Introduction

Now we are in the era of video endoscopy passed through optic fiberoscopy in 1980s. The development of endoscopic equipment leads to significant change and growth in the field of gastroenterology, allowing correct and detailed examination of microscopic lesions. By correlating endoscopically detected lesions with pathologic finding and assessing the disease progress, the academic area of gastroenterology, especially for the gastrointestinal tract disease has been expanded and consolidated. The development of optical imaging technology is in progress. In the early 2000s, new technology called ‘image-enhanced endoscopy’ was incorporated to GI endoscopy equipment leading to new paradigm in the field of GI endoscopy. Among image-enhanced endoscopies currently known, two representative techniques are narrow-band imaging (NBI) and autofluorescence imaging (AFI). These techniques are developed for finding and observing subtle mucosal abnormality, and especially in colon, these are useful for detecting or differentiating epithelial tumors (polyps). Initially, good results had been reported mainly from the countries which developed these techniques but recently, there are many studies from worldwide reporting contradictory results, so the efficacy and benefit are controversial still. Image-enhanced endoscopy, mainly NBI has been used increasingly in Korea and notably in primary medical facilities. But the indications and benefits of these techniques are not established yet. In this report, we will discuss the use of image-enhanced endoscopy in the diagnosis and treatment of colonic epithelial tumors focusing on the unsettled area of these techniques.

Screening

The most important and common purpose of colonoscopy is the screening for colon cancer or precancerous lesion such as adenoma. In cancer or adenoma, the growth of mucosal capillary is enhanced and microvascular density is increased. NBI detects these microvascular structures by enhanced optical image and was expected to be useful in finding small flat lesions which are easily missed in routine colonoscopy. But several large randomized trials reported no difference in detecting adenomas between NBI and routine endoscopy [1,2,3,4]. In addition to the simple randomized studies, there is a randomized tandem colonoscopy trial for comparing NBI with routine endoscopy directly. In this study, 1st endoscopy was conducted by either routine colonoscopy or NBI
and 2nd endoscopy by routine colonoscopy to all patients for checking the missed polyps at 1st endoscopy, enabling direct comparison of these two methods in the same patient. The miss rate for NBI and routine colonoscopy was 12.6% and 12.1% respectively showing no significant difference [5]. The meta-analysis of these studies also showed similar adenoma detection rate, polyp detection rate, small adenoma (≤10mm) detection rate, flat adenoma detection rate, flat adenoma detection rate per patient between NBI and routine colonoscopy [6].

In another meta-analysis analyzing 3,000 patients, the rate of adenoma detection and polyp detection was not significantly different between two methods [7]. Of course, it is difficult to conclude clearly from previous studies because double-blind trial is impossible for this kind of study and there are many other possible confounding factors such as different endoscopic machines used for NBI and routine endoscopy or interobserver variation conducting endoscopy. So further studies controlling these factors are necessary, but we can conclude that the usefulness of image-enhanced endoscopy in screening for colon cancer is not clear from many studies conducted so far.

**Surveillance**

Surveillance colonoscopy is conducted for early detection and treatment of colon cancer or adenoma in patients with increased risk of colon cancer such as long lasting ulcerative colitis or hereditary non-polyposis colorectal cancer. There are some reports supporting usefulness of NBI for observation accurately of dysplastic lesions but few studies report the rate of adenoma detection. One study compared NBI with routine colonoscopy for detecting dysplasia and reported the rate of detection 40% vs. 31% for NBI and routine colonoscopy, respectively, showing higher rate of detection by NBI even though statistically not significant [8]. These results may come from several factors such as mucosal inflammatory change accompanied by dysplasia interfering image enhancing or mucosal hemorrhage disturbing mucosal observation by image-enhanced endoscopy. So, currently image-enhanced endoscopy is not sufficient for surveillance of ulcerative colitis and chromoendoscopy is recommended for this purpose.

**Assessment of pathology**

Image-enhanced endoscopy, especially NBI is known to be useful in differentiation of polypoid lesions and predicting invasion depth of cancer by many studies. However, there is no standard guideline classifying vascular pattern, density, or surface morphology detected by NBI [9]. The currently known classification is Kudo classification, Sano classification, Hiroshima classification, Showa classification, Jikei classification, and FICE classification which are all made in Japan. Sano, Showa, and Jikei classification are based only on vascular pattern and Hiroshima, FICE classification are based both on vascular and surface pattern [10]. There are several Japanese reports about the efficacy of various classification systems but few studies compare these classifications with each other and the degree of agreement among endoscopist using these classifications was not studied also. In addition, these systems are very complex and difficult to endoscopist unfamiliar with these classifications. In one recent Japanese study, the agreement was measured between classification by pit pattern using conventional mucosal staining method and NBI. This study reported significant disagreement in case of severe dysplastic lesion with irregular surface [11]. Western endoscopists also developed more simple classifications in their own.
One of them uses vascular pattern intensity, designating neoplastic lesion when vascular density is high compared to adjacent mucosa and non-neoplastic lesion when vascular density is low in NBI image [12]. Another system classifies hyperplastic polyp and adenoma as type A and B using vessel and mucosal pattern [13]. These situations make global standardization between western and orient difficult. Recently worldwide experts gathered together for making simple and easy classification system and NICE (NBI international colorectal endoscopic classification) was developed. Recently, in Northern America, one study was conducted for estimating efficacy of NICE system correlating endoscopist’s NBI finding with pathologic finding after training gastroenterologists for NICE classification with computerized teaching module. In the evaluation of real-time optical biopsy analysis of polyps with NBI, only 25% of gastroenterologists assessed polyps with ≥90% accuracy showing disappointing results [14]. So, it is too early to generalize and apply current classification system and further effort for standardization is needed.

Conclusions

The field of gastrointestinal endoscopy is facing new era by introduction of image-enhanced endoscopy. Currently there are unsettled areas such as screening and surveillance of colon cancer or pathology assessment as mentioned above, despite clearly defined benefits in clinical application of this technique are also exist. Nothing is perfect and clearly apprehending the strengths and weaknesses of this new technique and applying adequately are the most important things in the current situation. We expect the shortcomings of current technology is overcome by advanced image-enhanced endoscopy technology using more powerful light source.

References

1. Rex DK, Helbig CC. High yields of small and flat adenomas with high-definition colonoscopes using either white light or narrow band imaging. Gastroenterology 2007;133:42-7.