Chapter 30 – Lateral Pharyngotomy

Ricardo L. Carrau

Ryan J. Soose

Tumors of the base of the tongue and hypopharynx are often silent until they have attained considerable size, and regional metastasis has frequently occurred by the time of diagnosis. In advanced-stage cancer, the therapeutic plan most often involves combined chemoradiation therapy, but extirpative surgery with postoperative irradiation remains a viable alternative as a primary treatment modality or as salvage treatment of persistent or recurrent tumors.

The surgical approach must provide adequate exposure to visualize the entire cancer and allow wide resection. Surgical approaches commonly used for cancer of the base of the tongue include transoral transendoscopy, mandibulotomy, mandibulectomy, transhyoid pharyngotomy, and lateral pharyngotomy. Cancer of the hypopharynx is commonly resected with concurrent laryngectomy. Large cancers may require total pharyngectomy, whereas some limited lesions may be resected via lateral pharyngotomy. Advances in transendoscopic techniques have reduced the indications for this technique; nonetheless, it remains an important tool in the surgical armamentarium. This chapter discusses the diagnostic, technical, and post-operative factors related to lateral pharyngotomy. Other approaches are discussed in Chapters 29 and 34.

The lateral pharyngotomy approach was first reported by Cheever in 1878, who used it to remove a tumor of the tonsil.[1] The approach was popularized by Trotter in England and Orton in the United States, who added their own modifications to the technique.[2,3]

Historically, lateral pharyngotomy was used as an effective approach to selected squamous cell carcinomas of the oropharynx and hypopharynx.[4,5] It also remains a rare option for access to arteriovenous malformations of the base of the tongue or benign tumors of the larynx, pharynx, or retropharyngeal space (e.g., pleomorphic adenoma or neurofibroma).[6–9] Other circumstances in which the lateral pharyngotomy approach has reportedly been used include removal of a complex foreign body, treatment of severe pharyngeal stenosis, and transposition of a lingual thyroid.[10–12]

PREOPERATIVE ASSESSMENT

Clinical Evaluation

Cancer of the base of the tongue and hypopharynx often does not produce symptoms until it reaches the deep tissues of the tongue and pharynx or until the bulk produces mechanical obstruction. Symptoms include dysphagia, odynophagia, globus sensation, blood in the saliva, trismus, and otalgia. Less frequently, a patient will have a mass in the neck as the chief complaint. These symptoms are nonspecific; however, pain and odynophagia suggest invasion of the deeper planes of the oropharynx, and trismus suggests invasion of the masticator muscles or mandible.

Thorough examination of the head and neck, including visualization of the pharynx and larynx with indirect or fiberoptic pharyngolaryngoscopy, reveals the cancer in the great majority of cases. Bimanual palpation is essential to assess the extent of the cancer, to detect submucosal extension, and to differentiate tumor from the lingual tonsils. Palpation also helps evaluate the mobility of the tumor.

Imaging

Computed tomography (CT) scanning of the oropharynx and neck may delineate the extent of the lesion and is especially useful in assessing erosion of the cortex of the mandible. CT scanning also evaluates the presence of lymphatic metastasis. We have adopted the use of fused positron emission tomography (PET)/CT to evaluate extension of the primary and the presence of metastasis (Fig. 30-1).

