Use of videobronchoscopic narrow band imaging compared with white light in diagnosing some bronchopulmonary diseases

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Objective Narrow band imaging (NBI) videobronchoscopy is an advanced technique aiming at obvious mucosal vasculature detection. This study investigated its role in diagnosing some bronchopulmonary diseases, compared with white light videobronchoscopy (WLB).

Methods In this study, we evaluated 30 patients presenting with different bronchopulmonary diseases and 15 controls presenting with chronic cough for at least 3 months. Full airway examination was done by fiberoptic bronchoscopy first under WLB then under NBI. Multiple biopsies were taken from susceptible lesions; pathological interpretation was performed.

Results In the present study, the most frequent presentations in CT scan in group A were lung masses in 16 patients. Endobronchial masses were detected in 8 patients by both WLB and NBI, all (100%) were pathologically positive by NBI compared to 7 patients (87.5%) by WLB. Eight patients were presented with peripheral masses, 4 patients (50%) were pathologically positive while none of them (0%) was positive by WLB samples.
NBI showed better sensitivity and accuracy in comparison to WLB (100% and 90.0% in NBI and 52.94% and 63.33% in WLB respectively), with similar specificity (76.92%).

Conclusions NBI is a safe and effective modality that can be used in combination with WLB to improve the in diagnosis of different bronchopulmonary disorders particularly lung cancer. It proved to be more sensitive and accurate than WLB alone. NBI could have a better diagnostic yield than WLB for lung cancer especially in peripheral lung masses. NBI is useful for characterization of vascular pattern of malignant lesions of the bronchial mucosa.
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Introduction

Narrow band imaging (NBI) is a real-time optical image enhancement technology that enhances visualization of the vascular network and surface texture of the mucosa, which enables tissue characterization, differentiation, and diagnosis [1].

This technology involves placing narrow band pass filters in front of a conventional white-light source to illuminate tissue at certain narrow wavelength bands. A unique filter is used for selecting light wavelengths that are preferentially absorbed by hemoglobin, therefore enabling better microvasculature detection [2–4].

The NBI systems uses two narrow band filters that illuminate tissues in the blue (415 nm) and green (540 nm) spectrum of light. Capillaries in the superficial mucosal layer are best visible by the 415 nm light, where they are seen as brown in color, whereas the deep mucosal and submucosal vessels are visualized by the 540 nm light and are seen as cyan in color [5].

White-light bronchoscopy uses the full visible wavelength range (400–700 nm) to produce a red–green–blue (RGB) image. However, NBI, combined with magnification bronchoscopy, illuminates the tissue surface using special filters that narrow the RGB bands while simultaneously increasing the relative intensity of the blue band. This enhances the tissue micro vasculature appearance, which is mainly because of the differential optical absorption of light by the hemoglobin in the mucosa associated with the development of dysplasia, especially in the blue range [6].

Dysplastic and neoplastic lesions are characterized by angiogenesis; therefore, NBI, through its accurate vascular visualization, can better detect early dysplastic lesions compared with other bronchoscopic modalities. In studies on high-risk patients, NBI showed the ability to identify lesions that could not be visualized by white-light bronchoscopy (WLB) with a sensitivity as high as that of AFB [7,8]. A study comparing WLB, AFB, and NBI in patients presenting for airway

examination reported comparable sensitivities in AFB and NBI, whereas NBI was more specific for the detection of abnormal lesions [8].

In this study, we aimed to evaluate the role of videobronchoscopic NBI compared with WLB in the diagnosis of some bronchopulmonary diseases.

Patients and methods

The study included 45 individuals divided into two groups:

Group A included 30 patients presenting with different bronchopulmonary diseases.
Group B included 15 individuals as a control group, with an assumed normal airway, requiring videobronchoscopic NBI, for example for chronic cough, suspicion of foreign body aspiration, etc., with no radiological evidence of any bronchopulmonary disease

Both groups were subjected to the following:

(1) Detailed assessment of history.
(2) Clinical examination.
(3) Plain chest radiographic posteroanterior view.
(4) Multidetector computed tomography.
(5) Bronchoscopy was first performed under white light and findings were recorded.
(6) NBI videobronchoscopy (Olympus Evis Exera II CV-180; Olympus Corporation of Industries, Tokyo, Japan) was performed to examine the microvascular networks and bronchial mucosa.
(7) Bronchial mucosal biopsies were taken according to morphological changes and were subjected to a pathological examination.

