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Fiberoptic Bronchoscopy: Correlation of Cytology and Biopsy Results

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ABSTRACT

Background: *Fiberoptic bronchoscopy is a diagnostic method for respiratory diseases. At present, its diagnostic yield has been increased by different cytologic and histologic procedures by convention.*

Objective: *This study was conducted to evaluate the concordance and agreement between cytologic and histologic findings in conventional diagnostic bronchoscopic methods (washing and biopsy) for lung malignancies.*

Materials and Methods: This was a *cross-sectional study performed on 2076 cases of bronchial biopsy and bronchial washing between 1996 and 2003.*

Results: *Of 2163 patients who underwent fiberoptic bronchoscopy after omitting 87(4%) cases due to unsatisfactory specimens, 2076 cases were studied including 832 (36.9%) females and 1244 (63.1%) males in the age range of 2 to 100 years, (mean age 57.7±16.3 yrs). Male to female ratio was 1.5.*

Malignancy was diagnosed in 657(31.6%) biopsy and 283(13.6%) cytology specimens. Two hundred and sixty-five cases had malignant lesions according to both bronchial biopsy and bronchial washing; therefore, Kappa coefficient in both methods was 46.7% (P value = 0.000). Concordance rate was 77.4%. Ninety-seven point three percent of malignant cases were diagnosed by biopsy and 41.9% by cytology. Cytology contributed to an additional diagnostic rate of 2.6%.

Conclusion: *Kappa agreement is classified as fair and although there is a very good concordance between the two sampling techniques, the diagnostic yield of cytology for malignancy must be improved by combination of multiple assays.* ***(Tanaffos 2007; 6(2): 46-50)***

Key words: *Fiberoptic bronchoscopy, Bronchial biopsy, Bronchial washing, Cytology, Histology, Concordance, Agreement*

INTRODUCTION

Bronchoscopy is a common indication for collection of various types of respiratory samples. These include washing, bronchoalveolar lavage, brushings and bronchial biopsy. Studies have documented that a combination of histological and cytological techniques have significantly increased the overall diagnostic yield of diagnostic bronchoscopy (1).

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Bronchial washing is performed by instillation of 20-40cc normal saline and suctioning through the working channel of the bronchoscope.

In bronchoalveolar lavage, after wedging of a bronchoscope as far as possible into a distal airway, at least 100 ml fluid must be instilled (2).

Bronchial biopsy provides histologic samples of the bronchial wall, lung parenchyma, and alveoli. Specimens are submitted to the pathology laboratory in 10% formalin for processing and then routine histopathologic preparation with hematoxylin and eosin is performed.

Although cytology has a low diagnostic yield compared to histology, it provided an exclusive diagnosis in as many as 12% of the study patients (3).

Among the cytologic methods, the usefulness of obtaining routine washings is still a subject of discussion (3, 4).

This cross-sectional study was performed on bronchoscopic specimens of patients admitted to NRITLD during 1996-2003 to evaluate the cyto-pathologic agreement and the diagnostic yield of cytology (washing) in malignancies.

MATERIALS AND METHODS

All diagnostic bronchoscopies were performed in NRITLD and had both cytology and biopsy specimens. A total of 2076 patients, from March 1996 to April 2003, were reviewed retrospectively.

The pathology and cytology reports were retrieved from the pathology lab archives. Patient's data, bronchoscopic findings and clinical impression were assessed via the physician's request notes.

Washings were obtained by lavage with 20-40 ml of normal saline and aspiration into the trap. Afterwards, blind biopsy without access to fluoroscopy was performed. Cytology specimens including both smear and cell blocks were prepared in the pathology lab.

Biopsy specimens were submitted to the pathology laboratory in 10% formalin for processing and then routine histopathologic preparation with hematoxylin and eosin was performed.

Specimens were interpreted by the pathologist as: positive for malignancy, negative for malignancy or inconclusive including atypical cells or dysplasia. For easy comparison with cytology, biopsy results were designated similar to cytology in this study. Thus, we classified the diagnosis as malignant and no malignancy seen.

