Bronchial Washings in the Diagnosis of Lung Cancer*

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Since Hempeln,1 in 1918, first reported tumor cells in the sputum of patients with lung cancer, a number of investigators2-4 have confirmed the value of cytological examination in the diagnosis of this disease. Using techniques developed by Papanicolaou,1 diagnosis of sputum cytology has been very accurate. Farber, et al.,8 reported 90 per cent accuracy in the positive diagnosis of lung cancer when five or more sputum specimens were examined. They also pointed out that this degree of accuracy declines sharply when the number of specimens is decreased. Despite the high degree of accuracy of diagnosis by sputum cytology, there remains a group of patients in whom other diagnostic techniques are necessary. This study was undertaken to determine the value of saline bronchial washings obtained at the time of bronchoscopy and to compare the incidence of positive sputum and bronchial washings with the ability to visualize the lesion bronchoscopically.

Methods and Materials

During the year 1959, 97 patients with proved bronchogenic carcinoma underwent bronchoscopy at the Roswell Park Memorial Institute. In all cases, bronchial washings were obtained at the time of bronchoscopy. A simple technique of instilling 5 cc. of isotonic saline solution into the appropriate bronchus, as indicated by the x-ray film examination, followed by aspiration and collection of as much of this material as possible, was utilized. The specimens were immediately taken to the Cytology Laboratory where a direct smear of the washings was made and, where possible, a cell block was prepared from the remaining material. Smears were stained by a modified Papanicolaou technique and were examined for tumor cells. Satisfactory samples were obtained in all cases. Only those specimens showing tumor cells were considered positive. That is to say, when atypical cells were found, the specimen was considered to be negative for tumor cells.

Sputum cytology studies were carried out in a large number of these same patients. Sputum was collected in fixative and a cell block prepared from the specimen. Three specimens was considered an adequate examination although a larger number would probably have yielded a higher incidence of positive findings. Many cases had inadequate sputum exam-

| TABLE 1—TUMOR CELLS IN BRONCHIAL WASHINGS ACCORDING TO POSITION OF LESION |
|---------------------------------|----------------|----------------|
|                                | Pos. Washings | Neg. Washings |
| Bronchoscopically Visible      | 28            | 22             |
| Not Bronchoscopically Visible  | 4             | 43             |
| Total                           | 32            | 65             |

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ination because the diagnosis was established by some other means, such as lymph node biopsy, before three specimens had been submitted for examination. Once the diagnosis was established, further sputum cytology was not done.

**Results**

The results are summarized in Table 1. It will be noted that in slightly more than one-half of the cases, it was possible to visualize the neoplastic lesion through the bronchoscope. This is a higher incidence than usually noted and may be a reflection of the advanced stage of disease of the majority of these patients. In 28 cases (56 per cent) tumor cells were found in the bronchial washings obtained at the time of bronchoscopy. However, in the 47 cases in which it was not possible to see the lesion via the bronchoscope, quite different findings were encountered. In only four of these cases were positive bronchial washings obtained. In three of the four with positive bronchial washings in the bronchoscopically not visible group, tumor cells were found in examinations of the sputum.

Sputum cytology was more productive of positive findings as can be seen in Table 2. In the group where it was not possible to visualize the lesion bronchoscopically, 14 of 24 patients (58.3 per cent) who had an adequate number of specimens studied were found to have tumor cells in the sputum. In the bronchoscopically visible group, 20 of 28 patients (71.4 per cent) adequately studied had positive sputum for tumor cells.

**Discussion**

The value of sputum cytology in the diagnosis of lung cancer has been well established. This study shows the incidence of positive sputa for tumor cells to be definitely greater in the more centrally occurring lesions if one uses bronchoscopic visualization as the measure of location. It is not surprising then that positive bronchial washings are much more common when the lesion is bronchoscopically visible. In the peripheral lesions, it would seem unlikely that the saline irrigant could reach the lesion with such force as to cause separation of cells. Cells which have been desquamated and lie free in the bronchus could be suspended in the saline solution and give a positive washing. However, if there are desquamated cells free in the bronchus, adequate sputum studies should yield a positive result.

The results would indicate that adequate sputum studies are superior to bronchial washings in the diagnosis of peripheral lung cancers. Since the incidence of positive washings is so low in the peripheral lesions, one must be extremely cautious in the interpretation of negative results. More than the usual number of sputum samples should be obtained in order to establish the diagnosis. The value of bronchoscopy in this disease is unquestioned. This is amply demonstrated by the large percentage of lesions which were bronchoscopically visible. However, bronchoscopy has its limitations, and one of these occurs when the lesion is peripherally located. It would appear from this study that the incidence of positive bronchial washings is sufficiently low that bronchoscopy undertaken for the sole purpose of obtaining washings is not indicated.

**SUMMARY**

1. Ninety-seven cases of proved bronchogenic carcinoma were bronchoscoped in a one-year period. Saline bronchial washings were obtained in all cases.

<table>
<thead>
<tr>
<th>TABLE 2—TUMOR CELLS IN SPUTUM ACCORDING TO POSITION OF LESION</th>
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<tbody>
<tr>
<td>Pos. Sputum</td>
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<td>Visible Bronchoscopically</td>
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<td>Not Visible Bronchoscopically</td>
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*Indicates diagnosis established before three sputum specimens were obtained.
2. Positive sputum for tumor cells was less frequent when the lesion was not bronchoscopically visible indicating the need for more extensive sputum studies in these cases.
3. Where the neoplastic lesion was not visible bronchoscopically, the yield of positive cytological findings in the saline washings was less than ten per cent.
4. Bronchoscopy, merely for the purpose of obtaining bronchial washings, does not appear to be justifiable.

RESUMEN
1. Noventa y siete casos de carcinoma broncogénico demostrado se sujetaron a broncoscopia en un año. Se obtuvieron lavados salinos bronquiales en todos los casos.
2. Los resultados positivos para células tumorales fueron menos frecuentes cuando la lesión no fue visible broncoscópicamente, lo que indica la necesidad de estudios de los esputos mas amplios en estos casos.
3. Cuando la lesión neoplásica no fue visible al broncoscopio el rendimiento de hallazgos positivos citológicos en los lavados salinos fue de menos de 10 por ciento.
4. La broncoscopia solo para obtener lavados bronquiales, no parece justificada.

ZUSAMMENFASSUNG
2. Sputum mit positivem Befund auf Tumorzellen war weniger häufig, wenn die Veränderung bronchoskopisch nicht sichtbar war. Daraus ergab sich die Notwendigkeit für intensive Sputumuntersuchungen dieser Fälle.
3. In denen der neoplastische Herd bronchoskopisch nicht sichtbar war, betrug die Anzahl positiver cytologischer Befunde in den Kochsalzlösungen weniger als 10%.
4. Eine Bronchoskopie mit dem ausschliesslichen Zweck Bronchialspülungen machen zu können, scheint nicht gerechtfertigt.

REFERENCES

CARDIAC RUPTURE AND HEMOPERICARDIUM
The incidence of myocardial rupture while rare is by no means a pathologic curiosity. The incidence at Touro Infirmary for a ten-year period was almost 1 per cent of all necropesies and 6 per cent of all necropesies of myocardial infarcts. The ratio of men to women in ruptured hearts is approximately one to one. Rupture is most apt to occur during the first week following infarction. In this series, 30 per cent occurred on the first day and 70 per cent occurred during the first week. No correlation between most drugs administered and rupture could be established except for antiadrenergic therapy which was probably associated with an increased incidence of rupture. Persistent hypertension and exertion are definitely more common in the ruptured group.