Case Report

A Case Study Associated with Oropharyngeal Cancer

Sandra J. Maurizio, RDH, PhD; Alicia L. Eckart, RDH, BS

Abstract

Purpose: Squamous cell carcinoma (SCC) is the most common oral malignancy, commonly located on the anterior floor of the mouth, lateral borders of the tongue, tonsillar pillars and lateral soft palate. A 59 year old male presented to a Midwestern university dental hygiene clinic following referral for pre-radiation and chemotherapy oral prophylaxis and comprehensive examination. He reported he found a firm lump in his neck and brought it to the attention of his general physician. Biopsy confirmed the diagnosis of SCC of the left tonsil. Surgery, radiation and chemotherapy were performed. This case study demonstrates the need to include careful palpation of lymph nodes in every intra- and extra-oral examination. Dental hygienists should document significant findings and notify the dentist of abnormalities and the need for subsequent referral, providing early detection results in improved prognosis for those who encounter experiences with oral, head and neck cancer. quent referral, providing early detection results in improved prognosis for those who encounter experiences with oral, head and neck cancer.

Keywords: Oral cancer, squamous cell carcinoma, tonsillar cancer, oropharyngeal cancer, radiation and chemotherapy, early detection

This study supports the NDHRA priority area, Clinical Dental Hygiene Care: Assess the use of evidence-based treatment recommendations in dental hygiene practice.

Introduction

A 59 year old Caucasian male presented to a university dental hygiene clinic for a pre-radiation and chemotherapy examination and prophylaxis in late August, 2007. Medical history revealed a recent diagnosis and surgical intervention for left tonsillar squamous cell carcinoma (SCC). The patient indicated he personally discovered a submental lump while shaving. He brought the lump to a medical doctor's attention in June during a previously scheduled routine office visit. The patient was initially prescribed antibiotics. After no improvement with antibiotic treatment, the physician referred the patient to an otolaryngologist, who subsequently referred him to a head and neck surgeon at a regional cancer center. A CAT scan performed on June 10, 2007 revealed an enlarged cervical chain of lymph nodes on the left side. Biopsy obtained from the area identified SCC of the tonsil. A CAT scan of the chest and radiographs of the thoracic spine revealed no evidence of metastasis. A modified radical neck dissection was performed on August 21, 2007.

The patient indicated he quit smoking cigarettes in April 2007, after 35 years of one pack per day tobacco use, with occasional efforts to quit. The patient reported no history of spit tobacco use. The patient consumed 2 to 6 alcoholic beverages per day. He continues to consume alcohol, but has reduced his intake to 2 to 3 alcoholic beverages 3 to 4 days per week. Dental history indicated sporadic dental treatment, primarily limited to extractions. Other medical history findings were within normal limits.

Extra-oral examination revealed a 23 cm incision site originating inferior to the left auricular lobe, extending along the sternocleidomastoid muscle to the area immediately superior to the clavicle and lateral to the midline of the submental region (Figure 1). A full mouth intraoral radiographic survey demonstrated generalized chronic periodontitis and missing teeth (Figure 2).

Intra-orally, there was evidence of recent oropharyngeal surgery. A triangular portion of the soft palate and tonsillar pillar was missing on the patient's left side. A maxillary partial denture was present.

