

Diagnostic Yield of Electromagnetic Navigational Bronchoscopy in a Low Volume Center When Performed by Community Pulmonologists

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Abstract: Introduction: Electromagnetic navigational bronchoscopy (ENB) may be used for evaluation of pulmonary nodules. The purpose of this study was to determine the yield of ENB at a low volume center (0–4 cases per month), where the cases were performed by community pulmonologists neither trained in interventional pulmonology nor an expert in electromagnetic navigational bronchoscopy. The primary endpoint was to find the diagnostic yield of ENB at our center. A safety analysis was also performed to evaluate complications during the procedures. Materials and methods: A retrospective chart review of all the patients who had undergone ENB from January 2019 to January 2021 was performed. A total of 29 ENB procedures were performed during that time frame. Four ENB procedures were performed for fiducial placement and were not included in the study. Results: Diagnosis was made in 72% of patients (18 cases out of 25 cases). With the exception of a single pneumothorax, no other complications were found. Conclusions: In conclusion our study shows that ENB, performed at low volume center by physicians not formally trained in interventional pulmonology or considered as experts in the procedure, has a high diagnostic yield and a good safety profile. This study shows that ENB may be performed by community pulmonologists at low volume center with a diagnostic yield comparable to high volume centers. This will help improve access of ENB to more patients.

Keywords: electromagnetic navigational bronchoscopy; pulmonary nodules; community hospital; bronchus sign

1. Introduction

Pulmonary nodules are common findings on computed tomography scans of the chest. The diagnosis of pulmonary nodules has increased since the emergence of lung cancer screening. Even in high risk population majority of the nodules are not malignant. It is therefore important to perform the least invasive procedure with the maximum accuracy [1]. Non surgical biopsy has usually been performed with transthoracic needle biopsy which has a diagnostic accuracy of greater than 90%, however, has a 20–30% risk of pneumothorax [2]. Electromagnetic navigational bronchoscopy (ENB) may be used for evaluation of pulmonary nodules at intermediate risk of malignancy. The yield with ENB has been between around 65–75%, however, most studies have been performed at large medical centers by interventional pulmonologists [3]. NAVIGATE is the largest multicenter study on ENB to diagnose its diagnostic accuracy. Its diagnostic yield was 73%. In the NAVIGATE trial > 90% of the procedures were performed by pulmonologists performing 5 or more electromagnetic bronchoscopies in a month. Only 7.9% procedures were performed at by operators with experience of 0–4 per month. The diagnostic yield in these centers was lower [4]. The purpose of this study was to determine the yield of ENB at a low volume center (0–4 cases per month), where the cases were performed by community

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pulmonologists neither trained in interventional pulmonology nor an expert in electromagnetic navigational bronchoscopy.

2. Materials and Methods

Electromagnetic navigational bronchoscopy at our center was started in January 2019. Our center is a community based, small hospital in USA. All procedures were performed in the endoscopy suite by a pulmonologist and the pulmonary fellow. The team also composed of an anesthesiologist and two nurses. Super dimension navigation system was used for the planning of the procedure. A retrospective chart review of all the patients who had undergone ENB from January 2019 to January 2021 was performed. A total of 29 ENB procedures were performed during that time frame. Four ENB procedures were performed for fiducial placement and were not included in the study.

Lesions were considered positive if a diagnosis of malignancy, was made during the ENB procedure. A non-malignant diagnosis was considered true positive only if the lesion was stable for a period of greater than 12 months.

Lesions were considered false negative if the diagnosis was made with other diagnostic procedures or there was an increase in the size of the mass/nodule.

The primary endpoint was to find the diagnostic yield of ENB at our center. A safety analysis was also performed to evaluate complications during the procedures. Complications requiring hospital admission are reported.

The study was approved by the Ethics Committee of our hospital.

3. Results

Patient demographics were mostly white (14 patients) and above the age of 65 (19 patients). Majority of them were smoker and had underlying lung disease (Table 1). One third of the lesions were peripheral, with majority of the lesions being less than 30 mm (Supplementary materials: Table S1). Operator experience was between 0–4 cases per month (Table S2). The mean procedure time was 70 minutes (Supplementary materials: Table S2).

