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Unguided bronchoscopic biopsy: Does yield increase with operator experience

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RESEARCH

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ABSTRACT

Background

Bronchoscopic Forceps biopsy (Endobronchial Biopsy (EBB) and Trans Bronchial Lung Biopsy (TBLB)) are commonly performed for diagnosis in patients with endobronchial abnormalities or diffuse parenchymal involvement. As the operator gains experience his yield of various diagnostic bronchoscopic biopsies is expected to increase, however, no studies on the subject are available in literature.

Aims

To determine the effect of on- job experience on the yield of unguided bronchoscopic biopsies.

Methods

A total of 244 bronchoscopies were performed between Oct 2013 and Oct 2016. A retrospective analysis of all these bronchoscopies was undertaken. All patients who underwent biopsy were included in the study. Patients were divided into two groups with first group (Group A) comprising of biopsies done between Oct 2013 to Apr 2015 and second group comprising biopsies done between May 2015 to Oct 2016 (Group B). The diagnostic yield in two groups was compared.

Results

Total 71 bronchoscopic biopsies were performed during Oct 2013 to Oct 2016. 36 patients were included in group A and 35 patients were included in group B. The groups were matched in demographic profile, clinical diagnosis, bronchoscopic findings and type of biopsy undertaken. The biopsy was diagnostic in 31 patient (43.6 per cent) and non-diagnostic in 33 patients (46.4 per cent). There were 15 diagnostic biopsies in group A and 16 diagnostic biopsies in group B. The difference in the diagnostic biopsies between the two groups was not significant.

Conclusion

There was no significant impact of on job experience on diagnostic yield of biopsies. This may be due to adequate exposure during training leading to a diagnostic plateau being reached.

Key Words

Bronchoscopy, trans bronchial lung biopsy, endobronchial biopsy

What this study adds:

1. What is known about this subject?

Unguided bronchoscopic biopsies are the most common test being performed by pulmonologist worldwide but no data is available on the effect of on job experience on the results of these biopsies.

2. What new information is offered in this study?

Ideally the bronchoscopic biopsy yield should increase with experience but this study shows that it does not. This may be explained on basis of a learning plateau post which the yield does not depend on operator but other factors only.

3. What are the implications for research, policy, or practice?

Further research will be needed to determine how many biopsies are required to achieve a learning plateau for diagnostic biopsy and same can be used to modify the training of same.

Background

Fibre Optic Bronchoscopy (FOB) is a non-invasive, commonly used tool in diagnosis of various respiratory

diseases. Bronchoscopic Forceps biopsy (Endobronchial Biopsy (EBB) and Trans Bronchial Lung Biopsy (TBLB)) are commonly performed for diagnosis in patients with endobronchial abnormalities or diffuse parenchymal involvement. Various techniques like Fluoroscopic guidance, Endo Bronchial Ultra Sound (EBUS) and Electromagnetic Navigation bronchoscopy are now available which increase the diagnostic yield of Bronchoscopic Forceps Biopsy,[1] but these are not routinely available. Bronchoscopic biopsy (EBB/TBLB) performed for evaluation of respiratory disorders or radiological abnormalities are commonly undertaken without fluoroscopic guidance or use of endobronchial ultrasound/ electromagnetic navigation.[1] There are differences in complexity of technique, sensitivity and diagnostic efficacy of EBB and TBLB. Still they are similar in various respects: both being bronchoscopic forceps biopsies and both can be performed by using only the fibreoptic bronchoscope even if modalities like fluoroscope are not available. Bronchoscopic forceps biopsy without guidance is frequently performed especially in resource poor setting. A comprehensive review of the literature by Schreiber et al. indicated sensitivity of EBB to be 74 per cent and TBLB to be 46 per cent.[2] This study was a pooled analysis of studies comparing various modalities for diagnosis of suspected lung cancer.[2] This study showed that sensitivity of the diagnostic technique also depends on site and size of lesion, with higher sensitivity in more central and larger lesions.[2] Presently apprenticeship model of bronchoscopy training is under lot of criticism as the patients have to bear the burden of procedural training.[3] However in real world scenario lack of required equipment, paucity of skilled educators and already overburdened trainees[3] lead to apprenticeship model still being often followed in most training institutes. In this model various bronchoscopy techniques are taught and learned under strict supervision of recognised teachers having wide experience in this field. The amount of exposure in this model is variable depending on facilities available and the work load of the institute. Faculty training programmes with a goal of establishing a minimal standard of procedural skills are also being implemented to improve training.[3] Although there is an increasing emphasis on improving the training and the trainers[3] research on the effectiveness of techniques learned during training in the real world scenario is lacking. Once certified the students perform these skilled diagnostic procedure unassisted. As the operator gains experience his yield of various diagnostic bronchoscopic biopsies is expected to increase. However no studies on the subject are available in literature. We undertook a single centre, single operator retrospective observational study to determine if the yield of Bronchoscopic Forceps Biopsy increases as the operator gains on the job experience post training.

