Imaging of human oral cancer using multiphoton microscopy

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ABSTRACT

Due to the growing importance of optical imaging in tissue diagnosis, we use multi-photon microscopy, to characterize normal and cancerous oral tissues. We acquired both microscopic and spectroscopic data for the characterization of normal and cancerous oral tissues. Our results show that both multiphoton fluorescence and harmonic generation images may be used to distinguish both tissue types. An image of different oral tissues will be of value for clinicians in the diagnosis and treatment of oral diseases.

INTRODUCTIONS

At present, much of the disease diagnosis is achieved using histological procedures. For oral cancer, cervical cancer, and other tumors near tissue surfaces, in vivo optical biopsy can be an alternative for providing fast diagnosis of tissue states, and multiphoton generated autofluorescence and harmonic generation signals may be used for such purposes. In this work, we propose to use multiphoton microscopy for the diagnosis of oral tumors.

METHODS

Experiment Setup

TPM is a nonlinear high resolution optical method used in a variety of biological imaging applications, Two-photon interactions in MPM result in SHG and twophoton excited fluorescence (TPF). The goal of this study is to investigate the application of a multimodal nonlinear Imaging approach based on the integration of multiphoton microscopy (MPM) with second harmonic generation microscopy (SHGM) for in vivo evaluation of oral tissue microstructure. We choose to use two-photon fluorescence and second-harmonic generation microscopy as imaging techniques. Our microscope is home-built from an upright microscope (E800, Nikon, Japan) and the multiphoton laser wavelength used was 780 nm. A schematic of the two-photon microscope used in this study is show in Fig1.

Fig. 1

RESULTS

We obtained the multiphoton autofluorescence and second harmonic generation from normal and cancerous oral tissue. And .Shown in Fig. 2 is a non-tumor tongue tissue and fig.3 is a tumor tongue tissue . Shown in blue is SHG and green color designates autofluorescence.

Fig.2 non-tumor tongue tissue

Fig.3 tumor tongue tissue

CONCLUSIONS

Our results indicate that a difference in SHG and autofluorescence images exist between normal and cancerous tongue tissues. Such differences may be used for the in vivo diagnosis of normal and cancerous tongue tissues. We plan to extend this work into the multiphoton characterization of other oral diseases. This will help the diagnosis and treatment of oral diseases.

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