A written consent was obtained from all participants before beginning the study according to the hospital's protocol.

Narrow band imaging and white-light bronchoscopy

Using NBI images for examining airways, superficial blood vessels were visualized as brown, whereas deeper vessels were visualized as cyan. The airways examined by NBI and WLB were graded as normal, abnormal, and tumor. Endobronchial forceps biopsies were taken from any abnormal lesion appearing by the use of either modality. At least three biopsies were taken from each lesion. In patients with multiple lesions, biopsies were taken from distal lesions before proximal ones. We used a new forceps for each site to prevent cross-contamination. No biopsies were taken from apparently normal bronchial mucosa. Biopsies were

taken under the illumination that produced optimum visualization of the abnormality.

In the present study, there were three major categories according to the naked-eye appearance of WLB and NBI: 'normal' if no visual mucosal or endobronchial abnormalities were visualized, except for slight or localized hyperemia in WLB (marked hyperemia was considered abnormal), 'abnormal' if there were any mucosal or endobronchial abnormalities, and 'tumor' if an endobronchial mass visualized.

We considered that slight or localized hyperemia in WLB is normal because nine (60%) individuals in the control group had slight or localized mucosal hyperemia without any other findings, and this may have been caused by the effect of chronic cough in those cases. Some studies have inferred that idiopathic chronic cough is associated with lymphocytic airway inflammation that may cause slight mucosal hyperemia [9].

Statistical analysis

Quantitative variables were presented as mean±SD. Means for parametric variables were compared using the student t-test or analysis of variance according to situation. Non parametric quantitative variables were compared using the Mann–Whitney test and the Kruskal–Wallis test as needed. Qualitative variables were expressed as frequencies and comparisons were made using the χ^2-test. A comparison was made between the two groups' baseline demographic, clinical, and naked-eye appearance.

Results

Baseline characteristics of both groups

This study included 30 patients with different pulmonary diseases (group A) and 15 control participants (group B) with no radiological evidence of any bronchopulmonary disease. The patients in group A were significantly older than those in group B ($P=0.001$), but with no significant sex difference. More patients were smokers in group A, with a higher pack-year index ($P=0.006$ and 0.005, respectively). Table 1 shows the baseline of the two groups.

Radiological pattern of the studied groups

The computed tomography (CT) chest examination indicated that there were three (10%) patients with unremarkable findings and 27 (90%) patients with positive findings in group A, whereas all participants in group B (100%) had unremarkable findings. Positive radiological findings in group A

Table 1 Comparison between the two groups studied according to demographic data

	Cases	Control	P
Sex [n (%)]			
Male	20 (66.7)	11 (73.3)	0.743
Female	10 (33.3)	4 (26.7)	
Age [mean (range)] (years)	54.50 (23.0–76.0)	24.0 (21.0–76.0)	0.001*
Smoking [n (%)]			
No	13 (43.3)	13 (86.7)	0.006*
Yes	17 (56.7)	2 (13.3)	
Pack-year index (mean±SD)	31.18±8.57	3.0±0.0	0.005*

*Statistically significant at $P \leq 0.05$.

are shown in Table 2; some patients had more than one finding.

All controls had unremarkable findings on CT chest examination.

Bronchoscopic findings

The abnormal findings obtained by WLB in group A included marked mucosal hyperemia, endobronchial narrowing, apparent endobronchial mass, mucosal congestion, or necrotic tissue. Some patients had more than one finding (Table 3 and Figs 1–7). However, in the control group, twelve patients showed normal mucosa by WLB or for slight or localized hyperemia that were considered normal as mentioned previously in the methodology; three patients showed bronchial hypertrophy and one patient only showed endobronchial narrowing.

The abnormal findings found by NBI in group A included dotted vessels, abruptly ended vessels with large caliber, tortuous vessels, mucosal hypervascularity with capillary loops, endobronchial narrowing, or apparent mass. Some patients had more than one finding (Figs 1–4), but participants in the control group showed normal vascularity by NBI and no masses were detected.

