LESSON ASSIGNMENT

LESSON 1
Eye, Ear, Nose, and Throat (EENT) Surgery.

TEXT ASSIGNMENT
Paragraphs 1-1 through 1-45.

LESSON OBJECTIVES
After completing this lesson, you should be able to:

1-1. Identify terms and their definitions that are related to EENT surgery.

1-2. Identify preparation procedures of the operating room and of the patient for EENT surgery.

1-3. Identify special safety precautions related to EENT surgery.

1-4. Identify specific EENT surgical instruments.

1-5. Identify specific surgical procedures used for EENT surgery.

1-6. Identify procedures for tongue and neck surgery.

SUGGESTION
After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.
LESSON 1

EYE, EAR, NOSE, AND THROAT (EENT) SURGERY

Section I. EYE SURGERY

1-1. INTRODUCTION

a. **General.** The anatomy, physiology, and the location of the eye make surgery upon the eye a highly specialized field of surgery. Therefore, procedures done by the specialist when assisting with eye surgery differ from procedures used for other surgical specialties. However, the principles of asepsis and safe, skillful care apply as in all other surgery. The ensuing text presents a discussion of the necessary considerations that are applicable in the majority of cases in this specialty.

b. **Special Care of Instruments.** The specialist is to use exacting care when working with instruments for eye, ear, nose, and throat surgery because most of these instruments are delicate. Sharp surfaces of these instruments must be preserved to ensure the success of the operative procedure. The specialist is to follow local policy in the care and handling of these instruments.

c. **Anatomy and Physiology of the Eye.** The eye is also referred to as the eyeball or globe. In the adult, it is slightly less than one inch in its longest diameter. See figure 1-1 for parts of the eye.

   (1) The lids and anterior surface of the eye, except for the center, are covered by the conjunctiva.

   (2) The cornea forms the anterior center of the eye and transmits and refracts light. Behind it, the anterior chamber contains the iris (which gives eye color and forms the pupil) and the aqueous humor.

   (3) The lens focuses light on the retina allowing for near and far vision.

   (4) The posterior chamber contains the jelly-like vitreous humor, which helps give rigidity to the eye.

   (5) The retina receives light and converts it to impulses to the brain via the optic nerve.

   (6) The main body of the eye is made of three layers called tunics. The external tunic includes the sclera (the white part of the eye) and clear cornea. The middle tunic includes the choroid, the ciliary body, and the iris. The iris is the colored part that changes the aperture size over the eye lens. The internal tunic is sometimes called the nervous covering, but is usually referred to as the retina. The retina is a thin network of nerve cells and fibers that receives the images of objects the eye is seeing.
1-2. SPECIAL PREPARATION OF THE OPERATING ROOM

a. **Instruments.** All instruments used for eye surgery are made for this purpose, and are unlike those for surgical procedures in other areas of the body. Preferences for instruments vary so widely among eye surgeons that it may be necessary to list all instruments used for each operation by each different surgeon. Therefore, the surgeon's card must be carefully checked when selecting instruments for an eye operation.

b. **Sponges.** Gauze sponges are considered much too rough for use on an eyeball. Instead, dampened cotton applicators are used. Special cellulose sponges, specifically designed and prepackaged sterile by manufacturers for eye surgery, are also available.

c. **Magnifying Glasses.** The surgeon may wish to use special magnifying glasses during the procedure; therefore, these must be cleansed and ready for use.
d. **Lighting.** Illumination for eye surgery may be furnished by a number of methods.

(1) One method is the use of the standard overhead light. The circulator may be responsible for adjusting the light during surgery. If this need occurs, he should pay particular attention to not contaminating the sterile field and scrubbed personnel.

(2) A second source is the use of an electric head lamp. This lamp is strapped to the surgeon's head and is used in the same manner as a coal miner's helmet. The surgeon may redirect the light during surgery.

(3) The third method is the use of the operating microscope. This is a device used to magnify the site of surgery and enable the surgeon to do very delicate work with excellent illumination. This device is draped with sterile material before the procedure is started, and the surgeon may make any adjustments. The microscope is being used more and more for eye and other delicate surgery.

e. **Medications.** As many as 5 or 6 solutions may be kept within the sterile field for use during eye procedures; examples of these are saline (for dampening the eyeball), local anesthetic agents, and epinephrine. If these are not prepackaged and sterilized in individually labeled doses, the specialist should label medicine glasses to show the name and the strength of each solution. During preparation for an operation, the circulator should pour the solutions needed into the medicine glasses, making sure that the solution he is pouring matches the label on the glass. Great care should be taken to assure that ophthalmic solutions of the desired drugs are used.

f. **Sterile Setup.** If both of the patient's eyes are to be operated on for correction of defects requiring muscle surgery or other extraocular procedures, only one Mayo table needs to be up. However, if intraocular surgery is to be performed on both eyes, the specialist sets up two tables--one for each eye. When the procedure on the first eye is completed, the surgeon and specialist change only their gloves in preparation for the second eye.

**NOTE:** A large percentage of intraocular surgery does not require double setups. Advancement in techniques and equipment makes the practice ineffective and costly.

**1-3. PREPARATION OF THE PATIENT**

a. **Preoperative Prep.** For a successful operation, the physical, spiritual, and emotional needs of the person must be considered. Each member of the staff should endeavor to meet the needs of each patient and help him to cope with his specific problems.
(1) **Emotional factors.**

(a) The loss of vision or any interference with the use of the eyes, even temporarily, has a severe emotional effect on any person. It means loss of mobility and ability to take care of or protect oneself. This tends frequently to make the patient nervous and sometimes depressed. The patient is often awake during the entire operation. All operating staff members should allay the fears of each patient. The emotional state of the patient is an important factor in a successful recovery.

(b) A quiet environment and a calm, kindly, understanding voice create confidence in the patient. The patient's comfort is further enhanced by pleasant surroundings and freedom from noise and confusion. When a patient is sedated, he is often unable to speak coherently, but is usually conscious of noises, which become exaggerated in his mind.

(2) **Drugs which may be given.**

(a) To allay anxiety and reduce general muscle tone, the patient is usually given a barbiturate-narcotic drug on call to surgery, as well as any ophthalmic drugs that may be prescribed. This is often followed by topical anesthetic drops upon arrival at surgery (see figure 1-2).

![Figure 1-2. Instillation of eye medication.](image)

**NOTE:** Observe the position of the dropper and the capillary attraction.

(b) Mydriatic drops are used to dilate the pupil with the patient retaining the ability to focus his eye. This is usually 10 percent phenylephrine (Neo-Synephrine®).

(c) Cycloplegic drugs dilate the pupil and prevent focusing of the eye. Commonly used cycloplegics are 1 percent tropicamide (Mydriacyl), 1 percent atropine, and 1 percent cyclopentolate (Cyclogyl®). Atropine has a long-lasting effect.
(d) Miotic drugs cause the pupil of the eye to contract. Commonly used miotics are 1 percent to 4 percent pilocarpine and 0.012 percent to 0.25 percent phospholine iodides®. Miotics improve the ease with which the aqueous fluid escapes from the eye independent of their action on the pupil, thereby resulting in decrease of intraocular pressure. Miotics are used in the treatment of glaucoma. These drugs increase contraction of the sphincter of the iris, thus causing it to become smaller. Phospholine iodide® is usually discontinued before intraocular surgery is performed.

(e) A great number of corticosteroid preparations exist. They are used to prevent the normal inflammatory response to noxious stimuli. Corticosteroids reduce the resistance of the eye to invasion by pathogens; therefore, they are not used in the presence of infection.

(f) Topical antibiotics are often used prophylactically to prevent infection. Antibiotic instillation may be given prior to intraocular surgery to help prevent wound infection. Zinc sulfate, 0.25 percent, is used to reduce redness and swelling and to soothe tissue. It may be ordered in combination with a 0.125 percent preparation of phenylephrine. Zinc also is a necessary cofactor in wound healing. Lubricating drops or ointments such as Methylcellululose, 0.5 percent, are often used to protect the cornea.

(g) Hyperosmotic agents increase the osmolarity of the serum and, by the effect of the induced osmotic pressure gradient, shrink the vitreous body and reduce the intraocular pressure. These drugs are used routinely in the preoperative medication of patients about to undergo ophthalmic surgery, as well as therapeutically in cases of uncontrolled glaucoma. These drugs, given either orally or by injection, induce diuresis, so nursing personnel have urinals and sterile catheters on hand.

b. Admission into the Operating Room. When the patient is admitted to the operating room, the nursing team should:

(1) Make positive identification of the patient by name, dealing with him in a gentle, kind, and professional manner.

(2) Check the patient's name on his wristlet band with the name on the chart.

(3) Prepare the operating table, making sure all the necessary attachments for the table are in proper readiness.

c. Preparation of the Patient's Face.

(1) Preparation of the patient is done under aseptic conditions. Topical anesthetic drops are administered first if the patient is to be given a local anesthetic. A sterile preparation tray containing sterile normal saline solution, irrigation bulbs, basins, cotton, sponges, towels, and antibacterial skin disinfectant should be near the operating table.
Neither the clipping of eyelashes nor shaving of eyebrows is done routinely. When eyelashes are clipped, this is done prior to the skin preparation. A thin film of petrolatum is smoothed over the cutting surfaces of the curved eyelash scissors so that free lashes will adhere to the blades. This prevents the free eyelashes from falling into the eyes or onto the face.

The preparation includes cleansing the eyelids of both eyes, lid margins, lashes, eyebrows, and surrounding skin with an antibacterial soap or disinfectant. To prevent the agent from entering the patient's ears, they may be temporarily plugged, using cotton pledgets. Care is taken to keep the agent out of the eyes. The preparation area is washed with warm sterile water, using soft-texture gauze or cotton sponges. The operative area is painted with an aqueous nonirritating skin antiseptic.

When toxic chemicals or small particles of foreign matter must be removed, the eyes may be irrigated with tepid sterile normal saline solution. The conjunctival sac is thoroughly flushed, using an irrigating bulb or an Asepto syringe.

d. **Draping the Patient.** For general eye surgery, the basic draping procedure is as follows:

1. A large, folded sheet is needed to cover the patient and operating table.
2. The head is draped with a double-thickness half sheet and two towels or appropriate disposable drapes.
3. A fenestrated eye sheet, 14 inches square, with a center opening of 2 1/2 x 3 inches, is placed over the operative site. More recently, disposable plastic drapes have been used.

e. **Anesthesia.** Local anesthesia is frequently preferred and indicated for eye surgery, especially in elderly individuals and in those with circulatory and other systematic diseases. A sedative is given the night before surgery and again two hours prior to surgery.

1. **Anesthesia setup.** The operating room staff assembles the sterile local anesthesia setup as ordered by the surgeon before the patient enters the operating room and checks the bottles of drugs to make sure they are the correct medications and of the proper strength.

2. **Needles and syringes.**
   
   (a) Subcutaneous injection and infiltration. Two Luer-Lok 2-ml syringes and two 25-gauge needles, 1/2-inch length may be used.

   (b) Subconjunctival injection. Two Luer-Lok 2-ml syringes and two 26- or 27-gauge needles, 1-or 1 1/2-inch length.
(c) Retrobulbar injection. Two Luer-Lok 2-or 5-ml syringes or one 10-ml syringe and two 24-gauge needles, 1-or 1 1/2-inch length.

(3) Frequently-used drugs.

(a) Tetracaine hydrochloride (Pontocaine hydrochloride®) in a 2 percent solution may be instilled into the eye before an operation. For local anesthesia in adults, 2 percent lidocaine (Xylocaine®) with epinephrine hydrochloride in a 1:150,000 or 1:200,000 dilution is frequently used.

(b) Hyaluronidase (Wydase®, Alidase) is commonly mixed with the anesthetic solution (75u/10ml). The enzyme increases the diffusion of the anesthetic through the tissue, thereby improving the effectiveness of the anesthetic nerve block. For cataract surgery, an effective retrobulbar injection reduces intraocular pressure by preventing positive muscle contraction, thus becoming a surgical safeguard against vitreous loss. Hyaluronidase is nontoxic and is effective over a wide range of concentrations.

(c) In cataract surgery, alpha chymotrypsin in a 1:5,000 or 1:10,000 solution may be used to dissolve the zonular fibers that suspend the cataract within the eye. To produce eye muscle paralysis in intraocular surgery, tubocurarine chloride or succinylcholine chloride may be administered intravenously by the anesthesiologist.

