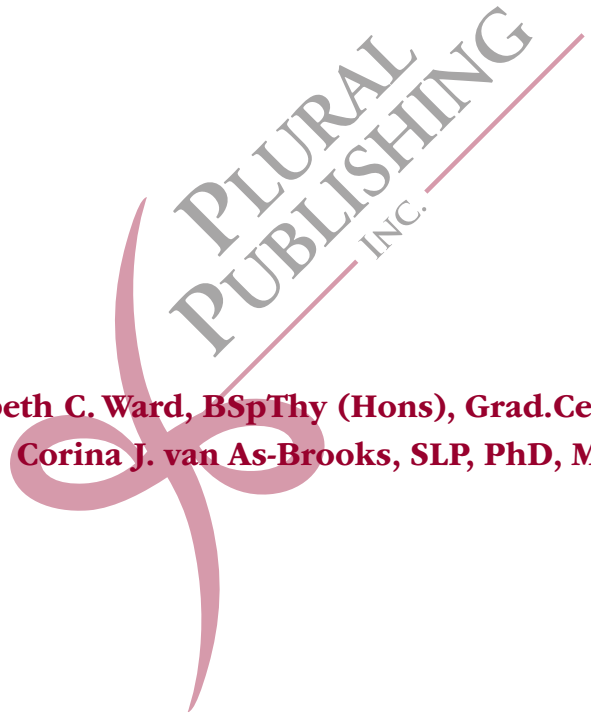
HEAD AND NECK CANCER

Treatment, Rehabilitation, and Outcomes

Second Edition



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PREFACE

In producing this second edition we have had the opportunity to reflect on just how much has happened in head and neck cancer (HNC) care since the first edition was published. In under a decade we have seen our understanding of the causes and influencing factors for HNC rapidly expand. With this has come the development and clinical implementation of targeted therapies and the future potential for de-escalation of treatment intensity for some individuals. The treatment options themselves have also changed for the better with new forms of non-surgical management providing more focused, targeted treatment, while surgical interventions are continuing to refine and enhance reconstruction. The importance of the multidisciplinary team management continues to be paramount and now, more than ever before, the focus of the team is on patient outcomes and survivorship.

In the field of speech-language pathology, our evidence base has also been rapidly expanding. Early studies that explored the nature and extent of negative treatment outcomes have been expanded upon, and emerging data are helping to develop insights into prognostic factors that influence outcome. There is active interest in the potential value of preventative treatment and early intervention for nonsurgical patients. Understanding the long-term changes that occur years after nonsurgical treatment is also a current focus in many research/clinical teams. Surgical voice restoration also continues to be refined and equipment and devices enhanced to optimize outcomes. Furthermore, helping patients and their carers live well with the negative consequences of treatment and embracing a more holistic approach to evaluating patient outcomes is changing the nature of clinical care. With all this, there has emerged a great interest in new models of service delivery and alternate modes for providing improved patient services and support.

However, although a lot has been achieved across all fields involved in HNC care, there is still so much more to do. The authors of the current chapters in this book represent just a small subset of the thousands of clinicians and researchers who are working daily to improve patient care and outcomes following HNC. The potential of what still can be achieved is enormous. We hope your teams benefit from the clinical and research insights that have been amassed here in this textbook and we look forward to the next decade of enhanced patient care. We also hope you find inspiration in José Cruz, a post laryngectomy patient, skydiving on his 80th birthday on the cover!

5

SPEECH AND SWALLOWING FOLLOWING ORAL, OROPHARYNGEAL, AND NASOPHARYNGEAL CANCERS

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Elizabeth C. Ward, and Edwin M. Yiu

CHAPTER OUTLINE

Introduction

While the previous chapter detailed the various surgical and nonsurgical treatment options for patients with oral, oropharyngeal, and nasopharyngeal cancers, the current chapter reviews the evaluation and management of the resultant speech and swallowing disorders following treatment for these populations. As discussed in Chapter 4, cancer of the oral and oropharyngeal region may be treated surgically or with primary radiotherapy ± chemotherapy. In comparison, due to the radiosensitive nature of the tumor type, nasopharyngeal cancers are managed primarily using radiotherapy ± chemotherapy. For each of these populations, the *location of the cancer*, the *treatment modality*, and the *extent of treatment* (i.e., the extent of surgery, radiotherapy dose) have specific implications for speech and swallowing, the subsequent management of the presenting disorders, and final patient outcomes. The current chapter commences with a discussion of the speech and swallowing changes noted following primary surgical and nonsurgical treatment modalities. The subsequent sections detail the assessment and rehabilitation techniques applicable for these populations and pertinent research literature in relation to patient outcomes.

