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Oral Cancer: Update for the Oral Healthcare Provider
A Peer-Reviewed Publication
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Educational Objectives
Upon completion of this course, the clinician will be able to do the following:
1. Understand the diverse demographic of patients who are affected by oral cancer.
2. Understand the risk factors that directly relate in culmination of oral cancer, especially alcohol and tobacco use.
3. Comprehend healthcare professional methods for detection, (ie., types of cancer screening), and provide proper protocol for prevention.

Abstract
Over 30,000 new cases are expected to be diagnosed in the United States this year alone. With proper intra-oral and extra-oral examinations conducted by a trained healthcare professional, early diagnosis can make all the difference in the management of the patient’s condition, although prevention remains the healthcare provider’s best option. To help avert future incidence, at-risk patients need to be educated by healthcare providers, including on nutritional information and, in the case of tobacco users, the U.S. Public Health Service’s “Five A’s.” Armed with a full understanding of the disease, the oral healthcare professional is the most likely frontline clinician to prevent, diagnose and manage a patient’s oral cancer.

Introduction
For the purpose of this article, the term “oral cancer” applies to malignancies occurring distal to the vermilion border of the lips in the oral cavity, and some pharyngeal sites, such as the oropharynx and tonsils, that are readily visible or palpable during a comprehensive examination by an oral healthcare provider (OHCP). Oral squamous cell carcinoma (SCCA), arising from the epithelium, comprises 90 percent of oral cancers, with the remaining 10 percent attributed to rare cancers, including salivary gland malignancies, sarcomas, and others. SCCA is the endpoint of an accumulation of alterations in genes responsible for maintaining the integrity of the genome (“caretaker” genes) and/or those responsible for controlling cellular proliferation (“gatekeeper” genes). Such alterations vary and range from subtle changes in DNA sequences to gross chromosomal gains or losses. The precise mechanisms by which these alterations lead to the genetic instability predicting malignant transformation, proliferation, and metastasis remains hotly debated. In general it seems clear that the progression follows a distinct temporal pattern from normal mucosa to precancer (oral epithelial dysplasia) to SCCA (commensurate with invasion into submucosal tissues), and that the majority of the genetic alterations found in SCCA are present in lesions preceding malignant transformation. Although the time line for pathogenesis is variable, there is an opportunity in most cases to visualize this disease during the premalignant stage where the changes are confined to the epithelial layers, or while the SCCA is at an early stage before it has spread from the primary site. Indeed, in the future it may be possible to detect molecular markers for these genetic mutations before any visual changes are evident. This article provides an update to OHCP’s to facilitate early detection, which should translate into a reduction in both the morbidity and mortality of this terrible disease.

Epidemiology
United States estimates for oral cavity and pharyngeal cancers in 2006 indicate that 30,990 new cases will be diagnosed, 7,430 of which will be terminal. From 1975–2002 this data represents a modest yet significant decrease in the annual percentage changes in both incidence and mortality rates. That said, the 2006 data represents 1.5 percent and 5.5 percent increases in incidence and mortality, respectively. The lifetime risk for developing oral and pharyngeal cancer is one in 98.

With respect to incidence this translates to an age-adjusted rate of 10.5 in 100,000 men and women per year. Incidence rates increase with age, with 89 percent over the age of 35 and an average age at diagnosis of 63. There has been a significant increase in oral cancer in the under–40 age group. In men, oral cavity and pharynx comprise the eighth leading site for cancer in the U.S., with incidence rates (15.5/100,000) that are more than twice those of women (6.4/100,000). By race, African American men have the highest incidence rates (19.0/100,000) and the poorest survival outcomes. Oropharyngeal cancers can occur at any subsite, with the tongue presenting the greatest number or occurrences.

With respect to mortality, there is a similar age, gender, and racial trend: an overall age-adjusted mortality rate of 2.8 in 100,000 men and women per year with higher rates in men (4.2/100,000 versus 1.6/100,000 in women), and the highest rates in African American men (7.1/100,000).

