SURGERY of the Head and Neck

OTHER NECK SURGERIES

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Several surgical procedures are performed for specific benign processes in the neck, including branchial cleft and thyroglossal duct cysts, and Zenker's diverticulum. This article will also review three surgeries of various salivary glands and conclude with an overview of tracheotomy.

BRANCHIAL CLEFT CYST

Between the fourth and sixth week of gestation, five paired swellings occur in the head of the embryo. These swellings, or branchial arches, have a corresponding internal pouch and are separated by four grooves or clefts externally. Inside each branchial arch are developed specific anatomic features, such as cranial nerves, arteries, and cartilage. During natural development, the pouches should close and the grooves dissolve. When these pouches and grooves do not follow their natural course, an anomaly occurs. Branchial cleft remnants are usually smooth, nontender masses located between the preauricular area and the supraclavicular area of the neck. However, these cysts may form a sinus tract extending to the skin.

The majority of branchial cleft cysts arise from the second branchial arch. Indications for surgery to remove a branchial cleft cyst include: recurrent infections, increase in size, and for cosmetic reasons. In removing the branchial cleft cyst, it is important to remove the cyst, any sinus tract, and any tissue surrounding the cyst that may have been involved in attempts to drain the infected cyst.

Instruments for a branchial cleft cyst excision are contained in the standard neck set. Any special instrumentation needed depends on the location of the cyst. Supplies are similar for any neck dissection and include a bipolar forceps and cord. The surgeon will likely use a headlight.

Editor's Note: This is the fourth and final installment in this series. Please refer to past issues for an overview of normal anatomy for this region. Anatomical variations specific to a procedure will be discussed with its description.

The patient can choose between general anesthesia or local injection with monitored anesthesia care depending on the size and location of the cyst. Most patients undergo the procedure with general anesthesia. The patient is placed on the operating table in the supine position with the neck extended and the head turned away from the affected side.

The surgeon will make a horizontal incision in the nearest skin crease of the neck. If a sinus tract is present, it is incorporated through an elliptical incision. The sinus tract is part of the specimen. Skin and tissue flaps are dissected around the cyst to protect any major structures that may lie in the area. The cyst is identified and dissected from the surrounding tissue. Care is taken not to rupture the cyst, as the contents could contaminate the wound. The cyst is carefully dissected from the carotid sheath and hypoglossal nerve.

Once the cyst is dissected fully, the tract is followed superiorly, usually between the internal and external carotid arteries, to rule out a second branchial cleft cyst. The tract then runs past the posterior digastric belly to the pharynx. If no internal connection to the pharynx is established, the tract can be ligated and removed with the cyst. If it is connected to the pharynx, the whole tract must be removed. The wound is irrigated and a drain is placed. The wound is closed and dressed appropriately.

The drain is removed 24 to 48 hours postoperatively. If there is spillage in the wound or communication with the pharynx, the patient is given prophylactic antibiotics for 48 hours. Complications are rare, but include hematoma, seroma, and infection.

Thyroglossal duct cyst

Thyroglossal duct cyst is an upper-midline cervical mass, with a common presentation next to the hyoid bone and the thyrohyoid membrane. It is the most common mass in the midline of the neck.

The surgeon's knowledge of embryological and developmental anatomy of the thyroid is important. Embryologically, thyroid tissue descends anteriorly to the pharynx. The tissue has two lobes with a stalk-like attachment to the base of tongue. The hyoid bone divides the tract into upper and lower segments. When the thyroid settles into its final position, the tract should be resorbed. When it is not resorbed, a thyroglossal duct cyst may form.

A patient with a thyroglossal duct cyst presents with a midline mass, which moves upon swallowing or with movement of the tongue. Dysphagia and/or a choking sensation, and rarely upper respiratory obstruction may also occur. Indications for thyroglossal duct cyst excision are an undiagnosed midline mass, history of infection in the mass, the possibility of malignant degeneration into cancer, and cosmetic appearance, as the mass may increase in size.

