PROGNOSIS IN PULMONARY TUBERCULOSIS.

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The prognosis of the individual case of tuberculosis is one of the most difficult problems in clinical medicine, yet we have a larger body of statistical information relating to prognosis in this than in any other disease.

This information is contained in the returns made annually by every Medical Officer of Health showing the present condition of all patients on the Tuberculosis Dispensary Registers and the reason for removal therefrom of those no longer on the Register. These returns have been furnished from the Dispensary at the Royal Northern Hospital since 1929 and I take this summarised information from them.

TABLE

Showing Present Condition of Cases of Pulmonary Tuberculosis Diagnosed 1929—1937.

Total	Cured	Arrested	Not Arrested	Died	Moved
Class TB + 1436	58	62	323	510	483
Class TB -- 688	58	67	142	47	374

Of those Patients appearing under the head of "Moved" a definite percentage will have died, but neglecting these it will be seen that of the T.B. plus group 35 per cent. are dead whereas of the T.B. minus group only 7 per cent. are dead.

These figures relate to patients who have received all the benefits which a modern tuberculosis scheme can provide, and they at once sound a cautionary note in estimating the prognosis of the individual case.

Pulmonary tuberculosis is a disease which only too frequently attacks the wage earner in a family, and it follows therefore that the medical attendant will frequently be asked two questions: firstly, is the patient going to recover, and secondly, will he be able to resume work, and when?

Our mental processes in making a prognosis are largely subconscious and are based on the synthesis of our theoretical and practical experience. What are the factors which must be taken into consideration in any individual case? They may be summarised as follows:—

- (a) Factors peculiar to the patient, and
- (b) Factors peculiar to his environment.

(a) Factors peculiar to the Patient.

- I. Family history.
- II. Age, sex and race.
- III. Extent and type of disease.
- IV. Presence of complications, and
- V. Temperament.

These factors will now be considered in greater detail.

i. **Family History.** The fact that one of the patient's parents has died of tuberculosis, although indicating the possible source of infection, does not necessarily give a bad prognosis. If brothers or sisters, however, have died, in my experience it is common for the disease to run a similar course. A family seen recently is an example of this.

F. S. J. was diagnosed as a case of pulmonary tuberculosis in 1934 when aged 35, and has had several periods of sanatorium treatment. He has now extensive bilateral disease with cavitation, and dyspnoea prevents him from taking any exercise except gentle walking on the level. Sputum remains positive.

H. S. J. aged 45 attended hospital in February 1937 with a history of cough and loss of weight for four months. X-ray showed extensive bilateral tuberculosis. He was sent to a sanatorium but went rapidly downhill and died in October, 1937.

T. S. J. aged 47 was diagnosed as a case of pulmonary tuberculosis in October 1937, when X-ray showed fairly extensive bilateral disease. He went to a sanatorium but made no progress and is now confined to bed at home with advanced disease.

The rather remarkable feature of these cases is the late age of onset in three brothers who were not living in the same house, the progress of the disease being very rapid in two cases although rather less rapid in the third.

ii. **Age and Sex.** Pulmonary tuberculosis occurs in childhood in three forms: as a generalised miliary form, commonest in the first two years and almost always fatal; as the adult fibro-caseous type, occurring occasionally even in infants, when the condition is rapidly fatal, (in older children this type of disease may run a prolonged course of several years, but the ultimate outlook is bad), and as a much commoner type incorporating the conditions variously known as hilar tuberculosis, tuberculous mediastinal glands and epituberculosis. It may be said at once that except in certain cases of epituberculosis the diagnosis can only be made with certainty by X-rays, and the condition is usually found during routine examination of child "contacts". These children are frequently well nourished and the prognosis is almost always favourable, with or without a period of convalescent treatment although this should be given in all cases as a precautionary measure. Sex has little influence on the prognosis in infancy and childhood.

After puberty is reached the incidence of pulmonary tuberculosis shows a rapidly upward trend in both sexes and the disease from the age of fifteen to twenty-five is liable to run a more acute course especially in females. It is in this age group that "galloping consumption" is more especially liable to occur, though in my experience it is becoming increasingly more rare. For these reasons a guarded prognosis is highly desirable in this age group especially in girls.

After the age of twenty-five the incidence and virulence diminish in both sexes, and it is in the age group of twenty-five to forty that the best prognosis can be given, both as regards life and capacity to resume employment. At about the age of forty-five in men, there is another rise in the incidence and here again the prognosis is not so good.

