ABSTRACT

The prognosis for oral cancer remains poor in spite of advances in therapy. Early diagnosis and treatment remain the key to improved patient survival. Because scalpel biopsy for diagnosis is invasive and has potential morbidity, it is reserved for evaluating highly suspicious lesions and not for the lesions which are clinically not suspicious. Early stage oral cancers cannot be adequately identified by visual inspection alone and may be overlooked and neglected. A number of new diagnostic aids to conventional oral examination have recently been introduced to assist in the detection of oral cancer.

KEYWORDS: Oral Cancer, Vizilite, Oral CDX, Autofluorescence

INTRODUCTION

Oral cancer accounts for approximately 3% of all malignancies and is a significant worldwide health problem. Early diagnosis and treatment of cancer are based on the concept that a carcinoma develops over a long period of time going through intermediate stages of different biological significance and the treatment at this early or pre-cancerous stage offers the best prognosis and even the chance of cure.

Pre-cancerous and early stage oral cancers may not be adequately identified by visual inspection alone and may be easily overlooked and neglected even by highly trained professionals.

Clinical diagnostic tools available for the early detection of oral cancer include vital staining, vizilite, oral brush biopsy, chemiluminescence and photodiagnosis.

Vital staining

Vital staining of oral epithelium has been suggested as a means of surveillance in patients who are at risk of developing oral cancer and for those who have had a confirmed neoplasm in other parts of aerodigestive tract.

Toluidine blue is an acidophilic metachromatic dye of thiazine group that selectively stains acidic tissue components such as DNA and RNA. Its use is based on the fact that dysplastic and anaplastic cells contain quantitatively more nucleic acid than normal cells. It stains mainly two types of lesions: squamous cell carcinoma and inflamed traumatic tissue.

To perform the staining, a 1% solution is placed on the oral mucosa and removed after 1-2 minutes with 2% acetic acid. The clinician then examines the oral mucosa for the areas of increased cellular staining.

Vizilite

It is a non-toxic chemiluminescent light that is shined in the mouth. Under this light, abnormal tissue glows differently from normal tissue thus making it more visible, though cannot tell if they are potentially cancerous.

Each vizilite kit contains: vizilite rinse (1% acetic acid solution), vizilite capsule (chemiluminescent stick) and vizilite retractor (sheath and handle) for a single use.
Physics of vizilite technology: Normal epithelium absorbs vizilite, appears dark, abnormal epithelium reflects vizilite appears white. As a cell becomes more dysplastic the nucleus becomes larger compared to the rest of the cell. The enlarged nucleus reflects light and thus appears white.

Oral cytology

Oral cytology describes a diagnostic technique used to sample oral tissue for histomorphological analysis. To obtain a tissue sample, the clinician applies a stiff brush to the oral mucosa with enough pressure to induce pinpoint bleeding, which ensures full thickness or trans-epithelial tissue sample. These cellular samples can then be analysed by a variety of unique diagnostic measures including cytometry, DNA cytometry and immunochemical analysis.

Computerised image analysis of brush biopsy samples (oral CDX) uses computer to perform morphological and cytological analysis of tissue samples. The computerised analysis ranks cells based on the amount of abnormal morphology which are then presented to the pathologist for further distinction and classification. The sensitivity of oral CDX ranges from 0.71 to 1.00 and specificity is as low as 0.32.

DNA cytometry uses DNA specific Feulgen dye to quantify and identify deviations in DNA content in sampled tissue. Although data are still limited, the addition of DNA measurements to cytological analysis has been shown to increase sensitivity and specificity of brush biopsy.

Photodiagnosis

There are a range of tissue-light interactions which can be exploited to improve the visualisation of neoplastic lesions. Tissue autofluorescence has recently shown promise as an adjunctive diagnostic tool. Fluorophores within the epithelium and stroma absorb UV light and visible light and re-emit some of this light at longer wave length in the form of fluorescence. When the reflected illumination light is blocked with an absorbing filter it is possible to visualise the longer wavelength fluorescence even with naked eye. Autofluorescence originates from variety of fluorophores within the oral cavity, and is sensitive to alterations in both tissue morphology and biochemistry associated with neoplasia. This autofluorescence is largely attributed to a decrease in fluorescent crosslinks associated with stromal collagen that underlies the neoplastic lesion.

The VELscope (LED Dental, Inc., White Rock, BC, Canada) is an early detection device. Under excitation with VELscope device, normal mucosa emits a pale green light, whereas abnormal mucosa appears dark. The initial evidence suggests that the VELscope may be useful as both an adjuvant method of margin determination during surgical procedures as well as screening technique to identify pre-malignant lesions not visualised during conventional examinations.

High resolution optical techniques

An advantage of optical imaging of oral tissue is the ability to record images with sub-cellular resolution in vivo without performing biopsies. Confocal reflectance microscopy is an optical technology that can provide detailed images of tissue architecture and cellular morphology throughout the epithelium of living tissue in near real time. Contrast is based on differences in refractive index, which can be enhanced using simple contrast agents such as acetic acid. Distinct features indicative of oral precancer, such as nuclear enlargement, crowding and pleomorphism can be correlated well with the histologic features observed in subsequent biopsies.

In conclusion early diagnosis of oral cancer is a priority health objective in which oral professionals may play a vital role. Detection should lead to less damage from cancer therapy and a better prognosis. There are number of novel techniques that may variously help in the diagnosis of oral malignancy. There is a critical need to engineer imaging systems that are appropriate for use not just in specialised clinics but for first line practice setting such as dental clinic.

References

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