A standard neck set is required for a thyroglossal duct cyst excision. A bone cutter should also be available, as most surgeons remove part of the hyoid bone. Supplies are the same as for a branchial cleft cyst. As with any similar procedure, a headlight is needed.

Excision of a thyroglossal duct cyst is called the Sistrunk procedure. Walter Sistrunk first performed the surgery in 1920. He had excellent results with a recurrence rate of about 1.5% to 4%. The Sistrunk procedure includes the excision of the mass with the midportion of the hyoid bone and the block of muscle that theoretically contains the thyroglossal duct remnant.

The patient undergoes general anesthesia and is placed in the supine position on the operating table with the neck extended. The incision is made in a skin crease in the upper midline of the neck. If the skin is adhered to the cyst as a result of recurrent infection, that skin is excised with the mass via an elliptical incision. A superior flap is dissected to the hyoid bone. The strap muscles are identified and retracted. The cyst is dissected free on all sides. The hyoid bone is grasped, usually with a Lahey clamp or a Kocher, and the muscle and soft tissue are dissected from the body of the hyoid bone. The body of the hyoid bone is transected with bone cutters or a curved Mayo scissors.

A large curved retractor is placed in the mouth to push the base of the tongue into the

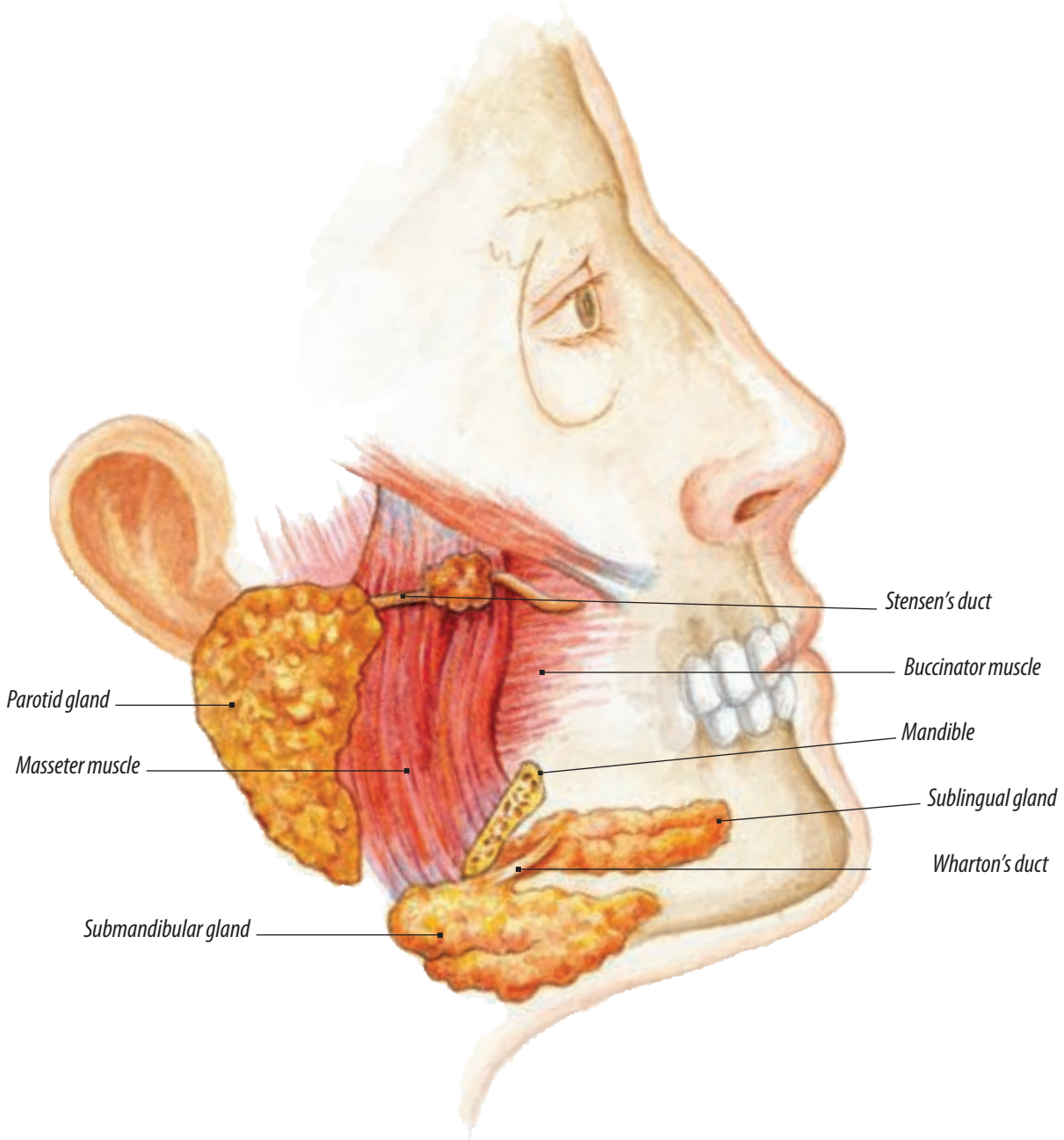


FIGURE 1
Major salivary glands and surrounding anatomy.

neck wound. The stalk of the cyst is followed upward and cut out of the muscle of the tongue base. The wound is irrigated, a drain is placed, and the wound is closed. An appropriate dressing is placed, if necessary. Complications of thyroglossal duct cyst excision are hematoma, seroma, and wound infection.

Zenker's diverticulectomy

Zenker's diverticulum is a pharyngoesophageal pouch that is formed by forces within the muscles of the esophagus acting against an area of low resistance. The diverticulum was first described by Frederick Albert Von Zenker in 1877. Patients with Zenker's diverticulum present with intermittent cervical dysphagia that becomes progressively worse. The patient may hear a gurgling sound when swallowing and have excessive saliva, which can lead to aspiration. Halitosis, or bad breath, is a frequent symptom.

