Clinical Usefulness of Magnifying Chromoendoscopy and Magnifying Narrow Band Imaging Endoscopy for Predicting the Submucosal Invasion of Early Colorectal Cancers

Kwang An Kwon and Yang Suh Ku

Department of Gastroenterology, Gachon University Gil Medical Center, Gachon University of Medicine and Science, Incheon, Korea

From both clinical and economic standpoints, preoperative diagnosis is of overriding importance, as it may result in avoidance of unnecessary treatment. Determination of the depth of invasion of submucosal (SM) colorectal cancer (CRC) prior to endoscopic mucosal resection or surgery with lymph node dissection is important. As a part of this, a thorough endoscopic examination is considered necessary for selection of an appropriate therapeutic modality.

According to the 2010 Japanese Society for Cancer of the Colon and Rectum Guidelines for Treatment of Colorectal Cancer, curative endoscopic resection of SM CRC must satisfy all of the following criteria: 1) achievement of complete resection; 2) diagnosis of the carcinoma as well or moderately differentiated; 3) a depth of invasion of less than 1,000 μm (SM-s); and 4) no evidence of vessel involvement. In order for an endoscopic resection of SM CRC to be considered curative, complete resection of the lesion, including a negative vertical margin, is imperative.[1]

Several methods, including malignant morphological features, a nonlifting sign on SM injection, Kudo type V pit pattern on magnifying chromoendoscopy (MCE), magnifying narrow band image endoscopy (MNE) and the use of endoscopic ultrasound, have been used for the assessment of SM invasion and to define resectability of early CRC.[2]

Ikehara et al.[3] used tumor size, loss of lobulation, excavation, demarcated depressed area, stalk swelling, fullness, and fold convergence as endoscopic factors. When a particular lesion included four or more such endoscopic factors, overall diagnostic accuracy was highest for the pedunculated type (86%). As for both the sessile and superficial types, it was as high as 81% and 80%, respectively, when two or more of the endoscopic factors were observed.[3] The fact that a diagnosis using conventional white light endoscopy (CWE) findings could achieve such good results is important. However, when one or more endoscopic factors were observed, the overall diagnostic accuracy was as low as 56.1% in the pedunculated type, 66.3% in the sessile type, and 68.7% in the superficial type.[3] Choi et al.[4] used hardness, surrounding white spots, depression, surface nodularity, full expansion, deformed adjacent wall, mucosal friability, convergence of mucosal folds, erosion, or ulceration as endoscopic factors. In an article reported by Choi et al.,[4] they did not classify tumors according to the morphology of lesions, and the diagnostic accuracy for SM invasion using gross findings of CWE ranged from 67% to 82%.

Choi et al.[4] focused on the relevance of diagnostic performance in estimating the depth of invasion in early CRC, based on the consideration that this is one of the most important clinical purposes of MCE and MNE.

MCE is known to be useful for assessing the depth of invasion of early CRC. Classification of colorectal lesions according to the pit pattern, as initially proposed by Kudo, is related to the histologic characteristics of the lesions. Classification of pit patterns using MCE has been reported to be effective for diagnosing the depth of early CRC. Correct classification of the type V pit pattern is essential, as it can suggest the pres-

ence of SM invasion. This has significant consequences for endoscopic resections, because breaching of the deeper SM layers increases the risk of incomplete or complicated resection and is associated with a significantly higher frequency of lymph node involvement. A number of studies have reported on the type V_N pit pattern as an indicator of massive SM invasion. However, colorectal neoplasms of the type V_I pit pattern include various histologic features, such as tubular adenoma, mucosal cancer, superficial SM cancer, and massive SM cancer. Therefore, determination of the optimal therapeutic strategies for colorectal neoplasms is not easily based on pit pattern classification alone. In the study reported by Ikehara et al.,[3] overall accuracy for differentiation of mucosal/sm-slight cancer from sm-deep cancer was 84% in the pedunculated type, 89% in the sessile type, and 93% in the superficial type. The diagnostic accuracy of the pit pattern was lower for pedunculated type lesions than for the other two macroscopic subtypes.[3] In the study by Choi et al.,[4] a diagnostic accuracy of pit V_N pattern ranging from 85% to 88% was reported as an indicator of SM invasion.

Although MCE has a good predictive value for guiding management toward either endoscopic resection or surgical resection, MCE is not widely used in practical colonoscopy because it is troublesome, time-consuming, requiring the use of staining solutions and spraying catheters, and because mucus on the lesion surface might obstruct image acquisition.

However, MNE does not involve a complicated technique and provides vascular information in a simple way.[5] MNE can be easily performed without dye spraying or crystal violet staining.

In general, in relation to histological atypia of a colorectal tumor, the tumor is vascularized and the diameter and density of microvessels increase. Microvessels in the superficial layer of normal mucosa or a hyperplastic lesion are very fine and sparse, and are therefore difficult to recognize even by narrow band imaging (NBI) observation at the currently accepted wavelength setting. However, neoplastic lesions are recognizable as dark brown because of the increased diameter and density of microvessels in the superficial layer.[6]

Currently, several MNE observation classifications for colorectal tumor (Sano classification, Hiroshima classification, Showa classification, and so on) have been proposed; however, no standardized classification has been established yet.[6] Among them, Showa classification evaluates both the surface pattern and the microvascular architecture, and expresses these characteristics morphologically. Therefore, this classification differs from category-based classification systems, such as Hiroshima classification and Sano classification. In Showa classification, colorectal tumors are classified according to the pattern of microvessels surrounding the pits.[7]

Although the criteria for predicting the depth of invasion of early CRC by analysis of the microvascular architecture were different, the overall diagnostic accuracies reported by Horimatsu et al.,[8] Ikematsu et al.,[9] and Wada et al.[10] were similarly high at 82.4%, 88%, and 88.3%, respectively.[11] Choi et al.[4] used a "sparse pattern" in Showa classification as a SM invasion.[4] In their article, the diagnostic accuracy for SM invasion using MNE ranged from 85% to 88%.[4]

In order to enable meaningful selection of the appropriate treatment, a simpler means of endoscopic examination by MNE is needed. The NBI International Colorectal Endoscopic (NICE) classification, which was proposed in order to provide international standards for currently available diagnostic strategies, would be helpful for endoscopists with or without a magnifying endoscope.[12] In addition, NICE would be helpful for endoscopists who are experienced as well as those who are less-experienced in performing magnifying endoscopy.

In addition, Choi et al.[4] assessed interobserver agreement for the three endoscopic modalities. Interobserver agreement for the diagnosis of SM invasion with each modality indicated moderate agreement for CWE (κ=0.564) and substantial interobserver agreement for MCE (κ=0.673) and MNE (κ=0.673).[4] Interobserver variability in the pit pattern analysis and MNE for the diagnosis of SM invasion showed greater improvement than in the past.[13]

In the article by Choi et al.,[4] all images were taken by only one colonoscopist, who was experienced in performing magnifying endoscopy and NBI endoscopy. I think that, in the future, comprehensive evaluation of the effectiveness of CWE, MCE, and MNE will require involvement of endoscopists with varying backgrounds and degrees of experience.

Conflicts of Interest

The authors have no financial conflicts of interest.

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