(d) Epinephrine in a 1:1,000 solution may be applied topically to mucous membranes to decrease bleeding. Epinephrine in a 1:500,000 to 1:200,000 solution may be combined with injectable anesthetics to prolong the duration of anesthesia. Epinephrine in a 1:1,000 solution is not used in local anesthetics because if it were used in such concentrations, the patient could succumb to cardiac arrhythmia.

(4) Methods used for administration of local anesthetics. The three methods of administration are instillation of eye drops, infiltration, and block or regional anesthesia.

(a) Instillation of eye drops. With the patient's face, tilted upward, the first drop is placed in the lower cul-de-sac, and the following drops (number depends on the type of operation to be performed) may be placed from above, with the patient looking downward and the upper lid raised. However, the natural blinking of the lids distributes the drug evenly on the eye surface, regardless of where the drop is placed. When a toxic drug is instilled, the inner corner of the eyelids should be dried of excessive fluid with a tissue or clean cotton ball after the instillation of each drop, thereby minimizing systemic absorption of the drug. The tip of the applicator must not touch the patient's skin or any part of the eye.

(b) Infiltration method. The surgeon injects the anesthetic solution beneath the skin, beneath the conjunctiva, or into Tenon's capsule, depending on the
type of surgery. Retrobulbar injection is usually performed 10 to 15 minutes before surgery to produce a temporary paralysis of the extraocular muscles.

(c) Block or regional anesthesia. The solution is injected into the base of the eyelids at the level of the orbital margins or behind the eyeball to block the ciliary ganglion and nerves. For eyelid repairs, the solution is introduced through the lower lid. For operations on the lacrimal apparatus, the anesthetic is injected at the level of the anterior ethmoidal foramen in order to anesthetize the internal and external nasal nerves. In the Van Lint block method, procaine solution is injected into the orbicular muscle and reaches the ends of the facial nerve.

(5) General anesthesia. A general anesthetic, with or without intravenous injection of thiopental sodium (Pentothal Sodium®) is used when a patient is unable to cooperate because of youth, dementia, or nervousness, or because the solutions of 20 percent mannitol (Osmotrol®) or 5 percent glucose in water are given intravenously during surgery. A sedative is given the night before surgery, and a drying agent (atropine or scopolamine) and an analgesic are given 1 to 1 1/2 hours prior to surgery. The patient must not eat or drink anything for 6 hours prior to induction.

1-4. CONSIDERATIONS AT THE COMPLETION OF SURGERY

a. At the completion of the operation, the surgical area is cleansed, using saline sponges.

b. Antibiotic ointment may be thinly spread over the skin and eyelashes to prevent adhesion of the bandage. This is frequently done after plastic procedures on the lids or lacrimal duct.

c. Dressings are applied to prevent palpebral movements, protect the operative wound from dust and external contaminants, and absorb any blood and tears that are produced.

d. The initial dressing usually consists of a piece of fine cotton. An eye pad that is commercially prepared and sterilized is applied over the cotton splint. The eye dressing may be held in place by means of paper tape.

e. After intraocular operations, when external pressure on the eyes might be very harmful, the initial dressing is covered with a protector such as a wire gauze cap, perforated aluminum plate, convex perforated metal cup, convex flexible celluloid plate, or some other kind of shield.

f. A pressure bandage may be used in some cases when a compression effect is desired. The gauze roller bandage is applied over the initial dressing, encircling the head.

g. The instruments are carefully cleaned and sterilized.
1-5. SPECIAL SAFETY PRECAUTIONS

The precautions set forth for eye surgery should be scrupulously observed by the specialist as well as all other members of the operating room team, because errors or carelessness could cost the patient his sight.

a. Eye Medications. There must be absolutely no error in the administration of any solutions. In addition, all solutions must be sterile and fresh.

b. Room to Breathe. There must be sufficient ventilation for the patient beneath the drapes.

c. Quiet, Calm Room.

(1) To perform eye surgery satisfactorily, the surgeon must have a skilled and steady hand, and he must be able to concentrate on the operation. To maintain the needed quiet, calm atmosphere, all team members should keep conversation low and at a minimum. The movements of all team members should be executed smoothly and gently. This is especially important for persons working near the operative area. In addition, a sign should be placed outside the door to warn others that eye surgery is in progress and to keep traffic with its noise and confusion out of the area.

(2) When the patient has been given local anesthesia, it is necessary that he lie still without moving his head. Even though he is awake, his unaffected eye may be left uncovered; he may move if there is a loud noise or hurried activity near him.

(3) Eye instruments should be cleaned after each use during the operation with a nonfibrous sponge. After the operation, the instruments should be cleaned and dried thoroughly before storage. Microsurgical instruments should undergo ultrasonic cleaning with distilled water and appropriate cleansing agent. They should be individually hand held or immersed in ultrasonic cleaner as long as they are not touching each other. The instruments should be rinsed with distilled water and thoroughly dried.

NOTE: A regular preventive maintenance program should be established for sharpening, realigning, and adjusting the precision eye instruments.

d. Instruments and Their Care. Eye instruments are delicate and are assembled and stored in specialized instruments cases. They are easily bent, broken, or dulled. These instruments are also expensive and they must be handled with these characteristics in mind.

(1) Eye instruments are never to be stacked—before, during, or after a surgical procedure. The specialist should carefully arrange the instruments on the table so that no instrument is touching another, and they must not be stacked or thrown down carelessly at any time.
(2) Eye knives require even more scrupulous care. The blades must be protected by suspension at all times when they are not actually touching the patient's eyes. In some instances, they are tested before use with a thin kidskin stretched over a drum. The knives must be capable of cutting without any pressure being applied to the knife.

(3) A basic eye surgery instrument set with the addition of other instruments, supplies, and suture materials as preferred by the surgeon, will usually suffice for all of the more detailed minor surgery performed on the eye. Examples of such minor surgery are tarsorrhaphy, repairs of eyelid lacerations, and repair of conjunctival lacerations. The basic eye instrument set will include:

(a) Self-retaining eye speculum.
(b) Lid retractor.
(c) Muscle hooks.
(d) Knife handle.
(e) Scissors (tenotomy, stitch, corneal, and iris).
(f) Forceps (suturing fine and heavy, iris, fixation, tying).
(g) Caliper.
(h) Needle holders (micro and heavy).
(i) Irrigating cannula (19- and 27-gauge).
(j) Iris spatula.

1-6. HANDLING OF SPECIMENS

Whenever tissue removed during eye surgery is to be either examined for pathology or processed for storage in a "bank," the specimen is processed as described in Subcourse MD0927.

1-7. SUTURING TYPES USUALLY USED

Preferences vary among eye surgeons both as to the size and kind of sutures used and the type of stitch used. Therefore, the specialist should carefully check the surgeon's preference card for the procedure before preparing any sutures. In general, the sutures used for eye surgery are much smaller than those used for operations on other parts of the body. Silk, size 6-0, is frequently used, as is plain catgut in small sizes. In addition, double-arm sutures (a suture with a needle swaged on both ends)
are used for many operations. The specialist prepares this suture as described for
swaged-on sutures, taking care not to exert pull on either of the needles. He must also
avoid pricking his gloves with the needles. Both of the swaged-on needles are clamped
into needle holders before the suture is handled. Either interrupted or continuous
stitches may be taken, depending upon the preference of the surgeon.

1-8. OPERATIONS ON THE EYES

a. Introduction. In the following text, some examples of surgical procedures on
the eyes are defined in order to acquaint the specialist with these operations. When the
specialist is assigned to scrub or circulate for an eye operation, he is to perform duties
as indicated in paragraphs 1-3 through 1-7, using whatever modifications may be
prescribed locally.

b. Extraocular (Outside the Eye) Procedures. The operations discussed in
paragraphs 1-9 through 1-11 are those done outside the eye. Anesthesia used maybe
either general or local depending upon the needs of the situation.

c. Intraocular (Within the Eye) Procedures. Operations performed within the
eye are discussed in paragraphs 1-12 through 1-17. Anesthesia of choice is
usually--though not always--local.

1-9. PROCEDURES ON EYELIDS

a. Plastic Repair of Eyelid. Various reconstructive techniques may be
employed by the surgeon in repairing the eyelid following lacerations or burns. Plastic
repair may also be indicated as treatment for acquired malfunctions of the eyelid. Such
malfunctions sometimes result from scars that form after the healing of injuries or burns
of the lids. These malformations may be classified as follows:

(1) Ectropion. This is the rolling outward of the eyelid margin so that a
portion of the conjunctiva is exposed. It is usually accompanied by epiphora (tears
running down the cheek). This condition may be caused by injury or it may occur
spontaneously in elderly persons with no history of injury.

(2) Entropion. This is the rolling inward of the lid margin so that it presses
against the cornea and the eyelashes are in contact with the eyeball.

b. Tarsorrhaphy. This is the surgical closure of the lids by a plastic operation.
It is indicated when the lids cannot close sufficiently to cover the cornea during sleep
(exposure of the cornea results in the drying of its surface and produces corneal ulcer).

c. Excision of Chalazion. A chalazion is a small benign tumor of the eyelid.
The removal of a chalazion is indicated when the chalazion fails to disappear without
surgical intervention in the course of several weeks. (Approximately 70 percent of
chalazia require excision.) In addition, excision is indicated if the chalazion
progressively enlarges.
(1) The surgeon may excise the chalazion through either the conjunctival surface or the skin of the lid (see figure 1-3). The route of excision depends upon the surface upon which the chalazion is located. Very fine silk suture on a swaged-on needle is used if excision is through the skin surface. No suture is required if excision is through the conjunctival surface.

(2) A chalazion set is used with other instruments, supplies, and sutures according to the surgeon's preference.

d. **Excision of Pterygium (Benign Growth of Conjunctival Tissue Over the Cornea).** Removal of a pterygium is indicated when the pterygium is progressive and is invading the cornea.

e. **Hordeolum (Sty).** A sty is an infection of one or more glands of the skin of the eyelid. A painful lump occurs in the skin and the abscess, which can form may break through the surface and drain pus. Although the common treatment is application of hot compresses, pointing may necessitate opening and draining.

f. **Ptosis.** Ptosis is a drooping of the upper eyelid. It can be caused by neurological disorder, ocular conditions such as microphthalmus (abnormal smallness of the eyes), and local injury such as traumatic rupture of the levator muscle as well as other malfunctions. Lid surgery may be indicated if other treatments cannot remove the causes.

Figure 1-3. Preparation of eyelid for Chalazion removal. The incision on the inner lid surface is to avoid scarring.
1-10. PROCEDURES ON LACRIMAL APPARATUS (TEAR-DUCT SYSTEM)

a. **Dacryocystectomy.** A dacryocyst is a lacrimal (tear) sac. Therefore, dacryocystectomy is excision of the wall of the lacrimal sac. It is indicated as treatment for acute dacryocystitis. A lump may appear under the skin at the inner corner of the eye as the tear sac fills with pus. If the pus cannot be discharged from the sac by pressing on it, the ducts may be blocked and surgical incision and drainage of the sac is required to relieve the condition.

b. **Dacryocystorhinostomy.** This is the construction of an opening from the tear sac into the nasal cavity. The surgery may be done as treatment for chronic dacryocystitis, trauma to the nasolacrimal duct, or congenital malformation of the duct. In children, early probing of the nasolacrimal duct (before age of 1) may prevent the need for a dacryocystorhinostomy later.

1-11. PROCEDURES ON EXTRAOCULAR MUSCLES

a. **General.** Operations on muscles outside the eyeball are done for correction of strabismus. Strabismus is a term describing muscle imbalance between two eyes. An eye deviating outward or away from its fellow eye is a condition termed exotropia. If the eye deviates inward, it is termed esotropia.

b. **Objective of Surgery.**

   (1) To secure binocular single vision by performing accurate binocular alignment.

