slow growth rate of these fungi making them more susceptible than *T. mentagrophytes* to overgrowth by other organisms on the culture plate. But the main reason would seem to be their rarity on the school children's feet (English and Gibson, 1959).

The two potential reservoirs of infection in swimming-baths are the pool itself and the surrounding floors. Infection could be by fragments of skin in which the fungus is embedded, or direct by conidia and hyphae of the saprophytically growing fungus. There is no evidence that dermatophytes exist in a saprophytic condition in these baths, as brushing down effectively removes contamination. It is unlikely that fragments of skin floating in the pool could attach themselves firmly enough to the feet to start an infection, and Tritsmans and Vaubreuseghem (1955) were unable to isolate dermatophytes from swimming-baths by setting "baits" of hair in the water, a method which is successful for collecting keratophilous fungi in soil. It is probable, therefore, that the main source of infection is pieces of infected skin pressed on to the foot while walking over contaminated floors.

The frequency with which *T. mentagrophytes* was isolated from the boys' changing accommodation compared with that of the girls, which is in agreement with an incidence of tinea pedis four times greater in boys than in girls using these baths (English and Gibson, 1959), is evidence for the importance of swimming-baths as a source of infection with tinea pedis in children. Also, the greater contamination of bath A coincides with the high incidence of tinea pedis in district A, found in the same survey, and it is possible that both are attributable to the lack of sluicing down of this bath, as well as to the more extensive use made of their bath by schools in this district compared with other districts.

The implication here is of a vicious circle of foot infection and floor contamination. A highly infected population would shed more infective particles than a slightly infected one, and this in turn would increase the risk for hitherto healthy users. As cleaning methods appear to be effective, cross-infection must occur mainly between bathers using the baths between each cleaning. Almost continuous cleaning and sluicing, as is already done in some baths, would appear to be a practical way of preventing the accumulation of contaminating particles.

The high incidence of tinea pedis in those members of the staffs who enter the water compared with those who do not, also implicates the baths as a source of infection and suggests that a regular mycological examination of the feet of such people could be undertaken with advantage.

Though this investigation was not planned on a statistical basis the results do add further to the evidence of Amrein and of Tritsmans and Vaubreuseghem that swimming-baths are an important source of infection with tinea pedis.

Summary

Trichophyton mentagrophytes has been isolated repeatedly from the floors of three swimming-baths by Gentles's direct sampling technique.

The fungus was found more often in baths and parts of baths used by populations with a high incidence of tinea pedis than in those used by populations with a lower incidence.

Brushing down and frequent sluicing appear to be reasonably effective methods of removing infective particles.

Eight out of 14 members of the swimming-bath staff whose duties entailed their entering the water were found to be suffering from tinea pedis. None of the 11 persons who never swam were infected.

It is concluded that swimming-baths are an important source of infection with tinea pedis.

We are indebted to Mr. J. Hancock, chief superintendent of Bristol's swimming-baths, for his ready permission to carry out this investigation, and to Mr. J. McA. Milne, chief organizer of physical education in Bristol, and the superintendents and staffs of the baths for their co-operation. Our thanks are also due to Dr. R. P. Warin and Dr. C. D. Evans, of Bristol Royal Hospital, and to Dr. R. C. Wofinden, medical officer of health, Bristol, for their interest and encouragement.

REFERENCES

- Ajello, L., and Getz, M. E. (1954). *J. invest. Derm.*, **22**, 17.
Amrein, H. P. (1953). *Praxis*, **42**, 197.
English, Mary P., and Gibson, Mary D. (1959). *Brit. med. J.*, **1**, 1442.
Gentles, J. C. (1956). *J. clin. Path.*, **9**, 374.
Tritsmans, E., and Vaubreuseghem, R. (1955). *Belg. T. Geneesk.*, **11**, 625.

HOW CHRONIC IS PULMONARY TUBERCULOSIS IN THE ELDERLY ?

BY

JAMES SMITH, M.B., D.P.H.

