Narrow-band Imaging International Colorectal Endoscopic Classification to predict polyp histology: REDEFINE study (with videos)

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Background and Aims: The Narrow-band Imaging International Colorectal Endoscopic (NICE) Classification has been validated for differentiating hyperplastic from adenomatous polyps. This classification system was based on narrow-band imaging (NBI) technology, leaving uncertainty regarding its applicability to other systems. The aim of this study was to assess accuracy and reliability of histologic predictions for polyps <1 cm by applying the NICE classification to the Fujinon Spectral Imaging Color Enhancement (FICE) System.

Methods: A video library of 55 polyps <1 cm histologically verified with FICE was prospectively created, including polyps that fulfilled inclusion criteria (morphology, size, histology) in consecutive colonoscopies. Six endoscopists with experience in electronic chromoendoscopy independently reviewed the polyp images, scored the polyps as adenomatous or hyperplastic, and assigned a level of confidence to the predictions. Twenty videos were reassessed at 6 months. The diagnostic performances of the endoscopists was calculated both combined and individually according to the histopathology of the polyps. A mixed-effect logistic regression model, in which polyps were considered as random effects, and polyp histology, confidence level, and readers were considered as fixed effects, was used. Results were expressed as odds ratios (ORs) with 95% confidence intervals (CIs).

Results: Of the 55 polyps (mean size 4.6 mm), 29 (53%) were adenomas, and 26 (47%) were hyperplastic. Across all the readers and observations, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy, and area under the curve (AUC) were 77%, 75%, 88%, 75%, 77%, and 0.82, respectively. Individual rater accuracy ranged from 66% to 96%, being <90% in 5 of 6 cases. Overall, 68.5% of predictions (226/330) were made with high confidence, although there was high variability (Fleiss kappa, 0.15; 95% CI, 0.08-0.22). Sensitivity, specificity, PPV, NPV, accuracy, and AUC for predictions made with high confidence were 81%, 80.5%, 80%, 77%, 82%, and 0.88 being significantly more accurate as compared with a low confidence of diagnosis (OR 2.4; 95% CI, 1.2-4.7). Regarding the performance of the individual NICE criteria, the odds of adenoma detection were 3.4 (95% CI, 1.8-6.3) and 4.0 (95% CI, 2.1-7.5) by using surface and vessels patterns alone, as compared with the color criterion. Interrater and intrarater agreement with the NICE was only moderate (interrater: Fleiss kappa, 0.51; 95% CI, 0.44-0.56; intrarater: kappa, 0.40; 95% CI, 0.20-0.60).

Conclusions: The application of the NICE classification to FICE resulted in suboptimal accuracy and only moderate interobserver agreement. (Gastrointest Endosc 2016;84:479-86.)

(footnotes appear on last page of article)

This video can be viewed directly from the GIE website or by using the QR code and your mobile device. Download a free QR code scanner by searching "QR Scanner" in your mobile device's app store.

Colorectal cancer (CRC) represents an important health problem in Western countries. In Europe, almost 413,000 people are newly diagnosed with CRC, and about half of them will die of the disease, CRC representing the second leading cause of cancer deaths.[1]

Colonoscopy is currently regarded as the criterion standard for detection of polyps and cancers in the colon.[2] The efficacy of colonoscopy in preventing CRC has been attributed to the removal of adenomas.[3,4] On the other

hand, the removal of hyperplastic polyps generally has been regarded as a false-positive result of this procedure, except for larger hyperplastic or other serrated lesions. Because of the impossibility of predicting final histology with white-light endoscopy, endoscopists remove all the detected polyps in order to refer them to pathology. However, the cost of pathology examination for small hyperplastic polyps is likely to negatively affect the cost effectiveness of the procedure.[5,6] The possibility of harboring a polyp with hyperplastic histology is much higher in the small (<10 mm) than in the large lesions, and it is also higher in diminutive (≤5 mm) than in 6- to 9-mm polyps. Of note, diminutive and small polyps account for over 80% of all the polypoid lesions.[7,8]

