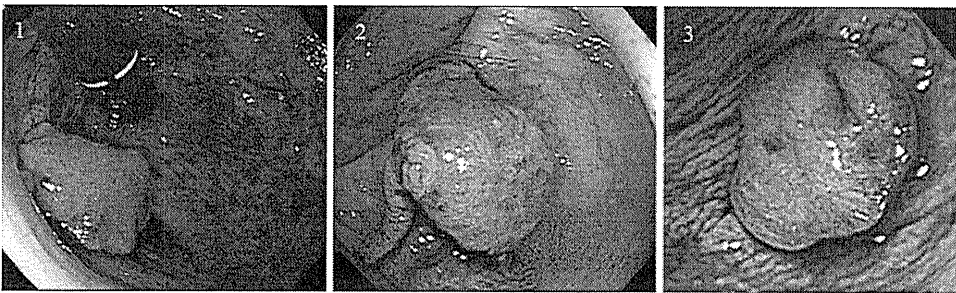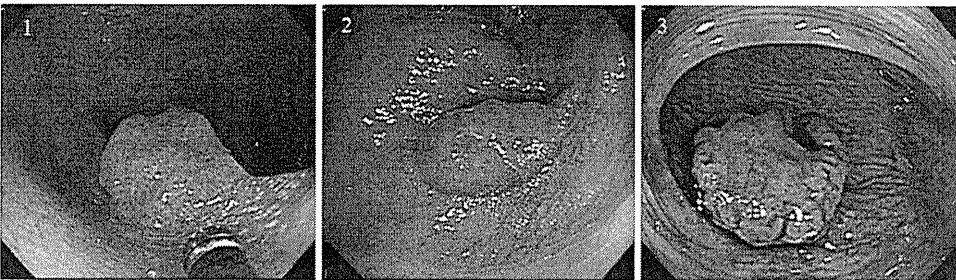**Figure 6**   Redness (reddened area). (1) IIc (LST-NG), SM superficial cancer; (2) Is, SM deep cancer; and (3) IIa + IIc, SM deep cancer. (Color figure is available online at www.techgiendoscopy.com.)

Figure 7   Expansion. (1) Is, SM deep cancer; and (2 and 3) Is + IIc, SM deep cancer. (Color figure is available online at www.techgiendoscopy.com.)

Figure 8   Firm consistency. (1 and 2) Is, SM deep cancer; and (3) IIa + IIc, SM deep cancer. (Color figure is available online at www.techgiendoscopy.com.)
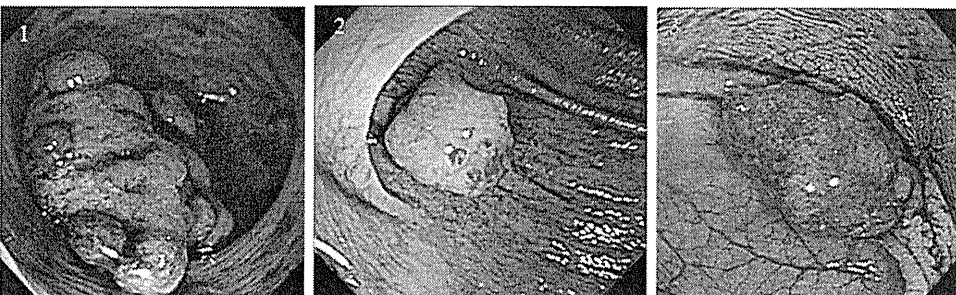
Figure 9   Irregular surface. (1-3) Is, SM deep cancer. (Color figure is available online at www.techgiendoscopy.com.)

Figure 10 Loss of lobulation. (1-3) Is, SM deep cancer. (Color figure is available online at www.techgiendoscopy.com.)

(LST-NG) type, which has no submucosal invasion resembles this finding because of submucosal fibrosis.

*Irregular bottom of depression surface (*Figure 4*).* Most of these lesions have cancer cells already invading deeply into the submucosal layer. Morphologically, such lesions are usually named Is + IIc type.

