OPTICAL DIAGNOSIS OF ORAL CANCER AND ORAL POTENTIALLY MALIGNANT DISORDER- A EARLY DIAGNOSTIC TOOL

DR.S.JAYACHANDRAN

MDS PhD MAMS MBA M.Sc FDS RCPS (Glasgow)

PROFESSOR & HEAD (DEPT OF ORAL MEDICINE AND RADIOLOGY – TNGDCH)

ID-46

INTRODUCTION

Oral cancers are often preceded by oral potentially malignant disorders (OPMD). Early detection of oral cancer or OPMDs by non-invasive methods using optical techniques like fluorescence spectroscopy, reflectance spectroscopy, Raman spectroscopy on tissues and bio fluids will aid in the early intervention and improve the prognosis of the disease. Herewith, 3 of our original research studies are complied and discussed.

MATERIALS & METHODS

Auto Fluorescence Diffuse Reflectance[1]

- n = 40 patients (clinically proven 20 – premalignant, histopathologically proven 20 – OSCC)

Raman Spectroscopy[2]: - n = 205 patients

46% - premalignancy (26% - OSMF, 20% leukoplakia), 31% - oral cancer (histologically proven OSCC) and 23% - healthy controls. 158 samples of blood, 158 samples of urine, 158 samples of saliva (50 (32%) oral cancer, 87 (55%) OPMDs, 21 (13%) controls), and 89 tissue samples, 29 (32%) oral cancer, 22 (25%) premalignancy, 38 (43%) controls were collected.

Auto Fluorescence[3] (Pre And Post OSMF) – n = 20

(Only patients suspicious of malignancy underwent biopsy)

•Department Of Oral Medicine & Radiology, Tamilnadu Government Dental College And Hospital, Chennai

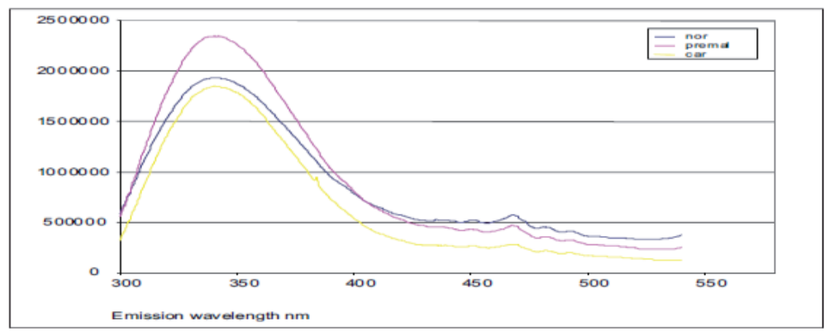
•Division Of Medical Physics And Lasers, Department Of Physics, Anna University ,Chennai

RESULTS

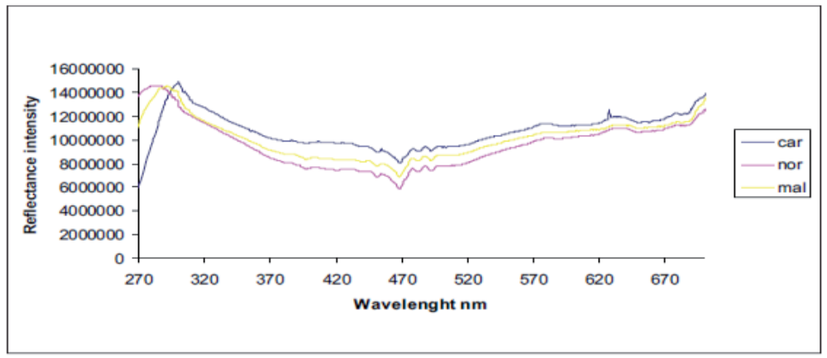
Autofluorescence and diffuse reflectance at 280 nm, the excitation emission peak was seen at 340 nm and mild peak was seen at 468 nm, and at 325 nm the excitation peak was seen at 400 nm, 468 nm and mild peak at 560 nm.

