear, causing further detachment. If the macula is detached, central vision is lost, and the prognosis for full vision restoration is poorer.

PRACTICE ALERT

Carefully assess anyone who complains of a sudden rapid loss of vision because these are often medical emergencies.

- Assess for other manifestations of eye disease. *Retinal detachment is painless and has no outward manifestations. The client with a red eye or cloudy cornea may be experiencing acute angle-closure glaucoma rather than retinal detachment.*
- Notify physician and the ophthalmologist immediately. *Immediate medical intervention is required in clients with retinal detachment to preserve vision.*
- Position so the area of detachment is inferior. For instance, for a superior temporal retinal detachment of the right eye (with corresponding vision loss in the inferior medial visual field of that eye), place supine with the head turned to the right. *Correct positioning allows the contents of the posterior portion of the eye to place pressure on the detached area, bringing the retina in closer contact with the choroid.*

Anxiety

Retinal detachment causes a rapid decline in vision in the affected eye, often occurring spontaneously and without pain. Unless previous episodes have occurred, the client usually does not know what is causing the problem. Anxiety and fear of complete vision loss are common, expected reactions.

- Maintain a calm, confident attitude while carrying out priority interventions. *Administering care in a calm although urgent manner helps reassure the client that the problem is treatable and that appropriate measures are being taken.*
- Reassure that most retinal detachments are successfully treated, usually on an outpatient basis. *Reassurance can help allay the client’s fear of permanent vision loss.*
- For spontaneous detachments, assure the client that he or she did not cause the detachment to occur. *The client may believe that the detachment is related to a specific activity and feel guilty for “causing” this loss of vision.*
- Explain all procedures fully, including the reason for positioning. *Explanations facilitate understanding and help relieve anxiety in unfamiliar settings.*
- Allow supportive family members or friends to remain with the client as much as possible. *Additional support helps lower the client’s anxiety level.*

Community-Based Care

Teaching for the client undergoing surgical repair of retinal detachment is similar to that for clients experiencing other types of eye surgery (see page 1699). If the retina remains detached, provide instructions about the change in peripheral vision or other visual fields and changes in depth perception.

Discuss the following topics with the client and family to prepare for home care:

- Limitations on positioning the head before or following repair
- Activity restrictions such as no bending or straining at stool
- Use of eye shield
- Early manifestations and the importance of seeking immediate treatment
- Follow-up treatment with the ophthalmologist.

THE CLIENT WITH RETINITIS PIGMENTOSA

Retinitis pigmentosa is a hereditary degenerative disease characterized by retinal atrophy and loss of retinal function progressing from the periphery to the central region of the retina. It is inherited as an autosomal dominant, autosomal recessive, or X-linked trait and may be associated with other genetic defects (Kasper et al., 2005; Porth, 2005).

In retinitis pigmentosa, the genetic defect appears to cause production of an unstable form of rhodopsin, the receptor protein of rod cells in the retina. Rod cells degenerate, initially at the periphery of the retina. The areas of degeneration and cell death slowly expand, causing vision to narrow. Central vision is finally lost as well.

The initial manifestation of retinitis pigmentosa, difficulty with night vision, is often noted during childhood. As the disease progresses, there is slow loss of visual fields, photophobia, and disrupted color vision. The progression to tunnel vision and blindness is gradual; the client may be totally blind by age 40.

Currently, there is no effective treatment for retinitis pigmentosa. Research into the role that defective rhodopsin plays in the disease holds future promise for the development of therapy that may at least slow its progress.

Clients with retinitis pigmentosa may benefit from low-vision aids, much like those for the client with macular degeneration. Additionally, information about the disease and its progress is vital so the client can plan for the eventual total loss of sight. Clients with retinitis pigmentosa should be referred for genetic counseling prior to starting a family to determine the risk of transmitting the disease to their children.

THE CLIENT WITH HIV INFECTION

More than 50% of people infected with the human immunodeficiency virus (HIV) develop an infectious or noninfectious ocular condition, generally as a late manifestation of the disease (Kasper et al., 2005).

HIV retinopathy, seen as cotton-wool spots around the optic nerve, is the most common noninfectious ophthalmic lesion in AIDS. Cotton-wool spots indicate areas of retinal ischemia. Microaneurysms and dot-, blot-, or flame-shaped hemorrhages may also be seen in HIV retinopathy.

Neoplasms common in the client with AIDS can also affect the eye. Kaposi's sarcoma may affect the external surface or anterior segment of the eye or the eyelids. Kaposi's lesions vary in color (red, brown, or purple) and in size, shape, and location. Conjunctival lesions resemble a benign subconjunctival hemorrhage. Kaposi's lesions of the lid may cause **ptosis** (drooping of the lid) and abnormal lid function. Vision or eye position and movement may be affected by the tumor or by the effect of increased intracranial pressure on the cranial nerves.

The most serious and frequent opportunistic eye infection associated with HIV infection is cytomegalovirus (CMV) retinitis. CMV retinitis generally develops when CD4 cell counts drop below 50 mL. Initially unilateral, CMV retinitis commonly progresses to become bilateral because of the systemic nature of the infection. CMV invades the retina of the eye directly, producing exudate and cotton-wool spots, hemorrhage, cell death, and necrosis. Visual field deficits develop and can progress to eventual blindness.

Corneal ulcers from opportunistic bacterial, fungal, protozoal, or viral infections are also associated with HIV infection. Toxoplasmic and fungal retinal infections may occur.

The client with an HIV-associated eye disorder may complain of a change in visual acuity, blurring, floaters, or gaps in the field of vision. Extensive retinal damage may cause retinal detachment and symptoms of flashing lights, multiple floaters, and a loss of vision. Because the observed changes in the retina are nonspecific, it is important for the examining physician to know that the client is HIV positive in order to make an accurate diagnosis.

In addition to the general treatment of HIV infection with retroviral medications, specific therapies may be directed toward the ocular manifestations of the disease. CMV retinitis is commonly treated with the antivirals ganciclovir (Cytovene) and foscarnet sodium (Foscavir).

Although treatment of ocular Kaposi's sarcoma is usually not indicated, conjunctival lesions may be excised for comfort or cosmetic reasons. Lid lesions may be treated with radiation or intralesional chemotherapy.

THE CLIENT WITH AN ENUCLEATION

Occasionally surgical removal of an eye is necessary because of trauma, infection, glaucoma, intractable pain, or malignancy. This procedure is known as **enucleation**.

Enucleation is performed under local or general anesthesia. After the globe is removed, the conjunctiva and eye muscles are sutured to a round implant inserted into the orbit to maintain its shape. A pressure dressing is left in place for 24 to 48 hours. The client is permitted out of bed on the day of surgery. Hemorrhage and infection are the most commonly seen complications.

Postoperative nursing care includes teaching, psychologic support, and observation for potential complications. The client may be instructed to apply warm compresses and instill antibiotic ointment or drops postoperatively.

Within 1 week, a temporary prosthesis called a conformer is fitted into the empty socket. The permanent prosthesis is individually designed to closely resemble the client's other eye. The prosthesis can be fitted 1 to 2 months after surgery. Often it is difficult to discern which eye is functional and which is the prosthesis. Procedure 48-1 outlines the proper way to remove and reinsert an eye prosthesis when the client is unable to do so.



EAR DISORDERS

For a person to hear, sound waves must enter the external auditory meatus and travel through the ear canal to vibrate the tympanic membrane and bony structures of the middle ear, which in turn activate the receptors of the cochlea. Trauma or disease involving any portion of this pathway can affect hearing. **Tinnitus**, the perception of sound such as ringing, buzzing, or roaring in the ears, is another potential result of problems affecting the auditory system.

Disorders of the external ear, including the auricle, auditory meatus, and ear canal, can affect the conduction of sound waves and hearing. Obstruction of the external auditory canal or damage to the tympanic membrane, which separates the outer from the middle ear, may lead to conductive hearing loss. Infection or inflammation, trauma, and obstruction of the ear

canal with cerumen (wax) or a foreign body are the most common conditions affecting the external ear.

Disorders of the middle ear may be either acute or chronic. Unless these disorders are treated promptly and effectively, damage and scarring of middle ear structures can result in a permanent conductive hearing loss. Infectious or inflammatory disorders such as otitis media and mastoiditis are the most common conditions affecting the middle ear. Otosclerosis, a genetic condition, may also affect the structures of the middle ear.

THE CLIENT WITH OTITIS EXTERNA

Otitis externa is inflammation of the ear canal. Commonly known as *swimmer's ear*, it is most prevalent in people who

PROCEDURE 48-1 REMOVING AND REINSERTING A PROSTHETIC EYE**GATHER SUPPLIES**

- Gloves
- Clean basin or plastic denture cup
- Sterile normal saline or soap and water for cleaning the prosthesis
- Gauze squares or cotton cloth for cleaning the socket
- A bulb syringe for irrigation if necessary

BEFORE THE PROCEDURE

Most clients who have an artificial eye provide self-care and require little assistance. However, it may be necessary for the nurse to re-

move an eye prosthesis from the unconscious or debilitated client. If the client is conscious, explain the procedure and provide for privacy.

PROCEDURE

- Follow standard precautions.
- Wash the hands and put on clean exam gloves.
- To remove the prosthesis, do one of the following:
 - Pull down the lower lid and gently exert outward and upward pressure on the lower edge of the prosthesis. This pressure usually causes the prosthesis to slip out.
 - Pull down the lower lid and apply a moistened suction cup to the prosthesis by squeezing the device. Twist gently to remove the prosthesis from the socket.
- Wash the prosthesis using mild soap and water or normal saline. Rinse thoroughly. Do not use abrasives or chemicals for cleaning.
- If the prosthesis is not immediately replaced in the eye socket, store it in a clearly labeled plastic container lined with a soft cloth or gauze squares. Avoid scratching or damaging the prosthesis. Store it in a safe place to prevent loss.
- If irrigation of the eye socket is ordered, have the client lean over a sink or basin if possible, or position on the affected side with a clean emesis basin to hold the irrigant as it flows out of the socket. Gently hold the lids open and irrigate the socket using a bulb syringe and clean warm water.
- Reinsert the prosthesis.
 - a. Moisten the prosthesis with warm normal saline or water.
 - b. Gently hold the lids open. Insert the upper edge of the prosthesis under the upper lid first, then the lower edge under the lower lid using slight pressure.
 - c. If a suction device is used, attach it to the cleaned prosthesis over the pupil. Holding the lids open, insert the prosthesis using the above procedure, then remove the suction cup by squeezing it gently and exerting slight pressure on the edge of the cup with the lower lid.

AFTER THE PROCEDURE

Ensure that the client is comfortable. Chart the procedure and any abnormal findings, such as drainage or inflammation.

spend significant time in the water. Competitive athletes, including swimmers, divers, and surfers, are particularly prone to otitis externa. Wearing a hearing aid or ear plugs, which hold moisture in the ear canal, is an additional risk factor. Although *Pseudomonas aeruginosa* or other bacterial infection is the most common cause, external otitis may also be due to fungal infection, mechanical trauma (such as cleaning the ear with a toothpick), or a local hypersensitivity reaction.

Pathophysiology and Manifestations

Disruption of the normal environment within the external auditory canal typically precedes the inflammatory process. Retained moisture, cleaning, or drying of the ear canal remove the protective layer of cerumen, an acidic, water-repellent substance with antimicrobial properties. Its removal leaves the skin of the ear canal vulnerable to invasion and infection. For surfers, the presence of *exostoses*, bony growths in the ear canals resulting from prolonged exposure to cold, predisposes to impaction and retained moisture within the canal.

The client with otitis externa often complains of a feeling of fullness in the ear. Ear pain typically is present and may be severe. The pain of otitis externa can be differentiated from that associated with otitis media by manipulation of the auricle. In external otitis, this maneuver increases the pain, whereas the

client with otitis media experiences no change in pain perception. Odorless watery or purulent drainage may be present. The ear canal appears inflamed and edematous on examination.

INTERDISCIPLINARY CARE



Management of the client with an external ear disorder focuses on restoring the normal balance of the external ear and canal and teaching the client how to prevent future problems.

For otitis externa, the following steps are recommended in treatment:

- Thorough cleansing of the ear canal, particularly if drainage or debris is present
- Treatment of the infection with local antibiotics; if cellulitis is present, systemic antibiotics may be necessary
- Medication to relieve the pain and itching
- Teaching on the prevention of future episodes of swimmer's ear.

A topical antibiotic is often prescribed for the treatment of otitis externa. A topical corticosteroid may be ordered in combination with the antibiotic to provide immediate relief of the pain, swelling, and itching. Polymyxin B-neomycin-hydrocortisone (Cortisporin Otic) is a typical combination preparation used to treat external otitis; these antibiotics are effective against

Pseudomonas. It is important to identify known sensitivity to any of the drugs in this preparation prior to initiating therapy. Clients who are sensitive to neomycin may develop dermatitis, in which case the drug must be stopped. Other preparations such as 1% tolnaftate solution (Tinactin) may be prescribed for a fungal infection of the ear canal.



NURSING CARE

External otitis can cause severe pain and discomfort. Although the disorder is rarely serious enough to require hospitalization, the nurse teaches the client about the disorder, comfort measures, and prevention of future episodes.

Nursing Diagnoses and Interventions

Impaired Tissue Integrity

External otitis may result from attempts to clean the ear canal with a toothpick, cotton-tipped applicator, or other implement that damages the skin, allowing an infectious organism to invade the tissue. Even if the canal is not damaged by attempts to clean it, the cleaning process often interrupts normal mechanisms, causing cerumen and debris to collect in the canal. This collected debris, in turn, tends to trap water within the canal, causing maceration of the skin.