Chest Physician, Ruchill Hospital, Glasgow

It is now generally recognized that pulmonary tuberculosis is increasingly becoming a disease of older people and particularly of men over the age of 65. The notification rate for pulmonary tuberculosis in men over this age in England and Wales has almost doubled in the sixteen years from 1938 to 1954 (Wilkins, 1956). Likewise in New York City the number of newly diagnosed cases in men over 45 years of age is twice that of a generation ago (Robins, 1953). This increase in the disease in older people is not accounted for merely because there is a higher percentage of elderly people in the population. In the 1957 Glasgow mass x-ray campaign, for example, the yield of active pulmonary tuberculosis was 7.0 per 1,000 examined in those over 60, compared with 4.37 per 1,000 examined in the age group 15-59 years (Glasgow Corporation, 1958).

Traditionally, pulmonary tuberculosis in older people is supposed often to masquerade for years as chronic bronchitis. From textbook to textbook the picture is painted of the elderly parent or grandparent, with "chronic bronchitis," disseminating infection among household and other contacts. Nash (1955), endorsing this view, has suggested that if men over 45 could be x-rayed once "it would drain the unknown infector pool of most of its long-term members."

On the other hand, the presenting features of many cases of pulmonary tuberculosis in the elderly seen at Ruchill Hospital suggested that the disease might be of recent origin, and it was thought that further investigation of the problem would be profitable. Accordingly, in 100 consecutive cases of pulmonary tuberculosis newly diagnosed in people over 55 every

effort was made to obtain previous chest x-ray films and, failing these, radiological reports. These cases were unselected in regard to both type and extent of disease.

Results

Fifty patients had had their chests x-rayed, 12 of them more than once. Radiological reports of all these films were obtained, and in 33 cases the films were also available. In 23 (46%) of these 50 cases the chest had been reported as radiologically clear. In the remaining 27 (54%) an abnormality had been noted. In one further case the patient had been x-rayed because of a fractured arm, and the film showed early active pulmonary tuberculosis in the left apex which had been visualized incidentally: this tuberculous disease had not been reported. Six years later, at the age of 69, this woman was found to have gross tuberculous infiltration in the left lung, with a large upper-lobe cavity.

The available films were reassessed by me and an experienced chest radiologist. In the 23 cases originally reported as clear, apical fibrosis was noted in two cases; and in a further film two small calcified foci were seen in an upper lobe. These appearances were minimal, and the films might well have been passed as normal.

The abnormalities reported in the remaining 27 cases were inactive fibrotic tuberculosis (12), unresolved pneumonia (7), bronchitic changes (4), miliary opacities (1), bronchiectasis (1), calcified foci (1), and pleural effusion (1).

In all cases in which inactive tuberculosis had been originally reported there was agreement when the films were reassessed, except in one in which it was felt that the possibility of activity might have been raised and in another in which a small area of fibrosis in the contralateral side had been overlooked.

Seven patients, admitted to various hospitals with pneumonia, had been discharged before radiological resolution was complete. In two cases retrospective examination of the films showed that significant radiological features had been overlooked: in one case the development in serial films of a small area of infiltration in the contralateral lung, and in another the presence of a small pleural effusion.

In four cases a diagnosis of chronic bronchitis had been made presumably because of increased lung markings associated with some fibrosis and emphysematous change.

The possibility of miliary tuberculosis was reported in one patient, but the occupational history and subsequent progress confirmed a retrospective diagnosis of pneumoconiosis.

In two successive years left-lower-lobe bronchiectasis had been reported in a patient with a long history of cough, purulent spit, and dyspnoea; infiltration in both upper lobes had been overlooked. This was reported when a year later he was admitted to hospital with an acute exacerbation of his "bronchiectasis." Sputum examination, carried out apparently for the first time, revealed numerous tubercle bacilli.

