

Bronchial brushing and bronchial biopsy: comparison of diagnostic accuracy and cell typing reliability in lung cancer

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ABSTRACT A total of 443 patients with lung cancer underwent brush and forceps biopsy through a fibreoptic bronchoscope. The biopsy was taken from the area of suspected malignancy which had been brushed.

Of 443 patients, 400 (90.3%) showed positive results on brushing and 287 (64.8%) on biopsy. A combination of both techniques yielded the highest percentage of positive diagnoses (93.7%). Histologically, there was a high incidence of positive diagnosis for squamous and small cell carcinoma. One hundred and three (83.7%) of 123 specimens obtained by brushing and 75 (81.5%) of 92 specimens obtained by biopsy agreed with the cell type found in the surgical or necropsy specimen. Cell typing accuracy was higher in squamous and in small cell carcinoma in both techniques. As the cell typing accuracy of the two methods is similar, the results obtained by both techniques should be taken into consideration in the management of individual cases of lung cancer.

In the Center for Adult Diseases, Osaka, most cases of lung cancer are investigated by brushing and biopsy through a fibreoptic bronchoscope. During the 15 years from January 1969 to December 1983 443 cases were diagnosed in this way.

Several studies have investigated the accuracy of brushing and biopsy.¹⁻⁶ Payne *et al*⁵ compared the diagnoses of cell type made from bronchial aspirate and bronchial biopsy specimen with the diagnoses based on surgical or necropsy specimen, but not all patients had both examinations. Lyall *et al*⁶ compared the cell types obtained by bronchial brushing and by conventional biopsy, but did not confirm their findings in surgical or necropsy material.

In this report we compare the diagnostic accuracy of bronchial brushing and biopsy and look at the reliability of cell typing of the specimens as measured against the final histological diagnosis.

Methods

Cytological and histological specimens were obtained at fibreoptic bronchoscopy under local anaesthesia. The area of suspected malignancy was brushed two or three times; smears were immediately fixed in 95% alcohol and stained by Papanicolaou's method. Then a single specimen was taken for histological examination from the same area by forceps, and stained with haematoxylin and eosin after being processed. Specimens that showed malignant characteristics were classified as positive, while those with

Table 1 Accuracy of bronchial brushing and bronchial biopsy in the 443 cases

| Group | No (%) of cases |
|----------------------|-----------------|
| Brushing +, biopsy + | 272 (61.4) |
| Brushing +, biopsy - | 128 (28.9) |
| Brushing -, biopsy + | 15 (3.4) |
| Total positive | 415 (93.7) |
| Brushing -, biopsy - | 28 (6.3) |
| Brushing positive | 400 (90.3) |
| Biopsy positive | 287 (64.8) |

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Table 2 Diagnostic accuracy of bronchial brushing and bronchial biopsy for each histological type

| Histological type | No of cases | Diagnostic accuracy | |
|-------------------|-------------|---------------------|---------------|
| | | Brushing No (%) | Biopsy No (%) |
| Squamous | 71 | 66 (93.0) | 52 (73.2) |
| Small cell | 24 | 23 (95.8) | 18 (75.0) |
| Adenocarcinoma | 25 | 22 (88.0) | 14 (56.0) |
| Large cell | 9 | 9 (100.0) | 5 (55.6) |
| Adenosquamous | 2 | 1 (50.0) | 1 (50.0) |
| Carcinoid | 2 | 2 (100.0) | 1 (50.0) |
| Mixed tumour | 1 | 0 | 1 (100.0) |
| Total | 134 | 123 (91.8) | 92 (68.7) |