- Inform that ear canals rarely need cleansing beyond washing of the external meatus with soap and water. Teach clients of all ages not to clean ear canals with any implement. *“Cleaning” increases the risk of tissue damage and impairs the normal mechanism that clears the canal of accumulated cerumen and debris.*
- Teach client (and, if necessary, a family member) how to instill prescribed eardrops:
 - a. Wash the hands.
 - b. Warm the medication briefly by holding the container in the hand or placing it in a pocket for approximately 5 minutes before instilling the drops. *Warming the medication promotes comfort.*

- c. Lie on the unaffected side; if sitting, tilt the head toward the unaffected side. *This position allows gravity to assist in moving the medication to the inner portion of the ear canal.*
 - d. Partially fill the ear dropper with medication.
 - e. Using the nondominant hand, straighten the ear canal by pulling the pinna of the ear up and back. *Straightening helps the medication travel along the length of the canal.*
 - f. Administer the prescribed number of drops into the ear canal. *It is important that the full amount of prescribed medication be administered to penetrate the length of the canal and achieve full effectiveness.*
 - g. Remain in the side-lying position for approximately 5 minutes after the instillation of drops. *This position allows the medication to penetrate into deeper portions of the canal and prevents it from running out when the head is moved upright.*
 - h. Loosely place a small piece of cotton in the auditory meatus for 15 to 20 minutes. *The cotton helps keep the medication in the canal.*
- Teach to avoid getting water in the affected ear until it is fully healed. Cotton balls may be used while showering to prevent water from entering the ear canal. The client should refrain from water sports and activities until approved by the primary care provider. *Retained moisture in the ear canal can further impair skin integrity, increasing inflammation.*

Community-Based Care

The client is ultimately responsible for carrying out the prescribed treatment regimen in external otitis and for implementing measures to prevent future episodes. Teaching is vital. Provide verbal and written instructions on use of the prescribed medications. Teach the client care measures to prevent recurrent episodes especially important in swimmers, divers, and surfers (Box 48–2).

Cellulitis of the surrounding tissue is a possible complication of external otitis. Instruct the client to report to the primary

BOX 48–2 Teaching to Prevent Otitis Externa

- Stay out of the water until the acute inflammatory process is completely resolved. Ideally, allow 7 to 10 days before resuming water activities.
- Take precautions to keep the ear canal dry while in the water:
 - a. Use silicone earplugs, which can keep water out of the ear without reducing hearing significantly.
 - b. Wear a tight-fitting swim cap or wet suit hood, especially in cold ocean water. Although these do not prevent water from entering the ear, they protect the ear from the cold and possibly slow the formation of bony growths in the ears. They also protect the ear from sand and other water debris.
- Immediately after swimming, dry the ear canal. Allow water to drain by tilting the head and jumping to shake water out of the ear. Dry the outer ear with a towel, then use a hair dryer on the lowest setting several inches from the ear to dry the canal.
- Do not insert cotton swabs or other objects into the ear canal to dry it. This removes the protective layer of cerumen and may damage the skin of the canal, increasing the risk of bacterial infection. In addition, if debris such as sand is present, the swab may actually push debris further into the canal, forming an impacted mass.
- Use a drying agent in the ear canal after swimming. A 2% acetic acid solution or 2% boric acid in ethyl alcohol is effective in drying the canal and restoring its normal acidic environment.
- If it is necessary to remove impacted debris from the ear canal, irrigate the ear with warm tap water. A bulb syringe available over the counter or a 20-mL syringe attached to a short Teflon intravenous catheter (with the needle removed) is effective. With the head tilted toward the affected side, direct a stream of warm water toward the upper wall of the ear canal, allowing the water to run out into a bowl or sink. Repeated instillations may be necessary to break up and flush out impacted wax and debris.

care provider any increase in pain, swelling, or redness of surrounding tissues; fever; or other manifestations of infection such as malaise or increased fatigue.

THE CLIENT WITH IMPACTED CERUMEN OR A FOREIGN BODY

The external auditory canal can be obstructed by cerumen or foreign bodies. The curved shape and narrow lumen of the canal make it particularly vulnerable to obstruction.

Pathophysiology and Manifestations

As cerumen dries, it moves down and out of the ear canal. In some individuals it tends to accumulate, narrowing the canal. Aging is a risk factor for impaction, because less cerumen is produced and it is harder and drier. The accumulation of cerumen is often aggravated by attempting to remove it using cotton-tipped swabs or hairpins, which pack it more deeply into the ear canal.

A variety of objects become foreign bodies in the ear canal. In adults, implements used to clean the ear canal may break and become lodged. Insects also may enter the ear canal and be unable to exit.

When the ear canal becomes occluded with either cerumen or a foreign body, the client experiences a conductive hearing loss in the affected ear. Manifestations include a sensation of fullness, along with tinnitus and coughing due to stimulation of the vagal nerve. The foreign body or impacted cerumen may be visualized on otoscopy. Impacted cerumen appears as a yellow, brown, or black mass in the canal.

INTERDISCIPLINARY CARE



Treatment focuses on clearing the canal. If there is no evidence of tympanic membrane perforation, irrigation of the canal is often the initial therapy.

Impacted wax, objects, or insects may require physical removal using an ear curet, forceps, or right-angle hook inserted via an otoscope and ear speculum. Mineral oil or topical lidocaine drops are used to immobilize or kill insects prior to their removal from the ear. When an organic foreign body such as a bean or an insect is suspected, water should not be instilled into the ear canal, because it may cause the object to swell, making its removal more difficult. Smooth, round objects present the biggest challenge to remove from the ear canal. Suction applied using a piece of soft intravenous tubing may be effective.



NURSING CARE

Nurses are often involved in identifying and relieving obstructions of the ear canal, especially in outpatient and community settings. Any client with evidence of a new conductive hearing loss or complaints of discomfort and fullness in one ear should be evaluated for possible obstruction. Inability to visualize the tympanic membrane or observation of a dark, shiny mass obstructing the canal may indicate a need for an irrigation or other procedure to clear the canal. It is important to deter-

mine that the tympanic membrane is intact before irrigating; assessment by a physician or advanced practitioner may be necessary if a ruptured membrane is suspected.

Because obstruction of the ear canal with cerumen or a foreign body is generally preventable, teaching is a key component of nursing care. Clients need to know appropriate care measures for the external ear. Although the ear canal rarely needs cleaning, the client prone to cerumen impaction needs teaching about the use of mineral oil or commercial products to soften wax and of irrigation to remove it. All clients should understand the importance of not inserting anything smaller than a finger wrapped with a washcloth into the ear canal to avoid trauma to the canal or eardrum. Stress the risk of impacting cerumen against the tympanic membrane when using cotton-tipped swabs to clean the ear canal. Additionally, the swab may break and lodge in the canal. If eardrops have been prescribed, teach the client and a family member how to instill them.

THE CLIENT WITH OTITIS MEDIA

Otitis media, inflammation or infection of the middle ear, primarily affects infants and young children but may also occur in adults. The tympanic membrane, which separates the middle ear from the external auditory canal, protects the middle ear from the external environment. The eustachian (auditory) tube connects the middle ear with the nasopharynx to help equalize the pressure in the middle ear with the atmospheric pressure. Unfortunately, this connecting tube also provides a route by which infectious organisms enter the middle ear from the nose and throat, causing otitis media, the most common disease of the middle ear.

Pathophysiology

There are two primary forms of otitis media: (1) serous and (2) acute or suppurative. Both forms are associated with upper respiratory infection and eustachian tube dysfunction. The eustachian tube is narrow and flat, normally opening only during yawning and swallowing. Allergies or upper respiratory tract infections can cause edema of the tube lining, impairing its function. Air within the middle ear is trapped and gradually absorbed, creating negative pressure in this space.

Serous Otitis Media

Serous otitis media (also called *otitis media with effusion*) occurs when the eustachian tube is obstructed for a prolonged time, impairing equalization of air pressure in the middle ear. Air within the middle ear space is gradually absorbed; the tube obstruction prevents more air from entering the middle ear. The resulting negative pressure in the middle ear causes sterile serous fluid to move from the capillaries into the space, forming a sterile effusion of the middle ear.

Upper respiratory infection or allergies such as hay fever predispose the client to serous otitis media. In addition, clients with narrowed or edematous eustachian tubes may also be subject to barotrauma or barotitis media. In these clients, the middle ear cannot adapt to rapid changes in barometric pressure such as those that occur during air travel or underwater diving. Barotrauma tends to occur during descent in an airplane, because negative

pressure within the middle ear causes the eustachian tube to collapse and lock. However, underwater diving places even greater stress on the eustachian tube and middle ear (Tierney et al., 2005).

MANIFESTATIONS Typical manifestations of serous otitis media include decreased hearing in the affected ear and complaints of “snapping” or “popping” in the ear. On examination, the tympanic membrane demonstrates decreased mobility and may appear retracted or bulging. Fluid or air bubbles are often visible behind the drum. Severe pressure differences such as those occurring with barotrauma may cause acute pain, hemorrhage into the middle ear, rupture of the tympanic membrane, or even rupture of the round window with sensory hearing loss and severe **vertigo** (a sensation of whirling or rotation). *Hemotympanum*, bleeding into or behind the tympanic membrane, may be observed on otoscopic examination.

Acute Otitis Media

The eustachian tube also provides a route for the entry of pathogens into the normally sterile middle ear, resulting in acute or suppurative otitis media. Acute otitis media typically follows an upper respiratory infection. Edema of the eustachian tube impairs drainage of the middle ear, causing mucus and serous fluid to accumulate. This fluid is an excellent environment for the growth of bacteria, which may enter from the oronasopharynx via the eustachian tube. Although a viral upper respiratory infection may predispose the client to a middle ear infection, the bacteria *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Streptococcus pyogenes* account for most cases of otitis media in adults. Invasion and colonization of the middle ear by bacteria and the resultant migration of white blood cells cause pus formation. Accumulated pus can increase middle ear pressure sufficiently to rupture the tympanic membrane. The bacterial infection may also migrate internally, causing mastoiditis, brain abscess, or bacterial meningitis. A more common complication of otitis media is a persistent conductive hearing loss, which typically resolves when the middle ear effusion clears.

MANIFESTATIONS The client with acute otitis media experiences mild to severe pain in the affected ear. The client’s temperature is often elevated. Diminished hearing, dizziness, vertigo, and tinnitus are common associated complaints. Pus within the mastoid air cells often causes mastoid tenderness in acute otitis media. On otoscopic examination, the tympanic membrane appears red and inflamed or dull and bulging (Figure 48–15 ■). Decreased movement of the membrane is demonstrated by tympanometry or air insufflation. Spontaneous rupture of the tympanic membrane releases a purulent discharge. **Myringotomy** (an incision of the tympanic membrane) may be performed to relieve the pressure.

INTERDISCIPLINARY CARE



The diagnosis of otitis media is usually based on the history and the physical examination. The tympanic membrane can be visualized and its mobility evaluated using a pneumatic otoscope that allows a puff of air to be instilled into the ear canal. Generally, the tympanic membrane moves slightly when air is instilled or the client performs the Valsalva maneuver. Less

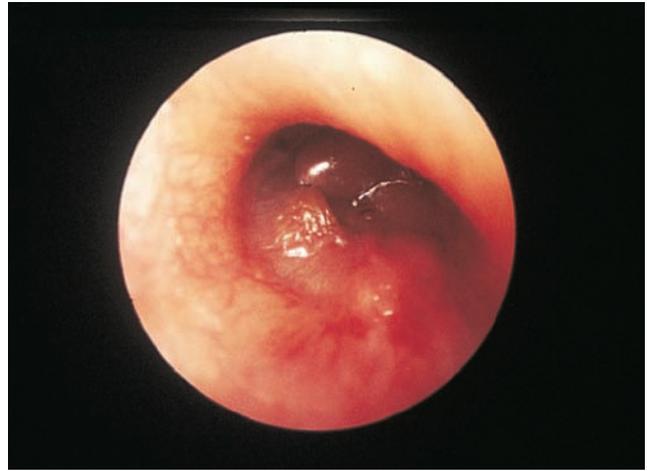


Figure 48–15 ■ A red, bulging tympanic membrane of otitis media.

Source: Janet Hayes/Medical Images, Inc.

movement is seen in clients with eustachian tube dysfunction and acute otitis media with effusion.

Diagnosis

- **Impedance audiometry**, also known as tympanometry, is an accurate diagnostic test for otitis media with effusion. A continuous tone is delivered to the tympanic membrane by an audiometer with a sealed probe tip. Compliance of the tympanic membrane and middle ear is measured by recording energy reflected from the membrane surface. With middle ear effusion, compliance is reduced.
- A **complete blood count (CBC)** may be done to assess for an elevated WBC count and increased numbers of immature cells indicative of acute bacterial infection.
- If the tympanic membrane has ruptured or a tympanocentesis or myringotomy is performed, drainage is cultured to determine the infecting organism.

Medications

When eustachian tube dysfunction and serous otitis media do not spontaneously resolve or lead to hearing loss, a short course of an anti-inflammatory drug (e.g., oral prednisone for 7 days) is prescribed to reduce mucosal edema of the tube and improve its patency. Although a decongestant or antihistamine may be used, there is little evidence of their effectiveness in treating serous otitis media. See Chapter 13 ∞ for the nursing implications of corticosteroid medications.