However, the most important epidemiologic data is related to survival. Given the easy screening access, it is remarkable that the overall five-year relative survival rate for a patient diagnosed with oral and pharyngeal cancer during the period from 1995–2001 has been estimated to be about 59.4 percent, in stark contrast to breast or prostate cancer which have overall five-year relative survival rates of 88 percent and 100 percent respectively. Only 34 percent of oral and pharyngeal cancers are diagnosed with localized stage disease (i.e., no detectable spread of the primary cancer to regional lymph nodes). The importance of early detection is evident when survival rates are stratified by stage: localized disease is associated with the highest five-year relative survival rates (82.1 percent), compared to advanced disease that has spread to regional lymph nodes (51.3 percent) or to distant sites (27.6 percent). In addition to the high mortality of this disease if detected in the advanced stages, it is also important to note that quality of life for patients who do survive is greatly diminished due to the nature of the main treatment options, which include disfiguring surgery and radiation therapy that predict numerous complications.
Risk Factors
Seventy-five percent of all cases of oral cancer in the United States are associated with tobacco smoking and heavy alcohol use. It is the long-term carcinogenic exposure to such risk factors that, in the context of individual host susceptibility, causes the accumulation of genetic abnormalities leading to oral cancer. Cigarette smokers older than 40 years of age with a history of heavy alcohol use are at highest risk. Use of all forms of tobacco has been associated with oral cancer, including cigar and pipe smoking, smokeless or chewing tobacco, and other forms of tobacco used by certain ethnic groups such as bidi smoking, clove cigarettes, hookahs, or chewing a combination of areca nut and tobacco (paan masala or gutkha).7

Other avoidable risk factors include sun exposure (for lip cancer), a diet low in fruits and vegetables, and recent data suggests a possible association with marijuana use, although there is conflicting data.8,9,10 Patients with a past history of upper aerodigestive tract cancer, particularly oral cancer, are at a much higher risk for recurrence. Immunocompromised patients, including but not limited to those with HIV infection, may also be at heightened risk.11

Risk factors for the remaining 25 percent of the population who develop oral cancer remain enigmatic. Other than inherited genetic mutations, researchers speculate that oral infection with oncogenic viruses, particularly certain strains of the human papilloma virus, may confer a higher risk and may explain the increase in oral cancer within the under-40 age group.

Role of Oral Healthcare Providers in Early Detection and Prevention
Of the various frontline clinicians, the OHCPs’ training arguably makes them the best qualified to examine the oral cavity and intercept oral premalignancy or early oral cancers. Given the devastating consequences of delayed diagnosis, they have a professional obligation to optimize their ability to detect disease earlier by performing opportunistic oral cancer screenings for every patient presenting to the dental clinic, whether for routine or emergency care. In addition, preventive counseling about avoidable risk factors and proper nutrition must also be considered standard care. The practice of early detection and prevention constitutes an oral cancer screening, and the first step towards inculcating this practice is to ensure that you are updated in this area. Indeed, some U.S. states are now mandating continuing education in oral cancer early detection and prevention. Furthermore, there is an increase in malpractice suits stemming from late diagnoses of oral cancer.12

Oral Cancer Screening
This can take fewer than five minutes and could save a life. It involves risk factor assessment, physical examination, and preventive counseling. In addition to visualizing oral abnormalities, screening exams can be used as an opportunity to educate patients about the symptoms of oral cancer and help them understand the factors that put them at risk. Step 1 is a risk factor assessment that includes eliciting current and past history of tobacco and alcohol use, a medical history (or family history) of previous cancers (particularly upper aerodigestive tract cancers) or indicative of a compromised immune system (e.g., HIV infection, chronic steroid use), and a nutritional history. Step 2, applied regardless of the results of the risk factor assessment, is a physical examination of both extra-oral and intra-oral tissues. In order for the examination to have both high sensitivity and specificity for detecting an abnormal finding, the examiner must have knowledge of the range of “normal” anatomy (including the anatomy of edentulous patients) and the ability to visualize or gain access to all regions to be examined. Many patients are unfamiliar with such an examination, so it is important to explain and demonstrate the process and encourage self-examination between visits. There are no current guidelines for the frequency of oral cancer screenings in the general population, although given the minimal time required and the potential benefits of early detection, screening all new patients (including emergencies) and at recall seems prudent. Remember, if you bill the patient or a third party for a comprehensive or periodontal evaluation (CDT D0150 or D0180), you are obligated to perform an oral cancer screening.

Extra-Oral Examination
The extra-oral examination should include inspection and palpation of both the midline and lateral structures of the head and neck primarily to detect abnormal lymph nodes (lymphadenopathy) that may indicate regional spread. Indeed, the most common reason for a lateral neck swelling in an adult is a metastatic lymph node. However, this is also an opportunity to intercept head and neck skin cancers or other abnormalities in this region. Clothing or long hair restricting direct visualization should be removed or pushed aside respectively. Under proper lighting, assess the patient’s general features for swelling and asymmetry. Throughout the examination, carefully inspect the skin for color changes, growths, or ulcerations. In addition to other structures such as the TMJs, muscles of mastication, and the parotid glands, the examiner should pay close attention to the structures as described below.

