Case study 39

Man aged 62 years with laryngeal carcinoma

Introduction

The following exercise is a case study of a man ('MT') who was studied by Burkart et al. (2010). MT presented with a late-stage supraglottic carcinoma. He was treated with open supraglottic laryngectomy and postoperative radiation therapy. The case study is presented in five sections: primer on laryngeal carcinoma; client history; medical evaluation and diagnosis; medical and surgical management; focus on post-laryngectomy communication.

Primer on laryngeal carcinoma

Laryngeal cancer is a life-threatening disease which also causes significant disability in the individuals who develop it. The epidemiology of laryngeal cancer is monitored through the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute in the United States. According to SEER statistics, there were an estimated 88,852 people living with laryngeal cancer in the US in 2012. There were 13,560 estimated new cases in 2015 and 3,640 deaths in the same year. Between 2008 and 2012, most new laryngeal cancers (31.2%) occurred in the age group 55 to 64 years (National Cancer Institute, 2015). Historically, more men than women have developed laryngeal cancer. This is still the case today. However, there is evidence that women are representing an increasing proportion of cases over time (Brandstorp-Boesen et al., 2014). MacNeil et al. (2015) reported a five-year survival rate of 57.4% in a study of 4,298 patients who were diagnosed with laryngeal cancer in Ontario between 1995 and 2007. This was lower still (45.4%) for laryngectomy-free survival. This study also showed that overall and laryngectomy-free survival had remained unchanged since the mid-1990s.

Laryngeal carcinoma has a multifactorial aetiology. Among the factors linked to the development of the disease are smoking and alcohol consumption, gastroesophageal reflux disease (GERD), immunosuppression (in HIV/AIDS and transplant recipients), infection with human papillomavirus and helicobacter pylori, and a history of head and neck cancer in first-degree relatives. Laskaris et al. (2014) examined HPV infection in 54 patients with squamous cell carcinoma of the larynx. HPV DNA was present in 18.5% (10/54) laryngeal squamous cell carcinomas. HPV 16, which was the most common type, was detected in 7.5% of patients. Zhang et al. (2014) conducted a systematic review of studies published up to November 2013 that examined the prevalence of GERD in laryngeal or pharyngeal cancer. In a meta-analysis of 10 studies, GERD was found to be significantly associated with laryngeal cancer, but not pharyngeal carcinoma. Piselli et al. (2015) reported a particularly elevated standardised incidence ratio for cancer of the larynx in liver transplant recipients with alcoholic liver disease.

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Treatment for laryngeal cancer involves surgery, radiotherapy and chemotherapy. Today, protocols emphasise organ- and function-preserving interventions as a primary treatment method. When a laryngectomy is performed, it is often undertaken as a salvage procedure when radiation or chemoradiation has failed. The result has been a decrease in the number of laryngectomies that are performed (Grau et al., 2003). When surgery is adopted as the primary modality, conservative procedures (partial laryngectomy) are pursued whenever possible. The choice of total versus partial laryngectomy as well as type of partial laryngectomy is determined by a range of factors including the location of a tumour. For example, a supraglottic laryngectomy is performed if there is a tumour of the false vocal fold. However, if a supraglottic lesion extends to the glottis, a supracricoid laryngectomy is performed. These procedures have different implications for voice and swallowing function. A supraglottic laryngectomy can leave an individual with relatively good voice quality but often causes serious swallowing difficulties. When a carcinoma of the tongue or oesophagus invades laryngeal tissues, the larynx may also need to be removed. In this case, laryngectomy is performed alongside glossectomy or oesophagectomy.

Unit 39.1 Primer on laryngeal carcinoma

(1) The epidemiology of laryngeal cancer has revealed that women are representing an increasing proportion of cases over time. Why do you think this is the case?

(2) The subjects studied by Piselli et al. (2015) had a particularly elevated standardised incidence ratio for cancer of the larynx. Which *two* risk factors for laryngeal cancer do these subjects exhibit?

