

Poster presentation

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Fluorescence spectroscopy in the detection of oral dysplasia

Iordanis Toursounidis, Tahwinder Upile, Christian S Betz, Priya Shah and Colin Hopper*

Address: UCLH Head and Neck Centre, London, UK

* Corresponding author

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Introduction

Fluorescence spectroscopy (FS) is a non-invasive technique which can be used to distinguish normal from abnormal tissue and can identify at an early stage dysplastic changes as well as provide clinical screening in real time without the need for tissue removal or processing.

Modalities

All tissues fluoresce due to the presence of fluorescent chromophores (fluorophores) within them. The commonly fluorophores are NADH, collagen, elastin and co-factors such as flavins (FAD, FMN). FS can detect these substances and provide characteristic spectra that reflect biochemical changes within the tissues. There are three main ways to obtain fluorescence, autofluorescence (induced by UV light) Laser-induced and enhanced/dye which can be by either topical or systemic application of 5-aminolaevulinic acid (5-ALA). Dysplastic and malignant tissues, as well as having different spectral characteristics, tend to have increased red fluorescence and decreased green fluorescence. Therefore, significant increase in the red/green fluorescence ratio is an accurate predictor of dysplasia and malignancy.

Instrumentation in FS consists of a light source such as lamps, a fluorescence interference filter and an optical endoscope for both illumination and detection of the tissue fluorescence. The eyepiece of the endoscope is connected to a highly sensitive single chip, charge-coupled device (CCD) colour camera integrated with red/green/blue (RGB) mosaic filter and the images can be captured by a frame-grabber fitted with an analogue/digital con-

verter (ADC) and analyzed and displayed using a software of a personal computer.

Various clinical studies have been conducted to demonstrate the accuracy of this method in detecting dysplastic lesions. Gillenwater et al found a sensitivity of 88% and a specificity of 100% using autofluorescence in the oral mucosa, Wang et al found a sensitivity of 81.25% and a specificity of 93.75% with a positive predictive value of 92.86%, Van Staveren et al found a sensitivity of 86% and specificity of 100%, Zheng et al found a sensitivity of 95% and specificity of 97%, Sharwani et al found a sensitivity of 83–90% and specificity of 89% by applying 5-ALA in the form of mouthrinse prior to fluorescence imaging.

Conclusion

FS is a valuable tool which can provide real-time diagnosis of premalignant/malignant lesions, it is cost effective and can certainly improve the patient's prognosis.