White spots (chicken skin appearance; Figure 5*).* Sometimes intramucosal lesions (adenoma or intramucosal cancer) indicate this finding.

Redness (reddened area; Figure 6*).* Chromoendoscopy (with indigo carmine) is helpful in recognizing this finding. Intramucosal lesions (adenoma or intramucosal cancer) sometimes resemble this finding. A combination of this finding and the other findings (eg, deep depression, irregular surface, expansion) are significant indicators of submucosal deep cancer.

*Expansion (*Figure 7*).* Most of these lesions have cancer cells already invading deeply into the submucosal layer. Morphologically, such lesions are usually named Is type. There is a strong relationship between this finding and loss of lobulation.

*Firm consistency (*Figure 8*).* It is crucial to confirm this finding under air volume control during observation. Lesions should be judged not only under deflated conditions but also under full inflation.

*Irregular surface (*Figure 9*).* Most of these lesions have cancer cells already invading deeply into the submucosal

layer. There is a strong relationship between this finding and loss of lobulation.

*Loss of lobulation (*Figure 10*).* Most of these lesions have cancer cells already invading deeply into the submucosal layer. Morphologically, such lesions are usually named Is type. There is a strong relationship between this finding and expansion/irregular surface.

*Thick stalk (*Figure 11*).* The definition of this finding is "a thickened and expanded stalk." There is a strong relationship between this finding and submucosal deep invasion (ie, stalk invasion) in pedunculated lesions.

Magnifying colonoscopy (magnifying chromoendoscopy, NBI with magnification)

