

Chapter 56 – Cancer of the Cervical Esophagus

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Cancer arising in the cervical esophagus is an aggressive cancer, usually squamous cell carcinoma, and is typically diagnosed at an advanced stage.^[1] It is often associated with involvement of the larynx and trachea, as well as with a high rate of metastasis to regional lymph nodes and distant organs.^[2]

Because the cervical esophagus may be secondarily invaded by cancer of the hypopharynx, it is very difficult to determine actual survival rates for cancer of the cervical esophagus since these cases are usually embedded in the literature on cancer of the hypopharynx.^[3,4] Patients with squamous cell carcinoma of the cervical esophagus have a dismal prospect for survival, less than a 20% survival rate 5 years after treatment.^[5,6] In comparison, squamous cell carcinoma of the hypopharynx, which is closely related anatomically and histologically, has a 5-year survival rate of nearly 40%.^[6,7]

The poor cure rate for cancer of the cervical esophagus is thought to be related to several factors. Symptoms of cancer of the cervical esophagus are vague and nonlocalizing. Early symptoms usually include mild difficulty swallowing, although some patients may complain only of excessive mucus or a globus sensation. These symptoms are difficult to differentiate from those associated with laryngopharyngeal reflux, which is a very common problem. Thus, these patients may be ignored or treated medically for a long time while the cancer continues to grow. Dysphagia is a late symptom that occurs only when obstruction of the esophageal lumen impairs swallowing function. Pain, marked weight loss, debilitation, and enlarged cervical lymph nodes are also late signs and symptoms of cancer in this anatomic site. Adding to the difficulty in diagnosis is the fact that cancer of the cervical esophagus cannot be visualized by transnasal laryngopharyngoscopy in the outpatient setting.

The aggressive clinical course of cancer of the cervical esophagus is also influenced by the high incidence of submucosal spread, ipsilateral or bilateral cervical lymph node metastasis, and the high rate of a second primary cancer in the esophagus. In the long term there is a high incidence of distant metastasis, intercurrent disease, and second primary malignancies. Despite these aggressive features of the disease, in some cases we have the ability to achieve locoregional control or preservation of organ function (or both) and im-proved survival rates.

Cancer of the cervical esophagus is at an advanced stage in most patients at the time that the diagnosis is made and is treated by surgical resection, usually total laryngopharyngoesophagectomy, total thyroidectomy, and bilateral neck dissection. Chemotherapy has been added to the standard postoperative radiation therapy because recent studies have shown a better outcome for this combined treatment than for radiation therapy alone.^[4,8]

There has been a trend in recent years to use a multidisciplinary approach to the treatment of patients with laryngopharyngeal cancer. The multidisciplinary team must include a head and neck surgeon, reconstructive surgeon, thoracic surgeon, radiation and medical oncologists, radiologist, and speech-language pathologist. This multidisciplinary approach allows us to tailor the treatment program to each patient's needs with the main goals of cure and functional rehabilitation to maximize quality of life.^[1] Forastiere and coauthors reported cure rates with chemoradiation therapy to be comparable to those with surgery followed by adjunctive radiation therapy.^[9] This treatment program, when successful, has the advantage of laryngeal preservation. Unfortunately, this type of nonsurgical treatment may be problematic because the activity of radiation therapy is intensified by the chemotherapy, thus delivering a high dose to the musculature of the pharynx and cervical esophagus, which may render the preserved organ nonfunctional. Scar formation also occurs after destruction of the cancer and produces ulceration of the mucosa. These two factors may result in permanent dysphagia and the need for some form of enteral feeding.

ANATOMY

The cervical esophagus is a short tube that extends from the cricopharyngeal sphincter to the thoracic inlet. The cervical esophagus is lined by nonkeratinizing squamous epithelium over a loose stroma and a muscular layer consisting of an inner circular and an outer longitudinal layer covered by a fascial sheath. Anteriorly, the cervical esophagus has a direct relationship with the posterior wall of the trachea. Laterally lie the recurrent laryngeal nerves, the paratracheal lymph nodes, and the thyroid gland and carotid sheath. Posteriorly, the fascia separates the esophagus from the retroesophageal space, which is continuous with the retropharyngeal space above and the posterior mediastinum below.

There is a rich submucosal lymphatic network that terminates in the lymph nodes along the jugular vein (levels II,

III, and IV) and the paratracheal lymph nodes (level VI).

EPIDEMIOLOGY

Squamous cell carcinoma of the cervical esophagus is strongly linked to excessive cigarette smoking, heavy consumption of alcohol, lower socioeconomic class, and lower educational levels. The possibility of a genetic predisposition to the development of cancer of the hypopharynx and cervical esophagus is currently under investigation. Genotypic and phenotypic deficiencies in the metabolism of tobacco-related carcinogens, as well as abnormalities in the mechanism of DNA repair, may be implicated in the predisposition to cancer of the pharynx and cervical esophagus.^[1]

PATHOLOGY

Squamous cell carcinoma is the most frequent histologic type of cancer found in the cervical esophagus. Submucosal spread around the macroscopic margins of the tumor is a frequent feature either in direct continuity with the cancer or at some distance from the main tumor mass, thus making complete excision difficult.^[9]

Liberale and coworkers^[10] added a case of verrucous carcinoma, a variant of squamous cell carcinoma, to the literature, which previously included 20 such cases. The authors mentioned the recent hypothesis that human papillomavirus (HPV) plays a causative role in the development of verrucous carcinoma. Qualitative polymerase chain reaction assay of a biopsy sample of this tumor revealed the presence of HPV infection. The patient was not deemed fit for surgery and was treated with a local antiviral preparation; the patient's good initial response was unfortunately followed by sudden progression of disease leading to death 6 months later.

Primary adenocarcinoma of the cervical esophagus is rare and may arise from Barrett's esophagus. Less common are tumors that arise from heterotopic gastric mucosa without evidence of Barrett's disease. Alrawi and coauthors reported a patient in whom a primary, moderately differentiated adenocarcinoma with no evidence of Barrett's esophagus was diagnosed. The authors referenced 19 other cases reported in the literature. They also pointed out that these patients had a much better prognosis than those whose cancer arose from Barrett's esophagus.^[11]

Abe and colleagues^[12] reported a patient with adenocarcinoma arising from ectopic gastric mucosa (inlet patch). Their review of the literature revealed only 17 similar cases. von Rahden and associates^[13] also reported a patient with unresectable adenocarcinoma arising in heterotopic gastric mucosa who was successfully treated with chemotherapy and radiation therapy and, after a good response, underwent limited esophageal resection. The patient exhibited no evidence of cancer and had normal swallowing after a 3-year follow-up.