Method

A total of 244 bronchoscopies were performed between Oct 2013 and Oct 2016 at our centre, which is a tertiary care Respiratory centre. A retrospective analysis of all these bronchoscopies was undertaken. Ethical approval for the study was obtained from the Institutional Ethics committee. All patients who underwent biopsy (Endobronchial biopsy (EBB) or Trans Bronchial Lung Biopsy (TBLB)) were included in the study. Consent was taken prior to bronchoscopy and biopsy after informing the patients regarding indication and complication of the procedure. All the bronchoscopies and biopsies were performed by a single operator who joined the centre immediately after completing his Post Graduation in Respiratory Medicine. The operator was performing bronchoscopic biopsies under supervision prior to Oct 2013. Post Oct 2013 he started performing biopsies unassisted. All procedures were carried out under local anaesthesia using flexible bronchoscope (Olympus FB 10). The pre procedure clinical and radiological findings (Chest Radiograph, Computerised Tomography (CT) Scan) were considered to reach a clinical diagnosis. The radiological findings were recorded as mass, nodule, collapse, consolidation, effusion etc. The entire endobronchial tree was examined and any endobronchial abnormalities were noted as enobronchial mass, mucosal abnormality, external compression etc. Patients who underwent either an endobronchial biopsy or TBLB were only included in the study. Four or more samples were taken for either biopsy as is the standard procedure at our centre. In the absence of bronchoscopically visible lesion, the bronchoscope was advanced toward the selected segmental branch (based on radiological abnormality) in order to obtain the specimens. All biopsies were performed without fluoroscopic guidance or use of endobronchial ultrasound/ electromagnetic navigation. A definite diagnosis was considered when the biopsy confirmed a malignancy or a non-neoplastic aetiology. If the biopsy was considered suspicious but not confirmatory it was considered only partially diagnostic. Any biopsy which was reported as non-representative, inadequate tissue and showed nonspecific changes which were not consistent with clinical suspicion was considered non diagnostic. In these patients other methods (CT guided biopsy, thoracoscopic biopsy or fluoroscopy guided biopsy) were undertaken. The patients who underwent bronchoscopic biopsy were divided into two groups with first group (Group A) comprising of biopsies done between Oct 2013 to Apr 2015 and second group comprising biopsies done between May 2015 to Oct 2016 (Group B). The

diagnostic yield in two groups was compared. Data analysis was done by using SPSS (Statistical package for social sciences) version 20:0. Qualitative data variables were expressed using frequency and percentage (%). Quantitative data variables were expressed by using descriptive statistics viz. Mean, SD etc. For the comparison between group A and group B with various qualitative data variables viz. Age group, Gender, Clinical diagnosis and radiological findings we have used Chi-square test and Fisher's exact test. P-value <0.05 considered as significant.

