MEDICAL PRACTICE

Contemporary Themes

Surveillance of Elderly Hospital Patients for Pulmonary Tuberculosis

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Summary

A retrospective study of pulmonary tuberculosis in a general hospital showed that the diagnosis had been frequently overlooked in the middle-aged or elderly because the patient also suffered from a more acute condition which preoccupied the attention of the doctor. The commonest error was to discount chest x-ray abnormalities by omitting sputum culture or serial radiography.

Surveillance was carried out on all patients aged 60 or over admitted to a large general hospital whose routine chest radiograph showed signs of possible pulmonary tuberculosis whether apparently active or inactive. Three sputum samples from each patient were examined for *Mycobacterium tuberculosis* without reference to the clinical presentation. In a nine-month period six out of 81 patients proved to have active pulmonary tuberculosis (7.4%). It is suggested that this may be a useful method of screening the elderly hospital population for pulmonary tuberculosis.

Introduction

Admission to a general hospital should ensure the prompt diagnosis and effective treatment of any case of tuberculosis even if previously unsuspected, but recent experience in Britain has shown that the diagnosis may be delayed or over-

looked for a variety of reasons.¹ These include, in particular, a mistaken diagnosis of chronic bronchitis or carcinomatosis in old people, failure to appreciate the possibility of atypical forms of the disease among immigrants or the elderly, and clinical omissions in the recognition or investigation of chest x-ray abnormalities. In general, there is a widespread but mistaken belief that the disease is rare.

Such considerations led us to investigate our own experience with cases of pulmonary tuberculosis admitted to a general hospital with the dual purpose of seeking evidence and explanations for delays or failure in diagnosis and testing a screening programme designed to identify hospital patients with the disease.

Methods

The study was divided into two parts. The first part was a retrospective investigation of the case histories of 30 patients admitted as emergencies to a general medical unit between September 1969 and September 1972. In each one a diagnosis of active pulmonary tuberculosis had been made by identifying *Mycobacterium tuberculosis* in the sputum, either on direct microscopical examination or by culture, associated with radiological changes of tuberculosis in the lungs. A synopsis of the usual clinical data was recorded, including the diagnoses, the presenting symptoms and signs, concurrent diseases, past history, social background, radiological and haematological findings, and any other abnormalities observed. Special attention was paid to bacteriological or radiological investigations which had been carried out during the year leading up to the admission under our care. These data were scrutinized for errors or omissions which might have led to diagnostic delay.

The second part of the study was designed to identify cases of active pulmonary tuberculosis among all patients over 60 years of age admitted to the wards of the hospital

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between October 1972 and June 1973 for whom a chest radiograph had been requested by the attending consultant. A record card was completed by the radiologist whenever he inspected and reported on a chest radiograph from among this group of patients which showed changes that, in his opinion, might be due to present or past tuberculosis. The site and nature of the abnormalities were briefly tabulated, but the question of "activity" was not considered. The completed cards were collected daily, and without reference to the patients' clinical state three sputum specimens were obtained from each on three successive mornings and sent for routine laboratory examination (microscopy and culture). A positive diagnosis was recorded if acid-alcohol-fast bacilli were seen on direct microscopy or if colonies of *M. tuberculosis* were observed after culture for six weeks.

Results

RETROSPECTIVE STUDY

Among the 30 patients studied retrospectively, men outnumbered women by three to one. There was also a preponderance of old people, nearly two-thirds being over 60 and one-third over 70 years of age; only four were under 40 years.

The clinical picture in this study was indistinguishable from the classical one of productive cough, shortness of breath, chest pain (usually pleuritic), haemoptysis mainly confined to the younger patients, and systemic symptoms of fever, weakness, anorexia, and weight loss. A prominent feature was the frequency with which other diseases, usually more acute ones, appeared to overshadow the tuberculosis. Of the 26 patients over 40, 17 were suffering from one or more other illnesses, including chronic bronchitis in nine (often complicated by respiratory failure or cor pulmonale), diabetes mellitus in four, cardiovascular diseases such as stroke and myocardial infarction in three, rheumatoid arthritis in two, renal failure in one, severe megaloblastic anaemia in one, and hypopituitarism in one.