   (2) To achieve alignment that allows the best possible cosmetic effect and enables maintenance of the effect for as long as possible.

c. **Kinds of Operations.** Strabismus may be treated surgically by procedures done either to strengthen weak muscles (refer to paragraphs 1-11d, e, and f below) or to weaken overactive muscles (refer to paragraphs g and h below).

d. **Tucking.** A tuck is sutured in the muscle, thus shortening it and increasing its effective strength.

e. **Advancement.** The muscle is freed at its attachment point, and it is reattached closer to the cornea, thus increasing its leverage.

f. **Recession (Shortening).** Part of the tendon of a extraocular muscle is excised. The muscle is reattached to the sclera at the original point of insertion.

g. **Tenotomy.** This is transection of the muscle sheath and tendon.

h. **Recession (Lengthening).** The muscle is detached from the eyeball and is sutured to the sclera posterior to the original insertion.
1-12. PROCEDURES ON THE EYEBALL

a. Enucleation. This is excision of the eyeball and its muscles, with or without introduction of an implant (device made of glass or plastic used to prevent unsightly appearance of the eye and to form, a base for a prosthesis). Enucleation is sometimes indicated as treatment following penetrating or crushing wounds of the eyeball, and upon diagnosis of certain other conditions--especially the threat of sympathetic ophthalmia. (Sympathetic ophthalmia is bilateral inflammation of the entire uveal tract.) The condition is nearly always secondary to a perforating wound of the eye. Sympathetic ophthalmia nearly always progresses to blindness unless the injured eye ("exciting eye") is removed before the disease is well underway in the other eye ("sympathizing eye"). The anesthesia of choice for this operation is general anesthesia.

b. Evisceration. In contrast to enucleation, evisceration is excision of the cornea and removal of all contents of the globe, leaving the scleral shell and muscles intact. The procedure is indicated following injury when a virulent organism invades the eye. Evisceration provides less danger of the transmission of infection to the brain than does enucleation. General anesthesia is usually used for this procedure.

c. Exenteration of Orbit. This is the removal of the entire contents of the orbit (eye, tendons, muscles, fatty and fibrous tissue). The operation is indicated as treatment for malignant tumor. General anesthesia is usually given for this procedure.

1-13. PROCEDURES FOR REPAIR OF DETACHED RETINA

a. General. A retinal detachment is a separation of the portion of the retina that contains the rods and cones from the portion of the retina called the pigment epithelium. As a result, the rods and cones lose nutrition and cease to function. Thus, the visual defect will vary with the extent and location of the detachment.

(1) There are many causes for a retinal detachment. These include trauma, high myopia (causing a thin retina), degeneration, diabetes, infections, and tumors. The danger of a small retinal detachment is that eventually the entire retina will separate and the eye will lose all vision.

(2) Blood or fluid may be present as a result of direct or indirect trauma, severe inflammation, or certain diseases.

b. Operative Procedures.

(1) If the retina is detached as a result of tumor, enucleation may be the operation indicated.

(2) Retinal detachment due to the presence of blood or fluid offers a choice of several operative procedures to the surgeon. All operations are based on the principle of sealing off the area in which the tear has been located, of draining off
sub-retinal fluid, and of creating a watertight adhesion between the choroid and the retina. A frequently used operation involves the use of electrocautery. The surgery may be performed using general or local anesthesia.

1-14. PROCEDURES FOR REMOVAL OF INTRAOCULAR FOREIGN BODIES

a. General. The presence of an intraocular foreign body usually represents a serious ocular problem. Disturbance of the function of the eye results from several sources, including the destruction of or damage to the tissues caused by the entrance of a missile; infection introduced by the missile; and destruction of or damage to the delicate intraocular tissues caused by reactions to the intraocular intruder, such as siderosis caused by iron or inflammation caused by wood particles.

(1) Before surgery is undertaken, the size and location of the foreign body must be determined. This is done by special X-ray procedures of the skull with special bone-free X-ray using dental film and other techniques.

(2) In addition, metal-locating instruments and ultrasonic probes are employed to locate the foreign bodies.

b. Operative Procedures. The operation performed depends upon the size, location, and magnetic property of the embedded object. Local anesthesia is used because the cooperation of the patient is required.

(1) The magnet tip may be directed to the eye and the foreign body removed without incision into the eye if the size and location of the object makes this procedure feasible.

(2) If the size, shape (jagged edges), or the location of the foreign body is such that passage of the object would endanger structures vital to vision, the sclera is incised and the magnet tip is advanced into the vitreous, humor for removal of the object.

(3) A nonmagnetic foreign body is removed by incision and extraction, but it must be seen to be removed.

1-15. PROCEDURES IN THE TREATMENT OF CATARACT

a. General. Cataract is a clouding or an opacity of the crystalline lens, its capsule, or of both. A cataract may result from local or systemic disease, from eye injury, or the cataract may be congenital. Cataracts seen in the elderly are referred to as primary or senile cataracts. Medical treatment of cataracts is not available. Only surgical removal of the lens is of any significant assistance and this is indicated when the patient's vision is sufficiently depressed.
b. Operative Procedures.

(1) Discussion, or needling of lens. The capsule is incised and the lens substance is broken up. The aqueous humor exerts a solvent action on the exposed lens tissue, thus a clear opening for the passage of light is obtained. The principal use for needling is in cases of cataract due to trauma and in cataract surgery performed on children.

(2) Iridectomy. A sector of the iris is removed as a preliminary step in extraction of the cataract (lens extraction).

(3) Lens extraction, intracapsular. The entire lens within the capsule is removed intact through a corneoscleral incision (see figure 1-4).

Figure 1-4. Intracapsular lens extraction.

(4) Lens extraction, extracapsular. The anterior capsule is cut, and the lens substance is delivered through the opening in the capsule. The posterior lens capsule
is left in place. Therefore, in extracapsular cataract extraction, the major portion of the lens is removed but some remnants of the lens tissue remain.

c. **Precautions After Surgery.** After surgery, the patient is usually kept at bed rest for a short period, then gradually allowed to ambulate, depending on postoperative conditions. All patients are generally cautioned not to stoop over, lift heavy objects, or strain themselves physically. This warning is maintained during the time when the wound is healing.

1-16. **PROCEDURES IN THE TREATMENT OF GLAUCOMA**

   a. **General.** In glaucoma, there is increased tension or pressure within the eye. Increased intraocular pressure may lead to hardening of the eyeball and blindness. Glaucoma may result from iritis or from trauma.

   b. **Operative Procedures.** The various operations used are aimed at reducing tension in the eye by improving intraocular drainage of fluid. The operation performed depends upon several factors, one being the status of the glaucoma (acute, subacute, or chronic).

      (1) **Iridotomy.** This is incision of the iris. The operation is done to create a communication between the anterior and posterior chambers and thus relieve the acute phase of the attack of glaucoma.

      (2) **Iridectomy.** This is excision of part of the iris. A sector of the iris is removed to increase drainage and relieve tension on the eye.

      (3) **Iridencleisis.** This is the formation of an artificial pupil. A fistula is created to provide an outlet for aqueous humor. The iris is incised through an incision at the corneoscleral junction. The free ends are brought out and covered with conjunctival flap.

      (4) **Trephine.** An opening is made by inserting a trephine through the cornea at the corneoscleral junction and cutting through the globe down to the posterior layer of corneoscleral tissue. The trephine is then removed and an iridectomy is performed. The surgeon may perform a trephine operation as the first surgical procedure in the treatment of glaucoma.

      (5) **Cyclodialysis.** A new drainage channel is constructed from the anterior chamber so that aqueous humor drains into the suprachoroidal space. This operation is often done as treatment for glaucoma following cataract extraction.

1-17. **PROCEDURES ON THE CORNEA**

   a. **Repair of Laceration.** A flap of the conjunctiva is used to seal off the tear.
b. **Removal of Foreign Body.** This is done very gently using aseptic technique to avoid secondary infection.

(1) Serious damage to the ocular structures often results from the careless or unskilled removal of foreign bodies from the eye.

(2) The foreign bodies which most commonly cause injury and irritation of the conjunctiva or cornea are dust particles from grinding wheels, cinders, street dirt, gravel, and grains of sand. Foreign bodies such as splinters of wood, metal, or glass which become embedded in or penetrate the eye often cause serious damage.

(3) A foreign body, which is lying on the cornea, is embedded in, or penetrates the eye, is always removed by a medical officer.

c. **Graft of Cornea.** Opaque corneal tissue is excised and healthy corneal tissue of the same size and shape is placed. The operation is done to restore vision by permitting light to enter the eye. An important factor in the success of this surgery is that the donor tissue absolutely be fresh. If opacity (the condition in which light cannot penetrate) has begun to develop in the graft tissue, the success of the operation is doubtful. Eye "banks," similar to other tissue "banks," provide for acquisition, preservation, and transportation of healthy corneal tissue to the hospital where the operation is to be done.

**Section II. EAR SURGERY**

1-18. **GENERAL ANATOMY AND PHYSIOLOGY OF THE EAR**

The ear (see figure 1-5) is made up of three distinct divisions: the external ear, the middle ear, and the inner ear. The middle and inner ear structures are situated in the temporal bone cavity.
a. **External Ear.** The external ear consists of an auricle, or pinna, and an external auditory meatus (a tube ending at the tympanic membrane or ear drum). The auricle collects the sound vibrations in the air and sends them through the external canal to the ear drum.

b. **Tympanic Membrane.** The tympanic membrane (see figure 1-6) is a tri-layered membrane stretched across the end of the external meatus. The sound waves come through the meatus and vibrate the membrane.

c. **Middle Ear.** Inside the tympanic membrane is a narrow, irregular, oblong, air-conditioned cavity in the tympanic part of the temporal bone. This air-filled space contains three small bones, which transfer the vibrations from the tympanic membrane to the inner ear. Figure 1-7 shows the ossicles of the middle ear.

d. **Inner Ear.** The inner ear is a complex structure located in the petrous portion of the temporal bone. It is made up of two distinct parts, each of which contains its own kind of fluid. Sound vibrations carried by the bones of the inner ear are transferred by way of the oval window to the fluid in the cochlea and received through a fine membrane by the organ of Corti, the delicate neural end organ for sound. A second function of the inner ear is the maintenance of balance, controlled by the movement of fluid in the labyrinth in relation to neuroepithelial cells.

e. **Temporal Bone.** The temporal bone houses the middle and inner ear as well as the mastoid sinuses.

![Figure 1-6. Landmarks of right tympanic membrane.](image-url)
1-19. EAR OPERATIONS

Ear operations are done on the canals, the middle and inner ears, and the mastoid sinuses (airspaces within the temporal bone). Surgery may be done to correct the effects of trauma or disease, or in an effort to correct hearing disorders.

1-20. PREP FOR EAR SURGERY

a. For operations involving the ear, preparation normally consists of washing the outer ear and surrounding skin with an anti-bacterial detergent and irrigating the canal with a mild antiseptic solution. The canal may also be cleaned with cotton applicators. The hair should be shampooed.

b. Depending upon the approach in surgery and local policy, a 2-inch strip may be shaved at an area of incision. This would also be true in mastoid operations. If hair is to be shaved from the patient's head, the specialist should check local policy regarding the disposition of the hair.

c. Positioning and draping.

(1) Quietness and immobility of the patient are most important in otological (ear) surgery. The head must be carefully immobilized by whatever method is prescribed for a particular procedure. The patient is to be placed on his back with his
head turned to the side, with the affected ear up. Great care must be taken in alignment of the patient, especially if the procedure is time consuming.

(2) In the presence of infection, disposable sheets and towels should be used. An opening can be readily made with scissors in the sterile sheet or towel to expose the operative site. A standard ear pack is used.

(3) Three towels are folded lengthwise and placed around the operative site. The first one is placed horizontally above the ear, the second towel is placed diagonally on the outer prepared skin area surrounding the ear, and the third vertically in front of the meatus. A folded fenestrated sheet is unfolded over the patient and table, with the operative site in view through the opening.

(4) The draped tables with sterile instruments and the operating microscope are positioned around the patient. For example, if the operation involves the left ear, the sterile instrument table is placed near the left side of the operating table. The scrub usually sits or stands near the instrument table and passes the instruments to the surgeon in such a manner that he does not have to turn away from the operative microscope.

(5) All safeguards should be taken to prevent explosive hazards. This is most important because there are many electrical appliances in use during otological surgery.

d. Anesthesia for ear surgery may be local or general depending upon the severity of the surgery to be performed and the age of the patient.

e. The dressing applied following surgery is usually one of two types. For internal canal work, an ear wick may be inserted. For surgery on the mastoid sinuses or any posterior approach, a large compression type dressing commonly referred to as a mastoid dressing is applied.

1-21. INSTRUMENTS AND SUPPLIES

Check the surgeon’s card carefully, and make sure that all instruments and equipment are assembled. The operating microscope, suctioning equipment, and drill are often required. All equipment must be in working order. Since the operating microscope is used in such close proximity to the surgical wound, it is draped with disposable microscope drapes before use. Electric cautery equipment is also sometimes needed.