Results

Total 71 bronchoscopic biopsies were performed during Oct 2014 to Oct 2016. 36 patients were included in group A and 35 patients were included in group B based on methods as described earlier. 20 patients were female and 51 were male. The age of patient included in the study ranged from 21–85 years. There were no significant differences between the proportion of individuals in various age groups (p=0.177), and gender distribution (p=0.605) between group A and B. There were no significant differences between the radiological findings and the clinical diagnosis between the two groups as indicated in Table 1.

Radiological lesion included as others in Table 1 consisted of Hilar/Mediastinal mass (2 (5.5 per cent) in group A, 3 (8.5 per cent) in group B), fibrosis (1 (2.7 per cent) in group A), Hilar/Mediastinal lymphadenopathy (2(5.5 per cent) in group A, 1(2.8 per cent) in group B)), honey combing with ground glass opacities (2 (5.5 per cent) in group A), ground glass opacities with multiple cysts (1(2.8 per cent) in group B) and solitary pulmonary nodule (1(2.8 per cent) in group B).

Clinical diagnosis included as ILD in Table 1 included Sarcoidosis (3 (8.3 per cent in group A, 4 (11.4 per cent) in group B), probable idiopathic pulmonary fibrosis (2 (5.5 per cent) in group A), organizing pneumonia (2 (5.5 per cent) in group A), idiopathic chronic eosinophillic pneumonia (1 (2.7 per cent) in group A) and Desquamating Interstitial Pneumonia (1(2.8 per cent) in group B). Bronchoscopy findings in the two groups were as described in Table 2.

The bronchoscopy findings included as others in Table 2 consisted of fibrotic tracheal band (1 (2.7 per cent) in group A) and vocal cord palsy (1 (2.7 per cent) in group A, 2(5.7 per cent) in group B).

A total of 24 TBLB and 47 EBB were performed. 23 EBB and 13 TBLB were performed in group A while 24 EBB and 11 TBLB were performed in group B. The distribution of biopsies between two groups was similar (p=0.803).

Of the 45 patients suspected to have Carcinoma Lung on clinical basis 20 (44.4 per cent) were diagnosed by biopsy. 5 patients (11.1 per cent) had biopsy results which were suspicious but not diagnostic by themselves. One patient was diagnosed as pulmonary tuberculosis while initial clinical suspicion was of malignancy. 19 patients (42.2 per cent) patients had biopsy results that were non diagnostic. Among 13 patients suspected to have ILD clinically 4 (36.6 per cent) were diagnosed on biopsy while one patient was diagnosed as carcinoma lung on biopsy. Detailed breakup of the initial clinical diagnosis and final biopsy results are given in Table 3.

The subgroup analysis of the Endobronchial biopsy performed in the study is given in Table 4. Out of a total of 47 EBB performed during the study 20(42.5 per cent) were diagnostic while 2 (6.3 per cent) were suspicious but not diagnostic. 10 EBB in each group were diagnostic.

The analysis of TBLB revealed that 11 (45.8 per cent) out of 24 biopsy were diagnostic. 11 patients were suspected to have interstitial lung disease of which 5 (45.5 per cent) had diagnostic biopsies. 5 TBLB in group A and 6 TBLB in group B were diagnostic.

In subgroup analysis of the EBB done during study diagnostic positivity in patients having endobronchial mass was 75 per cent (9 diagnostic biopsy out of 12 endobronchial mass lesion). In patients having unhealthy mucosa (n=18) 10 patients (55 per cent) had a diagnostic biopsy. In patients having external compression only (n=10) none of the biopsies were diagnostic.

The biopsy was diagnostic in 31 patient (43.6 per cent) and non-diagnostic in 33 patients (46.4 per cent). In 7 patients although biopsy was reported as being suspicious of diagnosis but it was not confirmatory. There were 15 diagnostic biopsies in group A and 16 diagnostic biopsies in group B. The difference in the diagnostic biopsies between the two groups was not significant. Other than diagnosis of carcinoma lung in 22 (30.9 per cent) (10 (27 per cent) in group A, 12 (34.2 per cent) in group B) Sarcoidosis was diagnosed in 3 patients (4.2 per cent) (1(2.7 per cent) in group A, 2(5.7 per cent) in group B), Pulmonary tuberculosis in 1 ((2.7 per cent) in group A) and Fungal and Pneumocystis jirovecii pneumonia in 1 patient each in group B ((2.8 per cent) in group B).