Tuberculosis in old age is apt to run a chronic course and in many cases it is never diagnosed, the condition being regarded as chronic bronchitis; in the more sheltered conditions of later life the condition is comparatively benign to the sufferer if not to his relations, and the disease frequently does not materially shorten the span of life.

With regard to race, it is well established that certain races are more vulnerable to the disease than others. In this country the Irish are more liable to suffer from an acute type of disease and on the other hand Jews have a high resistance.

iii. **Extent and Type of Disease.** This has already been discussed in the case of children. In adults the disease may take various forms:

- (a) Productive or fibrotic.
- (b) Exudative or caseous.
- (c) Mixtures of the above; or fibro-caseous.
- (d) Pneumonic, and
- (e) Miliary.

The *fibrotic* type of disease indicates good resistance. It occurs especially in adults after the age of twenty-five and the prognosis is reasonably good. If extensive, however, fibrosis interferes with respiration and may thus incapacitate for manual work.

The *exudative* type of disease is a more acute type common in young adults and leading to rapid lung destruction. The prognosis must therefore be regarded as serious.

The *fibro-caseous* type is the commonest and in this there is a constant struggle between the resistance of the host producing fibrosis and the organism producing caseation, now one and now the other predominating. The immediate prognosis in these cases is good and the ultimate outlook depends primarily on the presence of permanent cavitation with usually a resultant persistence of tubercle bacilli in the sputum.

In all these types the prognosis is influenced by the extent of the disease. It may be said at once that if the diagnosis can be made *definitely* on physical signs, then the disease is fairly extensive. This is not to decry the value of physical examination in detecting early tuberculosis, because we may find suspicious signs which are more of a negative nature e.g. slightly diminished movement, patches of weak or "sticky" breath sounds which are in many cases the first signs of early disease. The outlook will depend directly on the amount of disease present and this can be accurately gauged only with the aid of the X-ray. Unilateral disease gives a more satisfactory prognosis on account of the possibility of collapse therapy. The presence of cavitation has a considerable bearing on the prognosis. It is particularly apt to occur in the chronic type of disease although it may develop rapidly in acute cases also. I have recently seen a girl of 20 examined as a "contact" in which an X-ray in August 1937 showed perfectly normal lung fields, while in January 1938 a further X-ray revealed a cavity over an inch in diameter with surrounding infiltration in the right upper lobe.

Mention must be made of the value of the tomograph in determining the presence and the site of cavities (McDougall 1937). This is a device whereby X-rays can be taken of a thin slice of lung in a pre-determined plane.

The presence of persistent cavitation commonly results in a persistently positive sputum with all that this implies in the liability to complications, and the tendency to hæmoptysis, from a ruptured vessel in the cavity.

With regard to the influence of hæmoptysis, it has long been taught that when the disease declares itself in this way the outlook is good, chiefly because the patient seeks treatment in an early stage, and this is no doubt true. Hæmoptysis in the early case is not usually violent, but if occurring in the course of the disease is probably an indication of the presence of cavitation. Certain patients are undoubtedly prone to recurrent hæmoptysis, and the prognosis in these is bad owing to gradual or rapid extension of the disease, and in a certain percentage to the occurrence of an actual fatal hæmorrhage.

(d) *Pneumonic phthisis* may occur in either lobar or broncho-pneumonic forms. The former is in my experience very rare; the latter is not uncommon and forms the terminal phase of galloping consumption or less commonly of chronic fibroid phthisis. The prognosis in either case is well nigh hopeless.

(e) X-rays have modified our views as to the prognosis of the *miliary condition* (Hoyle and Vaizey) and it is now known that a considerable percentage of adult cases recover, the miliary deposits either gradually disappearing or else hardening into tiny spots of calcification, and I have followed up several cases for some years. In these cases the disease is probably not part of a generalised miliary spread in the other organs of the body, thus differing from the miliary disease of infants.

The prognosis of *pleurisy* must now be discussed. Dry pleurisy occurring suddenly without an obvious cause must be presumed to be of tuberculous origin and the prognosis is excellent, although it must be borne in mind that a certain number of cases recur. In pleurisy with effusion the prognosis depends on the presence or not of obvious underlying disease and this can only be decided by X-ray when the fluid has either been absorbed or removed. In the majority of cases such underlying lung disease is not found. The immediate prognosis is in all cases excellent, but here again must be remembered the tendency to recurrence in later years and the fact that about a third may subsequently develop active disease in the lungs, although I am sure such a percentage could be decreased by proper treatment and after-care. It is sometimes difficult to decide what form this after-care should take as many doctors hesitate to brand these patients as tuberculous by notification to the medical officer of health. My practice is not to notify cases of dry pleurisy, but to arrange a period of convalescent treatment either through an approved society or some charitable source; pleurisy with an effusion is best dealt with by notification and treatment for a few months in a sanatorium where only early cases are taken.