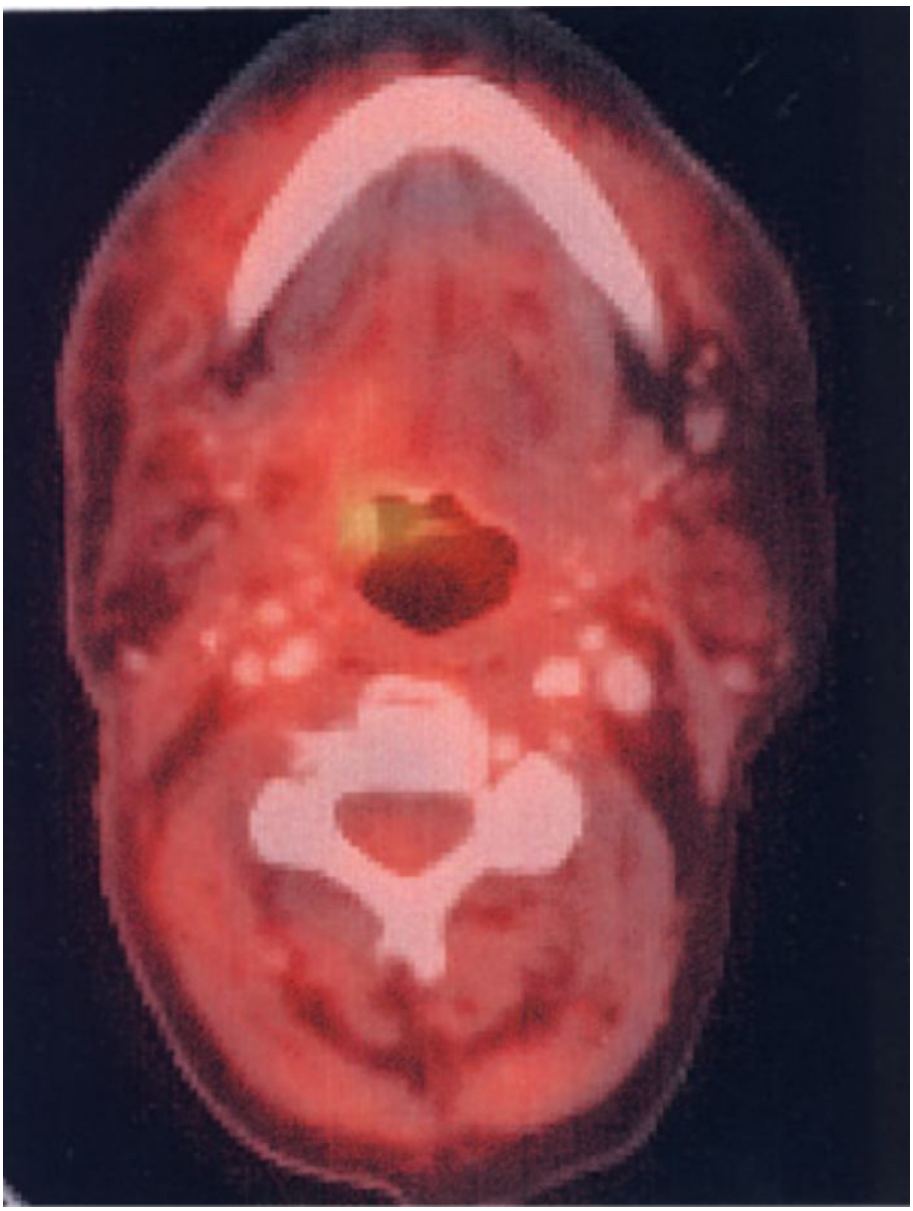

Figure 30-1 Positron emission tomography–computed tomography image showing increased uptake of fluorodeoxyglucose in the left base of the tongue and lateral pharyngeal wall suggestive of recurrence.

Magnetic resonance imaging (MRI) better defines the extent of lesions of the base of the tongue and extension into the bone marrow of the mandible. Nevertheless, MRI is more time consuming and expensive. The time required to complete the study leads to swallowing and movement artifact, which downgrades resolution of the images. In addition, approximately 10% of patients will not tolerate MRI because of anxiety or claustrophobia. Either technique allows assessment of the cervical and retropharyngeal nodes.

A barium swallow esophagogram and a chest radiograph are recommended to rule out a second primary cancer. In addition, videofluoroscopy is best to ascertain the presence of fixation of the posterior wall of the pharynx to the prevertebral fascia. Patients with chronic obstructive pulmonary disease or other parenchymal disease who have advanced cancer (i.e., T3, T4) require a CT scan of the chest. The chest radiographs of these patients are very difficult to evaluate and may be associated with a significant number of false-positive and false-negative results. Patients with metastasis in zones 4 or 5 of the neck have a higher risk of metastasis to the mediastinum and lungs; therefore, they are also evaluated with a CT scan of the chest or, as previously mentioned, a PET/CT fusion study.