Age at Previous X-ray Examination.—Table I shows the ages of the patients when the original plates had been taken. In only three cases was the patient under 50. The earliest age at which a previous film had been carried out was 42; this film was clear. Thus out of 50 cases no fewer than 47 were 50 years of age or over when first x-rayed. Further, 15 patients had been

TABLE I

Result of Original X-ray Examination	Age (in Years) at Previous X-ray Examination					Total
	—49	49–54	55–59	60–64	65+	
Clear	1	10	5	5	2	23
Abnormal ..	2	5	10	5	5	27
Total	3	15	15	10	7	50

x-rayed when 55 to 59 years old, and in five the films were clear; 10 had been x-rayed at ages 60 to 64 years, and in five the films were clear; finally seven had been originally x-rayed when aged 65 or more, two of these x-ray films being reported clear.

Duration Between Diagnosis of Tuberculosis and Previous X-ray Examination.—Table II shows the length of time elapsing between diagnosis and the previous films. Only 12 of the 50 patients were x-rayed more than five years prior to diagnosis, six with clear films

TABLE II

Result of Original X-ray Examination	Length of Time (in Years) Since Previous X-ray Examination										Total
	1	2	3	4	5	6	7	8	9	10+	
Clear	—	4	3	7	3	1	—	1	1	2	23
Abnormal ..	5	5	5	1	5	2	—	—	1	3	27
Total	5	9	8	8	8	3	1	1	2	5	50

and six having films in which an abnormality had been found. Thus 76% of the patients had been x-rayed within five years of diagnosis. In one patient a further x-ray examination of the chest, carried out only two months after a clear film, showed active tuberculosis at one apex.

Reason for Pre-diagnostic X-ray Examination

Previous x-ray examinations had been carried out for a variety of reasons: in 27 cases because of respiratory symptoms; in 13 during an investigation of non-respiratory illnesses; in 5 at mass radiography; in 3 because of contact with a known case of tuberculosis; and in 2 because of trauma (injury to thoracic cage).

Two points call for special comment. First, in two cases the evidence suggested that the disease had developed in the same manner as a primary tuberculous lesion. One patient aged 56 was first x-rayed two months before his daughter was diagnosed as having active pulmonary tuberculosis. His x-ray film was then clear. Two years later he developed a left pleural effusion which resolved completely in six weeks. As there was no evidence of a tuberculous focus in the lung, it had apparently been concluded that the aetiology of the effusion was not tuberculous. However, after a further two years two new cases of active pulmonary tuberculosis presented in the household, and a further x-ray film of the parent's chest then showed active tuberculosis in the left mid-zone and right apex. Sputum contained tubercle bacilli. Another man developed a right pleural effusion at the age of 59, but, as it resolved quickly and he was found to have electrocardiographic changes suggestive of myocardial degeneration, the effusion was attributed to heart failure. A year later, however, he was x-rayed again because of dyspnoea, and infiltration in the right upper lobe was discovered. Examination of the sputum revealed tubercle bacilli.

The second point is that three patients, aged 55, 55, and 59 years at diagnosis, appear to have contracted the

disease as a result of infection from a younger member of the household. These patients had had a negative x-ray report after the source case had been diagnosed. In a further case, a man aged 51 whose wife had active tuberculosis had a clear x-ray film, but four years later he had developed bilateral pulmonary tuberculosis with cavitation.

Discussion

The aim of tuberculosis work is not now concerned so much with control of disease as with eradication of infection. Simmonds (1953) has pointed out that "as tuberculosis becomes less widespread its significance as an infectious disease tends to increase. The seed becomes relatively more important when it may find so many susceptibles." It is therefore of vital importance that the pool of unknown infected persons should be drained. Once diagnosed, practically all these cases, except the recalcitrant and unteachable, would soon cease to be public-health problems. Wilkins (1956) has shown that a large number of cases of pulmonary tuberculosis are to be found, especially in men over the age of 65, and recent trends in tuberculosis mortality and morbidity suggest that sources of active infection will be increasingly concentrated in this group.

It has generally been thought that tuberculosis in older people is a very chronic disease, and for this reason it has been suggested that a complete x-ray survey of men over 45 would be virtually sufficient to root out most of the disease in this group (Nash, 1955). The present investigation, however, suggests that this statement needs qualification.

