Global Academic Journal of Medical Sciences

Available online at www.gajrc.com
DOI: 10.36348/gajms.2024.v06i03.008

OPEN ACCESS

ISSN: 2706-9036 (P)
ISSN: 2707-2533 (O)

Original Research Article

Central Lung Cancer Location Along with Bronchoscopic Correlation- A Retrospective Cross-Sectional Study

Abul Kalam Mohammad Mohiuddin[1*], Sufia Khanam[2]

[1]Assistant Professor, Department of Respiratory Medicine, Chattogram Medical College, Chattogram, Bangladesh
[2]Medical Officer, Guruduara Health Centre, Hathazari, Chattogram, Bangladesh

***Corresponding Author**
Abul Kalam Mohammad Mohiuddin
Assistant Professor, Department of Respiratory Medicine, Chattogram Medical College, Chattogram, Bangladesh

Article History
Received: 22.05.2024
Accepted: 27.06.2024
Published: 29.06.2024

Abstract: ***Background:*** Lung cancer is currently the leading cause of death from neoplastic diseases worldwide. During the preceding decades, it was the most commonly occurring malignant disease, both in terms of impact and mortality. Fiberoptic bronchoscopy is the most important diagnostic tool for lung cancer. Early tissue diagnosis and proper staging remains the key to the management of the lung cancer patient. Endobronchial forceps biopsy has high diagnostic yield from the visible lesions. The aim of the study was to evaluate diagnostic yield of endobronchial biopsy. ***Methods:*** A Cross Sectional Retrospective study of all patients with provisional diagnosis of lung cancer based on computed tomography (CT) scan of chest undergoing fiberoptic bronchoscopy was done at Department of Respiratory Medicine, Ibn Sina Diagnostic & Consultation Center, Chattogram, Bangladesh from July 2022 to June 2023. All fiberoptic bronchoscopy was done in endoscopy suite under local anesthesia. Patients were explained about the procedure thoroughly. Endobronchial biopsy was the main procedure performed. ***Results:*** A total of 120 patients underwent bronchoscopy for suspected lung cancer. The mean age of the patients was 58 years with range of 18 to 75 years. Among them 93 (77.5%) were male and 27 (22.5%) were female. Majority of the patients, 108 (90%) were smoker with a mean pack year of 42. The lesion was present more in right side (N=65) than the left side (N=55). Majority of the lesion was present in lobar bronchus followed by main bronchus. Bronchoscopy was normal in 10 patients (8.3%). 12 patients had lesion in multiple locations. The diagnostic yield of endobronchial biopsy was 75%. The diagnostic yield for central tumor was 81.6% which was statistically significant ($p<0.001$) compared to peripheral tumor and extrinsic compression. ***Conclusion:*** Endobronchial biopsy provides good diagnostic yield especially in central tumors. Fiberoptic bronchoscopy is a safe procedure.

Keywords: Fiberoptic bronchoscopy, Lung cancer, Endobronchial biopsy.

INTRODUCTION

Lung cancer is currently the leading cause of death from neoplastic diseases worldwide. During the preceding decades, it was the most commonly occurring malignant disease, both in terms of impact and mortality. According to Globocan, it is estimated that for the year 2020 there were more than 2 million new cases and 1.7 million deaths from lung cancer, making lung cancer the most common and deadly malignant disease. In Greece, during 2020, almost 9000 new lung cancer cases were diagnosed [1]. Lung cancer is the leading cause of cancer related mortality in the world [2]. Mortality remains high all across the world despite newer targeted therapies developed by the higher knowledge of the tumor biology [2]. Lung cancer is classified

histologically into two types: Non-Small Cell Lung Cancer (NSCLC) and Small Cell Lung Cancer (SCLC). NSCLC is subdivided into adenocarcinoma, squamous cell carcinoma and large cell carcinoma. However adenocarcinoma is increasing globally and it is currently the most common histological subtype [3-5]. Early tissue diagnosis and proper staging remains the key to management of the lung cancer patients [6]. Though lung cancer is the leading cause of death in most areas, the incidence rates vary significantly between countries, as they reflect the smoking habits, the socioeconomic status and cultural differences of each country as they evolve over time [7]. Early tissue diagnosis and proper staging remains the key to management of the lung cancer patients [6]. Fiberoptic bronchoscopy has been a valuable tool in the diagnosis of pulmonary diseases since the introduction of the first flexible fiberoptic bronchoscope by Shigeto Ikeda in 1966 [8]. It is the important diagnostic modality which allows direct visualization of the tumors and biopsy can be obtained for the histopathological diagnosis [9]. Bronchial wash and bronchoalveolar lavage, bronchial brushing, transbronchial and endobronchial needle aspiration, and transbronchial and endobronchial forceps biopsy are the various conventional bronchoscopic techniques with variable diagnostic sensitivity [10]. Endobronchial biopsy forceps is used for taking the biopsy from the visible lesions with high diagnostic yield of up to 85% [11]. The most common indication for performing endobronchial biopsy is to diagnose lung cancer [12]. The aim of this study is to report the patients who underwent fiberoptic bronchoscopy with suspected lung cancer and analyze diagnostic yield and complications of endobronchial biopsy.