The client with eustachian tube dysfunction may be taught to autoinflate the middle ear by performing the Valsalva maneuver or by forcefully exhaling against closed nostrils. Additionally, the client is advised to avoid air travel and underwater diving.

Acute otitis media usually is treated with antibiotic therapy, especially amoxicillin, trimethoprim-sulfamethoxazole, cefaclor, or azithromycin for 5 to 10 days. This course of treatment is long enough to ensure eradication of the infective organism, yet short enough to reduce the incidence of bacterial resistance. (See Chapter 12 ∞ for further discussion of antibiotics.) Symptomatic relief may be provided by analgesics, antipyretics, antihistamines, and local application of heat.

Surgery

A myringotomy or tympanocentesis may be performed to relieve excess pressure in the middle ear and prevent spontaneous rupture of the eardrum. To perform a tympanocentesis, the physician inserts a 20-gauge spinal needle through the inferior portion of the tympanic membrane, allowing aspiration of fluid and pus from the middle ear to relieve pressure and, if necessary, obtain a specimen for culture. Myringotomy may be performed to relieve severe pain or when complications of acute otitis media, such as mastoiditis, are present. As soon as the pressure is released, pain subsides and hearing improves.

Clients who do not respond to antibiotic therapy may require myringotomy with insertion of ventilation (tympanostomy) tubes. Small tubes are inserted into the inferior portion of the tympanic membrane, providing for ventilation and drainage of the middle ear during healing. The tube is eventually extruded from the ear, and the tympanic membrane heals. While the tube is in place, it is important to avoid getting any water in the ear canal because it may then enter the middle ear space.



NURSING CARE

Clients with otitis media are commonly treated in outpatient and community settings. The nursing role is primarily one of support and education.

Health Promotion

Health promotion for otitis media focuses on educating clients about the importance of seeking medical care for prolonged, severe ear pain with or without drainage combined with an upper respiratory tract infection. Untreated or repeated attacks of otitis media can progress to a chronic form of otitis media, acute mastoiditis, or eardrum perforation.

Assessment

Collect assessment data through a health history and physical examination (Chapter 47 ∞).

- *Health history:* Recent upper respiratory infection; presence, intensity, and nature of pain in affected ear; sense of fullness or pressure in the ear; change in hearing; snapping or popping sensation in the affected ear; presence of vertigo.
- *Physical examination:* Temperature; hearing test; inspect tympanic membrane.

Nursing Diagnosis and Interventions

Pain can be a significant problem for clients with otitis media, as can the risk of damage to delicate tissues of the middle ear by the infectious and inflammatory processes.

Pain

Tissue edema, effusion of the middle ear, and the inflammatory response can affect the pain-sensitive tissues of the middle ear in otitis media, causing acute discomfort. This discomfort is increased by pressure changes, such as those that occur during air travel or underwater diving.

- Assess pain for severity, quality, and location. *A thorough assessment is important to determine the source of the pain.*

The pain of otitis media, unlike that of external otitis, is not aggravated by movement of the external ear.

- Encourage the use of mild analgesics such as aspirin or acetaminophen every 4 hours as needed to relieve pain and fever. *These nonprescription medications are effective in reducing the perception of pain. Aspirin also has anti-inflammatory properties that may help relieve the inflammation of the ear.*
- Advise to apply heat to the affected side unless contraindicated. *Heat dilates blood vessels, promoting the reabsorption of fluid and reducing swelling.*
- Instruct to avoid air travel, rapid changes in elevation, or diving. *A rapid change in barometric pressure can increase the client's pain significantly.*
- Instruct to report promptly an abrupt relief of pain to the primary care provider. *Pain that subsides abruptly may indicate spontaneous perforation of the tympanic membrane with relief of pressure within the middle ear.*

Community-Based Care

The client who has otitis media needs teaching about the disorder, its causes and prevention, and any specific treatment recommended or prescribed. Discuss the following topics with the client and family:

- Antibiotic therapy and potential side effects
- Importance of completing all ordered doses
- Follow-up examinations in 2 to 4 weeks
- Avoidance of swimming, diving, or submerging the head while bathing if ventilation tubes are in place.

If surgical intervention is necessary, teach the client and family members about the surgery and postoperative care. Provide instruction about any special postoperative precautions, such as avoiding water in the ear canals or avoiding sudden changes in air pressure.

THE CLIENT WITH ACUTE MASTOIDITIS

The mastoid process is a portion of the temporal bone of the skull lying adjacent to the middle ear. It is full of air cavities called mastoid air cells or mastoid sinuses. The infection of acute otitis media generally extends into the mastoid air cells; effective treatment of acute otitis media eliminates the infection from the mastoid cells as well. When treatment is ineffective, pus remains in the mastoid air cells, and acute **mastoiditis**, bacterial infection of the mastoid process, may develop.

The incidence of acute mastoiditis is low in the United States and in other countries in which the use of antibiotics to treat acute otitis media is similar to that of the United States. Its incidence is higher in countries where antibiotics are less likely to be prescribed for acute otitis media (Kasper et al., 2005).

Pathophysiology and Complications

In acute mastoiditis, the bony septa between mastoid air cells are destroyed and cells coalesce to form large spaces. Portions of the mastoid process are eroded. With chronic infection, an abscess may form, or bony sclerosis of the mastoid may result. Acute mastoiditis increases the risk of meningitis because only

a very thin bony plate separates mastoid air cells from the brain. Fortunately, this complication is rare since the advent of effective antibiotic therapy for treating otitis media.

Manifestations

Manifestations of acute mastoiditis usually develop approximately 2 to 3 weeks after an episode of acute otitis media and include recurrent earache and hearing loss on the affected side. The pain is persistent and throbbing; tenderness is present over the mastoid process (behind the ear). It may also be red and inflamed. Swelling of the process can cause the auricle of the ear to protrude more than normal. Fever may be accompanied by tinnitus and headache. Profuse drainage from the affected ear may be noted.

INTERDISCIPLINARY CARE



In addition to the manifestations of acute mastoiditis, loss of septa between mastoid air cells may be noted on radiologic examination. Acute mastoiditis is treated aggressively with antibiotic therapy. Intravenous ticarcillin-clavulanate (Timentin) and gentamicin may be used initially, with therapy tailored to the specific organism once culture results are obtained. Antibiotics are continued for at least 14 days. Infections that do not respond to medical therapy or that pose a high risk of spreading to the brain may necessitate *mastoidectomy*, surgical removal of the infected mastoid air cells, bone, and pus, and inspection of the underlying dura for possible abscess. The extent of tissue destruction determines the extent of surgery required. In a modified mastoidectomy, as much tissue is preserved as possible to avoid disruption of hearing. A radical mastoidectomy involves removal of middle ear structures including the incus and malleus as well as the diseased portions of the mastoid process. Unless reconstruction is performed at the time of surgery, this surgery results in conductive hearing loss. **Tympanoplasty**, surgical reconstruction of the middle ear, can restore or preserve hearing.



NURSING CARE

Prevention is the primary focus of collaborative and nursing care related to mastoiditis. Adequate, effective antibiotic treatment of acute otitis media prevents mastoiditis in nearly all instances.

Following surgical intervention, carefully assess the wound and drainage for evidence of infection or other complications. The client's hearing may be temporarily or permanently affected, depending on the extent of the surgery. If the client has impaired hearing in the unaffected ear as well, develop a means of communication with the client prior to surgery. If the hearing is preserved in the unaffected ear, position the client with that ear toward the door. Speak slowly and clearly; do not shout or speak unusually loudly. Be sure that family and staff know about the client's hearing loss and use appropriate communication techniques. Assist the client with ambulation initially, because dizziness and vertigo are not unusual following surgery.

Nursing care of the client having ear surgery is discussed in the box on the next page.

Community-Based Care

When teaching about acute mastoiditis, stress the importance of complying with the prescribed antibiotic therapy and recommendations for follow-up. Instruct the client and family to report any adverse reactions to the primary care provider so that therapy can be adjusted. Teach the client and family how to change the surgical dressing using aseptic technique. Provide referrals to appropriate community agencies for the client with a new hearing loss resulting from mastoiditis or its treatment.

THE CLIENT WITH CHRONIC OTITIS MEDIA

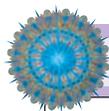
Chronic otitis media involves permanent perforation of the tympanic membrane, with or without recurrent pus formation. Changes in the mucosa and bony structures (ossicles) of the middle ear often accompany chronic otitis media. It usually is the result of recurrent acute otitis media and eustachian tube dysfunction, but may also result from trauma or other diseases.

Marginal perforations, which usually occur in the posterior-superior portion of the tympanic membrane, are associated with more complications than central perforations. With marginal perforations, squamous epithelium may migrate from the ear canal into the middle ear, where it begins to desquamate and accumulate, forming a *cholesteatoma* (a cyst or mass filled with epithelial cell debris). Its incidence is highest in children and young adults. The desquamating epithelium continues to accumulate and remains infected, producing collagenases (enzymes) that destroy adjacent bone. The inflammatory process impairs the blood supply to the stapes, causing its destruction and conductive hearing loss. Cholesteatomas are benign and slow-growing tumors, which can enlarge to fill the entire middle ear. Untreated, the cholesteatoma can progressively destroy the ossicles and erode into the inner ear, causing profound hearing loss.

Systemic antibiotics are prescribed for exacerbations of purulent otitis media. Tympanic membrane perforation is repaired with a tympanoplasty to restore sound conduction and the integrity of the middle ear. A cholesteatoma may require delicate surgery for its removal. If at all possible, radical mastoidectomy with removal of the tympanic membrane, ossicles, and tumor is avoided.

As with other complications of acute otitis media, a priority of nursing care is prevention of chronic otitis media and cholesteatoma. Clients with chronic otitis media need to understand various treatment options and their risks and benefits, as well as the long-term risk of not treating a perforated tympanic membrane. They are also taught how to instill eardrops, to clean the external auditory meatus, and to not irrigate the ear when the tympanic membrane is perforated or if they think it might be.

If surgical treatment of chronic otitis media will affect the client's hearing, include this information in preoperative teach-



NURSING CARE OF THE CLIENT HAVING Ear Surgery

PREOPERATIVE CARE

- Review Chapter 4  for routine preoperative care.
- Assess hearing or verify documentation of preoperative hearing assessment. *These data are important in evaluating the results of the surgical procedure.*
- Establish a means of communication to be used after surgery. *Hearing may be impaired after surgery.*
- Explain that blowing of the nose, coughing, and sneezing are restricted postoperatively to prevent pressure changes in the middle ear and potential disruption of the surgical site. Keeping the mouth open during a cough or sneeze minimizes pressure changes in the middle ear. *Providing teaching and the opportunity to practice before surgery promotes cooperation in the postoperative period.*

POSTOPERATIVE CARE

- Review Chapter 4  for routine postoperative care.
- Assess for bleeding or drainage from the affected ear. *Infection and hemorrhage are possible complications.*
- Administer antiemetics as ordered to prevent vomiting. *Vomiting may increase the pressure in the middle ear, disrupting the surgical site.*
- Elevate the head of bed and position the client on the unaffected side. *This position minimizes the pressure in the middle ear.*
- Assess for vertigo or dizziness, especially with ambulation or movement in bed. Avoid unnecessary movements such as turning. Take measures to ensure safety during ambulation. *Surgery on the ear may disrupt equilibrium, increasing the risk of falling.*

- Assess hearing postoperatively. Stand on the unaffected side to communicate and use other measures such as written messages as needed for effective communication with the client with impaired hearing. Reassure the client that decreased hearing acuity immediately after surgery is expected. *Hearing improvement, if an expected result of the ear surgery, typically does not occur until earplugs are removed and edema and drainage at the operative site have resolved. If no reconstruction of the middle ear is done or the cochlea is involved, permanent hearing loss in the affected ear may be an expected result.*
- Remind to avoid coughing, sneezing, or blowing the nose. *These increase pressure in the middle ear.*

Health Education for the Client and Family

- Provide instructions for home care:
 - a. To prevent contamination of the ear canal, avoid showers, shampooing, and immersing the head until the physician says you can do so.
 - b. Keep the outer earplug clean and dry, changing it as needed. Do not remove inner ear dressing until instructed to do so by the physician.
 - c. Avoid blowing the nose; if you need to cough or sneeze, keep the mouth open.
 - d. Do not swim or dive without physician approval. Check with your doctor regarding air travel.
 - e. Meclizine hydrochloride (Antivert) or other antiemetic/antihistamine medication may be necessary for up to 1 month following surgery.
 - f. Fever, bleeding, increased drainage, increased dizziness, or decreased hearing after discharge may indicate a complication. Notify the physician if any of these occur.

ing. Teach the client and family how to use alternative means of communication if this will be necessary postoperatively. When an assistive device is ordered, teach the client and a family member about its use.

THE CLIENT WITH OTOSCLEROSIS

Otosclerosis is a common cause of conductive hearing loss. Abnormal bone formation in the osseous labyrinth of the temporal bone causes the footplate of the stapes to become fixed or immobile in the oval window. The result is a conductive hearing loss.

Otosclerosis is a hereditary disorder with an autosomal dominant pattern of inheritance. It occurs most commonly in Caucasians and in females. The progressive hearing loss typically begins in adolescence or early adulthood and seems to be accelerated by pregnancy. Although both ears are affected, the rate of hearing loss is asymmetric. Because bone conduction of sound is retained, the client may be able to use the telephone but have difficulty conversing in person. Tinnitus may also be associated with otosclerosis.

