Complications and predictors of diagnostic yield of endobronchial forceps biopsy in visible lesions

Bishow Kumar Shrestha, Shital Adhikari, Binay Kumar Thakur, Dipen Kadaria, Kishore Kumar Tamrakar, Mukti Devkota

Abstract

Background: Fiberoptic bronchoscopy is an important and relatively safe procedure for evaluation of various pulmonary diseases. Endobronchial forceps biopsy is commonly performed sampling technique for visible lesions in tracheobronchial tree. Diagnostic yield of biopsy depends upon lesion type and the number of biopsy samples taken. This study aimed to evaluate the complications and diagnostic yield of endobronchial forceps biopsy in visible lesions and correlate the number of biopsy samples taken with the yield.

Methods:

This was an observational study conducted at two tertiary care hospitals in Chitwan; Chitwan Medical College Teaching Hospital and B P Koirala Memorial Cancer Hospital. One hundred and forty patients who underwent endobronchial forceps biopsy of bronchoscopically visible lesions were included. Complications and diagnostic yield of the biopsy samples and its correlation with number of biopsies taken were evaluated.

Results:

The common complications observed were transient drop in saturation > 4% (22%) and mild bleeding (9.9%). The net diagnostic yield was 67.4% that significantly improved with an increase in the number of biopsies taken. The yield was better for exophytic growths compared to submucosal/mucosal lesions (83.7% vs. 57%, OR = 8.1 (2.2 – 29.9), P<0.001). The association of improved yield with increased number of biopsy was more pronounced in exophytic growths compared to submucosal/mucosal lesions.

Conclusion:

Endobronchial forceps biopsy is a safe procedure that gives a good diagnostic yield in bronchoscopically visible lesions, provided adequate number of biopsy sample are taken. The probability of getting a positive yield is high in exophytic growths.

Introduction

Fiberoptic bronchoscopy (FOB) has greatly revolutionized the field of pulmonary medicine and has been the procedure of choice for diagnosis of various pulmonary diseases. It is a safe procedure that can be performed under local anaesthesia and provides maximal visualization of tracheobronchial tree in short time. FOB is primarily used to obtain tissue samples for histologic

Keywords: Bronchoscopy; forceps biopsy; exophytic growth; predictors

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mouth guard in 5 patients (3.5%). All the patients received oxygen insertion. Bronchoscopy was performed via trans-oral route with distal ends were lubricated with 2% lidocaine jelly prior to bronchoscope with working channel 2 mm in BPKMcH, whose the study. At least 6 hours fasting prior to the procedure was chest) indications for bronchoscopy and routine investigations taken are regarded as good predictors of diagnostic yield. The were included. A detailed clinical data including age, gender, symptoms, smoking status, comorbidities, clinical and radiological (based on CT scan chest) indications for bronchoscopy and routine investigations results were recorded in proforma at the time of enrolment in the study. At least 6 hours fasting prior to the procedure was made mandatory and an intravenous line was accessed in all the patients.

After thoroughly explaining the procedure to the patient, 10% lidocaine was sprayed onto oropharynx and 2% lidocaine jelly was put into the nostril. Briefly following topical anaesthesia, bronchoscopy was performed, mostly through trans-nasal route in supine position, using Fujinon EB-530T bronchoscope with working channel 2.8 mm in CMCTH or PENTAX 1000 series bronchoscope with working channel 2 mm in BPKMC, whose distal ends were lubricated with 2% lidocaine jelly prior to insertion. Bronchoscopy was performed via trans-oral route with mouth guard in 5 patients (3.5%). All the patients received oxygen supplementation by nasal cannula, started 2 to 5 minutes prior to the procedure and were continuously monitored with cardiac monitor and pulse oximeter.

Local anaesthesia was supplemented with aliquots of 1 to 2 millilitres of 1% lidocaine solution through the procedure port for topical bronchial anaesthesia as needed, not exceeding 300 mg of lidocaine in total. None of the patient received sedation during the procedure.