Thyroid gland
A bilobed structure attached to the trachea, with the isthmus at a level just inferior to the cricoid cartilage (Figure 1). An abnormal thyroid is consistent with glandular enlargement, either diffuse (which may be obvious by visual inspection alone) or as a discrete nodule or nodules. Standing behind the patient, the examiner should locate the isthmus, using the prominent thyroid cartilage as a landmark and moving inferior to the cricoid cartilage (Figure 2). Pushing the sternocleidomastoid muscle laterally and posteriorly with two
fingers, the examiner may palpate the lobes (in turn) by applying light pressure (Figure 3). Asking the patient to swallow some water may also facilitate palpation of the thyroid.

**Trachea**

An abnormal trachea may be consistent with tracheal fixation (axial immobility) or displacement from its usual midline position. With the patient’s neck relaxed, the examiner should grasp the tracheal rings and gently move the trachea laterally (Figure 4). Free and symmetrical axial movement with mild crepitus is normal. Tracheal displacement may be evaluated by palpating its relationship to the midline suprasternal notch.

**Lymph Nodes of the Head and Neck**

The examiner must be familiar with the lymphatic drainage of the head and neck (Figure 5), and understand how to recognize lymphadenopathy. The lymphatic system of the head and neck is both complex and highly variable. Superficial lymph nodes drain into deep lymph nodes, and lymph nodes of the head drain into the descending nodes of the neck. In a healthy individual, some of the superficial nodes may be palpable. When lymph drainage contains mediators of inflammation or foreign antigens (e.g., microorganisms or tumors), lymphadenitis or lymph node hyperplasia may result. These lymph nodes are enlarged, freely movable, and often tender. Metastatic lymph nodes occur following seeding of malignant cells (especially carcinomas) into the regional lymph node, and, depending upon time and tumor type, this usually manifests clinically as a firm and nonpainful nodal enlargement that may be bound to surrounding tissues. This bonding is known as “fixation.” Lymphomas, especially Hodgkin’s disease, may manifest as rubbery enlarged cervical lymph nodes. While enlargement of superficial nodes is easier to detect, deep nodes are only palpable when larger than 2 cm in diameter. Depending on the region, most lymph drainage from the oral cavity will enter the submental, submandibular, or jugulodigastric lymph nodes either directly or indirectly. In oral cancer, metastatic disease will usually involve these lymph nodes and spread inferiorly. If the examiner prefers to start the extra-oral examination with the thyroid and trachea, it makes sense to examine the lymph nodes of the neck before those of the head. Since skin is elastic, it is more efficient to palpate underlying structures by digitally moving a section of skin rather than sliding fingers over the skin surface. The sternocleidomastoid (SCM) muscles separate the anterior and posterior triangles of the neck, serving as an ideal landmark for examination of the neck lymph nodes since the cervical lymph nodes are found in close proximity to them. Position the patient’s head to reveal the outline of the SCM. This can
be accomplished by having the patient lift his or her head off the headrest or by turning his or her head away from the side being examined. Once the SCM is visible, starting superiorly, palpate along the entire anterior border of the SCM, pushing under the body of the muscle to facilitate detection of enlarged deep cervical nodes (Figure 6). Although rarely a site for metastatic lymphadenopathy, you can also palpate the posterior neck triangle along the entire posterior border of the SCM from the suboccipital region superiorly to the supraclavicular region inferiorly. Repeat the process for the contralateral neck lymph nodes and compare findings. The submandibular node can easily be palpated in most patients and allows the examiner to experience the tactile characteristics of a healthy node. Have the patient position his chin down and, with the fingers cupped, drag the loose skin under the chin laterally across the inferior border of the mandible (Figure 7). In this way it is possible to capture and palpate the node against the mandible. In a similar fashion, the submental node can be palpated by dragging tissue under the chin anteriorly (Figure 8).

Figure 7

Figure 8

Intra-Oral Examination

Oral abnormal findings may range from an asymptomatic and small (less than 1 cm in diameter) red, white, or mixed red/white patch with or without ulceration as the earliest visible premalignant epithelial change to a massive (greater than 4 cm in diameter) exophytic tumor with induration and associated pain with an advanced SCCA. No awards go to oral healthcare providers who detect advanced cancers; the odds of survival do not favor the patient. However, the critical interception of early disease requires the examiner to be able to carefully visualize all soft tissues. Oral cancer may develop on any mucosal surface, although the highest risk sites in the U.S. are the tongue, followed by the oropharynx, lower lip, and floor of the mouth.