The illness was fatal in eight of the 30 patients (27%), pulmonary tuberculosis being the major cause of death in one patient and an important contributory cause in the remainder. Four patients died before the diagnosis had been made and three within three months of starting antituberculous therapy. Errors or omissions leading to delay in the diagnosis of active tuberculosis were recognized in eight of the 30 patients (27%). They fell into three categories: failure to arrange a chest radiograph (one incident); failure to arrange sputum culture or serial radiographs in a patient with an abnormal radiograph (five incidents); and failure to take note of a positive sputum culture (three incidents). These examples are given as illustrations:

Case 1.—A 69-year-old man was admitted with a femoral hernia. He also suffered from chronic bronchitis. Herniorrhaphy was successfully carried out and he was discharged home though his chest x-ray film had been reported as showing "a patch of consolidation in left mid zone. There is pleural thickening at both apices . . ." The sputum was not examined. He was readmitted to hospital seven months later with a complaint of haemoptysis, chest pain, night sweats, and weight loss. The chest x-ray picture now showed "probable cavitation in the left mid zone . . ." and the sputum showed tubercle bacilli on direct examination.

Case 2.—A 64-year-old diabetic man with a history of chronic bronchitis was admitted to hospital complaining of thirst, polyuria, productive cough, and weakness. He was treated for uncontrolled diabetes, and a routine chest x-ray examination was reported as showing "a good deal of pulmonary fibrosis with emphysema. The condition is probably non-tuberculous and there is no definite active pulmonary lesion." Sputum culture for tuberculosis was not set up and no further chest x-ray pictures were requested. Seven months later he was admitted acutely ill to another hospital. He was treated for an exacerbation of chronic bronchitis but de-

veloped respiratory failure and died two weeks after admission. The chest x-ray film was reported as showing ". . . patchy inflammatory changes in the left mid zone . . ." and sputum cultures for tuberculosis were reported as positive after the patient's death.

Case 3.—A man of 71 was admitted to five hospitals over the space of six months with the same complaint of wheeziness, shortness of breath, and productive cough at each. At the first hospital he was fully investigated and sputum cultures for tuberculosis were set up, but were not reported on before his discharge. At the second and third hospitals he was treated for an exacerbation of chronic bronchitis though the chest x-ray film at the third admission was reported as showing "old acid-fast disease in both apices with pleural thickening at the right base. . . . There is patchy consolidation in the left mid zone suggestive of acute inflammatory changes . . ." He was readmitted in rapid succession to two further hospitals, where the diagnosis was again thought to be an acute exacerbation of chronic bronchitis and finally transferred to a mental hospital because of aggressive paranoid behaviour. Here the chest radiographs were restudied and a positive sputum culture from the first hospital which had been overlooked, was located.

SCREENING PROCEDURE

During the nine month period of the screening procedure 81 patients were judged to show radiographic changes suggestive of pulmonary tuberculosis. Of these, six (7.4%) were found to have active tuberculosis on examination of the sputum, three being diagnosed on the basis of direct microscopy of a sputum smear and the other three from positive cultures. Though in each case the diagnosis of active pulmonary tuberculosis was recognized initially as a result of the screening programme probably three of the cases would have been correctly diagnosed in the normal course of medical investigation. On the other hand, the remaining three cases, illustrated by the following example, were overlooked by the clinicians during the period of their hospital admission, the diagnosis being directly attributable to the screening procedure.

Case 4.—A 63-year-old man was admitted for lens extraction because of failing vision due to bilateral cataracts. He had been treated for pulmonary tuberculosis 20 years before. He had a chronic productive cough and the chest x-ray film showed "evidence of long-standing, acid-fast disease at the left apex with some collapse of the left upper lobe. There are a few chronic inflammatory changes at both bases." The operation was successfully performed and he was discharged without further investigation.