The field of advanced endoscopic imaging, aiming to reliably predict the histology of colorectal lesions based on endoscopic features,[9-12] was revolutionized by the development of electronic or virtual chromoendoscopy. The main advantages of electronic or virtual chromoendoscopy are the simple and immediate activation and the wide availability on the new generations of endoscopes. In order to differentiate between neoplastic (adenomatous) and nonneoplastic (hyperplastic) lesions, electronic or virtual chromoendoscopy exploits the neoangiogenesis of neoplastic lesions as well as the mucosal pit pattern. Promising results in differentiating between different histologies recently have been reported in a meta-analysis with all of the available technologies.[13] This has prompted the development of the resect-and-discard strategies, with no resection and/or histopathology assessment for clinically irrelevant diminutive lesions.[14]

Clinical application of narrow-band imaging (NBI) in particular has been standardized by the validation of the Narrow-band Imaging International Colorectal Endoscopic (NICE) Classification.[15] NBI technology uses a physical filter in order to exploit the capacity of hemoglobin to selectively absorb blue light.[5,6] In contrast, Fujinon Spectral Imaging Color Enhancement (FICE, Fujifilm Europe GmbH, Duesseldorf, Germany) is a postprocessor technology that electronically removes the red part of the waveband in order to achieve vascular enhancement.[7] Because of the underlying differences between the NBI and FICE technologies, it remains uncertain whether the NICE classification may be translated to FICE.

The aim of our study was to validate the NICE classification for differentiating hyperplastic and adenomatous polyps <1 cm when diagnosed with high confidence by using FICE with high definition without optical magnification: the REDEFINE (REsect and Discard study Extension to FIce of NIce) study.

METHODS

A video library of polyps <10 mm characterized with FICE technology was prospectively created for the purpose of this study. Six experienced endoscopists applied the NICE classification to these videos, and their performance in terms of diagnostic confidence and accuracy was measured. All institutions participating in this noninterventional clinical study obtained the appropriate institutional review board approval.

Study population

Consecutive adult patients referred for elective outpatient colonoscopy were enrolled from June to November 2014. Exclusion criteria were inflammatory bowel disease, a personal history of polyposis syndrome, diverticulitis or toxic megacolon, and a history of radiation therapy to the abdomen or pelvis. Patients with histories of severe cardiovascular, pulmonary, liver, or renal disease as well as those with coagulation disorders or use of anticoagulants were excluded.

Video library

One expert endoscopist who was not involved in the subsequent phases of the study (C.C.) recorded high-definition videos of consecutive polyps <1 cm diagnosed in the study period. All endoscopies were performed with a Fujinon colonoscope series EC-600 with the FICE system (VD-4450-HD, FUJIFILM Europe GmbH, Duesseldorf, Germany). Each video consisted of 5 to 10 seconds of white-light endoscopy and 30 to 60 seconds of FICE use (types 1, 4, and 8). For the purpose of this study, magnification was not allowed during recording. All polyps were resected and sent for histopathologic examination that was used as the criterion standard for our analysis, and that was performed by an experienced GI pathologist according to the revised Vienna classification.[16] Because of the unclear accuracy of the NICE classification for sessile serrated polyps,[15] we decided not to include them in the present analysis.

Endoscopist reading

Endoscopists with at least 2 years of regular practice with advanced endoscopic imaging, such as NBI or FICE, were selected. After a formal session on the NICE classification based on its theoretical background and a series of NBI-based cases,[17] each endoscopist reviewed each video and applied the NICE classification in order to predict the possible histotype (Table 1).[15] In detail, each endoscopist individually scored each of the 3 criteria of the NICE system (color/vessel/surface pattern) as present/absent/uncertain and eventually indicated the overall level of confidence (high/low/no confidence) and the possible NICE category, that is, type 1 for nonadenomatous and type 2 for adenomatous, in a dedicated form (Supplemental Table 1, available online at www.giejournal.org).

Polyps were predicted to be adenomatous or hyperplastic with high confidence if they had one or more features associated with one histology and no features