Table 3 Comparison of cell types obtained by bronchial brushing and bronchial biopsy

| Bronchial biopsy | Bronchial brushing | | | | | | Total |
|------------------|--------------------|------------|----------------|------------|-----------|--------------|-------|
| | Squamous | Small cell | Adenocarcinoma | Large cell | Carcinoid | Unclassified | |
| Squamous | 119 | 4 | 11 | | | 3 | 137 |
| Small cell | 3 | 57 | 4 | | | 2 | 66 |
| Adenocarcinoma | 4 | | 9 | | | 1 | 25 |
| Large cell | 4 | 2 | 12 | 1 | | | 22 |
| Adenosquamous | | 1 | | 4 | | | 1 |
| Carcinoid | | | 1 | | | | 2 |
| Mucoepidermoid | 2 | | | | 1 | | 2 |
| Unclassified | 6 | | | | 2 | | 8 |
| Total | 138 | 64 | 54 | 6 | 2 | | 272 |

□ Same cell type.

Table 4 Comparison between bronchial brushing and final histological diagnosis

| Histological type | Bronchial brushing | | | | | | Total |
|-------------------|--------------------|------------|----------------|------------|-----------|--------------|-------|
| | Squamous | Small cell | Adenocarcinoma | Large cell | Carcinoid | Unclassified | |
| Squamous | 62 | | 2 | 1 | | 1 | 66 |
| Small cell | | 21 | 1 | | | 1 | 23 |
| Adenocarcinoma | 2 | 2 | 1 | | | | 22 |
| Large cell | 6 | 1 | | 1 | | 1 | 9 |
| Adenosquamous | 1 | | | | 2 | | 2 |
| Carcinoid | | | | | 3 | | 1 |
| Total | 71 | 24 | 20 | 3 | 2 | | 123 |

□ Same cell type.

Table 5 Comparison between bronchial biopsy and final histological diagnosis

| Histological type | Bronchial biopsy | | | | | | Total |
|-------------------|------------------|------------|----------------|------------|--------------|---|-------|
| | Squamous | Small cell | Adenocarcinoma | Large cell | Unclassified | | |
| Squamous | 50 | | | | 2 | | 52 |
| Small cell | 1 | | | | | 1 | 18 |
| Adenocarcinoma | 3 | 1 | 7 | | | 1 | 14 |
| Large cell | 1 | 2 | 1 | | | | 5 |
| Adenosquamous | 1 | | | | | | 1 |
| Carcinoid | | | | | 1 | | 1 |
| Mixed tumour | | | | | 1 | | 1 |
| Total | 56 | 20 | 8 | 3 | 5 | | 92 |

□ Same cell type.

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Table 6 Summary of cell typing accuracy with bronchial brushing and bronchial biopsy

| Histological type | Cell typing accuracy | |
|-------------------|----------------------|-------------|
| | Brushing No % | Biopsy No % |
| Squamous | 62 (93.9) | 50 (96.2) |
| Small cell | 21 (91.3) | 17 (94.4) |
| Adenocarcinoma | 17 (77.3) | 7 (50.0) |
| Large cell | 1 (11.1) | 1 (20.0) |
| Carcinoid | 2 (100.0) | |
| Total | 103 (83.7) | 75 (81.5) |

appearances suggestive but not diagnostic of malignancy were classified as negative.

We compared the diagnoses made from brushings and biopsy material in 443 cases, and compared these diagnoses with the final histological diagnosis made from the surgical or necropsy material in 134 cases.

Results

COMPARISON OF DIAGNOSTIC ACCURACY OF BRONCHIAL BRUSHING AND BRONCHIAL BIOPSY

The diagnoses made by brushing and biopsy of the 443 patients are compared in table 1. Of the 443 patients, 400 (90.3%) were classified as showing positive results by brushing, and 287 (64.8%) by biopsy. A combination of the two techniques yielded the highest percentage of positive diagnoses (93.7%). The final histological diagnosis of 134 patients is shown in table 2, with the number of cases in which brushing and biopsy material yielded the correct diagnosis of cell type.