(3) Gastroesophageal reflux disease (GERD) is now recognised as a significant risk factor for laryngeal cancer. Explain how GERD is associated with the development of laryngeal cancer.

(4) Which of the following procedures may be used to treat a tumour of the epiglottis and false vocal folds?
   (a) total laryngectomy
   (b) vertical partial laryngectomy
   (c) supraglottic laryngectomy
   (d) supracricoid laryngectomy
   (e) hemilaryngectomy

(5) Respond with *true* or *false* to each of the following statements about swallowing after laryngectomy:
   (a) Aspiration is a significant risk after total laryngectomy.
   (b) There is a high incidence of dysphagia after supracricoid laryngectomy.
   (c) Videofluoroscopy can be used to evaluate swallowing after laryngectomy.
   (d) Dysphagia normally resolves within 6 months after laryngectomy.
   (e) Manometry can be used to evaluate swallowing after laryngectomy.

Client history

MT is a 62-year-old man who is a construction worker. He presented for assessment because of hoarseness which had lasted for three months. He reported mild dysphagia

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and odynophagia. He exhibited no weight loss or otalgia and is otherwise healthy. MT has smoked one pack of cigarettes per day for 40 years and has consumed alcohol socially.

Unit 39.2 Client history

(1) MT conforms to the demographic profile of individuals who are most likely to develop laryngeal cancer. In what *two* respects is this the case?

(2) Which *two* lifestyle risk factors for laryngeal cancer does MT have?

(3) MT presented for assessment on account of persistent hoarseness. Depending on the location of a laryngeal tumour, hoarseness can be an early symptom of disease or a sign of a more advanced tumour. Explain.

(4) Among the symptoms that MT exhibited were odynophagia and otalgia. Describe these symptoms.

(5) Apart from the symptoms described above, list *three* other symptoms associated with laryngeal cancer.

Medical evaluation and diagnosis

MT underwent an extensive medical evaluation. His larynx was mobile on physical examination. Flexible fibreoptic laryngoscopy was performed. It revealed a friable, ulcerated mass on the laryngeal surface of the infrahyoid epiglottis and the left false vocal fold. The true vocal folds were crisp and appeared to be clear of tumour. There was no involvement of the anterior and posterior commissures and the arytenoids. The right vocal fold was fully mobile and was effectively compensating for mildly impaired mobility of the left vocal fold. MT had a left, firm, palpable, enlarged, upper jugular node which was less than 3 cm in diameter. There were no other signs of adenopathy or other masses in the head and neck region on examination. MT had poor dentition.

Other medical investigations were performed. MT had a CT scan of the head and neck. This revealed a 2.5 × 2.3 × 1.9 cm left supraglottic tumour that involved the epiglottis and left false vocal fold but not the laryngeal cartilages. The scan also showed a single 2.5 cm ipsilateral level 2 lymph node with central necrosis but no other adenopathy. Panendoscopy was performed and revealed no second primary tumour. The base of the tongue had normal consistency during bimanual palpation. There was fullness in the pre-epiglottic space. The laryngeal tumour biopsy that was performed during direct laryngoscopy revealed a moderately differentiated keratinising squamous cell carcinoma. Squamous cell carcinoma clusters were obtained from a fine-needle aspiration of the cervical lymph node. A chest radiograph was negative for metastatic foci. On the basis of these investigations, a diagnosis was made: MT had a stage III (T2N1M0) squamous cell carcinoma of the supraglottic larynx.