Endoscopy

Endoscopic examination under general anesthesia complements the clinical examination and imaging evaluation. Bimanual examination of the primary site and palpation of the neck are repeated under the paralyzing effects of general anesthesia. Palpation under general anesthesia often yields better assessment of the extent of the lesion and may reveal lymphadenopathy that could not be palpated during the office examination.

Direct rigid laryngoscopy allows better assessment of the vallecula and piriform sinuses than can be achieved with flexible laryngoscopy. Laryngoscopy also allows the surgeon to evaluate for the presence of fixation to the prevertebral fascia by assessing the mobility of the posterior pharyngeal mucosa. Esophagoscopy adds sensitivity and specificity to the esophagogram to rule out a second primary cancer in the esophagus. Bronchoscopy is not warranted unless a lesion is detected on the chest radiograph. Biopsies are performed as needed during the pertinent endoscopic procedure.

In selected cases, panendoscopy may be performed just before the extirpative surgery (i.e., single stage) to spare the patient a second visit to the operating room and a second anesthesia. The single-stage approach is also more cost-effective. However, this approach requires that the office examination and imaging provide sufficient information to define the extent of resection and reconstruction needed. It also requires that the patient, family, and surgeon be comfortable with this concept.

PATIENT SELECTION

Lateral pharyngotomy is used most commonly to expose benign and malignant tumors of the lateral and posterior walls of the oropharynx and hypopharynx, as well as those arising at the base of the tongue and postcricoid areas.[13–16] Benign tumors of the supraglottis, such as adenomas and cystic lesions, may also be approached through a lateral pharyngotomy. Most of these lesions, however, are amenable to transendoscopic approaches. An extremely rare indication for lateral pharyngotomy is a complex or sharp foreign body that cannot be retrieved transendoscopically.

Tumors of the base of tongue involving the vallecula are not amenable to a transhyoid approach (see Chapter 29) and may be resected through a lateral pharyngotomy. Superficial lesions, requiring resection of the mucosa only, that may be reconstructed with a split-thickness skin graft can be approached with a contralateral pharyngotomy. This provides direct visualization of the lesion and enough access to suture and bolster the skin graft. Alternatively, the remaining mucosa may be tacked down to the prevertebral fascia and the defect left to heal by secondary intention.

Patients with cancer who require a supraglottic or total laryngectomy or in whom resection involves more than a third of the pharyngeal circumference are not candidates for a lateral pharyngotomy approach. However, lateral pharyngotomy may be combined with another approach, such as median mandibulotomy or a pull-through approach, to provide optimal visu-alization for extirpation of a large cancer of the oro-pharynx.

SURGICAL PROCEDURE

A tracheotomy is usually performed at the beginning of surgery because lateral pharyngotomy produces significant pharyngeal edema and dysphagia, which may lead to airway obstruction and aspiration. In addition, an orotracheal tube may interfere with exposure of the tumor.

A horizontal incision that follows a midneck skin crease is extended through subcutaneous tissue and the platysma muscle. When neck dissection is necessary, the incision can be designed to provide adequate access to the entire cervical area (Fig. 30-2). If a vertical limb is needed to provide better exposure of the posterior aspect of the neck, the trifurcation should consist of three 120-degree angles and be placed as far posterior as possible (i.e., away from the carotid artery).