Benign tumors occur infrequently in the cervical esophagus. The most common benign lesions reported in the cervical esophagus are pedunculated hyperplastic or fibrovascular polyps. Oguma and coworkers^[14] reported a patient with a hyperplastic polyp arising in ectopic gastric mucosa. Matsushita and Okazaki^[15] reported a patient who had a pedunculated hyperplastic polyp treated by snare polypectomy. Caceres and coauthors^[16] reported a case and carried out the largest review of the literature consisting of 110 cases of fibrovascular polyp. Sargent and Hood^[17] described a patient who asphyxiated because of airway obstruction caused by a giant fibrovascular polyp. Szumilo and associates^[18] reported a patient in whom a leiomyoma was diagnosed that was asymptomatic and discovered unexpectedly during esophagoscopy. It was removed uneventfully with electrodissection. Marin and colleagues^[19] described two patients with rare tumors of the cervical esophagus. One was a granular cell tumor and one a schwannoma. Both patients were treated by excision of the tumor and reconstruction of the defect with a radial forearm free tissue transfer, which maximized the functional outcome.

PATIENT SELECTION

Patients with locally advanced cancer typically have a history of sore throat, dysphagia, odynophagia, referred otalgia, a mass in the neck, and weight loss. Early in the development of the cancer there may be some nonspecific swallowing difficulty and perhaps a globus sensation. In the life of every practicing otolaryngologist, patients are seen every day with similar symptoms that are either the result of upper aerodigestive tract manifestations of gastroesophageal reflux disease (GERD) or stress related. Some patients will exhibit dysphonia as a result of paralysis of one or both vocal cords secondary to spread of the cancer through the wall of the esophagus and into the recurrent laryngeal nerve. Patients with some or all of the aforementioned symptoms that may be suggestive of cancer of the cervical esophagus should certainly undergo appropriate imaging such as barium esophagography and computed tomography (CT) with intravenous contrast enhancement, including imaging of the head, neck, and chest. These studies contribute to diagnosis and staging and also give information about whether the cancer appears to be technically operable.

Patients in whom distant metastasis has been identified on imaging studies should not be considered for surgical resection. Patients must also undergo diagnostic endoscopy and biopsy, which could include direct laryngoscopy, hypopharyngoscopy, tracheoscopy, cervical esophagoscopy, and when possible, examination of the entire

esophagus. With the amount of tumor found in the cervical esophagus it is often not possible or safe to try to examine the thoracic esophagus for fear of perforating this structure. Pesko and colleagues^[20] described a technique of intraoperative endoscopy in patients with obstructive hypopharyngeal carcinoma that could be adapted to carcinoma obstructing the cervical esophagus. In seven patients, preoperative endoscopic evaluation of the esophagus and stomach could not be performed because of obstruction of the lumen by the tumor. In these patients, intraoperative endoscopy of the esophagus and stomach was carried out through an incision in the cervical esophagus. In one patient a synchronous carcinoma was found in the esophagus despite the fact that neither the preoperative barium esophagogram or CT scan revealed this second primary cancer. Tracheoscopy should be carried out to rule out invasion of the trachea by cancer of the cervical esophagus. Such a finding would not necessarily render the patient inoperable but would have an impact on the extent of the surgery and the type of the reconstruction to be performed. Imaging would also be helpful in detecting whether there is local involvement or encasement of adjacent structures such as the great vessels. Occasionally, there is extension into the midthoracic esophagus, which is often associated with involvement of adjacent structures such as the pericardium.^[2]

Patients often have severe comorbid conditions such as chronic obstructive pulmonary disease (COPD) related to the cigarette smoking that has been implicated as the primary cause of squamous cell carcinoma of the cervical esophagus. Resection of the cervical esophagus generally requires using a gastric transposition (pull-up) and pharyngogastric anastomosis for reconstruction, and patients with severe COPD may not tolerate this procedure. Severe cardiac or other comorbid conditions may also be strong contraindications to surgery. A history of previous abdominal surgery such as gastrectomy or colectomy will likewise limit the choices for reconstruction.

Physical examination plays a key role in the selection of patients for treatment. The oral cavity and oropharynx are examined so that asymptomatic second primary cancers will not be overlooked. At the same time the patient's dental status can be evaluated. Indirect mirror examination of the hypopharynx may be complemented by flexible fiberoptic endoscopy, which provides a global view of the entire pharynx and larynx, including assessment of vocal cord mobility. Failure to identify a tumor in the hypopharynx in a patient with pooling of saliva in the hypopharynx is an indirect sign of cancer of the cervical esophagus. Bilateral vocal cord paralysis may be encountered in patients with cancer of the cervical esophagus. The mechanism is invasion of cancer through the wall of the esophagus into the tracheoesophageal sulcus and then into the recurrent laryngeal nerves. Palpation of the neck is necessary to detect cervical adenopathy. The finding of fixation of a cervical mass on palpation is a contraindication to surgical management of the cancer because of encirclement of the carotid artery.

Many of these patients have lost significant weight and are nutritionally depleted. Attempting to perform extensive surgery on such individuals will result in an unacceptable rate of complications, lengthy hospitalization, and mortality. The Veterans Administration Surgical Risk Study^[21] dramatically demonstrated that low levels of serum albumin correlate with an increased incidence of postoperative complications. Low hemoglobin has also been shown to be a negative prognosticator for survival. Hence, assessment of the patient's nutritional status must be an integral component of the preoperative evaluation. Enteral feeding through a nasogastric or percutaneous endoscopic gastrostomy (PEG) tube is necessary to replenish the nutritional status of patients who are being considered for surgery, as well as those who will be treated with chemotherapy.

Certainly, the most obvious contraindication to surgery is refusal of the patient to provide consent for the procedure. There is a great deal of interest and publicity concerning the use of chemoradiation therapy for the treatment of cancer, as well as for the treatment of other diseases not related to cancer of the head and neck. Patients may wish to forego laryngectomy, which is oncologically necessary in most of these cases, and prefer to have the cancer treated by nonsurgical means such as chemoradiation therapy. Patients who are found to have invasion of the prevertebral fascia or bone are incurable and may simply be assigned to palliative care.

PREOPERATIVE PLANNING

Physical examination should certainly include an evaluation of the head and neck. One would expect on either indirect mirror laryngoscopy or flexible fiberoptic laryngoscopy to find pooling of secretions in the hypopharynx as a result of distal obstruction by tumor in the cervical esophagus. Either unilateral or bilateral paralysis of the vocal cords may be present because of extension of cancer through the wall of the cervical esophagus into the vagus or recurrent laryngeal nerves. In the presence of vocal cord paralysis, a history of chronic aspiration would be anticipated.

