Confocal Endomicroscopy in GI Tract Diseases: Time for in-vivo Histologic Diagnosis by Endoscopists

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Endomicroscopy is a newly developed diagnostic tool which enables in vivo microscopy with subcellular resolution during ongoing endoscopy. Thus, endomicroscopy is a revolutionary technology, providing endoscopists for the first time with information about living cells in human beings. Endoscopy and pathology are no longer separate subjects, and thus endomicroscopy leads to a close interaction between the endoscopist and the pathologist.

The talk “Confocal endomicroscopy in GI tract diseases: Time for in vivo diagnosis” is dealing with the new insights provided by endomicroscopy and gives an overview of the development, the requirements, the technique, the current indications and further possibilities of endomicroscopy.

Endomicroscopy today represents the beginning of a new era; further technical improvements and refinements are emerging and new diagnostic possibilities present themselves almost daily. It is absolutely worthwhile to learn about the new possibilities of endomicroscopy because it will influence our clinical algorithm now and in the future. Today, it is possible to analyse the mucosal architecture in vivo, which leads to targeted and safe mucosal biopsies. Tomorrow, new contrast agents might greatly facilitate the diagnosis of cancerous tissue with clear visualisation of distinct malignant epitopes (molecular imaging).

Endomicroscopy is a new imaging dimension in gastrointestinal endoscopy. It provides in vivo histology at subcellular resolution during ongoing endoscopy by combining confocal laser microscopy with standard video endoscopy. Thus, the mucosal layer can be optically analyzed and judged based on cellular and vascular changes. Endomicroscopy can be ideally used for patients with higher risk for the development of GI malignancies.

Patients with long standing ulcerative colitis face an increased risk of the development of colorectal cancer. Colitis-associated dysplasias are precursors of cancer. However, these premalignant changes tend to grow flat and multifocal. Here, chromoendoscopy with Methylene blue is very helpful to identify circumscribed lesions, which subsequently can be analyzed using endomicroscopy.

This combined approach allows increasing the diagnostic yield identifying of intraepithelial neoplasias four times and endomicroscopy enables to safe 90% of mucosal biopsies.

Furthermore, epithelial gaps within the epithelial cell layer could be identified endomicroscopically. These gaps play an important role in the integrity of the mucosal barrier function as firstly proved with endomicroscopy (Kiesslich et al. Gastroenterology 2007). Epithelial gaps are much more common in patients with inflammatory bowel diseases. Here, gaps show a dysfunction of the sealing mechanism, which is responsible to close the gaps quickly after the shedding of single cells. Gaps are persistent open in patients with IBD allowing the influx of
bacteria into the lamina propria. Tissue based bacteria can be identified in 64% of patients with IBD whereas these bacteria in the intercryptal space are only present in 14% of the control population. Interestingly the occurrence of gaps can be induced by external administration of rectal flora to the small bowel in the same individual. Bacteria can lead to a total disintegration of the epithelial cell layer in patients with IBD, which might explain the onset of chronic inflammation.

Furthermore, endomicroscopy is helpful diagnosing Barrett’s epithelium and Barrett’s associated neoplasia as well as gastric neoplasia. It can be used to diagnose celiac disease and microscopic colitis.

Thus, endomicroscopy is truly the begin of a new era where in vivo imaging will help to define different diseases and predict their outcome. Endomicroscopy is highly examiner dependent. However, it opens the door for better diagnosis and targeted treatment of GI diseases after passing the individual learning curve.

REFERENCES