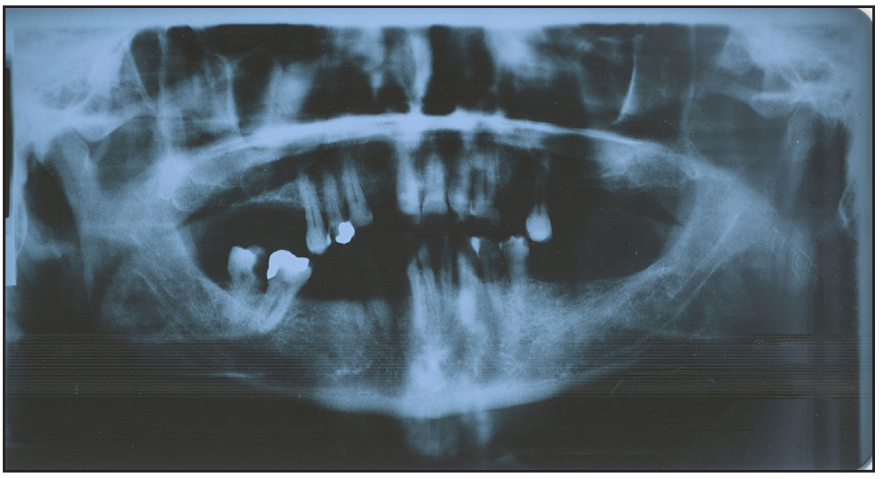
Treatment

Preventive and Restorative Treatment

Following consultation with several dentists and dental hygienists, a maxillofacial surgeon, the dental hygiene student and the patient, a dental hygiene diagnosis was determined and a treatment plan was developed. The patient provided informed consent. Because the radiation oncologist would not initiate radiation therapy and chemotherapy until all dental treatment was completed, time was critical. The patient scheduled all preventive and restorative treatment during the 3 week period following the initial examination. The dentist extracted 2 teeth to avoid the possibility of

Figure 1

Figure 2



future osteoradionecrosis following radiation therapy.[1-3] All restorations were completed. The maxillary partial denture fit well and required no alterations. Additional intra- and extra-oral photographs were taken 1 month postoperative.

The student dental hygienist performed quadrant periodontal debridement under local anesthesia and provided oral hygiene instructions. Fluoride varnish was applied to exposed surfaces of the teeth. The student demonstrated to the patient correct flossing and brushing techniques using an extra soft toothbrush and suggested saliva substitutes such as Biotene® (Laclede, Inc., Dominguez, CA) or Oasis (Gebauer Consumer Healthcare, Cleveland, OH) to help alleviate xerostomia caused by radiation therapy. The student obtained alginate impressions, from which a custom tray of soft acrylic was constructed. The patient was given 1.1% neutral sodium fluoride gel and instructed on appropriate use. Instructions include placing a small amount of gel in the custom tray, applying the trays once daily for 5 minutes and refraining from eating or drinking for 30 minutes. Trays should be rinsed after use with room temperature water, air dried and placed in cool water for storage. The student recommended he apply the fluoride at the same time every day to help him incorporate the application into his daily routine, suggesting after breakfast, during bathing or before bedtime as options to make it easier and more comfortable to abstain from food and beverages for 30 minutes. Because patients often tolerate mild or flavorless fluoride better than those with strong flavors, a mild flavor was prescribed.[4-6] A casein phosphopetides-amorphous calcium phosphate product was also prescribed with instructions to brush the gel on all surfaces of the teeth at least once per day.[7] These products saturate the tooth surface to assist in remineralization and are used in conjunction with other fluoride therapy products for individuals with high caries risk, such as those with xerostomia.[7-9]

Patient instructions included discussing the need to place removable appliances in denture solution overnight and the use of non-petrolatum-based lip products. Frequent re-evaluation appointments were stressed to alleviate any oral complications following treatment.[10]

During subsequent periodontal maintenance recalls, the patient's oral health was assessed. Light debridement was indicated. Gingival and periodontal health remained unchanged. Additional photographs were obtained to document the continued healing of the surgical site (Figures 3, 4).

Surgical Intervention

The surgeon's operative report indicated he initially performed a laryngoscopy to examine the larynx and the base of the tongue, and to palpate the base of the tongue to determine the extent of the lesion. The larynx was normal. The tumor extended from the soft palate, and included a portion above the uvula, both the anterior and posterior pillars and the inferior base of the tongue. The surgical procedure was accessed through the oral cavity. The surgeon removed the soft palate on the left side, the anterior and posterior tonsillar pillar, the tonsillar fossa, the triangular fossa and the base of the tongue up to the posterior pharyngeal wall. The surgeon performed a modified radical neck dissection on the left side.[11-13] The sublingual and submandibular glands, along with the tail of the parotid, were removed. All major nerves were spared.