Patients should be asked to remove lipstick and removable dental appliances and to rinse out food particles. It is important for the examiner to develop a consistent examination sequence. The order of this is not important, as long as all elements are completed. An adequate light source is critical; if a standard overhead halogen dental light is not available, the clinician is advised to use a portable headlight in order to keep both hands free. An air syringe, mouth mirror, and gauze are helpful adjuncts to the standard intra-oral examination.

1. Lips: Abnormal lip findings include a loss of vermillion border, ulcerations that have not healed within two weeks, and other surface changes or color irregularities. Bimanual palpation of the lips is essential to rule out submucosal growths.
2. Labial Mucosa: Reflecting the lips (Figure 9), look for any surface changes.
3. Buccal Mucosa: Use the fingers or the mirror to retract and visualize all aspects of the buccal mucosa (Figure 10). Palpate the parotid extra-orally to ensure that salivary flow through the Stensen’s duct orifice is normal.
4. Gingivae: Both palpation and visualization are important.
5. Tongue: All surfaces of the anterior two-thirds of the tongue (dorsal, lateral, and ventral) are generally easy to visualize and palpate. A piece of gauze may be wrapped around the tongue to allow access to the posterior aspect of the dorsum and posterolateral border of the tongue where the foliate papillae can be visualized (Figure 11). The posterior third of the tongue is more difficult to visualize directly, digital palpation and indirect visualization by mirror are encouraged (Figure 12).
6. Floor of Mouth: Since surface changes may be subtle, air-drying this region facilitates examination (Figure 13). Bimanual palpation for any growths or asymmetry can be achieved by moving two opposing fingers, one extra-orally and the other intra-orally, from posterior to anterior, palpating the interposing soft tissue (Figure 14).
7. Palate: Palpation and direct visualization of both the hard and soft palate is important (Figure 15).
8. Oropharynx: Often overlooked, this area includes the soft palate and uvula, the anterior and posterior pillars (or faucae), the palatine tonsils (or scars from their removal), and the posterior pharyngeal wall (Figure 16).

Oral Cancer Screening Adjuncts

In recent years new screening adjuncts have emerged (and continue to emerge) with the principal aim being not to replace the standard screening examination but to improve its “yield.” An ideal screening adjunct should be highly sensitive (i.e., it should detect oral premalignant lesions or early oral cancers), inexpensive, noninvasive, and simple to use. Currently there is only one commercially available screening adjunct in the United States. ViziLite® (Zila Inc., Phoenix, AZ) is FDA-cleared as an adjunct to the standard oral examination to improve identification, evaluation, and monitoring of white oral mucosal abnormalities in populations at increased risk for oral cancer. There is a CDT code for this test (D0431) that may be covered by some insurance carriers. Based on chemiluminescence (a low-energy blue-white light), it is an

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immediate and noninvasive screening adjunctive technique adapted for oral use following demonstration of its ability in gynecology to enhance the direct visualization of cervical lesions suspicious for neoplasia. The technique involves a customary standard visual intra-oral examination (recording any abnormalities), and then the patient is asked to rinse for 60 seconds with dilute acetic acid. The chemiluminescent “wand” is then activated, and a second visual examination is performed in a darkened room to detect any abnormalities, specifically “acetowhite changes” (Figure 17). Two preliminary screening studies carried out in high-risk populations by oral medicine experts have demonstrated that this technology provides modest additional visual information to the standard examination, although the utility of this adjunct to specifically detect oral cancer and precancer was not tested.

White lesions, particularly nonhomogeneous ones, are more likely to be visualized by ViziLite. A recent study in a small cohort of patients with suspicious lesions suggests that this technology has high accuracy in detecting oral cancer and precancer. More studies are needed to better define the role of ViziLite in the hands of frontline screeners, and at the very least its use may benefit oral cancer awareness in both the public and professional domain.

Recently, ViziLitePlus (Zila Inc., Phoenix, AZ) has been introduced into the marketplace. This product includes a TBlue Oral Lesion Marking System, a toluidine blue dye used to assist in the further evaluation of ViziLite-identified white oral mucosal lesions for patients at increased risk for oral cancer.