Unit 39.3 Medical evaluation and diagnosis

(1) During a visual examination of the larynx, MT's tumour was found to involve certain laryngeal structures while other structures appeared to be free of disease. The diagram

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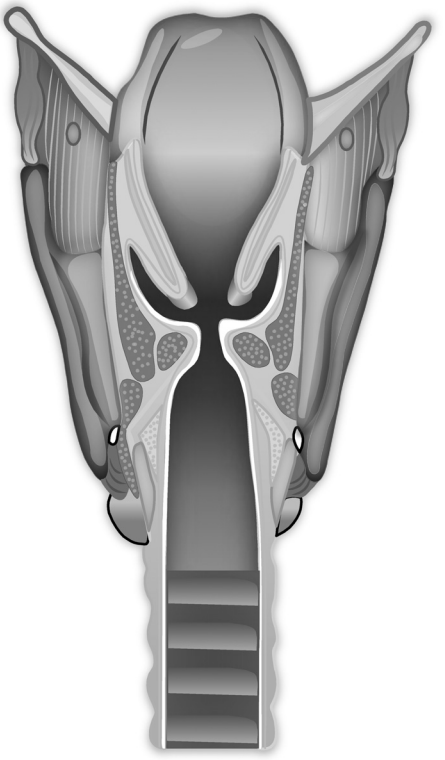
below is a coronal section of the larynx viewed from the back. Place an **X** on the structures that are compromised by MT's tumour.



(2) What type of laryngectomy is warranted in MT's case? Provide support for your answer. Is any additional surgical procedure necessary?

(3) What significance does the poor condition of MT's dentition have for any post-surgical rehabilitation?

(4) One of the medical investigations that were undertaken was a panendoscopy. What is panendoscopy? Give *two* reasons why this procedure is performed.

(5) Speech-language pathologists who work with cancer patients must understand the TNM staging system. On the basis of this system, MT was diagnosed as having a T2N1M0 squamous cell carcinoma of the supraglottic larynx. Explain what T2N1M0 means.

Medical and surgical management

MT was treated with open supraglottic laryngectomy. He also underwent left modified radical neck dissection and right selective neck dissection. The neck specimen revealed extracapsular spread, for which MT received postoperative radiation therapy.

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Unit 39.4 Medical and surgical management

(1) MT was treated with open supraglottic laryngectomy. Which aspect of this client's post-surgical rehabilitation will be of most concern to the speech-language pathologist?

(2) Which of the following stages of swallowing is most compromised in clients with supraglottic laryngectomy? *oral preparatory; oral propulsive; pharyngeal; oesophageal.* Explain why the stage you have selected is most compromised.

(3) Which other aspect of MT's management is likely to contribute to any swallowing problems?

(4) MT was treated with an open supraglottic laryngectomy. What other type of supraglottic laryngectomy can be performed? Do these different procedures have the same voice and swallowing outcomes?

(5) Which histological finding is a poor prognostic indicator for MT?

Focus on post-laryngectomy communication

MT underwent an open supraglottic laryngectomy in which his vocal function was preserved. Such a procedure can establish safe short-term swallow function. However, clients who have a partial laryngectomy may subsequently require completion laryngectomy because of late dysphagia and chronic aspiration (Bagwell et al., 2015). After completion laryngectomy, clients face a new challenge of alaryngeal communication. In this unit, different methods of post-laryngectomy voice production will be examined. These methods are as relevant to clients who require completion laryngectomy as they are to clients who have total laryngectomy as a primary treatment modality.

The three methods of communication that are available to clients after total laryngectomy are (i) the use of an artificial or electronic larynx, (ii) the use of oesophageal voice and (iii) the use of a tracheoesophageal voice prosthesis. There are different types of commercially available artificial or electronic larynxes. The electronic neck-type and electronic mouth-type artificial larynxes are the most common of these devices (Benninger et al., 2007). In the neck-type device, a battery-produced sound is conducted through the neck into the oral cavity where the articulators proceed to produce speech sounds as normal. The head of the device is placed against the neck. For effective sound conduction to occur, neck tissue must be supple. Post-operative swelling of the neck tissue and changes to neck tissue related to radiotherapy may make this device difficult to use initially. In the electronic mouth-type device, battery produced sound is carried via a mouth tube into the oral cavity. Because these devices produce continuous sound at the push of a button, clients must be taught strategies for normal phrasing and dealing with the inability to produce contrasts between voiced and voiceless sounds (Benninger et al., 2007). An electronic neck-type device is shown in Figure 39.1.

