Dysphagia After Total Laryngectomy

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Abstract

Previous thought was that total laryngectomy and difficulty with swallowing were incongruous. Patients were counseled that the loss of their larynx would leave them without a vocal source, but that swallowing would not be affected. Successful rehabilitation was defined as being cancer-free and regaining functional communication. Patients were not queried and frequently did not complain of dysphagia as long as they were able to maintain an oral diet. Knowledge has changed, and this article will focus on dysphagia in the patient with laryngectomy and will discuss anatomical sites to physiologic problems.

Introduction

Historically, the first total laryngectomy completed for cancer was performed by Dr. Billroth in 1873. A pharyngo-cutaneous fistula developed post-operatively complicating swallowing function and eventually closed, allowing the patient returned to an oral diet. However, he developed a recurrence of his disease and later demised from it. For more than 100 years thereafter, total laryngectomy became a common and curative treatment for advanced laryngeal carcinoma with the expectation that individuals would retain normal swallowing function and regain a functional means of speaking. Since that time, many variations on surgical procedures have been developed, and most of the emphasis has been on preventing complications and improving means of communication. Organ preservation treatment became a possibility about 25 years ago and encompasses attempts at curative treatment with combined chemo-radiation and retaining speech and swallowing function (Agrawal & Goldenberg, 2008; Bajaj et al., 2009; Chu & Kim, 2008). In addition, variations on partial laryngectomy procedures from the original more common supraglottic and hemi-vertical laryngectomy to modifications including near-total, supra-cricoid, and other surgeries have developed that preserve enough structure to allow voicing and facilitate swallowing function.

Today, a total laryngectomy typically is performed as a primary or secondary treatment for laryngeal carcinoma. When indicated for a primary, untreated tumor, it is usually for advanced disease that cannot be adequately managed in a more conservative manner. Organ

preservation either via modified partial laryngectomy procedures or combined chemo-radiation therapy has become more common (The Department of Veterans Affairs Laryngeal Cancer Study Group, 1991). Secondary laryngectomies are performed for recurrent or persistent disease after prior surgical excisions or radiation therapy or organ preservation with combined radio-chemotherapy. The significance of this is that, in secondary laryngectomy, the tissues being operated on have been violated by prior treatment, disease recurrence, or, in the case of a primary surgery, a more extensive lesion has potentially spread to surrounding tissues. In addition, a laryngectomy is occasionally performed as a last resort for the individual with chronic aspiration and a non-functional larynx either from prior cancer treatment or complications from other benign conditions. Thus, an individual after laryngectomy today presents a more complicated case and frequently requires larger resections and reconstruction procedures. Swallowing difficulties now are recognized as common occurrences after total laryngectomies (Lazarus, 2000). In addition, subtle problems with swallowing now are being found in patients who had undergone previous surgery for less serious disease.

Anatomic Considerations

Total laryngectomy requires separation of the airway from the esophagus. The trachea typically is brought forward below the level of the larynx and is sutured to the base of the neck just above the sternal notch, creating a permanent tracheostoma for breathing. Many times, surgery is extensive and may involve partial to total pharyngectomy, esophagectomy or neck dissection. The significance of added surgery relates to the manner of reconstruction and degree of scarring. Nonetheless, with the separation between trachea and esophagus, aspiration should not occur. However, not only is aspiration possible if complications arise, but dysphagia due to other anatomic/physiologic changes may arise.

In addition to the creation of the tracheostoma, a neopharynx is reconstructed either via primary closure or with reconstructed tissues for larger defects. The most common primary closure methods include the T-shaped, vertical, and horizontal methods, which are all designed with the objective of creating the least amount of tension across suture lines in hopes of preventing complications, such as fistulae, scarring, and strictures.

Specific anatomic deficits occur after removal of the larynx. Along with the cartilages of the larynx, the hyoid bone is removed, which formerly contributed to hyolaryngeal elevation just prior to and during the swallow. The base of tongue forms the upper anastomosis with the neopharynx for reconstruction leading to the pharyngoesophageal sphincter and joined by the closure of the layers of the cricopharyngeus muscles over the sphincter. As such, there may be limits in tongue base retraction either from weakness or decreased range of motion. McConnel (1988) found that higher tongue base to posterior pharyngeal wall pressures are required after laryngectomy to propel a bolus through the pharynx. In addition, the tonicity of the pharyngoesophageal segment, which acts as the upper esophageal sphincter (UES), is affected by the potential driving forces of the tongue base and hyolaryngeal elevation along with the basic tonus of the sphincter itself. As many of these structures have been altered and/or rearranged, relaxation of the sphincter is not as readily accomplished.

Finally, the extent of surgical resection affects anatomic integrity for swallowing. Extensive resections involving base of tongue or pharyngectomy or esophagectomy along with potential cranial nerve deficits may further adversely affect swallowing physiology.

