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ORIGINAL ARTICLE

SYNCHRONOUS LUMINESCENCE SPECTROSCOPY FOR THE DETERMINATION OF DEGREE OF MALIGNANCY:

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Abstract:

A cancer incidence and mortality have globally increased in the past decade. It is well known that early diagnosis can increase the survival rate substantially and current method of screening have to be improved. We prepared sample of malignant and normal tissue of the cervical affected organ. We record the synchronous luminescence spectra normal cells and cancerous cells. We consider several samples for the determination and the present result in case of cervical cancer. We obtain the ratio of the intensity of malignant tissue to the emitted by the normal tissue of a sample of function of wavelength. The degree of malignancy of the cervical sample may be obtained by studying the intensity ratio and they are distinguished from each other.

KEYWORDS:

Synchronous Luminescence spectroscopy, cervical cancer cell, cervical normal cell.

INTRODUCTION

Cervical cancer is the third most common cancer worldwide and for women, the second most common after the breast cancer. Each year there are 4,66,000 new cases globally and around 2 in 32,000 women die of cervical cancer in India, Cervical cancer is the leading malignancy in the women with about 90,000 new cases reported annually. The number of cases and number of deaths from cervical cancer are higher in the less developed country where the screening is not wide spread (1).

From the study it is observed that there is an increase in the emission of NADH, Flavin and porphyrin and also increasing hemoglobin reobsorbtion as the tissue progresses from normal in to malignant (2-3). Fluorescence spectroscopy has been tested by several groups to successfully differentiate normal malignant tissue. In this technique the discrimination potential depends on the various emission and excitation spectra which could changes the tissue morphology and the composition due to the repeated exposure during the spectral measurement. Also the overlapping spectral features representative of a complex mixer of biomolecules is all but useless. These drawbacks can be overcome to great extent by applying synchronous luminescence spectroscopy (SLS) in which a single spectral measurement might reveal the required details regarding the tissue pathology. A recent study reported on the use of SL spectra in the determination of different malignant condition from the normal tissue (4). In a similar manner an attempt is made in the present work to determine human cervical sample by SL spectra.

MATERIALAND METHOD:

Samples of female cervical cancer where obtain from Rashtrasant Tukdoji Cancer Hospital

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Nagpur and Dhoot Cancer Hospital Aurangabad (MS). The study involved a total of seven patients of cervical sample from squamous cell carcinoma. Normal tissues were also collected from the adjacent normal site of the abnormalities. The measurement were taken using a fluorolog (Model FL-3 22, Jobin Yuon) Spectroflourometer within 2-3 weeks after the tissue removal.

RESULT AND DISCUSSION:

The SLS of cervical cancer sample where recorded by simultaneously scanning both the emission and excitation wavelength with fixed interval between them. The offset was kept at 20nm and the emission was scanned in the 280 to 540 nm in the range. The Experimental arrangement of synchronous luminescence spectroscopy of cervical cancer as showing fig a The average of all SL spectra from cervical tissue sample are shown in the fig b & c