In the second method of alaryngeal communication after laryngectomy – oesophageal voice production – air is either inhaled or injected into the hypopharynx. The inhaled or injected air is then quickly expelled through the pharyngoesophageal (PE) segment, a narrow sphincter of muscle fibres at the juncture of the hypopharynx and the oesophagus (Benninger et al., 2007). Because this method only has access to air in the hypopharynx,

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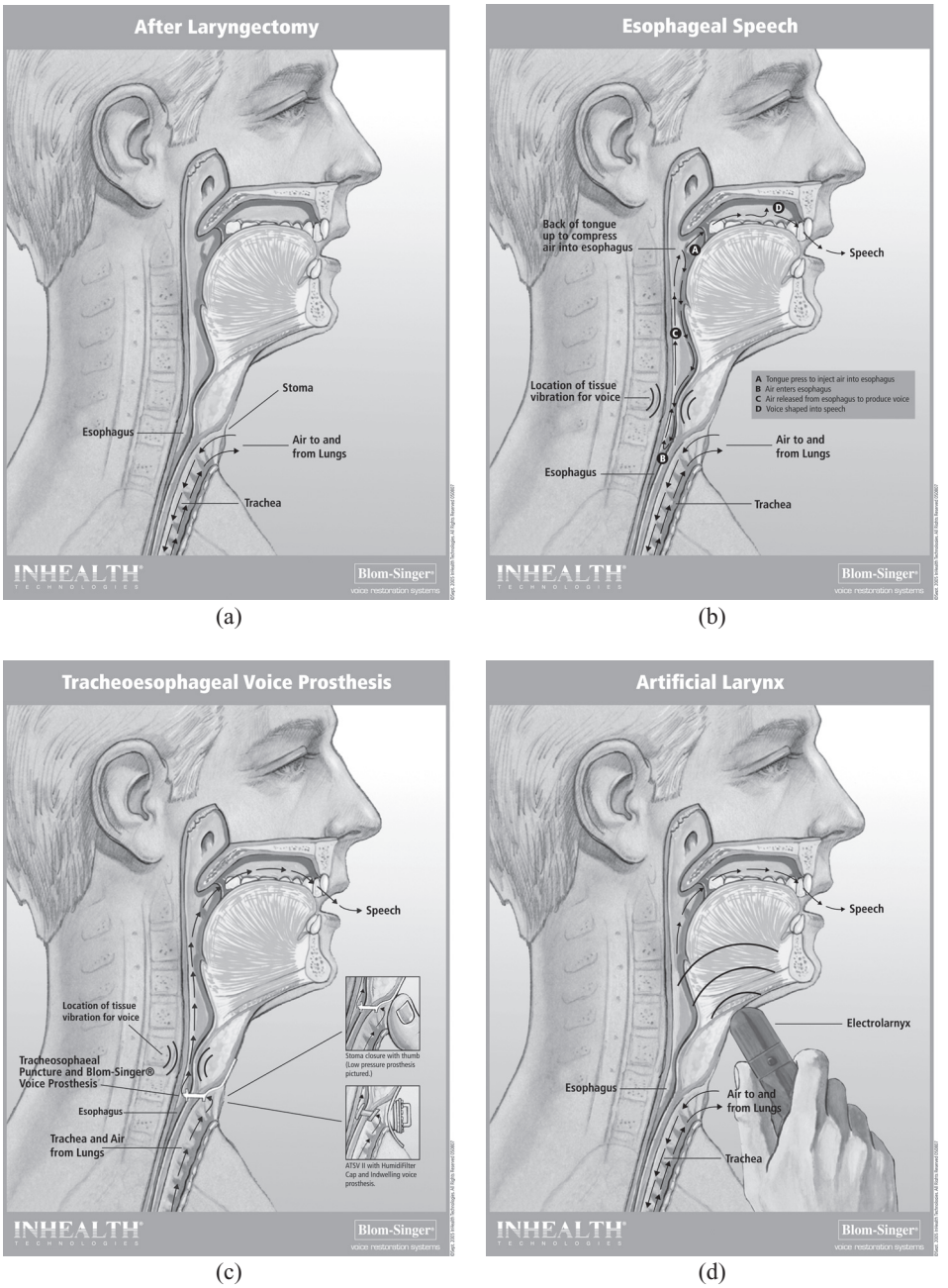