Narrow band imaging compared with white-light bronchoscopy

Endobronchial masses were detected in eight patients by both WLB and NBI, seven (87.5%) patients showed a positive histopathological diagnosis in WLB samples, and all of them (100%) showed a positive histopathological diagnosis in NBI samples. Eight patients presented with peripheral masses, none of whom (0%) had a positive histopathological diagnosis in WLB samples, whereas four (50%) patients had a positive histopathological diagnosis in NBI samples. Three patients presented with diffuse

Table 2 Abnormal computed tomography findings of the diseased group (group A)

CT chest	n (%)
Enlarged lymphadenopathy	15 (50.0)
Endobronchial attenuation	8 (26.6)
Right upper lobar mass	5 (16.7)
Left hilar mass	4 (13.3)
Right hilar mass	3 (10.0)
Diffuse pulmonary nodules	3 (10.0)
Hyperinflation	3 (10.0)
Vascular attenuation	3 (10.0)
Consolidation	2 (6.7)
Right lower lobar mass	2 (6.7)
Bilateral hilar shadow	2 (6.7)
Bony erosion	2 (6.7)
Bronchiectatic changes	2 (6.7)
Interstitial thickening	1 (3.3)
Left Lingular mass	1 (3.3)
Left upper lobar mass	1 (3.3)

CT, computed tomography.

Table 3 Comparison between the two groups studied according to white-light bronchoscope

White-light bronchoscope	Cases (n=30) [n (%)]	Control (n=15) [n (%)]	χ^2	^{FE}P
Healthy mucosa	18 (60)	12 (80.0)	0.865	0.492
Marked hyperemia	10 (33.3)	0 (0.0)	6.429*	0.019*
Bronchial hypertrophy	8 (26.7)	3 (20.0)	0.241	0.726
Endobronchial narrowing	8 (26.7)	1 (6.7)	2.500	0.234
Apparent mass	8 (26.7)	0 (0.0)	4.865*	0.038*
Congested mucosa	15 (6.7)	0 (0.0)	132.8	0.153
Necrotic tissue	4 (13.3)	0 (0.0)	2.195	0.285

χ^2, value for χ^2. FE, Fisher exact. *Statistically significant at $P \leq 0.05$.

pulmonary nodules, none of whom (0%) had a positive histopathological diagnosis in WLB samples, whereas one (33.3%) patient had a positive histopathological diagnosis in NBI samples.

Two patients presented with noncaseating granuloma (sarcoidosis); one of them (50%) had a positive histopathological diagnosis in WLB samples whereas both of them (100%) had a positive histopathological diagnosis in NBI samples. Another two patients with multiple lymphadenopathy and interstitial lung fibrosis, respectively, had a positive histopathological diagnosis in NBI transbronchial forceps biopsies samples and a negative histopathological diagnosis in WLB (transbronchial forceps biopsies) samples (Tables 4 and 5).

Sensitivity, specificity, and accuracy of narrow band imaging and white-light bronchoscopy
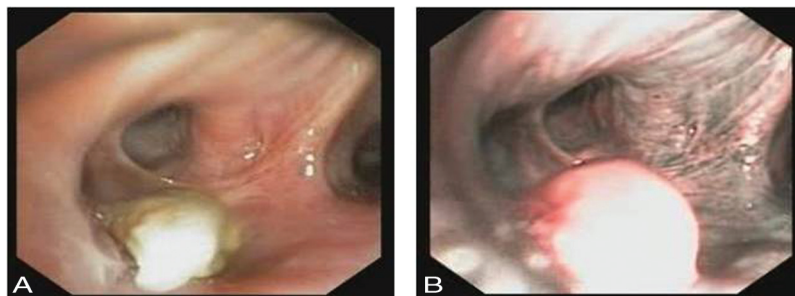
NBI detected 20 patients to have an abnormal bronchoscopic appearance; 17 of them showed positive

Figure 1
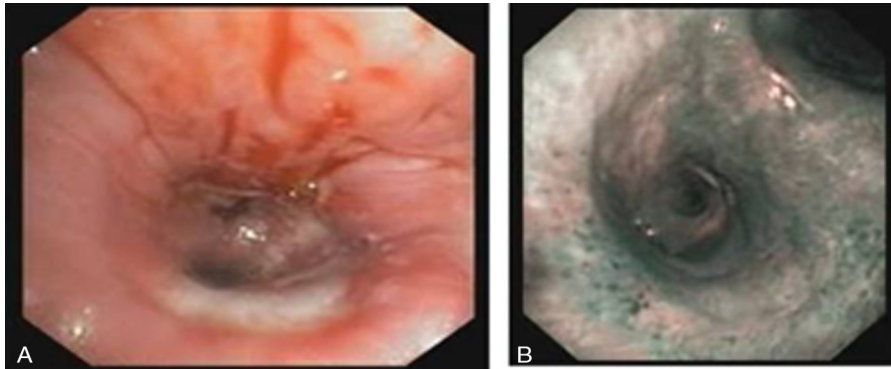
(a) White-light bronchoscopy of case no. 1 showing hypervascular mucosa. (b) Narrow band imaging of case no. 1 showing multiple dotted vessels in the bronchial mucosa.