Toluidine blue is well established as both a screening and diagnostic adjunct. It has been used “off-label” for many years and it is commercially available as a screening adjunct (OraTest, Zila Inc., Phoenix, AZ) in 14 countries outside of the United States. As of the publication of this article, studies are currently under way to sup-
port its FDA clearance. Toluidine blue is a vital stain that is rapidly absorbed into actively dividing (e.g., neoplastic) cells. There are numerous studies demonstrating toluidine blue's extremely high accuracy for detecting SCCA, carcinoma in situ, and higher-grade dysplastic lesions via an intense blue stain, but it is less accurate in the detection of lower-grade dysplastic lesions, as demonstrated by false negative rates of greater than 20 percent. In addition, since toluidine blue can also adhere mechanically to tissue crevices or bind to actively dividing nonneoplastic cells, such as inflammatory conditions or tissues undergoing repair, false positive results are possible unless the clinician restains tissues after a waiting period of two to three weeks or has adequate experience in interpretation. Recently, it has been demonstrated that positive toluidine blue staining predicts a high risk of malignant transformation in premalignant lesions, suggesting its utility as a prognostic test.

Other emerging screening technologies include tissue autofluorescence and salivary molecular diagnostics. Oral cancer and precancerous lesions show different autofluorescence profiles compared to normal oral mucosa and technology for chairside visualization of tissue autofluorescence offers another novel approach to screening. The VELscope (LED Medical Diagnostics Inc., Vancouver, British Columbia, Canada) has approval in Canada for use and FDA clearance is pending.

**Diagnostic Procedures**

Upon an abnormal finding during the standard examination, the oral health provider should attempt to develop a provisional or differential diagnosis. Diagnosing an advanced SCCA requires very little diagnostic acumen because of its obvious clinical presentation: large; usually exophytic; ulcerated; nodular; indurated/fixated; bleeds easily upon slight provocation; lymphadenopathic; and possessed of associated symptoms such as pain, dysphagia, or limitation of function (Figure 18). These patients have a high likelihood of metastatic disease and a poor prognosis. The diagnostic challenge of early detection becomes more difficult as one regresses in the lifetime of the cancer through metastasis and malignant transformation, and back to the time when the earliest precancerous changes are evident, or potentially even earlier.

The terms leukoplakia, erythroplakia, and erythroleukoplakia are clinical diagnoses given to persistent, most often unilateral, white, red, or mixed red/white patches respectively, and for which an etiology remains unclear. Leukoplakias cannot be wiped off and are much less likely to undergo malignant transformation compared to patches with a red component. These and chronically ulcerated lesions of unclear etiology represent the clinical spectrum of premalignant (or early cancer) presentations and should be suspected as such until proven otherwise. There should be a high index of suspicion when a clinician detects such lesions with one or more of the following features:

1. High-risk site (such as the lateral/ventral tongue, floor of mouth, or oropharynx).
2. Larger size (greater than 1 cm in diameter) or multiple site involvement.
3. Containing a red component (erythroplakic area), nonhomogeneous leukoplakias, or leukoplakias with irregular surface changes (Figure 19). Patients over 40 with a positive risk factor history are at higher risk for oral cancer, although a younger patient presenting with these features is even more worrisome and may indicate highly aggressive disease. Such patients who also display overtly suspicious epithelial lesions should be promptly referred to an expert for scalpel or punch biopsy and definitive histopathologic diagnosis.

However, earlier stage precancerous or cancerous lesions are often smaller, show subtler features, and can easily be mistaken for benign-looking common inflammatory or traumatically induced epithelial changes (Figure 20). When faced with such benign-looking lesions, a decision must be made about how to proceed. The first step should be to go back through the patient’s data: demographics, a careful history and risk factor assessment, and the results of a thorough clinical examination. This data may reveal possible etiologies for the lesion. The removal or modification of a putative etiologic factor, such as the influence of a sharp tooth cusp or habit followed by a period of waiting and watching (two to three weeks is usually sufficient time for an inflammatory or traumatic lesion to heal), is an acceptable way to proceed unless the patient fails to return for follow-up in a timely manner, or if the oral health provider forgets to watch the
lesion. Take a photographic record of the lesion at baseline, and if the lesion persists, further investigation is warranted.

There are a number of diagnostic options available today. The gold standard diagnostic “test” applied to an overtly suspicious epithelial lesion is a scalpel/punch biopsy followed by histopathological examination by an oral pathologist to rule out a squamous (or verrucous) carcinoma or epithelial dysplasia (premalignancy). Technically, a tissue biopsy usually requires very little expertise, particularly with the use of a punch (CDT code D07286). Biopsy site selection may require expertise, and adjunctive toluidine blue stain applied to the lesion can direct the clinician to the highest-risk site (Figure 21). Few general dentists feel adequately trained to perform them and there is hesitation to send patients with a benign-looking lesion for an invasive and costly procedure that will likely confirm a benign result. In addition, faced with the thought of the associated discomfort of undergoing a biopsy, many patients refuse referral and opt to wait.