Discussion

The findings of this study are consistent with recent surveys which have shown that among the indigenous population in Britain pulmonary tuberculosis has become most commonly a disease of older men.^{1,2} Probably this high incidence in old age may be attributed to incomplete eradication of previous infection among a generation which has been at high infective risk compared with younger age groups, and no fewer than 12 (33%) of our 36 patients with active tuberculosis had been treated for the disease in the past.

Mistakes or unnecessary delays in the diagnosis of pulmonary tuberculosis are a well-recognized clinical pitfall¹⁻³ and in this study the common factor seemed to be a pre-occupation with another diagnosis. In most cases in which a mistake was made the clinical presentation was dominated by an acute problem which beguiled the attention of the clinical team or masked the evidence of underlying tuberculosis. The most frequent error was failure to take note of abnormalities in the chest x-ray picture which should have led to sputum examination and serial radiography. In many cases the clinician appeared to have overlooked a radiological lesion or to have been unaware of its significance, but in some at least—for example, case 2—the radiologist seems to

have misled the clinician by the wording of his report. In view of the multiple diagnoses it is difficult to assess the effect of such mistakes upon the course of each patient's illness, but in four of the eight patients who died the diagnosis had been overlooked or delayed. The importance of early diagnosis is not confined to the need for prompt treatment of the affected individual, for there is a very real risk of infection to hospital staff attending an unsuspected case if the sputum is heavily contaminated with tubercle bacilli,⁴ and similar risks apply to the family and close associates of the patient if he languishes at home with the diagnosis unrecognized.⁵

Hence it seemed worth devising a simple screening system which would be largely independent of clinical decision-making and which could be applied to all "high-risk" patients in the hospital population who came within the over-60 age group, and whose symptoms were conspicuous enough to have called for routine chest radiography. A nine month trial of the screening procedure described in this study not only brought to light three cases of active disease which had been overlooked but also demonstrated the feasibility of such a scheme for identifying active pulmonary tuberculosis in the hospital population, and therefore by inference in the population at large. As a means of providing an infallible screening method for hospital patients the scheme described may be criticized at four points. Firstly, it was limited to patients over 60 years of age. Secondly, it depended on the assumption that patients with cough or dyspnoea would be sent for chest x-ray examination, whereas possibly a few such patients whose symptoms are not obtrusive may not be fully investigated, especially if they are admitted to non-medical wards. Thirdly, the radiological criteria for inclusion in the survey were somewhat imprecise though a review of the completed record cards showed that in all but four cases the radiologist's selection depended on observing shadowing, fibrosis, or "stranding" in the upper zones of one or both lungs. Lastly, the collection of sputum specimens might be carried out ineffectively unless done by trained staff who are aware of the significance of the investigation and can obtain an adequate sputum sample.

Within these limitations our screening method seems to offer a practical method for the prompt identification of hos-

pital patients with active pulmonary tuberculosis. The increase in work load for the radiologists and the bacteriology laboratory staff was readily absorbed into the routine work of these departments, and the collection of sputum specimens was carried out as a half-hour daily routine by a trained technician or nurse.

Several conclusions may be drawn from this study. The need for increased awareness of the relatively high prevalence of active pulmonary tuberculosis among elderly members of the indigenous population has been emphasized by others¹ but we would also stress the need for a suspicious watchfulness of any radiographic shadow in this age group which could be attributed to tuberculosis, even if apparently inactive. In such cases at least three sputum samples should be cultured and serial radiographs arranged. These principles are well understood by chest physicians but do not seem to be recognized clearly enough by doctors in other specialties. Improved consultation between radiologists and other specialists would reduce the likelihood of error but there are practical difficulties in ensuring a joint review of every doubtful case. A routine scheme of surveillance of "high-risk" elderly patients in hospital therefore seems to offer a practical means of identifying an appreciable number of active cases which might otherwise be missed, and hence of reducing the level of active disease in the community.

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