Figure 2

(a) White-light bronchoscopy of case no. 2 showing an endobronchial necrotic mass surrounded by corrugated mucosa. (b) Narrow band imaging of case no. 2 showing an endobronchial highly vascular mass surrounded with a mesh of abruptly ended vessels.

Figure 3
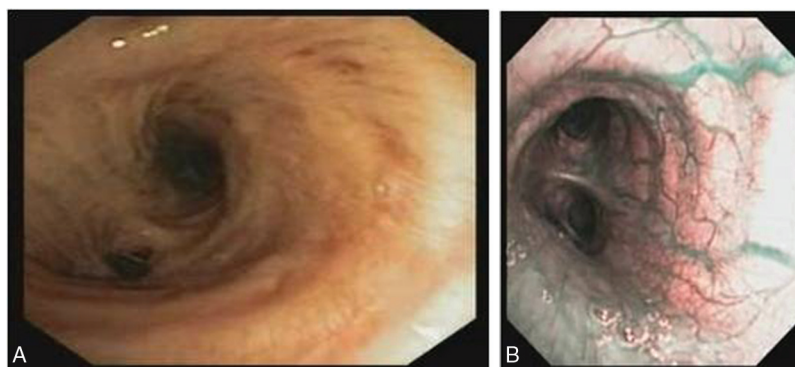
(a) White-light bronchoscopy of case no. 3 showing corrugated unhealthy mucosa. (b) Narrow band imaging of case no 3 showing dilated tortuous vessels in the bronchial mucosa.

histopathological results. The remaining three were negative by histopathology (false positive). However, none of the biopsies, obtained in a blinded manner from the 10 apparently normal patients by NBI, showed any positive histopathologic diagnosis; there were no false negatives (Table 6).
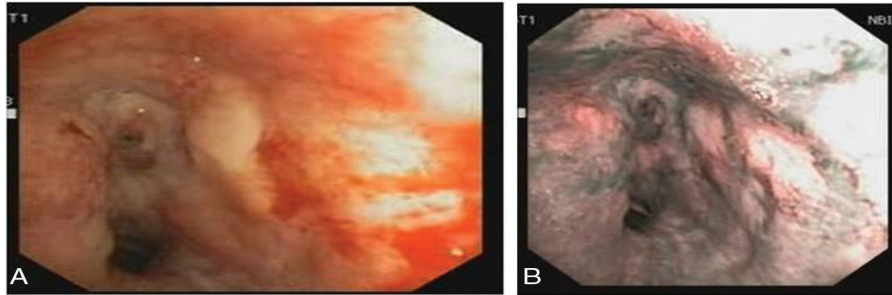
Sensitivity of NBI [10]=True positive×100/true positive+false negative=17×100/17=100%.

Specificity of NBI [10]=True negative×100/true negative +false positive= 10×100/13=76.92%.

Accuracy of NBI [10]=(True positive+true negative)×100/total number of cases=(17+10)×100/30=90%.
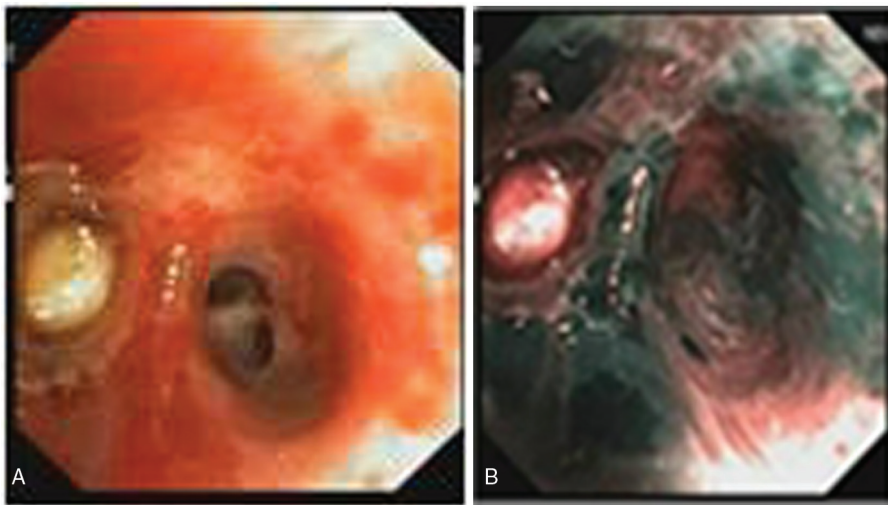
WLB detected 12 patients of abnormal bronchoscopic appearance; nine of these patients showed

