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Validation of Narrow Band Imaging using the NICE classification of Colorectal Polyps at Manila Doctors Hospital

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2016

Background/Aims: Narrow band imaging (NBI) is a technique that uses optical filters for imaging of mucosal morphology. The aim of this study was to correlate findings of NBI using the NICE classification and histology for prediction of non-neoplastic and neoplastic colorectal polyps.

Methods: Between January 8, 2016 to October 28, 2016, a total of 256 colon polyps from 166 patients were detected by conventional colonoscopy and subsequently evaluated by the NICE classification and correlated with its histopathologic findings.

Results: NICE classification (Type 1, and Type 2&3) to discriminate between neoplastic and non-neoplastic lesions at Manila Doctors Hospital had a sensitivity of 78.9%and a specificity 90.2%, NPV of 79.8%, PPV of 89.7%.

Conclusions: Since we have high sensitivity, specificity, NPV, PPV, we can say that the test (NBI) is ideal. This study confirms that NBI can be used to predict the histopathology of suspected colorectal polyps.

INTRODUCTION

Narrow band imaging (NBI) endoscopy is a technique that uses 2 optical filters to pass only the short (blue/green) wavelengths enhancing the visualization of microvessels and their fine structures on the mucosal surface, based on the fact that the depth of light infiltration depends on its wavelength. The contrast on the vessel areas could be increased by artificially narrowing the wavelength area using filters because the sharpness may be improved by eliminating the wavelength areas with dispersed lights. NBI uses 415 nm and 540 nm of wavelength; the former enhances microvessels in the mucosal surface layer with brown image, whereas the latter enhances the submucosal layer or microvessels in the submucosal layer with green image, both enabling detailed observation of mucosal structure and capillary pattern. NBI is not only useful for the detection of tumors but also for the differential diagnosis between tubular adenoma and hyperplastic polyp. [1]

This study observed the colorectal polyps classified under the NICE classification and correlated it with the histologic diagnosis.

OBJECTIVES

GENERAL OBJECTIVE: To correlate findings of NBI using the NICE classification and histology for prediction of non-neoplastic and neoplastic polyps.

SPECIFIC OBJECTIVE: To determine the specificity, sensitivity, NPV, PPV, of using the NICE classification (Type 1, and Type 2 &3) for predicting neoplastic and non-neoplastic lesions.

MATERIALS AND METHODS

Patients and colonoscopic observations

This retrospective study was performed by reviewing the photos and endoscopic reports of patients who underwent colonoscopy with polypectomy with the use of NBI with or without magnification using Image Ark Database: Endosoft 2, File version 210.290.0.11, Product Version 2.1 at Manila Doctors Hospital from January 8 to October 28, 2016. Every polyp was detected using white-light colonoscopy with NBI using Olympus 190CF-H190L, and EVIS EXERA III CV190/Utech Products Inc was used for videoendoscope system. All polyps were then classified into 3 types based on NICE classification, which consists of 3 types as shown in Figure 1.

Five GI-fellows-in-training performed the endoscopic observations in this study. This study involved patients who underwent elective colonoscopy. Exclusion criteria included: 1) Colonoscopy on which NBI was not done 2) Colonoscopy on which resection of colorectal polyps were not performed 3) Colonoscopy on which colorectal polyps were removed/biopsied but not sent for histopathologic examination at Manila Doctors Hospital. The demographic characteristics, the characteristics (NICE classification and histopathology results) of the colorectal lesions were collected. All data that were collected from the participants are confidential. After detailed observation by NBI and subsequent classification, the results were correlated with its histopathologic findings. And subsequently grouped according to whether it is neoplastic or non-neoplastic. Pathologic examinations were performed by eight (8) Philippine board-certified Manila Doctors Hospital pathologists unaware of the NBI classification of each case.