New diagnostic adjuncts are available to assess the significance of epithelial lesions that are not highly suspicious (i.e., benign-looking lesions) without subjecting the patient to a standard biopsy. Exfoliative cytology, a technique traditionally used in cervical cancer screening, has limitations for use in the oral cavity by the general dentist because the cells collected are superficial and may not be representative of atypical cells found in deeper layers of the epithelium. The Oral CDX brush biopsy is a simple, painless, and accurate cytopathologic technique developed by CDX Laboratories (Sufferin, NY). A number of studies support its indicated use. The sampling problems associated with exfoliative cytology have been solved by using a brush designed to sample cells from all layers of the epithelium (Figure 22). In general practices, the brush biopsy is indicated for small, benign-looking epithelial lesions of unclear etiology. Although overtly suspicious epithelial lesions may be tested using this technique, referral of patients with such lesions to a specialist with more experience is prudent, particularly in the case of larger lesions where there may be a risk of sampling error. Without local anesthesia, the brush is rotated repeatedly against the lesion. A cell sample is then transported and fixed onto a glass slide, which is then mailed to the laboratory (Figure 22). Upon receipt, the slide is stained and the cells are analyzed using a neural network software that can identify cells with atypical morphological characteristics to facilitate diagnosis by an oral cytopathologist. A CDT code for a transepithelial brush biopsy (D7288) now exists and is covered by a number of insurance carriers. There are four results: inadequate sample, benign, atypical, and positive. CDX laboratories will fax the result within a week and later send a color hard copy depicting the cellular morphology, a powerful way to explain the significance of the result to the patient and thereby increase appropriate follow-up compliance. Eighty-five to 90 percent of all brush biopsy results are benign, meaning that the sample submitted contained no atypical cells. However, because a negative result could lead to a false sense of complacency in the patient, the dentist should use a benign test result as an opportunity to promote risk factor behavior modification and regular follow-up. All persistent benign lesions should be serially tested or referred to a specialist for definitive diagnosis. An atypical result (approximately 10–15 percent of all results) indicates that the lesion requires further evaluation and warrants prompt referral to a specialist. Several studies show that an atypical result has a positive predictive value of 20–40 percent. In other words, two to four
out of every 10 atypical results represent a premalignant or malignant change.\textsuperscript{22,23,24} A positive result, although rare, is almost guaranteed to represent a malignant or premalignant lesion.

With the advent of the sophisticated technology available today, there is hope that we can employ biomarkers to detect early disease, predict the likelihood for malignant transformation in premalignant disease, or indicate optimal management strategies. Biomarkers include gross analysis of DNA content (DNA ploidy), classic cytogenetics (karyotyping), molecular cytogenetics such as fluorescence in-situ hybridization (FISH), comparative genomic hybridization (CGH), microsatellite analyses to detect loss of heterozygosity or microsatellite instability, gene expression microarrays, serial analysis of gene expression (SAGE), and the identification of mutations of various genes (e.g., telomerase, p53, ras, COX-2).

Management of Oral Cancer and Precancer
Management strategies for patients with oral cancer and precancer are variable. The most important issue is that once diagnosed, patients must avoid all risky behaviors and be placed under the close surveillance of an expert over the long term.

OHCPs can play an important role in the management of this patient population. Each of the current cancer treatment modalities of surgery, radiotherapy, and chemotherapy may cause both short-term and long-term oral complications that can influence morbidity and, when severe, even mortality. Such complications may include mucositis, taste alterations, dysphagia, difficulties in mastication, xerostomia, radiation caries, trismus, periodontal deterioration, decreased resiliency in perioral tissue, temporomandibular dysfunction, oral and/or systemic infections, bleeding, soft tissue radionecrosis and osteoradionecrosis, and the potential for either a recurrence or a new malignancy.\textsuperscript{25} The OHCP should participate in the prevention, the early interception, and treatment of these complications. The maintenance of oral health during and after cancer therapy requires an investment of time and effort beyond that needed for normal oral care.

Prevention
Early detection is only part of the responsibility of the OHCP. Our role in treating patients with tobacco dependence is becoming more important, not only for cancer prevention, but also because of the strong association with loss of periodontal attachment in tobacco users. The U.S. Public Health Service guidelines using “the 5 A’s” (Ask, Advise, Assess, Assist, and Arrange) constitute an evidence-based strategy to help patients quit and even minimal interventions by OHCPs are effective.\textsuperscript{26} Promoting use of alcohol in moderation and nutrition high in fresh fruits and vegetables should also be part of our message.