METHODS

A Cross Sectional Retrospective study of all patients with provisional diagnosis of lung cancer based on computed tomography (CT) scan of chest undergoing fiberoptic bronchoscopy was done at Department of Respiratory Medicine, Ibn Sina Diagnostic & Consultation Center, Chattogram, Bangladesh from July 2022 to June 2023. All fiberoptic bronchoscopy was done in endoscopy suite under local anesthesia. Patients were explained about the procedure thoroughly. Bronchoscopy was done in supine position using Pentax Bronchoscope (EB15-J10) with 5.2 mm diameter and 2 mm working channel. Continuous pulse oximetry, electrocardiography and sphygmomanometry were used for patient monitoring. Pre oxygenation was done via face mask with oxygen at 6 L/min. Local anesthesia was given transtracheal using 2% lignocaine and also in bilateral nostrils. Shaft of bronchoscope was lubricated with 2% lignocaine jelly before insertion through nasal pathway. Bronchoscope was inserted till the vocal cords and epiglottis were clearly visible, then 2 ml of 2% lignocaine was flushed. Bronchoscope was then inserted into the trachea where another 2 ml of 2% lignocaine was flushed. Tracheobronchial tree including bronchial Segment B1-B10 were examined. Broncoscopically tumors were classified into central (lesions located up to the level of segmental bronchi), peripheral (located beyond segmental bronchi), extrinsic compression and normal. Endobronchial biopsy (EBB), brush cytology and bronchoalveolar lavage (BAL) were taken (in indicated patients only). For endobronchial biopsy 3-4 pieces of samples were taken. Biopsy material obtained was transferred to a container containing 10% formalin and send for histopathological examination. All the patients were monitored for assessing post-bronchoscopy complications and advised to be nil per oral for 1 hour. Retrospective review of consecutive bronchoscopy reports and medical records of patients was done. Therapeutic bronchoscopy and incomplete records were excluded from the study. Data entry and analysis was done in Statistical software Package for Social Sciences (SPSS version 25). Descriptive statistics was performed and results were interpreted in mean, frequency and percentage.

RESULTS

A total of 120 patients underwent bronchoscopy for suspected lung cancer. The mean age of the patients was 58 years with range of 18 to 75 years. Among them 93 (77.5%) were male and 27 (22.5%) were female. Majority of the patients, 108 (90%) were smoker with a mean pack year of 42. The lesion was present more in right side (N=65) than the left side (N=55). Majority of the lesion was present in lobar bronchus followed by main bronchus. Bronchoscopy was normal in 10 patients (8.3%). 12 patients had lesion in multiple locations. Vocal cord palsy, congested mucosa and suppurative infections were the additional findings (table-1).

Squamous cell carcinoma was the most common histological diagnosis seen in 45 cases. NSCLC accounted for 14 cases (11.6%) while SCLC was seen in 13 cases (10.8%). A normal bronchoscopic finding was present in 10 cases, so biopsy was not done in those cases. The overall diagnostic yield was 90.0% which included all the patients undergoing bronchoscopy. The diagnostic yield while considering only the cases undergoing endobronchial biopsy was 75%. The diagnostic yield for central tumor was 82.5%, peripheral tumor was 48.3% and extrinsic compression was 3.4%. The diagnostic yield was statistically significan ($p<0.001$) for central tumors compared to peripheral and extrinsic compression (table-2).

Most common complication was temporary desaturation seen in 22 patients (18.4%). There were 1 mortalities (0.8%) due to massive hemorrhage. Minor bleeding was present in 5 patients (4.1%) which was managed conservatively. 8.3% of the patients (N=10) required admission due to respiratory distress or haemorrhage (table-3).

Table 1: Bronchoscopy findings (N=120)

Bronchoscopy Findings		**N**	**%**
Visible tumor	Main bronchus	36	30.0
	Lobar bronchus	38	31.6
	Segmental bronchus	10	8.3
	Subsegmental bronchus	1	0.8
	Carina & main bronchus	8	6.6
	Trachea & main bronchus	1	0.8
	Trachea, carina, main bronchus	2	1.6
Extrinsic compression only		8	6.6
Normal		10	8.3
Vocal cord palsy		2	1.6
Congested mucosa		3	2.5
Suppurative Infection		1	0.8

Table 2: Histopathological findings of endobronchial biopsy (N=120)

Histopathological diagnosis	**N**
Non-small cell lung cancer (NSCLC)	14
Squamous cell carcinoma (SCC)	45
Adenocarcinoma	8
Large cell carcinoma	1
Poorly differentiated carcinoma	4
Small cell lung cancer (SCLC)	13
Negative	23
Biopsy not done	12
Total	**120**

Table 3: Comparison between location and diagnostic yield (excluding normal bronchoscopy cases)

Location	**+ve**	**-ve**	**Total**	**p-value**
Central	56	17	73	<0.001
Peripheral	14	18	32	
Extrinsic compression	1	14	15	
Total	**71**	**49**	**120**	