The *presence or absence of sputum* and whether it contains tubercle bacilli has a profound bearing on prognosis as will be seen by reference to the previous table. The presence of mucoid colourless sputum may be evidence only of catarrh, but a copious purulent sputum is usually evidence of lung destruction. Absence of sputum though in general a good sign is not always to be relied upon, because in certain cases lung destruction can proceed for a time without connection with a bronchus; in other cases patients consciously or unconsciously swallow the sputum and claim to have none, as illustrated by the following case.

M. K. aged 22, has had gradually progressive bilateral pulmonary tuberculosis for the past four years and has had several periods of sanatorium treatment. She claims never to have had any sputum, but a stomach wash reveals the presence of tubercle bacilli and she has recently developed a persistent enteritis no doubt indicating tuberculous ulceration.

The presence of tubercle bacilli in the sputum is of vital importance although one observation is of little value. A persistently negative sputum is of good prognosis, while a persistently positive sputum is equally bad, but in exceptional cases patients may survive for many years, leading a comparatively comfortable existence although a constant menace to those in contact with them. I have known several such cases with records of a persistent positive sputum dating back over periods of fifteen years. In examination of the sputum cultural methods are of great value in negative cases, and a considerable percentage negative in the direct smear will prove positive on culture.

In any case prognosis is, of course, made much easier by a period of observation in hospital, when the immediate response to rest can be estimated. Of most value

under these conditions is the *temperature chart*, although its interpretation has definite pitfalls. In patients under the age of thirty an afebrile chart is of good omen, but after this age and particularly in middle and old age, an afebrile chart is frequently seen in cases of extensive disease and even in advanced and dying cases. In this type of case the *pulse rate* is of greater value and a persistent resting pulse-rate of 90 or over is certainly indicative of a serious condition. The *sedimentation rate of the red blood cells* is also of help, and this test is simple enough to be performed by the general practitioner. The normal reading should be under ten millimetres, and in very active cases it may reach eighty millimetres in one hour or more. In many cases of afebrile disease in young adults who in other respects seem to be doing well, it will be found that the sedimentation rate remains raised to twenty to thirty millimetres and in these cases a guarded view of the outlook must be taken. More elaborate investigations of the blood picture have also been utilised for their bearing on prognosis particularly by Houghton (1936).

iv. **Complications.** The bearing of complications on prognosis will now be considered. These may be summarised in frequency of occurrence in the following order: (1) laryngitis; (2) enteritis; (3) metastases; and (4) amyloid disease. Minor disabilities which are part of the disease rather than complications such as dyspepsia, disturbance of sleep by cough, and pains in the chest, all aggravate the condition and render the prognosis worse. These, however, are the complaints which yield to symptomatic treatment and too much trouble cannot be spent by the medical attendant in treating what may appear to him to be minor complaints, but which cumulatively may have such a disastrous effect on the patient. This point was recently stressed by McPhail (1938). Of the true complications tuberculous affection of the larynx is the commonest and most dreaded and this is not because of the involvement of the larynx itself but because of the frequent extension to the pharynx and resultant extreme dysphagia which adds starvation to the other troubles of the patient. The condition may spread to the tonsils and tongue causing painful ulcers. In rare cases patients may present themselves with an ulcer on the tongue or lip without any chest complaint, but in these cases the ulcer is nearly always secondary to lung disease and the prognosis is bad. Tuberculosis of the larynx however is not always fatal and if a case is seen early and a strict régime of silence instituted the condition will become arrested in a fair percentage of cases.

Enteritis due to tuberculous ulceration of the intestines is an indication that the disease has reached an advanced stage. Enteritis may also be a symptom of amyloid disease which is comparatively common in advanced chronic pulmonary tuberculosis, and were its presence more often suspected it would be more often found. Frequently the condition is incompletely developed, the commonest sign being a marked hard enlargement of the liver and this may or may not coexist with massive albuminuria, or, in other cases, there may be signs of amyloid disease of the kidney without marked enlargement of the liver. In any case, the presence of amyloid disease indicates the terminal stage of the illness.