1-22. INCISIONAL APPROACHES

a. The endaural (vertical) incision frequently is used for temporal operations, except for simple mastoidectomy. The first incision extends from the superior meatus
wall, and the second extends directly upward to a point between the meatus and the upper edge of the auricle, where the two incisions join.

b. The high posterior incision may be used in operations on infants or young children. The incision is placed at a higher posterior level than is the endaural incision, thereby avoiding possible damage to the facial nerve.

c. The postaural incision may be used to expose the mastoid process. It follows the curve of the postaural fold, beginning at the upper attachment of the auricle and continuing behind the postaural fold downward to the tip of the mastoid process.

d. For stapes surgery, a circumferential incision is made in the posterior half of the canal, starting at the inferior aspect of the annulus and ending posterior to the short process of the malleus.

e. For myringotomy, a circumferential (posteroinferior) incision is made. It provides for wide drainage and removal of pus or fluid under pressure from the middle ear.

1-23. MYRINGOTOMY

a. **General.** Myringotomy is an incision through the tympanic membrane. This may be done when an inner ear infection produces pus that is causing undue pressure on the membrane. It may also be done to correct hearing loss due to fluids in the middle ear.

b. **Preparation of the Operating Room.** Sterile instruments are set up in accordance with local policy and the surgeon's preference. Non-instrument items in the setup include cotton-tipped applicators, cotton (for plugging the canal after surgery), and culture tubes.

c. **Operative Procedure.**

(1) Through microscopic visualization, the aural speculum is inserted in the canal. Using a sharp myringotomy knife, a small curved incision is made in the posteroinferior quadrant or the pars tensa, and the thickened membrane is cut.

(2) A culture is taken to determine the type of organisms present.

(3) Pus and fluids are suctioned out.

(4) A plastic tympanotomy tube prosthesis is usually put into place.
1-24. RADICAL MASTOIDECTOMY

a. General. Radical mastoidectomy involves the removal of the mastoid air cells, the tympanic membrane, the involved malleus, incus, chorda tympani, and mucoperiosteal lining which converts the middle ear and the mastoid into one cavity. This procedure may be used to treat a chronic otitis media (inflammation or infection of the middle ear) that has spread into the mastoid air cells, and when skin from the external auditory canal has grown into the middle ear (cholesteatoma) where it acts as a foreign body. Radical mastoidectomy may also be done to provide adequate exposure in the treatment of facial nerve decompression to drain an extradural abscess in the bony labyrinth.

b. Preparation of Operating Room. This requires an extensive setup of instruments and other sterile items. These are set up in the appropriate sizes and numbers, as prescribed locally.

c. Operative Procedure.

(1) An endaural or postural incision is made using a Bard-Parker knife. Bleeding vessels are clamped and ligated. With a second knife, the periosteum (connective tissue over bone) is incised and freed to form a flap. The wound is retracted with a self-retaining retractor.

(2) The meatus flap is cut, exposing the mastoid area by means of a circumferential knife, narrow periosteal elevator, and curved scissors.

(3) The mastoid antrum is exposed. By means of round cutting burrs attached to an electric drill, the bone of the outer cortex is removed. The osseous metal walls are removed with rongeurs or burrs. The wound is irrigated and suctioned. Cotton pledgets are used for sponging the operative site.

(4) The thin bridge of bone between the meatus and antrum is removed with angular dissectors and fine curettes.

(5) The tympanic membrane, malleus, incus, and mucoperiosteal lining of the middle ear cavity are excised by means of stapes instruments, as for a stapes operation.

(6) The tympanic cavity is cleaned. The wound is closed with sutures. A musculo-plasty may be done by taking a strip of temporalis muscle from above the ear and placing it in the mastoid cavity. In time, the skin grows over the muscle.

(7) The mastoid cavity is usually packed with a strip of 1/2 x 8 inch gauze packing that has been impregnated with petrolatum or an antibiotic ointment. The wound is closed.
The ear dressing is applied, including a shaped ear pad. Fluffed 4 x 8 inch gauze sponges are placed around and behind the affected ear and then flat compresses over the affected ear. A gauze bandage is applied in a particular manner to hold the dressings in place and avoid pressure.

1-25. SIMPLE MASTOIDECTOMY

a. General. Simple mastoidectomy involves the removal of the air cells of the mastoid process without disturbing the contents of the middle ear. It may be done occasionally to treat acute empyema (accumulation of pus) of the mastoid, but has been made almost obsolete by antibiotics.

b. Operative Procedure. A postural or endaural incision is made. Perform procedures for a radical mastoidectomy as stated in paragraphs 1-24c(1), (2), (3), and (6).

NOTE: A modified radical mastoidectomy may also be done in which the middle ear is not involved, but in which the thin bridge of bone between the external canal wall and antrum is removed.

1-26. TYMPANOPLASTY OPERATIONS

Tympanoplasty involves a large variety of reconstructive operations of the middle ear designed to restore or improve hearing in patients with middle ear or conductive-type hearing loss. In various operations of this type, tissue grafts of different kinds are often used.

Section III. NOSE SURGERY

1-27. OPERATIONS ON THE NOSE

Operations on or through the nose (see figure 1-8) may be required to correct results of trauma to the nose and related structures; to correct deformities that interfere with breathing, such as deviated nasal septum, hypertrophy of the turbinates, and polyps or other neoplasms; and to relieve the effects of sinusitis.

1-28. ANATOMY AND PHYSIOLOGY OF THE NOSE

The nose is divided into the prominent external nose and the internal nose known as the nasal cavity. The chief purpose of the nose is the preparation of air for use in the lungs.
Figure 1-8. Nasal skeletal framework.

a. External Nose.

(1) The external nose projects from the face. The upper portion of the nose is formed by the nasal bones and the frontal process of the maxillae. The lower portion is formed by a group of nasal cartilages and connective tissue covered with skin. The nostrils and the tip of the nose are shaped by the major alar cartilages. The nares are separated by the columella, which is formed by the lower margin of the septal cartilage, the medial parts of the major alar cartilages and the anterior nasal spine, all of which are covered by skin.

(2) The nasal septum is composed of three structures: the nasal cartilage, the vomer bone, and the perpendicular plate of the ethmoid bone. The septum is covered by mucous membrane on either side. The deviated or fractured septum may be repaired surgically by mobilization of the fracture or removal of the deformed cartilage or bone.

b. Internal Nose.

(1) The internal nose or nasal cavity is divided into two parts at its midline by the nasal septum. The nasal cavity communicates with the outside by its external openings, called the anterior nares. The nares open into the nasopharynx behind through the choanae. The nasal cavity is also associated with each ear by means of the eustachian tube and with the paranasal air sinuses (see figure 1-9) (frontal, maxillary, ethmoid, and sphenoid) via their respective orifices (meatuses). The nasal cavity communicates with the conjunctive through the nasolacrimal duct as well.
Figure 1-9. The paranasal sinuses (lateral and anterior aspects).

(2) The nasal cavity is separated from the lingual cavity by the hard and soft palates and from the cranial cavity by the ethmoid bone. The nasal cavity is held together by periosteal covering and by perichondrium, which extends over the cartilages.

c. Turbinate Bones and Sinuses.

(1) The turbinate bones of the nasal structure are arranged one above the other, separated by grooves (the meatuses). These act as drainage passages of the accessory sinuses and are known as the sphenoethmoidal recess and the superior, middle, and inferior meatus, respectively.

(2) The nasal sinuses serve as air spaces and communicate with the nasal cavity via the meatuses. Anteriorly, on each side of the skull, the frontal sinus, the anterior ethmoid cells, and the maxillary sinus (antrum of Highmore) drain into the middle meatus; posteriorly, the ethmoid cells and the sphenoid sinus drain into the superior meatus and the sphenoethmoidal recess. A passageway for the flow of air is provided by the irregular air spaces present between these structures. Because of their shape, the air is forced to flow in thin airwaves.

d. Nerve and Blood Supplies.

(1) The sensory nerve supply of the nasal cavity is derived from the trigeminal nerve.

(2) The nose and sinuses receive their blood supply from branches of the internal maxillary artery. There are masses of communicating veins below the epithelial
layer of the turbinated bones, and those veins lying just beneath the mucosa
anastomose (communicate) freely. Dilatation of the superficial veins may cause the
turbinated bone mucosa to swell, whereas contraction of these vessels may cause the
mucosa to shrink.

1-29. PREP, POSITION, DRAPE, ANESTHESIA, AND LIGHTING

All procedures performed prior to the start of surgery must be explained to the
patient to avoid fright and apprehension.

a. The male patient shaves his face prior to surgery. The immediate
preoperative prep may include clipping the hairs within the nostrils using small tenotomy
scissors. The specialist is to coat the blades of the scissors with a film of vaseline so
that the patient will not aspirate the nasal hairs. The patient's face is then washed with
antibacterial detergent and sponged dry. His eyes should be protected during this
procedure with damp gauze compresses. No solution is applied inside the nose.

b. The patient is placed in either the supine position or the reclining position.
For procedures done using local anesthesia, the reclining position enables the patient to
expectorate any fluid collecting in his mouth and thus helps keep the operative area free
from drainage.

c. A large drape sheet is placed lengthwise over the front of the patient and is
secured bib-fashion. Suction tubing is pinned to the sheet. Sterile towels may be
wrapped around the patient's head and secured with towel forceps, leaving his face
exposed but his eyes covered. Another method of draping the head is to cover it with a
small fenestrated sheet through which the nose and mouth are exposed.

d. Local anesthesia is usually employed for nasal surgical procedures on adults.
The method of administration is a combination of topical (nasal packs) and infiltration
anesthesia. The specialist assists the surgeon as necessary in packing the nose. Use
of local anesthesia enables the patient to cooperate with the surgeon and avoids the
complication of vomiting.

e. Illumination is provided by either of two methods: the electric head lamp or
the overhead light. The two devices are sometimes used in conjunction.

1-30. SEPTECTOMY, OR SUBMUCOUS RESECTION

a. General. Septectomy, or submucous resection (SMR) deviations of the nasal
septum may result from faulty development of the septum or from injury to the nose.
The patient's symptoms include inadequate or difficult nasal breathing or obstruction of
nasal drainage. Septal deviations tend to cause sinus disease and the formation of polyps.
The operation consists of removing the bent parts of the nasal septum that lie between
the flaps of mucus membrane to establish a straight partition.
b. **Preparation of the Operating Room.**

(1) The setup of sterile instruments and other equipment is done as prescribed locally. Gauze packing is included for use as a pressure dressing.

(2) The room is darkened before the patient arrives. The surgeon usually uses an electrical head lamp that will focus a beam into the nostrils. The circulator is to connect and carefully check all special lighting equipment prior to the start of the procedure.

(3) This operation is generally done with the patient under local and/or topical anesthesia. Before the patient arrives, the operating table is made into a reclining chair by use of a foot-piece and pillows placed for protection of feet from pressure and relief of strain on vessels and tendons of the lower extremities. The reclining chair is adjusted to meet the physical characteristics and comfort of the patient. The table is raised or lowered to accommodate the surgeon.

c. **Preparation of the Patient.**

(1) In some cases, the hair of the nostrils may be clipped with fine, curved scissors. Sterile mineral oil drops or an antibiotic ointment may be put in the eyes of the patient to protect them from prepping solutions. The face is scrubbed with a mild soap and water. The face prep and draping of the patient is done prior to anesthetizing. The circulating nurse should observe changes in the vital signs of the patient. When cocaine or some similar narcotic agent is used, a thiopental (Pentothal®) sodium setup and oxygen equipment should be in the room. **Topical medications that have changed color should not be used.** The amount of the topical agent dispensed for the operation must be recorded on the anesthesia record and on the pharmacy’s narcotic form.

(2) The patient is draped with sterile towels and sheets as follows:

(a) Place the small sheet with two towels on top of it over the head of the table and under the head of the patient.

(b) Bring the uppermost towel around the head, including the hairline.

(c) Secure the ends of the uppermost towel with a towel forceps and tuck the free ends under the patient’s head.

(d) Drape a large sheet over the patient, bringing its upper end up to the chin.

(e) Place the tray with the instruments in position for the surgeon.

(f) Adjust the lighting system.
(g) Record the vital signs of the patient.

(h) Reassure the patient if awake.

d. **Operative Procedure.** The operative procedure will vary with the individual surgeon. A general review of most procedures is as follows:

(1) The nostril is opened with a speculum. An incision is made through the mucoperichondrium and mucoperiosteum of the septum with a knife, blade number 15. The tissues are separated and elevated, using a Freer knife.

(2) The cartilage is incised with a knife, and the mucous membrane is elevated with a septal elevator; part of the septal cartilage is excised with a Ballenger knife; deviated cartilage and bony, thickened structures are removed with a septum punch and a nasal cutting forceps.

(3) The mucous membrane is freed from the bony septal base by means of a chisel, gouge and mallet, or punch forceps. Bleeding is controlled by cotton sponges; suctioning is used to expose the field.