On examination, a reddish or pinkish-orange tympanic membrane may be noted because of increased vascularity of the middle ear. The Rinne test (Chapter 47 ) shows bone

sound conduction to be equal to or greater than air conduction, an abnormal finding.

Clients with otosclerosis may choose conservative treatment, relying on a hearing aid to improve their ability to hear and interact with others. Sodium fluoride may be prescribed to slow bone resorption and overgrowth. Surgical treatment involves a stapedectomy and middle ear reconstruction or a stapedotomy. A *stapedectomy* is a microsurgical technique for removing the diseased stapes. A metallic prosthesis is then inserted, with one end connected to the incus and the other inserted into the oval window. *Stapedotomy* involves creation of a small hole in the footplate of the stapes and insertion of a wire or platinum ribbon prosthesis. An argon, KTP, or CO₂ laser may be used for surgery. Surgery usually restores hearing for the client with otosclerosis.

Education and referral of the client to appropriate community agencies are important nursing care priorities for the client with otosclerosis. For the client who chooses surgical treatment, nursing care is similar to that for other clients undergoing ear surgery. The following nursing diagnoses may be appropriate:

- *Risk for Injury* related to hearing loss or postoperative vertigo
- *Disturbed Sensory Perception: Auditory* related to bony sclerosis of the stapes

- *Impaired Verbal Communication* related to hearing loss
- *Anxiety* related to concern about transmission of a genetic disorder to children.

THE CLIENT WITH AN INNER EAR DISORDER

Disorders affecting the inner ear are much less common than disorders of the outer or middle ear. Inner ear disorders affect equilibrium and may also affect sensorineural hearing, the perception of sound. Labyrinthitis and Ménière's disease are the most common diseases of the inner ear. Vertigo may be a disorder of the inner ear itself or a manifestation of other disorders.

Pathophysiology and Manifestations

The inner ear (also called the labyrinth) contains the cochlea and the semicircular canals. The hair cells and neurons that allow sound perception and transmission to the auditory center of the brain are in the cochlea. The semicircular canals filled with endolymph are the primary organs involved in maintaining equilibrium. Disruption of this portion of the ear by an inflammatory process or excess endolymph not only affects balance but may also result in permanent hearing loss.

Vertigo

Normally, the integration of input from the labyrinths, eyes, muscles, joints, and neural centers maintains balance and posture. This input and integration can be affected by disorders of the labyrinth, vestibular nerve or nuclei, eyes, cerebellum, brainstem, or cerebral cortex, causing vertigo. Vertigo, the sensation of movement when there is none, is a disorder of equilibrium. The sensation of whirling, rotation, or movement is described as either subjective or objective.

Clients with subjective vertigo report the sensation of being in motion in a stable environment. This is not always a sense of spinning; the client may have a sense of tumbling or falling forward or backward. The sensation is reversed in objective vertigo; clients report a sensation of stability in a moving environment. This motion may be perceived as the room spinning around the client or the ground rocking beneath the client's feet. Dizziness, which may be mistaken for vertigo, is a sensation of unsteadiness, lack of balance, light-headedness, or movement within the head. The person who is dizzy does not have the rotational sensation felt with vertigo.

Vertigo may be disabling, resulting in falls, injury, and difficulty walking. Attacks of vertigo are often accompanied by nausea and vomiting, nystagmus, and autonomic symptoms such as pallor, sweating, hypotension, and salivation.

Labyrinthitis

Labyrinthitis, also called otitis interna, is inflammation of the inner ear. It is an uncommon disorder, because the bony protection of the membranous labyrinth makes it difficult for organisms to enter the inner ear. However, bacteria, viruses, and other organisms may enter and infect the inner ear through the oval window during acute otitis media, through the cochlear aqueduct during meningitis, or through the blood. Viral labyrinthitis is suspected when the client has a sudden onset of

symptoms after an upper respiratory infection or when there is no evidence of concurrent otitis media. Labyrinthitis also may result from an autoimmune process of unknown etiology.

MANIFESTATIONS Inflammation of the labyrinth typically causes vertigo, sensorineural hearing deficit, and **nystagmus** (rapid involuntary eye movements).

Vertigo is the hallmark manifestation of inner ear disorders. The vertigo of labyrinthitis is severe and often accompanied by nausea and vomiting. Any movement can aggravate the vertigo, and falling is a significant risk if the client attempts to stand. Vertigo lasts days to weeks in labyrinthitis, making client education a vital component of care.

Hearing loss in the ear affected by labyrinthitis may be temporary or permanent. If inflammation destroys tissue of the membranous labyrinth, the hearing loss may be complete and permanent.

The involuntary rhythmic eye movements of nystagmus may not be present in all clients with labyrinthitis. When present, the eye movement is typically horizontal. Applying positive or negative pressure to the tympanic membrane of the affected ear may stimulate nystagmus, as will caloric testing (irrigating the ear canal with warm or cool water). Although nystagmus may also be a symptom of brainstem or cerebellar dysfunction, vertigo and hearing loss are not typically associated with those disorders.

Ménière's Disease

Ménière's disease, also known as endolymphatic hydrops, is a chronic disorder characterized by recurrent attacks of vertigo with tinnitus and a progressive unilateral hearing loss. This disorder affects men and women equally, with adults between the ages of 35 and 60 at highest risk. The cause of Ménière's disease is unclear, although the most common form of the disease is thought to result from viral injury to the fluid transport system of the inner ear. Other factors that may increase the risk for Ménière's disease include trauma, bacterial infections such as syphilis, autoimmune processes, and vascular disorders (Copstead & Banasik, 2005; Porth, 2005). A family history of the disease increases risk, suggesting a possible genetic link in some clients.

Ménière's disease results from an excess of endolymph, the fluid in the membranous labyrinth of the inner ear. Although the precise pathophysiologic mechanism leading to accumulation of endolymph is unclear, it is thought to result from impaired filtration and excretion of the fluid by the endolymphatic sac (Porth, 2005; Tierney et al., 2005). Excessive pressure resulting from the increased fluid volume causes neural organs of the cochlea to degenerate.

COURSE AND MANIFESTATIONS The onset of Ménière's disease may be gradual or sudden. It is characterized by recurrent attacks of vertigo, gradual loss of hearing, and tinnitus. Attacks may be preceded by a feeling of fullness in the ears, and a roaring or ringing sensation. The sensorineural hearing loss and tinnitus are usually unilateral but can become bilateral. Attacks of severe rotary vertigo occur abruptly and often unpredictably, lasting from minutes to hours. An attack may be linked to increased sodium intake, stress, allergies, vasoconstriction, or premenstrual fluid retention. As the disease continues, hearing

loss progresses and the vertigo can be severe enough to cause immobility, nausea, and vomiting. Attacks are often accompanied by hypotension, sweating, and nystagmus.

INTERDISCIPLINARY CARE



The manifestations associated with inner ear disorders are similar, making testing necessary to establish a diagnosis. Once the diagnosis is determined, collaborative care is directed toward managing symptoms and preventing permanent hearing loss. Clients with labyrinthitis or an acute attack of Ménière's disease may require hospitalization to manage the vertigo and its effects.

Diagnosis

The following diagnostic studies may be ordered:

- **Caloric testing (electronystagmography)** evaluates the vestibulo-ocular reflex by identifying eye movements (nystagmus) in response to caloric testing. In clients with impaired vestibular function, the normal nystagmus response is blunted or absent. This portion of the test is contraindicated in clients who have a perforated tympanic membrane.
- **Rinne and Weber tests** of hearing (Chapter 47 ) show decreased air and bone conduction on the affected side if a sensorineural hearing loss is present. In Ménière's disease, audiology shows sensorineural hearing loss involving the low tones.
- **X-rays and CT scans** of the petrous bones are used to evaluate the internal auditory canal. In clients with Ménière's disease, the vestibular aqueducts may be shorter and straighter than normal.
- **Glycerol test** is conducted by giving the client oral glycerol to decrease fluid pressure in the inner ear. An acute temporary hearing improvement is considered diagnostic for Ménière's disease.

Medications

A scopolamine patch may be used for clients with recurrent vertigo, although adverse effects such as dry mouth, blurred vision, and urinary retention may limit its use. In Ménière's disease, a diuretic such as hydrochlorothiazide may be prescribed to reduce endolymphatic pressure. A central nervous system depressant such as diazepam (Valium) or lorazepam (Ativan) may halt an attack of vertigo. Parenteral droperidol (Inapsine) provides both a sedative and antiemetic effect, making it a useful drug for acute attacks. Antivertigo/antiemetic medications such as meclizine (Antivert), prochlorperazine (Compazine), or hydroxyzine hydrochloride (Vistaril) are prescribed to reduce the whirling sensation and nausea. If the nausea and vomiting are severe, intravenous fluids may be necessary to maintain fluid and electrolyte balance.

Treatments

Bed rest in a quiet, darkened room with minimal sensory stimuli and minimal movement provides the most comfort for the client experiencing an acute attack of vertigo.

Between acute attacks, management of the client with Ménière's disease is directed at preventing future attacks and pre-

serving hearing. A low-sodium diet helps reduce labyrinthine pressure. The Furstenberg diet, a salt-free neutral ash diet, may be prescribed if moderate sodium restriction is ineffective in controlling attacks. Clients should avoid tobacco, which causes vasoconstriction and can precipitate an attack, along with alcohol and caffeine.

Surgery

When episodes of vertigo are not controlled through medical interventions, surgery may be necessary. Surgical *endolymphatic decompression* relieves the excess pressure in the labyrinth; a shunt is then inserted between the membranous labyrinth and the subarachnoid space to drain excess fluid away from the labyrinths and maintain lower pressure. This procedure preserves hearing for most clients. Vertigo is relieved in approximately 70% of clients, but about half of clients undergoing this procedure continue to experience sensations of fullness and tinnitus.

Destruction of a portion of the acoustic nerve is an alternative to shunting procedures. In a *vestibular neurectomy*, the portion of cranial nerve VIII that controls balance and sensations of vertigo is severed. This procedure relieves vertigo for up to 90% of clients. Although there is a risk of damage to the cochlear portion of the nerve and resultant hearing loss, for most clients hearing loss stabilizes after neurectomy, even improving for some.

The surgery of last resort for Ménière's disease is a *labyrinthectomy*. The labyrinth is completely removed, destroying cochlear function. This procedure is used only when hearing loss is nearly complete and vertigo is persistent. Although labyrinthectomy relieves vertigo in nearly all cases, the client may remain unsteady and have continued problems with balance.

After surgery on the inner ear, the client is positioned to minimize ear pressure and vertigo. Movement is restricted, and assistance is provided when the client gets up. Antiemetics and antivertigo medications are used to manage symptoms resulting from disruption of the inner ear. Complications include infection and leakage of cerebrospinal fluid.



NURSING CARE

The client with an inner ear disorder has multiple nursing care needs related to the manifestations of the disorder.

Health Promotion

Health promotion focuses on identifying clients with potential inner ear disorders. Persistent episodes of dizziness, ringing in the ears, balance problems, or loss of hearing should be reported to a healthcare provider. Clients diagnosed early may have a lower risk for injury and can be taught strategies for maintaining as near normal as possible their work and social life.

Assessment

In addition to the following, assess the older client for other medical causes of imbalance and dizziness, such as neurologic dysfunction, musculoskeletal and cardiovascular disorders, and endocrine problems.

- **Health history:** Medication use; presence of vertigo, tinnitus, nausea and vomiting, and hearing loss; balance problems; frequency and duration of symptoms, precipitating factors for an attack.
- **Physical examination:** Vital signs, general health; hearing, nystagmus, balance.

Nursing Diagnoses and Interventions

The risk for trauma in clients with inner ear disorders is great. Attacks of vertigo may occur without warning and can be so severe that the client is unable to remain upright. If frequent attacks are accompanied by nausea, nutrition may be compromised. Constant or intermittent tinnitus can interfere with sleep and rest. Finally, because nearly all inner ear disorders are associated with some degree of hearing loss, which may be progressive, the client has significant psychosocial needs.

Risk for Trauma

Because of the unpredictable nature of attacks, the client with vertigo due to an inner ear disorder needs to learn strategies for dealing with an acute episode. Because vertigo tends to be chronic except in acute labyrinthitis, the emphasis is on helping the client develop strategies to reduce the frequency of attacks and the risk of injury.

- Monitor for vertigo, nystagmus, nausea, vomiting, and hearing loss. *Monitoring is important to determine the severity of impairment, the duration of attacks, and the client's ability to predict an impending attack.*
- Instruct to not get up without assistance during episodes of vertigo. *During attacks of vertigo, assistance reduces the risk of falling.*

PRACTICE ALERT

During an acute attack of vertigo, keep on bed rest with the side rails raised and the call light readily accessible.