Figure 39.1(a)–(d) Diagrams showing: (a) anatomical structures after laryngectomy and various methods of alaryngeal communication; (b) oesophageal voice; (c) tracheoesophageal voice prosthesis; (d) artificial larynx. Source: images courtesy of InHealth Technologies (www.inhealth.com).

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there are reduced air volumes for speech. Accordingly, oesophageal voice users need to frequently insufflate the PE segment during continuous speech. In rehabilitation, clients can be taught different methods of optimal air intake and how to achieve appropriate phrase lengths during speech. They can also be advised on how to avoid stoma and air injection noise (Benninger et al., 2007). The quality of oesophageal voice is associated with the vibratory function of the PE segment. Van Weissenbruch et al. (2000) found that hypertonicity, spasm, strictures, and hypotonicity of the PE segment were correlated significantly with poor or moderate alaryngeal speech in 60 post-laryngectomy patients. The use of oesophageal voice is also illustrated in Figure 39.1.

The third method of alaryngeal communication is the use of a tracheoesophageal voice prosthesis (TEVP). TEVP has become the gold standard in the management of clients who undergo total laryngectomy (Kapila et al., 2011). A fistula is surgically created in the common wall of the posterior trachea and the anterior oesophagus. A voice prosthesis is fitted into this fistula, with the proximal end in the stoma and the distal end in the lumen of the oesophagus (Benninger et al., 2007). The prosthesis is a one-way valve. As such, it permits air to enter the oesophagus but prevents food and secretions in the oesophagus from entering the trachea. When the stoma is manually occluded, pulmonary air is directed through the valve into the oesophagus where it travels superiorly to vibrate the PE segment. An adjustable tracheostoma valve obviates the need to manually block the stoma. A TEVP may be fitted at the time that a total laryngectomy is performed (primary TE puncture). Alternatively, it may be fitted some weeks after total laryngectomy (secondary TE puncture). Because a pulmonary airstream is used to vibrate the PE segment in this form of alaryngeal communication, it is easier for clients to produce continuous speech using a TEVP than standard oesophageal voice. The use of a TEVP is also illustrated in Figure 39.1.

Unit 39.5 Focus on post-laryngectomy communication

(1) Respond with *true* or *false* to each of the following statements about alaryngeal communication:
   (a) Blom-Singer is one type of voice prosthesis.
   (b) Clients can use more than one method of alaryngeal communication.
   (c) There are four different methods of oesophageal insufflation.
   (d) Voice prostheses cannot prevent aspiration into the airway.
   (e) Irradiated tissue presents challenges for alaryngeal communication.

(2) Effective alaryngeal communication is integral to the quality of life of clients who have a laryngectomy. Describe *three* ways in which alaryngeal communication can contribute to quality of life in laryngectomy clients.

(3) All three methods of alaryngeal communication have drawbacks as well as advantages. Five of these drawbacks are listed below. Identify the form of alaryngeal communication to which each of these drawbacks relates:
   (a) Volume and pitch alterations can be achieved but are compromised.
   (b) Regular equipment maintenance is required.
   (c) A limited air source results in reduced continuous speech.
   (d) Management of secretions is required.
   (e) Enlargement of the tracheoesophageal puncture can occur along with periprosthetic leakage.

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(4) The use of external beam radiation therapy and chemotherapy to treat upper aerodigestive tract malignancy can result in radiation-induced pharyngoesophageal stenosis (Urben et al., 2012). Which method(s) of alaryngeal communication are compromised by PE stenosis? What other function is compromised by PE stenosis?

(5) Some voice prostheses require daily or weekly cleaning. What *two* skills must a client have to be considered a candidate for TEVP?

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