Case
A 58-year-old Hispanic male presents for a dental check up. He has numerous broken teeth but experiences no pain. His medical history is pertinent for HIV infection (viral load < 1000 viral particles/mL, CD4 count 350 cells/mL, on three antiretroviral medications). He has a past history of tobacco use (two packs per day for 30 years, quit six years ago: 60-pack per year history) and alcohol use (four drinks per day on average for 30 years, quit 10 years ago). His examination reveals no lymphadenopathy. His soft tissue examination reveals multiple broken teeth and a mixed red/white patch (erythroplakia) measuring approximately 2 cm in diameter on the left oropharynx that bleeds easily and has an exophytic component (inferior left aspect) that is firm to palpation.
Your Approach
His history reveals several risk factors. He is an immunocompromised male over the age of 40 with a lengthy history of heavy tobacco and alcohol use. His exam should raise your index of suspicion for an oral premalignant lesion or SCCA because it is on a high-risk site (oropharynx), is more than 1 cm in diameter, has a red component, has a surface irregularity, is firm in a site that should be soft, and bleeds easily. You should photograph the lesion, document your findings, and immediately refer this patient for a scalpel/punch biopsy. Toluidine blue staining further confirms the suspicious nature of this lesion, and biopsy at Site 1 revealed carcinoma in situ and at Site 2, SCCA. He was staged T2N0M0 (tumor of greater than 2 cm diameter, with no lymph nodes and no metastatic spread), and was treated surgically with no radiation.

References

Author Profile
Dr. A. Ross Kerr
Dr. Kerr received his DDS from McGill University in Montreal, Canada, and his MSD and certificate in oral medicine at the University of Washington. He is a diplomate of the American Board of Oral Medicine and clinical associate professor in the department of oral and maxillofacial pathology, radiology and medicine at New York University College of Dentistry, where he is the director of the Oral Mucosal Disease Service. He is the chair of the Oral Cancer Consortium and is an investigator on two ongoing NIH-funded grants, one evaluating current and emerging technologies for the early detection of oral cancer, and the other evaluating tobacco cessation in a dental practice setting. He has lectured nationally and internationally on oral-medicine-related topics, and has contributed to the dental and medical literature. His private practice is focused on the dental management of medically complex patients and the management of patients with oral mucosal disease, salivary hypofunction, and orofacial pain.

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Questions

1. Which type of carcinoma accounts for over 90 percent of all oral cancers?
   a. Sarcoma
   b. Basal cell carcinoma
   c. Leukoplakia
   d. Squamous cell carcinoma

2. Genes responsible for maintaining the integrity of the genome are commonly referred to as
   a. Caretaker genes
   b. Proliferation genes
   c. Keymaster genes
   d. Gatekeeper genes

3. According to the article, approximately how many Americans will be diagnosed with oral/pharyngeal cancer in 2006?
   a. 40,000
   b. 30,000
   c. 50,000
   d. 20,000

4. The average age of diagnosis for oral/pharyngeal cancer is
   a. 40
   b. 35
   c. 63
   d. 89

5. According to the article, the lifetime risk for developing oral/pharyngeal cancer is
   a. One in 40
   b. One in 98
   c. One in 89
   d. One in 100,000

6. How does the average rate of incidence for African American men compare to the average rate of incidence for women?
   a. Half
   b. Twice
   c. Approximately the same as
   d. Nearly three times

7. What is the highest risk site for oral cancer?
   a. Gingiva
   b. Tongue
   c. Buccal mucosa
   d. Lower lip

8. The overall five-year relative survival rate for a patient with oral/pharyngeal cancer is _____ that of a patient with prostate cancer.
   a. Approximately the same as
   b. Nearly twice
   c. Nearly half
   d. One-third

9. Seventy-five percent of all oral cancer cases in the United States are associated with
   a. Tobacco and alcohol
   b. A diet low in fruit
   c. Genetic risk factors
   d. Papilloma virus

10. Which of the following noted during an oral cancer screening carries the strongest association for the development of oral cancer?
    a. Patient has a poor diet
    b. Patient has a history of cancer in his family
    c. Patient complains of frequent canker sores
    d. Patient reports heavy alcohol and tobacco use

11. The first step in an oral cancer screening should be
    a. Physical examination
    b. Risk factor assessment
    c. Preventative counseling
    d. Periodontal evaluation

12. Which of these does the author suggest is a prerequisite to conducting a physical examination?
    a. The results of a risk factor assessment
    b. The patient’s attitude during preventative counseling
    c. A knowledge of the range of normal anatomy
    d. The patient’s prior familiarity with the examination

13. Current guidelines suggest that an oral cancer screening should be conducted every three months.
    a. True
    b. False