Imaging studies are invaluable for evaluating the presence and extent of locoregional disease, as well as for determining the possibility of distant metastasis, which would rule out the possibility of extirpative surgery. Barium esophagography remains a very important study for evaluation of the extent of the primary tumor, particularly if esophagoscopy is not feasible (Fig. 56-1A). This study is used to determine the extent of mucosal involvement and to establish the presence of a second primary cancer in the more distal part of the esophagus. Perhaps the most valuable aspect of this study is fluoroscopic determination of whether invasion through the posterior wall of the esophagus has occurred. Obliteration of the retropharyngeal and retroesophageal space or invasion of the prevertebral fascia can be estimated through dynamic fluoroscopic evaluation rather than still images. In the

presence of aspiration, it would be prudent to carry out a diatrizoate meglumine (Gastrografin) esophagogram rather than a barium esophagogram because less reaction occurs if the patient aspirates Gastrografin into the lungs than if barium is aspirated.

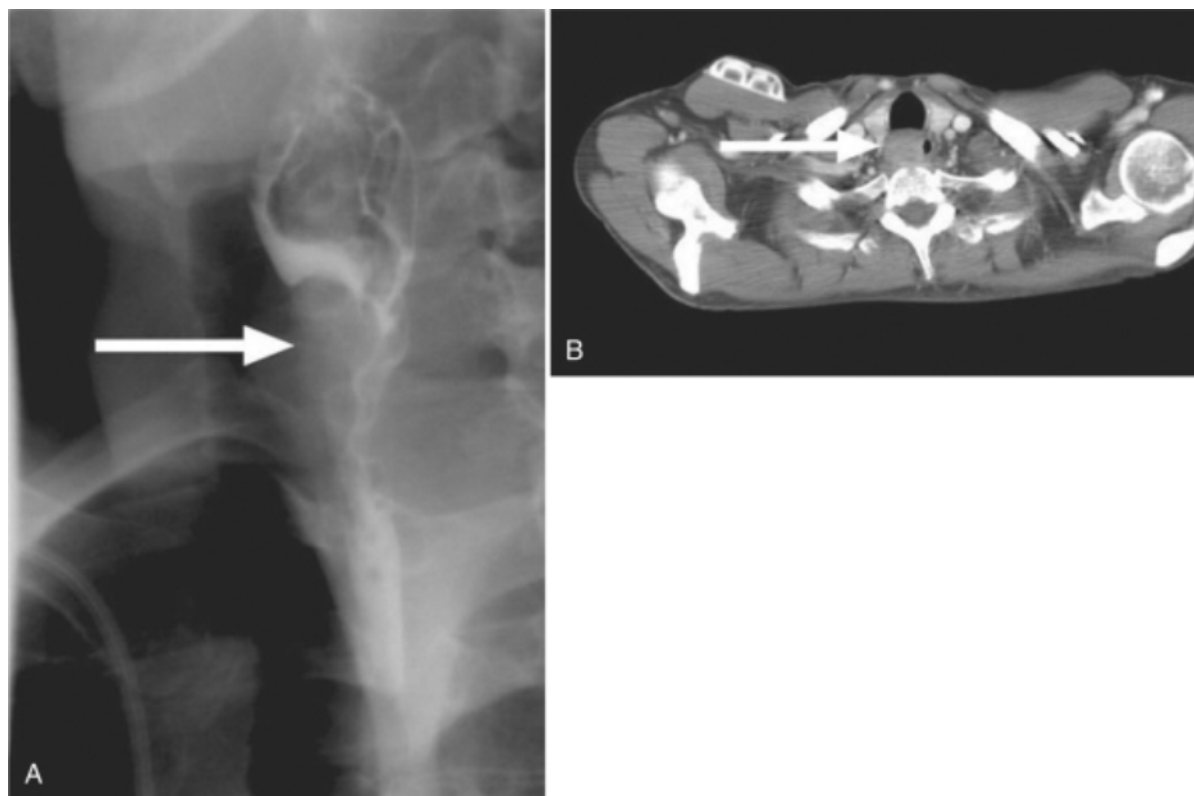


Figure 56-1 A, Barium esophagogram demonstrating carcinoma of the cervical esophagus (*arrow*). B, Computed tomography scan of same patient demonstrating the cancer with narrowing of the lumen of the cervical esophagus (*arrow*).

A CT scan of the head, neck, and chest with intravenous contrast enhancement is still the most widely used imaging modality for the initial evaluation of patients with cancer of the cervical esophagus (Fig. 56-2). Fine-cut CT scanning can be done very quickly, even in patients who have difficulty lying supine because of their advanced cancer. The goals of CT scanning are to accurately evaluate the location and size of the primary cancer and determine whether there is direct extension of tumor into the neck (see Fig. 56-1B), especially posteriorly into the retropharyngeal and esophageal space, prevertebral fascia, or vertebral column. An anterior-posterior diameter of the cervical esophagus greater than 24 mm must be considered abnormal. The average thickness of the wall is 4.8 mm laterally and 3.8 mm posteriorly. Two criteria with the best sensitivity are thickening of the esophageal wall and effacement of the fat plane. Another criterion that has a reported sensitivity of 100% is the presence of a circumferential mass surrounding the esophagus greater than 180 or 270 degrees.[1]



Figure 56-2 Squamous cell carcinoma of the cervical esophagus with extensive invasion of surrounding structures in the neck (*arrow*).

Determination of the presence or absence of cervical lymph node metastasis by contrast-enhanced CT is fundamental in preoperative planning. Encasement of the carotid artery is a definite contraindication to surgery. CT scanning is preferably performed before endoscopy and biopsy so that the surgeon is aware of the extent of the disease and also to prevent distortion of tissues, which may result in overestimation of cancer infiltration.

Magnetic resonance imaging (MRI) is not routinely performed for staging of cancer of the cervical esophagus. Although MRI has superior resolution for demonstrating soft tissue detail, its susceptibility to motion-induced artifact makes CT a superior technique.

Positron emission tomography (PET)/CT scanning has recently been accepted as a useful technique for staging cancer of the head and neck. Fusion of the qualitative analysis of the PET portion with the precise details and volumetric analysis of the CT portion makes this a valuable staging procedure. Whole-body PET/CT scanning also provides information about the presence or absence of distant metastasis and second primary cancers. In addition, this technique plays a valuable role in the reevaluation of a patient who has undergone chemoradiation therapy.

Ultrasonography is useful in the assessment of cervical lymph node metastasis. It is a simple, noninvasive, highly sensitive technique that when combined with fine-needle aspiration biopsy, provides valuable information in the staging process.