- Teach to avoid sudden head movements or position changes. *Sudden movement may precipitate an attack of vertigo.*
- Administer prescribed medications as ordered, including antiemetics, diuretics, and sedatives. *These medications may reduce the frequency, severity, and duration of vertigo attacks.*
- Instruct to take the prescribed medication and lie down in a quiet, darkened room when an impending attack is sensed. *These measures help protect the client from injury and may shorten the duration and reduce the severity of the attack.*
- Advise to pull to the side of the road and wait for the symptoms to subside if an attack occurs while driving. *Perception and judgment necessary for safe driving may be impaired during an acute attack; pulling off the road is vital to protect the safety of the client and others.*
- Discuss the effect of unilateral hearing loss on the ability to identify the direction of sounds. To ensure safety, encourage the client to use other senses (e.g., when crossing the street). *Just as depth perception changes when vision is lost in one eye, sound perception and differentiation of direction change when hearing is lost unilaterally.*

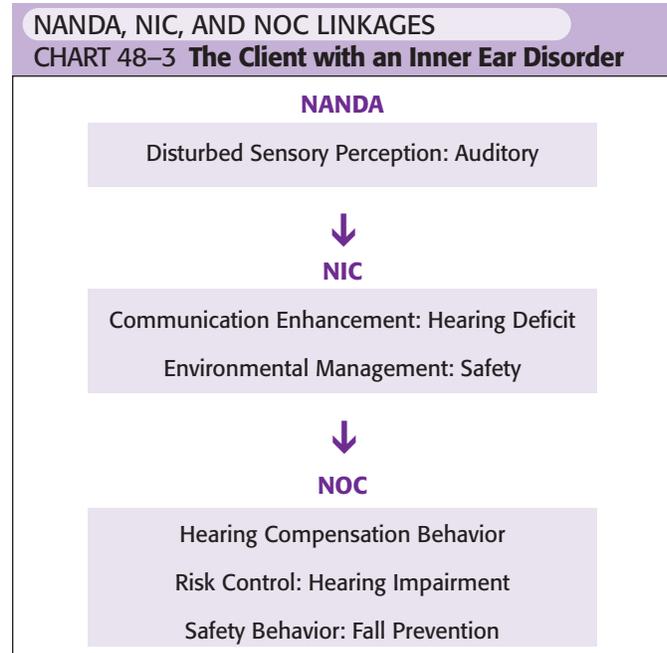
Disturbed Sleep Pattern

The tinnitus often associated with inner ear disorders may be loud and continuous, interfering with the client's ability to concentrate, relax, and sleep. It may be perceived as a continuous high-pitched whine, buzzing, ringing, or humming sound. In some clients, it may have a pulsatile quality.

- Refer for a complete hearing and ear examination if one has not been done. *Although most tinnitus is associated with hearing loss, often due to noise exposure, it may also be associated with treatable conditions such as impacted cerumen, hypertension, cerebrovascular disorders, and other conditions.*
- Discuss options for masking tinnitus to promote concentration and sleep:
 - a. Ambient noise from a radio or sound system
 - b. Masking device or white-noise machine
 - c. Hearing aid that produces a tone to mask the tinnitus
 - d. Hearing aid that amplifies ambient sound.*These techniques or devices help mask the subjective perception of tinnitus, allowing the client to focus on something other than the sound.*
- Discuss the possible risks and benefits of medications to treat tinnitus. *Many medications have been used to treat tinnitus; oral antidepressants such as nortriptyline (Aventyl, Pamelor) taken at bedtime have been shown to be most effective.*

Using NANDA, NIC, and NOC

Linkages between nursing diagnoses, nursing interventions, and nursing outcomes for the client with an inner ear disorder are illustrated in Chart 48–3.



Data from NANDA's *Nursing Diagnoses: Definition & Classification 2005–2006* by NANDA International (2005), Philadelphia; *Nursing Interventions Classification (NIC)* (4th ed.) by J. M. Dochterman & G. M. Bulechek (2004), St. Louis, MO: Mosby; and *Nursing Outcomes Classification (NOC)* (3rd ed.) by S. Moorhead, M. Johnson, and M. Mass (2004), St. Louis, MO: Mosby.

Community-Based Care

Because disorders of the inner ear disrupt balance, safety is a primary focus of teaching. Assist the client to identify possible hazards in the home environment. Discuss the following points during the teaching session:

- Change positions slowly, especially when ambulating.
- Turn the whole body rather than just the head.
- Sit down immediately with the onset of vertigo and lie down if possible.
- Take prescribed antiemetic and antivertigo medications.
- Wear Medic-Alert identification.
- If appropriate, discuss the surgical procedure, the immediate postoperative period, and the long-term effects of the surgery.
- Discuss alternative communication techniques as needed.
- Suggest the following resources:
 - Better Hearing Institute
 - Self-Help for Hard of Hearing People.

THE CLIENT WITH AN ACOUSTIC NEUROMA

An **acoustic neuroma** or schwannoma is a benign tumor of cranial nerve VIII. It typically occurs in adults between the ages of 40 and 50. Acoustic neuromas are common and account for 7% to 8% of intracranial tumors (Way & Doherty, 2003).

These tumors usually occur in the internal auditory meatus, compressing the auditory nerve where it exits the skull to the inner ear. Both the vestibular and cochlear branches are affected; however, the tumor arises from the vestibular division of the auditory nerve twice as often. If allowed to grow, the tumor eventually destroys the labyrinth, including the cochlea and vestibular apparatus. As the tumor expands, it erodes the wall of the internal auditory meatus. The tumor may eventually impinge on the inferior cerebellar artery, which provides blood to the lateral pons and medulla, the brainstem, and the cerebellum. An obstructive hydrocephalus can also occur. Cranial nerves VII (facial) and V (trigeminal) are often affected by the expanding tumor; the tumor frequently wraps around the facial nerve.

Early manifestations of an acoustic neuroma are those associated with disorders of the inner ear: tinnitus, unilateral hearing loss, and nystagmus. Dizziness or vertigo may occur. As the tumor expands and occupies increasing amounts of space in the closed cranium, the client experiences neurologic signs related to the area of the brain affected.

The presence of the tumor can generally be identified on CT or MRI scans. X-ray films of the petrous pyramid of the temporal bone may show erosion caused by the tumor.

The treatment of choice for an acoustic neuroma is surgical excision. In surgery, every effort is made to preserve this nerve and its function as well as other cranial nerves that may be affected. Small tumors of the vestibular division of the acoustic nerve may be excised using microsurgical techniques; hearing can often be preserved. A translabyrinthine approach provides good access to the tumor and allows the facial nerve to be preserved. However, this approach destroys hearing in the affected ear, and it is usually used only when the tumor is large or little

effective hearing remains in the affected ear. Larger tumors require craniotomy for removal; facial nerve paralysis is a common result of surgery.

Postoperative nursing care focuses on preserving cerebral function. Position the client to minimize cerebral edema and monitor frequently for signs of increased intracranial pressure. Because the gag reflex may be affected, assess the client carefully before food and fluids are allowed by mouth. Speech therapy is often prescribed for the client after surgery. Because deficits may not resolve for a long time after surgery, education and support are vital components of nursing care for the client. (See Chapter 44 ∞ for care of the client undergoing craniotomy.)

THE CLIENT WITH HEARING LOSS

Hearing loss is a significant problem, affecting an estimated 10% of adults in the United States (Kasper et al., 2005). The problem of hearing loss is particularly significant in older adults, affecting about 30% to 35% of people between the ages of 65 and 74, and more than 40% of those over age 75 (National Institute on Deafness and Other Communication Disorders, 2005d). As many as 70% of nursing home residents have impaired hearing.

Hearing loss impairs the ability to communicate in a world filled with sound and hearing individuals. A hearing deficit can be partial or total, congenital or acquired. It may affect one or both ears. In some types of hearing loss, the ability to perceive sound at specific frequencies is lost. In others, hearing is diminished across all frequencies.

Clients with a hearing loss often display signs that caregivers can recognize. The voice volume of the client with impaired hearing frequently increases, and the client positions the head with the better ear toward the speaker. The client frequently may ask people to repeat what they have said or respond inappropriately to questions or statements. A question may elicit a blank look if the client has not heard or understood its content.

Pathophysiology and Manifestations

Lesions in the outer ear, middle ear, inner ear, or central auditory pathways can result in hearing loss. The process of aging also can affect the structures of the ear and hearing. Hearing loss is classified as conductive, sensorineural, or mixed, depending on what portion of the auditory system is affected. Profound deafness is often a congenital condition.

Conductive Hearing Loss

Anything that disrupts the transmission of sound from the external auditory meatus to the inner ear results in a conductive hearing loss. The most common cause of conductive hearing loss is obstruction of the external ear canal. Impacted cerumen, edema of the canal lining, stenosis, and neoplasms all may lead to canal obstruction. Other causes of conductive loss include a perforated tympanic membrane, disruption or fixation of the ossicles of the middle ear, fluid, scarring, or tumors of the middle ear.

With conductive hearing loss, there is an equal loss of hearing at all sound frequencies. If the level of sound is greater than

the threshold for hearing, speech discrimination is good. Because of this, the client with a conductive hearing loss benefits from amplification by a hearing aid.

Sensorineural Hearing Loss

Disorders that affect the inner ear, the auditory nerve, or the auditory pathways of the brain may lead to a sensorineural hearing loss. In this type of hearing loss, sound waves are effectively transmitted to the inner ear. In the inner ear, however, lost or damaged receptor cells, changes in the cochlear apparatus, or auditory nerve abnormalities decrease or distort the ability to receive and interpret stimuli.

A significant cause of sensorineural hearing deficit is damage to the hair cells of the organ of Corti. In the United States, noise exposure is the major cause. Damage may result from either loud impulse noise (e.g., an explosion) or loud continuous noise (e.g., machinery). Exposure to a high level of noise (e.g., standing close to the stage or speakers at a rock concert) on an intermittent or continuing basis damages the hair and supporting cells of the organ of Corti. Ototoxic drugs also damage the hair cells; when combined with high noise levels, the damage is greater and resultant hearing loss more profound. Ototoxic drugs include aspirin, furosemide (Lasix), aminoglycosides, streptomycin, vancomycin (Vancocin), antimalarial drugs, and chemotherapy such as cisplatin (Platinol). Other potential causes of sensory hearing loss include prenatal exposure to rubella, viral infections, meningitis, trauma, Ménière's disease, and aging.

Tumors such as acoustic neuromas, vascular disorders, demyelinating or degenerative diseases, infections (bacterial meningitis in particular), or trauma may affect the central auditory pathways and produce a neural hearing loss.

Sensorineural hearing losses typically affect the ability to hear high-frequency tones more than low-frequency tones. This loss makes speech discrimination difficult, especially in a noisy environment. Hearing aids are often not useful, because they amplify both speech and background noise. The increased sound intensity may actually cause discomfort for the client.

Presbycusis

With aging, the hair cells of the cochlea degenerate, producing a progressive sensorineural hearing loss. In **presbycusis**, gradual hearing loss associated with aging, hearing acuity begins to decrease in early adulthood and progresses as long as the individual lives. Higher pitched tones and conversational speech are lost initially. Hearing aids and other amplification devices are useful for most clients with presbycusis.

Because the hearing loss of presbycusis is gradual, the client and family may not realize the extent of the deficit. The individual with a hearing impairment may be described as unsociable or paranoid. The family may worry that the person is becoming increasingly forgetful, absentminded, or perhaps "senile." Depression, confusion, inattentiveness, tension, and negativism have been noted in older adults with hearing impairments. Functional problems such as poor general health, reduced mobility, and impaired interpersonal communication are also associated with hearing loss. Caregivers need to be alert for signs of impaired hearing such as cupping an ear, difficulty understanding verbal communication when the person cannot

see the speaker's face, difficulty following conversation in a large group, and withdrawal from social activities.

Tinnitus

Tinnitus is the perception of sound or noise in the ears without stimulus from the environment. The sound may be steady, intermittent, or pulsatile and is often described as a buzzing, roaring, or ringing.

Tinnitus is usually associated with hearing loss (conductive or sensorineural); however, the mechanism producing the sound is poorly understood. It is often an early symptom of noise-induced hearing damage and drug-related ototoxicity. Tinnitus is especially associated with salicylate, quinine, or quinidine toxicity. Other etiologies include obstruction of the auditory meatus, presbycusis, middle or inner ear inflammations and infections, otosclerosis, and Ménière's disease. Most tinnitus, however, is chronic and has no pathologic importance.

Tinnitus that is intermittent or slight enough to be masked by environmental sounds is often well tolerated. When it is loud, continuous, and not responsive to treatment, tinnitus can be a significant stressor. It can interfere with activities of daily living, sleep, and rest.

INTERDISCIPLINARY CARE



The best treatment for hearing loss is prevention. Clients need to know the risk for hearing damage and how to prevent it. Awareness of the effects of noise exposure, especially when combined with the ototoxic effects of aspirin or other drugs, is important to prevent sensorineural hearing loss.

Diagnosis

Hearing evaluation includes gross tests of hearing (such as the whisper test), the Rinne and Weber tests, and audiometry.

- *Rinne* and *Weber tests* compare air and bone sound conduction. When bone conduction of sound is better than air conduction, the hearing deficit is a conductive loss. The Rinne test can identify even mild conductive hearing losses. If both air and bone conduction are impaired, a sensorineural loss is indicated (Chapter 47 .
- *Audiometry* identifies the type and pattern of hearing loss. Specific sound frequencies are presented to each ear by either air or bone conduction.
- *Speech audiometry* identifies the intensity at which speech can be recognized and interpreted. *Speech discrimination* evaluates the ability to discriminate among various speech sounds.
- *Tympanometry* is an indirect measurement of the compliance and impedance of the middle ear to sound transmission. The external auditory meatus is subjected to neutral, positive, and negative air pressure while the resultant sound energy flow is monitored.
- *Acoustic reflex testing* uses a tone presented at various intensities to evaluate movement of the structures of the middle ear.