Patterns and features according to the NICE (Narrow-band imaging International Colorectal Classification)

Endoscopic pit patterns and capillary patterns were categorized using the NICE (Narrow-band imaging International Colorectal Classification) (Fig. 1)

RESULTS

Patients characteristics and colonoscopic observations

A total of 166 colonoscopy results of patients (97 male, 69 female) were used in the study, and their mean age was 59 years old (range, 4 to 95 years old). White-light colonoscopy and NBI with or without magnifying colonoscopy were performed in every patient, with successful intubation of cecum. Bowel preparation was conducted in every

test, and lesions in every patient were categorized proficiently following the observation of colorectal mucosa by NBI.

A total of 256 colorectal polyps were detected by white-light colonoscopy and NBI that were subsequently submitted for histopathologic review were observed.

Table 1 Narrow-band imaging International Colorectal Endoscopic Classification[1]

* taken from Santa Hattori, Mineo Iwatate et al. **Narrow-band imaging observation of colorectal lesions using NICE classification to avoid discarding significant lesions.** *World J Gastrointest Endosc* 2014 December 16; 6(12): 600-605 ISSN 1948-5190 (online)

Relationship between endoscopic diagnosis using the NICE classification and pathological diagnosis

Among the 2 groups divided based on histopathologic findings (neoplastic and non-neoplastic), we detected a total of 256 polyps in 166 patients.

A total of 133 polyps classified under NICE Type 1 were identified. Final histology showed 28 neoplastic lesions and 105 non-neoplastic lesions (See Chart 1): 84 were identified as hyperplastic polyps (63%), 25 were tubular adenomas (19%), 2 hyperplastic with adjacent tubular adenoma, 1 tubulovillous adenoma. The others were identified as: 12 chronic non-specific colitis, 1 chronic nonspecific colitis with lymphoid pseudoplyp, 1 lymphoid pseudopolyp, 2 chronic colitis with stromal fibrosis, 1 hemartomatous polyp, 2 chronic colitis with eosinophilia, 1 retention polyp, and 1 inflammatory pseudopolyp. (See Pie Graph 1)

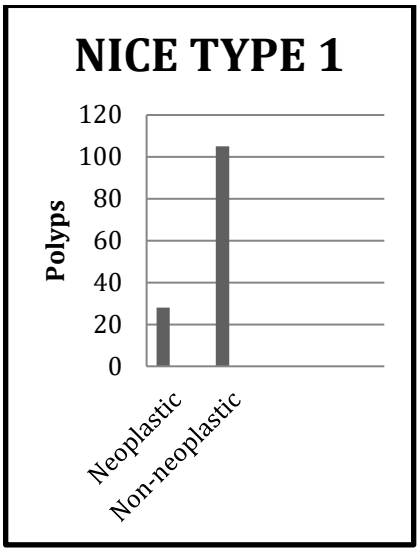
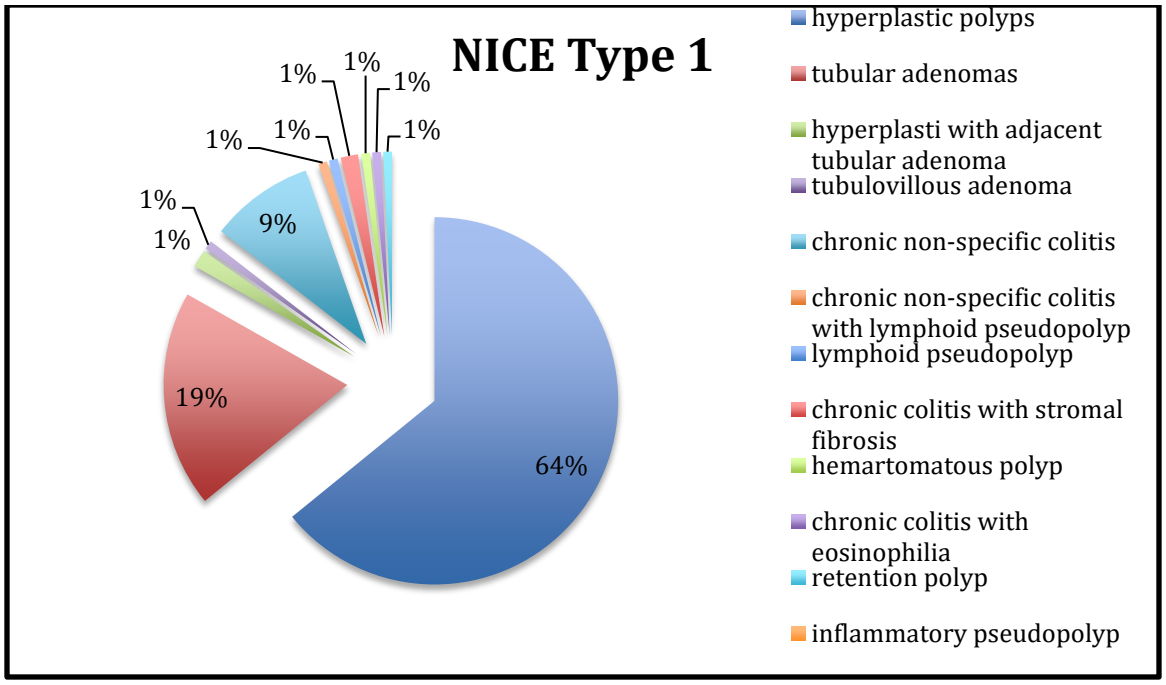