In patients with a Zenker's diverticulum, food gets caught in the diverticulum instead of going down to the stomach. The food caught in the diverticulum can be expelled into the airway causing aspiration. Patients with advanced cases of Zenker's diverticulum may have recurrent pulmonary infections due to aspiration and weight loss. Patients rarely feel a mass, as the diverticulum is located deep within the neck. Indirect laryngoscopy in the doctor's office often

shows pooling of secretions in the hypopharynx. A barium esophagram is used to determine the size and exact location of the diverticulum.

Instrumentation for the excision of a Zenker's diverticulum is a standard neck set and an esophagoscopy set, which includes a light source. There will be two fields, one clean and one sterile. Supplies are the same for a branchial cleft cyst, but should also include something to pack the diverticulum: either plain gauze or Vaseline® gauze (surgeon's preference). Some surgeons may use a linear stapler (30 or 55 mm) to remove the diverticulum and close the esophagus in one step. The surgeon will likely wear a headlight. Separate suction sets are needed for each field.

The patient undergoes general anesthesia and is placed in the supine position on the operating table with the neck extended. A rigid esophagoscopy is performed before the prep, so that the surgeon can visualize the diverticulum, clean it out, and pack it if necessary. The packing will help to identify the diverticulum in the neck.

The patient is prepped and draped. A transverse incision is made two finger breadths above the clavicle. The upper flap is dissected to the thyroid cartilage of the larynx. The sternocleidomastoid muscle is retracted laterally. The carotid sheath is identified and retracted laterally. The larynx is retracted medially. The dissection is carried out to the prevertebral fascia of the spinal cord.

The Zenker's diverticulum is identified through the cricopharyngeus muscle. The muscle is cut, and strips of the muscles are excised to prevent stricture formation postoperatively. The diverticulum is exposed and grasped with Babcock clamps. The linear stapler is placed along the esophagus and fired. The diverticulum is excised from the closed esophagus. If the stapler is not used, the diverticulum is removed from the esophagus and the defect is closed, usually with an absorbable suture.

