Multi-wavelength spectroscopy of endogenous fluorescence in Barrett’s esophagus

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Background

In Barrett’s esophagus the squamous epithelium is replaced by specialized intestinal metaplasia which is associated with an increased risk of esophageal cancer (Fig. 1).

Fluorescence spectroscopy has the potential to improve early detection of dysplasia in the Barrett’s epithelium which is essential for the long term survival of patients [2-3]. A multi-wavelength spectroscopy system was designed to find the optimal (combinations of) excitation wavelengths for improved early cancer detection.

Aim

The aim of this study was to assess the feasibility of the developed multi-wavelength spectroscopy system for the detection of high-grade dysplasia/cancer in Barrett’s esophagus.

Materials & Methods

The multi-wavelength spectroscopy system emits UV/blue light (365nm, 405nm, 417nm, 450nm) to excite different fluorophores. In addition white light is used to obtain reflectance spectra (Fig. 2). The study design consists of ex-vivo measurements of endoscopic mucosal resections and in-vivo measurements which are followed by a biopsy (Fig. 3).

Spectra were analyzed and correlated with histology results to identify features for discrimination.

Results

Figure 4 presents selected results of the data set. Fluorescence spectra of normal Barrett, high-grade dysplasia and cancer tissue show differences in the relative intensity and in spectral shape.

Discussion

Using limited amount of spectra, we were able to determine differences between the intensity ratios and spectral shape of normal Barrett and high-grade dysplasia/cancer.

We hypothesize that these differences are related to changes in oxygenated haemoglobin and porphyrin content and distribution.

Conclusion

The multi-wavelength spectroscopy system is feasible to determine features for distinguishing normal Barrett from high-grade dysplasia/cancer using different excitation wavelengths.

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References