Anterior Segment Upper Lobe Tuberculosis in the Adult*

Occurrence in Primary and Reactivation Disease

David Spencer, M.D.; Rauf Yagan, M.D.; Richard Blinkhorn, M.D.; and Philip J. Spagnuolo, M.D., F.C.C.P.

Nine patients with pulmonary tuberculosis involving predominantly or exclusively the anterior segment of one or both upper lobes were seen over a five-year period. The incidence of anterior segment upper lobe tuberculosis was 6.3 percent of 142 patients presenting with pulmonary tuberculosis during the same time period. Five of the nine patients with anterior segment upper lobe involvement had reactivation disease. An increased incidence of advanced age, diabetes, associated malignant neoplasms, alcoholism, and steroid use were noted in those patients with anterior segment involvement, although only the occurrence of diabetes was statistically significant. We suggest vigilance with regard to the diagnosis of tuberculosis in patients who are elderly, diabetic, or alcohol abusers, particularly where the roentgenographic appearance of anterior segment upper lobe involvement would tend to favor an alternative diagnosis. (Chest 1990; 97:384-86)

Roentgenographic localization of adult reactivation pulmonary tuberculosis to the anterior segment of either or both upper lobes rarely has been reported in the recent literature. This is contrary to reports of childhood or adult primary pulmonary tuberculosis in which disease is not uncommonly described in this location.1-3 In a series of 142 adults with pulmonary tuberculosis seen over a five-year period at this institution, nine patients were noted to have an initial radiologic lesion localized either solely or predominantly to the anterior segment of either or both upper lobes. Five of these patients had evidence of postprimary or reactivation tuberculosis. This report demonstrates that upper lobe anterior segment infiltrates may occur in adult pulmonary tuberculosis, including reactivation forms of the disease.

Materials and Methods

Records of patients attending the Cleveland (Ohio) Metropolitan General Hospital during the five-year period (July 1983 to June 1988) were evaluated. Patients were included in the study if they had a positive culture for Mycobacterium tuberculosis from specimens of sputum, bronchial washings, or lung biopsy. The charts and roentgenograms of 142 patients were reviewed. Of this group, 56 patients had disease localized to the upper lobes only. Further review of the latter group by two investigators, including a senior radiologist (R.Y.), categorized the extent of roentgenographic disease to segments of the right upper lobe (anterior, posterior, or apical segments) or left upper lobe (anterior or apico-posterior segments). Case histories were reviewed to ascertain the frequency of advanced age (older than 65 years), diabetes mellitus, chronic alcoholism, corticosteroid usage, and concurrent or recent malignant neoplasm.

Results

Of the 142 patients in the study group, 93 were men and 49 were women. Twenty-nine patients (20.4 percent) were 65 years of age or older, while 62 (43.6 percent) were between 40 and 65 years; 51 patients (36 percent) were younger than 40 years.

Disease exclusive to the upper lobes was found in 56 (39 percent) of the 142 patients. A further 63 patients (44 percent) had disease involving upper lobes and either middle, lingular, or lower lobes. Only 23 patients had either miliary disease or lesions located in lung fields other than the upper lobes. The segmental localization of lesions in patients with upper lobe disease is shown in Table 1. Involvement of either the posterior or apical segments of the right upper lobe was at least twice as common as involvement of the anterior segment of that lobe. Apico-posterior disease of the left upper lobe was at least four times more likely to occur than disease affecting the anterior segment of that lobe. The right anterior segment was involved almost twice as often as the left anterior segment.

Of the 56 patients with disease involving only the upper lobes of the lung, nine had disease predominantly localized to the anterior segment of the upper lobe. Considered in the context of the entire group of 142 patients, predominant involvement of the upper lobe anterior segment occurred in nine (6.3 percent) of 142 patients. Of this group of nine patients, disease restricted to the anterior segment was noted in four (patients 1 through 4, Table 2). This result represented...
Table 1—Roentgenographic Distribution of Pulmonary Tuberculosis within the Upper Lobes in Adult Patients*

<table>
<thead>
<tr>
<th>Year</th>
<th>Upper Lobe†</th>
<th>Lesions Confined to Upper Lobe Only</th>
<th>Right Upper Lobe</th>
<th>Left Upper Lobe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>RAS</td>
<td>RPS</td>
</tr>
<tr>
<td>1983</td>
<td>14</td>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>1984</td>
<td>32</td>
<td>12</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>1985</td>
<td>24</td>
<td>14</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>1986</td>
<td>19</td>
<td>12</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>1987</td>
<td>13</td>
<td>7</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>1988</td>
<td>17</td>
<td>6</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>n</td>
<td>119</td>
<td>56</td>
<td>31</td>
<td>72</td>
</tr>
</tbody>
</table>

*Abbreviations: RAS = right anterior segment; RPS = right posterior segment; RAPs = right apical segment; LAS = left anterior segment; and LAPS = left apico-posterior segment.
†Includes all patients with disease of upper lobes with or without other lobe involvement (n = total number).

and incidence of 7 percent of patients with upper lobe involvement (four of 56) or 2.8 percent of all patients (four of 142). The infiltrates observed were either dense consolidations (two patients) or nodular masses (two patients, Fig 1). Minimal adjacent disease of one other upper lobe segment was present in a further five patients (patients 5 through 9; Table 2 and Fig 2). The incidence of both isolated and predominant anterior segment disease was 16 percent of patients with upper lobe involvement (nine of 56). Interestingly, the anterior segment of the left upper lobe was involved in two patients only, whereas all nine patients had involvement of the right anterior segment of the upper lobe.