Figure 4

(a) White-light bronchoscopy of case no. 4 showing multiple bleeding sites with endobronchial narrowing. (b) Narrow band imaging of case no 4 showing multiple capillary loops surrounding the area of endobronchial narrowing.

Figure 5

(a) White-light bronchoscopy of case no. 7 showing endobronchial mass obstructing the right main bronchus and surrounded by mucosal hyperemia. (b) Narrow band imaging of case no. 7 showing the same mass and surrounded by multiple capillary loops and tortuous vessels.

Figure 6
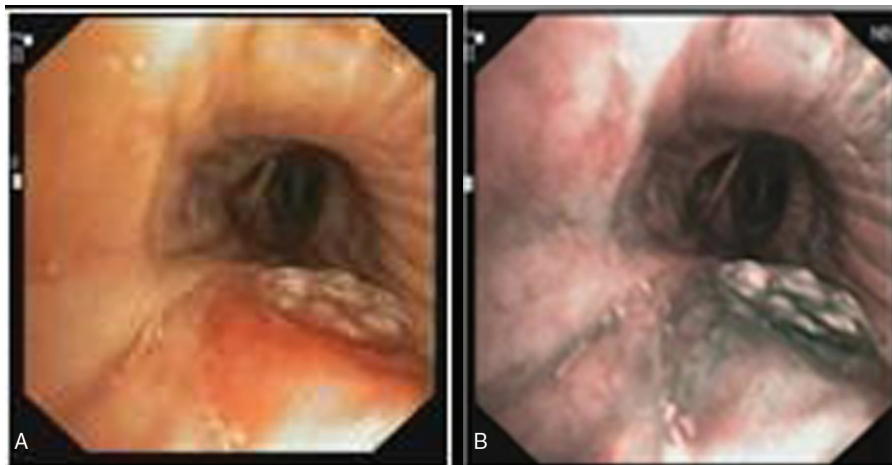
(a) White-light bronchoscopy of case no. 8 showing necrotic mass lesion. (b) Narrow band imaging of case no. 8 showing the same mass lesion surrounded by abruptly ended vessels of large caliber and multiple capillary loops.

positive histopathological results. Also, three of them were negative by histopathology (false positive).

Among the 18 apparently normal patients by WLB, eight showed positive histopathologies by NBI samples; that is eight false-negative cases (Table 6).

Figure 7
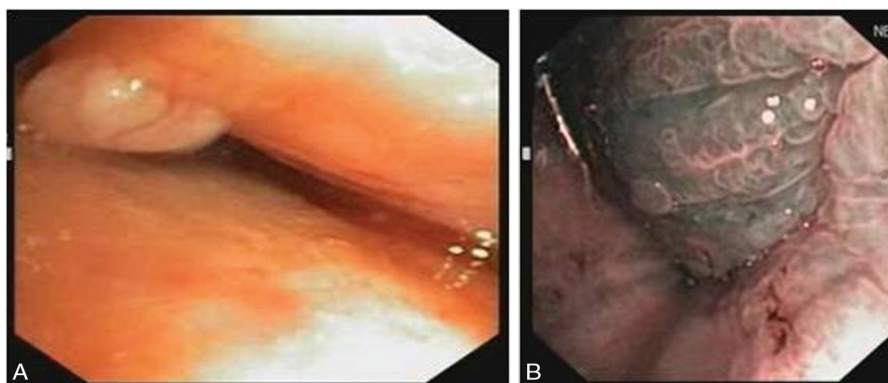
(a) White-light bronchoscopy of case no. 10 showing a large endobronchial mass at the carina. (b) Narrow band imaging of case no. 10 showing a large papillated mass, highly vascular and surrounded by a large mesh of dilated tortuous vessels.