Discussion

Various studies have studied the yield of bronchoscopic forceps biopsy and the factors affecting it. Su et al. found that the incidence of positive bronchoscopy yield was 65.7 per cent in patients with a localised mass ≥4cm in diameter, whereas the yield fell to 24.5 per cent in lesions <4cm.[4] In study done by Boonsarngsuk et al. the diagnostic yield in patients who had endobronchial lesion was 80.6 per cent, whereas the diagnostic yield in patients with non-visible lesions was only 38.2 per cent.[1] In a study done by Fuladi et al. the diagnostic yield of Endobronchial biopsy was found to be positive in 76.92 per cent (20 EBB were positive among 26 visible endobronchial lesion).[5] This is comparable to the diagnostic yield of EBB in our study which was 76.9 per cent (10 diagnostic biopsies in 13 patients having endobronchial mass). However other studies have reported higher yield of EBB. Ibungo et al. reported a diagnostic yield of 97.3 per cent[6] with EBB being positive in 71 out of 73 patients with lung malignancy having endobronchial lesion. However when they considered all 95 cases with endobronchial lesion (including benign lesion) the diagnostic yield fell to 90.5 per cent. It is difficult to postulate the cause of such wide difference in the reported diagnostic yield of same procedure. Diagnostic yield of TBLB in literature has been variedly reported from 17–77 per cent in patients with peripheral lung cancer.[7] The diagnostic yield of bronchoscopic biopsies in our study was 43.6 per cent. No significant difference was seen between the yields of bronchoscopic biopsies in two groups which indicate that there is no significant impact of on job experience on diagnostic yield of biopsies. Learning curve analysis for various surgical procedures has been assessed. Terzi et al. assessed the learning curve for Total Laproscopic Hysterectomy and determined that a plateau is reached after first 75 cases.[8] Sharma et al. studied the learning curve of robotic sacral colpoplexy and determined the same to be between 25 to 36 cases.[9] Both these studies used improvement in operator time to assess the learning curve. Latif et al. studied the time and number of attempts required to train novices in fibre optic bronchoscopy. They determined that proficiency levels were reached after 11±5 attempts and also decay in skills started within 2 months post training.[10] Any procedure has a learning curve with initial poor results which improve with experience. Boonsarngsuk et al. studied self-learning experience in trans bronchial needle aspiration (TBNA). During the first 6-month, the authors' diagnostic yield and adequacy of specimens was low. With experience and modification of technique, the frequency of inadequate specimens significant decreased from 36.4 per cent to 0 per cent (p=0.03).[11] Various models have been suggested to ensure adequate competency post training.[3] Procedural volume with 100 flexible bronchoscopies and 50 EBUS procedure to achieve competence has been suggested,[12] but adequacy of these arbitrarily defined numbers has been questioned.[13,14] In a study done by Wahidi et al. the authors showed that there was considerable differences in skill acquisition at 50th bronchoscopy.[15] They also showed a relative flattening of learning curve after 20 procedures.[15] No improvement in diagnostic yield of biopsies in our study, may be attributable to a learning plateau being reached during training, due to adequate exposure during training However there might be a beneficial effect of on job experience as it may not allow the decay in bronchoscopic skills learned and hence help in maintaining consistent results. Limitations of our study include that it was a single centre, single operator study. A similar multicentre study with multiple operators will help in determining the effects of on job experience more effectively (Table 5 and Figure 1).

Conclusion

There was no significant impact of on job experience on diagnostic yield of biopsies. This may be due to adequate exposure during training leading to a diagnostic plateau being reached.

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PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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ETHICS COMMITTEE APPROVAL

Hospital Ethics Committee of INHS Asvini.