Specific Swallowing Difficulties

Patients typically begin oral feedings, first with liquids, about 5–7 days after surgery in uncomplicated cases. Oral feeding may be delayed 7–14 days after more extensive procedures or after prior radiation, which may negatively affect healing. Barring complications, most patients resume a near-normal diet within a few weeks after beginning oral intake. However,

many patients resume an oral diet, but also experience dysphagia. Swallowing efficiency is frequently affected (Starmer, Tippet, & Webster, 2008) with estimates ranging widely from 17–70%, depending on the degree of dysphagia measured (Balfe et al., 1982; Maclean, Cotton, & Perry, 2008).

Fistulae may develop at any point after surgical excision, but most frequently occur in the first few weeks. Depending on the location, pharyngo-cutaneous, oro-cutaneous fistuale are more common in patients requiring more extensive resections, especially including pharyngectomy or when surgery is performed as a salvage procedure after failed chemoradiation (Starmer et al., 2008). Post-operative infections also increase the likelihood of developing fistulae. Patients are typically NPO while fistulae are present to reduce any flow through the fistula tract and to promote healing. Once the fistula is closed, diet progresses from liquids to denser consistencies as tolerated.

The most common symptom of a fistula is leakage of saliva or food material from an opening on the neck. This is typically noted after swallowing and may be induced by gently pressing in the surrounding area to express secretions. Fistulae often require surgical management. The role for the speech-language pathologist (SLP) is primarily supportive until healing has occurred and rehabilitation may resume.

Pharyngeal clearance problems may exist after laryngectomy and adversely affect swallowing. This can then result in backflow of material into the pharynx during the swallow. Pharyngeal residue visualized on videofluoroscopy may be a primary sign of reduced pharyngeal pressure (Pauloski et al., 2008). Sullivan and Hartig (2001) discussed that reduced pharyngeal clearance may be due to the loss of both superior and anterior motion previously accomplished by hyolaryngeal elevation and tongue base retraction that are required to assist opening of the UES. Potential causes for pharyngeal stasis include anything that might impair neuromuscular control of the pharyngeal wall or base of tongue musculature, including post-treatment edema and surgical resection impairing range and strength of palatal motion. In some cases, reverse or poorly coordinated peristalsis occurs related to surgical resections requiring a gastric transposition. This may alter propulsive properties and also be responsible for residual material in the pharynx after swallowing. These problems compound the time required to swallow a bolus and complete a meal. Pharyngeal transit times may double, making mealtime more laborious and challenging.

Problems with pharyngeal clearance are evident when patients complain of feeling persistent material in their throats, regurgitate material they were attempting to swallow, and exhibit a wet, gurgly vocal quality. Traditional swallowing exercises aimed at maximizing tongue base retraction via the Masako or tongue-hold maneuver (Fujiu & Logemann, 1996) are indicated when weakness impairs bolus propulsion, given that these have been shown to increase pharyngeal wall movement anteriorly, allowing better tongue base contact for propulsion. Alternating liquids and solids also can help to clear the pooled residual material. In addition, compensatory strategies, like a head rotation or an effortful swallow, are sometimes effective in increasing pharyngeal pressure and promoting improved bolus passage through the pharynx and the esophagus.

Stricture (narrowing) may develop in the pharynx or esophagus and impede bolus passage. This is more commonly seen in the hypopharynx related to tight surgical closures. Prior radiation therapy and post-operative infections also may increase the likelihood of scarring and stricture formation.

A stricture is suspected when patients evidence difficulties with denser consistencies of food along with a globus sensation and pooled materials in the pharynx (Samlan & Webster, 2002). In some cases, a stricture may be so narrow as to allow only the passage of thin liquids. A stricture can usually be seen on videofluoroscopic exam whereby the bolus column segmentally narrows in a consistent area on repeated swallows. Another symptom of

esophageal stricture is nasal regurgitation that occurs after the swallow. This is related to ineffective bolus passage through a narrowed area, with pooling or backflow of material in a retrograde manner through the nasopharynx after the swallow is complete and velopharyngeal closure has relaxed. Strictures are managed medically or surgically by dilating the constricted area. This may need to be repeated multiple times and at regular intervals, because the tissues frequently scar back to their prior position. It is important that patients are counseled to push oral intake after dilations, especially trying denser consistencies to stretch the dilated area. Occasionally, strictures are not amenable to conservative management and require surgical excision with reconstruction. Dietary modifications can be helpful in these cases, including alternating liquids and solids while eating.