(4) The perpendicular plate of the ethmoid may be removed, as well as the vomer, by means of the S-retractor, chisel and mallet, and a suitable septum-cutting forceps.

(5) The incision may or may not be sutured with silk #3-0 fused to a small 1/2-circle taper-point needle on a Crile needle holder.

(6) Nostrils are packed with petrolatum gauze in order to keep the septal flaps in a midline position. The face is cleansed with both moist and dry compresses.

e. **Specimens.** Excised tissue is processed as a specimen.

**OTHER NASAL OPERATIONS**

The specialist assigned to scrub or circulate for the operations duties are similar to those described for submucous resection. The specialist is to check local policy carefully concerning instruments, sutures, and other items in the setup for the operation to be performed.

a. **Excision of Nasal Polyps.** Polyps are soft, benign tumors of the nasal mucosa caused by chronic nasal allergy (see figure 1-10).
Figure 1-10. Nasal polyps.

(1) **Operation.** Polyps that arise from the border of the middle turbinate may be removed by means of a submucous resection setup, using a nasal snare. Polyps that arise above this level may involve a sinus cavity, thus necessitating surgery of the sinus. In this event, the instruments and other setup are determined by the specific sinus cavity involved.

(2) **Indications.** The pressure exerted by nasal polyps results in obstruction to the passage of air through the nostrils. The obstruction may lead to a condition of chronic infection of the nose and give rise to frequent attacks of nasopharyngitis. The infection may extend also into the nasal sinuses, thus obstructing drainage from the affected sinus. The patient suffers pain in the region of the sinus involved. Treatment of the condition is excision of the polyps.

b. **Turbinectomy.** Turbinectomy is the surgical removal of hypertrophied portion of a turbinate bone.

(1) Hypertrophy of the turbinate prevents adequate breathing and drainage through the nose and produces painful pressure against the floor of the nose. Treatment is the removal of the hypertrophied turbinate.

(2) Excision of the hypertrophied portion of the turbinate is done using a setup as described for removal of nasal polyps.
c. **Intranasal Antrostomy (Antral window).**

   (1) **General.** This procedure involves making an opening in the lateral wall of the nose under the inferior turbinate. It is done to relieve headaches, edema, infection, or swelling of the membranes lining the sinuses.

   (2) **Operative procedure.** After prep and anesthesia, a postnasal plug is inserted. The inferior turbinate is elevated superiorly by means of a large elevator or tonsil dissector. An opening is made into the maxillary sinus beneath the inferior turbinate by means of a gouge, perforator, or antrum cannulae. The opening is enlarged with cutting forceps and antrum punches. Accessory polyps and degenerate mucosa are removed with a snare, septum forceps, and suction. The sinus is irrigated with saline solution by means of a Thornwald irrigator and suction apparatus; the sinus is packed with petrolatum impregnated iodoform gauze, and the face is cleaned and dried.

d. **Radical Antrostomy (Caldwell-Luc Operation).**

   (1) **General.** This procedure involves an incision into the canine fossa of the upper jaw and exposure of the antrum for removal of bony diseased portions of the antral wall and contents of the sinus, or establishment of drainage by means of a counteropening into the nose through the inferior meatus.

   (2) **Operative procedure.**

      (a) The upper lip is elevated with a retractor, and a transverse incision is made in the gingivolabial sulcus just above the teeth; the incision is carried down to the underlying bone. Periosteum and soft tissue are elevated with dissectors and periosteal elevators.

      (b) The thin bony plate is perforated with a gouge, the antrum is entered, and its opening is enlarged with nasal rongeurs. The anterior angle of the sinus may be opened by enlarging the window with Jansen-Middleton septum-cutting forceps, double-action rongeurs, and Kerrison forceps.

      (c) The mucous membrane of the antrum is removed with Coakley or Myles angled currettes.

      (d) Nasoantral drainage may be established by removal of a portion of the nasoantral wall below the inferior turbinate by means of cutting forceps and rasps.

      (e) The antrum is packed with petrolatum gauze.

      (f) The labial incision may or may not be sutured. The face of the patient is cleaned and dried.
e. **Frontal Sinus Operation.**

(1) **General.** This procedure involves making an incision through the eyebrow of the affected side and through the anterior wall and floor of the frontal sinus for removal of the diseased tissue, cleansing of the sinus cavity, and drainage. It may be made necessary in acute frontal sinusitis with persistent headaches and edema of the upper lid when other modes of therapy have failed.

(2) **Operative procedure.**

(a) An incision is made over the affected frontal sinus, extending from the base of the nose through the eyebrow as far as the supraorbital notch. A self-retaining retractor, hook retractor, knife, sponges, fine hemostats, fine ligatures, and suction set are needed.

(b) Either the anterior wall of the frontal sinus or the floor of the sinus is opened by means of dental burrs, chisel, mallet, gouges, septum-cutting forceps, curettes, and nasal forceps. Drainage is established by either the nasofrontal duct or the insertion of drains.

(c) An ethmoidal incision is made behind the nasal process of the superior maxillary bone with a chisel and mallet. The lacrimal duct is identified and preserved. Ethmoid cells are curetted.

(d) A Penrose drain is introduced; the external wound is approximated with fine silk sutures and dressing applied. The patient’s face is cleaned and dried.

f. **Ethmoidectomy.**

(1) **General.** This is for removal of the diseased portion of the middle turbinate, opening and removal of ethmoid cells, and removal of diseased tissue in the nasal fossa through a nasal approach or external approach. It reduces the many celled ethmoid labyrinth into one large cavity to ensure adequate drainage and aeration.

(2) **Operative procedure.** For the nasal route, the procedure is similar to intranasal antrostomy described previously. For the external route, the procedure is similar to the frontal sinus operation.

g. **Sphenoidectomy.**

(1) **General.** This involves making an opening into one or both of the sphenoid sinuses by the intranasal or external ethmoidectomy approach. It is difficult to visualize the cavity of the sphenoid sinus because of its depth. Surgery of the sphenoid sinus is usually done intranasally or through an external ethmoidectomy approach.

(2) **Operative procedure.** This is the same as for intranasal antrostomy.
h. Fracture of the Nose.

(1) General. This procedure involves the manipulation and mobilization of fractured nasal bones and cartilages. Early reduction is important.

(2) Operative procedure. A rubber-covered narrow forceps is inserted into the nostril; the nasal bones are elevated and molded into place by external manipulation.

Section IV. THROAT, TONGUE, AND NECK SURGERY

1-32. THROAT OPERATIONS

Surgery of the throat (see figure 1-11) may be done to halt or correct the effects of trauma or disease, including neoplasm. Structures included in throat surgery are the pharynx, larynx, trachea, tongue, palate, tonsils, and adenoids.

Figure 1-11. Sagittal section of the face and neck.
1-33. ANATOMY AND PHYSIOLOGY OF THE THROAT AND NECK

The word throat refers to those structures of the neck in front of the vertebral column, including the mouth, tongue, pharynx, tonsils, larynx, and trachea.

a. **The Mouth.** The mouth extends from the lips to the anterior pillars of the fauces. The portion of the mouth outside the teeth is known as the buccal cavity and that on the inner side of the teeth as the lingual cavity. The tongue occupies a large portion of the floor of the mouth. The hard and soft palates form the upper and posterior boundaries of the oral cavity, separating it from the nasal cavity and the nasopharynx. The soft palate emerges from the posterior border of the hard palate to form the uvula, a fingerlike movable projection. On either side, the uvula is adjacent to the base of the tongue anteriorly and the pharynx posteriorly.

b. **The Pharynx.**

(1) The pharynx serves as a channel for both the digestive and respiratory systems. It is situated behind the nasal cavities, mouth, and larynx. The food and air passages cross each other in the pharynx. The pharynx is a funnel-shaped structure, wide above and narrower below, about 12 cm in length. It is composed of muscular and fibrous layers and lined with mucous membrane. It is associated above with the sphenoid and the basilar part of the occipital bone. Below, it joins the esophagus. Seven cavities communicate with the pharynx: the two nasal cavities, the two tympanic cavities, the mouth, the larynx, and esophagus. The cavity of the pharynx may be subdivided from above downward into three parts: nasal, oral, and laryngeal. Infection may spread from the pharynx to the middle ear via the auditory tube. This auditory tube can be catheterized through the nostril.

(2) The nasopharynx communicates with the oropharynx through the pharyngeal isthmus, which is closed by muscular action during swallowing. The oropharynx and the laryngopharynx cannot be closed by muscular action during swallowing. The oropharynx and the laryngopharynx cannot be closed off from each other; both service respiratory and digestive functions.

(3) The pharynx is made up of three groups of constrictor muscles. Each muscle fits within the one below, and each inserts posteriorly in the median line with its mate from the opposite side. The constrictor muscles provide constriction of the pharynx for dilatation. Between the origins of the constrictor muscle groups, there are so-called intervals through which pass ligaments, nerves, and arteries. The recurrent laryngeal nerve is closely associated with the lower portion of the pharynx.

c. **The Tonsils.**

(1) The tonsils are situated one on each side of the oropharynx, lodged in a tonsillar fossa that is attached to folds of membrane containing muscle. One pair, the palatine tonsils, is the only lymphatic organ covered with stratified squamous epithelium.
The lateral surface of each tonsil is usually covered with a fibrous capsule. The anterior and posterior tonsillar pillars join to form a triangular fossa, with the posterior lateral aspects of the tongue at its base. The so-called palatine tonsils are lodged in each fossa. The adenoids (pharyngeal tonsil) are suspended from the roof of the nasopharynx and consist of an accumulation of lymphoid tissue.

(2) The arteries of the tonsils enter the upper and lower poles. The tonsils are supplied with blood primarily by the tonsillar branch and the ascending palatine branch of the facial artery (branches of the external carotid artery). The external carotid artery on each side lies behind and lateral to each tonsil. The nerves supplying the tonsils are derived from the middle and posterior palatine branches of the maxillary and glossopharyngeal nerves.

d. The Larynx and Associated Structures.

(1) The larynx.

(a) The larynx is located at the upper end of the respiratory tract and is situated between the trachea and the root of the tongue, at the upper front part of the neck. The larynx has three main functions: a passageway for air, a valve for closing off air passages from the digestive system, and the pharynx, and a voice box on which sound and speech depend on to a degree.

(b) The larynx is a cartilaginous box, situated in front of the fourth, fifth, and sixth cervical vertebrae. The upper portion of the larynx is continuous with the pharynx above, and its lower portion joins the trachea. The skeletal structure provides for patency of the enclosed airway. The complex muscle action and arrangement of tissues within the structure provide for closure of the lumen for protection against trauma and entrance of foreign bodies and for phonation.

(2) Cartilages. The skeletal framework of the larynx consists of cartilages and membranes. There are nine separate cartilages-- three of them single and six arranged in pairs. The main cartilages of the larynx include the thyroid, cricoid, epiglottis, two arytenoid, two corniculate, and two cuneiform. The thyroid cartilage (Adam’s apple) forms the anterior portion of the voice box. The cricoid cartilage, which resembles a signet ring, rests beneath the thyroid cartilage and within the laryngotracheal space. The epiglottis is a slightly curled, leaf-shaped, elastic fibrous membrane. It is prolonged below into a slender process, attached in the midline to the upper border of the thyroid cartilage. When the cricothyroid muscle contracts, it pulls the thyroid cartilage and the cricoid cartilage, thereby tightening the vocal cords and, if unopposed, closing the glottis. The arytenoid cartilages, which rest above the signet ring portion of the cricoid cartilage, support the posterior portion of the true vocal cords.
(3) **Laryngeal ligaments.**

(a) The extrinsic ligaments of the larynx are those connecting the thyroid cartilage and epiglottis with the hyoid bone and the cricoid cartilage with the trachea. The intrinsic ligaments of the larynx are those connecting several cartilages of the organ to each other. They are considered the elastic membrane of the larynx.

(b) The mucous lining of the larynx blends with the fibrous tissue to form two folds on each side of the larynx. The upper set are known as the false cords. The lower set are called the true vocal cords because they are primarily concerned with the speaking voice and protection of the lower respiratory channels against the invasion of food and foreign bodies.

(4) **Laryngeal muscles.**

(a) The laryngeal muscles perform two distinct functions. There are muscles (extrinsic type) that open and close the glottis and those (intrinsic type) that regulate the degree of tension of the vocal cords.

(b) It should be noted that the spoken voice also depends on the sphincter action of the soft palate, tongue, and lips. The muscle action of the larynx permits the glottis to close either voluntarily or involuntarily by reflex action. The closure of the inlet by this mechanism protects the respiratory passages. The closure of the glottis and the action of the vocal cords are precisely coordinated to produce the spoken voice.