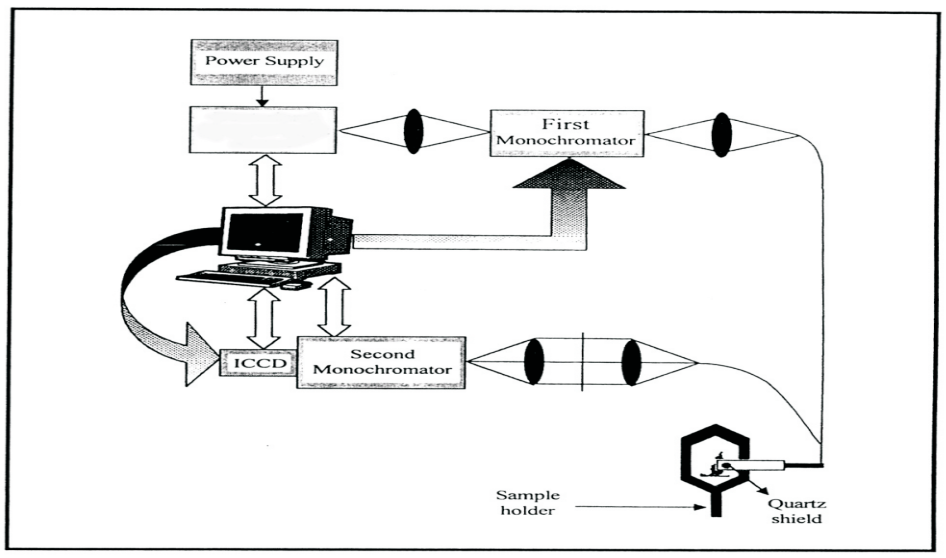
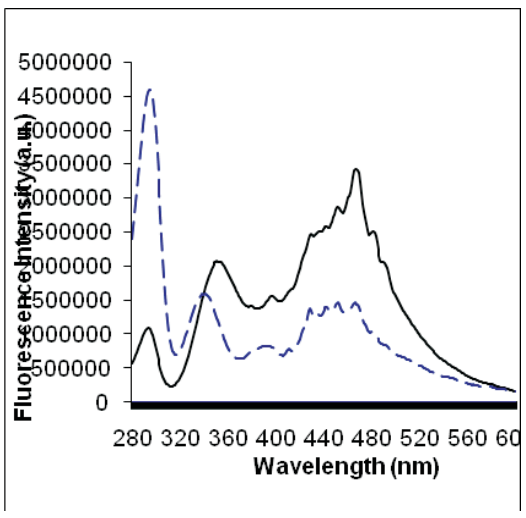


Figure (a): Experimental arrangement for recording synchronous Luminescence spectra of cancer tissue.



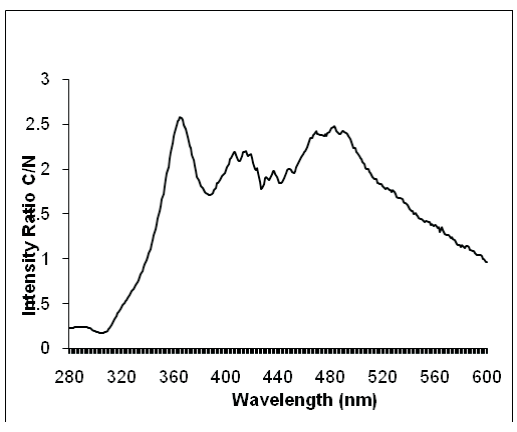


Fig (b): SL spectra of cancer and normal tissue of Cervical2 Fig (c): Intensity ratio C/N of Cervical2 cancer of SL spectra Cancer

In all the SL spectra significant difference can be seen in the intensity of different bands for the

malignant and normal tissues. It has been found experimentally that the fluorescence spectra of biomolecules changes when it becomes abnormal. This is due to the modification of the fluorophores in abnormal tissue as compared to normal tissue.

Difference in the spectra may arise due to biochemical or morphological changes between the tissue types. In all the spectra the peak around 295 nm is due to amino acid mainly the tyrosine emission. The peak around 350 nm is due to tryptophan and structural proteins. The broadband around 460 nm may be due to the presence of pyrodixal phosphate, carotenes and lipopigments which is observed in some samples. Few samples show the fine structure in the wavelength range 450-500nm which is due to stray xenon light reaching the exit slit of the excitation monochromator (23). There can be contribution from NADH to the total intensity around 430 nm. The peak around 510 nm is due to FAD or Flavin.

Fig (c) shows the observed ratio of integrated fluorescence intensity of cancerous to adjoining normal tissue was 2.5 and at their corresponding peak wavelength and corresponding ratio cancer to normal at nitrogen laser wavelength was 360 nm. The study of degree of malignancy also needs calibration of the intensity. We obtain the intensity ratio for all the cancer to normal sample of cervical tissue.

CONCLUSION:

The investigation shows that the degree of malignancy can be obtained by the study of SL spectra if proper calibration is done the disease may be diagnosed within one minute.

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