Pseudoepiglottis or a pseudodiverticulum may form and be additional complications to efficient swallowing. These abnormal pseudo-structures develop as a result of surgical healing along with scar development. Pseudodiverticulum appears as a pharyngeal pouch, while a pseudoepiglottis develops at the base of tongue area. mimicking the appearance of an epiglottis. Due to lack of muscular presence, a pseudoepiglottis serves as an impediment to bolus passage. Depending on the size and location, these may collect significant amounts of food while the patient is eating. Similar to patients with a Zenker's diverticulum, individuals will frequently complain of regurgitating undigested food or sensing the material for prolonged periods of time after eating and halitosis (Oursin, Pitzer, Fournier, Bongartz, & Steinbrich, 1999). Because these anatomic structures develop above the level of the pharygoesophageal segment, they also are subject to inadvertent vibration during tracheo-esophageal speech because the airflow may vibrate through the collected material and distort sound production. Management depends on the severity of symptoms produced. For minor complaints, patients may benefit from washing foods through with liquids, changes in head posture as observed on a videofluoroscopy for effectiveness, and increasing the effort of swallowing. More significant problems occasionally are managed surgically.

Pharyngo-esophageal (P-E) problems may present as both swallowing and alaryngeal speech difficulties. Coordination of P-E segment relaxation for the passage of a bolus while swallowing, or in reverse to allow air passage while speaking, is vital. Problems with the UES or P-E segment are suspected when patients evidence transient difficulties with denser consistencies of food. Thickening or prominence arising from the posterior pharyngeal wall can be seen on radiographic study assisting in confirmation of this phenomenon (Crary & Glowasky, 1996). In addition, a potential stricture may be seen, but then be noted to open, demonstrating the transient nature of a spasm. Further diagnostic measures may be employed, including esophageal manometry to measure the various pressures within the esophagus and pharynx during swallowing. Treatment of P-E problems varies depending on the severity of dysphagia experienced. In some minor case, this is only an inconvenience, and patients tolerate occasional difficulties without further intervention. More significant problems can be managed with Botox injections or surgical myotomy. The injection of Botox typically is delivered bilaterally to multiple sites along the pharyngoesophageal area with guidance from an EMG signal. Confirmation of location is made when an active signal reduces during swallowing. In normal subjects, the signal should be very active at rest, as the muscles contract to maintain a closed sphincter, and significantly diminish during swallowing to allow relaxation of the sphincter and bolus passage.

Xerostomia (dryness) is a persistent aggravating problem that many patients experience. Xerostomia can affect lubrication of the bolus, making drier and more crumbly foods difficult to manage (Gaziano, 2002). Xerostomia also may interfere with the reflux barrier and increase symptomatic gastroesophageal reflux disease (Sullivan & Hartig, 2001). Xerostomia typically is the reaction of the mucosa and salivary glands to radiation exposure, reducing fluid production. This, in turn, changes the characteristically thin and watery saliva to scant, thick, and viscous.

Patients with xerostomia complain of dry mouth and challenges with food sticking in the oral cavity. Individuals who have had prior radiation therapy usually are counseled to maximize hydration with decaffeinated liquids. Many pharmaceutical products are available to address xerostomia and provide artificial saliva and lubrication (Dietrich-Burns, Messing, & Farrell, 2006). Additionally, dietary modifications, like moistening drier foods with sauces, gravies, olive oil, and other condiments, may assist in bolus manipulation in the oral preparatory phase and ease transit through the pharynx.

Other senses also are affected after total laryngectomy. Dysosmia (decreased sense of smell) frequently arises as a consequence of altered respiration, rendering nasal breathing unsuccessful. The ability to smell when the oderant molecules reach the olfactory epithelium requires appropriate airflow through the nasal cavity, which is obliterated after laryngectomy (van Dam et al., 1999). Dysguesia (decreased sense of taste) is another problem that may arise due to changes in the mucosal lining of the oral cavity through to the pharyngo-esophageal segment, impairing taste bud function as a result of radiation, chemotherapy, or surgical alteration (Mirza et al., 2008). Dysosmia and dysguesia can negatively affect a patient's desire, not ability, to swallow certain foods and their overall appetite, which could then compromise nutrition.

Strategies for patients experiencing dysosmia and dysgeusia include experimenting with a variety of foods to determine which are most satisfying. Because foods may taste bland, patients are encouraged to add spices to determine which improve their enjoyment of eating. It should be noted that taste function is poorly understood in individuals undergoing cancer treatment and is an area needing further research to determine the exact nature of deficit and recovery, as well as impact on swallowing ability.

Summary

Dysphagia after total laryngectomy is a real and common problem that, in all likelihood, is underreported. Dysosmia, dysguesia, prolonged mealtimes, use of compensatory strategies, and diet alterations may decrease quality of life. Persistent difficulties with solid foods frequently may be overlooked as a symptom of dysphagia, but be bothersome to the otherwise asymptomatic patient who experiences difficulties only with very hard foods, like steak. There are numerous physiologic problems seen after laryngectomy that require careful surveillance and monitoring by the SLP. Therapeutic exercise frequently is recommended, and long-term follow-up is needed to ensure that problems do not develop in the future.

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