Speech and Swallowing Following Surgical Management of Oral and Oropharyngeal Cancer

Surgical management of oral and oropharyngeal cancer can have a major impact on speech and swallowing (Cerenko, McConnel, & Jackson, 1989; Conley, 1962; Fujiu, Logemann, & Pauloski, 1995; Hamlet, Jones, Mathog, Bolton, & Patterson, 1988; Hamlet, Mathog, Patterson, & Fleming, 1990; Logemann, 1984; Logemann & Bytell, 1979; Pauloski et al., 1994). The following sections detail the specific nature of the deficits that present in this population and discuss the impact of the extent and type of reconstruction and the additional negative effects of postoperative radiotherapy.

Speech Disorders Following Surgical Management

Speech impairment after oral and oropharyngeal cancer treatment can include reduced intelligibility and articulation errors, including omissions, substitutions, and distortions of stop, affricate, and fricative consonants and vowels (Dios, Feijoo, Ferreiro, & Alvarez, 1994; Greven, Meijer, & Tiwari, 1994; Hamlet et al., 1990; Heller, Levy, & Sciubba, 1991; Hufnagle, Pullon, & Hufnagle, 1978; Imai & Michi, 1992; Morrish, 1988; Nicoletti et al., 2004; Pauloski, Logemann, et al., 1998; Rentschler & Mann, 1980). Speech intelligibility is often reduced after total glossectomy (Rentschler & Mann, 1980). However, total and subtotal glossectomy patients often spontaneously compensate for the lack of lingual tissue by forming a narrowing (for fricatives) or a contact (for plosives) using residual lingual tissue and adjacent tissue in the oral cavity/pharynx. For example, back-velar tongue sounds (i.e., /k/, /g/) are substituted with stop consonants produced in the pharynx by constricting the residual tongue base to the pharyngeal wall, and tip-alveolar stop consonants (i.e., /t/, /d/) are produced by using a slightly altered bilabial seal, which differentiates these phonemes from the bilabial stops /b/, /p/ (Lazarus, Davis, Logemann, & Hurst, 1983; Morrish, 1988; Skelly, Spector, Donaldson, Brodeur, & Paletta, 1971). Resonance is often hypernasal when surgery involves resection of the soft palate. In this case, palatal obturator prostheses (see later in chapter) should be considered to improve resonance as well as prevent nasal reflux of material during swallowing.

Swallowing Disorders Following Surgical Management

Following surgical management, swallowing disorders have been observed in the oral preparatory, oral propulsive, and pharyngeal phases of swallowing. Disorders can include increased oral transit times due to reduced ability to manipulate and propel the bolus of food or liquid into the pharynx, increased oral residue, reduced range of motion (ROM) and strength of tongue and tongue base, reduced pharyngeal contraction, increased pharyngeal residue, reduced hyolaryn-

geal motion, reduced airway entrance closure, and aspiration (Fujiu et al., 1995; Furia et al., 2000; Hamlet, Patterson, & Fleming, 1989; Lazarus, Logemann, & Gibbons, 1993; Logemann et al., 1993; Pauloski, Logemann, Fox, & Colangelo, 1995; Pauloski et al., 1993, 1994). On the DVD (see Chapter 5: VFSS files: "Partial Tongue Resection" and "Floor of Mouth Reconstruction"), examples of videofluoroscopic swallowing study (VFSS) assessments have been provided for the reader to exemplify this typical postsurgical pattern of deficits.

Patients with oral tongue resections typically demonstrate oral phase swallowing problems. However, pharyngeal phase swallowing disorders can also occur after anterior oral cavity resections, particularly if the floor of mouth muscles are cut or resected, resulting in altered hyolaryngeal excursion, tongue base and pharyngeal wall motion, and cricopharyngeal opening during swallowing (Pauloski et al., 1995). Patients having undergone posterior oral cavity resection may have had the tongue base, faucial arch, and lateral pharyngeal wall resected. These patients often demonstrate delayed triggering of the pharyngeal motor response, reduced tongue base posterior motion, and reduced pharyngeal contraction for swallowing.

