PTU-029 EVALUATION OF A RAMAN PROBE FOR PATHOLOGICAL DIAGNOSIS AT COLONOSCOPY

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Introduction Numerous techniques for improving lesion detection and classification at colonoscopy are under development. When light is scattered by a substance it may be altered in wavelength. By detection of scattered light this process can be represented as a Raman spectrum where wavelength change is plotted against intensity. Raman

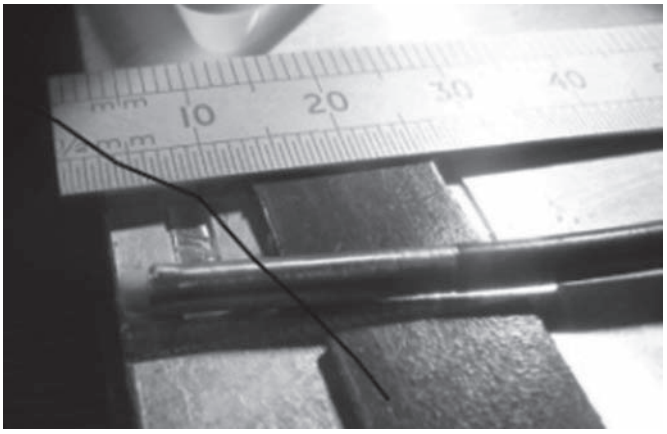

Figure 1 PTU-029

spectroscopy of human tissue can provide a molecular 'fingerprint' unique to the tissue studied and has potential to classify disease.[1] An 'in-house' fibreoptic Raman probe has been designed which can fit down the accessory channel of a colonoscope[2] (see figure 1). This study evaluated the potential to provide a pathological diagnosis at colonoscopy using Raman spectroscopy.

Methods Biopsy samples were collected at colonoscopy, placed in a 2 ml Cryovial (BDH Corning Ltd.), immediately snap-frozen in liquid nitrogen and stored at –80°C. Raman spectra with 10s acquisition period were measured with the probe tip in contact with the mucosal surface of thawed specimens. The probe illuminated samples with 830 nm laser light. Scattered light was collected by the probe and returned via fibreoptic cables to a Renishaw system 100 spectrometer. Following measurement, samples were formalin fixed and subjected to routine histopathological processing and review. Preliminary mathematical modelling using principal component analysis and linear discriminant analysis was used to correlate Raman spectra with routine histopathological diagnoses.

Results 350 Raman spectra were measured from a total of 310 colon biopsies (81, 72, 86 and 71 biopsies of normal colon mucosa, hyperplastic polyps (HP), adenomatous polyps and adenocarcinoma respectively). Overall spectral classification accuracy was 78.8% for normal tissue versus HP, 77.5% for normal tissue vs. adenomas, 80.7% for normal tissue versus adenocarcinoma, 85.5% for HP versus adenomas, 86.1% for HP versus adenocarcinoma, and 83.5% for adenomas versus adenocarcinoma.

Conclusion Our Raman probe system can distinguish between different colorectal pathologies. It is anticipated that a more advanced analysis of this data will increase the classification accuracy to a level suitable for clinical implementation. Experiments with 1s spectral acquisition times are underway which we anticipate will show Raman probe spectroscopy to be a useful tool that can provide an instant pathological diagnosis at colonoscopy.

Competing interests None.

Keywords colonoscopy, pathology, Raman spectroscopy.

REFERENCES

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