Diagnosis of Tuberculosis: Routine Cultures of Bronchial Washings Are Not Indicated*

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During a five-year period, cultures of bronchial washings for Mycobacterium tuberculosis were obtained almost routinely (859 of 1,012 bronchoscopic examinations). This practice proved costly, and the diagnostic yield was extremely low. Only three cases were diagnosed solely by this method (0.35 percent). Five other cases were false-positive. Additionally, 39 patients with known active pulmonary tuberculosis had false-negative cultures of bronchial washings; 13 of these 39 patients were receiving antituberculosis drugs at the time of their bronchoscopic examinations. The inhibitory effect of local anesthetics upon the growth of M tuberculosis is the possible cause for the remaining 26 false-negative cultures. We conclude that bronchoscopic examination and culture of bronchial washings are not the best sources for diagnosis of pulmonary tuberculosis and that cultures of sputum and/or gastric washings are usually sufficient. The practice of obtaining routine cultures of bronchial washings in known pulmonary tuberculosis is of questionable value, when nearly two-thirds may be false-negative.

It is the purpose of this report to analyze critically the routine practice of sending an aliquot of bronchial washings for culture for M tuberculosis without regard to the probability that the patient undergoing bronchoscopic examination may have pulmonary tuberculosis, as was our practice during the years 1969 through 1974. This practice seemed logical since the incidence of tuberculosis in Detroit is two and one-half times the national average, and since we saw approximately 85 new cases of tuberculosis at Henry Ford Hospital each year of the study. This report is a retrospective review of the results of culture of bronchial washings for M tuberculosis during this five-year period, and analyzes the use of such cultures in the diagnosis and management of tuberculosis.

Materials and Methods

Consecutive bronchoscopic examinations (1,012) performed by the Division of Pulmonary Medicine at Henry Ford Hospital between June 23, 1969 and February 28, 1975 were reviewed. Bronchial washings were obtained by lavage with nonbacteriostatic normal saline solution and were cultured on three different media (Lowenstein-Jensen, Gruft, and Petragnani) for M tuberculosis in 859 procedures (84.9 percent).

Most of the examinations were performed with a flexible fiberoptic bronchoscope via the nose, mouth, or a previously placed endotracheal tube with the patient in the supine position. A maximum of 30 ml of 2 percent lidocaine was used to anesthetize nose, pharynx, larynx, and tracheobronchial tree.

Results

Cultures of the bronchial washings were positive for M tuberculosis in 18 of the 859 patients (2.1 percent). None was positive for atypical mycobacteria. Review of the 859 patients also revealed that 57 patients had positive cultures for M tuberculosis from sputum, gastric washings, lung tissue, pleural fluid or pleural biopsies. Thirty-nine of these 57 patients had a negative bronchial washing culture for M tuberculosis, a false-negative rate of 68 percent. Thirteen of these 39 patients were receiving antituberculosis drugs at the time of their bronchoscopic examinations.

Ten of the 18 patients whose cultures of bronchial washings grew M tuberculosis also grew acid-fast bacilli from other sources. The organism grew from sputum in eight, from pleural fluid in one, and from both sputum and lung tissue in one. In only eight patients (0.9 percent) were bronchial washings the only source of a positive culture. Table 1 consolidates the pertinent data from these eight patients.

The first two patients listed in Table 1 definitely had pulmonary tuberculosis; the third patient is also considered to have a true-positive culture. Five of the patients listed in Table 1 (4 through 8) are considered to have false-positive cultures from the...
Table 1—Patients with Bronchial Washings As the Only Positive Culture for M tuberculosis

<table>
<thead>
<tr>
<th>Patient, Age (Years)</th>
<th>Sput/GW* Before</th>
<th>Sput/GW* After</th>
<th>Growth from BW†</th>
<th>Skin Test PPD</th>
<th>Control</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 60</td>
<td>1</td>
<td>4</td>
<td>1+</td>
<td>(Pos)**</td>
<td>—</td>
<td>Known TB in 1929</td>
</tr>
<tr>
<td>2, 67</td>
<td>0</td>
<td>0</td>
<td>Few</td>
<td>Pos</td>
<td>—</td>
<td>Middle lobe syndrome; failed to consider TB</td>
</tr>
<tr>
<td>3, 77</td>
<td>0</td>
<td>0</td>
<td>Few</td>
<td>Neg</td>
<td>Pos</td>
<td>COPD with respiratory insufficiency, pleural effusion; died 5 days after bronchoscopic myopericardial infarction</td>
</tr>
<tr>
<td>4, 74</td>
<td>0</td>
<td>3</td>
<td>1+</td>
<td>Pos</td>
<td>—</td>
<td>No clinical or roentgenographic evidence of TB</td>
</tr>
<tr>
<td>5, 76</td>
<td>0</td>
<td>3</td>
<td>4+</td>
<td>Neg</td>
<td>Pos</td>
<td>No clinical or roentgenographic evidence of TB</td>
</tr>
<tr>
<td>6, 47</td>
<td>9</td>
<td>4</td>
<td>3+</td>
<td>Neg</td>
<td>Pos</td>
<td>Simple lung abscess; no pathologic evidence of TB at lobectomy</td>
</tr>
<tr>
<td>7, 64</td>
<td>0</td>
<td>0</td>
<td>Few</td>
<td>Neg</td>
<td>Pos</td>
<td>No clinical or roentgenographic evidence of TB</td>
</tr>
<tr>
<td>8, 59</td>
<td>2</td>
<td>1</td>
<td>1+</td>
<td>Neg</td>
<td>Pos</td>
<td>No clinical or roentgenographic evidence of TB</td>
</tr>
</tbody>
</table>

*Number of negative sputum specimens or gastric washings obtained in the two weeks before or after bronchoscopic examination.