Statistical analysis

Chi-square test was used for comparing the categorical data. $P \leq 0.05$ was considered as statistically significant. Data were analyzed by using Statistical Package for the Social Science (SPSS) software, version 11.5. Rater agreement test was used to estimate the kappa coefficient and the confidence interval was calculated.

RESULTS

During a 7-year period, 2076 patients including 832(36.9%) women and 1244(63.1%) men with a mean age of 57.7 years (SD= 16.3) (range: 2-100 yrs) underwent bronchial biopsy and washing.

The results of bronchial biopsy were as follows:

657 cases (31.6%) had malignancy and in 1419 cases (68.3%) no malignancy was detected. [64 cases(3%)had inconclusive results as atypia or dysplasia)]

The results of bronchial washing indicated malignancy in 283 cases (13.6%) and no malignancy in 1793 cases (85%) [including 101(4%) cases with inconclusive results] (Table-1 and Figure-1).

Table1. Diagnostic classification by each method:

Bronchoscopic Modalities	Malignancy	No Malignancy	Total
Bronchial washing	283	1793	2076
Bronchial biopsy	657	1419	2076

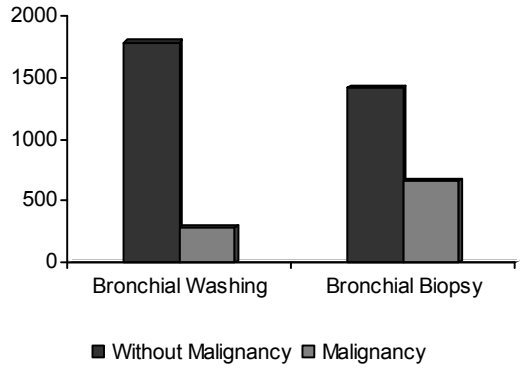

Figure 1. Frequency of diagnoses according to diagnostic method

The clinical impression was malignancy in 838 cases (40.4%) and benign lesions in 1238 cases (59.6%).

Cross tabulations of clinical impression with bronchial biopsy and washing are shown in Table 2 and Table 3.

Table 2. Clinical impression and bronchial washing cross tabulation

C.I. / B.W	Benign	Malignancy	Total
Malignancy	90	193	283
No malignancy	1113	578	1691
Inconclusive	35	67	102
Total	1238	838	2076

CI: Clinical impression
BW: Bronchial washing

Table 3. Clinical impression and bronchial biopsy cross tabulation

C.I. / B.B.	Benign	Malignancy	Total
Malignancy	201	456	657
No Malignancy	1016	339	1353
Inconclusive	21	45	66
Total	1238	838	2076

C.I: Clinical impression
B.B: Bronchial biopsy

In patients with clinical impression of malignancy, biopsy specimens and cytology were positive for malignancy in 54.4% and 23% of cases respectively.

In those with clinical impression of benign lesion, biopsy specimens and cytology were positive for malignancy in 16.2% and 7.2% respectively.

One hundred and sixteen cases had endobronchial lesions out of which 48 cases (41.3%) were diagnosed by biopsy and 19 cases (16.3%) by washing, as malignancy (Table 4).

Table 4. Bronchial washing and bronchial biopsy diagnosis crosstabulation for endobronchial lesions

B.W / B.B	No Malignancy	Malignancy	Total
Malignancy	29	19	48
No Malignancy	68	0	68
Total	97	19	116

B.W: Bronchial washing
B.B: Bronchial biopsy

The diagnosis of malignancy was made by biopsy in 657 cases (31.6%) and by cytology in 283 cases (13.6%). Two hundred and sixty-five cases had malignant lesions according to both bronchial biopsy and washing. Therefore, the agreement between both specimens was 46.1% (the 95% confidence interval was: 0.42- 0.50) (p= 0.000).

In 675 cases eventually diagnosed as having a malignant lesion, biopsy specimens were positive for malignancy in 97.3% while washings were positive in 41.9%. Biopsy material alone gave a positive result in 58% of cases, whereas, this rate was 2.6% for washings.