A nasogastric tube is placed into the esophagus and saline is injected to ensure that the mucosa of the esophagus is properly closed. The nasogastric tube is then advanced into the stomach for postoperative feeding until healing is complete. This reduces the risk of pharyngocutaneous fistula. The cut muscle is not closed to prevent stricture. A drain may be placed in the wound before the wound is closed. A pressure dressing may be applied.

Complications of Zenker's diverticulectomy are recurrent laryngeal nerve injury, hypopharyngeal stricture, or pharyngocutaneous fistula. These complications are rare but must be explained to the patient.

Submandibular gland excision

The submandibular gland is one of three paired salivary glands that drain into the oral cavity (Figure 1). The gland lies under the mandible in what is called the submandibular triangle. The marginal mandibular nerve passes right above the gland and care must be taken not to injure the nerve when excising the gland. The submandibular gland is removed for recurring infection due to presence of a stone in the duct or the possibility of a mass in the gland.

Instrumentation for a submandibular gland excision is the standard neck set. Supplies are the same as a neck dissection but fewer are needed. Make sure that a bipolar electrosurgical unit is available, and a bipolar cord and forceps are on the field. Peanut dissectors are often used to dissect the submandibular gland. The surgeon will use a headlight.

The patient is placed in the supine position on the operating table with the neck extended, and the head turned away from the affected side. The incision is made in a skin crease below the level of the submandibular gland. The skin flap is dissected upward to identify the gland. The gland is grasped by an Allis clamp, and downward traction is applied.

The vessels supplying the gland are divided, and the gland is pulled upward to expose the duct. Care is taken to identify the lingual and hypoglossal nerves before dividing the duct. The duct is divided, ligated, and the gland is removed. The wound is irrigated and hemostasis is achieved. A nerve stimulator may be used to check the marginal mandibular, lingual, and

hypoglossal nerves for damage. A drain may be placed, and the wound closed.

Postoperatively, the head of the patient's bed is elevated for about 24 to 48 hours. If present, the drain is removed on the second or third postoperative day. Complications include: injury to marginal mandibular nerve, which would cause the lower lip to droop; injuries to the lingual and hypoglossal nerves, which would disturb function of the tongue; hematoma; and infection.

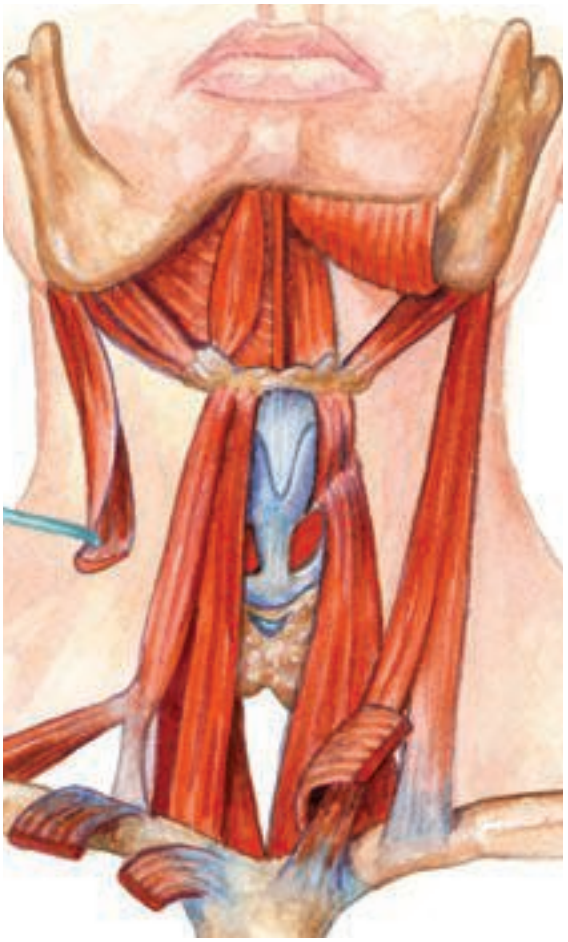
Parotid gland

The parotid gland is the largest salivary gland, which lies directly in front of each ear. The gland functions to produce saliva, which aids digestion of food and is a mechanical cleanser of the mouth. In some animals, the parotid gland serves as a defense mechanism by producing and storing venom, which is used to disable prey.