Chart 1



Pie Graph 1

A total of 112 polyps classified under NICE Type 2 were identified. Final histology showed 102 neoplastic lesions and 10 non-neoplastic lesions (See Chart 2): 90 were identified as tubular adenomas (82%), 1 tubulovillous adenoma with high grade dysplasia, 1 focal low grade grandular dysplasia, 1 serrated adenoma, 1 villous adenoma, 4 tubulovillous adenomas, 2 tubular adenoma with high grade dysplasia. The others were identified as: 6 hyperplastic polyps, 2 chronic nonspecific colitis, 1 inflammatory pseudopolyp with hypereosinophilia, 1 benign glandular epithelial fragments. (See Pie Graph 2).

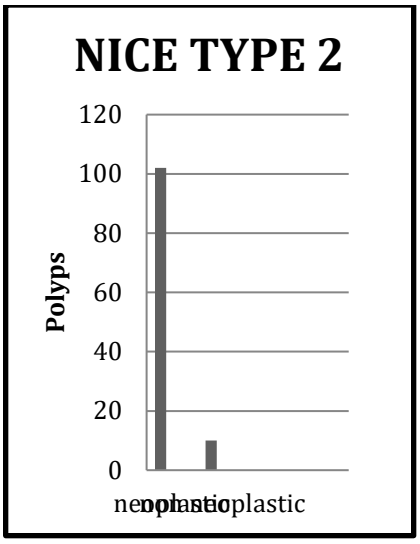
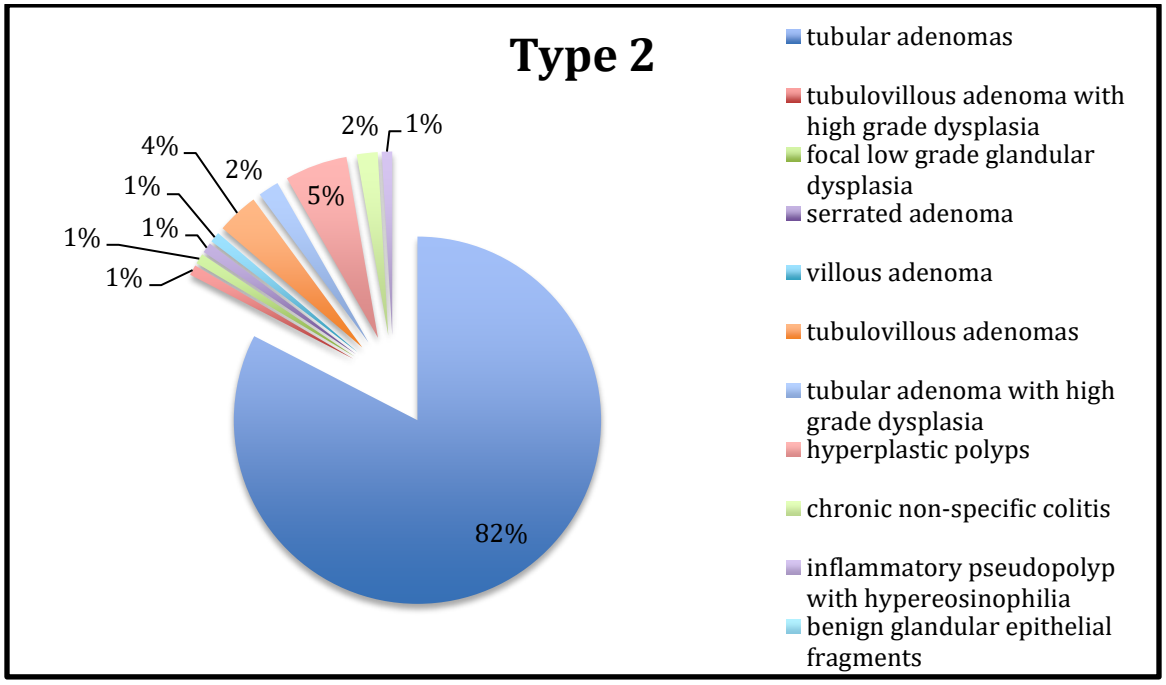