Thorough examination of tongue base, epiglottis, vallecula, aryepiglottic folds, pyriform fossa, vocal cords, upper airways and tracheobronchial tree was performed. Bronchoscopically visible endobronchial lesions were classified as exophytic growth, submucosal/mucosal infiltrative lesions and extrinsic compression. Exophytic growth included fleshy or friable polypoidal, cauliflower, nodular or multiodular endobronchial growth. Submucosal/mucosal infiltrative lesions included loss of normal bronchial markings, mucosal irregularity, erythema or vascular flares, mucosal/submucosal thickening causing none to minimal luminal narrowing. Severity of bleeding was assessed as per BTS guidelines (2013)7 as no bleeding, mild bleeding, moderate bleeding and severe bleeding. Cold saline and diluted adrenaline solution were kept ready during the procedure. All the patients were kept under constant supervision for assessing post-bronchoscopy complication with advice of nil per oral for 2 hours.

The biopsy samples were sent for histologic examination at the earliest possible. All the samples were examined and interpreted by consultant pathologists of the respective hospitals. Histopathology reports that mentioned “sample inadequate for analysis” (n=5) were excluded from yield calculation and the report that mentioned “suspicious for malignancy” (n=3) were taken as positive yield and included in the yield calculation.

The data collected were entered and analyzed using IBM SPSS Statistics 20. The data were presented as mean (±SD), frequency (percentage). Multivariate logistic regression analysis was used to calculate the effect size of possible predictors of diagnostic yield of the bronchoscopic biopsy procedure.

### Results

The baseline data of the patients is shown in Table 1

| Variables | Variables |
|-----------|-----------|
| Age       | 61.72 ± 12.38 years |
| Sex       | 69 (48.9 %) |
| Male      | 72 (51.1 %) |
| Female    | 77 (54.6 %) |
| Comorbidies | 64 (45.4 %) |

The table 1: Baseline data of different variables of the patients (n = 140)
Complications and predictors of diagnostic yield of endobronchial forceps biopsy in visible lesions

Table 2. Relationship between Diagnostic yield and number of biopsies

| Number of biopsies taken | Diagnostic yield (%) |
|-------------------------|----------------------|
| 3 (n=18)                | 10.5 %               |
| 4 (n=45)                | 40.0 %               |
| 5 (n=65)                | 98.5 %               |
| 6 (n=5)                 | 100.0 %              |
| 8 (n=2)                 | 100.0 %              |

The most common complication observed was transient drop in saturation > 4% (22.0%). Mild bleeding occurred in 9.9%, which was significantly associated with presence of superior vena cava obstruction (SVCO) (incidence of mild bleeding: 60.0 % vs. 8.1 % in patients with and without SVCO respectively, P <0.001). Bradycardia and transient fever occurred in 1% each.

Table 3 shows the distribution of histopathological diagnoses obtained. The net diagnostic yield was 67.4%. Diagnosis of “suspicious for malignancy” was made in 3 patients (2.2%).

Table 3. Distribution of histopathological diagnosis in the study population

| Diagnosis                             | N (%) |
|---------------------------------------|-------|
| Lung malignancy                       |       |
| SCLC*                                 | 81 (60.0%) |
| NSCLC**                              | 22    |
| Squamous cell carcinoma               | 56    |
| Adenocarcinoma                        | 14    |
| Morphologically                       |       |
| Unclassifiable NSCLC                  | 38    |
| Small round cell tumor                | 2 (1.5%) |
| Typical carcinoid tumor               | 1 (0.7%) |
| Chronic inflammatory lesion           | 6 (4.4%) |
| TB                                    | 1 (0.7%) |
| Suspicious for malignancy             | 3 (2.2%) |
| No diagnosis made                     | 44 (32.6%) |

*SCLC: Small cell lung cancer **NSCLC: Non-small cell lung cancer

Overall, the diagnostic yield increased significantly with increase in the number of biopsies taken. The yield was 98.5% (n=65) with 5 and 100% (n=6) with 6 biopsy samples. There was a significant difference in diagnostic yield between the patient group where <4 biopsies were taken and patient group where ≥ 4 biopsies were taken (10.5 % vs. 73.6 %, P <0.001).