A complete medical evaluation should be carried out to determine the patient's ability to undergo diagnostic endoscopy and biopsy. Because of their smoking history, many of these patients will have COPD with poor pulmonary reserve. Many of the patients who have undergone laryngopharyngoesophagectomy for treatment of cancer of the cervical esophagus have been reconstructed via gastric transposition, which requires dissection of the posterior mediastinum and insertion of chest tubes because pulmonary complications may occur. If very severe COPD is present, the patient may be eliminated as a candidate for such surgery. Previous cardiac surgery, including coronary artery bypass grafting, can cause scarring that may make it dangerous when the mediastinum is entered during reconstructive surgery. The patient's liver function should be evaluated. Many of these patients have a history of chronic alcoholism with cirrhosis of the liver, which may not allow them to qualify for chemotherapy either in the postoperative adjuvant setting or as part of a protocol with organ preservation. A chronic alcoholic who continues to drink heavily before surgery is at high risk for delirium tremens.

Endoscopy should be carried out under general anesthesia; however, some of these patients will also have upper

airway obstruction or an unstable airway because of bilateral vocal cord paralysis. These patients are best served by performing a tracheostomy under local anesthesia before endoscopy. Tracheoscopy is also necessary because of the possibility of cancer of the cervical esophagus invading the posterior wall of the cervical trachea. Although such invasion is not necessarily a contraindication to surgery, it does have an impact on the extent of surgery and surgical reconstruction and should be known ahead of time for proper procedure planning. If there is involvement of the prevertebral fascia or vertebral column or encasement of the carotid arteries, surgery is contraindicated. Generous biopsy samples of the cancer should be taken at the time of endoscopy.

If the patient has previously undergone abdominal surgery or if there is a history of gastric or colonic disease, additional evaluation may require gastrointestinal endoscopy. Operative reports from previous abdominal surgery should be obtained. In Weisberger's experience,^[2] coexisting hypertrophic gastritis increases the risk for ischemia of the stomach when gastric transposition is used as a method of reconstructing the esophagus. If a free tissue transfer or colon transposition is used, it is important to exclude any significant pathology involving the colon. Therefore, colonoscopy should also be carried out in such patients.

Patients with comorbid conditions should be optimized before surgery. For instance, patients with low hemoglobin should undergo transfusion, and patients whose nutritional status would not allow them to be surgical candidates should be treated with intravenous hyperalimentation; alternatively, if it was thought that the stomach would not be used for reconstruction, a percutaneous gastrostomy tube may be placed and nutritional replenishment carried out before surgery.

After the patient has been thoroughly evaluated and the biopsy report is available, staging of the cancer should be performed. The current staging system for cancer of the cervical esophagus is identical to that for the intrathoracic esophagus (Table 56-1).

Table 56-1 -- STAGING OF CERVICAL ESOPHAGEAL CANCER

For cancer of the cervical esophagus, the recommended staging is identical to that for the intrathoracic esophagus:	
Tis	Carcinoma in situ
T1	Tumor invades the lamina propria or submucosa
T2	Tumor invades the muscularis propria
T3	Tumor invades the adventitia
T4	Tumor invades adjacent structures
The nodal classification for the hypopharynx is the same as that for other sites in the head and neck. For the cervical esophagus, the nodal classification differs as follows:	
N0	No regional lymph node metastasis
N1	Regional lymph node metastasis

From Lefebvre JL, Chevalier D, Coche-Dequeant B: Cancer of the hypopharynx and cervical esophagus. In Myers EN, Suen JY, Myers JN, Hanna EY (eds): Cancer of the Head and Neck, 4th ed. Philadelphia, WB Saunders, 2003, pp 379-390.

There are two reasons for the lack of evidence-based decision making in cancer of the cervical esophagus: cancer in this anatomic site is rare, and the results of treatment of these cancers are usually embedded in the literature on treatment of the much more commonly encountered cancer of the hypopharynx. Historically, cure rates with radiation therapy alone were poor, but newer protocols using concurrent chemoradiation therapy appear to offer improved cure rates with occasional effective palliation. Most patients require long-term gastrostomy tube feeding, and some require palliative laryngectomy or laryngotracheal separation to control aspiration. Control rates of 88% were reported by Burmeister and coworkers, with surgical salvage successful in five patients.^[4] Peracchia and colleagues, however, reported local control in only approximately 33% of their patients randomized to one of two chemoradiation arms.^[3] Successful surgical salvage was reported in 25 patients treated by Meunier and associates.^[22]

Reconstruction of an intact swallowing tube is a prerequisite for the rehabilitation of patients with cancer of the cervical esophagus. With the exception of the very few patients with limited cancer, most are treated by total laryngopharyngoesophagectomy with gastric transposition (pull-up) and pharyngogastric anastomosis as described by Ong and Lee more than 40 years ago.^[23] This technique permits removal of the primary cancer, as well as the entire esophagus, which has the attendant risk of submucosal spread and "skip" lesions. Such "skip lesions" were identified in 3% of a series of 209 patients treated by Peracchia and coworkers.^[3]

SURGICAL TECHNIQUE

The patient is taken to the operating room and endotracheal anesthesia is induced. A rolled towel is placed under

the patient's shoulders to provide extension of the neck. The patient is then prepared and draped in such a way that there is access not only to the head and neck but also to the chest and abdomen. Appropriate draping is carried out so that after the head and neck procedure is complete, the drapes may be removed and the reconstruction carried out.

An apron flap is elevated. One sternocleidomastoid muscle is retracted laterally and the larynx medially. The carotid sheath is retracted laterally and the prevertebral fascia is identified by blunt dissection. Finger palpation is then used to determine whether the cancer has infiltrated into the retropharyngeal or retroesophageal space or into the prevertebral fascia. If cancer is present in the retropharyngeal or retroesophageal space, the surgery should be terminated because it is impossible to get a clear margin of resection posteriorly when invasion of the prevertebral fascia is present. In such cases, a gastrostomy and possibly a tracheostomy should be carried out to provide a means of nutrition and maintenance of the airway. If the retropharyngeal space is clear, surgery should proceed. Bilateral selective neck dissection is performed. If the patient has an N0 neck, levels II, III, IV, and VI are dissected. Dissection of level VI is mandatory because multiple lymph nodes in the tracheoesophageal groove may be involved. For more information on neck dissection, see Chapter 78.

The extent of tracheal resection is dictated by the imaging studies and tracheoscopy. If there is no tracheal involvement, the usual transection of the trachea between the second and third tracheal rings is appropriate. However, if cancer has extended into the trachea, more of the distal trachea may need to be resected. It is important to remove the thoracic esophagus because of the frequent presence of multifocal disease and second primaries of the esophagus.

