IN VIVO FLUORESCENCE CONFOCAL ENDOMICROSCOPY OF THE HUMAN GASTROINTESTINAL TRACT OFFERS A HIGH NEGATIVE PREDICTIVE VALUE VS HISTOLOGY OF BIOPSIES

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INTRODUCTION & AIMS: A scanning optical fibre fluorescence confocal microscope head has been miniaturised and integrated into the distal tip of an otherwise conventional medical endoscope (modified Pentax EC3870K) [1]. This enables surface and subsurface microscopy of the human gastrointestinal epithelium during otherwise routine endoscopy. Clinical studies evaluating confocal endomicroscopy for diagnosis of neoplasia in ulcerative colitis, Barretts Esophagus, neoplasia in screening colonoscopy and H. pylori diagnosis have yielded high sensitivity and specificity data [1,2]. This study assessed the negative predictive value for absence of disease during colonoscopy using a simple image scoring system.

METHODS: The device collected 1 megapixel fluorescence confocal images (ex: 488nm em: 505-585; lateral resolution 0.7um; axial resolution 7um). Imaging depth was movable relative to a sealed contact window over an axial distance of 250um via buttons on the endoscope control body. 27 patients undergoing screening colonoscopy for various indications were examined. After administration of an exogenous fluorophore, images were collected from the rectum to the caecum (and in some instances the terminal ileum) in regions of pathology and normal mucosa, and a biopsy taken for conventional histologic processing. Confocal images were graded according to cellular and vascular changes in morphology in a blinded fashion.

RESULTS: Topical Acriflavine (0.05% in saline) provided strong staining of the surface epithelium. IV fluorescein (5-10 ml of a 10% solution) resulted in strong contrast in the lamina propria and the subsurface microvasculature. A comparison of 1889 confocal images from 78 random image sites and 15 targeted image sites (e.g. polyps, inflammation) was made with the corresponding histopathological data from biopsies. 98.7% sensitivity and 97.7% specificity was achieved for detection of colonic disease. A negative predictive value of 99.57% for the absence of disease during colonoscopy was achieved.

CONCLUSIONS: Confocal endomicroscopy allows key histological features of normal and diseased gastrointestinal mucosa to be rapidly distinguished during otherwise conventional colonoscopy. The technique provides high negative predictive value with minimal learning. The study findings support use of confocal imaging to identify pathology and target biopsies with the potential to increase diagnostic yield and/or reduce unnecessary random biopsies. Being a fluorescence modality, endomicroscopy now enables the possibility of clinical molecular targeted fluorescence microscopy.

REFERENCES: