Chapter 5

LIGHT-BASED OPTICAL DIAGNOSTIC METHODS FOR DENTAL AND ORAL SOFT TISSUES

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INTRODUCTION

The clinical need for a sensitive imaging tool for non-invasive assessment of intraoral dental conditions remains high. Several innovative technologies have been developed over the last decade that can be used as diagnostic adjuncts to help detect oral diseases early and to treat cases preventively. Optical diagnostic methods are highly attractive in biological applications because they are non-destructive, safe, non-invasive, non-ionizing imaging systems that provide real-time information with high reproducibility. Diffuse optical techniques allow for the distinction between diseased and normal states of the tissue based on the absorption and scattering properties in the red to near-infrared spectrum. The selected tissues are distinguished based on their fluorescence emission, absorption and scattering properties.

This chapter describes various technologies that can be used to assist dentists in detecting the early stages of changes in oral soft or dental tissues, assessing the activity of detected lesions, and quantitatively or qualitatively monitoring the lesion over time.

OPTICAL DIAGNOSTIC TECHNIQUES FOR ORAL SOFT TISSUES

Oral cancer is among the leading causes of death from cancer worldwide and is usually associated with the presence of white or red lesions in the oral cavity that may be painless.[1] A majority of oral cancers are squamous cell carcinomas (SCCs) that arise from the epithelial cells at the surface of the oral cavity.[2] The prognosis is strongly dependent on the stage of the tumor at the time of diagnosis.

Despite the importance of conventional physical examination of adult dental patients, it is noted that extra aid may be helpful in distinguishing between

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primary screening tool. Emerging optical techniques are envisaged to evolve with the incorporation of AI-based algorithms for the diagnosis of mucosal lesions and dental pathologies.

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