Diagnosis was made in 72% of patients (18 cases out of 25 cases). One third of the cases in which a diagnosis was made, with ENB, were benign and two thirds were malignant (Table 2). With the exception of a single pneumothorax, no other complications were found (Supplementary materials: Table S3). Of patients who were diagnosed, with navigational bronchoscopy, bronchus sign had the highest prevalence (Supplementary materials: Table S4).

Table 1.

Demographics	Subjects (<i>n</i> = 25)
Age (mean)	64.25
Age >65	19
Male	13
Race:	
Caucasians	14
African American	3
Hispanic/Latino	3
Others	5
Tobacco history:	
Current or former	15
Non-smoker	5
N/A	5
Chronic obstructive lung disease	12
N/A	4

Personal history of lung cancer	6
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Table 2.

Diagnosis:	Subjects (<i>n</i> = 25)	
Yes	18	(72%)
No	7	(28%)
Diagnosis with ENB		
Malignant	12	
Adenocarcinoma	7	
Squamous cell carcinoma	2	
Small cell lung cancer	1	
B cell lymphoma	1	
Urothelial cancer	1	
Non Malignant	6	
Tuberculosis	1	
Sarcoidosis	1	
Atypical adenomatous hyperplasia	1	
Benign lesion	3	
Diagnosis not made with ENB	7	
Malignant	4	
Adenocarcinoma	2	
Renal cell cancer	1	
Thyroid cancer	1	
Non malignant		
Sarcoidosis	1	
N/A	2	

ENB — electromagnetic navigational bronchoscopy.

4. Discussion

Our diagnostic yield was 72% which is consistent with what was seen in the NAVI-GATE study. For operators performing 0–4 cases per month in the NAVIGATE study had a diagnostic yield of 64.9%. Our review of literature shows one other study evaluating the diagnostic yield of ENB at a community hospital performed by pulmonologists not trained in interventional pulmonary [5]. Their result showed a diagnostic accuracy of 80.2%. These studies show that ENB has an almost 70% yield even when performed at low volume centers. In contrast TTNA diagnostic yield ranges from 77% to greater than 90% however the risk of pneumothorax is significantly higher — reaching up to 30% [6–8]. In our study out of the 7 negative cases, 2 diagnoses were made with endobronchial ultrasound-transbronchial needle aspiration and 1 with transbronchial biopsy.

Out of the 25 procedures performed there was only 1 patient experiencing pneumothorax requiring chest tube placement and hospitalization. None of the other patients required hospitalization. This is lower than the NAVIGATE trial which reported pneumothorax occurrence at 4.3% with 2.9% requiring hospitalization.

This suggests that even at low volume centers the diagnostic yield is high and it has an excellent safety profile. Furthermore patients can undergo EBUS for staging in the same anesthetic episode.

In our study patients having a bronchus sign had a trend towards a higher diagnostic yield. Subjects having a bronchus sign had a diagnostic yield of 84.6% whereas subjects who did not have a bronchus sign had a diagnostic yield of 58.3%. This is in line with the NAVIGATE study. In the NAVIGATE study, however, in subjects not having a bronchus sign had a higher diagnostic efficacy of 67.1%. This may be due to increased expertise in the procedure.

Our study also showed that at our center the physicians had an average total time of 65 minutes for the procedure which is higher than the NAVIGATE trial where more than half the procedures had a total time of less than 60 minutes.

The major limitation of our study includes its retrospective nature. Also the population size is small and therefore results of this study can not be generalized. All nodules which were labelled as true negative had not been followed for 24 months.

5. Conclusions

In conclusion our study shows that ENB, performed at low volume center by physicians not formally trained in interventional pulmonology or considered as experts in the procedure, has a high diagnostic yield and a good safety profile. This is important as this may help increase the utilization of ENB for lung nodules or mass.

This study shows that the diagnostic yield of ENB at low volume community center is comparable to high volume centers. This allows for greater access to ENB by the community at large. This will also allow for community hospital to have lung cancer screening programs, which is a necessity considering lung cancer continues to be diagnosed in most patients at a later stage.

Supplementary Materials: The following supporting information can be downloaded at: www.mdpi.com/xxx/s1, Table S1: Lesion Properties; Table S2: Procedure Characteristics; Table S3: Complications

Conflicts of Interest: None declared.

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