On subgroup analysis, diagnostic yield of biopsies taken from exophytic growth was 83.7% (41/49) and that from submucosal/mucosal infiltrative lesion was 57.0% (49/86) (Table 4). The diagnostic yield was significantly higher in the patient group that had ≥ 4 biopsies (for both exophytic growth and submucosal/mucosal infiltrative lesion) compared to <4 biopsies (95.2 % vs. 14.3% for exophytic growth, 64.9 % vs. 8.3 % for infiltrative lesion, P<0.001).

Table 4. Number of biopsies, diagnostic yield and lesion types in the study population

| Number of biopsies | Diagnostic yield from exophytic growth (%) (n=49) | Diagnostic yield from infiltrative lesions (%) (n=86) |
|--------------------|-----------------------------------------------------|-----------------------------------------------------|
| 3                  | 14.3 %                                              | 8.3 %                                               |
| 4                  | 77.8 %                                              | 30.5 %                                              |
| 5                  | 100.0 %                                             | 97.1 %                                              |
| 6                  | 100.0 %                                             | 100.0 %                                             |
| 8                  | -                                                   | 100.0%                                              |
| Overall diagnostic yield | 83.7 %                                          | 57.0 %                                              |

After multivariate logistic regression, it was found that the number of biopsies taken and the type of bronchoscopically visible lesion significantly predicted diagnostic yield. The odds of getting positive diagnostic yield was 8.1 times higher when the sample was taken from exophytic growth compared to infiltrative lesion. Similarly, the diagnostic yield reduced by 98.5 % when <4 biopsies were taken from the samples compared to ≥ 4 biopsies. (Table 5)
The diagnostic yield for patients with exophytic growth was higher compared to patients with submucosal/mucosal infiltrative lesion (83.7% vs. 57%). This is in agreement with study by Kacar et al.21 that reported similar yields for exophytic growth (86.4%) and infiltrative/peribronchial lesions (47.2%).

EBB specimens generally are small and contain small number of malignant cells.28 Coghill et al.30 reported that not every biopsy sample contained tumour cells, with the mean percentage area of tumour in an endobronchial biopsy sample being 33% and fewer than half the cases contained tumour in all biopsy samples. In our study, the net diagnostic yield improved significantly with increase in the number of EBB taken and reached almost 100% when 5 or more EBB samples were taken. This is consistent with the study by Gellert AR et al.4 which reported the frequency of at least one specimen with evidence of carcinoma increased to 96% with 5 and 100% with 6 biopsy specimens. In our study, the difference in net diagnostic yield was significantly higher in patient group where ≥ 4 biopsies were taken (73.6 vs. 10.5%, p <0.001). This observation is supported by other studies that reported higher diagnostic yield with increased number of biopsy specimens.5,25,26,28 Several studies suggested bronchoscopic visibility, tumour-size and location as significant predictors of higher diagnostic yields.31,32 We found that the odds of obtaining diagnostic yield was 8.1 times higher when EBB were taken from exophytic growth compared to infiltrative lesions. The probable reason for this finding could be that the tumour cell burden of exophytic growth and infiltrative lesion vary; the burden being higher in the exophytic growth increasing the probability of picking up sample with tumour cells.

This is an observational study and sample size is relatively small and may fall short to validate these findings in general. But it highlights the need of sufficiently powered larger study to confirm our findings, i.e., to ensure satisfactory yield, what minimum number of EBB is required from these two different categories of the visible lesions in different disease states.

Conclusion:
Endobronchial forceps biopsy is a safe procedure with few minor complications. The yield of EBB increased as the number of biopsy samples increased and satisfactory yield was obtained with minimum of five biopsy samples both in exophytic growths and submucosal/mucosal infiltrative lesions. However, the odd of getting positive diagnosis with EBB was high in exophytic growth.
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