Nature and Extent of Surgery

The extent of surgical resection and type of reconstruction can have a significant impact on speech and swallow function. Larger surgical resections, including oral tongue or tongue base, are associated with worse speech function, in terms of understandability and correct phoneme productions (Nicoletti et al., 2004; Pauloski, Logemann, et al., 1998). Similarly, larger reconstruction procedures have been found to have a negative impact on speech and swallowing (Nicoletti et al., 2004). Historically, primary closure (where remaining tissues from around the removed tumor are sutured together, Figure 5–1) for oral and oropharyngeal resections had been thought to result in better speech and swallow function than flap reconstruction procedures (McConnel et al., 1998; Nicoletti et al., 2004; Pauloski, Logemann, et al., 1998). However, recent research has challenged this notion, reporting superior speech and swallowing outcomes for oral cancer in patients undergoing microvascular free flap reconstruction compared to those who had received primary closure (Hanasono et al., 2009). Free flap reconstructions, such as the radial forearm flap (Figure 5–2), are often thinner and more flexible than local and regional flaps and can result in less tethering of the residual tongue for improved speech and swallowing (Urken, Moscoso, Lawson, & Biller, 1994). Furthermore, if the reconstruction material is sensate (e.g., transferring a sensory nerve with the radial forearm free flap), patients may achieve heightened recovery of oral sensation, masticatory function, and speech intelligibility (Kuriakose, Loree, Spies, Meyers, & Hicks, 2001; Loewen, Boliek, Harris, Seikaly, & Rieger, 2010; Santamaria, Wei, Chen, & Chuang, 1999).

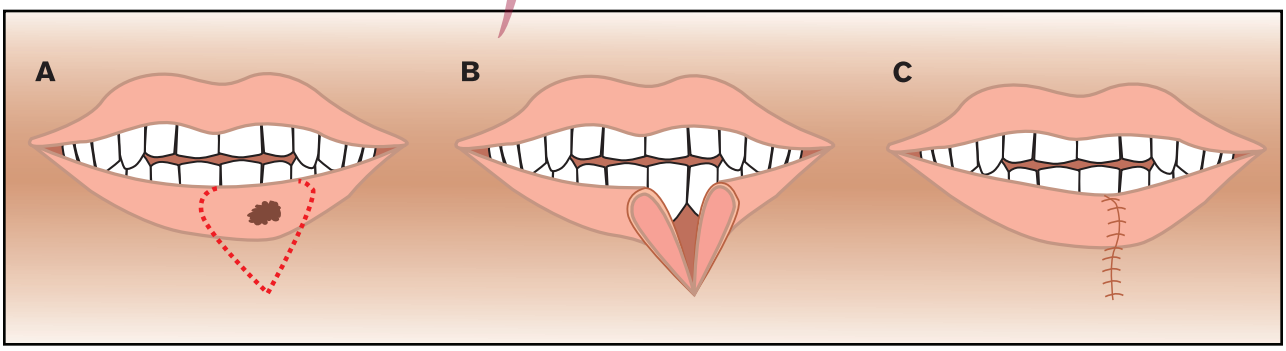

Figure 5–1. Schematic representation from **A** to **C** of the process of a primary lip closure after surgical removal of a tumor of the lip.