A transhyoid pharyngotomy is carried out (Fig. 56-3) and the retropharyngeal fascia is separated from the prevertebral fascia in the retropharyngeal space up into the level of the transhyoid incision. At this point scissors can be used to cut through the posterior wall of the pharynx. After this is carried out, the specimen containing the larynx and pharynx attached to the cervical esophagus is then elevated by sharp and blunt dissection down as far as possible into the anterior mediastinum (Fig. 56-4). Ligation of the superior laryngeal arteries and veins is carried out during this procedure. The adjacent lymph nodes, including the retropharyngeal group, should also be taken at this point. Inspection of the thyroid gland will determine whether the thyroid gland should be left intact or be totally or partially removed. Oftentimes the thyroid tissue has been infiltrated by cancer and must therefore be removed (see Fig. 56-2). Specimens should be taken from the superior margin of resection of the pharynx and sent to the pathology department to make certain that the margins of resection are free of cancer. If not, additional specimens must be taken until clear margins are obtained. The specimen remains attached until the stomach is mobilized.

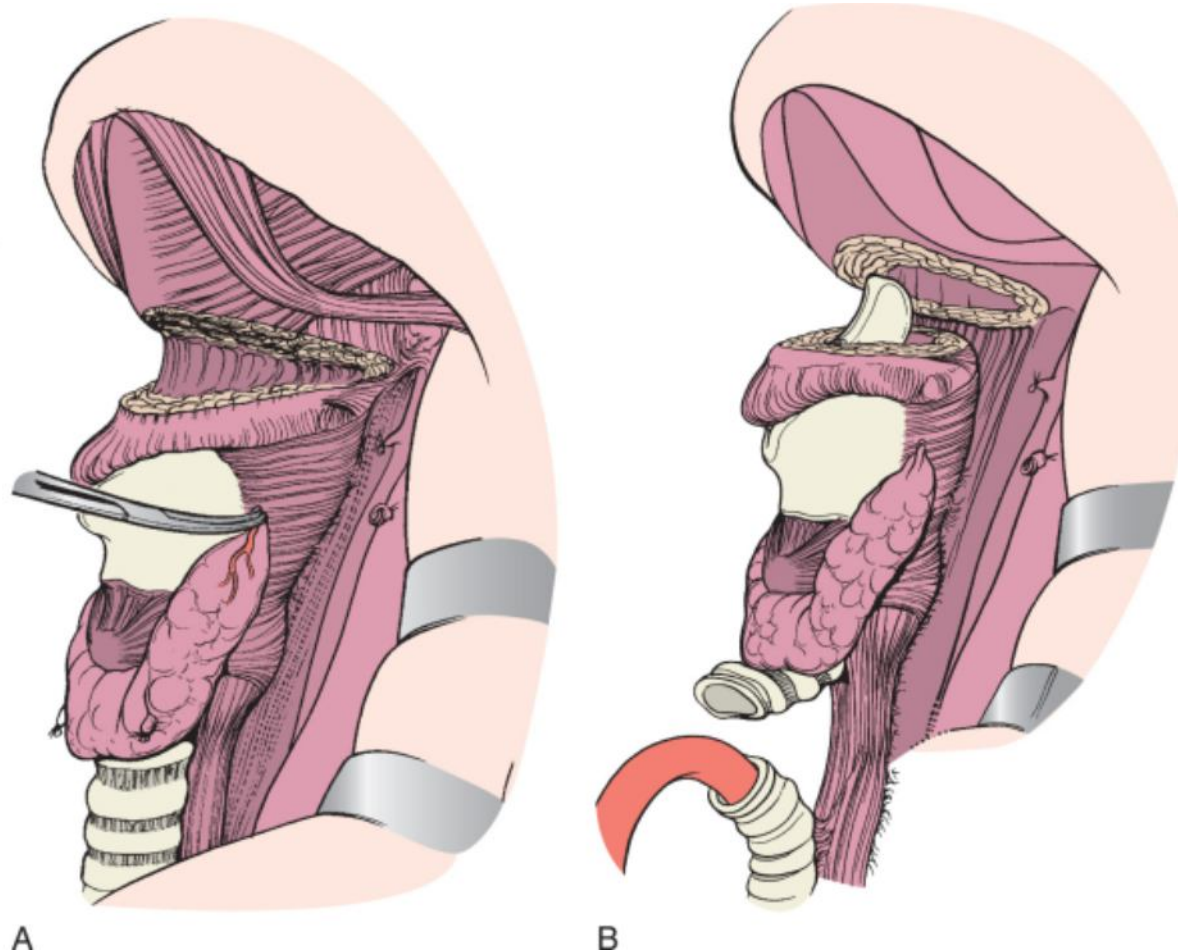


Figure 56-3 **A**, Transhyoid pharyngotomy is carried out and the pharyngeal lumen is explored. **B**, The incision is carried through the lateral and posterior pharyngeal wall to separate the pharynx from the base of the tongue. (From Silver CE: *Surgery for Cancer of the Larynx and Related Structures*. New York, Churchill Livingstone, 1981, pp 198-199.)



Figure 56-4 The specimen is elevated off the prevertebral fascia by finger dissection as far inferior as the superior mediastinum, where it is pedicled on the cervical esophagus.

It should be known beforehand, with the combination of imaging studies and endoscopy, whether the tumor is fixed to the prevertebral fascia or is encasing the carotid arteries. If, however, the surgeon unexpectedly finds encasement of the carotid arteries, the extirpative part of the procedure should be continued with the understanding that this is palliative rather than curative surgery. The stomach is then mobilized in the abdomen. Blunt dissection in the mediastinum from the abdomen into the neck allows the specimen to be delivered and the stomach to be delivered into the neck by applying gentle traction to each (Fig. 56-5). The esophagus is separated from the stomach at the gastroesophageal junction, the lumen of the pharynx and esophagus is opened, and the edges of the specimen are checked microscopically for tumor clearance (Fig. 56-6).