A 1.7 cm tumor with a depth of 6 mm was identified. Metastasis to 3 of 29 lymph nodes to a maximum depth of 3.5 cm was present. Biopsy of all surgical margins indicated no evidence of malignancy.

The surgical specimen was examined by a pathologist. He diagnosed stage IV (T1/N2b/MX) SCC of the left tonsillar bed. T1 indicates the tumor is ≤2 cm. N2b indicates that metastasis in multiple ipsilateral lymph nodes were present, none >6 cm. MX indicates distant metastasis cannot be assessed from the specimen provided.[14-15] The tumor extended through the nodes into the left portion of the neck. Soft tissue metastasis was present and lymph node structure was completely obliterated. A maximum area of metastasis was 3.5 cm. Distant me-

tastasis could not be assessed from the specimen provided (however, as previously noted, a CAT scan of the chest and radiographs of the thoracic spine indicated no evidence of distant metastasis).

Radiation and Chemotherapy

Advanced tumors of the oropharynx are generally treated with a combination of surgical resection and postoperative radiotherapy.[1,16] This patient received chemotherapy in addition to neck resection and radiotherapy. In September 2007, prior to initiation of radiation and chemotherapy, a gastric feeding tube was inserted to provide nutritional intake due to the expected development of mucositis and subsequent inability to orally consume food. Medical consultation indicated no need for antibiotic prophylaxis associated with dental treatment following gastric tube placement.

Radiation therapy and chemotherapy were administered concurrently beginning in October 2007. The patient received 30 treatments of Intensity Modulated Radiation Therapy (IMRT).[1,17] Advantages of IMRT include the ability to modify the radiation beam for the patient's specific anatomy and tumor shape to reduce the dose of radiation to normal tissues. IMRT helps preserve critical anatomical features like salivary glands, cochlea, eye, brain and spinal cord, while delivering the radiation dose.[3,17-19] The procedure utilizes a custom-made mesh mask with markings for the precise and consistent administration of radiation (Figure 5). The mask is positioned over the patient's face so the radiation dose is administered to the same location each time. The dose consisted of 210 Centigray (cGy), using a 9-field technique with a custom block using MLC blocking with 6 MV photon. A total of 6,300 cGy was delivered over a 7 week period from mid-October to the end of November. The patient indicated each treatment took about 15 minutes.

Chemotherapy consisted of 7 treatments of 69 to 71 mg of Cisplatin and other components (Table I).[20] Concurrent radiation and chemotherapy are frequently prescribed following surgery for late-stage patients at increased risk for recurrence and low survival rate.[15,19] Extra-capsular extension and positive surgical margins in particular have demonstrated significant benefit from concurrent chemoradiotherapy.[3]

Figure 3

One dose of Aloxi® (palonosetron HCl) was administered each day of chemotherapy and for 2 days after therapy to avoid nausea and vomiting. A 5 mg prescription of Salagen® (pilocarpine hydrochloride) was prescribed orally 3 times a day during post radiation treatment to help alleviate dry mouth symptoms resulting from salivary gland hypofunction caused by the radiotherapy.[17-21] Radiation and chemotherapy were completed in late November 2007. The feeding tube was removed mid-January 2008.

Side Effects Experienced

Radiation and chemotherapy combined create a more complicated situation for maintaining the patient's comfort, lifestyle and defense from infection.[2] The patient in this case study experienced many of the side effects frequently observed in patients who receive radiation therapy, including pronounced fatigue, nausea, loss of appetite, diminished taste sensation, xerostomia, weight loss and overall flu-like symptoms throughout radiation and chemotherapy treatment[2,3,21] (Table II). He also endured radiation burns to the skin at the site of treatment. The patient experienced transient dysphagia, or difficulty swallowing, oral mucositis and esophagitis during treatment. During the months following radiation and chemotherapy, the patient's xerostomia, taste and appetite gradually improved.