Overall, a positive diagnosis was made in 272 cases by both techniques (table 1). A comparison of the cell types diagnosed is shown in table 3; there was agreement between the diagnoses in 200 cases (73.5%). A final histological diagnosis was obtained in 123 of the cases classified as positive by bronchial brushing. The diagnoses made by the two techniques and the accuracy of cell typing are indicated in table 4. A final histological diagnosis was available in 92 of the patients in whom the biopsy material had been classified as positive. The results obtained by the two techniques and the accuracy of cell typing are presented in tables 5 and 6.

A correct diagnosis was made on the brushing and biopsy specimens in over 90% of cases of squamous or small cell carcinoma. By contrast, the diagnostic accuracy in large cell carcinoma and in adenocarcinoma was 20% and 50% respectively.

Discussion

Three groups of workers have reported that bronchial

brushing and biopsy have similar diagnostic accuracy,²⁻⁴ whereas others have found that bronchial brushing is more likely than biopsy to give a positive result.^{1,6} This study also confirms previous reports suggesting that the yield of malignant cells is higher in squamous and small cell carcinoma than in other types of tumour.⁵ According to Lyall *et al*,⁶ where both techniques gave a positive result, the cell type was reported as the same in 80.4% of cases, a figure that is similar to ours.

Correct histological typing of lung cancer is important in clinical management and it is generally accepted that the cell type diagnosed from bronchial biopsy material will be an accurate reflection of the main tumour. In this investigation, however, the bronchial biopsy diagnosis agreed with the final diagnosis in 81.5% of cases overall; the corresponding figures for squamous and small cell carcinomas were 96.2% and 94.4%, but only 50% for adenocarcinoma and 20% for large cell carcinoma. Moreover, Payne *et al*⁵ found that in only 45% of squamous carcinomas diagnosed from biopsy specimens was the cell type confirmed by final histological diagnosis, although all of their small cell carcinomas were correctly categorised. Their figures for the correct diagnosis of adenocarcinoma and large cell carcinoma were 82% and 38% respectively. Hinson's group⁷ also investigated the accuracy of bronchial biopsy and found that 95% of their squamous carcinomas, 83% of small cell carcinomas, and 75% of adenocarcinomas but none of the large cell carcinomas had been correctly diagnosed.

Fibreoptic biopsy specimens are small and generally taken from one area. Furthermore, the degree of differentiation of the tumour may vary from place to place, and if no glandular component is found in a small biopsy specimen of an adenocarcinoma it may be reported as poorly differentiated squamous or large cell carcinoma. An accurate diagnosis of large cell carcinoma cannot be made from a small biopsy specimen, and necrotising tumours are often misdiagnosed as small cell carcinoma. Although Hinson *et al*⁷ stated that bronchial biopsy gives an accurate indication of the type of primary tumour, Chuang *et al*⁸ affirmed that if clearcut morphological criteria cannot be satisfied a diagnosis of "lung cancer, non-small cell type" should be made. Shure *et al*⁹ suggested performing three biopsies of the endobronchial lesion to achieve an optimal diagnostic yield, but to our knowledge no correlation between number of biopsy specimens and cell typing accuracy has been reported.

In brush specimens there was good agreement with the final diagnosis in small cell and squamous carcinoma, but large cell carcinomas and adenocarcinomas were often misdiagnosed. Other workers

have also encountered difficulties in the diagnosis of these last two variants of lung cancer.⁵⁻¹⁰ Metaplastic squamous cells in adenocarcinoma may be wrongly interpreted as squamous carcinoma, and conversely in squamous carcinoma the cells may be clustered and have large nucleoli, suggesting adenocarcinoma. The loosely coherent, pleomorphic cells of large cell carcinoma may also be mistaken for those of a squamous carcinoma, and sometimes the cells shed by polygonal small cell carcinomas give rise to similar problems.^{11,12}

We conclude that brushing and forceps biopsy have a similar cell typing accuracy, and the results of both must be taken into consideration in the management of individual cases. The diagnostic yield of bronchial brushing is higher than biopsy; a combination of the two techniques gives the highest percentage of positive diagnoses.

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