Two-hundred and sixty five specimens were positive for malignancy according to both cytology and biopsy while 1401 were diagnosed negative for malignancy (Table 5). Concordance rate was 77.4%. Three hundred and ninety-two cases were diagnosed positive for malignancy by biopsy alone. This rate was 18 by cytology alone. The diagnoses in these 18

cases were as follows: adenocarcinoma 1 case; non-small cell carcinoma, 1 case; malignancy with squamous cell origin, 5 cases; and malignancy of epithelial origin, 4 cases. The origin was not defined for other cases.

Table 5. Bronchial washing and bronchial biopsy cross tabulation

B.W / B.B.	Malignancy	No Malignancy	Total
Malignancy	265	392	657
No Malignancy	18	1401	1419
Total	283	1793	2076

BW: Bronchial Washing
BB: Bronchial Biopsy

If the biopsy method is used for detection of malignancy with 95% confidence interval, the positive rate is between 16-20% higher than cytology alone.

DISCUSSION

In this study, the overall cyto-pathology Kappa agreement index for diagnosis of bronchoscopic specimens was 0.461 which is considered as fair, although they are concordant in 77.4%.

Ninety seven point three percent of malignant cases, in this study, were diagnosed by biopsy and 41.9% by washing.

To establish a cytologic or histologic diagnosis in a patient with suspected lung cancer, flexible bronchoscopy (FB) is an essential step in the workup. Washings, brushings, and forceps biopsies are often combined to increase the diagnostic yield (7-11). The usefulness of obtaining washings is still a subject of discussion (5-6). The diagnostic yield of washings in patients with endoscopically visible (central) tumors varies from 49% to 76% and is similar to that of brushings (52 to 77%) but inferior to that of biopsies (71% to 91%) (8, 10-13).

Overall, the yield could be decreased if there is surface necrosis, sampling error or inadequate tissue (4).

In our study the diagnostic yield of pathology and cytology for endobronchial lesions was 41.3% and 16.3% respectively.

However, the diagnostic yield of FB performed to establish the diagnosis of solitary lung lesions in the absence of endobronchial lesion, has a wide variability (18%-75%) (6).

In our study the diagnostic yield for cases without endobronchial lesions was 31% by histology and 13.4% by cytology.

van der Drift et al. (14) in their prospective study of 221 patients showed that although the additional diagnostic yield of washing and brushing during bronchoscopy is relatively low, it is cost-effective to use these procedures in the diagnostic workup of patients who are clinically suspected of having a pulmonary malignancy. Also, they showed that there were no differences in the diagnostic yield of washings before or after biopsies and brushings.

Overall, a variety of factors may be responsible for the wide variability of diagnostic yield of FB performed to establish the diagnosis of solitary lung lesions in the absence of endobronchial abnormalities. These include the study design, size of the lesion, exclusion of benign lesions in the analysis of FB, obtaining CT-scan prior to FB, using biplane fluoroscopy during FB, variability in the experience of the bronchoscopists, and types of biopsy procedures performed during FB (6).

The present study was a cross-sectional study; therefore, we were unable to establish the final outcome of the patients. There were undoubtedly variations in the techniques and experience of the bronchoscopists, as there would be in any respiratory unit. For example, no standard numbers of biopsy specimens were taken. At least five biopsy specimens were required to give more than 90% probability of obtaining a positive specimen as shown by Papovich et al. (15). Also, patients who had undergone

bronchoscopy but did not have a cytology or histological diagnosis were not included in this study.

A prospective study with standard procedures and multiple specimens (including brushing of submucosal and peribronchial lesions and also transbronchial aspirations) taken under fluoroscopic guidance is recommended to predict and improve the diagnostic yield of fiberoptic bronchoscopies.

CONCLUSION

Although there are good concordance and fair agreement between the results of bronchial washing and biopsy, the diagnostic yield of cytology is very low and must be increased with other modalities including brushing and transbronchial needle aspiration in selected conditions.

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