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## Endoscopic detection of early lower gastrointestinal cancer

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The prognosis for patients with malignancies of the lower gastrointestinal tract is strictly dependent on early detection of premalignant and malignant lesions. What should an ideal screening and surveillance colonoscopy be able to accomplish? The technique should allow detection of large but also discrete mucosal alterations. Ideally, endoscopic discrimination between neoplastic and non-neoplastic lesions would be possible during the ongoing procedure. At present, endoscopy can be performed with powerful new endoscopes. Comparable to the rapid development in chip technology, the optical features of the newly designed endoscopes offer resolutions, which allow new surface details to be seen. In conjunction with chromoendoscopy, the newly discovered tool video colonoscopy is much easier and more impressive today than with the previously used fibre-optic endoscopes. Recently, new endoscopic technologies such as narrow band imaging, endocytoscopy, or confocal laser endoscopy have allowed the discovery of a whole new world of image details which will surely improve the diagnostic yield in the field of early malignancies. This review summarises newly available technologies and clinical data about the diagnosis of early lower gastrointestinal cancers.

**Key words:** chromoendoscopy; chromoscopy; colorectal cancer; magnifying endoscopy; narrow-band imaging; endomicroscopy; confocal laser endoscopy; endocytoscopy.

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The prognosis for patients with malignancies of the lower gastrointestinal (GI) tract is strictly dependent on early detection of premalignant and malignant lesions. Colonoscopy is the gold standard for screening and surveillance for colorectal cancer. In addition, virtual colonoscopy based on computer tomography or magnetic resonance technology is an evolving screening tool that has started to challenge the position of colonoscopy. However, small, flat or depressed neoplastic lesions remain difficult to

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detect with these technologies, limiting their value for polyp and cancer screening.<sup>1</sup> In addition, while virtual colonoscopy is a diagnostic tool only, colonoscopy offers the possibility of immediate therapy and complete resection of premalignant lesions or early cancers by endoscopic resection. Hereby, it is important to detect and remove not only the more common polypoid type of malignant and adenomatous lesions but also flat and depressed neoplasias. Hence, the goal of every routine colonoscopy is the detection—and if possible resection—of early cancers and premalignant lesions.

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Recently, new endoscopic technologies such as narrow band imaging, endocytoscopy, or confocal laser endoscopy have allowed the discovery of a whole new world of image details which will surely improve the diagnostic yield in the field of early malignancies. This review summarises newly available technologies and clinical data relevant for the diagnosis of early lower gastrointestinal cancers.

## HIGH-RESOLUTION AND MAGNIFYING ENDOSCOPY

High-resolution and magnification endoscopes offer image quality that is significantly better than that of first-generation video endoscopes or the older fibre-optic systems. The *resolution* of an endoscopic image is a different quality from the *magnification*, and is defined as the ability to distinguish between two points that are close together. High-resolution imaging improves the ability to discriminate details while magnification enlarges the image (see [Figure 1](#)). In digital video imaging, resolution is a function of pixel density. By incorporating high-pixel-density charged-coupled devices (CCDs), high-resolution endoscopes provide slightly magnified views of the gastrointestinal tract with greater mucosal detail. Magnification endoscopy utilises a movable lens controlled by the endoscopist to vary the degree of magnification, which ranges from  $\times 1.5$  to  $\times 150$ . Newly designed magnification endoscopes provide high-resolution and magnification features.<sup>2</sup> Magnifying endoscopy allows a detailed inspection of the mucosa (see [Figure 2](#)). The glandular openings of adenomatous tissues can be seen and differentiated from surrounding normal mucosa. Maximal efficiency of magnifying endoscopes is reached in combination with chromoendoscopy (see [Figure 3](#)).<sup>3</sup>

A currently available magnifying endoscope (endocytoscopy) allows a magnification of up to 1125-fold and provides a field of view of  $120 \times 120 \mu\text{m}$  area at the mucosal surface. So far, 12 patients with superficial oesophageal cancers were examined with methylene-blue-aided endocytoscopy. Different cell distribution and nuclear/cytoplasm ratio could be observed in normal and malignant tissue.<sup>4</sup>

## CHROMOENDOSCOPY

Chromoendoscopy or tissue staining is a relatively 'old' endoscopic technique that has been used for decades. It involves the topical application of stains or pigments to

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