Table 1: Patient characteristics and clinical diagnosis between two groups

S. No.	Patient Characteristic	Group A (n=36)	Group B (n=35)	P Value
1	Age Group			
	<40 yrs	4 (11.1%)	1 (2.8%)	0.177
	40-59 yrs	12 (33.3%)	18 (51.4%)	
	>60 yrs	20 (55.5%)	16 (45.7%)	
2	Gender			
	Male	27 (75.0%)	24 (68.5%)	0.605
	Female	9 (25%)	11 (31.4%)	
3	Radiological Findings			
	Mass Lesion	13 (36.1%)	16 (45.7%)	0.480
	Collapse	3 (8.3%)	2 (5.7%)	0.999
	Consolidation	4 (11.1%)	4 (11.4%)	0.735
	Collapse Consolidation	1 (2.7%)	2 (5.7%)	0.999
	Pleural Effusion	3 (8.3%)	2 (5.7%)	0.999
	Bilateral Nodules	5 (13.8%)	3 (8.5%)	0.746
	Others	7 (19.4%)	6 (17.1%)	0.580
4	Clinical Diagnosis			
	Carcinoma Lung	22 (61.1%)	23 (65.7%)	0.912
	Interstitial Lung Disease	8 (22.2%)	5 (14.2%)	
	Pulmonary Tuberculosis	3 (8.3%)	3 (8.5%)	
	Others	3 (8.3%)	4 (11.4%)	

Table 2: Bronchoscopic findings in two groups

S. No.	Bronchoscopic Finding	Group A (n=36)	Group B (n=35)	P Value
1	Endobronchial Mass	9 (25.0%)	4 (11.4%)	0.256
2	Unhealthy Mucosa	7 (19.4%)	15 (42.8%)	
3	External Compression	6 (16.6%)	5 (14.2%)	
4	Normal	12 (33.3%)	9 (25.7%)	
5	Others	2 (5.5%)	2 (5.7%)	

Table 3: Comparison of initial clinical diagnosis with final biopsy results

	Final Biopsy Result							
		Carcinoma Lung	Partially Diagnostic	Non Diagnostic	Interstitial Lung Disease/UIP	Pulmonary Tuberculosis	Others	Total
Clinical Diagnosis	Carcinoma Lung	20	5	19	0	1	0	45
	ILD	1	0	7	4	0	1	13
	Pulmonary Tuberculosis	1	0	3	1	0	1	6
	Others	0	2	4	0	0	1	7
	Total	22	7	33	5	1	3	71

Table 4: Analysis of EBB done during study with respect to clinical diagnosis and biopsy result

	Final Biopsy Result						
	Carcinoma Lung	**Partially Diagnostic**	**Non Diagnostic**	**Interstitial Lung Disease/UIP**	**Pulmonary Tuberculosis**	**Others**	**Total**
Clinical Diagnosis: Carcinoma Lung	18	2	18	-	-	0	38
Clinical Diagnosis: ILD	0	0	2	-	-	0	2
Clinical Diagnosis: Pulmonary Tuberculosis	1	0	2	-	-	1	4
Clinical Diagnosis: Others	0	1	2	-	-	0	3
Clinical Diagnosis: Total	19	3	24	-	-	1	47

Table 5: Analysis of TBLB done during study with respect to clinical diagnosis and biopsy result

	Final Biopsy Result						
	Carcinoma Lung	**Partially Diagnostic**	**Non Diagnostic**	**Interstitial Lung Disease/UIP**	**Pulmonary Tuberculosis**	**Others**	**Total**
Clinical Diagnosis: Carcinoma Lung	2	3	1	0	1	0	7
Clinical Diagnosis: ILD	1	0	5	4	0	1	11
Clinical Diagnosis: Pulmonary Tuberculosis	0	0	1	1	0	0	2
Clinical Diagnosis: Others	0	1	2	0	0	1	4
Clinical Diagnosis: Total	3	4	9	5	1	2	24

Figure 1: Results of bronchoscopic Biopsy