Current Practice

RESPIRATORY TRACT DISEASE

Early Diagnosis of Pulmonary Tuberculosis

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The earlier the diagnosis of pulmonary tuberculosis is made the better for the patient and the community. Patients with early tuberculosis need suffer little interruption of their normal activities during treatment, in contrast to the prolonged stay in hospital and absence from work which may be required for those with advanced disease. The community benefits both economically and in health, since the sooner the sources of infection are diagnosed and treated the fewer the contacts they are likely to have infected. Diagnosis of pulmonary tuberculosis before it becomes infectious is therefore desirable and is often possible.

General practitioners in Britain have a variety of facilities available to help them diagnose pulmonary tuberculosis. These include the use of miniature radiography, chest clinics, tuberculosis home visitors, tuberculin testing in schools, and contact examination. Widespread knowledge among the public and their medical attendants of the best way to use these facilities is an essential step forward towards finally getting rid of tuberculosis. Ignorance, fear, or prejudice may prevent people seeking medical advice early. Unreasonable fear of tuberculosis and of its social, domestic, and financial consequences are still all too prevalent. The co-operation of the public in the campaign against tuberculosis needs to be maintained by continuing to inform them about the success of modern methods of treatment and prevention.

Early Symptoms of Pulmonary Tuberculosis

Tuberculous patients whose symptoms are of recent onset are not necessarily those whose tuberculosis is of recent onset. The time between infection and the development of pulmonary tuberculosis is generally unknown. Pulmonary tuberculosis is termed "early" when the chest radiograph shows only a small area of lung involved by tuberculous disease. The relationship between the size of the lung lesion and the presence or absence of symptoms and their nature and severity depends on a number of factors, which include the site of the lesion, the resistance of the patient, and the virulence of the organisms.

The most important recent advance in the diagnosis of early pulmonary tuberculosis in Britain has been made by general practitioners through their use of the direct radiography services provided for them by mass x-ray units and chest clinics. The clinical acumen of general practitioners is shown by the fact that the number of cases of tuberculosis discovered among about a quarter of a million patients referred by them for miniature radiography was equal to the number discovered from examination of seven times that number of persons x-rayed during mass radiography of factories and offices in 1962.¹

Cough

Persistent cough is the commonest symptom of pulmonary tuberculosis. A cough lasting two months is a good indication for referral for miniature radiography. Pulmonary tuberculosis is most frequent in men over 45, many of whom suffer also from persistent cough and sputum due to chronic bronchitis, and who often regard cough as "normal." Almost inevitably these men delay seeking medical advice until they suffer an increase in the severity of symptoms sufficiently severe to cause them to go to their doctor. An exacerbation of cough in a chronic bronchitic may be due to the fluctuating course of bronchitis; alternatively, it may herald the onset of another pulmonary disease such as tuberculosis or bronchial carcinoma. It is clearly impracticable to x-ray all patients with chronic bronchitis each time they have an increase in their symptoms. The difficulty of deciding when a bronchitic patient should be x-rayed often causes delay in diagnosis of tuberculosis in these patients.

Haemoptysis

Blood-spitting is an alarming symptom, and sufferers usually seek medical advice promptly. Haemoptysis is always an indication for chest radiography unless the bleeding is known to have come from the nose or throat. Slight blood-staining of sputum or a small haemoptysis may occur in minimal tuberculosis and may lead to diagnosis of early disease. The commonest cause of blood-staining of the sputum in Britain is chronic bronchitis; however, in bronchitics bleeding may also result from coexistent tuberculosis, bronchial carcinoma, or other chest disease.

Chest Pain

Chest pain in pulmonary tuberculosis is usually pleuritic in type and is sometimes associated with a pleural rub. The pleurisy may be dry or there may be pleural effusion with characteristic physical signs. Pleurisy may occur early or late in pulmonary tuberculosis. Thus in primary pulmonary tuberculosis occurring in late childhood and early adult life the primary focus is frequently sub-pleural and gives rise to pleurisy or pleural effusion. Post-primary pulmonary tuberculosis may be associated with pleurisy either early or in its advanced stages.

Patients with pleurisy should have their chests x-rayed. When no certain cause, such as an acute respiratory infection, can be found to account for the pleurisy, a tuberculin test should be performed. If the test is strongly positive and the patient has not received B.C.G. vaccination regular follow-up by chest radiography is desirable, even in those whose film is

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normal, since pulmonary tuberculosis may develop some years after tuberculous pleurisy. When pleural effusion is caused by tuberculosis proof of this may be obtained in the majority of cases by means of needle biopsy of the pleura.