Table 4 Findings of narrow band imaging and histopathological diagnoses of group A

	n (%)
Findings of narrow band imaging	
Dotted vessels	13 (43.3)
Abruptly ended vessels with large caliber	10 (33.3)
Hypervascular mucosa with capillary loop	10 (33.3)
Tortuous vessels	8 (26.7)
Endobronchial narrowing	8 (26.7)
Apparent mass	8 (26.7)
Histopathological diagnoses	
Poorly differentiated squamous cell carcinoma	5 (16.7)
Small cell carcinoma	4 (13.3)
Well differentiated adenocarcinoma	4 (13.3)
Noncaseating granulomatous reaction	2 (6.7)
Interstitial lung fibrosis	1 (3.3)
Well differentiated squamous cell carcinoma	1 (3.3)

Sensitivity of WLB [10]=True positive×100/true positive+false negative=9×100/17=52.94%.

Specificity of WLB [10]=True negative×100/true negative+false positive=10×100/13=76.92%.

Accuracy of WLB [10]=(True positive+true negative)×100/total number of cases=(9+10)×100/30=63.33%.

Therefore, NBI showed better sensitivity and accuracy in comparison with WLB, with similar specificity. Sensitivity was 100%, specificity was 76.92%, and accuracy was 90.0% in NBI and sensitivity was 52.94%, specificity was 76.92%, and accuracy was 63.33% in WLB (Tables 6 and 7).

Discussion

This study investigated the utility of a high-magnification videobronchoscopy system combined with NBI in the diagnosis of some pulmonary

Table 5 Comparison between white-light bronchoscope and narrow band imaging

	WLB		NBI		P
	Negative	Positive	Negative	Positive	
Endobronchial masses	1 (12.5)	7 (87.5)	0 (0)	8 (100)	1.000
Peripheral masses	8 (100)	0 (0)	4 (50)	4 (50)	0.077
Diffuse pulmonary nodules	3 (100)	0 (0)	2 (66.7)	1 (33.3)	1.000
ILD	1 (100)	0 (0)	0 (0)	1 (100)	1.000
Non caseating granuloma	1 (50)	1 (50)	0 (0)	2 (100)	1.000
Multiple lymphadenopathy	1 (100)	0 (0)	0 (0)	1 (100)	1.000

Qualitative data were described using n (%) and was compared using the χ^2 or the Fisher exact test. ILD, interstitial lung fibrosis; NBI, narrow band imaging; WLB, white-light bronchoscope.

disorders. We examined the airways using the conventional RGB white-light illumination and then shifted to the NBI filter to enable better visualization of the bronchial vascular patterns. The wavelength ranges of the NBI filter included the NBI-Blue 1 (NBI-B1) filter at 400–430 nm, which included the 410 nm absorption wavelengths for hemoglobin, therefore enabling a more accurate assessment of vascular structures [5,6].

In the present study, the most frequent findings in CT in group A were lung masses, which were found in 16 patients. Endobronchial masses were detected in eight patients by both WLB and NBI ; all (100%) were pathologically positive by NBI compared with seven (87.5%) by WLB samples. Eight patients presented with peripheral masses, four (50%) patients were pathologically positive by NBI, whereas none of them (0%) was positive by WLB samples. Therefore, when using NBI, 75% of patients presenting with lung masses showed malignancy in

the histopathological analysis compared with 44% of patients when using WLB alone. Therefore, the combination of NBI with WLB has improved the pathological diagnosis of patients presenting with lung masses.

In patients in whom NBI failed to show a histopathological diagnosis, this was found to be related to the size of masses and their association with endobronchial attenuation. Since in the patients presenting wih peripheral masses only 4 of them yielded positive histopathological diagnosis in biopsies taken by NBI, the remaining four whose histopathology were negative, there were no endobronchial attenuation and the masses were peripheral and less than 3 cm in diameter. While all patients with endobronchial masses yielded positive histopathological diagnosis by NBI.

The factors that affect the diagnostic yield of bronchoscopy for peripheral lung masses include the size of the lesion, its distance from the hilum, and its relationship with the bronchus [11–13]. The bronchoscopic diagnostic yield for lesions whose diameter is less than 3 cm varies from 14 to 50%, whereas it increases to 46–80% in larger lesions [14,15]. However, in the present study, the diagnostic yield of bronchoscopy for peripheral lesions was 0% by WLB compared with 50% by NBI, which could be because of its better visualization of vascular changes observed in premalignant or malignant lesions, thereby better guiding the site for biopsy selection and improving its diagnostic yield. In peripheral lung tumors, NBI aids the early detection of abnormal vascular patterns that can be observed because of microscopic central extensions that were not visualized by WLB and thus better directed the biopsy to these areas of vascular abnormalities with a higher chance of positive biopsy results [7].