Magnifying chromoendoscopy is a validated method that facilitates detailed analysis of the morphologic architecture of colonic mucosal crypt orifices (pit pattern) in a simple and efficient manner. However, magnifying colonoscopes are still rarely used in endoscopy units. An unrecognized need and lack of randomized studies validating the effectiveness of magnifying chromoendoscopy are possible reasons for this. We believe that magnifying chromoendoscopy is an essential tool in gastrointestinal endoscopy units, with its main clinical significance being the in vivo diagnosis of the nature of colorectal lesions to determine the appropriate treatment modality. Recently, NBI, a modified technique that provides a unique image emphasizing the CP, as well as the surface pattern, has become widely available. Its
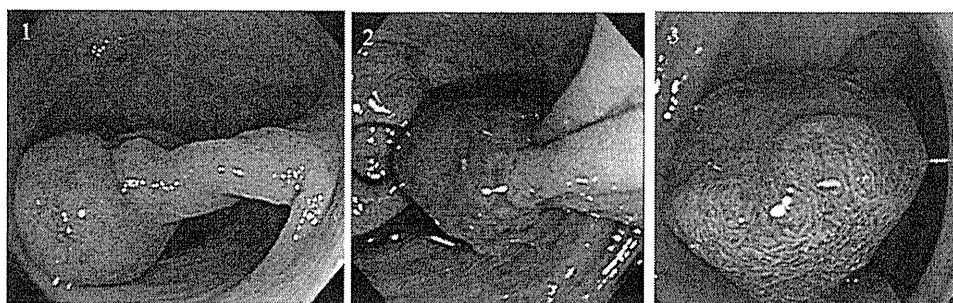
Figure 11 Thick stalk. (1) Ip, SM deep (stalk invasion) cancer; (2) Ip, SM superficial (head invasion) cancer; and (3) Ip + IIc, SM deep (stalk invasion) cancer. (Color figure is available online at www.techgiendoscopy.com.)
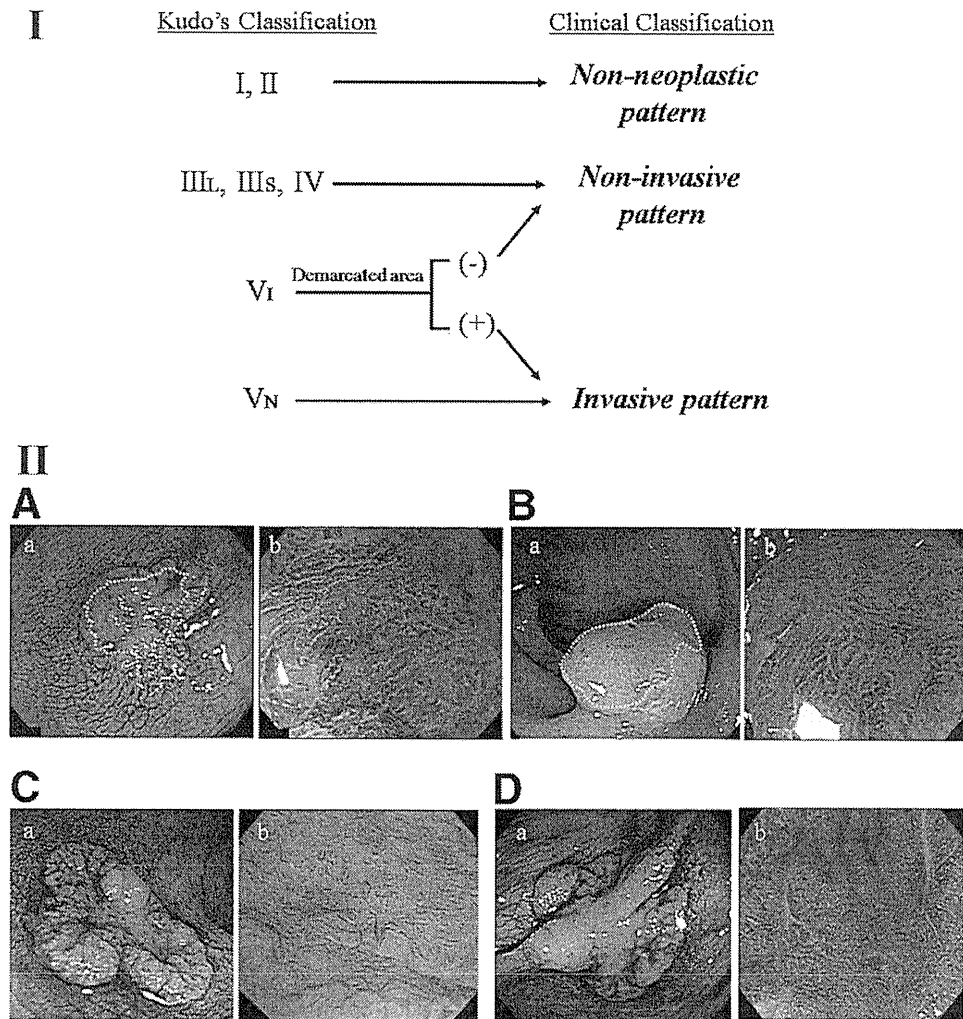
Figure 12   Definition of invasive/noninvasive pattern. (A and B) Invasive pattern: irregular or distorted pit with demarcated area. (C and D) Noninvasive pattern: regular pit with or without demarcated area or irregular pits without a demarcated area. (Color figure is available online at www.techgiendoscopy.com.)

visual effect is similar to that of chromoendoscopy. Because of the layered nature of the gastrointestinal mucosa, assessment of the CP is critical for the diagnosis of superficial lesions. Otherwise, this system can be installed by changing the optical filters from the conventional broadband type to a narrow-band type and is available for existing endoscopes, including the magnifying endoscope.[11,22-24]

## How to differentiate between mucosal/submucosal superficial and submucosal deep cancers?

Magnifying chromoendoscopy (pit pattern diagnosis). Clinical classification of the colonic pit pattern (invasive and noninvasive) using magnifying chromoendoscopy was originally described by Fujii in 1998 with the aim of discriminating between intramucosal–submucosal superficial invasion and submucosal deep invasion.[7] Contrary to the anatomic classification of Kudo et al,[5] the rationale for the clinical classification is based on the identification of irregular or distorted crypts in a demarcated area, which highly

suggests that the cancerous lesion is already invading deeply into the submucosal layer.