Where sufficient data were available, an attempt was made to distinguish between primary-onset and reactivation forms of tuberculosis in patients with anterior segment disease. In only three of our patients was information available regarding previous skin test status. Another three patients who had been healthy previously were known to have had recent exposure to a family member with active pulmonary disease. Five of the patients had either a history of distant past exposure or roentgenographic evidence suggesting old apical tuberculosis with or without calcified hilar adenopathy. Patients 1, 2, 5, 6, and 7 (Table 2) were believed to have case histories and roentgenographic findings compatible with prior exposure to tuberculosis. However, patients 3, 4, 8, and 9 in all likelihood had adult-onset primary tuberculosis.

The incidence of associated conditions differed between patients with anterior segment disease and all other patients (Table 3). The incidence of alcohol abuse, advanced age, diabetes, concurrent malignant neoplasm, or steroid use was increased in patients who presented with anterior segment disease. On further analysis, however, only the incidence of diabetes was significantly greater in the group with anterior segment disease. None of the group with anterior segment disease had features suggestive of human immunodeficiency virus (HIV)-related syndromes. Only one of these patients (patient 3) had a history of intravenous drug abuse. The HIV serologic test was negative in this instance. Of the group of 142 patients, seven were known to be intravenous drug abusers. Three of these had concomitant diagnoses of the acquired immunodeficiency syndrome (AIDS). It is likely that this represents underrecording of the

Table 2—Clinical Features and Roentgenographic Localization of Anterior Segment Tuberculosis*

<table>
<thead>
<tr>
<th>Patient No./ Age, y/Sex</th>
<th>Underlying Diseases</th>
<th>Cultures Positive for MTB</th>
<th>Disease Type</th>
<th>Roentgenographic Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/56/M</td>
<td>Alcoholism, diabetes</td>
<td>Sputum</td>
<td>Reactivation</td>
<td>RAS nodular mass (Fig 1)</td>
</tr>
<tr>
<td>2/77/F</td>
<td>Diabetes</td>
<td>Lung</td>
<td>Reactivation</td>
<td>RAS nodular mass</td>
</tr>
<tr>
<td>3/28/M</td>
<td>IVDA</td>
<td>Sputum</td>
<td>Primary</td>
<td>Bilateral anterior segment consolidation</td>
</tr>
<tr>
<td>4/77/M</td>
<td>COPD</td>
<td>Sputum</td>
<td>Primary</td>
<td>Bilateral anterior segment nodular infiltrates</td>
</tr>
<tr>
<td>5/35M</td>
<td>Alcoholism</td>
<td>Sputum</td>
<td>Reactivation</td>
<td>RAS and minimal RPS infiltrates (Fig 2)</td>
</tr>
<tr>
<td>6/84/F</td>
<td>Rheumatoid arthritis, receiving corticosteroids</td>
<td>Sputum</td>
<td>Reactivation</td>
<td>RAS and minimal RAPs infiltrates</td>
</tr>
<tr>
<td>7/72/M</td>
<td>Alcoholism, adenocarcinoma of lung</td>
<td>Sputum</td>
<td>Reactivation</td>
<td>RAS and minimal RPS infiltrates</td>
</tr>
<tr>
<td>8/34/M</td>
<td>None</td>
<td>Sputum</td>
<td>Primary</td>
<td>RAS and minimal RPS infiltrates</td>
</tr>
<tr>
<td>9/27/F</td>
<td>None</td>
<td>Sputum</td>
<td>Primary</td>
<td>RAS and minimal RPS infiltrates</td>
</tr>
</tbody>
</table>

*Abbreviations: RAS = right upper lobe anterior segment; RAPs = right apical segment; RPS = right posterior segment; IVDA = intravenous drug abuse; MTB = Mycobacterium tuberculosis; and COPD = chronic obstructive pulmonary disease.
Figure 1. Chest roentgenogram of patient 1 demonstrating a nodular mass in the anterior segment of right upper lobe. Left, posteroanterior view; right, lateral view.

Association as HIV serologic tests were not performed routinely during the early years of the present study.

Discussion

A number of reports over recent years have drawn
attention to the unusual roentgenographic presentations of pulmonary tuberculosis. With few exceptions, these reports have given little attention to tuberculous involvement of the anterior segment of the upper lobes. Anterior segment involvement is relatively common in primary disease of childhood, but it is less frequent in adulthood. Moreover, anterior segment disease, when apparent in the adult, is generally understood to signify "recent infection," ie, adult-onset primary tuberculosis. Unfortunately, the reports documenting anterior segment disease have, with the exception of that of Woodring et al, seldom differentiated between primary and reactivation disease.

