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ORIGINAL ARTICLE

Comparison of narrow band imaging to white light bronchoscopy for evaluation of histopathological biopsy

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KEYWORDS

Narrow band imaging (NBI);
White light bronchoscopy (WLB);
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Carcinoma in situ

Abstract *Background:* It is difficult to detect precancerous lesions such as dysplasia and carcinoma in situ (CIS) by conventional white light bronchoscopy (WLB). Narrow Band Imaging Bronchoscopy (NBI) has been reported to detect such lesions more readily.

Objective: The objective of the present study is to characterize the appearance of different airway mucosal lesions under NBI mode and to evaluate the role of NBI compared to WLB in diagnosis of premalignant and malignant lesions.

Methods: 30 patients presented with radiological changes to chest department in Fayoum University Hospital. They were subjected to full airway examination by fiberoptic bronchoscopy first under WLB then under NBI. Biopsies were taken from susceptible lesions; pathological interpretation was performed.

Results: 18 patients (60%) were proved by NBI to have invasive carcinoma compared to 11 patients (36.7%) by WLB. 3 patients (10%) were proved by NBI to have severe dysplasia/CIS compared to 6 patients (20%) by WLB. 3 patients (10%) were proved by NBI to have mild/moderate dysplasia compared to 4 patients (13.3%) by WLB (p value = 0.03). The sensitivity of both WLB and NBI (76.9%) is better than WLB alone or NBI alone (9.1% and 57.1% respectively) in

Abbreviations: CIS, carcinoma in situ; NBI, Narrow Band Imaging Bronchoscopy; NPV, negative predictive value; PPV, positive predictive value; WLB, white light bronchoscopy

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detecting premalignant lesions while the sensitivity of both WLB and NBI (52.6%) is less than WLB alone (55.6%) and better than NBI alone (26.7%) in detecting malignant lesions.

Conclusion: NBI can be used in combination with WLB to improve detection of premalignant lesions. It influences biopsy selection and therapeutic planning.

Introduction

Bronchoscopy is a valuable tool utilized for the diagnosis, staging, and management of lung cancer. Over the past decade, advanced imaging techniques, such as narrow-band imaging (NBI) have greatly expanded the diagnostic utility of bronchoscopy [1]. NBI uses a unique filter to select light wavelengths that preferentially are absorbed by hemoglobin, thereby permitting superior microvasculature detection. Because angiogenesis occurs preferentially in dysplastic and neoplastic lesions, NBI identifies early dysplastic lesions better than WLB [2]. The biological hypothesis driving the development of NBI is that the microvascular patterns of premalignant lesions are different from those of normal bronchial mucosa [3]. Special emphasis has been placed on the role of NBI in the early detection and staging of lung cancer [4]. The early diagnosis of malignant and premalignant changes of the bronchial mucosa remains a major challenge during bronchoscopy [5]. Lung cancer, especially in heavy smokers, is thought to develop through multiple stages from squamous metaplasia to dysplasia, followed by carcinoma in situ (CIS), progressing to invasive cancer [6]. It would be ideal to be able to detect and treat pre-invasive bronchial lesions defined as dysplasia and CIS before progressing to invasive cancer. NBI has been suggested to have the capability of detecting pre-invasive lesions [7].

The aim of the study is to characterize the appearance of different airway mucosal lesions under NBI mode and to evaluate the role of NBI compared to WLB in diagnosis of premalignant and malignant lesions.

Subjects and methods

The present prospective study was performed in chest department, Fayoum University Hospital between November 2011 and January 2014 on 30 patients presenting with radiological changes. This study was approved by the Ethics Committee of the University of Fayoum, Faculty of medicine. All the patients were informed about the procedure, its potential benefits and the risks, all patients provided written informed consent.

All patients were subjected to: detailed history taking thorough clinical examination, routine chemical and hematological blood analysis including liver and kidney functions tests, complete blood count, ESR and coagulation profile, plain chest X-ray (P-A and lateral views) and CT scan of chest with IV contrast. Full airway bronchoscopic examination, first under WLB then under NBI then biopsy taken from susceptible lesions followed by pathological interpretation and grading of different airways mucosal lesions comparing WLB versus NBI.

Fiberoptic bronchoscopy was performed in a well equipped respiratory endoscopy unit of Fayoum University Hospital. Bronchoscopy was performed under local anesthesia and conscious sedation. Sedation was provided during the procedure in the form of intravenous midazolam (0.06 mg/kg) and propofol (2.8 mg/kg). Oxygen saturation on pulse oximetry, heart rate, arterial blood pressure and ECG were monitored and recorded during procedure.

Video-bronchoscopy was performed using a flexible video-bronchoscopy system EVIS EXERA II video system center CLV-180 bronchoscope, CLV-180 Xenon light source, and LMD – 2140MD LCD monitor; Olympus; Japan. Examination and inspection of the airways were performed starting with the vocal cords followed by the trachea, followed by the right and left bronchial trees. Bronchial mucosa was first examined with the WLB, followed by NBI, the EVIS EXERA bronchoscope enabled the endoscopist to switch from WLB to NBI. Trauma to the mucosa, either by the bronchoscope tip or by suctioning was avoided to prevent image obscure.

Visually pathologic areas under NBI were classified according to the vasculature of the bronchial lesions into four main types: "tortuous vessels", "dotted vessels", "tortuous dilated vessels" and "spiral and screw vessels" [8]. Once the pathologic sites were identified, targeted biopsies were performed in order to obtain specimens for pathological examination.

All biopsy specimens were fixed in 10% formalin and embedded in paraffin wax, sections 4 μ thick were cut from each block & stained with Hematoxylin & Eosin. All slides were examined by the same pathologist blinded to clinical data.

Pathologic patterns of bronchial submucosal showing micro vessel structures under NBI technique were examined and graded [9]. Biopsy specimens were graded according to an arbitrarily system modified from International Histological Classification of Tumors of the World Health Organization (WHO) [10] as follows:

0: Inadequate for histologic examination.
1: Normal.
2: Reactive changes/reserve cell hyperplasia.
3: Squamous metaplasia.
4: Mild/moderate dysplasia.
5: Severe dysplasia/carcinoma in situ (CIS).
6: Invasive Cancer.

Statistical analysis

Data were collected, tabulated and statistical analysis was performed using SPSS software version 18. Chi square test was used to compare two or more than two qualitative groups. Pearson correlation analysis was used and $P < 0.05$ was considered as statistically significant.