Tumors of the parotid glands account for less than 5% of all head and neck cancers. Treatment of these cancers has been controversial with many differing opinions on the subject. Currently, superficial parotidectomy is the treatment of choice for benign lesions, and total parotidectomy is preferred for malignant lesions. The pathology of the malignancy determines whether or not a neck dissection is performed with the parotidectomy. The most common parotid tumor is a pleomorphic adenoma, which is a benign, mixed-cell tumor. Most often, the patients with a parotid lesion present with a painless, slow-growing mass in their cheek or in front of their mandible. Patients are most commonly in their forties or fifties.

Parotid anatomy

The parotid glands are situated in front of and slightly below the ears. The lateral surface of the gland is covered with skin, and the medial or deep portion is bordered by the styloid process and the muscles, which attach to it and to the carotid sheath. The superior border of the gland is the zygomatic arch, and the inferior border is the sternocleidomastoid muscle. The parotid gland is described as having a superficial



and deep lobe. The plane between the lobes is the facial nerve and its branches.

The facial nerve exits the skull base at the stylomastoid foramen and proceeds up to the parotid gland where it branches. There are five branches of the facial nerve: the temporal, zygomatic, buccal, marginal mandibular, and cervical. The place where the nerve starts to branch is called the pes anserinus or goose's foot.

Knowledge of how the nerve branches and where it exits the skull base is very important to a successful parotidectomy. The pes anserinus is often identified first and then the branches are followed to complete the dissection. Sometimes a branch of the nerve may be involved in the tumor and has to be sacrificed. If the whole nerve has to be sacrificed, it is only necessary to reinnervate the zygomatic and marginal mandibular branches for cosmetic reasons. The zygomatic branch is responsible for closing the upper eyelid and, if injured, may require the placement

of a gold weight in the eyelid to facilitate closing until it is healed. The marginal mandibular nerve turns the corner of the mouth up and out. If injured, the mouth would droop. Most surgeons verify that the facial nerve is intact postoperatively by having the patient blink and smile.

The parotid duct, also called Stensen's duct, appears to originate from the superficial lobe but also has been described as arising from a pattern of extra glandular ductules from both lobes. The duct goes over the surface of the masseter muscle and crosses the mandible at a point approximately one finger breadth below the zygomatic arch. From there, the duct abruptly turns medially to pierce the buccinator muscle and the buccal fat pad to enter the oral cavity at the level of the second maxillary molar.

Superficial parotidectomy

A basic neck set is often used for superficial parotidectomy. Make sure that fine tonsil clamps and fine mosquitoes are available. If not on the set, small needle holders may also be needed. Make sure that the tips come together correctly. Supplies needed for a superficial parotidectomy include X-ray detectable 4″ x 4″ sponges, suction apparatus, unipolar and bipolar electrosurgical units. A nerve stimulator/locator is used to help identify the facial nerve. A 7 mm Jackson-Pratt drain set should be available. Most often, 3-0 silk ties and stick ties are utilized, as well as a small suture (eg 5-0 or 6-0 fast-absorbing gut). Nylon may also be used. A 2-0 silk on a cutting needle may be required to secure the drain, if placed.

The patient is placed on the operating table in the supine position with some semi-Fowlers and undergoes general anesthesia. The table is turned so the affected side is away from the anesthesia provider and equipment. The patient is prepped, taking care to avoid prep solution entering the ear canal. Often, a cotton ball is placed in the ear canal for prevention. The cotton ball is removed when the prep is finished; a sterile cotton ball may be placed to prevent any blood or irrigation fluid from entering the canal. The patient is draped.

The most common incision for parotidectomy is called the modified Blair incision. The incision begins in front of the tragus of the ear and is continued inferiorly to the ear lobule, where it gently curves back over the mastoid tip. The incision then follows the anterior border of the sternocleidomastoid muscle to a point two fingerbreadths below the mandible.