Dyspnoea

In pulmonary tuberculosis dyspnoea may be due to extensive inflammation or fibrosis of the lung, or compression of the lung by pleural effusion. Alternatively, it may result from bronchial obstruction by endobronchial tuberculosis, or from occlusion of main bronchi by enlarged lymph nodes in primary tuberculosis, sometimes resulting in unilateral wheeze.

Constitutional Symptoms

Constitutional symptoms, including fever, night sweats, lassitude, anorexia, and weight loss, usually occur when the pulmonary disease is extensive; though in a few patients quite minimal disease is found to be responsible for these symptoms.

Erythema Nodosum

In Britain tuberculosis is responsible for about half the cases of erythema nodosum. Other causes include streptococcal infection, sarcoidosis, and drug reactions. Chest radiography and tuberculin testing should form part of the routine investigation of this disorder.

Chest Physical Signs

Physical examination of the chest is of little value in the detection of minimal tuberculosis. A chest x-ray is of much greater importance and should always be provided for patients with chest symptoms of undetermined cause. Occasionally early tuberculosis gives rise to localized rales or post-tussive crepitations, localized rhonchi, pleural rub, unilateral restrictions of movement, or localized muscle wasting. Usually, however, there are no abnormal physical signs.

Routine Chest Radiography

Early pulmonary tuberculosis is usually symptomless. Chest radiography enables diagnosis to be made before the onset of symptoms. A variety of radiographic services are available, including mobile mass miniature radiography, static miniature radiography units, and x-ray facilities in the hospitals and clinics. The objects of these methods differ and should be understood so that the best use is made of them.

The object of mass miniature radiography is to detect the largest number of hitherto unknown cases of tuberculosis by means of examination of apparently healthy individuals. Mobile miniature x-ray units are used to examine volunteers from factories, offices, and homes. The yield of active tuberculosis detected by this method in Britain has been progressively less during the last five years and is now about one case for every thousand persons x-rayed.¹ However, the total number of cases discovered is great because of the large number of people that can be x-rayed in this way. It has been argued that an important step in eliminating tuberculosis is to x-ray the whole population at least once. This could be done relatively easily and cheaply if the x-ray was made compulsory, as it is in Australia, Norway, and Iceland, but to obtain 100% attendance in a voluntary survey is difficult and usually needs intensive home visiting and propaganda.² Nevertheless, large-scale voluntary surveys of British

cities have been carried out in which more than 75% of the population have co-operated. Such surveys have been shown to have favourably influenced the subsequent annual notification rates of tuberculosis in these cities for several years after the campaign.³ Mobile radiography is especially valuable when it is used to survey areas suspected of being local "black spots" with a high incidence of tuberculosis.

There are special categories of persons who are likely to have a greater than average incidence of pulmonary tuberculosis. These include the inmates of prisons and borstals, mental institutions, and common lodging-houses. Special attention should be given to these high incidence groups, using mobile radiography. General practitioners can help by referring to static miniature radiography units the patients on their lists who are among the high incidence groups, particularly persons of poor economic and environmental status, immigrants, alcoholics, and vagrants, even though they may have no symptoms referable to the respiratory system.

Immigrants from certain countries have a high incidence of tuberculosis and this presents a serious problem in some localities with large immigrant populations.⁴ Study of immigrants in Birmingham showed that in Pakistanis the rate of tuberculosis is at least 20 times as great as that in the native-born population. Corresponding figures for other nationalities were Indians six times, Irish three times, and West Indians four times.⁵ Survey of Chinese (mainly from Hong Kong) working in the catering trade in Soho, London, revealed an incidence 30 times as great as that in the general population.⁶ Most of the Pakistani and Chinese immigrants who are found to have active tuberculosis are thought to have brought the disease into Britain, having been infected in their own countries, where the incidence of the disease is high. Other immigrants, including West Indians and Cypriots, are thought usually to arrive uninfected but are highly susceptible and often live in overcrowded conditions with tuberculous immigrants who infect them after arrival. Immigrants who have tuberculosis when they arrive ought to be diagnosed on or before entry into the country. X-ray of all immigrants on arrival at ports and airports is necessary. In addition, tuberculin testing and B.C.G. vaccination of the uninfected is desirable. Efforts are being made to encourage immigrants to register promptly with general practitioners, whom it is hoped will arrange tuberculin testing and x-ray. In some areas the medical officer of health is notified of the arrival of immigrants in his area and public health inspectors are sent to visit the immigrants to encourage them to undergo medical examination.

Tuberculin Testing

The earliest detectable change after tuberculous infection is the occurrence of a positive tuberculin test. However, only a minority of persons infected with tubercle bacilli develop pulmonary tuberculosis, and not all persons who have a positive tuberculin test have been infected by tubercle bacilli. In young people in Britain high grade tuberculin sensitivity—that is, a reaction to a small dose of tuberculin (1 in 10,000 or 1 in 1,000)—indicates past or present infection with human or bovine bacilli. However, low grade sensitivity—that is, a reaction to a large dose of tuberculin (1 in 100)—may often represent a cross reaction to infections with avian or other related bacilli.⁷ Nevertheless, any child with a positive tuberculin reaction should have a chest x-ray.

