Pulmonary Tuberculosis with Negative Findings on Chest X-ray Films: A Study of 40 Cases*

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Forty cases of active pulmonary tuberculosis with chest x-ray films read as negative are described. The diagnoses were made by positive sputa and gastric cultures using the acetylcysteine method of digestion. The public health implications are emphasized.

A positive diagnosis of active pulmonary tuberculosis can be made only on obtaining a positive sputum or gastric culture for M tuberculosis. The chest x-ray film and tuberculin skin test1 have been used as screening methods. During the third year after the introduction of the acetylcysteine method of digestion at our facility,* 40 cases of active tuberculosis with chest x-ray films read as negative were discovered.

**Materials and Methods**

In 40 patients where suspicion of pulmonary tuberculosis was present, although chest x-ray pictures were read as negative, sputum and/or gastric cultures were positive. In this study all specimens were analyzed using 2 percent sodium hydroxide plus acetylcysteine as the digestant.2 Previously, strong alkalis such as 4 percent sodium hydroxide had been used as the digestant which resulted in few positive cultures where the chest x-ray films gave negative findings. These 40 patients were placed in six clinical categories as seen in Table 1. There were 327 patients in the same categories whose cultures remained negative. All patients were called from 2,016 outpatient visits during the year of the study. A representative case is presented to illustrate each group.

**Case Reports**

**Case 1, Convertor**

A 54-year-old woman employee had a negative 5 TU PPD-S skin test in October, 1966. One year later a repeat skin test was positive, while at the same time PA chest films (Fig 1) and apicogram were interpreted as normal. A sputum culture, however, grew out nonchromogenic acid-fast mycobacteria. Isoniazid was then administered for one year. On January 18, 1968, the chest x-ray picture was still negative.

**Case 2, Pleural Effusion**

A 52-year-old man who worked on our tuberculosis ward developed a positive 5 TU PPD-S skin test in August, 1961. Subsequently, he was admitted to the Bronx Veterans Administration Hospital with pleural effusion, and a pleural biopsy showed tubercles with giant cells. After 20 months of therapy, INH and PAS were discontinued. Chest x-ray film at that time showed only left ventricular enlargement. Several years later, in August, 1967 he had a positive sputum culture for nonchromogenic acid-fast mycobacteria. A chest x-ray film at that time was again unchanged (Fig 2).

**Case 3, Symptomatic**

A 44-year-old man was admitted in May, 1966, for evaluation of back pain. He had a two-year history of hemoptysis. Chest x-ray film (Fig 3) and apicogram were negative but acid-fast mycobacteria were seen on sputum smear and cultures grew out nonchromogenic acid-fast mycobacteria. He was placed on INH and PAS. Chest x-ray film taken in March, 1967, continued negative.

**Case 4, Rapid Resolution**

A 70-year-old man patient was seen in February, 1966,

**Table 1—Patients with Negative Chest X-ray Films.**

<table>
<thead>
<tr>
<th>Clinical Groups</th>
<th>Patients with Positive Cultures</th>
<th>Patients with Negative Cultures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Convertors</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>2 Pleural effusions</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>3 Symptomatic</td>
<td>8</td>
<td>89</td>
</tr>
<tr>
<td>4 Rapid resolution</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>5 Post surgery</td>
<td>5</td>
<td>62</td>
</tr>
<tr>
<td>6 Old healed cases</td>
<td>14</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>327</td>
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*The US Public Health Service Hospital, Staten Island, New York, is a 650 bed general hospital with a 30 bed tuberculosis unit housing the active patients. Over 2,000 visits are made annually in the outpatient medical chest clinic. The patients in this study were in the outpatient setting and came from tuberculous and nontuberculous medical and surgical referrals.
with fever and pleuritic chest pain. A chest x-ray picture at that time was interpreted as demonstrating right middle lobe densities (Fig 4). Sputum cultures were negative for AFB. He was treated with penicillin and improved clinically. Five months later a chest film (Fig 5) was interpreted as negative but sputum and gastric cultures grew out nonchromogenic Acid-fast mycobacteria. Antituberculosis therapy was then started.

Case 5, Post surgery

A 35-year-old Coast Guardsman had the superior segment of his right lower lobe resected in May, 1963 for cavitary tuberculosis disease and was treated with INH for two years post surgery. Nineteen months after cessation of therapy, in December, 1966 (Fig 6), he had a positive culture, and x-ray pictures taken then and seven months later were interpreted as showing only thoracotomy changes, stable for two years.

Discussion

Chest x-ray films alone cannot be relied upon exclusively to discover all cases of pulmonary tuberculosis. Schmidek and Hardy\(^3\) reported eight cases of pulmonary tuberculosis with normal findings on chest x-ray films. Skin testing is also a most useful mass screening method. Where the index of suspicion is high, however, positive cultures for \textit{M tuberculosis} are the only positive proof of active
disease. A study at our facility compared the results of 2 percent sodium hydroxide plus acetylcysteine versus 4 percent sodium hydroxide digestion of 258 split sputum specimens. As seen in Table 2 the acetylcysteine method detected acid-fast bacteria in stained smears 3½ times as often as the older 4 percent sodium hydroxide method. Positive acid-fast bacterial cultures were obtained three times as often using the acetylcysteine method. The effectiveness of this method is obvious in the many positive cultures obtained with no x-ray evidence of active disease. Rarely had positive cultures for acid-fast bacilli been obtained in this outpatient population in the five years preceding this study.

This study has shown that in selected categories of patients, positive cultures are frequently obtained, even in the presence of virtually negative chest x-ray films. If a patient is tuberculin positive and falls within the categories described, several sputum and gastric cultures should be obtained for acid-fast bacilli. The presence of a negative chest film does not rule out the possibility of active pulmonary tuberculosis. The use of the acetylcysteine method will lead to an earlier diagnosis of tuberculosis with obvious clinical and public health advantages.

References
1 Zack MB, Fulkerson LL: Clinical reliability of stabilized and nonstabilized tuberculin PPD. Amer Rev Resp Dis 102:91, 1970

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