Figure 4

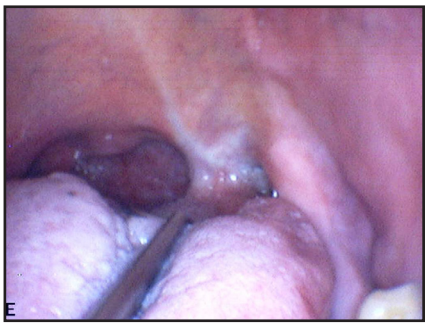
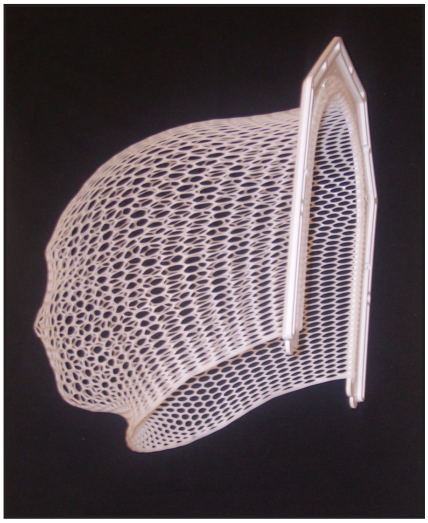


Figure 5



Mucositis is an extremely painful condition that involves inflammation of the mucosal lining of the entire gastrointestinal tract.[21-26] It causes significant morbidity, including malnutrition and local and systemic infections, in addition to pain. Topical anesthetics, chewing on ice chips, consumption of liquid or soft foods and use of bland oral rinses

Table I: Components of Chemotherapy for Case Study Patient[20]

Drug	Dose	Purpose
Palonosetron (AloxiTM)	0.25 mg	Antiemetic to prevent acute and delayed chemotherapy-induced nausea and vomiting.
Diphenhydramine	25 mg	Antihistimine and antinauseant
Dexamethasone	20 mg	Anti-inflammatory; corticosteroid used systemically and locally to prevent chronic swelling; antiemetic.
Cimetidine (Tagamet®)	300 mg	Prevent upper GI bleeding in critically-ill patients; OTC to relieve heartburn or acid indigestion
Amifostine (Ethyol®)	500 mg	Protective agent for selective cells to reduce toxicities associated with radiation and chemotherapy, particularly xerostomia
Cisplatin (Platinol®-AQ)	69 – 71 mg	Antineoplastic agent used to treat a variety of cancers, including head and neck cancers
Magnesium Sulfate	1.5 gm	Electrolyte supplement used to treat and prevent hypomagnesaemia and cardiac arrhythmias; short-term treatment of constipation or soaking aid; anticonvulsant
Potassium Chloride	20 mEq	Electrolyte supplement used to Treat and prevent hypokalemia (deficiency of potassium in blood)
Mannitol	25 gm	Diuretic and/or I.V. fluid replacement.

Table II. Side Effects of Cancer Therapy

Radiation Therapy
Alterations in pigmentation of skin, including white patches (vitiligo) or tanning
Loss of hair (alopecia)
Subcutaneous changes • Telangiectasia (dilated capillaries or "spider veins") • Fibrosis • Edema (swelling)
Acute mucositis
Xerostomia (hyposalivation or dry mouth) and changes in quality of saliva
Candidiasis (fungal overgrowth)
Hypogeusia, dysgeusia, or ageusia (partial loss, changes in perception, or complete loss of taste, respectively)
Dental caries
Osteoradionecrosis
Soft tissue necrosis (mucosal ulcer)
Chemotherapy
Acute mucositis
Xerostomia and changes in quality of saliva
Hemorrhage
Candidiasis

serve as therapeutic regimens for oral mucositis.[22]