DISCUSSION

During the early years of the development of bronchoscopy, the indications for the procedure were primarily therapeutic: removal of foreign bodies and dilation of strictures from tuberculosis and diphtheria. In the early part of the 20th century, Chevalier Jackson, the father of American Broncho-Esophagology Association, further advanced bronchoscopic techniques and designed modern rigid bronchoscopies [13]. Again, the primary indication was often therapeutic. Fibreoptic bronchoscopy (FOB) was developed in the late 1960s by S. Ikeda [14] and has become the mainstay investigation in the evaluation of patients suspected of lung cancer. It is employed mainly as a diagnostic tool providing tissue to determine the histological type of tumour. Bronchoscopy also has a role in disease staging and an extended role in delivering therapeutic modalities. FOB is convenient to perform, safe and well tolerated by the patient. Internationally, lung cancer continues to be the leading cause of cancer-related deaths in men and women [2]. Lung cancer is more prevalent in older age group. The mean age of the patients in our study was 60 years which is similar to the most of the previous studies. The majority of the patients were male (65%) which is similar to the study by Devkota KC et al., [15], Ghimire RH et al., [16] and Pant P et al., [17]. The preponderance of males probably was related to their smoking habits and greater exposure to environmental pollutants. The correlation between smoking and lung cancer has been established by several studies. In this study, most of the patients (90%) were smokers with significant mean pack year (42 pack years). Being a tertiary cancer center, most of the patients with lung cancer

are referred for the evaluation in our center from all over the country. Fiberoptic bronchoscopy is the most common procedure to diagnose lung cancer and endobronchial biopsy is performed in all the visible lesions. The diagnostic yield of the EBB varies from 48 to 93% [8]. The overall diagnostic yield was 68.4% which is similar to the study by Shrestha BK et al., [18] and Rivera MP et al., [19] but it is lower than the study by Zavala DC [20] and Popp W et al., [21]. British Thoracic Society guidelines recommend diagnostic level of 85% should be attainable when definite endobronchial tumor is visible. In the current study, the diagnostic yield of EBB was 75% despite repeated biopsies were taken in 21.2% of cases, which is below the recommended level. This could be increased with the addition of bronchial brushing and bronchial washing along with the EBB [19, 22]. Various factors like the number of biopsy samples taken, necrotic tissue overlying the lesion, crushing artifact of biopsied tissue, size of the sample and experience of the operator may affect the diagnostic yield [23-26]. In the subgroup analysis, the diagnostic yield of EBB was 82.3% for the central tumor which was statistically significant ($p<0.001$). The diagnostic yield of central tumor is better for EBB has been shown in various studies in the past [19]. More than 70% of lung carcinomas are visible to the FOB and although the yield is dependent on operator experience, a high level of diagnostic accuracy can be achieved by taking between three and five biopsy specimens and a combination of brushing, biopsy and bronchial washes can expect to establish a diagnosis in >60% of cases [27-30]. When the tumour is visible but is intramural rather than endobronchial in distribution, the diagnostic yield falls to 55% and is reduced further when the tumour lies beyond the bronchoscopists vision [27, 28, 31]. Majority of the lesion was present in lobar bronchus followed by main bronchus. Bronchoscopy was normal in 10 patients (8.3%). 12 patients had lesion in multiple locations. Vocal cord palsy, congested mucosa and suppurative infections were the additional findings. Over the last two decades, the adenocarcinoma is increasing in number and has surpassed SCC being the most common subtype [2, 32]. In our study the overall diagnostic yield was 90.0% which included all the patients undergoing bronchoscopy. The diagnostic yield while considering only the cases undergoing endobronchial biopsy was 75%. The diagnostic yield for central tumor was 82.5%, peripheral tumor was 48.3% and extrinsic compression was 3.4%. The diagnostic yield was statistically significan ($p<0.001$) for central tumors compared to peripheral and extrinsic compression. Fiberoptic bronchoscopy is relatively safe procedure [11, 33]. However, we had three mortalities due to massive hemorrhage. The incidence of significant hemorrhage ranges from 0.2% to 5% reported in various studies, [34] which is similar to our study with 4% patients having mild bleeding. Shrestha BK *et al.,* [18] reported mild bleeding of 9.9% in recent study, which may be higher due to EBB. The transient hypoxemia was seen in 18.4% and most of them did not require any specific intervention as stated by Jones A, *et al.,* [35]. Only few studies have been done on the diagnostic yield of EBB for diagnosis of lung cancer [5, 18]. Although this study had a large sample size, limitations are retrospective study, lack of data on other modalities like bronchoalveolar lavage and brush biopsy, lack of description of visible lesion and number of biopsies taken, and lack of immunohistochemistry for subtyping the morphologically undifferentiated NSCLC.

CONCLUSION

Fiberoptic bronchoscopy is the important diagnostic tool for diagnosing lung cancer. Endobronchial biopsy provides histopathological diagnosis with high diagnostic yield in the central tumors. It is a safe procedure with minor complications.

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