

Chapter 6

Rehabilitation of Individuals with Head and Neck Cancers



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Case Presentation

A 70-year-old man presents to your office with T1N1 stage III laryngeal cancer. He is a smoker with mild COPD. He is starting chemotherapy and radiotherapy, and is scheduled to have a laryngectomy and radical neck dissection in 3 weeks.

What further information do you need to know in order to plan his rehabilitation? What complications and impairments might you anticipate?

Anatomic Regions

In order to rehabilitate patients with head and neck cancers (HNC), physiatrists should familiarize themselves with the basic anatomy of the region. Cancers of the head and neck encompass lesions at oral cavity, pharynx, larynx, salivary glands, and paranasal sinuses. The location and origin of the

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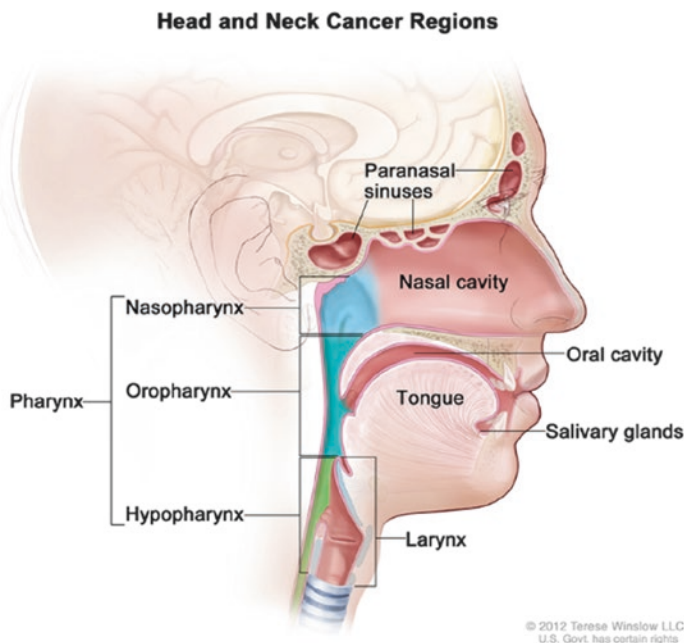


FIGURE 6.1 Picture in cancer rehabilitation. Page 305, Fig. 22.1 [1]

tumors is critical for staging, treatment plan, and management, as well as impairment profile. Figure 6.1 shows a diagram of the main regions in the head and neck (H&N).

Epidemiology and Survival

Cancer of the head and neck represents 5.6% of all cancers in the United States [2], and it predominantly affects males, with an M:F ratio of 3:1 [3]. There has been a steady rise in the incidence of head and neck cancers over the past decade and

this trend will continue in both developed and underdeveloped countries to the year 2030 [4].

The main etiologies in head and neck malignancies are exposure to tobacco products, alcohol consumption, and viral etiologies such as human papilloma virus in oropharyngeal cancer and Epstein-Barr virus in nasopharyngeal cancer.

The vast majority of malignancies involving the lip, oral cavity, and pharynx are squamous cell carcinomas. Approximately 500,000 new cases of head and neck squamous cell carcinoma are reported worldwide every year, and 40,000 of these are diagnosed in the USA [5]. Over the past two decades, there has been a shift in the primary site distribution, with an increase in oropharyngeal cancers and a decrease in tumors located in the larynx and hypopharynx. Parallel with this change of prevalence in primary sites, we have observed a shift on the risk factor profile, with an overall decrease in smoking and the identification of high-risk oncogenic human papilloma virus as a risk factor for oropharyngeal tumors.

The HPV positive oropharyngeal cancer patients tend to be middle age (<60 years old), non-smoking, Caucasian males of higher socioeconomic status with a history of multiple sexual partners. The prognosis for the HPV positive patient is substantially better, with a 2-year overall survival of 94% versus 58% in the HPV negative tobacco related cancers [6]. This has driven major changes in the 2017 head and neck cancer staging manual, including distinct staging systems for HPV+ (p16+) and HPV- tumors with corresponding improved prediction of survival; incorporation of depth of invasion of oral cavity lesions to the T designation; and addition of extra nodal extension to the N pathologic criteria [6]. See Tables 6.1 and 6.2.

The 5-year Cumulative Index Function (CIF) of cancer-specific mortality of squamous cell carcinomas of head and neck is 26.7%, while the competing mortality (deaths from other causes) adds another 12.7%; hence overall survival is 60.6% [7].

TABLE 6.1 Anatomic stage and prognostic groups for human papilloma virus-associated (p-16 positive) oropharyngeal cancer

T Category	N Category			
	N0	N1	N2	N3
T0	NA	I	II	III
T1	I	I	II	III
T2	I	I	II	III
T3	II	II	II	III
T4	III	III	III	III

^aAny evidence of metastasis is Stage VI

Adapted from Deschler DG, Moore MG, Smith RV, eds. Quick Reference Guide to TNM Staging of Head and Neck Cancer and Neck Dissection Classification, 4th ed. Alexandria, VA: American Academy of Otolaryngology–Head and Neck Surgery Foundation, 2014

TABLE 6.2 Anatomic stage and prognostic groups for nonhuman papilloma virus-associated (p-16 negative) oropharyngeal cancer

T Category	N Category			
	N0	N1	N2^{a,b,c}	N3
T1	I	III	IVA	IVB
T2	II	III	IVA	IVB
T3	III	III	IVA	IVB
T4a	IVA	IVA	IVA	IVB
T4b	IVB	IVB	IVB	IVB

^aAny evidence of metastasis is Stage VIC

Adapted from Deschler DG, Moore MG, Smith RV, eds. Quick Reference Guide to TNM Staging of Head and Neck Cancer and Neck Dissection Classification, 4th ed. Alexandria, VA: American Academy of Otolaryngology–Head and Neck Surgery Foundation, 2014

Location-Specific Functional Impairments

The result of these epidemiologic changes in the head and neck cancer population is a growing number of younger survivors at risk of significant impairments associated with the disease pro-

cess itself and treatment toxicities, highlighting the importance of functional preservation. The loss, or reduction, of function associated with head and neck malignancies and its treatment toxicities have a profound impact on the survivor's quality of life. A multicenter international study looking at functional outcomes in H&N cancer patients revealed that the most common patient-reported impairments are disfigurement (82%), dysphagia (75%), and changes in articulation (67%). These restrict basic functions, such as the ability to ingest food and communicate with others, as well as participate in leisurely and community activities [5]. Other common reported complaints affecting quality of life include dysphonia, trismus, xerostomia, dental cavities, tracheostomy tube dependence, neck and shoulder dysfunction, neuropathy, and lymphedema.

Impairments can be categorized by the etiology of the deficits including those caused by the primary tumor, metastatic disease, and acute and chronic treatment side effects. The deficits associated with the primary tumor will depend on its anatomical location, size, and degree of loco-regional spread. Impairments commonly involve oral and/oropharyngeal dysphagia, changes in articulation, resonance, phonation, localized and referred pain, vocal cord dysfunction, and hearing loss. See Table 6.3.

TABLE 6.3 Primary tumor location specific consideration and impairments in head and neck cancer

Location	Site-specific consideration	Functional impairment
Lips, oral cavity, oral tongue	Early diagnosis due to visibility (i.e., routine dental evaluation) Sensory impairments can further limit functional recovery Dental rehabilitation Osteoradionecrosis after Radiation to the mandible	Oral swallow (bolus preparation and oral control of bolus) Speech (articulation) Xerostomia secondary to radiation to salivary glands

(continued)

TABLE 6.3 (continued)

Location	Site-specific consideration	Functional impairment
Oropharynx and base of tongue	Trismus secondary to pterygoid involvement or fibrosis Velopharyngeal insufficiency from involvement of soft palate Fibrosis to upper esophageal sphincter from radiation treatment Pain (referred to ear and neck)	Oral and pharyngeal swallow (bolus propulsion, poor pharyngeal contraction, UES dysfunction) Trismus (decreased range of motion of jaw) Speech (articulation, hypo/hypernasal speech) Xerostomia secondary to radiation to salivary glands
Nasopharynx	Mainstay of treatment is radiation, with wide field, including brain Lhermitte syndrome can be seen post radiation Osteoradionecrosis of skull base Bulbar palsy as late effect of radiation	Nasal regurgitation (velopharyngeal insufficiency) Hyponasal speech Neurocognitive deficits Hearing loss (eustachian tube involvement)
Laryngeal	Total laryngectomy associated with good swallowing outcome and serviceable voice (electrolarynx or tracheoesophageal prosthesis) Radiation associated with laryngeal edema and fibrosis as well as restricted laryngeal movement	Pharyngeal dysphagia (airway protection compromised with high risk of aspiration) Hypophonia/dysphonia Vocal cord dysfunction, glottic compromise

TABLE 6.3 (continued)

Location	Site-specific consideration	Functional impairment
Hypopharyngeal	Higher risk of metastasis Strictures with stenosis of upper esophagus	Pharyngeal dysphagia (outlet obstruction, poor pharyngeal contraction) Vocal cord dysfunction

The presence of loco-regional spread to cervical lymph nodes has a strong negative effect on prognosis and increased disease recurrence in the head and neck cancer patient. Furthermore, finding extracapsular spread (ECS) in the involved lymph nodes decreases the 5-year survival from 70% to 27% [8]. ECS is a biological marker of aggressive disease and one of the most important prognostic markers, leading to consideration of aggressive multimodal treatment in its presence.

Treatment-Specific Functional Impairments

Treatment of head and neck cancer varies by tumor histology, location, and staging. However, most of the regimens involve combinations of chemotherapy, radiation therapy, and surgery. Many of the protocols involve giving chemotherapy and/or radiation prior to surgical resection, unlike protocols for most other cancers, where chemotherapy or radiotherapy occur after resection.