Chart 2



Pie Graph 2

A total of 11 polyps classified under NICE Type 3 were identified. Final histology showed 9 neoplastic lesions and 2 non-neoplastic lesions (See Chart 3): 3 tubular adenoma, 1 adenocarcinoma well differentiated arising (5cm from the stalk) in tubular adenoma, 2

tubulovillous adenoma, 1 serrated adenoma, 1 retention polyp, 1 villous adenoma with high grade dysplasia, 1 lipoma, 1 tubulovillous adenoma with high grade dysplasia.

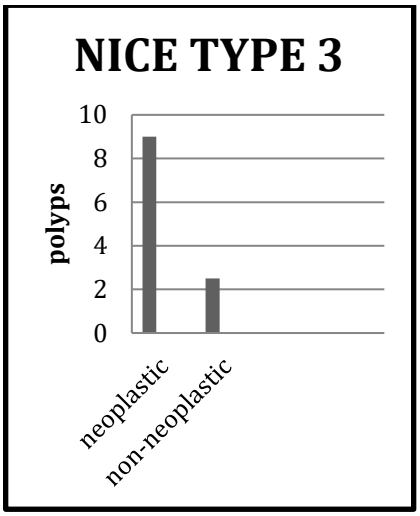
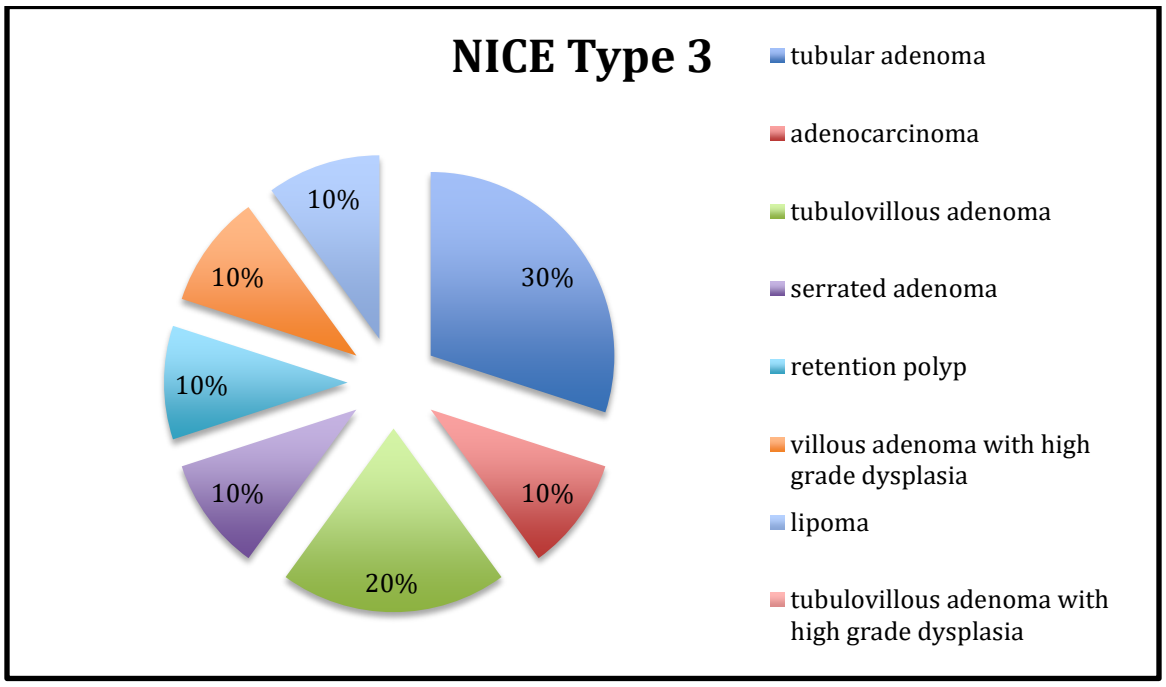