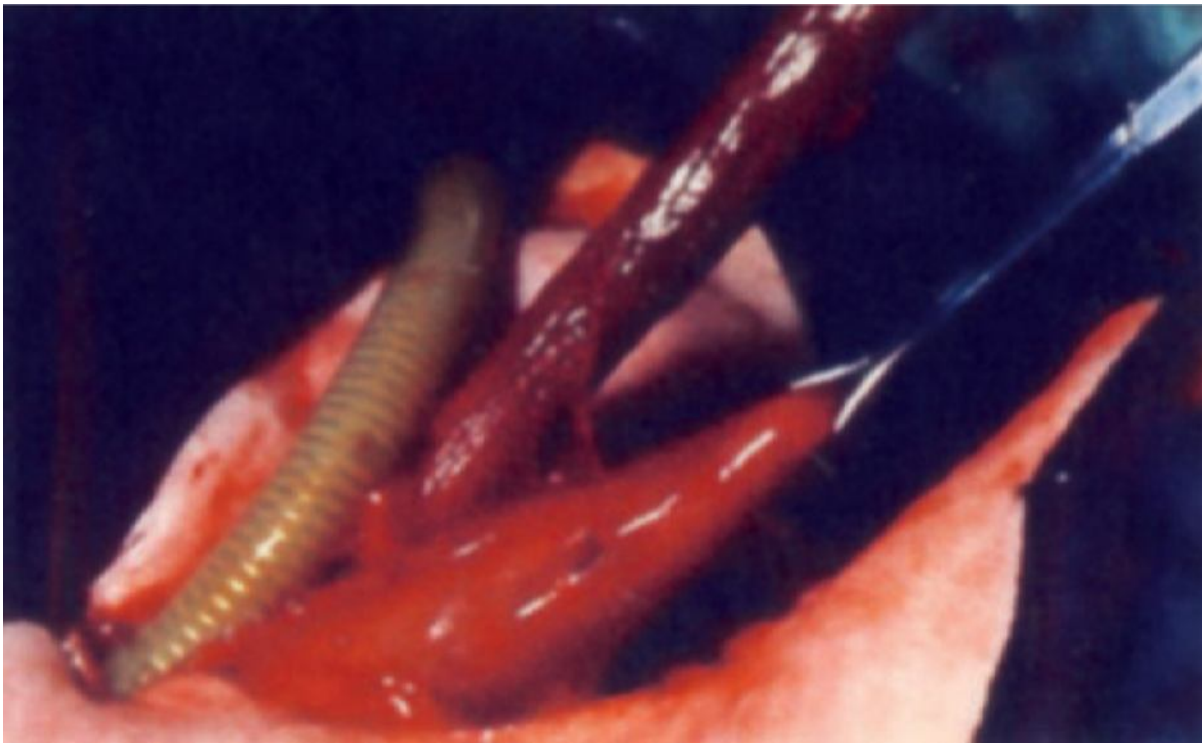


Figure 56-5 Using gentle traction on the specimen and the stomach allows the specimen to be delivered and the stomach to be brought into the neck to complete the pharyngogastric anastomosis.



Figure 56-6 Laryngopharyngoesophagectomy specimen. It will be opened lengthwise to inspect the mucosa of the pharynx and esophagus and to be certain that tumor clearance is microscopically adequate.

Most tumors arising in the cervical esophagus are malignant, and pharyngolaryngoesophagectomy is necessary to obtain clear margins of resection. For the occasional patient with a small cancer or in the event of a benign tumor, limited resection of the cervical esophagus with preservation of the larynx and the function of the cricopharyngeus muscle and vocal cords may be possible. However, an intact larynx and cervical trachea severely limit exposure of the cervical esophagus and make reconstruction technically difficult. Mizobuchi and colleagues^[24] used a Weerda laryngoscope to remove an early esophageal cancer.

Reconstruction

Reconstruction of the esophagus is carried out by a reconstructive team, with some exceptions, which will be explained later. Several types of surgical reconstructive techniques can be used in the case of total laryngopharyngoesophagectomy, including enteric procedures such as gastric and colonic transposition, free flaps, and a combination of free flaps and regional flaps.

Gastric Transposition

The late Sir Donald Harrison^[6] reported his experience in 1986 with a review of 101 operations carried out at the Royal Nose, Throat and Ear Hospital on patients with cancer of the hypopharynx and cervical esophagus. He popularized the use of laryngopharyngoesophagectomy with gastric transposition for cancer of the cervical esophagus. Most head and neck surgeons believe that resection of the entire esophagus gives the best opportunity both for control of the primary cancer in the cervical esophagus and for removal of second primary

cancers in the thoracic esophagus.

Rapid re-establishment of deglutition is very desirable, and gastric transposition also has the advantage of being a reliable single-stage method of reconstruction. The disadvantages are that abdominal dissection is required and gravity creates tension on the suture line, which may involve previously irradiated tissue. Introduction of the laparoscopic technique of mobilizing the stomach should overcome the disadvantage of the extensive open abdominal dissection.^[25] Patients commonly exhibit early satiety because of the loss of stomach-filling capacity.^[26]

After the stomach has been transposed up into the neck, a two-layer closure with nonabsorbable suture is carried out to sew the stomach to the remaining walls of the hypopharynx and the base of the tongue (Fig. 56-7). Postoperative chest radiography shows the stomach widening the mediastinal shadow (Fig. 56-8).

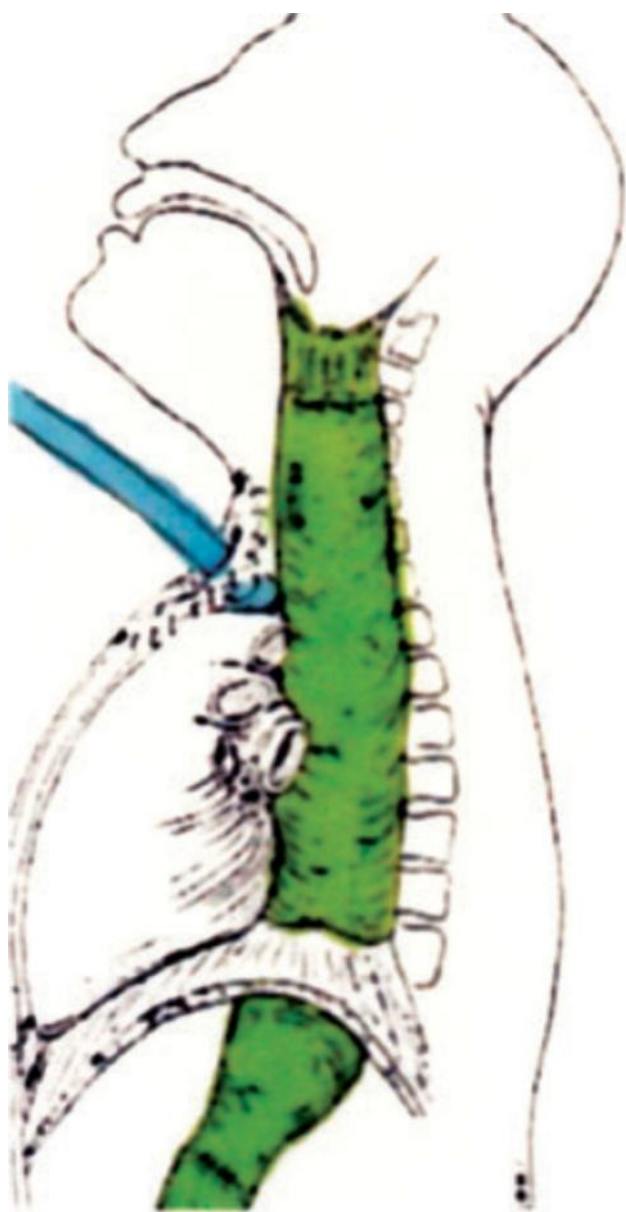


Figure 56-7 Diagram of gastric transposition with pharyngogastric anastomosis.