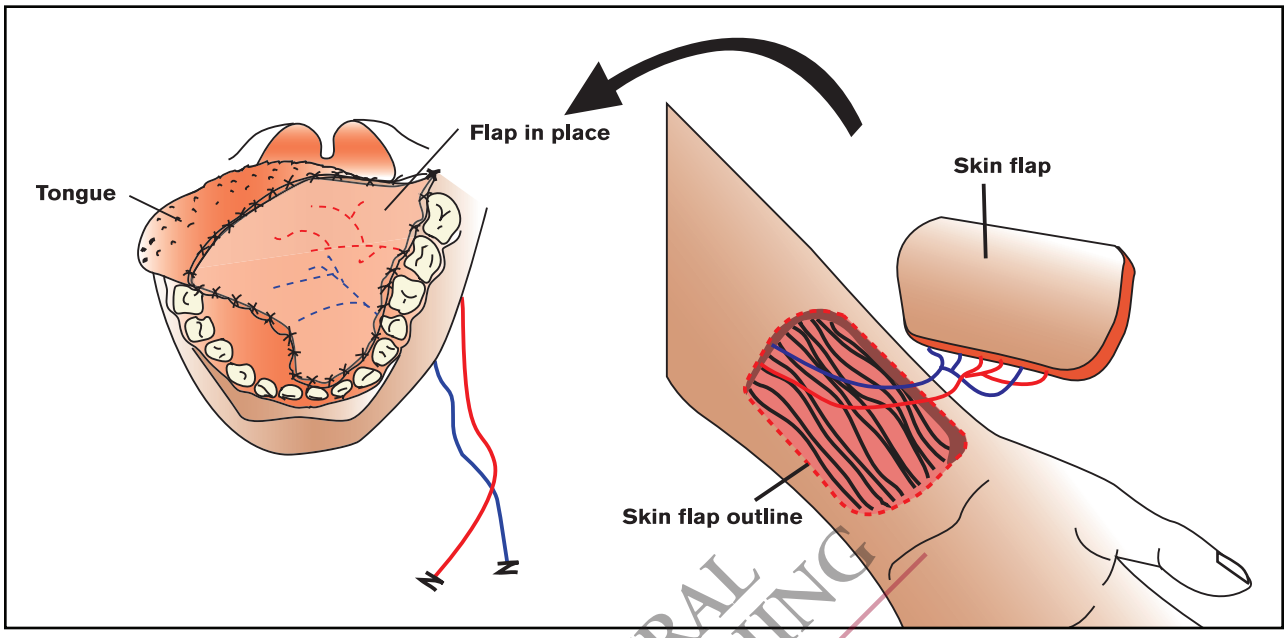

Figure 5–2. Schematic representation of a radial forearm reconstruction after surgical removal of a tumor of the tongue.

Impact of Additional Postoperative Radiotherapy

Postoperative radiotherapy (XRT) can have a negative impact on speech and swallow functioning and can result in worsened performance (Lazarus et al., 2013; Nicoletti et al., 2004; Pauloski et al., 1994). For many patients who resume oral intake postsurgery, the subsequent course of postoperative radiotherapy, with its negative acute side effects such as tissue edema and mucositis (see Chapter 3 for discussion of XRT side effects), leads to a temporary decline in function. This can be upsetting for some patients, and they need to be counseled to anticipate this temporary setback.

While some of the acute reactions to XRT such as the mucositis, edema, and associated pain/discomfort typically last only a few weeks posttreatment, other consequences such as xerostomia and discomfort from thinning of the oral mucosa may persist in the long term and have an ongoing negative impact to swallowing function.

The long-term impact of postoperative radiotherapy represents a potential further decline in patient function, with both swallow and speech function found to be worse over time in postoperatively irradiated patients with oral cancer compared to those treated with surgery alone (Lazarus et al., 2013; Pauloski et al., 1994; Pauloski, Rademaker, Logemann, & Colangelo, 1998; Shin et al., 2012). In particular, postoperatively irradiated patients exhibit longer oral transit times, lower oropharyngeal swallow efficiency, increased pharyngeal residue, and reduced cricopharyngeal opening duration. Speech also has been found to be worse, with fewer correctly produced phonemes and lower diadochokinetic rates. Both long-term swallowing and speech changes may relate to reduced tongue strength, which has been found to be worse in surgical oral cancer patients treated with postoperative radiotherapy compared to those without adjuvant postoperative treatment (Lazarus et al., 2013). In light of this exacerbation in dysfunction, it is not surprising that patients who undergo postoperative radiotherapy also express poorer ratings on quality-of-life scales (Dwivedi et al., 2012; Lazarus et al., 2013; Yang, Chen, Huang, Pan, & Li, 2010).