Amplification

A hearing aid or other amplification device can help many clients with hearing deficits. These assistive devices do not

ing to prevent, minimize, or treat the hearing loss itself. They amplify the sound presented to the hearing apparatus of the ear, which may bring the level of sound above the hearing threshold, allowing more accurate perception and interpretation of its meaning. When sound perception is distorted, a hearing aid may be less helpful, because it simply amplifies the distorted sound.

Unfortunately, less than one-fifth of older clients with a hearing deficit have or use a hearing aid. Denial of the deficit, other health problems, poor visual acuity, decreased manual dexterity, and cost all contribute to this low usage. Hearing aids must be individually prescribed by an audiologist. Proper design, proper fit, and regular maintenance are necessary for their effectiveness.

All hearing aids include a microphone, amplifier, speaker, earpiece, and volume control. Many include an option to turn off the microphone when using the telephone, others can be adjusted for the client's pattern of hearing loss. Hearing aids are available in a variety of styles, each with advantages and disadvantages:

- Canal hearing aids (in-the-canal and completely-in-canal) are the least noticeable style, fitting in the ear canal. They are appropriate for mild to moderately severe hearing loss. These small and unobtrusive devices allow use of the telephone and can be worn during exercise. Because of their small size, the client must have good manual dexterity to insert, clean, and change the batteries on canal hearing aids. For this reason, older clients or clients with impaired dexterity may be unable to use them.
- The in-ear style of hearing aid fits into the external ear and is used for mild to severe hearing loss (Figure 48–16 ■). Its larger size makes manipulation somewhat easier, although it still may be difficult for less dexterous individuals. A greater degree of amplification is possible with the in-ear aid. Many have a toggle switch for telephone usage.
- The behind-ear hearing aid allows finer adjustment of the level of amplification and is easier for the client to manipulate (Figure 48–17 ■). They can be used by clients with mild to profound hearing loss. For the client who wears glasses, this style can be modified, with all components fitting into the temple of the eyeglasses.
- Clients with profound hearing loss may require a body hearing aid. The microphone and amplifier of this aid are contained in a pocket-sized case that the client clips on to clothing, slips into a pocket, or carries in a harness. The re-

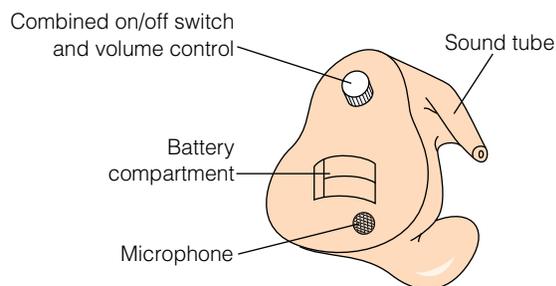


Figure 48–16 ■ An in-ear hearing aid.

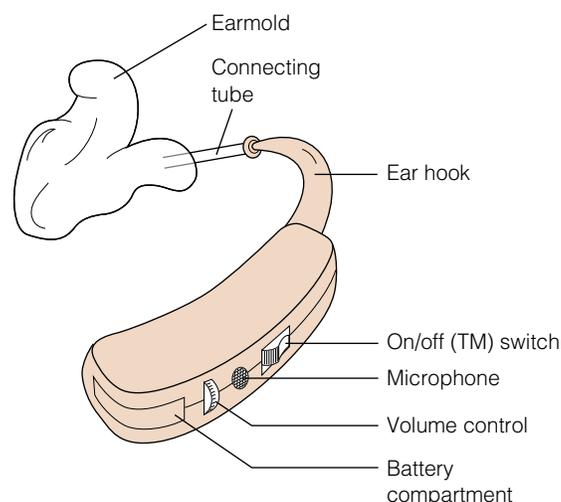


Figure 48–17 ■ A behind-ear hearing aid.

ceiver is attached by a cord to the case and clips onto the earmold, which delivers the sound to the ear canal.

With both the in-canal and in-ear style, cleaning is important. Small portals may become plugged with cerumen, interfering with sound transmission.

For the client who does not have a hearing aid, an *assistive listening device*, or “pocket talker,” with a microphone and “Walkman” type earpieces, is useful. Pocket talkers are available over the counter or through an audiologist and are relatively inexpensive. The earpiece requires no special fitting, and the external microphone allows the client to focus on the desired sound rather than simply amplifying all sounds. Assistive listening devices may also be used in conjunction with a hearing aid.

Clients with tinnitus may find a white-noise masking device helpful to promote concentration and rest. These devices conduct a pleasant sound to the affected ear, allowing the client to block out the abnormal sound.

Surgery

Reconstructive surgeries of the middle ear, such as a stapedectomy or tympanoplasty, may help restore hearing with a conductive hearing loss. Stapedectomy is the removal and replacement of the stapes. This procedure is used to treat hearing loss related to otosclerosis.

In a tympanoplasty, the structures of the middle ear are reconstructed to improve conductive hearing deficits. Chronic otitis media with necrosis and scarring of the middle ear is a common indication for this type of surgery.

For the client with a sensorineural hearing loss, a *cochlear implant* may be the only hope for restoring sound perception. The cochlear implant consists of a microphone, speech processor, transmitter and receiver/stimulator, and electrodes (Figure 48–18 ■). Its function is more similar to the way the ear normally receives and processes sounds than it is to a hearing aid. The microphone picks up sounds, sending them to the speech processor, which selects and processes useful sounds. The transmitter and receiver/stimulator receive signals from the speech processor, convert them to electrical impulses, and

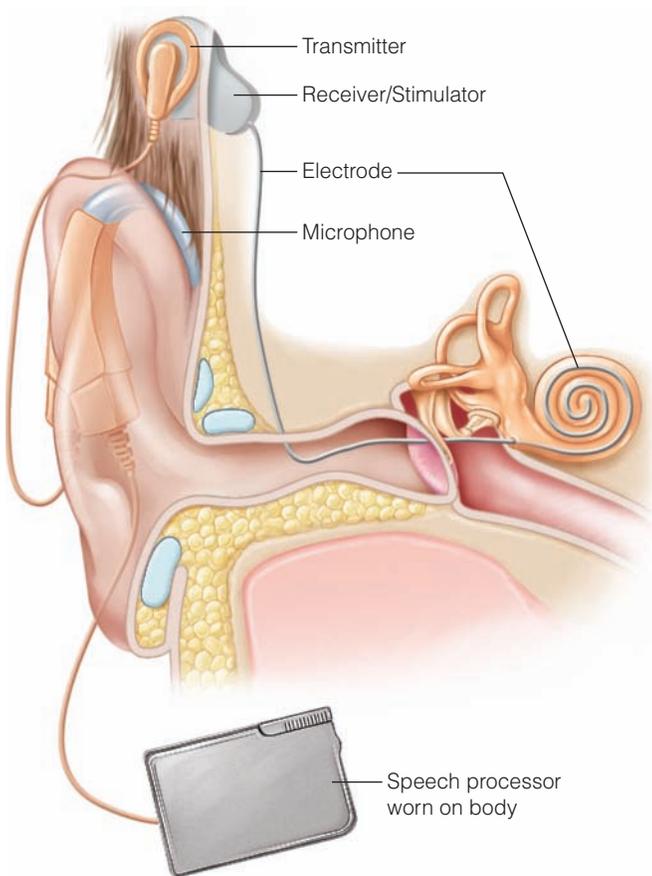


Figure 48–18 ■ A cochlear implant for sensorineural hearing loss.

send these impulses to the electrodes for transmission to the brain.

Cochlear implants provide sound perception but not normal hearing. The client is able to recognize warning sounds such as automobiles, sirens, telephones, and doors opening or closing. They also receive stimuli to alert them to incoming communication so they can focus on the person speaking. Many clients learn to interpret perceived sounds as words, especially when the hearing loss is acquired as an adult.

NURSING CARE

In planning and implementing nursing care for the client with a hearing deficit, the type and extent of hearing loss, the client's adaptation to the loss, and the availability of assistive hearing devices are considered, as well as the client's ability and willingness to use assistive devices.

Health Promotion

Healthcare personnel can be instrumental in preventing hearing loss through education. It is important to promote environmental noise control and the use of ear protection. The Occupational Safety and Health Administration requires ear protection for work environments that consis-

tently exceed 85 decibels. Teaching for primary prevention focuses on the following:

- Care of the ears and ear canals, including cleaning and treatment of infection
- Not placing hard objects into the ear canal
- Use of plugs to protect the ears during swimming or diving
- Avoiding intermittent or frequent exposure to loud noise
- Monitoring for side effects with ototoxic medications
- Hearing evaluation when hearing difficulty is present.

Assessment

- **Health history:** Perceived ability to hear; effect of hearing loss on function and lifestyle; risk factors such as use of ototoxic medications; upper respiratory tract or frequent ear infection; noise exposure; presence of vertigo, tinnitus, unsteadiness, or imbalance.
- **Physical examination:** Apparent perception of normal speech; inspection of external ear, tympanic membrane; whisper, Rinne, and Weber tests; tests of balance and cranial nerve function.

Nursing Diagnoses and Interventions

This section focuses on the problems of having a hearing deficit, impaired communication, and social isolation for the client who is hearing impaired.

Disturbed Sensory Perception: Auditory

Whether the client's hearing deficit is partial or total, impaired sound perception is the primary problem. The client needs to understand what causes the deficit and what to expect for the future. Nursing interventions focus on maximizing available hearing and preventing further deterioration to the extent possible.

- Encourage to talk about the hearing loss and its effect on activities of daily living. *Hearing loss affects each individual in a different way. The client may be denying the extent of the deficit or grieving the loss. Listening and providing support encourage the client to develop coping strategies.*
- Provide information about the type of hearing loss. Refer to an audiologist for evaluation of the hearing loss and possible exploration of amplification devices. *With improved understanding of the deficit, the client can plan ways to compensate.*
- Replace batteries in hearing aids regularly and as needed. *Hearing aid batteries last approximately 1 week. If a battery is old or has been improperly stored, the life may be reduced further.*
- If the hearing aid has a toggle switch for microphone/telephone, be sure it is in the appropriate position. *This ensures proper amplification with the hearing aid.*

PRACTICE ALERT

Check hearing aids for patency, cleaning out cerumen as necessary.

Impaired Verbal Communication

A hearing deficit impairs the client's ability to receive and interpret verbal communication. A hearing loss affects the client's

ability to follow conversations, use the telephone, and enjoy television or other forms of entertainment.

- Use the following techniques to improve communication:
 - a. Wave the hand or tap the shoulder before beginning to speak.
 - b. If the client wears corrective lenses, ensure that they are clean, and encourage the client to wear them.
 - c. When speaking, face your client and keep your hands away from your face.
 - d. Keep your face in full light.
 - e. Reduce the noise in the environment before speaking.
 - f. Use a low voice pitch with normal loudness.
 - g. Use short sentences and pause at the end of each sentence.
 - h. Speak at a normal rate, and do not overarticulate.
 - i. Use facial expressions or gestures.
 - j. Provide a magic slate for written communication.

Individuals with hearing impairments often lip-read, making good visibility of the speaker's face necessary. Excessive environmental noise interferes with the ability to perceive the message. Higher tones are typically lost with presbycusis and other types of hearing loss. Using short sentences and pausing give the client time to interpret the message. Over-articulating makes it more difficult to follow the flow and to lip-read. Nonverbal cues and written messages enhance the client's understanding.

- Be sure hearing aid is properly placed, is turned on, and has fresh batteries. *The client may not be aware that the hearing aid is not functioning well.*
- Do not place intravenous catheters in the dominant hand. *The client may need to use that hand to write.*
- Rephrase sentences when there is difficulty understanding. *Hearing losses may affect different sound tones, making some words more difficult to comprehend. Using alternative words and phrases may increase the client's ability to perceive the message.*
- Repeat important information. *The nurse makes sure that the client understands the information.*
- Inform other staff about the client's hearing deficit and effective strategies for communication. *Consistent use of effective strategies for communication decreases the client's frustration.*

Social Isolation

The client with impaired hearing often becomes socially isolated. This isolation may be self-imposed because of difficulty communicating, especially in a group. Often, however, the isolation comes about gradually and without intention. The client finds social settings such as family dinners or community gatherings increasingly difficult. Friends and family become frustrated trying to communicate with someone who has a hearing impairment, and invitations to participate in social activities dwindle.

- Identify the extent and cause of the social isolation. Help to differentiate the reality of the isolation and its cause from the client's perception of isolation. *Clients with impaired hearing may be unaware that they are isolated. Identifying factors that contribute to isolation may provide the needed impetus*

to remedy the hearing loss. Clients may also experience paranoid thinking as a result of impaired communication and believe that friends and family have purposely begun to avoid interactions.