Tuberculous metastases in other parts of the body such as those in bones, peritoneum, urogenital system and the nervous system may occur in pulmonary cases. These complications all make the prognosis worse, particularly of course in the case of involvement of the brain or meninges. Diabetes occasionally co-exists and materially worsens the prognosis.

v. **Temperament.** I do not believe, as we are frequently taught, that the person to be attacked by tuberculosis is of any particular temperamental type,

“artistic” or otherwise. The disease attacks all types indiscriminately, and if we take a large number of patients they will, I think, represent an average sample of the population. It is an old but true saying that no fool ever gets well from pulmonary tuberculosis. The patient who faces the situation in a spirit of bravado is the one whose prognosis is to be regarded with caution. These patients especially, find the necessary institutional discipline irksome and usually discharge themselves or have to be discharged on account of repeated breaches of the rules. One cannot but sympathise with them, as their reaction to what is undoubtedly a very unpleasant situation follows naturally on their psychological make-up and is indeed a rather pathetic attempt at conquering their fear.

Another type whose prognosis is unfavourable is the patient, usually a middle-aged man, of the type who “knows his own mind”. Such a patient is sure that he knows what is best for him and will go his own way without regard to advice. He will say that if the best treatment for him is at a sanatorium he can get all the air he needs in the local parks or his own garden, which he will proceed to do, perhaps toiling about in the heat of summer when he should be on strict bed rest. Such patients are prone to fall victims to the vendors of patent medicines.

The classical *spes pthisica* is rarely seen. It occurs only in advanced cases and the patient faces his hopeless situation by subconsciously closing his mind to the true position; each new symptom as it occurs is attributed to any trifling cause but the fatal march of the disease. In these cases, however, the prognosis will be sufficiently obvious from the gravity of the physical condition.

The best prognosis occurs in the patient who, although aware of the full implications of his illness, is yet quietly determined to put himself in the hands of the medical adviser and conscientiously carry out the details of his treatment.

(b.) Factors peculiar to the Environment.

These can at once be summed up in terms of finance. Facilities for treatment are provided free, or nearly so, by all local authorities in this country and arrangements can be made through the Public Assistance or charitable sources to support a wage-earner's family in his absence; and it is of great help in preventing a patient from discharging himself prematurely from the sanatorium to know that his family is not suffering in his absence. It is probably better to be either poor or rich, for as in the case of other illnesses it is the patient with the moderate income, who does not care to accept public treatment, but who can ill afford private fees, who suffers most. It would be my advice to such a patient to accept free public medical treatment to which he is entitled as a ratepayer rather than to strain his resources in seeking treatment in private sanatoria where, although the company may be better, the treatment may not. Occupation is of great importance and it is obviously inadvisable for a patient to have to return from a sanatorium and start heavy manual labour. It must not be forgotten that although a patient may have been on full gardening work at a sanatorium, this will only have been of four hours duration instead of the eight hours to which he will have to return. It is undoubtedly a favourable factor in prognosis if the patient has a clerical post, for he will then have no manual labour or exposure to the weather. Fortunately the idea that a tuberculous patient must have an outdoor job at all costs is dying out. A patient in these times finds it hard enough to get back to economic work in his own trade without the onus of learning a new one for which there may be little demand, poor pay, manual work, and exposure to the weather in the winter, for this is what an “open air” job often implies. The primary needs of a tuberculous patient are rest, good food and freedom from anxiety, and in proportion as these can be obtained so the prognosis improves.

Treatment has of course an important bearing on prognosis. As has been pointed out, treatment is available for all in this country, and it rests with the patient whether he or she makes best use of these facilities. Unfortunately it cannot be claimed that the usual stay in a sanatorium averaging perhaps five or six months is sufficiently long, owing to shortage of beds and inability of the patient to remain too long from work.

A detailed discussion of treatment falls outside the scope of this paper. Once again the value of rest must be stressed, and by rest is meant an initial period of strict bed treatment maintained for at least a month after the patient has become afebrile. Although it has been found difficult to assess the value of artificial pneumothorax treatment on the prognosis of the disease in general (Bentley 1936) there is no doubt that the prognosis of the individual case is greatly improved when adequate collapse of cavities can be obtained, and to obtain this in a number of cases will call for further surgical measures such as phrenic avulsion, adhesion cutting, extra-pleural pneumothorax, or even thoracoplasty. Thoracoplasty will add to the gravity of the prognosis, not only from the point of view of operative risk which, however, is now small in skilled hands, but from the fact that a patient after thoracoplasty has most of one lung permanently out of action, which will limit the capacity for manual work. Excellent results are, however, being obtained by this treatment and I know a case who still survives twenty-two years after the operation.

It must be concluded that in making a prognosis in this ever-varying disease a great many factors have to be taken into account, some of which have been discussed in this paper. Yet, in the end, a satisfactory prognosis can be made only with a wide experience of the disease and that innate ability which in combination constitute the art of medicine.

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