An additional potential sequela of postoperative radiotherapy following oral cancer treatment is development of pharyngoesophageal (PE) stenosis (Laurell

et al., 2003). PE stenosis is typically treated with dilation, botulinum toxin, or myotomy. However, if the stenosis recurs following repeated use of these procedures, surgical removal of this stenotic region and replacement with a radial forearm microvascular free flap (Figure 5–3) has been found to improve swallow functioning (Urken, Jacobson, & Lazarus, 2011).

Speech and Swallowing Following Radiotherapy and Chemoradiotherapy

Primary radiotherapy with or without adjuvant or concurrent chemotherapy ([Chemo]RT) has become a common treatment modality for head and neck cancer treatment, with comparable cure rates compared to surgical resection (Kraus et al., 1994; Mendenhall et al., 2000; Sessions, Lenox, Spector, Chao, & Chaudry, 2003; Vokes, Moran, Mick, Weichselbaum, & Panje, 1989). Chemoradiotherapy, also known as "organ preservation treatment," is designed to preserve the anatomy of the organ when used to treat larger, often unresectable tumors of the oral cavity and oropharynx. However, organ *function* is not necessarily spared, with voice, speech, and swallowing often affected. For patients with nasopharyngeal cancer, radiotherapy is indeed the standard treatment (Wei & Sham, 2005). However, due to tumor proximity to the base of the skull, critical structures highly susceptible to the effects of radiotherapy, including the brainstem, cranial nerves, middle and inner ears, and parotid glands, are often included in treatment fields (Wei & Sham, 2005). This makes voice, speech, and swallowing deficits a key issue for this population. The following sections detail the specific nature of these deficits that present in these nonsurgical populations.

Voice and Speech Disorders Following Radiotherapy or Chemoradiotherapy

Voice and speech have been found to be impaired following organ preservation treatments (Jacobi, van der Molen, Huiskens, van Rossum, & Hilgers, 2010). Patients have been reported to demonstrate dysphonia, abnormal vocal fold vibratory movement, and abnormal aerodynamic and acoustic measures (Carrara-de Angelis, Feher, Barros, Nishimoto, & Kowalski, 2003; Fung et al., 2001). These are reported to

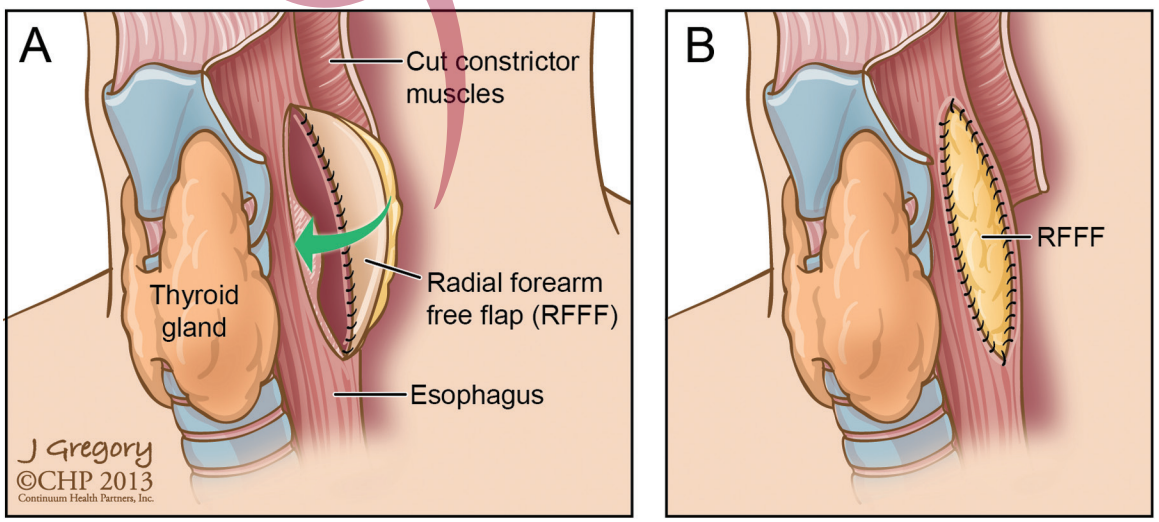

Figure 5–3. Management of area of stenosis (for patients with an intact larynx), using a radial forearm microvascular free flap (printed with permission from ©Continuum Health Partners).