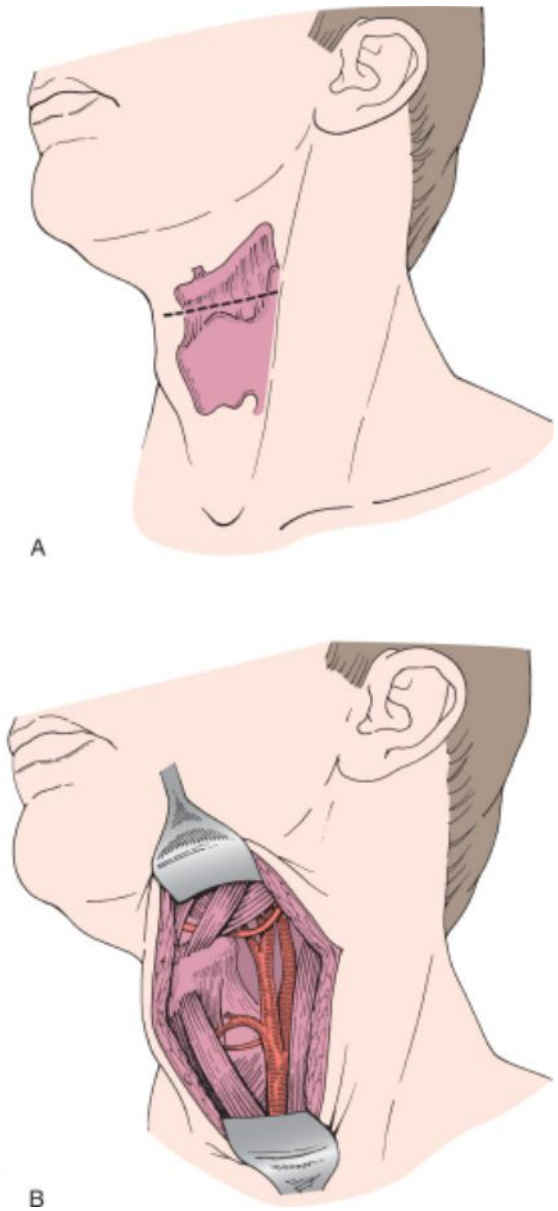

Figure 30-2 **A**, A horizontal incision is placed over the thyrohyoid membrane. Whenever feasible, the skin incision should be placed in a skin crease. The incision can be extended medially and laterally to facilitate neck dissection. **B**, The skin flaps have been elevated to expose the laryngotracheal complex and the contents of the carotid sheath.

Subplatysmal flaps are elevated to the extent appropriate for the intended procedure. If neck dissection is necessary, the inferior flap is elevated to the level of the clavicle. Superiorly, the flap is elevated beneath the platysma until the inferior edge of the submandibular gland is identified. At this time the plane of dissection is carried deep to the submandibular gland. The facial vein is dissected, ligated, and transected, and the distal stump is retracted superiorly with the cervical flap. These two latter maneuvers protect the marginal mandibular nerve. Malignant tumors generally require some type of neck dissection, as discussed in Chapter 78. The supraomohyoid anatomy will be visualized clearly after neck dissection, including zones 1, 2, and 3. Stern has provided an excellent discussion of the anatomy of this area.[17]

The sternocleidomastoid muscle is dissected from the strap muscles to expose the carotid sheath. The carotid sheath and its contents are retracted laterally to allow identification of the inferior constrictor muscle, as well as the superior pole of the thyroid gland and its vascular pedicle (Fig. 30-3). A double-pronged retractor is placed at the posterior edge of the thyroid ala to facilitate the dissection. The dissection is continued superiorly to identify the origin of the superior thyroid and superior laryngeal artery. Gentle retraction and mobilization of the carotid bulb and external carotid artery expose the superior laryngeal nerve, which travels medial to the internal carotid artery. The entire superior laryngeal neurovascular bundle is easily identified after this maneuver. The hypoglossal nerve should be identified cephalad to the superior laryngeal nerve as it curves anteriorly between the internal carotid artery and the internal jugular vein into the submandibular triangle.

