Evaluation of Blue Light Technology in Colonoscopy

Written by Emma Hitt Nichols, PhD

Chromoendoscopy/narrow-band imaging for the detection of adenomas during colonoscopy has evolved over the last several decades. Michael B. Wallace, MD, MPH, Mayo Clinic, Jacksonville, Florida, USA, discussed the 3 phases of blue light technology.

In the first phase, blue dyes (chromoendoscopy) were used to increase contrast by settling into the depressions of the gastrointestinal epithelium. In addition, the blue dye improved the ability to detect dysplasia. This technology is still used today for routine polyp detection and for conditions such as ulcerative colitis.

The second phase, which began in the mid-1990s, included the use of narrow-band imaging (NBI), in which filters are applied to a white light source in order to restrict the light to blue and green wavelengths during the illumination of the intestinal epithelium. This technology highlights vascular changes because hemoglobin absorbs blue light, thereby creating dark contrast to the surrounding tissue. In addition, due to the differing capacities of wavelengths of light to penetrate tissue, different layers of the epithelium can be visualized.

Several classification schemes arose during the second phase. Sano's classification used NBI to assess the organization of capillary vessels within a polyp for a differential diagnosis [Sano Y et al. *Gastrointest Endosc*. 2009]. Although this method is accurate when used by experienced clinicians, interobserver variation led to the development of the NBI International Classification for Endoscopy, which incorporated the color, vasculature, and pit patterns to distinguish hyperplastic polyps from adenomas [Hewitt DG et al. *Gastroenterology*. 2012].

Peer-Reviewed Highlights From

Digestive Disease Week 2015

May 16–19, 2015
Washington, DC, USA

During this time, endoscopes also evolved with new technologies and enhanced-light imaging. Indeed, the new endoscopic technology substantially improved detection of adenomas when used in combinations such as high-definition (HD) plus NBI vs standard-definition white light [Gross SA et al. *Endoscopy*. 2011].

A comprehensive systematic review and meta-analysis by the American Society for Gastrointestinal Endoscopy demonstrated that the negative predictive value (NPV) of a hyperplastic polyp was >90% for experts who were highly confident that an adenoma was absent [Abu Dayyeh BK et al. *Gastrointest Endosc*. 2015].

The third and current phase includes second-generation NBI and blue laser light imaging. The second-generation NBI uses dual focus and brighter imaging to improve vascular contrast. In blue laser light imaging, the laser emits blue light with 3 modes: blue light, brighter blue light, and white light. The standard blue light is used for illuminating the superficial epithelium, the bright blue light is used for distant viewing of the superficial surface, and the white light is used for compatibility with the conventional NBI system. However, blue laser imaging is not yet available for use in the United States.

The accuracy of dual-focus HD NBI colonoscopy is similar to that of standard colonoscopy [Wallace MB et al. *Gastrointest Endoscopy*. 2014]. However, a study that compared NBI with HD white light colonoscopy found that the adenoma detection rate was higher with NBI vs HD white light (48.3% vs 34.4%; $P = .01$), but the mean number of polyps per patient (1.49% vs 1.13%; $P = .07$) and the miss rates were similar among both modalities at about 21.5% [Leung WK et al. *Am J Gastroenterol*. 2014].

In conclusion, Dr Wallace stated that both 180 (1st-generation) and 190 (2nd-generation) NBI perform similarly in terms of adenoma detection rate and polyp surveillance. Although blue light imaging is promising, more research is needed.