In this study, the abnormal findings visualized by NBI in the lung cancer patients included dotted vessels, abruptly ended vessels with large caliber, tortuous vessels, and mucosal hypervascularity with capillary loops. The dotted vessels were the most common feature of malignancy appearing with the NBI mode; 10 patients from 13 patients with dotted vessels showed a positive histopathological analysis for malignancy. Earlier studies have shown a significant correlation between vascular changes visualized by NBI and angiogenesis present in premalignant and malignant lesions [6,8]. Shibuya *et al.* [16] found a significant correlation between the frequency of dotted vessels by NBI and pathologically diagnosed angiogenic squamous dysplasia. They also reported that dotted vessels were best detected in NBI-B1 wavelengths. Their explanation for this was that tissue optical absorption and scattering properties are strongly wavelength dependent [5]; therefore, blue light, with its relatively short wavelength, reaches shallow surfaces [17]. Hence, hemoglobin, which has a maximum

Table 6 Naked eye appearance of the white-light bronchoscope and narrow band imaging with the histopathological results in group A

PT	WLB appearance	NBI appearance	Histopathology
1	Abnormal	Abnormal	– (Both)
2	Abnormal	Abnormal	– (Both)
3	Abnormal	Abnormal	– (WLB)+ (NBI)
4	Tumor	Tumor	+ (Both)
5	Normal	Normal	– (Both)
6	Normal	Abnormal	– (WLB)+ (NBI)
7	Tumor	Tumor	+ (Both)
8	Normal	Normal	– (Both)
9	Normal	Normal	– (Both)
10	Tumor	Tumor	+ (Both)
11	Normal	Abnormal	– (WLB)+ (NBI)
12	Abnormal	Abnormal	– (Both)
13	Normal	Normal	– (Both)
14	Abnormal	Abnormal	– (WLB)+ (NBI)
15	Normal	Abnormal	– (WLB)+ (NBI)
16	Tumor	Tumor	+ (Both)
17	Normal	Abnormal	– (WLB)+ (NBI)
18	Tumor	Tumor	+ (Both)
19	Normal	Abnormal	– (WLB)+ (NBI)
20	Normal	Normal	– (Both)
21	Tumor	Tumor	+ (Both)
22	Normal	Abnormal	– (WLB)+ (NBI)
23	Normal	Normal	– (Both)
24	Tumor	Tumor	+ (Both)
25	Normal	Normal	– (Both)
26	Normal	Normal	– (Both)
27	Normal	Abnormal	– (WLB)+ (NBI)
28	Normal	Normal	– (Both)
29	Normal	Normal	– (Both)
30	Tumor	Tumor	+ (Both)

NBI, narrow band imaging; PT, patients; WLB, white-light bronchoscope.

Table 7 Sensitivity, specificity, and accuracy of narrow band imaging and white-light bronchoscope according to the histopathological diagnosis

	Sensitivity (%)	Specificity (%)	Accuracy (%)
Naked-eye appearance of narrow band imaging	100.0	76.92	90.0
Naked-eye appearance of white-light bronchoscope	52.94	76.92	63.33

absorptive wavelength of ∼415 nm [18,19], is the main chromophore in bronchial tissues in the visible wavelength range, which is within the range of the NBI-B1 filter. Therefore, NBI detected vascular structures more accurately than filters of other light wavelengths [16].

Even though the bronchial vascular abnormalities detected by NBI were proven to be histo-pathologicaly related to malignancy, however, other studies are needed to investigate whether the predominance of a specific vascular pattern could be related to a certain pathological subtype of lung cancer [20].

In the present study, NBI showed better sensitivity and accuracy in comparison with WLB: 100 and 90.0% in NBI and 52.94 and 63.33% in WLB, respectively, with similar specificity (76.92%).

Therefore, NBI can be used in combination with WLB to improve the detection of malignant and other bronchopulmonary diseases as it influences the site of biopsy selection and shows better sensitivity and accuracy than WLB alone.