Routine annual tuberculin testing of children is not generally carried out in Britain. However, all 13-year-old school-children are offered tuberculin testing under the school B.C.G. vaccination scheme, but the proportion willing to undergo the test leaves much to be desired in some localities. At present about 15% of those tested are tuberculin positive.

All these positive reactors should be sent for chest x-ray. Those with a strongly positive tuberculin test should have an annual x-ray for several years, since the annual incidence of tuberculosis among these is appreciably higher than in those with a weakly positive tuberculin reaction. Examination of contacts of these schoolchildren with strongly positive tuberculin reactions may reveal a likely source of tuberculosis in about one-third.⁸ It usually proves most convenient for general practitioners to refer contacts and others to chest clinics for tuberculin testing and B.C.G. vaccination. If the general practitioner wishes to carry out occasional tuberculin testing this may be done very conveniently using the disposable "tine" test multiple puncture unit, in which the prongs or tines have been drip-dried in tuberculin.

Contact Examination

The purpose of examining the contacts of patients with pulmonary tuberculosis is twofold: first, to detect as early as possible those who may have been infected by the patient, and, secondly, to reveal the source of the patient's infection. As the frequency of tuberculosis declines, the possibility of tracing the individual source of infection increases. One of the objects of compulsory notification of tuberculosis is to ensure that there is intensive investigation of the contact of all known sources of tuberculous infection. Chest clinics have good facilities for contact tracing, and by means of visits by well-trained and tactful tuberculosis home visitors assist in inquiring into all those who may have been in contact with the infection, and attempt to persuade them to attend for x-ray and tuberculin testing. Tuberculin testing is of value, since contacts who are strongly positive merit close radiographic follow-up: tuberculin negative contacts are usually offered B.C.G. vaccination. Elderly persons, who are so often the original source of the infection, may need much encouragement to get them to submit to x-ray. Those who refuse may be persuaded to provide a sputum specimen for examination for tubercle bacilli.

Contacts at work must be included. This is often best done by arranging for the mobile miniature radiography unit to include the place of work in the local survey; in this way contacts are x-rayed in a routine way without the need for reference to the identity of the source of tuberculosis, thus avoiding embarrassment to the patient.

About 5% of contacts show evidence of active pulmonary tuberculosis on initial examination. It is important to remember, however, that one radiographic examination is insufficient, because follow-up of those with normal x-rays on first examination shows that about 4% of them develop active tuberculosis during the following five years.⁹

Bacteriological Confirmation

Bacteriological confirmation of the diagnosis of pulmonary tuberculosis by sputum smear and culture examination should always be sought in order to prove the diagnosis, confirm that the disease is active and in need of treatment, and to inves-

tigate the drug sensitivity of the tubercle bacilli. If there is no sputum, material obtained by laryngeal swab or gastric lavage should be examined. Pulmonary secretions are bacteriologically negative in pulmonary tuberculosis which is inactive, or which is active but of limited extent. A record of a previously normal chest radiograph may be most valuable evidence in assessing the need for treatment of a presumed tuberculous shadow. In middle-aged and elderly smokers who have an abnormal chest x-ray, possibly due to tuberculosis or bronchial carcinoma, investigations, including bronchoscopy, sputum examination for acid-fast bacilli and malignant cells, tomography, and bronchography may fail to confirm the cause of the shadow. Sputum cultures for tubercle bacilli take up to six weeks. This delay is unjustified when a resectable bronchial carcinoma is thought to be a possibility. In these circumstances exploratory thoracotomy is usually the best policy.

Conclusions

A chest x-ray should be taken when any of the following symptoms occur in a patient in whom the cause is undetermined: persistent cough, haemoptysis, chest pain, dyspnoea, weight loss, lassitude, or erythema nodosum. Easy access by the patients of general practitioners to chest x-rays has been an important advance in the early diagnosis of pulmonary tuberculosis. Special efforts should be made to x-ray people who are among the high incidence groups even though they are asymptomatic. These groups include contacts of tuberculosis, persons of low economic and environmental status, immigrants from certain countries, including Pakistan, India, and Hong Kong, vagrants, alcoholics, and inmates of prisons, borstals, mental institutions, and common lodging-houses. Tuberculin testing is valuable in early diagnosis, especially in children. Modern methods of diagnosis and treatment of tuberculosis are highly effective and their widespread use has produced great benefit. Much more remains to be done before tuberculosis ceases to be a common disease in Britain.

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