

Development of Confocal Endoscopy for *in vivo* Cellular Imaging

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Abstract: Since its inception, endoscopy aims to establish an immediate diagnosis that is virtually consistent with the histologic diagnosis. In the past decade, confocal laser scanning microscopy has been introduced to endoscopy, enabling *in vivo* microscopic tissue visualization that is comparable to the magnification and resolution obtained with *ex vivo* microscopy of histological specimens. The major challenge of the instrumentation development lies in the miniturization of a fiber optic probe for microscopic imaging with micron resolution. Here we present the design and the construction of a confocal endoscope, which is based on a fiber bundle, with 2.2 μm lateral resolution and 8 fps imaging speed. The fiber optic probe has a diameter of 2.7 mm that is compatible with the biopsy channel of the conventional endoscope. The prototype of confocal endoscope has been used to observe epithelial cells in gastrointestinal tract of mice and will be demonstrated in the clinical trials. In a further step, the confocal endoscope can be used for translational studies of epithelial function to monitor how molecules work and cells interact in their natural environment..

Key words: confocal endoscopy, fiber optic probe, *in vivo* biopsy