(c) Two branches of the vagus nerve supply the intrinsic muscles. The recurrent laryngeal nerve branch of the vagus nerve is the important motor nerve of the intrinsic muscles of the larynx. The sensory nerve, which is derived from the branches of the superior laryngeal nerve, supplies the mucous membrane of the larynx.

(d) When both the recurrent laryngeal nerves become divided or paralyzed, the glottis remains closed so tightly that air cannot be drawn into the lungs. As a lifesaving measure, an endotracheal or tracheostomy tube is inserted immediately.

(e) The larynx derives its blood supply from the branches of the external carotid and subclavian arteries.

e. **Trachea.** The trachea, a cylindrical tube about 15 cm in length and from 2 to 2.5 cm in diameter, begins in the neck and extends from the lower part of the larynx, on a level with the sixth cervical vertebra, to the upper border of the fifth thoracic vertebra. The tube descends in front of the esophagus, enters the superior mediastinum, and divides into right and left main bronchi. The trachea is composed of a series of incomplete rings of hyaline cartilage. The carina is a ridge on the inside at the bifurcation of the trachea. It is a landmark during bronchoscopy and separates the upper end of the right main branches from the upper end of the left main branches of
the bronchi. Branches given off from the arch of the aorta—the brachiocephalic (innominate) and left common carotid arteries—are in close relation to the trachea. The cervical portion of the trachea is related anteriorly to the sternohyoid and sternothyroid muscles and to the isthmus of the thyroid gland.

f. **Salivary Glands.**

1. The salivary glands consist of three paired glands: the sublingual, submaxillary, and parotid. They communicate with the mouth and pour their secretions into its cavities. The combined secretion of all these glands is termed saliva. The salivary glands consist of tissue found in the mucosa of the cheek, tongue, palate, floor of the mouth, pharynx, lip and paranasal sinuses. A tumor of a salivary gland may occur in any of these structures.

2. The external carotid artery supplies the salivary glands and divides into its terminal branches: the internal maxillary and superficial temporal. The superficial temporal and internal maxillary veins unite to form the posterior facial vein.

3. The sublingual gland lies on the undersurface of the tongue beneath the mucous membrane of the floor of the mouth at the side of the frenulum linguae, in communication with the sublingual depression on the inner surface of the mandible. It is supplied with blood from the submental arteries. Its nerves are derived from the sympathetic nerves. The many tiny ducts of each gland separately enter into the oral cavity on the sublingual fold.

4. The submandibular gland lies partly above and partly below the posterior half of the base of the mandible and on the mylohyoid and hyoglossus muscles. This gland is closely associated with the lingual veins and the lingual and hypoglossal nerves. The external maxillary artery lies on the posterior border of the gland. Its duct (Wharton’s duct) enters the mouth at the frenulum of the tongue.

5. The parotid gland, the largest of the salivary glands, lies below the zygomatic arch in front of the mastoid process and behind the ramus of the mandible. This gland is enclosed in fascia, attached to surrounding muscles, and divided into two parts—a superficial and a deep portion—by means of the facial nerve. The parotid duct (Stensen’s duct) pierces the buccal pad of fat and the buccinator muscle, finally opening into the oral cavity opposite the crown of the upper second molar tooth. The superficial temporal artery and small branches of the external carotid arise in the parotid gland behind the neck of the mandible.

g. **General Structures of the Neck.**

1. The general topography of the organs lying in front of the prevertebral facial has been described. A layer of deep cervical fascia surrounds the neck like a collar and is attached to the trapezius and sternocleidomastoideus (sternocleidomastoid) muscles. In front of the neck, the deep fascial layer is attached to the lower border of the mandible.
(2) The pretracheal fascia of the neck lies deep in the strap muscles (sterno-thyroid, sternohyoid, and omohyoid) and partially encloses the thyroid gland, trachea, and larynx. The pretracheal fascia is pierced by the thyroid vessels. It fuses with the front of the carotid sheath on the deep surface of the sternocleido-mastoid. The carotid sheath consists of a network of areolar tissue surrounding the carotid arteries and vagus nerve.

(3) Laterally, the carotid sheath is fused with the fascia on the deep surface of the sternocleidomastoideus; anteriorly, it is fused with the middle cervical fascia along the lateral border of the sternothyroideus muscle. Lying between the floor and roof of this triangular formation of muscles are the lymph glands and the accessory nerve. Arteries and nerves traverse and pierce this triangle.

h. **Lymphatic System of the Neck.** The lymph glands of the neck are closely associated with the salivary glands and the lymph plexus. The submaxillary nodes, located in the submaxillary triangle, drain the cheek, side of the nose, upper lip, side of the lower lip, gums, side of the tongue, and medial palpebral commissure. Lymph from the facial and submental nodes also drains to these glands. The superficial cervical nodes, following the external jugular vein, drain the ear and parotid area to the superior deep cervical nodes. The cervical nodes are in close contact with the larynx, thyroid gland, nasal cavities, ear, nasopharynx, palate, esophagus, and skin and muscles of the neck.

1-34. **PREP, POSITION, DRAPE, AND ANESTHESIA**

a. The face is prepped with an antibacterial detergent, as for surgery of the nose. The inside of the mouth is not prepped. When the approach is through the lower throat, the area from the jaw line to the upper clavicle is prepped.

b. The supine position is usually employed during surgery of the throat. If a local anesthetic is used for an adult tonsillectomy, the patient is placed in a sitting position.

c. The patient's head is covered with sterile towels and he is draped with a sheet as for nasal surgery.

d. For surgical procedures other than an adult tonsillectomy, a general anesthetic may be used. A local anesthetic is given to the adult for tonsil surgery unless that patient is allergic to the drug. To administer the local anesthetic, special tonsil needles are used. They are longer than the normal needles used for local infiltration and have a ridge which prevents their being inserted too deeply.

1-35. **LARYNGOSCOPY**

a. **General.** This procedure is a mode of direct visual examination of the interior of the larynx by means of an electric-lighted speculum known as a laryngoscope, in
order to obtain a specimen of tissue or secretions for pathological examination or to instill a drug. Both psychological and drug preparation are needed in order to have the patient relaxed. An oral sedative is given the night before and again about an hour before the examination.

b. **Setup.** Check the surgeon’s card for the exact equipment required. It will also be necessary to find out the type of anesthetic needed. Very small infants will probably not need an anesthetic; children and adults who cannot relax are given a general anesthetic; adults who are well prepared do very well with the application of a topical anesthetic of lidocaine (Xylocaine®), tetracaine (Pontocaine®) or cocaine.

c. **Preparation of the Patient.** The patient is placed in a supine position, and an assistant holds the patient’s head in the proper position for good visualization of the vocal cords.

d. **Operative Procedure.**

(1) The spatula end of the laryngoscope is introduced into the right side of the patient’s mouth and directed toward the midline; then the dorsum of the tongue is elevated, exposing the epiglottis.

(2) The patient’s head is first tipped backward and then elevated and lifted upward as the laryngoscope is advanced into the larynx.

(3) The larynx is examined, a biopsy is taken, secretions are aspirated, and bleeding controlled.

(4) The patient’s face is cleansed. The patient is reassured and taken to his room or the recovery room.

1-36. **TONSILLECTOMY AND ADENOIDECTOMY**

a. **General.** Tonsils and adenoids that are hypertrophied or chronically infected are removed, which is called a tonsillectomy and adenoidectomy (T&A). Acute bacterial infections can attack a ring of lymphoid tissue encompassing the tonsil and adenoid tissue. Pain, malaise, anorexia, and increased temperature are typical symptoms.

b. **Preparation of the Operating Room.**

(1) The instruments in the setup include those needed for either sharp or blunt dissection, according to the method preferred by the surgeon.

(2) The number of tonsil sponges, with cords attached for applying pressure to the tonsil fossa, is included.
The lighting of the room is provided for in accordance with the desire of the surgeon. The circulator is to carefully check all details of lighting.

Tonsil snare wires must be prepared correctly. The loop in the snare wire must be large enough to pass over the handle of the tenaculum, but it must not be so large that its size prevents cutting through the pedicle of the tonsil. The scrub is to prepare the snares in accordance with local policy.

The mouth gag used must be of a correct size (not too large) to avoid inflicting injury to the patient's gums and lips and to avoid the danger of dislodging or breaking any teeth.

Special straight or curved needles with a security stop are used for the injection of the local anesthetic agent.

Sponges are normally handed on a curved hemostat.

Suction cautery is used for control of bleeding.

c. **Preparation of the Patient.**

If a general anesthetic is to be administered, the patient is anesthetized first, then placed in a slight Trendelenburg position. The neck is hyperextended by placing a roll under the shoulders. If a local anesthetic is to be administered, the patient is placed in a sitting position.

The patient's face may be cleaned with a germicide. The patient is draped as follows:

(a) An opened sheet and two opened towels are placed under the head of the patient.

(b) The uppermost towel is wrapped around the head and secured by forceps, and the free ends of the towel are tucked under the head.

(c) A second sheet is placed over the patient.

d. **Operative Procedure.**

When a general anesthetic is used, the mouth is retracted open with a self-retaining retractor, the tongue depressed with a blade retractor, and an anesthesia tube placed in the corner of the mouth. An efficient suction apparatus is most important. The tonsil suction tube is introduced gently and passed along the floor of the mouth, over the base of the tongue, and into the pharynx. During the procedure, the suctioning ensures adequate exposure of the operative site and prevents blood reaching the lungs.
(2) The tonsil is grasped with a pair of tonsil-grasping forceps and the mucous membrane of the anterior pillar incised with a knife; the tonsil lobe is freed from its attachments to the pillars with a tonsil dissector, curved scissors, and gauze sponges on a holder. The tonsil is withdrawn with forceps.

(3) The posterior pillar is cut with scissors, and the tonsil is removed with a snare. In some cases, the LaForce or Sluder tonsil guillotine clamp may be used.

(4) A tonsil sponge is placed in the fossa by a hemostat.

(5) Bleeding vessels are clamped with tonsil forceps, tied with slipknot ligatures of absorbable suture and the free ligature ends are cut.

(6) The adenoids are removed with an adenotome or curette. Bleeding is controlled by pressure with sponges.

(7) The fossa is carefully inspected, and any bleeding vessels are clamped and tied. Retractors are removed, the face of the patient is cleaned, and his head is turned to one side. The patient is kept in the semirecumbent (Fowler) position or on his side horizontally, to avoid aspiration of blood and venous engorgement.

e. Handling of Specimens. Tissue excised is processed for examination by the laboratory.

f. Suturing Types Usually Used.

(1) Absorbable suture of size specified by the surgeon--used for free ligatures.

(2) Absorbable suture, of size specified by the surgeon, affixed on tonsil needle--used for suture-ligature.

1-37. SURGERY OF THE ORAL CAVITY

a. General. This procedure consists of the excision of benign or malignant lesions of the tongue, floor of the mouth, alveolar ridge, buccal mucosa, or tonsillar area. Benign or small malignant tumors of the oral cavity may be excised without neck dissection. In the presence of tongue cancer without evidence of metastasis, a "prophylactic" neck dissection may be performed in an effort to control a cancerous growth in the upper jugular chain of the neck. When treating a typical carcinoma of the floor of the mouth with involvement of the mandible, a portion of the tongue and the mandible are removed. When there is a lesion of the tonsil or an extensive lesion at the base of the tongue with pharyngeal wall involvement, a resection of the ascending ramus of the mandible is necessary, and portions of the base of the tongue, pharyngeal wall, and the soft palate are removed to secure an adequate margin of normal tissue about the lesion.
b. **Patient Preparation.** The patient is placed in dorsal recumbent position with shoulders elevated. Generally, endotracheal anesthesia is used, and a pharyngeal pack of moist gauze is inserted in the mouth.

c. **Operative Procedure.** Although the case may be scheduled as a local excision, frequently lesions of the oral cavity require more extensive excision than planned preoperatively. The setup should be designed to include the instruments for a neck dissection, or to have them available. In most tumors of the oral cavity, a tracheostomy is performed to assure an airway postoperatively.

1-38. **ELECTIVE TRACHEOSTOMY**

a. **General.** This procedure involves opening the trachea and inserting a cannula through a midline incision in the neck, below the cricoid cartilage. It is used as an emergency procedure to treat upper respiratory tract obstruction and as a prophylactic measure in the presence of chronic lung disease in which an obstruction could occur. A prophylactic tracheostomy is performed at the time of surgery, thus providing for easy and frequent aspiration of the tracheobronchial tree and diminishing the dead space that exists from the opening of the mouth down to the supraclavicular region. The creation of a new clearance (tracheostomy) nearer to the functional areas in the lung provides for greater volume of air for the patient with a partly destroyed lung. Anesthesia may be maintained via a prophylactic tracheostomy.

b. **Preparation of the Operating Room.** The standard instruments and other items needed are kept sterile in a pack, ready for immediate use. In addition, the circulator is to have a cardiac arrest tray immediately available.

c. **Preparation of the Patient.** The patient is placed in a dorsal recumbent position, with the shoulders raised by a folded sheet to hyperextend the neck and head. The neck is cleansed and sterile drapes applied as for operations of the thyroid.

d. **Operative Procedure.**

(1) A vertical or transverse incision may be used. A vertical incision is made in the midline from approximately the cricoid cartilage to the suprasternal notch. When a transverse incision is made, it extends approximately one fingerbreadth above the suprasternal notch parallel to it and from the anterior border of one sternocleidomastoid muscle to the opposite side. Soft tissues and muscle are divided, and the isthmus of the thyroid gland that joins both lobes of the gland in the midline over the trachea is retracted in an upward direction with Cushing retractors, thus resulting in exposure of the underlying tracheal rings, usually the third and fourth. In some cases, two curved clamps may be inserted through this incision across the isthmus and the isthmus transected. The transected ends of the isthmus are secured with chromic gut sutures.
(2) With a knife and #15 blade, a vertical incision is made in the trachea directly across the two tracheal rings. The cut ends of the cricoid cartilage are retracted with a hook.

(3) The previously prepared tracheostomy tube (see figure 1-12) is inserted into the trachea, the obturator is quickly removed, and the trachea is suctioned with a catheter.

(4) The wound edges are lightly approximated with silk sutures or the wound edges are allowed to fall together around the tube. One or two skin sutures are inserted above the tube. The lower angle of the wound may be left open for drainage.

(5) The tracheostomy tube is held in place with tapes tied with a square knot behind the neck. The inner tube is then inserted. A gauze dressing split around the tube is applied to the wound. Assembler

1-39. EXCISION OF THE SUBMAXILLARY GLAND

a. **General.** This operation involves the removal of the gland and tumor through an incision made in the neck, just beneath the chin. It is performed to remove mixed tumors and multiple calculi associated with extensive chronic inflammation.

b. **Preparation of the Patient.** The patient is placed on the table in a dorsal recumbent position, with the affected side uppermost, and prepared as for neck surgery.
c. **Operative Procedure.**

(1) A small skin incision is made below and parallel to the mandible, extending forward to beneath the chin. The platysma is incised with scissors; the skin flaps and undersurface of the platysma and cervical fascia covering the gland are undermined, using fine hooks, tissue forceps, and Metzenbaum scissors.

(2) The mandibular branch of the facial nerve is retracted away with a small loop retractor.

(3) The submaxillary gland is elevated from the mylohyoid muscle. The edge of the muscle is retracted to expose the lingual veins and nerve and the hypoglossal nerve.

(4) The gland is freed by blunt dissection, and the submaxillary (Wharton's) duct is clamped, ligated, and divided.

(5) The external maxillary artery is clamped, ligated, and divided. The submaxillary gland is removed.

(6) The wound is closed with interrupted fine silk or chromic gut sutures. The skin edges are approximated with nylon sutures. A Penrose drain is inserted in the submaxillary bed and secured to the skin. Dressings are applied.

**1-40. PAROTIDECTOMY**

a. **General.** This operation involves the removal of a tumor and gland through a curved incision in the upper neck and behind the lobe of the ear, or through a Y-type incision in both sides of the ear and below the angle of the mandible. The majority of benign tumors of the salivary glands occur in the parotid gland. These benign tumors are of the same types as are those found in soft tissues in other parts of the body. The closeness of the parotid gland to the facial nerve makes it difficult to remove the entire tumor. Parotidectomy is indicated for removal of all benign and some malignant tumors, for inflammatory lesions, for vascular anomalies, and for metastatic cancer involving lymph nodes overlying the gland. When malignant tumors are found to involve adjacent structures, the operation may have to be extended to become a more radical procedure.

b. **Preparation of the Patient.** The patient is placed on the operating table in a dorsal recumbent position with the entire affected side of the face uppermost. The entire side of the face, the mouth, the outer canthus of the eye, and the forehead are prepared and left exposed.

c. **Operative Procedure.**

(1) The incision may extend from the posterior angle of the zygoma downward in front of the tragus of the ear and behind the lobule of the ear backward
over the mastoid process, then downward and forward on the neck parallel to and below the body of the mandible. (A chin incision may be used.) Bleeding vessels are controlled by hemostats and fine ligatures.

(2) Using fine-toothed tissue forceps and scissors, the skin flaps are elevated as described for thyroidectomy. The skin wound edges are retracted away by means of silk sutures fastened to the clamps.

(3) The upper portion of the sternocleidomastoid muscle is exposed and retracted, the auricular nerve is identified, and the lower part of the parotid gland is elevated, using curved hemostats.

(4) The superficial temporal artery and vein and external jugular vein are identified by means of blunt dissection.

(5) The parotid tissue is dissected from the cartilage of the ear and the tympanic plate of the temporal bone. The temporal, zygomatic, mandibular, and cervical branches of the facial nerve are identified and preserved.

(6) The superficial portion of the parotid gland containing the tumor is removed. In some cases, the entire superficial portion is removed, followed by ligation and division of the parotid duct.

(7) When the deep portion of the parotid gland must be removed, the facial nerve is retracted upward and outward by nerve hooks; then the parotid tissue is removed from beneath the nerve. Kocher retractors are used to retract the mandible. The external carotid artery is identified. In many cases, the internal maxillary and superficial temporal arteries are clamped, ligated, and divided.

(8) The wound is closed in layers with fine silk sutures. A small Penrose drain is inserted, and a pressure dressing is applied.

1-41. LARYNGOFISSION

a. General. This operation involves the opening of the larynx for exploratory, excisional, or reconstructive procedures. It is performed whenever access to the intrinsic larynx is necessary. The thyroid cartilages are split in the midline, and the true vocal cords and false vocal cords are incised at the midline anteriorly.

b. Patient Preparation. The patient is placed on the table in a dorsal recumbent position. The operative site is prepared and the patient draped with sterile sheets, as for thyroidectomy.
c. **Operative Procedure.**

(1) A tracheostomy is performed, and an endotracheal tube is inserted. A general anesthetic is administered, or the surgeon may elect to do the procedure with local anesthesia.

(2) A transverse incision is made through the skin and first layer of the cervical fascia and platysma muscles, approximately 2 cm above the sternoclavicular junction or in the normal skin crease by means of a knife handle #3 with a blade #10. The upper skin flap is undermined to the level of the cricoid cartilage; then the lower flap is undermined to the sternoclavicular joint.

(3) Bleeding vessels are clamped with mosquito hemostats and ligated. The strap muscles are elevated and incised in the midline.

(4) The thyroid cartilages are cut with a Stryker saw, and the true vocal cords are visualized through an incision into the cricothyroid membrane. The true vocal cords are divided in the midline (anterior commissure), and the interior of the larynx is exposed.

(5) The tracheostomy tube must be left in place postoperatively to ensure an airway.

**1-42. PARTIAL LARYNGECTOMY**

a. **General.** This operation involves the removal of a portion of the larynx. It is done to remove superficial neoplasms that are confined to one vocal cord or to remove a tumor extending up into the ventricle on the anterior commissure or a short distance below the cord. Cancers confined to the intrinsic larynx are generally of a low grade of malignancy and tend to remain localized for long periods.

b. **Preparation of the Patient.** The patient is placed on the table in a dorsal recumbent position. The operative site is prepared and the patient draped with sterile sheets, as described for thyroidectomy.

c. **Operative Procedure.**

(1) A tracheostomy is performed as previously described and an endotracheal tube is inserted.

(2) A vertical incision or a thyroid incision with elevation of a flap may be employed.

(3) The sternothyroid muscles are separated in the midline and retracted by means of loop retractors.
The fascial covering over the thyroid cartilage is incised with a knife, and the perichondrium is elevated from the cartilage on the side of the tumor with a Freer periosteal elevator.

The thyroid cartilage is divided longitudinally in midline by means of a Stryker power saw.

The cartilages are retracted with loop retractors. The cricothyroid membrane is incised with a knife. A blunt-nosed laryngeal scissors is introduced between the vocal cords to divide the mucosa of the anterior wall of the glottis.

The divided cartilages are retracted with Kocher retractors to expose the interior of the larynx. A small pack of moist gauze may be placed in the trachea to prevent aspiration of blood or mucous. A 10 percent solution of cocaine may be applied to the larynx to prevent laryngeal muscular spasm. The extent of the intrinsic laryngeal tumor is determined.

With a small periosteal elevator, the mucosa on the involved side of the larynx is freed; the false cord and mucosal layer of the region are lifted by means of a periosteal elevator and hooks. The involved cord is excised, using straight scissors.

In some cases, the thyroid cartilage may be removed with a knife and straight scissors. Bleeding is controlled with hemostats and fine chromic gut ligatures and sutures.

The gauze pack is removed from the trachea. The perichondrium is approximated with chromic gut #2-0 sutures. The strap muscles are approximated in the midline with chromic gut #2-0 sutures; then the platysma and the skin edges are approximated separately with fine silk sutures.

A tracheal-laryngeal tube is left in place. It is removed at a later date when the airway is adequate. Dressings are applied to the wound and around the tube.

1-43. SUPRAGLOTTIC LARYNGECTOMY

This procedure is the excision of the laryngeal structures above the true vocal cords. It is indicated in cancer of the epiglottis and false vocal cords. It is designed to remove the cancer, yet preserve the phonatory, respiratory, and sphincteric functions of the larynx. A neck dissection is always performed.

1-44. TOTAL LARYNGECTOMY

a. General. This procedure involves the complete removal of the cartilaginous larynx, the hyoid bone, and the strap muscles-connected to the larynx and possible removal of the pre-epiglottic space with the lesion. The tumor may have produced
immobility of the vocal cords, or be in the extrinsic larynx and hypopharynx where there is greater danger of metastasis. The lymphatics are often removed.

b. **Psychological Aspects.** Laryngectomy presents many psychological problems. The loss of voice that follows this procedure is a most tragic event for the patient and his family. The patient may be taught to talk either by using esophageal voice or with an artificial larynx. Esophageal voice is produced by the air contained in the esophagus rather than by that in the trachea. Speech requires a sounding air column. With instruction and practice, the patient is able to control the swallowing of air into the esophagus and re-introduction of this air into the mouth-with phonation. The sounding air column is then transformed into speech by means of the lips, tongue, and teeth.

c. **Patient Preparation.**

1. The patient is placed on the table in a dorsal recumbent position with his neck extended and shoulders raised by a rubberized block or folded sheet. The table is slanted downward to elevate the upper part of the body for the convenience of the surgeon.

2. An endotracheal anesthetic is administered. An effective suction apparatus is most essential.

3. The proposed operative site— including the anterior neck region, lateral surfaces of the neck down to the outer aspects of the shoulders, and the upper anterior chest region— is cleansed in the usual manner.

d. **Operative Procedure.**

1. A tracheostomy may be performed to control the airway.

2. A midline incision is made from the suprasternal notch to just above the hyoid bone. Skin flaps are undermined on each side. The sternothyroid, sternohyoid, and omohyoid muscles (strap muscles) on each side are divided by means of curved hemostats and a knife.

3. The suprahyoid muscles are severed from the portion of the hyoid to be divided. The hyoid bone is divided at the junction of its middle and lateral thirds with bone-cutting forceps. Bleeding vessels are clamped and ligated.

4. The superior laryngeal nerve and vessels are exposed and ligated on each side, using long curved fine hemostats and fine chromic gut or silk ligatures.

5. The isthmus of the thyroid gland is divided between hemostats. Each portion of the thyroid gland is dissected from the trachea, using fine dissection with Stevens and Metzenbaum scissors and fine tissue forceps. The superior pole of the
thyroid is retracted in a Greene retractor. The superior thyroid vessels are freed from
the larynx by a sharp dissection.

(6) The larynx is rotated. The inferior pharyngeal constrictor muscle is
severed from its attachment to the thyroid cartilage on each side.