- Encourage to interact with friends and family on a one-to-one basis in quiet settings. *Clients with impaired hearing are more successful in understanding conversations that take place in small groups and quiet settings.*
- Treat with dignity and remind friends and family that a hearing deficit does not indicate loss of mental faculties. *Inappropriate responses due to a hearing deficit can cause others to perceive the client as "stupid" or demented.*
- Involve in activities that do not require acute hearing, such as checkers and chess. *The client has an opportunity to interact socially without the stress of straining to hear.*
- Obtain a pocket talker or encourage the client and family to do so.
- Refer the client to an audiologist for evaluation and possible hearing-aid fitting.
- Refer to resources such as support groups and senior citizen centers. *These groups provide new social outlets.*

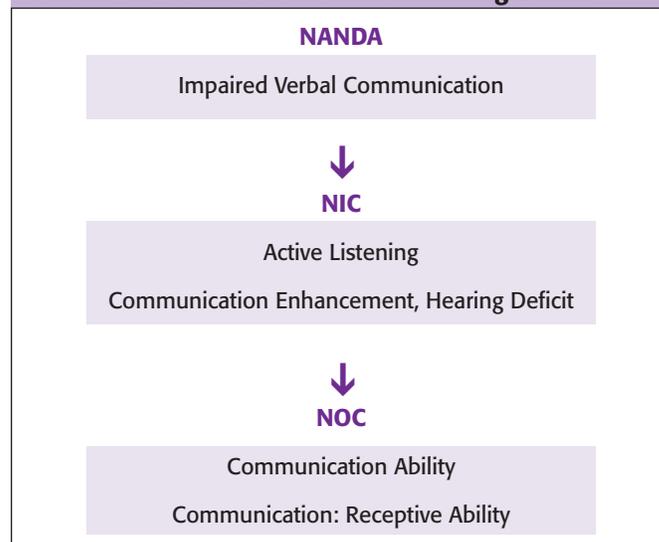
Using NANDA, NIC, and NOC

Chart 48–4 illustrates linkages between NANDA nursing diagnoses, NIC, and NOC for the client with a hearing deficit.

Community-Based Care

Teaching for home and community-based care for the client with hearing loss focuses on managing the deficit and developing coping strategies. Referral to an audiologist for evaluation of the deficit and the usefulness of a hearing aid may be

NANDA, NIC, AND NOC LINKAGES
CHART 48–4 The Client with a Hearing Deficit



Data from NANDA's *Nursing Diagnoses: Definitions & Classification 2005–2006* by NANDA International (2005), Philadelphia; *Nursing Interventions Classification (NIC)* (4th ed.) by J. M. Dochterman & G. M. Bulechek (2004), St. Louis, MO: Mosby; and *Nursing Outcomes Classification (NOC)* (3rd ed.) by S. Moorhead, M. Johnson, and M. Maas (2004), St. Louis, MO: Mosby.

appropriate. In addition, discuss the following topics as appropriate for each client:

- Use, care, and maintenance of a hearing aid
- Strategies for coping with the hearing deficit
- Voicing a preference for individual visits and small group interactions rather than large social functions
- Helpful resources include the following:

- American Academy of Audiology
- American Speech-Language-Hearing Association
- House Ear Institute
- National Institute on Deafness and Other Communication Disorders
- National Deaf Education Center
- Self-Help for Hard of Hearing People.

EXPLORE MEDIA LINK

Prentice Hall Nursing MediaLink DVD-ROM



Audio Glossary
NCLEX Review

Animations/Video

Middle Ear Dynamics
Pilocarpine

COMPANION WEBSITE www.prenhall.com/lemone



Audio Glossary
NCLEX-RN® Review
Care Plan Activity: The Client with a Hearing Aid
Case Study: Retinal Detachment
MediaLink Application: Cataracts
Links to Resources



CHAPTER HIGHLIGHTS

- Structures of the external eye are vulnerable to trauma and infection. While usually minor, these problems can cause significant pain, scarring and clouding of the cornea, and loss or impairment of vision.
- Cataracts, glaucoma, age-related macular degeneration, and diabetic retinopathy are leading causes of visual impairment in the United States. While these conditions cannot, in most cases, be prevented, they often can be treated or their progress slowed, preserving vision.
- Age, smoking, diabetes, and long-term use of certain drugs are risk factors for cataract development. Removal of the clouded lens with insertion of an intraocular lens is the treatment of choice for cataracts. Surgery is elective, performed only when the cataract significantly impairs the ability to maintain ADLs and recreational activities.
- Glaucoma is progressive loss of visual fields associated with increased intraocular pressure and impaired aqueous humor drainage. Open-angle glaucoma, the predominant form of the disorder, can be controlled using medications and, as needed, laser surgery to promote aqueous humor drainage.
- Angle-closure glaucoma is a medical emergency requiring immediate treatment to lower intraocular pressure to preserve vision. Angle-closure glaucoma usually affects only one eye; however, the client is at risk for future attacks affecting the other eye.
- Age-related macular degeneration, a leading cause of blindness, cannot be effectively treated, although its progress may be slowed or halted through use of high-dose antioxidant vitamins and zinc if it is identified early. Macular degeneration affects the macula, the area of high-acuity central vision.
- Diabetic retinopathy eventually affects nearly all people with diabetes. It is a disease of the small blood vessels of the retina, leading to formation of aneurysms, retinal ischemia, and growth of fragile new vessels (neovascularization) that easily rupture leading to hemorrhage. It is treated with laser surgery to seal fragile vessels.
- Otitis media is related to eustachian tube dysfunction, with impaired pressure equalization of the middle ear. Otitis media may be either serous (sterile) or infectious (suppurative). Both cause acute discomfort with diminished hearing, snapping, popping, and possible vertigo and systemic symptoms. The risk of complications, including rupture of the tympanic membrane, damage to structures of the middle ear, and spread of infection to surrounding tissues, is greater with acute suppurative otitis media.
- Potential complications of acute otitis media include mastoiditis, chronic otitis media with tympanic membrane perforation, and cholesteatoma formation. Hearing loss in the affected ear is a possibility with these disorders. The primary treatment is prevention through adequate treatment of acute otitis media.
- The primary manifestations of disorders of the inner ear are vertigo and possible hearing loss. Severe vertigo can interfere with safety, nutrition, and the client's ability to maintain ADLs and life roles.
- The two major types of hearing loss are conductive and sensorineural. Presbycusis, hearing loss associated with aging, is a type of sensorineural hearing loss. Hearing loss may be accompanied by tinnitus, the perception of sound without an environmental stimulus. Amplification devices (hearing aids) are the primary treatment for hearing loss.

TEST YOURSELF NCLEX-RN® REVIEW

- 1 A nurse is working with a group of residents in a long-term care facility. All of the residents have moderate to severe hearing or vision impairment. Which of the following does the nurse identify as the highest priority of care?
 1. preventing sensory deprivation
 2. encouraging social interaction
 3. promoting family relationships
 4. maintaining resident safety
- 2 The nurse teaching a client with newly diagnosed glaucoma emphasizes which of the following instructions?
 1. turning the head side to side to compensate for impaired peripheral vision
 2. using the prescribed eyedrops as directed on a continuing basis
 3. contacting the physician if further decline in vision is noticed
 4. avoiding coughing, sneezing, or straining to have a bowel movement
- 3 A patient with glaucoma has a history of heart failure. Which medication should the nurse discuss with the physician before administering it?
 1. brimonidine (Alphagan)
 2. dorzolamide (Trusopt)
 3. timolol (Timoptic)
 4. latanoprost (Xalatan)
- 4 A client with Ménière's disease experiences frequent attacks of vertigo and tinnitus. Of the following teaching points, which one has the highest priority for this client?
 1. Follow a low-sodium diet.
 2. Stop smoking.
 3. Take prescribed antiemetic medications.
 4. Sit down when an attack develops.
- 5 On a client's return from cataract surgery, the nurse in the ambulatory surgery recovery unit places the client:
 1. in semi-Fowler's position.
 2. on the affected side.
 3. in a private room.
 4. in proximity to the nurses' station.
- 6 A client calls her primary care provider's office with complaints of bright flashing lights to the side of her vision. The appropriate response by the nurse is to:
 1. recommend that she lie down until the sensation has passed.
 2. advise her to make an appointment to have her blood pressure checked.
 3. initiate immediate referral to an ophthalmologist.
 4. reassure her that this is not unusual and should resolve without treatment.
- 7 A client presents at the urgent care clinic with complaints of right ear pain. Which of the following should be included in physical assessment of this client? (Select all that apply.)
 1. vital signs with temperature
 2. inspection of the oral pharynx
 3. manipulation of the ear pinna
 4. palpation of cervical lymph nodes
 5. inspection of the ear canal and tympanic membrane
- 8 An elderly resident in an assisted living facility complains to the nurse that his head "feels stuffy" and he has ringing in his ears. The appropriate response by the nurse would be to
 1. make an appointment with the resident's primary care physician.
 2. refer the client for evaluation by a local audiologist.
 3. provide nonprescription eardrops for daily use.
 4. inspect the ear canals for patency.
- 9 The nurse caring for a client with a severe hearing deficit identifies which of the following as an appropriate goal toward improving the client's social interactions?
 1. Will plan to have dinner with one or two friends weekly.
 2. Will participate in senior center communal lunches at least twice per week.
 3. Will engage in activities such as card tournaments and dancing.
 4. Will attend religious services of choice.
- 10 When assessing a client, the nurse notes absence of the red reflex in the client's right eye. On questioning, the client responds "Oh yes, my doctor told me I have cataracts. When do you think I should have them removed?" How should the nurse respond?
 1. "It appears that the right eye is due for surgery."
 2. "Are you having difficulty reading or doing activities you enjoy?"
 3. "Are you starting to experience pain in your right eye or frequent headaches?"
 4. "Cataracts can be removed any time that it is convenient for you."