The skin flap is elevated superiorly from the zygomatic arch to the midportion of the digastric muscle inferiorly. Care is taken to leave the parotid capsule intact. The skin flap may be sutured out of the way with silk sutures. The surgeon carefully dissects the gland from the external auditory canal, taking care not to puncture the canal.

The surgeon tries to find the cartilaginous tragal pointer, which is said to point to the facial nerve. The surgeon identifies the facial nerve and follows it to its branches. Parotid tissue is dissected carefully from each nerve branch until the gland is removed. The surgeon may use a nerve stimulator/locator to ensure the nerve is in working order, as well as for identification.

Once the gland is removed, the skin flap is closed carefully. Depending on the size of the tumor, some skin may have to be removed for proper closure. A 7 mm Jackson-Pratt may be used to drain the wound. The skin can be closed with a 5-0 or 6-0 fast absorbing gut suture, which does not have to be removed. Most often, the only dressing is antibiotic ointment.

Several complications may arise in superficial parotidectomy patients. They include facial nerve paralysis or weakness, salivary fistula, and Frey's syndrome. Frey's syndrome is also known as gustatory sweating and has to deal with the thickness of the skin flap. If the skin flap is too thin, the nerves for the sebaceous glands may intermingle with the nerves of the salivary gland, producing sweat while eating. The way to prevent this is through an adequate skin flap.

Tracheotomy

Tracheotomy is most often performed to maintain airway patency. Indications for tracheotomy are relief of upper airway obstruction, providing means for mechanical ventilation, and to enable more efficient tracheobronchial com-

munication. Tracheotomy was first described many centuries ago. It is rumored that Alexander the Great performed a tracheotomy in the fourth century BCE. The first successful modern tracheotomy was performed in 1546 by Antonio Brasavola, a French physician. In 1909, Chevalier Jackson modified and improved the safety of the procedure, as well as devised the style of tracheotomy tube that remains in use today (see History of Surgery, page 24). Through the years, endotracheal intubation has replaced tracheotomy in many circumstances, especially in emergency situations where the glottis is not obstructed due to injury.

A standard tracheotomy set is required for this procedure. This set should contain several clamps, at least two right-angle clamps, curved Kocher clamps, at least four Allis clamps, a cricoid hook, and a tracheal spreader. Supplies for a tracheostomy include: peanuts, X-ray detectable 4″ x 4″ surgical sponges, a suction apparatus, silk stick ties, silk ties, and suture to stabilize the tracheotomy tube. A 12 cc syringe is needed to inflate the balloon of the tracheotomy tube.

Typically, the tracheotomy tube is cuffed and nonfenestrated. The type of tube is chosen based on the surgeon's preference. Use caution when obtaining the tube as the sizes may differ according to the manufacturer. Often, a rule of thumb is a smaller trach tube for women (eg a 6 Shiley) and a larger one for men (eg an 8 Shiley). Headlights for adequate lighting are important in this case, especially if it is an emergency.

The patient is placed in the supine position on the operating table with the neck extended. The patient is most often awake, and the procedure is performed with local injection and a little sedation to make sure the patient's airway isn't lost.

The surgical technologist should learn prior to the start of the procedure what size trach tube the surgeon anticipates. It is the surgical technologist's responsibility to assemble the tracheotomy tube with the obturator in place and verify patency of the balloon. Patency of the balloon is verified with air—never water. Time permitting, the wide umbilical tape, included in the tube's package, is prepared for use in securing the tube around the patient's neck after the procedure. A Velcro® strap designed for this purpose may be substituted.

An incision is made approximately 1 cm above the sternal notch. The surgeon dissects through the soft tissue, until the strap muscles are identified. The strap muscles are separated at the midline and retracted bilaterally. The next set of strap muscles is split the same way, and the retractors are repositioned.

If the thyroid isthmus is over the trachea in the field, the surgeon must decide whether it can be pushed out of the way with a peanut dissector or must be divided. If the isthmus is to be divided, right-angle clamps are used, and the clamped isthmus is divided electrosurgically. Each side of the isthmus is secured with a stick tie, then placed with the strap muscles in the retractor.