Chart 3



Pie Graph 3

Since this is retrospective study, Bayesian statistics was used to get the estimates. The sensitivity and specificity of the use of NBI at Manila Doctors Hospital, Sensitivity is **0.789.** This is computed by dividing the true positive value (105) by the total outcomes in the type 1 lesion which is 133 (ie =105/133). We can safely say that almost 79% of type 1 lesion will be classified as non-neoplastic. The specificity is **0.902** which is computed by dividing the true negative (111) by the total outcomes in type 2 & type 3 which is 123 (ie 111/123). This means that 90% of the type 2 & type 3 lesion will be tested neoplastic. Since we have high sensitivity and the specificity, we can say that the test (NBI) is ideal.

Our PPV is **0.897.** This is computed by TP/(TP+FP). This means 89.7% of the polyps screened as non-neoplastic is indeed type 1. Our NPV is **0.798** (computed by TN/(FN+TN)). This means that 78% of the polyps screened as neoplastic is indeed type 2 &/or type 3. Since the values are both high, the test is accurate when the polyps are classified as non-neoplastic and neoplastic.

Predicted Condition	**True Condition**	
	Type 1	Type 2 & Type 3
Non-Neoplastic	105 (TP)	12 (FP)
Neoplastic	28 (FN)	111 (TN)

Table 1.

DISCUSSION

Most colorectal cancers arise from preexisting adenomatous polyps, following the adenoma–carcinoma sequence. The other major type of colon polyps are the hyperplastic polyps that do not have a malignant potential except for the sessile

serrated lesions that are considered to be the precursors of the microsatellite instable cancers. Colonoscopy with polypectomy of neoplastic polyps has been shown to reduce the risk of future colorectal cancer and this procedure is considered by most as the gold standard for the detection and removal of colon polyps. However, standard colonoscopy is limited in its ability to distinguish between adenomatous and hyperplastic polyps and this necessitates the indiscriminate removal of all polyps detected during the procedure. This practice imposes an unnecessary economic cost burden (equipment used for polypectomy and histopathological analysis). It also results in futile resource utilization (time of endoscopist, endoscopy technician and pathologist) and risks associated with potentially avoidable polypectomies. Incorporation of a technique during standard colonoscopy that can accurately differentiate between adenomatous and hyperplastic polyps real time during the procedure is thus desirable.[2]