(7) The endotracheal tube is removed. The trachea is transected just below
the cricoid cartilage over a Kelly or Crile hemostat previously inserted between the
trachea and esophagus. The upper resected portion of the trachea and the cricoid
cartilage are held upward with Lahey forceps. A balloon-cuffed tube (endotracheal) or a
Foley catheter is inserted in the distal trachea.

(8) The larynx is freed from the cervical esophagus and attachments by
sharp and blunt dissection. A moist pack is placed around the endotracheal tube to
help prevent leakage of blood into the trachea.

(9) The pharynx is entered. In most cancers of the intrinsic larynx, the
pharynx is entered above the epiglottis. The mucosal membranous incision is extended
along either side of the epiglottis; the remaining portion of the pharynx and cervical
esophagus is dissected well away from the tumor by means of fine-toothed tissue
forceps, Metzenbaum scissors, knife, suctioning, and fine hemostats. The specimen is
removed en masse.

(10) A nasal feeding tube is inserted through one nares into the esophagus;
closure of the hypopharyngeal and esophageal defect is begun, using continuous
inverting fine sutures of chromic gut #3-0. The nasal tube is guided down past the
pharyngeal suture line.

(11) The pharyngeal suture line is reinforced with interrupted sutures; the
suprahyoid muscles are approximated to the cut edges of the inferior constrictor
muscles.

(12) The diameter of the tracheal stoma is increased by means of a knife and
heavy straight scissors. The two portions of the thyroid behind the tracheal opening are
approximated with interrupted silk sutures, thereby obliterating dead space posterior to
the upper portion of the trachea.

(13) A small Penrose drain or catheter is inserted through two separate stab
wounds on each side of the neck just below the pharyngeal suture line. If a closed
suction system is used, catheters connected to a suction apparatus are used.

(14) The edges of the deep cervical fascia and the platysma are closed
separately with interrupted fine silk sutures. When a great amount of the fascia and
platysma has been removed, the wound edges are approximated with silk sutures.
(15) A laryngectomy tube is inserted into the tracheal stoma; a pressure dressing is applied to the wound and neck.

1-45. RADICAL NECK DISSECTION

a. General. This operation involves the removal of a tumor, surrounding structures, and lymph nodes en masse, through a Y-shaped or trifurcate incision in the affected side of the neck. It is done to remove the tumor and metastatic cervical nodes present in malignant lesions and all nonvital structures of the neck. Metastasis occurs through the lymphatic channels via the bloodstream. Disease of the oral cavity, lips, and thyroid gland may spread slowly to the neck. Radical neck surgery is done in the presence of cervical node metastasis from a cancer of the head and neck, which has a reasonable chance of being controlled. It may also be done in a slightly less radical form when there is cancer of the tongue and no firm evidence of metastasis.

b. Preparation of the Patient.

(1) The patient is placed on the table in a dorsal recumbent position, with the head in moderate extension and the entire affected side of the face and neck facing uppermost. During surgery, the face of the patient is turned away from the surgeon.

(2) The preoperative skin preparation is extensive. The patient is draped with sterile towels and sheets, leaving a wide operative field. Endotracheal anesthesia is used. The anesthetic is administered before the patient is positioned for surgery. During the operation, the anesthesiologist works behind the sterile barrier, away from the surgical team.

c. Operative Procedure.

(1) One of several types of incisions may be used, including the Y-shaped, H-shaped, or trifurcate incision.

(2) The upper curved incision is made through the skin and platysma, using a knife, tissue forceps, and fine hemostats and ligatures for bleeding vessels. The upper flap is retracted; then the vertical portion of the incision is made and the skin flaps retracted anteriorly and posteriorly with retractors. The anterior margin of the trapezius muscle is exposed by means of curved scissors. The flaps are retracted to expose the entire lateral aspect of the neck. Branches of the jugular veins are clamped, ligated, and divided.

(3) The sternal and clavicular attachments of the sternocleidomastoid muscle are clamped with curved Rochester-Mayo clamps and then divided with a knife. The superficial layer of deep fascia is then incised. The omohyoid muscle is severed between clamps just above its scapular attachment.
(4) The internal jugular vein is isolated by blunt dissection and then doubly clamped, ligated with medium silk, and divided with Metzenbaum scissors. A transfixion suture is placed on the lower end of the vein.

(5) The common carotid artery and vagus nerve are identified. The fatty areolar tissue and fascia are dissected away, using Metzenbaum scissors and fine tissue forceps. Branches of the thyrocervical artery are clamped, divided, and ligated.

(6) The tissue and fascia of the posterior triangle are dissected, beginning at the anterior margin of the trapezius muscle, continuing near the brachial plexus and the levator scapulae and the scalene muscles. During the dissection, branches of the cervical and suprascapular arteries are clamped, ligated, and divided.

(7) The anterior portion of the block dissection is completed. The omohyoid muscle is severed at its attachment to the hyoid bone. Bleeding is controlled. All hemostats are removed, and the operative site is covered with warm, moist laparotomy packs.

(8) The sternocleidomastoid muscle is severed and retracted. The submental space is dissected free of fatty areolar tissue and lymph nodes from above downward.

(9) The deep fascia on the lower free edge of the mandible is incised; the facial vessels are divided and ligated.

(10) The submaxillary triangle is entered. The submaxillary duct is divided and ligated. The glands with surrounding fatty areolar tissue and lymph nodes are dissected toward the digastric muscle. The facial branch of the external carotid artery is divided. Portions of the digastric and stylohyoid muscles are severed from their attachments to the hyoid bone and on the mastoid. The upper end of the internal jugular vein is elevated and divided. The surgical specimen is removed.

(11) The entire field is examined for bleeding and then irrigated with warm saline solution. Penrose drains are placed in the wound and brought out through a stab wound, and #12 Fr catheters may be used.

(12) The flaps are then approximated with interrupted fine silk sutures. A bulky pressure dressing is applied to the neck. Gauze dressings are applied to the wound edges and covered with sterile fluffed gauze to provide even pressure. A wide gauze roller bandage is wrapped snugly around the neck and in some cases encircles the head. The dressing may then be covered with elastic bandage that is wrapped around the neck and anchored to the chest wall.

Continue with Exercises

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EXERCISES, LESSON 1

INSTRUCTIONS: The following exercises are to be answered by marking the lettered response that best answers the question or best completes the incomplete statement or by writing the correct word or phrase in the space provided.

After you have completed all the exercises turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. In treating eye infections, ______________________ should not be used.
   a. Stains.
   b. Miotics.
   c. Antibiotics.
   d. Corticosteroids.

2. A chalazion is a small:
   a. Plastic operation on the eyelid.
   b. Benign tumor of the eyelid.
   c. Silk suture.
   d. Sty.

3. A benign growth of conjunctival tissue over the cornea is called a:
   a. Ptosis.
   b. Hordeolum.
   c. Pterygium.
   d. Tarsorrhaphy.
4. If an eye is pulled inward by muscular imbalance, the condition is called:
   a. Tarsorrhaphy.
   b. Chalazion.
   c. Esotropia.
   d. Ptosis.

5. A hordeolum is a(n) ____________________________.

6. The operation in which an extraocular muscle is freed from its attachment point and reattached closer to the cornea is called:
   a. Advancement.
   b. Recession.
   c. Tenotomy.
   d. Tucking.

7. The "exciting eye" is referred to as the eye that is:
   a. Hard to focus.
   b. Twitching.
   c. Injured.
   d. Bright.

8. Exenteration of the orbit is usually performed for treatment for:
   a. Injury.
   b. Myopia.
   c. Diabetes.
   d. Malignant tumor.
Special Instructions for Exercises 9 through 15. Indicate whether each of the following statements is true or false. Circle the "T" if the statement is true; circle "F" if it is false.

T  F  9. Miotic drugs cause the pupil of the eye to contract.
T  F  10. To distribute their effect, instill eye drops in various places of the eye.
T  F  11. When cleaning up after eye surgery, stack the instruments.
T  F  12. Medical treatment for cataracts is often adequate.
T  F  13. The pharynx is composed largely of muscle and fibrous tissue.
T  F  14. Laryngoscopy can be done on relaxed, well-prepared adults with a topical anesthetic.
T  F  15. Although tumors of the mouth may be scheduled as a local excision, they frequently become much more extensive during the procedure.

16. Which of the following items might be used to locate a foreign body in the eye?
   a. X-ray exposures.
   b. Ultrasonic probes.
   c. Metal-locating instruments.
   d. All of the above.

17. In a cataract operation, the_______________ is removed.
   a. Lateral recuts.
   b. Choroid.
   c. Retina.
   d. Lens.
18. The middle ear contains air and:
   a. Three small bones.
   b. Organ of Corti.
   c. Labyrinth.
   d. Fluid.

19. The ear is made up of the external ear, the inner ear, and the:
   a. Tympanic membrane.
   b. Temporal bone.
   c. Middle ear.
   d. Labrinth.

20. Otological surgery involves the:
   a. Eye.
   b. Ear.
   c. Nose.
   d. Throat.

21. What incision may be used for surgery of the mastoid process?
   a. Endaural.
   b. Vertical.
   c. Postaural.
   d. Circumferential.
22. An incision through the tympanic membrane is called a:
   a. Mastoidectomy.
   b. Tympanoplasty.
   c. Myringotomy.
   d. Chalazion.

23. Simple mastoidectomy has been made essentially obsolete by:
   a. Radical mastoidectomy.
   b. Operating microscopes.
   c. Tympanoplasty.
   d. Antibiotics.

24. The columella is formed by part of the septal cartilage, the major alar cartilages, and the:
   a. Hyoid bone.
   b. Soft palate.
   c. Hard palate.
   d. Anterior nasal spine.

25. The nasal cavity is separated from the lingual cavity by the hard and soft palates and from the cranial cavity by the _____________ bone.
   a. Nasal.
   b. Ethmoid.
   c. Parietal.
   d. Temporal.
26. Another name for the maxillary sinus is ____________________________.

27. Nasal surgery on adults is normally done using ________________ anesthetic.
   a. General.
   b. Local.

28. Another name for a radical antrostomy is the ________________ operation.

29. A sinus operation involving incision through the eyebrow would ordinarily involve the ________________________ sinus.

30. A fingerlike projection at the posterior border of the soft palate is called the ____________________________

31. During the act of swallowing, the nasopharynx is:
   a. Open.
   b. Closed.

32. The adenoids consist of an accumulation of ________________ tissue.
   a. Lymphoid.
   b. Salivary.
   c. Muscular.
   d. Connective.
33. The larynx has three functions. It serves as a passageway for air, a valve to close air passages during swallowing, and as a:

a. Joint.
b. Voice box.
c. Lymph gland.
d. Vertebral structure.

34. The production of vocal sound in the larynx is by the vocal cords that are folds containing a blend of mucous membrane and _______________ tissue.

a. Fibrous.
b. Nervous.
c. Muscular.
d. Glandular.

35. When we speak, we use the breathing muscles, the vocal cords, and:

a. The lips.
b. The tongue.
c. The soft palate.
d. All of the above.

36. Damage to or paralysis of the laryngeal nerves will cause an emergency in which a/an __________________ will probably be necessary.

a. Oxygen tent.
b. Tracheostomy.
c. Appendectomy.
d. Blood transfusion.
37. For adult tonsillectomies, _______________ anesthesia is usually used.

   a. General.

   b. Local.

Check Your Answers on Next Page
SOLUTIONS TO EXERCISES, LESSON 1

1. d (para 1-3a(2)(e))
2. b (para 1-9c)
3. c (para 1-9d)
4. c (para 1-11a)
5. sty (para 1-9e)
6. a (para 1-11e)
7. c (para 1-12a)
8. d (para 1-12c)
9. T (para 1-3a(2)(d))
10. F (para 1-3e(4)(a))
11. F (para 1-5d(1))
12. F (para 1-15a)
13. T (para 1-33b)
14. T (para 1-35b)
15. T (para 1-37c)
16. d (para 1-14a(1) and (2))
17. d (para 1-15a)
18. a (para 1-18c)
19. c (para 1-18)
20. b (para 1-20c(1))
21. c (para 1-22c)
22. c (para 1-23a)
23. d (para 1-25a)
24. d (para 1-28a(1))
25. b (para 1-28b(2))
26. Antrum of Highmore (para 1-28c(2))
27. b (para 1-29d)
28. Caldwell-Luc (para 1-31d)
29. Frontal (para 1-31e(2)(a))
30. Uvula (para 1-33a)
31. b (para 1-33b(2))
32. a (para 1-33c(1))
33. b (para 1-33d(1)(a))
34. a (para 1-33d(3)(b))
35. d (para 1-33d(4)(b))
36. b (para 1-33d(4)(d))
37. b (para 1-34d)