Some studies have already reported the clinical usefulness of detailed determination of the V pit pattern using magnifying chromoendoscopy for predicting the depth of invasion of submucosal cancers.[5,9,25] We recently carried out a large prospective study of 4215 lesions in 3029 consecutive patients between 1998 and 2005. All lesions were detected by conventional endoscopic observation and assessed using magnifying chromoendoscopy for evidence of invasive features according to pit pattern evaluation.

Clinical classification
1. Nonneoplastic pattern: normal mucosa and star-shape crypts as observed in Kudo's type I or II, respectively (eg, hyperplastic, hamartomatous, and inflammatory polyps).
2. Noninvasive pattern: regular crypts with or without demarcated area or irregular pits without a demarcated
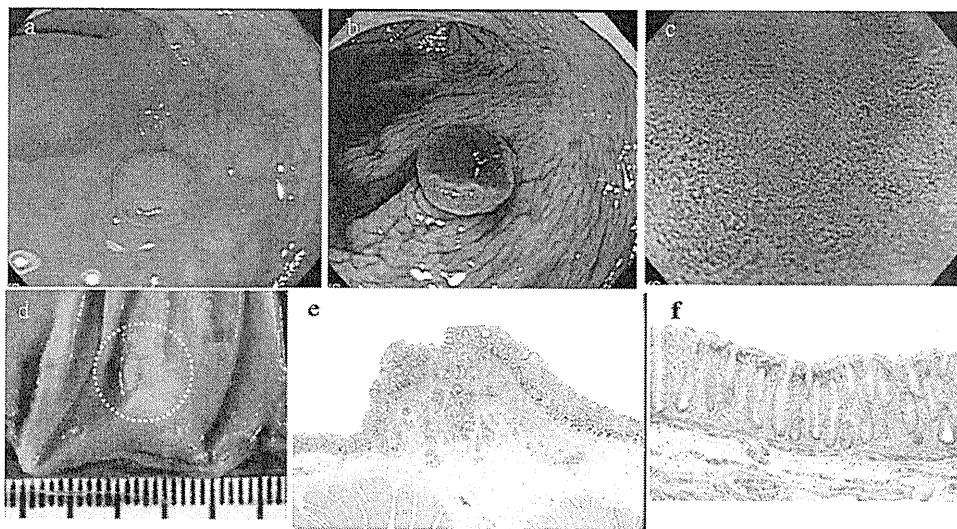
Figure 13   SM deep sigmoid colon cancer , IIa + IIc, 5 mm. Moderately differentiated adenocarcinoma with collagenous colitis. pSM (2500 μm), ly1, v0, n0. Final treatment, surgery. (Color figure is available online at www.techgiendoscopy.com.)

area. Usually observed in Kudo's type IIIs, IIIL, and IV and in selected cases of VI (eg, adenomatous polyps, intramucosal and submucosal superficial cancers), where endoscopic resection is appropriate.

3. Invasive pattern: irregular and distorted crypts in a demarcated area as observed in Kudo's type VN and selected cases of VI (eg, deep submucosal invasive cancers), where surgical resection is the appropriate treatment. Kudo's type VI is observed in both noninvasive and invasive patterns (Figures 12 and 13).