Emission at 440-460 nm & 535 nm are due to nicotinamide adenine dinucleotide & flavin adenine dinucleotide

The intensity for the carcinoma group, premalignant group, and normal mucosa group was compared using one-way ANOVA test, which revealed 99% significant difference between groups, followed by a post hoc test which showed significant difference between the normal and carcinoma group.[1]

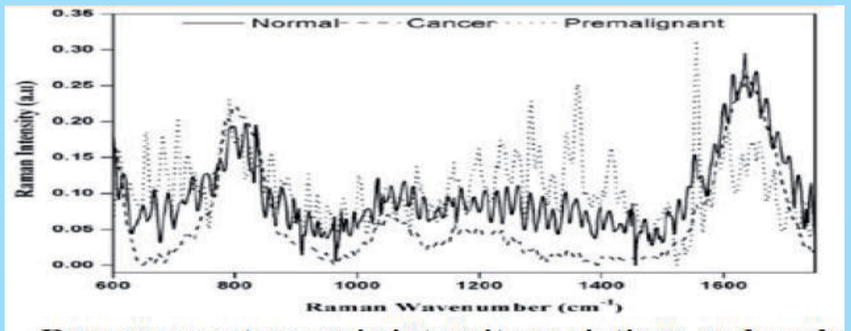


Comparison of fluorescence intensity at 280 nm



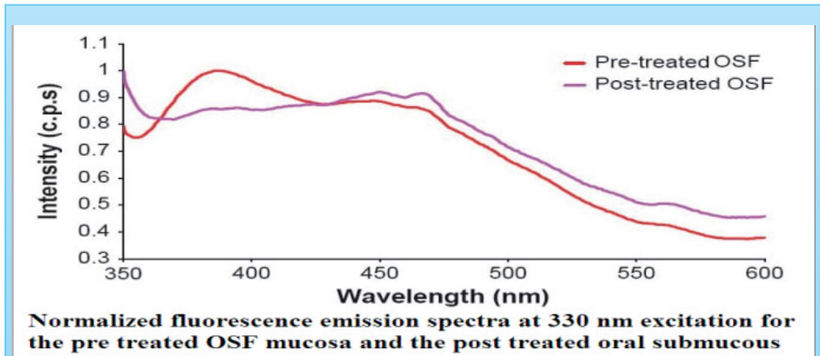
Comparison of reflectance spectra between groups

Raman spectroscopy gave an accuracy of 78%, 90.5%, 93.1 %, and 97.4% for blood, urine, saliva, and tissue samples in discriminating pre-malignancy and malignancy from control[2]



Ramans spectroscopic intensity variations and peak shift among three sample groups

Ultraviolet light at 330 nm excitation, spectra of the oral submucous fibrosis had an intense fluorescence emission of 385 nm and a secondary emission peak at 440 nm with that of normal oral mucosa. All the three clinical parameters (maximal mouth opening, tongue protrusion and the severity of burning sensation) showed a high statistical significance, with $P < 0.001$, as in the case of classification of pre-treated OSF mucosa from the post treated OSF mucosa using the autofluorescence technique.[3]



Normalized fluorescence emission spectra at 330 nm excitation for the pre treated OSF mucosa and the post treated oral submucous fibrosis mucosa

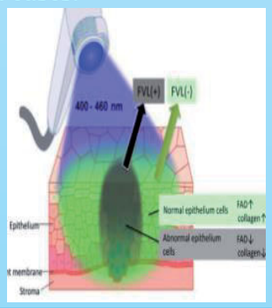
DISCUSSION

Autofluorescence and diffuse reflectance showed a significant difference between the three groups, with a decrease in fluorescence intensity from carcinoma to premalignant to normal mucosa group[1]

Raman spectroscopy has its unique nature by providing specific Raman bands of the biological molecules. Hence, this Raman study using blood plasma could be used in the near future in the clinical diagnosis of oral premalignant and malignant cases.[2]

Atrophic OSF epithelium allowed more excitation energy to penetrate the sub epithelial connective tissue in Autofluorescence[3].

A study on fluorescence emission spectrum for OSF mucosa analysed the changes in the fluorescence intensity of the endogenous fluorophores.



CONCLUSION

The alterations in the biochemical properties of a tissue are reflected in the optical properties Since those changes precede visible morphological changes, these optical techniques can serve as an early screening/diagnostic tool.

REFERENCES

1. Jayachandran S, Gombra V, Ganesan S. Autofluorescence and diffuse reflectance spectroscopic analysis of oral premalignancy and malignancy. J Ind Acad of Oral Med Rad. 2009 Apr 1;21(2):55.
2. Jaychandran S, Meenapriya PK, Ganesan S, Raman Spectroscopic Analysis of Blood, Urine, Saliva and Tissue of Oral Potentially Malignant Disorders and Malignancy-A Diagnostic Study. Int J Oral CraniofacSci 2016, 2(1): 011-014
3. Vedeswari CP, Jayachandran S, Ganesan S. In vivo autofluorescence characteristics of pre- and post- treated oral submucous fibrosis: A pilot study. Indian J Dent Res 2009;20:261-7.