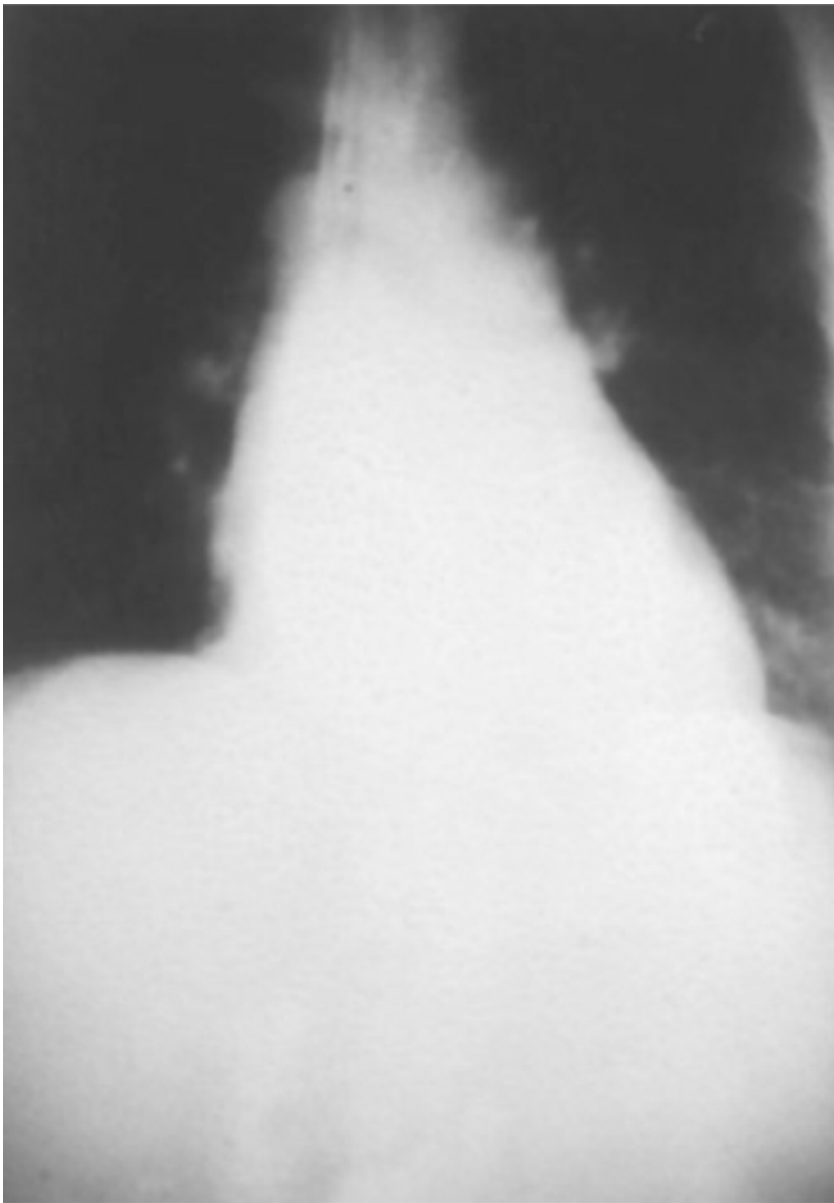


Figure 56-8 Postoperative chest radiograph demonstrating the stomach widening the mediastinal shadow.

Colonic Interposition

This procedure is usually reserved for the rare situation in which either a gastric transposition or a free tissue transfer is not possible. Preparation of the bowel with a pure liquid diet and oral intake of antibiotics directed at colonic flora is instituted 48 hours before surgery. Cheng and coauthors^[27] reported a series of cases in which colonic interposition was used for reconstruction in patients who had cancer of the esophagus that occurred after partial or subtotal gastrectomy. The authors believed that the reconstruction was performed without major complications and provided good function. Colonic interposition has somewhat limited reach cephalad, and the presence of inherent bacteria places the mediastinum and abdomen at risk if a leak occurs.^[26]

At the end of the procedure a tracheostoma is fashioned in the usual way (see Chapter 49). We have performed, with a reasonable degree of success, “tracheogastric” puncture in patients in whom reconstruction involves gastric transposition and “tracheojejunal” puncture in those in whom repair is accomplished with a jejunal interposition flap. This procedure is simple and safe, and puncture into the jejunum produces a rather “moist” voice but one that is understandable. Puncture through the posterior wall of the trachea into the transposed stomach also produces a suboptimal, though understandable low-volume voice. The reader is referred to Chapter 81 to obtain more information about reconstruction after laryngopharyngoesophagectomy.

Free Flaps

In 1959, Seidenberg and colleagues^[28] reported using a free jejunal autograft for reconstruction after pharyngoesophagectomy for recurrent cancer. This was the first use of a free tissue transfer in humans. Since that

time, several other free tissue transfers have been introduced for reconstruction after esophageal resection, including gastro-omental flaps, the radial forearm flap, and the anterolateral thigh flap. A gastro-omental flap has several advantages. The stomach mucosa can be used to line defects in the oral cavity and oropharynx and can be tubed for pharyngeal reconstruction. The mucosa of the stomach is non-hair bearing, pliable, and easily fashioned to reconstruct a three-dimensional defect.^[26] Perhaps the most unique advantage of this flap is its ability to secrete mucus. This improves the quality of life of patients, particularly in those who have postradiation xerostomia. Righini and associates^[29] also described the use of a tubed gastro-omental free flap for hypopharyngeal and cervical esophageal reconstruction after total laryngectomy. Five of their six patients had previously undergone chemoradiation therapy, and three had previously undergone surgery. Patients who survived had a normal diet and esophageal voice.

The free jejunal autograft (FJA) is a versatile flap that is most useful in patients with cancer of the hypopharynx because the distal suture line is not placed in the mediastinum. However, in surgical management of cancer of the cervical esophagus, use of the jejunum is limited. Some authors have reported success in a limited series of cases. Shirakawa and coauthors^[30] reported use of the FJA in a series of 54 patients. Cervical esophageal resection with successful laryngeal preservation and reconstruction with an FJA was performed in six patients with cancer of the cervical esophagus, all of whom enjoyed a good quality of life.

Wadsworth and colleagues^[31] described for the first time in humans laparoscopic harvesting of an FJA for reconstruction of hypopharyngeal and cervical esophageal lesions. Bardone and associates^[32] also described their experience with laparoscopic techniques and reported good results with a low complication rate. These advances in harvesting eliminate the potential morbidity of an open abdominal procedure. Ascoti and coworkers^[33] described a long-segment, supercharged, pedicled jejunal free tissue transfer for total esophageal reconstruction. Microvascular augmentation of a pedicled jejunal flap allows the creation of a longer conduit, thus making it possible to replace the entire esophagus in one stage. The authors reported excellent functional outcomes despite the severity of disease and the technical challenge. Takushima and colleagues^[34] described a double vascular pedicled free jejunal transfer for total esophageal reconstruction. A long jejunal segment with this vascular pedicle can be transferred as a free flap and used to reconstruct the entire esophagus in one stage.