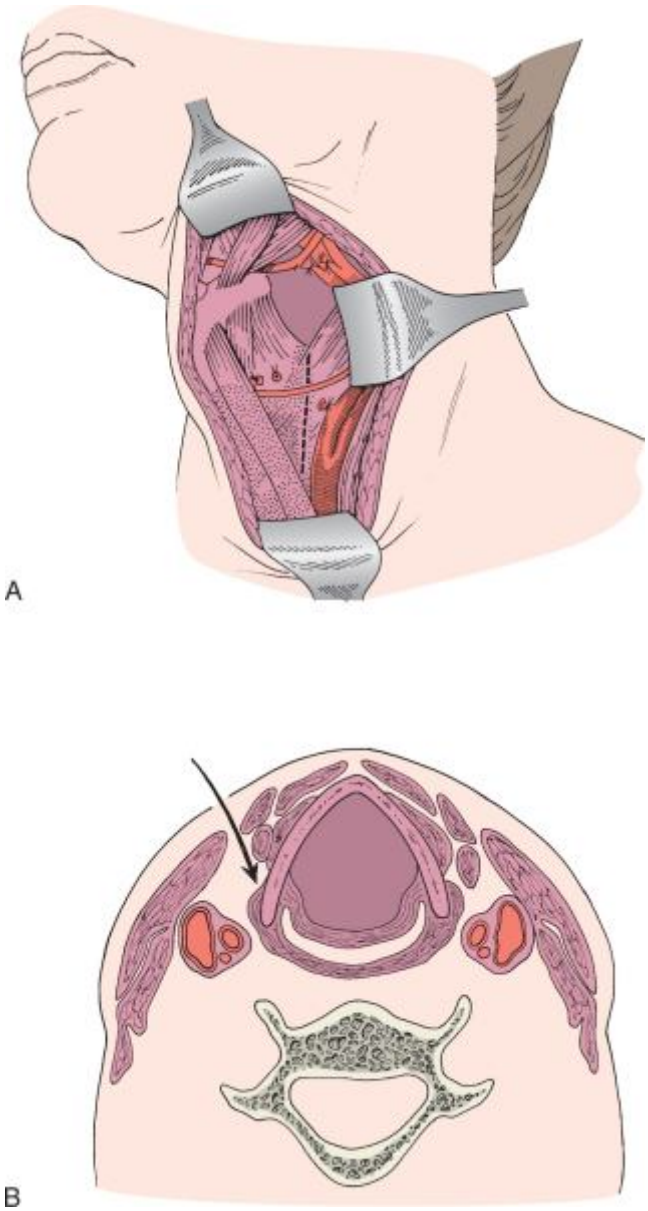

Figure 30-3 **A**, The contents of the carotid sheath and the sternocleidomastoid muscle are retracted laterally to expose the inferior constrictor muscle. The superior laryngeal nerve crosses anteriorly, medial to the carotid bifurcation. The hypoglossal nerve (XII) is shown in its horizontal position. The site for the inferior constrictor myotomy, at the posterior edge of the thyroid ala, is marked with a *dotted line*. **B**, In this axial view, the *arrow* shows the surgical route to expose the inferior constrictor muscle.

The stage and site of origin of the primary cancer dictate the extent of the lateral pharyngotomy. Lesions of the oropharynx require a higher lateral pharyngotomy than do lesions of the hypopharynx. A lateral pharyngotomy can be extended superiorly to expose the nasopharynx or inferiorly to expose the cervical esophagus.

A high pharyngotomy requires cephalic retraction of the laryngeal and hypoglossal nerves; however, the mobility of the superior laryngeal nerve is limited, even after skeletonization, and on rare occasion this nerve must be transected to provide adequate exposure. Mobilization of the soft tissues may be upgraded by removing the lateral third of the ipsilateral hyoid bone and superior cornu of the thyroid cartilage and transecting the thyrohyoid ligament. To enter the oropharynx, the incision is best carried out by placing the index finger along the base of the tongue, inferior and posterior to the tonsillar fossa, and away from the tumor. The finger tenses the middle constrictor muscle and mucosa, thereby facilitating performance of the pharyngotomy, and ensures that the incision is not carried through the tumor (Fig. 30-4). The posterior belly of the digastric muscle is retracted by superior and anterior dissection. If necessary, it can be sacrificed for oncologic margins.