14. The most common cause of lateral neck swelling in an adult is
    a. A metastatic lymph node
    b. The parotid gland
    c. An abnormal trachea
    d. None of the above

15. A firm and nonpainful nodal enlargement, possibly bound to surrounding tissues, is a probable symptom of
    a. Lymphoma, particularly Hodgkin’s disease
    b. Lymphadenitis
    c. A metastatic lymph node
    d. Lymph node hyperplasia

16. Deep nodes are only palpable when or more in diameter.
    a. 1 cm
    b. 2 mm
    c. 2 cm
    d. 3 cm

17. In oral cancer, metastatic disease will usually spread
    a. Interorily
    b. Anteriorly
    c. Posteriorly
    d. Inferiorly

18. Which lymph nodes are found in close proximity to the SCM muscles?
    a. Cervical
    b. Submandibular
    c. Jugulodigastric
    d. Submental

19. The anterior and posterior pillars, or fauces, are part of the
    a. Palate
    b. Floor of mouth
    c. Uvula
    d. Buccal mucosa

20. According to the article, an ideal screening adjunct should be all of the following except
    a. Highly sensitive
    b. Easy to use
    c. Fast
    d. Inexpensive

21. Which of the following is true about chemiluminescence?
    a. It is intended for stand-alone use to detect oral cancer
    b. The patient must rinse with dilute acetic acid before examination
    c. Red changes are visualized better than white changes
    d. It is a diagnostic test

22. Toluidine blue is the preferred screening adjunct in the United States.
    a. True
    b. False

23. An oral leukoplakia is a white patch that
    a. Is found on the oral mucosa
    b. Cannot be characterized as any other definable lesion
    c. Has a high risk for malignant transformation
    d. Can easily be rubbed off the mucosa

24. The “gold standard” diagnostic method applied to epithelial lesions is
    a. The transepithelial brush biopsy technique
    b. Exfoliative cytology
    c. The scalpel/punch biopsy
    d. FISH

25. Which of the following is NOT true of the transepithelial brush biopsy technique?
    a. It can be used by any trained oral healthcare provider
    b. It excels at detecting squamous cell carcinoma
    c. It samples the superficial cell layers only
    d. It does not require local anesthesia

26. As much as ____ percent of all brush biopsy results are benign.
    a. 75
    b. 80
    c. 85
    d. 90

27. As much as ____ percent of all atypical brush biopsy results represent a premalignant or malignant change.
    a. 30
    b. 40
    c. 50
    d. 15

28. Oral complications that can result from current cancer treatment modalities include
    a. Taste alterations
    b. Radiation caries
    c. Temporomandibular dysfunction
    d. All of the above

29. Which of these is not one of the U.S. Public Health Service’s “Five A’s”?
    a. Advise
    b. Ask
    c. Attend
    d. Arrange

30. The most appropriate diagnostic pathway for a patient with a 1 x 1.5 cm painless unilateral red patch of unknown duration located on the floor of the mouth is
    a. Prompt referral for scalpel/punch biopsy
    b. Watch and wait for three weeks and, if it hasn’t resolved, referral for biopsy
    c. Brush biopsy
    d. a or b
Requirements for successful completion of the course and to obtain dental continuing education credits: 1) Read the entire course. 2) Complete all information above. 3) Complete answer sheets in either pen or pencil. 4) Mark only one answer for each question. 5) A score of 70% on this test will earn you 4 CE credits. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp.

Educational Objectives

1. Understand the diverse demographic of patients who are affected by oral cancer.
2. Understand the risk factors that directly relate in culmination of oral cancer, especially alcohol and tobacco use.
3. Comprehend healthcare professional methods for detection, (ie., types of cancer screening), and provide proper protocol for prevention.

Course Evaluation

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. Were the individual course objectives met?  Objective #1: Yes No  Objective #2: Yes No

2. To what extent were the course objectives accomplished overall? 5 4 3 2 1 0

3. Please rate your personal mastery of the course objectives. 5 4 3 2 1 0

4. How do you rate the author's grasp of the topic? 5 4 3 2 1 0

5. How do you rate the instructor's effectiveness? 5 4 3 2 1 0

6. Do you feel that the references were adequate? Yes No

7. Was the overall administration of the course effective? 5 4 3 2 1 0

8. Would you participate in a similar program on a different topic? Yes No

9. If you were to recommend this course to someone else, would you? Yes No

10. To what extent were the course objectives accomplished overall? 5 4 3 2 1 0

11. Was there any subject matter you found confusing? Please describe.

12. What additional continuing dental education topics would you like to see?

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