The trachea is cleaned off with a peanut dissector and prepared for tracheotomy. The surgeon's preference should determine which rings are cut to achieve the tracheotomy. Some surgeons use a flap technique (ie a flap of a tracheal ring is cut and sutured back) so that, if the tube is taken out, it is easy to replace. Other techniques may be utilized according to the surgeon's preference based on the anatomy and the indications for tracheostomy.

Before an incision is made into the trachea, a cricoid hook is placed in the cricoid cartilage and the trachea is pulled up. The surgeon will make an incision in the trachea between two tracheal rings, usually the first and second. The incision may be extended with a curved Mayo scissors. Some surgeons use 4% lidocaine (plain) to anesthetize the trachea and to provide some comfort for the patient while the trachea becomes accustomed to the tube.

A tracheal spreader may be used to enlarge the opening in the trachea as the tube is being positioned. The obturator is pulled out of the tube, the inner cannula is placed in the tube, and the balloon is inflated. Care is taken not to apply too much pressure to the balloon, as excessive pressure may cause necrosis to the sides of the trachea. The trach tube is sewn to the skin and secured around the neck. The obturator is

cleaned and given to the circulator to be placed on the patient's chart in case of dislodgement of the tube. If there is an extra incision, the surgeon may close the wound. If not, the patient is cleaned off and taken to the postanesthesia care unit.

Postoperative complications include: hemorrhage, displacement of the tracheotomy tube, wound infection, and tube obstruction caused by heavy mucous from the bronchi. The patient must be taught how to properly care for the tube prior to discharge from the hospital.

Tracheotomy is generally performed for short term use. Tracheostomy is preferred when a long-term need of a stoma is expected. Tracheostomy involves suturing the mucosa of the trachea to the skin to form a stoma. A tracheotomy tube may remain in place during healing, but is removed when the stoma has matured.

About the author

Mary Sutton, CST, CFA, is currently an instructor at Concorde Career Institute in Jacksonville, Florida, and was recently a speaker at AST's 36th Annual National Conference in Orlando. She has been active in the Florida State Assembly, the AST national Board of Directors, and continues to serve the profession on the LCC-ST Board of Directors.

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1. A majority of branchial cleft cysts arise from the:
a. sinuses
b. second branchial arch
c. cranial nerves
d. fourth branchial arch

2. Which is the most common mass in the midline of the neck?
a. branchial left cyst
b. Zenker's diverticulum
c. parotid gland tumor
d. thyroglossal duct cyst

3. A Sistrunk procedure is performed to:
a. remove a branchial left cyst
b. excise Zenker's diverticulum
c. remove a thyroglossal duct mass
d. excise a parotid gland tumor

4. What structures are removed during the Sistrunk procedure?
a. midsection of the hyoid bone
b. muscle of the tongue base
c. skin that has adhered to the cyst
d. all of the above

5. Zenker's diverticulum is formed:
a. during development of the esophagus in utero
b. by pressure of the esophageal muscles against low resistance
c. after recurrent laryngeal nerve injury
d. by hypopharyngeal stricture

6. Which is the largest salivary gland?
a. parotid
b. submandibular
c. sublingual
d. Ebner

7. During submandibular gland excision, which nerves are checked for damage?
a. mandibular
b. hypoglossal
c. lingual
d. all of the above

8. If the nerve must be sacrificed during parotidectomy, which branches must be reinnervated for cosmetic reasons?
a. zygomatic and marginal mandibular
b. temporal and zygomatic
c. cervical and buccal
d. marginal mandibular and temporal

9. The point at which the facial nerve starts to branch is:
a. stylomastoid foramen
b. zygomatic arch
c. pes anserinus
d. Stensen's duct

10. Tracheotomy was first performed by:
a. Alexander the Great
b. Chevalier Jackson
c. Antonio Brasavola
d. None of the above

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5	❑	❑	❑	❑	10	❑	❑	❑	❑

Mark one box next to each number. Only one correct or best answer can be selected for each question.