Novel 3D Image of Colon Neoplasm Mucosal Tissues using Multiphoton Microscopy

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Introduction: During recent years, multiphoton microscopy became one of the most important optical imaging techniques for in vivo basic research. Multiphoton microscopy (MPM) can allow a detailed 3D structure analysis of tissue and can be used for the early diagnosis of dysplastic mucosal lesion.

Methods: The aim of this study was to make the gastrointestinal mucosa 3D structure using DNA probe of multiphoton microscopy and to compare normal mucosa with adenoma and adenocarcinoma tissues. This study was a single center study during July to September 2013. We obtained normal, adenoma and adenocarcinoma colon tissue samples by biopsy or endoscopic mucosal resection during colonoscopy from 7 patients. Then the tissues were placed in sterile specimen bottles containing PBS (phosphate buffer solution). Multiphoton images were collected using a DM IRE2 Microscope (Leica Microsystems GmbH, Wetzlar, Germany).

Results: Total 7 patient was composed of 4 adenoma and 7 adenocarcinoma. Among them, 4 patients were diagnosed adenoma and adenocarcinoma at the same time. We were able to get 3D structural images at depths of 90-140 µm. Normal tissue had a defined texture, whereas adenoma and cancer tissue was amorphous. And cancer tissues increased nucleus/cytoplasm ratio compared to normal mucosa.

Conclusion: Colon mucosa 3D structure analysis using multiphoton microscopy can be successfully used to determine colon mucosa architecture and may help to diagnose early colon cancer together with histopathologic examination.