As previously mentioned, the patient had 2 extractions prior to radiation therapy. The risk of osteoradionecrosis is lower if dental extractions are completed prior to radiation and chemotherapy. Osteoradionecrosis is a complication following high dose radiotherapy for head and neck cancer.[1-3,27-30] Specific definitions vary, but the condition involves exposed irradiated bone tissue that fails to heal in the absence of residual or recurrent tumors. Most osteoradionecrosis occurs within 2 years of radiotherapy, but the risk remains for life.[28]

Additional Biopsy and Surgery

In March 2009, approximately 20 months after the original surgical procedure, a PET scan revealed a suspicious mass in the right tonsillar region. Surgery was scheduled the following month. The right palatine tonsil was removed. The pathology report indicated lymphoid hyperplasia with no evidence of malignancy.

In April 2010, the patient complained of headaches and underwent an MRI of the brain, CT scan of the neck and PET/CT scans of the skull to thigh areas. All tests were negative for metastatic disease.

Discussion

SCC is the most common cancer associated with the oral cavity. It affects over 36,000 people annually in the United States and results in approximately 7,900 deaths.[31] Oropharyngeal cancer's 5 year relative survival rates depend upon stage and vary from 57% for Stage I to 30% for Stage IV cancers.[31] Avoidance of various risk factors, as previously stated, decreases the chances of acquiring this type of cancer. In addition, early detection results in improved prognosis for those who develop oral, head and neck cancer.

SCC contributes to approximately 90% of all malignant tumors in the mouth and is the sixth most common cancer worldwide.[31-32] SCC can be defined as a malignant neoplasm of stratified squamous epithelial origin that exceeds normal growth and may invade surrounding or distant tissues.[32] The male/female ratio of oral and pharyngeal cancers is approximately 2:1. Men may develop oral and pharyngeal cancers more often than women because they may be

more likely to participate in risk factors associated with the etiology of oral, head and neck cancers such as tobacco use and heavy alcohol consumption.[31,33]

SCC is commonly located on the lower lip, however, within the oral cavity the primary locations include the lateral borders of the tongue, anterior floor of the mouth, tonsillar pillars and lateral soft palate.[34] Eleven percent of oral SCC lesions are located in the oropharynx region, including the base of the tongue and the tonsillar fossa, the area affected in this patient.[35] At this location, the cancer tends to metastasize to the regional lymph nodes first, and may clinically reveal an asymptomatic, ulcerated, firm lesion in the soft tissue.[36]

Major risk factors for oral cancer include tobacco use and excessive alcohol consumption. Although each is carcinogenic, tobacco and alcohol have a synergistic effect that creates a very susceptible environment for oral cancer.[37,38] Other risk factors include human papillomavirus subtype 16 (HPV-16), age over 40, low fruit/vegetable intake, race and ultraviolet light (lip cancer)[37-39] (Table III).

Table III. Risk Factors Related to Oral and Oropharyngeal Cancers

Risk Factor	Explanation
Tobacco Use	9 out of 10 oral cancer cases are heavy smokers, and the risk of developing these cancers is dependent on duration and amount.
Alcohol Consumption	Heavy drinking combined with using tobacco increases oral cancer risk by 100-fold. Seven of 10 patients with oral cancer are heavy drinkers.
Human Papillomavirus	Some types of HPV that can cause cervical cancer have been known to cause some oral and oropharyngeal cancers, especially HPV-16.
Age	Individuals older than 40 years are at greater risk for oral cancer.
Ultraviolet Light	Prolonged exposure to the sun may increase the risk of cancer on the lips.
Poor Nutrition	Patients lacking fruits and vegetables in their diet are at greater risk of cancer of the oral cavity and oropharynx.