See *Test Yourself answers in Appendix C.*

BIBLIOGRAPHY

- Alper, B. S. (2005a). Evidence-based medicine. Lowering intraocular pressure delays visual-field loss in glaucoma. *Clinical Advisor for Nurse Practitioners*, 8(12), 128.
- _____. (2005b). Evidence-based medicine. Lowering intraocular pressure may prevent glaucoma. *Clinical Advisor for Nurse Practitioners*, 8(12), 128.
- Bremridge, T. (2005). Caring for those with age-related impaired sight. *Nursing & Residential Care*, 7(11), 507–509.
- Browne, M. (2003). The nurse's role in helping patients cope with sight loss. *Nursing Times*, 99(48), 30–31.
- Clinical: Glaucoma. (2005). *Nursing Times*, 101(6), 33.
- Clinical: What you need to know about infective conjunctivitis. (2004). *Nursing Times*, 100(32), 31.
- Cohen, A. S., & Ayello, E. A. (2005). Diabetes has taken a toll on your patient's vision: How can you help? *Nursing*, 35(5), 44–47.
- Conley, Y. P., & Gorin, M. B. (2003). The genetics of age-related macular degeneration. *Medsurg Nursing*, 12(4), 238–241, 259.
- Copstead, L. E., & Banasik, J. L. (2005). *Pathophysiology* (3rd ed.). Philadelphia: W. B. Saunders.
- Davies, S., & de Guzman, A. (2004). Ear drops containing steroids were better than acetic acid for otitis externa. *Evidence-Based Nursing*, 7(2), 43.
- Dochterman, J., & Bulechek, G. (2004). *Nursing interventions classification (NIC)* (4th ed.). St. Louis, MO: Mosby.
- Ervin, S. E. (2004). Ménière's disease: Identifying classic symptoms and current treatments. *AAOHN Journal*, 52(4), 156–158.
- Fontaine, K. L. (2005). *Healing practices: Alternative therapies for nursing* (2nd ed.). Upper Saddle River, NJ: Prentice Hall Health.
- Gallacher, R. (2004). Understanding the nursing role in patients who have cataract. *Nursing Times*, 100(21), 31.
- Greenlee, E. C. (2005). Laser and surgical treatments for glaucoma: an overview. *Insight: The Journal of the American Society of Ophthalmic Registered Nurses*, 30(4), 32–37.
- Halverson, P. (2005). The silent thief. *RN*, 68(3), 41–45, 70–71, 33.
- Heimink, A. L., & Segó, S. (2005). Advisor forum. Chronic tinnitus treatment. *Clinical Advisor for Nurse Practitioners*, 8(4), 56.
- Holcomb, S. S. (2004). This just in. New guidelines improve treatment of otitis media. *Nurse Practitioner: American Journal of Primary Health Care*, 29(10), 6, 8, 13.
- Holman, C., Roberts, S., & Nicol, M. (2005). Promoting good care for people with hearing impairment. *Nursing Older People*, 17(2), 31–32.
- Houde, S. C., & Huff, M. A. (2003). Age-related vision loss in older adults: A challenge for gerontological nurses. *Journal of Gerontological Nursing*, 29(4), 25–33, 51–52.
- Kasper, D. L., Braunwald, E., Fauci, A. S., Hauser, S. L., Longo, D. L., & Jameson, J. L. (Eds.). (2005). *Harrison's principles of internal medicine* (16th ed.). New York: McGraw-Hill.
- Kenny, C. (2003). Taking eye care to the patient. *Nursing Times*, 99(21), 40–41.
- Kleinbeck, C., & Williams, A. S. (2004). Disabilities, diabetes, and devices. *Home Healthcare Nurse*, 22(7), 469–475.
- Lusk, S. L., Ronis, D. L., Kazanis, A. S., Eakin, B. L., Hong, O., & Raymond, D. M. (2003). Effectiveness of a tailored intervention to increase factory workers' use of hearing protection. *Nursing Research*, 52(5), 289–295.
- Malmstrom, J. (2005). National Conference of Gerontological Nurse Practitioners. Gerontologic nurse practitioner care guidelines: assessing and managing hearing deficits in the older adult. *Geriatric Nursing*, 26(1), 57–59.
- Marsden, J. (2004a). Clinical. Cataract: The role of nurses in diagnosis, surgery and aftercare. *Nursing Times*, 100(7), 36–40.
- _____. (2004b). Clinical. Implications of and treatment options for retinal detachment. *Nursing Times*, 100(37), 44–47.
- Moore, L. W., & Miller, M. (2003). Older men's experience of living with severe visual impairment. *Journal of Advanced Nursing*, 43(1), 10–18.
- Moore, L. W., & Miller, M. (2005). Driving strategies used by older adults with macular degeneration: Assessing the risks. *Applied Nursing Research*, 18(2), 110–116.
- Moorhead, S., Johnson, M., & Maas, M. (2004). *Nursing outcomes classification (NOC)* (3rd ed.). St. Louis, MO: Mosby.
- National Eye Institutes, National Institutes of Health. (2003a). *Age-related macular degeneration: What you should know* (NIH Publication No. 03-2294). Bethesda, MD: Author.
- _____. (2003b). *Cataract: What you should know* (NIH Publication No. 03-201). Bethesda, MD: Author.
- _____. (2003c). *Diabetic retinopathy: What you should know* (NIH Publication No. 03-2171). Bethesda, MD: Author.
- _____. (2003d). *Glaucoma: What you should know* (NIH Publication No. 03-651). Bethesda, MD: Author.
- _____. (2004). *Statistics and data*. Retrieved from http://www.nei.nih.gov/evedata/pbd_tables.asp.
- _____. (2005a). *Facts about the cornea and corneal disease*. Retrieved from <http://www.nei.nih.gov>.
- _____. (2005c). *Retinal detachment*. Retrieved from <http://www.nei.nih.gov>.
- National Guideline Clearinghouse. (2005). *Contact lens care*. Retrieved from <http://www.guideline.gov>.
- National Institute on Deafness and Other Communication Disorders, National Institutes of Health. (2005a). *Cochlear implants*. Retrieved February 23, 2005, from <http://www.nidcd.nih.gov/health/hearing/coch.asp>.
- _____. (2005b). *Hearing aids*. Retrieved March 1, 2005, from <http://www.nidcd.nih.gov/health/hearing/hearingaid.asp>.
- _____. (2005c). *Noise-induced hearing loss*. Retrieved May 4, 2005, from <http://www.nidcd.nih.gov/health/hearing/noise.asp>.
- _____. (2005d). *Presbycusis*. Retrieved February 23, 2005, from <http://www.nidcd.nih.gov/health/hearing/presbycusis.asp>.
- Neault, G. (2005). Self-care needs of cataract patients following ambulatory surgery. *Insight: The Journal of the American Society of Ophthalmic Registered Nurses*, 30(4), 7–11.
- Opperwall, B. (2003). Asthma, allergy, and upper airway disease. *Nursing Clinics of North America*, 38(4), 697–711.
- Phillips, M. (2003). Genetics of hearing loss. *Medsurg Nursing*, 12(6), 386–390, 411.
- Porth, C. M. (2005). *Pathophysiology: Concepts of altered health states* (7th ed.). Philadelphia: Lippincott.
- Prevent Blindness America, & National Eye Institute, National Institutes of Health. (2002). *Vision problems in the U.S. Prevalence of adult vision impairment and age-related eye disease in America*. Retrieved from <http://www.usvisionproblems.org>.
- Quinlan, K. (2003). The importance of discharge instructions. *Journal of Emergency Nursing*, 29(4), 308.
- Rask, E. M. (2004). Recognize cholesteatomas early. *The Nurse Practitioner*, 29(2), 24–27.
- Rassin, M., Gorfansky, N., Shahin, E., Hacham, Y., Grant, P., et al. (2005). NT research. Importance of early referral in sudden loss of hearing. *Nursing Times*, 101(49), 34–36.
- Rothrock, J. C. (2003). *Alexander's care of the patient in surgery* (12th ed.). St. Louis, MO: Mosby.
- Smith, S. C., Lamb, P., & Liu, J. (2005). Age-related macular degeneration: answers to some common questions. *Insight: The Journal of the American Society of Ophthalmic Registered Nurses*, 30(3), 17–23.
- Tierney, L. M., McPhee, S. J., & Papadakis, M. A. (Eds.). (2005). *Current medical diagnosis & treatment* (44th ed.). Stamford, CT: Appleton & Lange.
- U. S. Preventive Services Task Force. (2005). Screening for glaucoma: Recommendation statement. *American Journal for Nurse Practitioners*, 9(9), 49–50, 52–55.
- Watkinson, S. (2005). Visual impairment in older people: The nurse's role. *Nursing Standard*, 19(17), 45–52, 54–55.
- Way, L. W., & Doherty, G. M. (2003). *Current surgical diagnosis & treatment* (11th ed.). New York: McGraw-Hill.
- Wilkinson, J. M. (2005). *Nursing diagnosis handbook* (8th ed.). Upper Saddle River, NJ: Prentice Hall.
- Williams, D. (2005). Does irrigation of the ear to remove impacted wax improve hearing? *British Journal of Community Nursing*, 10(5), 228–232.
- Wright, J. (2005). Common ear problems in the primary care setting. *Journal of Community Nursing*, 19(9), 43–44, 46.

UNIT 14 BUILDING CLINICAL COMPETENCE

Responses to Altered Visual and Auditory Function

FUNCTIONAL HEALTH PATTERN: Cognitive-Perceptual

- Think about clients with impaired vision or hearing for whom you have cared.
 - Were their major medical diagnoses related or unrelated to sensory perception?
 - How did the clients' sensory disorder interfere with their health status? Did the client have vision changes, eye pain, hearing loss, or vertigo? Did the client wear corrective lenses or use a hearing aid? When was the client's last vision or hearing examination? Did the client use any medications? Did the client have a chronic disease or history of a vision or hearing disorder?
- The Cognitive-Perceptual Pattern describes the ability to effectively use and interpret input from the five senses: vision, hearing, smell, taste, and touch.

The eyes and ears allow visual and auditory stimuli to reach the brain. The eyes encode patterns of light from the environment through photoreceptors and transmit the information to the brain. The brain gives meaning to the information. Disorders affecting the eyes can lead to manifestations such as:

 - Impaired visual acuity (corneal or lens distortion ► impaired light ray focus on the retina ► distorted or unclear image transmitted to visual centers)
 - Vision loss ► damage to and loss of retinal sensory receptors ► inability to transmit signals from affected retina to visual centers)
- The primary functions of the ears are hearing and balance. Sound waves vibrate the tympanic membrane, activating structures of the middle and inner ear and generating action potentials. Cranial nerve VIII transmits these signals to the brain for interpretation. The inner ear provides position information used to coordinate body movements, equilibrium, and balance. Ear disorders can lead to manifestations such as:
 - Hearing loss (obstruction of or damage to ear structures ► impaired sound wave transmission to cochlea ► hearing loss cochlear damage impaired transmission of auditory stimuli to auditory centers ► hearing loss)
 - Vertigo (altered inner ear pressure or circulation ► impaired transmission of position sense signals ► equilibrium loss and sensations such as whirling or falling)
- Vision and hearing allow the client to communicate, to gain access to information, and to derive pleasure from sights and sounds in the environment. Priority nursing diagnoses within the cognitive-perceptual health pattern may include:
 - *Disturbed Sensory Perception* as evidenced by blurred vision, seeing halos, black spots or floaters, difficulty hearing, altered sense of balance.
 - *Impaired Verbal Communication* as evidenced by difficulty comprehending and maintaining communication, inability to articulate speech, absence of eye contact
 - *Deficient Knowledge: Vision/Hearing Assistive Devices* as evidenced by expressions of helplessness, lack of health-seeking behaviors
 - *Nausea* as evidenced by complaints of queasiness, discomfort associated with movement of the head
- Two additional nursing diagnoses often are of high priority for the client with altered vision or hearing:
 - *Risk for Injury*
 - *Ineffective Health Maintenance*

Directions: Read the clinical scenarios below and answer the questions that follow. To complete this exercise successfully, you will use not only knowledge of the content in this unit, but also principles related to setting priorities and maintaining client safety.

CLINICAL SCENARIO

You have been assigned to work with the following four clients for the 0700 shift on a medical-surgical unit. Significant data obtained during report are as follows:

- Andrew Hardy, a 50-year-old type 1 diabetic with hypertension, is a new admission during the night shift with blood glucose of 600. On assessment, the client reveals that he has been seeing black spot floaters and flashing lights at times. He is now complaining of blurred vision.
- Gladys Harvey is an 84-year-old who had right eye cataract surgery yesterday. Her vital signs have been stable since surgery. She has begun complaining of itching and slight discomfort in the right eye.

- Georgia Stanley is a 45-year-old admitted with complaints of feeling like she is spinning or falling and has ringing and a fullness feeling in her left ear. Her vital signs are T 98.6°F, P 78, R 16, BP 102/68. She is diaphoretic and complains of nausea. She is scheduled for x-rays and a CT scan of her head at 0800.
- Kenneth Koch, a 30-year-old, is a postoperative client who had a right ear tympanoplasty yesterday because of hearing loss due to chronic otitis media. Vital signs are T 99.6°F, P 90, R 20, BP 136/86. The client is requesting medication for ear pain. Pain scale is 9 out of 10 on a scale of 10 being the highest.

Questions

1 In what order would you visit these patients after report?

1. _____
2. _____
3. _____
4. _____

2 What top two priority nursing diagnoses would you choose for each of the clients presented above? Can you explain, if asked, the rationale for your choices?

	Priority Nursing Diagnosis #1	Priority Nursing Diagnosis #2
Andrew Hardy		
Gladys Harvey		
Georgia Stanley		
Kenneth Koch		

3 Which is the correct treatment for a client such as Mr. Hardy who has symptoms of diabetic retinopathy?

1. scleral buckling
2. enucleation
3. photorefractive keratectomy
4. laser photocoagulation

4 After cataract surgery, Ms. Harvey is placed in which position to reduce intraocular pressure?

1. Sims' position on the unaffected side
2. semi-Fowler's position on the unaffected side
3. supine with the head elevated 10 degrees
4. prone position on the affected side

5 A low-sodium diet is ordered for Ms. Stanley, who has Ménière's disease. The client understands this diet when she picks which meal plan?

1. hot dog on a roll with catsup and mustard
2. ham and cheese sandwich with potato salad
3. grilled chicken sandwich with lettuce and tomato
4. hamburger on a roll with potato chips

6 Which assessment data would be most indicative of hyphema, a potential result of blunt eye trauma?

1. eye pain, decreased visual acuity, seeing a reddish tint
2. hypertension, headache, facial pain
3. white eye reflex, pressure and blindness in affected eye
4. double vision, sunken eye, limited eye movement

7 Which techniques may improve communication with the client who has a hearing impairment? (Select all that apply.)

1. Speak loudly to enhance hearing.
2. Speak at a normal rate and avoid overarticulating.

3. Stand in front of a window so client can see the face.
4. Face the client to enhance lip-reading.
5. Turn down the television or radio.
6. Use short sentences and pause frequently.

8 A prescription for gentamicin (Garamycin) is ordered for a client with conjunctivitis. The nurse understands that a serious adverse effect of aminoglycosides is which effect?

1. damage to the eighth cranial nerve resulting in hearing loss
2. vasodilation leading to migraine headaches
3. leg pain caused by thromboembolism
4. stomach irritation leading to gastric ulcers

9 When evaluating for Ménière's disease, which diagnostic studies would you expect to be ordered? (Select all that apply.)

1. caloric testing
2. Rinne and Weber tests
3. troponins
4. complete blood cell count
5. glycerol test
6. blood glucose test

10 After eye surgery, which measures does the nurse instruct the client in?

1. Avoid lifting more than 15 pounds.
2. Avoid coughing or sneezing.
3. Lie on the affected side.
4. Remove the eye patch when sleeping.

11 Which is the correct way to instill eardrops in the adult client with otitis media?

1. Have client hang head over side of bed, pull pinna of the ear straight up, instill eardrops and have client turn to instill drops to other ear.
2. Have client tilt head toward unaffected side, pull pinna of the ear down and back, instill eardrops, and have client remain still for 3 minutes.
3. Have client lie on unaffected side, pull the pinna of the ear up and back, instill eardrops, and have client remain still for 5 minutes.
4. Have client lie in Sims' position on unaffected side, pull the pinna of the ear back, instill eardrops, and have the client turn to other side after 1 minute.

12 Which is the appropriate primary prevention to teach Mr. Koch to prevent hearing loss?

1. Cleanse the ear with ear swabs to prevent earwax buildup.
2. Avoid getting water in the ears when showering.
3. Monitor for ringing in the ears when taking acetaminophen.
4. Wear ear protectors when exposed to loud noises.

Case Study



Reggie Madison is a 65-year-old African American male who is seen in the eye clinic for a routine eye examination. He states he has not had any recent eye infections or eye injuries. He denies pain in the eyes. Vital signs are T 98.8°F, P 84, R 16, BP 168/88. His height is 5' 8" and weight is 200 pounds. His medical history indicates that he has hypertension and type 2 diabetes. He is taking hydrochlorothiazide, captopril, and glyburide. He states that he is on a 2000-calorie diabetic diet but he is often noncompliant with the diet. He sees his medical doctor about once a year but has not had an eye exam in about 10 years. He is married with five grown children and six grandchildren. Mr. Madison states he does not know if there is any family history of glaucoma because his father died of a heart attack at age 50 years and his mother died of cancer at 60 years of age.

The ophthalmologist performs a tonometry, which indicates an increase in intraocular pressure. A fundoscopic examination indicates pallor and increase in the size and depth of the optic cup on the optic disc. Visual field testing indicates significant peripheral vision loss. The results of these tests indicate a diagnosis of glaucoma.

Based on the medical diagnosis of open-angle glaucoma and the client's decreased peripheral vision, the nursing diagnosis of *Disturbed Sensory Perception: Visual* is appropriate for planning care for Mr. Madison.