Our data showed that 99.4% of lesions diagnosed as noninvasive pattern were adenoma, intramucosal cancer, or submucosal invasion less than 1000 μm. Among lesions diagnosed with invasive pattern, 87% were cancers with submucosal deep invasion. Based on the macroscopic appearance, the diagnostic sensitivity of the clinical pit pattern to determine the depth of invasion of polypoid, flat, and depressed lesions was 75.8%, 85.7%, and 98.6%, respectively.[10]

NBI with magnification. Based on the surface characteristics of the meshed capillaries, CP type III were defined as demonstrating an irregular and unarranged pattern in the mesh-like microvascular architecture and exhibiting at least one of the following: irregular size, complicated branching,

SM-superficial cancer
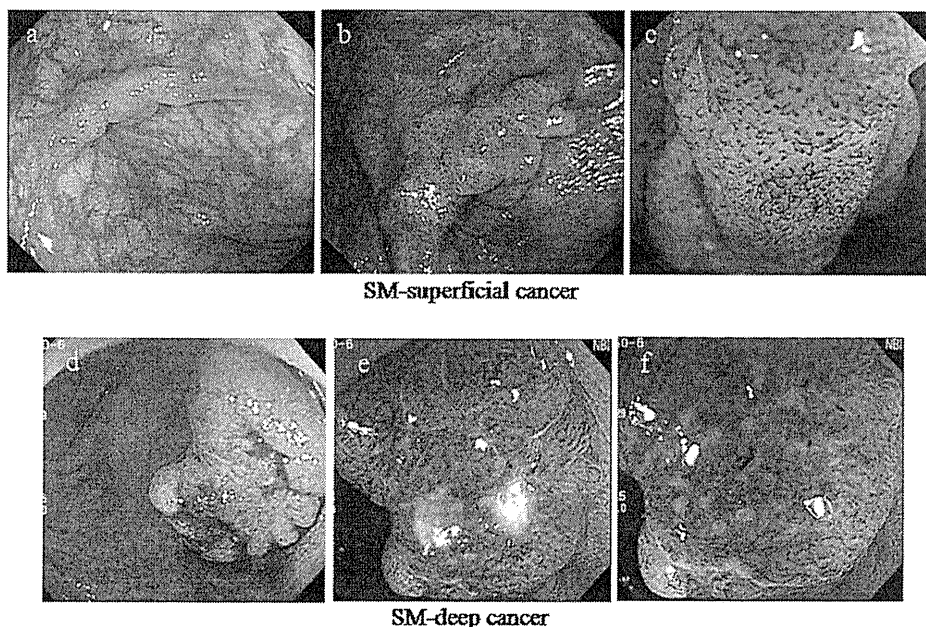
SM-deep cancer

Figure 14   (a-c) CP type IIIA, SM superficial cancer; and (d-f) CP type IIIB, SM deep cancer. (Color figure is available online at www.techgiendoscopy.com.)

and disrupted irregular winding when compared with the regular small-caliber capillaries observed in adenomatous polyps (CP type II). Moreover, CP type III lesions were further classified into 2 groups: type IIIA or IIIB.

CP Type IIIA

CP type III lesions clearly show visible microvascular architecture and high microvessel density with lack of uniformity, blind ending, branching, and curtailed irregularity.

CP Type IIIB

CP type III lesions show a clear distinction between normal/cancerous mucosa on the surface (demarcated area) and the presence of a nearly avascular or loose microvascular area (Figure 14).

The diagnostic sensitivity, specificity, and diagnostic accuracy of the CP type IIIA/IIIB for differentiating intramucosal cancer or submucosal invasion less than 1000 μm from submucosal deep invasion ($\geq$1000 μm) were 84.8%, 88.7%, and 87.7%, respectively. The accuracy of CP type IIIA (negative predictive value) was 94.5% (86/91) and that for lesions of CP type IIIB (positive predictive value) was 71.8% (29/39).[11] The identification of CP type IIIA/IIIB by magnifying NBI is useful for estimating the depth of invasion of early colorectal cancers; however, there is a greater interobserver variability compared with the pit pattern diagnosis.

Conclusions

The detection and diagnosis of early colorectal cancer presents both a challenge and an opportunity. Above all, characteristic colonoscopic findings obtained by a combination of conventional colonoscopy and magnifying chromoendoscopy are useful for determining the depth of invasion of these lesions, an essential factor in selecting a treatment modality.

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