

INTRODUCTION

The mortality rate for oral cancer is 40%, “with recurrence rates of 40 to 50% after 5 years of treatment (Sawan). The high rate of mortality and recurrence is tied to the fact that many oral cancers are diagnosed when they have reached stage III or IV (Lingen). It is “inescapable” that lesions are missed by practitioners and patients, causing the late stage diagnoses (Lingen). The recurrence rate for oral cancer drops to 10 to 20% when “disease is detected early” (Sawan). Therefore, aids in detecting oral cancers can have life saving implications. Toluidine blue, the VELscope, and light-based detection systems have been investigated for their utility and application.

Screening vs Case Finding

The goal of screening for disease is to “detect disease at an asymptomatic stage when its natural course can be readily interrupted, if not cured” (Lingen). When one screens, he generally examines a patient who is “symptom free” (Lingen). Case-finding involves examining a patient who presents with “abnormal signs or symptoms” and working to find a diagnosis and develop a treatment plan (Lingen). When screening a patient for oral cancer, the “standard may consist of examination and clinical evaluation by an expert clinician trained in diagnosis such as an oral and maxillofacial pathologist or oral medicine specialist” (Lingen). On the other hand, for case finding, “the gold standard is the scalpel biopsy” (Lingen).

Oral Cancer Risk Factors

The following are risks for oral cancers (Sawan):

1. Smoking → “The risk of oral cancer is 5- 10 times greater among smokers” when compared to non-smokers (Sawan)
2. Alcohol
3. HPV → “More than 10% of [epithelial cancer of the tonsils and oropharynx] have HPV DNA integrated in their genome” (Sawan).
4. Syphilis
5. Age → “98% of oral cancers occur at more than 40 years of age” (Sawan).
6. Malnutrition
7. Intraoral Infections
8. Direct Sunlight
9. Precancerous lesions → Red lesions have a “high” rate of transformation into malignancies in the oral cavity (Sawan).

Toluidine Blue

Toluidine blue can “stain nucleic acids and abnormal tissues” (Lingen). However, regarding what can be considered a positive for oral cancer with toluidine blue staining, “only dark royal blue should be regarded as positive” (Lingen). There is “no agreement in the literature on whether to include light blue-stained lesions as positive or not” (Warnakulasuriya). False positives can occur, especially with “benign ulcerations” (Warnakulasuriya). Likewise, false negatives can occur when “thick keratinized mucosa” cannot be penetrated by the dye (Warnakulasuriya). Despite this, toluidine blue “can be used as an adjunct in the surveillance of high-risk individuals” and evaluating oral lesions, when the operator is “experienced” with the technique (Lingen).

VELscope

The VELscope works by emitting a “blue excitation light at a wavelength of 400- 460 nm” (Warnakulasuriya). “Endogenous auto-fluorescent substances” in healthy tissue show autofluorescence (Warnakulasuriya). However, malignancies can cause “linkage of collagen fibers, loss of basal lamina and reduction in flavins,” which, as a result, cause the tissue to show as a “dark patch” or a “loss in fluorescence” (Warnakulasuriya). When screening for oral cancer with the VELscope, “loss of fluorescence often extends beyond the clinically visible lesion suggesting some field cancerization” (Warnakulasuriya). The VELscope can be used to detect borders for surgical biopsies and excisions (Sawan). When compared to the “gold standard,” surgical biopsy, the VELscope had a “98% sensitivity and 100% specificity for discriminating dysplasia and cancers from the normal oral mucosa” (Lingen). Note, sensitivity of a screening aid refers to its ability to correctly diagnose a patient with a disease, while specificity refers to the ability to identify people without disease (Sawan). However, the VELscope’s ability to confirm lesions that are “innocuous” and would not be seen clinically is not yet confirmed. The VELscope can not replace a thorough clinical exam on its own.

Light-Based Detective Systems

Light-based detective systems, like ViziLite “are intended to enhance the identification of oral mucosal abnormalities” (Lingen). Patients rinse with an acetic acid solution and then the oral cavity is examined using a blue-white light source (Lingen). Healthy tissue shows as “lightly bluish while abnormal epithelium appears distinctively white” (Lingen). When examining white lesions, the ViziLite has been shown to improve the “sharpness” of lesions (Lingen). Nevertheless, the ViziLite selects “preferentially” for white lesions over red lesions; which can be “missed” using this aid (Lingen). According to Lingen, “the use of reflective tissue fluorescence systems” (like ViziLite) to “aid in detection of oral premalignant lesions is...quite sparse (Lingen).

Conclusion

There are many aids in screening for oral cancer, some of which are quite promising. The VELscope is an atraumatic way to detect “pre-malignant and malignant lesions of the oral cavity” (Sawan). However, many of these aids identify lesions that are clinically conspicuous, meaning a practitioner would have noticed them without the use of screening aids (Lingen). Thus, no screening aids can substitute a thorough clinical examination, but they can help to confirm that a lesion should be investigated further. For instance, the VELscope can aid in detection of borders in surgical biopsy and surgical excision” (Sawan). Indeed, there are applications for oral screening aids for clinicians.

Works Cited

- Lingen MW, Kalmar JR, Karrison T, Speight PM. Critical evaluation of diagnostic aids for the detection of oral cancer. *Oral Oncol.* 2008 Jan;44(1):10-22. doi: 10.1016/j.oraloncology.2007.06.011. Epub 2007 Sep 6. PMID: 17825602; PMCID: PMC2424250.
- Sawan D, Mashlah A. Evaluation of pre-malignant and malignant lesions by fluorescent light (VELscope). *J Int Soc Prev Community Dent.* 2015 May-Jun;5(3):248-54. doi: 10.4103/2231-0762.159967. PMID: 26236687; PMCID: PMC4515810.
- Warnakulasuriya S. Diagnostic adjuncts on oral cancer and precancer: an update for practitioners. *Br Dent J.* 2017 Nov 10;223(9):663-666. doi: 10.1038/sj.bdj.2017.883. PMID: 29123318.