The present study noted an overall incidence of localized anterior segment involvement in 6.3 percent of patients. However, approximately half of this number actually had additional (though roentgenographically minimal) disease in a single adjacent upper lobe segment. If these cases are excluded, four patients of the 142 had truly focal anterior segment disease, an incidence of 2.8 percent. The latter corresponds with incidence rates of 2 percent, 3.9 percent, and 1.8 percent in previous studies. An equal number of patients with isolated anterior segment involvement had primary and reactivation disease. When considered in the context of all cases exclusively involving the upper lobes, focal anterior segment disease occurred with an incidence of 7.1 percent and predominant anterior segment disease occurred in 16 percent of patients.

The persistence of reports detailing difficulties in the expeditious diagnosis of pulmonary tuberculosis supports the current preoccupation with unusual roentgenographic features of the disease. Furthermore, it has been suggested that there is greater difficulty in demonstrating the presence of tubercle bacilli from secretions of patients with unusual roentgenographic disease. Focal lesions such as tuberculosis may not be expected to shed large numbers of bacilli into the bronchial tree. Failure to demonstrate the presence of acid-fast bacilli from respiratory secretions in patients with lower lobe and supposedly "stable" upper lobe disease has been regarded as evidence of a low bacillary burden. Little difficulty in arriving at the diagnosis of tuberculosis was encountered with the group of patients with anterior segment involvement described in this report. Bacilli were readily demonstrated in sputa in all but one who required an open lung biopsy. Indeed, this patient (case 2) was noted on bronchoscopy to have occlusion of the orifice of the right anterior segment bronchus and had endobronchial tuberculosis on open biopsy. In keeping with a number of reports on endobronchial tuberculosis, findings from sputum examination were repeatedly negative.

Impaired host immunity has been regarded as a predisposing factor in the reactivation of tuberculosis in adult life. Classically, tuberculosis has been reported to occur more commonly during old age, diabetes, renal failure, corticosteroid therapy, malignancy, and chronic alcoholism. More recently the associations have broadened to include AIDS. Whether these associations also foster the development of tuberculosis at unusual roentgenographic sites in the lungs is not entirely clear. Unusual roentgenographic presentations, particularly involving the lower lobes, have been described in pregnancy, diabetes, and advanced age. However, Hadlock et al and Shachor et al were not able to confirm an association of diabetes mellitus and unusual roentgenographic tuberculosis. No cases of diabetes were described in two widely quoted reports of lower lobe disease.

Lower lobe disease was found in these two latter reports to be more commonly associated with younger patients, specifically below the age of 40 years. The association of unusual roentgenographic disease with advanced age has also been questioned in two recent studies. Indeed, the increased occurrence of "unusual" disease at an earlier age was believed to reflect progression of primary tuberculosis and as such, was not necessarily unexpected. Hadlock et al suggest that the increased reporting of unusual roentgenographic appearances actually represents the increased frequency of primary disease within the adult population. Reports of patients with AIDS having concomitant pulmonary tuberculosis have drawn attention to the frequent occurrence of unusual radiologic disease. Several of these patients have had solitary anterior segment infiltrates. Unusual roentgenographic disease in this group may well be a manifestation of recently acquired infection, ie, primary disease.

Tuberculous disease of the anterior segment, while
previously reported infrequently, is nevertheless well documented. Most often anterior segment disease has been reported as a manifestation of primary disease. However, our cases demonstrate that anterior segment disease may be found in reactivated states as well. Why tuberculosis should choose to reactivate in this area of the lung is unclear; its rarity might suggest an element of randomness. It may be a manifestation of spread from less visible primary disease in the apical and/or posterior segment, regions of the lung more frequently associated with reactivation disease. Some cases are undoubtedly examples of endobronchial tuberculosis. This condition has been associated with reactivation cavitary disease, although more recent studies have suggested an association with primary disease as well.19

The importance of the unusual roentenogragic localization of tuberculosis lies in its potential to be overlooked in the pursuit of an alternative diagnosis, particularly malignant neoplasms. In fact, several textbooks of infectious diseases and pulmonary diseases suggest that anterior segment postprimary tuberculosis is a "rare" phenomenon. An overall incidence of 6.3 percent of all patients in our series would suggest a more frequent occurrence than previously appreciated. While our study does not confirm unequivocally a link between anterior segment disease and advanced age and alcoholism, the association with diabetes appears to be significant. It would seem prudent to advise particular vigilance with regard to the exclusion of tuberculosis in any patient with anterior segment roentenogragic changes, particularly where diabetes, advanced age, and alcoholism may coexist.

ACKNOWLEDGMENTS: The authors thank Emanuel Wolinsky M.D., for his critical review of the manuscript and Kristy Fouz for her secretarial assistance.

REFERENCES

5. Miller WT, MacGregor RR: Tuberculosis: frequency of unusual radiographic findings. AJR 1978; 130:867-75
32. Fraser RG: Pare JAP: Diagnosis of diseases of the chest, 2nd ed. Philadelphia: WB Saunders Co; 1978:743