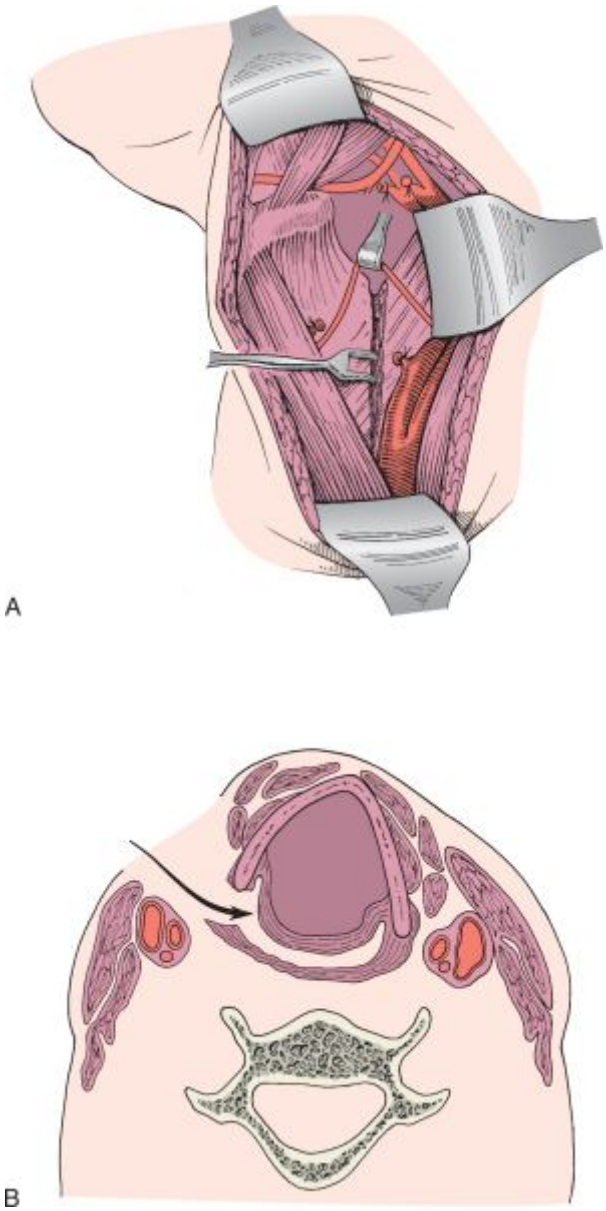

Figure 30-4 **A**, The superior laryngeal nerve is retracted upward, and an inferior constrictor myotomy is performed to expose the mucosa of the piriform sinus and the lateral hypopharynx. **B**, Axial view showing the surgical route *(arrow)* after myotomy.

Lesions located in the superior aspect of the hypopharynx (i.e., posterior pharyngeal wall) may require inferior extension of the pharyngotomy. The inferior constrictor muscle is incised over the posterior edge of the thyroid ala to expose the mucosa of the piriform sinus, which is then dissected from the medial facet of the thyroid ala. The piriform sinus pharyngotomy is opened with sharp instruments or cautery as the surgeon and assistant maintain the mucosa under tension (Fig. 30-5).