Although the cancer-inducing mechanism is unknown, HPV markers have been found in 20 to 75% of tonsillar cancers.[40] The overall prevalence of HPV in SCC of the head and neck region is 25%, with a prevalence of 36% in oropharyngeal carcinomas, 24% in oral carcinomas and 24% in laryngeal carcinomas.[40] The type of virus implicated in 87% of the HPV-positive oropharyngeal carcinomas is HPV-16.[40] Although conflicting studies exist, HPV-related oropharyngeal carcinomas have been implicated with sexual transmission.[40,42-48] Studies show a correlation between sexual behavior, such as younger age of first intercourse, multiple sex partners, oral-genital contact and the incidence of HPV-positive oropharyngeal cancer.[40] Women with HPV-related cervical cancer demonstrate a higher incidence of oral SCC, as do their partners.[40] Additional studies report concurrent HPV-related tonsillar carcinoma in 3 couples with DNA sequences that indicate infectious transmission.[42,48] Patients with cancers containing HPV tend to be younger and have better survival rates. It is postulated that the recent vaccines for the prevention of HPV-related diseases may impact the incidence of oral cancer, but the impact is not likely to appear for some time.[40-41] Currently, the vaccine is recommended for adolescent girls, and until males and older populations are included, diminished incidence of HPV-related oral cancer will not likely be apparent.[40] The patient described in this case study self-reported a negative HPV status, but the presence of HPV in his tumor tissue is unknown.

Conclusion

Early detection of head and neck cancer is an important measure that can greatly decrease morbidity and mortality. Due to this patient's age, gender, tobacco and alcohol use, the health history provided a good indication that he may be at higher risk for oral, head and neck cancer. He was a prime candidate for developing oral cancer. Although this patient found his neck mass independently, it is critical that dental care providers perform thorough examinations with complete palpation of all areas of the mouth, head and neck.[27] Lesions may not be readily apparent visually, but may be more easily detected through palpation. Because the incidence of young patients with no apparent risk factors is increasing, it is important to remember that oral cancer examinations should not be limited to high risk individuals. Failure to provide these simple, quick exams is inexcusable.

The case study portrayed the events surrounding a diagnosis of head, neck and oral cancer treatments taken by a team of physicians, surgeons, oncologists, dentists, professors, dental hygienists and dental hygiene students. Assessments were made by the dental team after surgery and prior to treatment to prevent side effects the patient may have suffered when undergoing radiation and chemotherapy. For example, the patient was advised and followed through with necessary extractions and restorations to prevent osteoradionecrosis and rampant decay. Products were dispensed to aid in salivary flow, and custom fluoride trays were fabricated to prevent xerostomia and radiation caries. In addition, the patient was monitored during radiation and chemotherapy for side effects and oral hygiene. This was especially important due to the high risk of patients quitting treatment due to

the discomfort of mucositis that often develops. After radiation and chemotherapy were completed, the patient was evaluated, treated to maintain oral status, obtain pictures and document changes. The patient has continued to follow up with periodontal maintenance visits at the clinic.

Treatment induced side effects can be greatly reduced or prevented when dental professionals are an integral part of the management team. Oral side effects caused by treatment are the major reason patients must temporarily halt their treatment protocols. It is estimated that 56% of infections that occur during treatment that result in the death of a patient originate in the oral cavity.[20] Therefore, it is imperative that dental professionals vigorously educate themselves and their cancer patients on the prevention and management of oral health before, during and after cancer treatment.

Dental hygienists must stress the importance of regular office visits, not only to prevent or maintain dental caries and periodontal disease, but also to prevent or detect oral cancer in the early stages. Providing information regarding risk factors of oral cancer is essential to allow the patient to adopt appropriate preventive measures. Upon finding suspicious areas, it is crucial to remain in contact with the patient to ensure he or she follows up on referral recommendations. It is our duty as members of the dental team to ensure that patients understand the importance of compliance with treatment recommendations, including frequent maintenance visits, monitoring and evaluating oral health and taking proper action to prevent side effects. With little effort on the dental team's part, we can truly save lives.

Sandra J. Maurizio, RDH, PhD, is an associate professor, Dental Hygiene, School of Allied Health, College of Applied Sciences and Arts, Southern Illinois University, Carbondale, Illinois; Alicia L. Eckart, RDH, BS is a 2008 graduate of Southern Illinois University Carbondale and currently works in private practice in Swansea, Illinois.

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