Chemotherapy Side Effects

The most common chemotherapeutic regimen for squamous cell head and neck cancer is a combination of cisplatin and fluorouracil. Cisplatin can cause fatigue, peripheral neuropathy, myalgia, vision changes, and gout, as well as alopecia, renal impairment, and myelosuppression. In rare cases, strokes and reversible posterior leukoencephalopathy have been reported.

Fluorouracil also causes fatigue, myelosuppression, and alopecia, but also causes a lot of acute gastrointestinal side effects (nausea, vomiting, diarrhea, and mucositis), and more rarely cardiotoxicity and cerebellar ataxia. Taxanes are also used with some frequency, and can cause peripheral neuropathy as well as arthralgia and myalgia. Pembrolizumab is a newer immunotherapy agent being used off-label for head and neck cancers. It also can cause fatigue, musculoskeletal pain, and in rare cases peripheral neuropathy. It has the potential to cause immune-mediated syndromes, including Stevens-Johnson syndrome and myasthenia gravis.

Radiation Therapy

Radiation fibrosis can occur in the field of treatment. It can manifest as pulmonary fibrosis when the lungs are involved, but also cause fibrosis of skin, soft tissue, and muscle. This can lead to torticollis and trismus, and cause significant pain. Abnormal jaw, neck, and shoulder motion



FIGURE 6.2 Jaw Dynasplint – PC Dr. Alba Azola

can result. Treatment of this can include range of motion exercise, taping, bracing (Fig. 6.2). Pentoxifylline with vitamin E has shown some promise in reducing symptoms [9]. In some cases, treatment with botulinum toxin injections may help [10].

Dysphagia occurs in approximately 75% of HNC patients, and is especially associated with radiation therapy (although local tumor burden and surgical resection also influence this). It can occur early in the course of the disease or can be late in onset. A recent study [11] demonstrated that prophylactic treatment with gabapentin during radiotherapy significantly decreased the subsequent incidence and severity of dysphagia.

Surgery

Surgical resections can result in significant impairments depending on the location and extent of the operation. Nasopharyngeal resections can be quite disfiguring, with resultant emotional distress in many cases. Glossectomy for tongue cancers may result in significant oral phase dysphagia if anterior, and oropharyngeal dysphagia if posterior. It also, of course, causes dysarthria. Laryngectomy is disfiguring, and causes aphonia or dysphonia. This can be mitigated with electrolarynx devices or with tracheo-esophageal prostheses. The latter requires surgical creation of a tracheo-esophageal fistula and placement of a one-way valve that allows air to move into the esophagus allowing the patient, with proper training, to produce speech. In cases where lymph node metastasis occurs, a radical or modified radical neck dissection may be indicated. This can involve resection of the sternocleidomastoid, with resultant limitation in range of motion. The recurrent laryngeal nerve may be damaged or sacrificed, with resultant severe dysphagia and dysphonia. The spinal accessory nerve also lies in close proximity, and injury of it will lead to inferolateral winging of the scapula due to trapezius weakness. This results in shoulder pain, weakness, and limited range of motion. Early intervention with physical therapy as well as electrical stimulation and taping of the scapula has been showed to improve shoulder functional outcomes [12].

Social Participation Restrictions

Taylor et al. [13] identified treatment with chemotherapy, neck dissection, and pain score as factors that increased the odds of disability, and estimated that 52% of patients working before diagnosis were able to return to work. A second study looking at return to work for H&N cancer patients younger than 65 years-old found that 71% of those working prior to diagnosis returned to work within 6 months of end of treatment, emphasizing age and level of education as favorable factors [14].

Case Presentation Continued...

Our patient underwent “prehab” prior to his surgery with speech and physical therapy; he also took gabapentin during his radiation treatments. Unfortunately, he had involvement of his recurrent laryngeal and spinal accessory nerves and has dysphagia as well as scapular winging and limited neck range of motion. He continues to work with PT and SLP. He has an electro-larynx, and is considering a TE prosthesis. Due to his social anxiety with his appearance, you have referred him to psychology. He is very grateful for the rehab team’s efforts.

Multiple Choice Questions

1. What percent of cancers does cancer of the head and neck represent?
 - A. 1–5%
 - B. 5–10%
 - C. 10–15%
 - D. 15–20%
 - E. 20–25%
2. Which of the following is/are risk factor(s) for head and neck cancer?
 - A. Tobacco use
 - B. Epstein Barr virus
 - C. Human papilloma virus
 - D. Alcohol use
 - E. All of the above

3. What is the significance of extracapsular spread in head and neck cancer?
 - A. Symptoms of hearing loss more likely
 - B. Increases the 5-year survival
 - C. Biologic marker of aggressive disease
 - D. Does not affect prognosis
4. Which chemotherapy agent used in head and neck cancer causes fatigue, peripheral neuropathy, myalgia, vision changes, and gout?
 - A. Fluorouracil
 - B. Cisplatin
 - C. Pembrolizumab
 - D. Pentoxifylline
5. What supportive devices are available post-laryngectomy?
 - A. Electrolarynx
 - B. Scrambler therapy
 - C. Tracheo-esophageal prosthetic
 - D. A and C

Answers

1. B
2. E
3. C
4. B
5. D

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