The results of the present study are in consistent with other studies. Vincent et al. [7] published a pilot study of NBI videobronchoscopy on the evaluation of normal airways, premalignant, and malignant lesions. They enrolled 22 patients, with 64 biopsies taken, of which 22 were controls and 42 were targeted biopsies from abnormally appearing sites by NBI, WLB, or both. They found that the addition of NBI led to significantly better detection of dysplasia or malignancy. In their study, the NBI showed a specificity for detection of dysplasia and malignancy of 81%. In their study, nine (41%) patients had lung cancer; also, they did not find any malignancy in biopsies from the normally seen areas by NBI. This confirmed the good diagnostic yield of the NBI. Vincent et al. [7] concluded that more studies are needed on NBI, whether as a stand-alone technology or in comparison with other technologies such as autofluorescence imaging (AFI).

Herth et al. [8] included 62 patients in their study aimed at evaluation of precancerous lesions and carcinoma in situ (CIS) using WL, AFI, and NBI bronchoscopy. They reported better sensitivity of NBI in differentiating CIS/severe dysplasia (100 and 90%), respectively. In their study, the specificity of NBI was greater than that of AFI (90 vs. 52%). Therefore, their results are not very different from

ours, with a sensitivity of 100% and a specificity of 76.9%, although we did not evaluate precancerous lesions.

Miyazu et al. [21] searched for possible clinical applications of high-magnification bronchoscopy combined with NBI. Lung cancer was detected in 20 out of their 25 studied patients. In their study, NBI showed more hypervascular lesions with more tortuous vessels in malignant lesions. In agreement with our study, the abnormal areas examined by NBI showed dotted and tortuous vessels in patients with malignancy.

Miyazu et al. [22] carried out another study similar in design to ours with results consistent with those that we have obtained. They investigated the clinical application of NBI for endobronchial lesions. A total of 92 patients were included in that study with 124 lesions (including the following diagnoses; 38 squamous cell carcinomas, two dysplasias, eight metaplasias, 15 adenocarcinomas, 13 mediastinal cancers, five sarcoidosis, 18 inflammatory). They correlated the NBI appearance of these lesions with histopathological findings. They found several particular vascular and mucosal patterns in the bronchial epithelia. The abnormal tumor vascular patterns were specific for malignant lesions. The sensitivity, specificity, positive predictive value, and negative predictive value were 79, 97, 94, and 91%, respectively, for squamous cell cancer and 73, 96, 73, and 96%, respectively, for adenocarcinoma. Compared with our results, sensitivity was 100%, specificity was 76.5%, and accuracy was 90%; therefore, our study is an additional confirmation of the role of NBI in diagnosing malignant lesions.

In another Egyptian study, Elhefny et al. [23] studied 30 patients with radiological abnor-malities. They underwent bronchoscopy under WLB and then NBI. Eighteen (60%) patients were found to have invasive carcinoma by NBI compared with 11 (36.7%) patients by WLB. Three (10%) patients were found to have severe dysplasia/CIS by NBI compared with six (20%) patients by WLB. Three (10%) patients were found to have mild/moderate dysplasia by NBI compared with four (13.3%) patients by WLB (P=0.03). The found that the sensitivity of the addition of NBI to WLB was better than either of them alone in detecting premalignant and malignant lesions. Therefore, they reported NBI as a perfect tool for detecting premalignant and malignant airway lesions.

The limitation of the study is that the several diagnoses included in the study yielded small numbers of participants for some diseases, especially uncommon ones, and thus statistically based conclusions could not be drawn in these cases. However, NBI was introduced recently in Alexandria at the time of this study, and this was the first application of NBI in bronchopulmonary diseases; therefore, this study was intended as a preliminary study of the possible benefits provided with adding NBI to conventional WLB. We were able to draw conclusions only for lung cancer as they were the larger group of patients. More studies are needed to assess the different applications of NBI in other diseases as well as its role in screening and early detection of lung cancer.

Conclusion

NBI videobronchoscopy, which was recently introduced in Egypt, is a promising technique that can provide a good clinical perspective. It is a safe and effective modality that can be used in combination with WLB to improve the diagnosis of lung cancer as it was found to be more accurate and sensitive than WLB videobronchoscopy alone. NBI is useful for accurately detecting abnormal vascular patterns of the bronchial mucosa for better selection of biopsy sites in lung cancer. Therefore, NBI could have a better diagnostic value than WLB or lung cancer, especially in peripheral lung masses, as it increases the fruitfulness of the biopsy by early detecting abnormal vascularities or microscopic central extensions that were could otherwise not be detected by WLB. Further studies are needed applying his advanced technology for screening and early detection of lung cancer, which could be the seed for establishing screening programs here in Egypt.

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Conflicts of interests
There are no conflicts of interest.

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