Removal of all adenomatous polyps during colonoscopy has been standardized worldwide. As the National Polyp Study (NPS) demonstrated that removal of all adenomatous polyps could significantly reduce colorectal cancer incidence and mortality. At present, it is routine practice to retrieve polyps for pathological evaluation because the accuracy of diagnosis to distinguish non-neoplastic from neoplastic colorectal lesions under observation with white light is not high and usually has a limit of 59% to 84%. [3]

The “resect and discard” policy may be employed for colorectal polyps. However, discarding polyps without performing histology runs the risk of failing to detect

diminutive and small colorectal invasive cancer, which would otherwise be received surgery.[3]

Narrow-band imaging (NBI) is a relatively novel optical technique which shortens the wavelength of the illumination light by using optical filters. It highlights superficial microcapillaries without the necessity of dye spraying. It is both convenient and time saving as it could be switched between white light and NBI view instantaneously just by touching a button.[5] It has been postulated that NBI may lead to the same contrast enhancement capabilities as chromoendoscopy, but without the toil of using dye agents.[4] In published studies, NBI technique yielded equivalent accuracy to chromoendoscopy in differentiating neoplastic from nonneoplastic lesions.

CLASSIFICATION OF COLORECTAL POLYPS
NEOPLASTIC MUCOSAL POLYPS
Benign (Adenoma)
Tubular adenoma
Tubulovillous adenoma
Villous adenoma
MALIGNANT (CARCINOMA)
Noninvasive carcinoma
Invasive carcinoma
SERRATED POLYPS
Sessile serrated polyp/adenoma
Traditional serrated adenoma
NONNEOPLASTIC MUCOSAL POLYPS
Hyperplastic polyp
Juvenile polyp
Peutz Jeghers polyp
Inflammatory polyp
Mucosal polyp
SUBMUCOSAL LESIONS
Colitis Cystica Profunda
Pneumatosis cystoides coli
Lymphoid polyps
Lipoma

Carcinoid
Metastatic neoplasms
Other rare lesions

Table 2. Classification of colorectal polyps

*taken from Mark Feldman, Lawrence Friedman et al. **Sleisenger and Fordtran's Gastrointestinal and Liver Disease 10th edition.** 2010; Volume 2, page2214

The NICE classification was proposed as a valid tool for not only differentiating hyperplastic from adenomatous polyps, but also predicting SM-d carcinomas in colorectal tumors.[3]

The NICE classification was established by an international cooperative group (Colon Tumor NBI Interest Group – CTNIG) including Japanese, USA, French and UK endoscopists. The NICE classification is based on the evaluation of the following three NBI characteristics in colorectal tumor: color, vessels, and surface pattern, both with or without using a magnifying endoscope. It consists of three types: types 1–3. Type 1 is characterized by the color being the same or lighter than the background, no or isolated lacy vessels and the surface pattern is dark or white spots of uniform size, or homogeneous absence of pattern. Type 1 is considered an index for hyperplastic lesions. Type 2 is characterized by the color being browner relative to the background, thick brown vessels surrounding white structures and the surface pattern being oval, tubular or branched white structures surrounded by brown vessels. Type 2 is considered an index for adenoma or mucosal/scanty SM-invasive carcinoma. Type 3 is characterized by the color being brown to dark brown relative to the background; sometimes a patchy whiter area, markedly distorted or missing vessels, and areas showing distortion or

absence of surface pattern. Type 3 is considered an index for deep SM-invasive carcinoma.[6]

CONCLUSION

Since we have high sensitivity, specificity, NPV, PPV, we can say that the test (NBI) & NICE classification (Type 1 & 2) is ideal. This study confirms that NBI can be used to predict the histopathology of suspected colorectal polyps.

This was a small retrospective study, and the data presented in the study require further investigation in multicenter studies, regarding the endoscopic findings and the superiority of NBI colonoscopy in detection and prediction of histologic diagnosis of the colorectal lesions.

Conflicts of Interest

The authors have no financial conflicts of interest.

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APPENDIX

THE DATA SHEET

Name	**age**	**sex**
Date		
Indication		
Lesion/s		
Location		
Morphology		
Size		
NICE classification		
Histopathology result		