Microvascular free jejunal transfer combined with a deltopectoral flap has been reported by McCarthy and coauthors^[35] for reconstruction of the tracheostoma and cervical esophagus after exenteration of the contents of the central portion of the neck. Combined defects of the skin, larynx, pharynx, and esophagus after exenteration of the central compartment of the neck can be extremely difficult to reconstruct. These complex defects can be effectively reconstructed with free jejunal transfer to restore continuity of the alimentary tract and with a deltopectoral flap to reconstruct the tracheostoma and surrounding cutaneous defects. The deltopectoral flap provides a large volume of well-vascularized tissue that affords reliable coverage of the newly reconstructed cervical esophagus and exposed major vessels after exenteration of the central compartment. Its thin, pliable nature allows suturing of the trachea to the skin edge without tension and avoids intraluminal prolapse of excess soft tissues, thus maintaining patency of the tracheostoma.

Yu^[36] described a novel technique performed in 10 patients for reconstruction of combined pharyngoesophageal, tracheal, and anterior neck defects with a single anterior thigh flap. The skin paddle was divided into two islands based on cutaneous perforators. One paddle was tubed and used for esophageal reconstruction and the other for repair of cutaneous defects. This technique provides good cosmetic and functional results with minimal morbidity and quick recovery.

POSTOPERATIVE MANAGEMENT AND COMPLICATIONS

Postoperative management and complications of neck dissection are described in Chapter 78 and complications of laryngectomy in Chapter 49. The principles are not different for patients undergoing surgery for cancer of the cervical esophagus and include progressive resumption of an oral diet. Postoperative management of patients who have undergone gastric transposition includes the insertion of a nasogastric tube to facilitate decompression of the gastrointestinal tract. If for some reason the condition of the patient precludes early resumption of oral intake, total parenteral nutrition through a central venous catheter can be instituted. Chest tubes are used routinely in patients undergoing gastric transposition and placed in water-sealed suction bottles.

Postoperative complications may include pleural effusion and pneumonia. This is related to the transmediastinal dissection and is usually self-limited, and the chest tubes are removed when no longer necessary. Intrathoracic chyle leak in which several liters of fluid can accumulate has been reported. Such high-volume chyle leaks need to be repaired surgically in the near term because they may produce severe metabolic abnormalities. Necrosis of the gastric transposition tube is a known complication that may be associated with a high mortality rate because the abdomen, thorax, mediastinum, and neck compartments all become contaminated with oral cavity bacteria. Stricture of the gastropharyngeal junction, though a possibility, has not been reported, and in fact the match between the stomach and hypopharynx is quite good and remains patulous, which fortunately, on the positive side, allows good swallowing, but it can also promote reflux and regurgitation both in the recumbent position and when

the patient stands upright and then bends over.

Triboulet and coauthors^[37] reported a total mortality rate of 4.8% and an overall morbidity rate of 38.3% in a series of 209 patients, including 78 with cancer of the cervical esophagus. Reconstruction was carried out via gastric transposition, colonic transposition, or a jejunal free flap. Gastric transposition is the most frequent cause of respiratory complications. The survival rate without dysphagia is better in patients with gastric transposition than in those with jejunal grafts. The authors found no significant difference in survival between the techniques of reconstruction. However, better results were obtained with gastric transposition because of fewer postoperative complications, faster re-establishment of oral feeding, and better quality of life.

Podrecca and colleagues,^[38] in their review of 346 patients who underwent free flap reconstruction in the head and neck, found that poor preoperative condition, previous treatment, and requirement for a vein graft were significantly associated with an increased risk for flap failure and other morbidities. Fistula formation occurs in 7% to 37% of patients.^[37] Necrosis and fistula rates are higher when jejunal free flaps are used than with gastric transposition. Murray and coworkers^[39] re-reported that in none of the 14 patients reconstructed with a combination of anterior thigh flap and salivary bypass did a fistula develop despite the fact that some had been treated previously. In one of their patients a stricture developed that was successfully treated by dilatation.

Stricture formation after pharyngolaryngoesophagectomy is a complication that can be treated in several ways. The most direct approach is surgical revision of the stricture. However, the stricture is often the result of fistula formation with healing by secondary intention. Because of intense scarring and previous irradiation therapy, this surgical approach may cause greater problems than the stricture with the potential for wound breakdown and fistula formation.

Balloon dilatation of strictures of the cervical anastomosis after pharyngoesophageal resection was performed successfully by Szentkereszty and associates.^[40] The mean time from surgery to dilatation was 7.8 months, and the mean number of dilatations was 3.2. A stent was placed in patients whose strictures were due to recurrent cancer.

Self-expanding metal stents have been used to provide rapid relief from dysphagia and may seal off tracheoesophageal fistulas.^[41] Some stents incorporate an antireflux valve, which has been shown to reduce symptoms of GERD. These stents are also useful for starting early feeding in patients. Tomifuji and colleagues^[42] used silicone stents for the treatment of pharyngocutaneous fistula.

Replacement of thyroid hormone is necessary in patients whose thyroid gland has been removed at the time of the surgery with the specimen. Similarly, calcium replacement is necessary when the parathyroid glands have been removed. GERD precautions should be taken and every patient should receive proton pump inhibitors in the postoperative period.

PEARLS

- Survival is heavily influenced by early diagnosis.
- Carcinoma arising in the cervical esophagus is rare, and cancer involving this site is more often direct extension from the hypopharynx.
- The best opportunity to cure squamous cell carcinoma of the cervical esophagus is provided by complete excision of the tumor.
- Gastric transposition after excision of cancer of the cervical esophagus is a reliable single-stage procedure that allows complete tumor extirpation and early resumption of swallowing.
- Resection of cancer of the cervical esophagus that is obstructing the patient's swallowing is a legitimate palliative procedure and may result in cure.

PITFALLS

- Attempts to resect the cervical esophagus while maintaining an intact laryngotracheal tract are challenging and require a nearly perfect combination of tumor location, stage, and surgical skill.
- Failure to adequately assess tumor extent preoperatively will often result in inadequate resection of the cancer.
- Previous gastric surgery or placement of a gastrostomy tube to correct malnutrition may make gastric transposition impossible.
- Postoperative complications are common after extensive procedures performed on nutritionally depleted patients.
- Salvage laryngopharyngoesophagectomy for failed chemoradiation therapy is associated with a high incidence of wound complications.