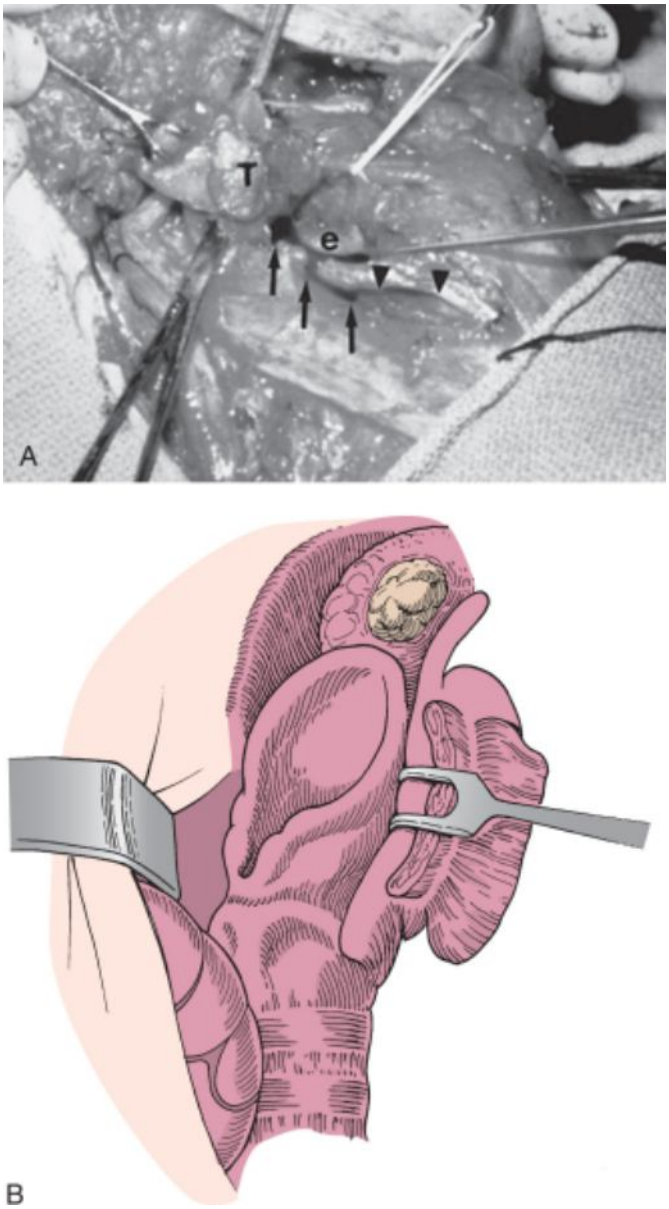

Figure 30-5 **A**, Extirpation of cancer of the base of the tongue (T) through a lateral pharyngotomy approach *(arrows)*. The thyroid cartilage's posterior edge *(arrowheads)* and the epiglottis (e) mark the medial boundary of the exposure. **B**, Base of the tongue lesion exposed through a lateral pharyngotomy.

After the extirpative surgery, a nasogastric tube is placed and the pharyngotomy is repaired with a double-layer technique. The mucosa is closed with an inverting stitch (e.g., Connell) of absorbable suture. The inferior and middle constrictor muscles are reapproximated with interrupted simple or figure-of-eight sutures. A suction drain is left in place, and the cutaneous wound is repaired with a multiple-layer closure.

If the pharyngotomy cannot be closed primarily, the surgeon will have to choose among other soft tissue reconstructive techniques, such as skin grafting, pedicled flaps, and microvascular free flaps. Skin grafting is reliable, is associated with minimal donor morbidity, and provides thin, supple tissue. Nevertheless, it lacks bulk (e.g., it is not appropriate for base of the tongue reconstruction) and is difficult to suture through a lateral pharyngotomy (suturing is easier if the pharyngotomy is combined with a mandibulotomy or pull-through approach). Pedicled flaps, such as the pectoralis major myocutaneous flap (PMMF), are reliable and easy to harvest. The main disadvantages of a PMMF are its tendency to sag with gravity (i.e., increasing the tension at the suture line) and its excessive bulk. A PMMF obliterates the lateral oropharyngeal sulcus and may form a ledge that directs the bolus into the larynx, thereby leading to dysphagia and aspiration. The use of a pectoralis myofascial graft may circumvent this problem and it is most suitable for base of the tongue defects or lateral pharyngeal wall defects when the carotid is at risk of becoming exposed to the pharyngeal lumen.

Microvascular free flaps, such as the radial forearm flap, provide supple tissue and adequate carotid coverage, thus making them ideal for large posterior or lateral pharyngeal defects. Nonetheless, their use requires microsurgical expertise, prolongs the surgical time significantly, and results in increased morbidity and mortality. At

present, all these methods fail to rehabilitate the swallowing mechanism because they lack motor function and sensation.