**Assumed to be positive because of her well documented history of tuberculosis.

†False-positive cultures for bronchial washings.

bronchial washings. Four of them had negative tuberculin skin tests with positive controls; and there was no clinical or roentgenographic evidence of tuberculosis in any except for patient 6 who was proved to have a simple lung abscess at the time of lobectomy. All of these five patients were followed-up for at least two years after the positive culture for M tuberculosis was discovered, and none developed any clinical or roentgenographic manifestations of pulmonary tuberculosis.

DISCUSSION

Sahn and Neff used bronchial brushings or post-brushing sputum to establish a diagnosis in five of 40 patients with miliary tuberculosis. Several other authors have noted a 5.5 percent incidence (25 of 454) of tuberculosis among patients undergoing bronchoscopic examination, which is nearly the same incidence as in our series (57 of 859; 6.6 percent) (Table 2). However, in our series, only 18 of these 57 patients had positive cultures which came from bronchial washings. The practice of routine cultures of bronchial washings in known pulmonary tuberculosis is thus of questionable value when nearly two-thirds may be false-negative.

There are other reports which note that cultures of bronchial aspirates often give false-negative results among patients with pulmonary tuberculosis (Table 3). False-negative cultures may be due to the inhibitory effect of local anesthetics on the growth of M tuberculosis, as bronchial aspirates may contain up to 1 percent lidocaine.

Table 3—Cultures of Bronchial Aspirates Among Patients with Pulmonary Tuberculosis

<table>
<thead>
<tr>
<th>Reference</th>
<th>No. Patients</th>
<th>No. Positive (%)</th>
<th>No. Negative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pecora and Yegian</td>
<td>33</td>
<td>28 (85)</td>
<td>5 (15)</td>
</tr>
<tr>
<td>Tevola</td>
<td>88</td>
<td>62 (70)</td>
<td>26 (30)</td>
</tr>
<tr>
<td>Steen</td>
<td>72</td>
<td>54 (75)</td>
<td>18 (25)</td>
</tr>
<tr>
<td>MacRae et al</td>
<td>109</td>
<td>72 (66)</td>
<td>37 (34)</td>
</tr>
<tr>
<td>Jett et al</td>
<td>32</td>
<td>28 (85)</td>
<td>5 (15)</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>18 (32)</td>
<td>39 (68)</td>
</tr>
</tbody>
</table>

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Schmidt and Rosenkranz\textsuperscript{14} studied the effects of lidocaine on ten different strains of \textit{M tuberculosis} and found that most strains were inhibited by a concentration of 0.5 percent; only one strain was able to grow (in reduced numbers) in 1 percent lidocaine. We believe that our use of lidocaine accounts, in part, for the low recovery rate of tubercle bacilli from bronchial washings among our patients with positive sputum or gastric washings.

Among the 18 patients with positive cultures of bronchial washings, there were eight patients whose only positive cultures for \textit{M tuberculosis} came from the bronchial washings. The number of colonies was small in five, and the possibility of contamination or errors in the handling of laboratory specimens exists. MacGregor and co-workers\textsuperscript{15} have recommended that a single specimen with a small colony count of \textit{M tuberculosis} should not be taken as unequivocal evidence of tuberculosis unless it is supported by clinical and roentgenographic evidence, or confirmed by a second positive culture. Six of the eight patients in our series whose only positive culture was from the bronchial washings had a sufficient number of sputum specimens or gastric washings obtained within two weeks of bronchoscopic examination to assure an 88 percent chance of having a culture positive for \textit{M tuberculosis}, if indeed they had tuberculosis\textsuperscript{16}.

From a cost-effective point of view, we made only three additional diagnoses of pulmonary tuberculosis among the 859 patients cultured routinely for \textit{M tuberculosis}. Thus, each diagnosis would cost $5,726.67 for the cultures alone (at a charge of $20.00 for each tuberculosis culture), assuming that bronchoscopic examinations would have been done anyway for other clinical purposes.

Bronchial washings should not be \textit{routinely} cultured for tubercle bacilli. In our series, 98 percent of such cultures were negative and we see two major problems with \textit{routine} bronchial washings cultures. Of the positive bronchial washings cultures in our series, five of 18 (28 percent) proved to be false positive. Conversely, in cases of pulmonary tuberculosis proven culture-positive by other techniques, cultures of bronchial washings are falsely negative in up to two-thirds of the cases. If the clinical diagnosis is tuberculosis, then cultures of sputum and/or gastric washings are sufficient. Treatment for tuberculosis can be started even when the sputum or gastric washing smears are negative with the expectation that the cultures will confirm the diagnosis in due time. However, this does not mean that bronchial washings or brushings should never be cultured for \textit{M tuberculosis}. If there are other reasons for bronchoscopic examination and the clinical or roentgenographic picture suggests the possibility of tuberculosis, then culture of the bronchial washings for tubercle bacilli may be successfully performed if technical procedures are modified. The inhibitory effect of local anesthetics upon the growth of tubercle bacilli dictates the use of the smallest possible dose when one contemplates culturing an aliquot of the bronchial washings for \textit{M tuberculosis}.

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\textbf{REFERENCES}