POSTOPERATIVE CARE

The patient is transferred to an intermediate care unit for postoperative monitoring. The head of the bed is elevated 30 to 45 degrees to diminish wound edema and decrease the probability of gastropharyngeal reflux or vomiting. Other maneuvers recommended to prevent gastropharyngeal problems include intravenous proton pump inhibitors and continuous low-pressure suctioning of the nasogastric tube. Broad-spectrum prophylactic perioperative antibiotics are continued to complete 24 hours of treatment after surgery.

The suction drains are maintained at 80 mm Hg via wall suction. These drains are kept in place until drainage diminishes to less than 20 mL per 24 hours.

The patient is administered humidified air or oxygen via a tracheotomy mask. The tracheotomy is suctioned frequently, and wound care is provided three to four times daily. The tracheotomy cuff is deflated the day after surgery, unless the patient is suffering significant aspiration. The tracheotomy tube is kept in place until the patient is able to handle the saliva and secretions. Once the patient swallows the saliva, the tube can be downsized to a no. 4 tube, plugged, and then removed within a 24- to 72-hour period. The patient is not fed by mouth until the tracheotomy tube is removed. Until then, enteral nutrition is maintained through a nasogastric tube.

COMPLICATIONS

Infection or Pharyngocutaneous Fistula

Diagnosis of infection or fistula requires the presence of purulent exudate or saliva arising from the wound. This is important because erythema, edema, and fever are very common in the postoperative period after head and neck surgery and may lead to overdiagnosis and unnecessary treatment.

The development of infection or a pharyngocutaneous fistula requires initial treatment with systemic antibiotics and adequate drainage to prevent sepsis. The latter is probably the most important factor in-fluencing the outcome of a postoperative wound infection.

Infection occurring while the suction drains are still in place will not require opening of the wound as long as the drains are functional and the wound appears to be well drained (i.e., no abscess). If the drains have been removed, the wound should be opened in a manner that promotes drainage away from the carotid artery.

Although most salivary fistulas heal spontaneously after conservative treatment, some require closure with local or pedicled flaps. This problem is more common when the extirpative surgery requires significant sacrifice of pharyngeal mucosa, which narrows the pharyngeal lumen and adds tension to the wound closure. Causes of nonhealing, such as a foreign body, persistent tumor, wound tension, malnutrition, and inadequate blood supply because of previous surgery, radiation therapy, or microvascular disease, should be kept in mind and eliminated accordingly before planning any complex reconstruction.

PEARLS

- The lateral pharyngotomy approach remains a viable option for the resection of selected squamous cell carcinomas of the oropharynx and hypopharynx.
- The lateral pharyngotomy approach can also be used for exposure and removal of benign laryngeal and pharyngeal lesions or even complex foreign bodies.
- A thorough head and neck examination, imaging, and rigid endoscopy are essential for proper selection of patients for lateral pharyngotomy.
- Mucosal defects of the posterior pharyngeal wall may be closed by primary closure, split-thickness skin grafting, or secondary intention by tacking the mucosal edges to the prevertebral fascia.
- Depending on the location and extent of resection, reconstruction may be accomplished with a split-thickness skin graft, pedicled flap, or microvascular free flap.

PITFALLS

- The lateral pharyngotomy approach is inadequate for patients with cancers that require a supraglottic or total laryngectomy or that involve more than a third of the pharyngeal circumference.
- Care must be taken to avoid injury to the superior laryngeal nerve, given its location and limited mobility.

- The potential for airway compromise as a result of postoperative pharyngeal edema and dysphagia necessitates a temporary tracheotomy in most cases.
- A pharyngocutaneous fistula, the most notorious complication of the lateral pharyngotomy approach, may be more likely to develop when significant sacrifice of pharyngeal mucosa has occurred.
- Failure of a postoperative pharyngocutaneous fistula to close with conservative therapy may require a tissue flap for reconstruction.