It seems evident that some older people have a clear x-ray report and subsequently develop active tuberculosis. In this series of 100 people diagnosed as having pulmonary tuberculosis over the age of 55 years, 49 had had a previous chest x-ray examination when they were more than 45 years old. The original film of 22 (44.9%) of these 49 patients showed no evidence of intrapulmonary disease and many of them had been x-rayed within five years of diagnosis. Similarly, Wraith and Ovens (1956) found that, of 106 patients over the age of 50, 14 had had an apparently normal x-ray film taken within 10 years of the diagnosis of tuberculosis and in a further 11 cases x-ray films taken within a similar period showed only a slight amount of inactive tuberculous disease at one or both apices. It therefore seems that a negative x-ray report in an older person is of limited value only.

It is also evident from this investigation that further problems arise even if disease is noted. Tuberculous disease which appears radiologically inactive may break down, often after many years, and there are practical difficulties in arranging indefinitely prolonged observation. Also, radiological reports of bronchitic changes in the lungs of older people must be regarded with reserve; sputum examination for tubercle bacilli is desirable in all these cases. "Unresolved" pneumonias should, of course, be regarded with the greatest suspicion from the point of view of both tuberculosis and lung cancer, and, although the importance of observing such cases until radiological resolution or stability has been reached is well recognized, this series shows that action does not always follow upon knowledge.

Springett (1951) has found in mass radiographic studies that many new cases in older people are due to breakdowns of old lesions regarded as inactive at

previous x-ray examinations, and no doubt in some cases the disease is due to reactivation of a lesion not radiologically visible. Medlar (1955) believes that in some cases, particularly in older men, the disease may arise as a result of exogenous infection, and there was evidence in the present investigation to support his contention. In four older patients it seems that the source of infection was an active case in the household. When the source case was diagnosed the elderly parent was radiologically free from infection. Further, in three of these cases, contrary to the usual course of events, the younger member of the household appeared to have infected the older. As eradication of tuberculous infection from the community proceeds such instances should become rarer.

Why should a person who has successfully resisted disease throughout adult life suddenly develop active pulmonary tuberculosis? It may be that disease in the older patients is facilitated by a waning of resistance to the tubercle bacillus (Pagel and Woolf, 1949; Lees and Munro, 1954). If previous tuberculous disease has healed completely any further infection occurs in what can be regarded as virgin soil. In such a case disease would be expected to assume the form of primary tuberculosis, and this in fact did happen in two cases.

How can these cases of active tuberculosis in older people best be detected? Obviously, regular mass surveys of older age groups would be the ideal method, but this is a counsel of perfection. The elderly are notoriously difficult to persuade to come for x-ray examination, and in the 1957 Glasgow mass x-ray campaign, despite intensive propaganda directed especially to the elderly, only 60.64% of men resident in the city over the age of 60 years came forward, compared with 76.24% of men in the age group 15-59. Similarly, 63.68% of women over the age of 60 were x-rayed, compared with 80.73% of those between the ages of 15 and 59.

It seems probable that the key figure in the attack against tuberculosis will be the general practitioner. The family doctor knows the patient, is most in contact with him professionally, and is in a good position to persuade him to submit to further investigation when he is ill. It must not be forgotten that, while in some old people pulmonary tuberculosis may present in an acute form, in others the onset may be much more insidious. Lassitude and loss of weight, too often regarded as a normal accompaniment of ageing, may be the only symptoms. Pyrexia and anaemia are uncommon, and a cough may be attributed to "bronchitis" or cigarettes. The disease progresses steadily, with no dramatic signs, and it is only after the patient has been under treatment for some time, with consequent marked improvement in his general condition, that he realizes by comparison how ill he was prior to diagnosis.

These deviations from the normal ageing process are most likely to be detected by the family physician. But, even though no respiratory symptoms or signs are present, the patient may have pulmonary tuberculosis, and the practitioner should not be deterred from having x-ray examination of the chest carried out because of a previous negative film, no matter how recent that may be. The necessity for re-examination of the chest is even more urgent if any abnormality has been previously detected. Lesions regarded as inactive may have reactivated, and changes in the lung fields thought to be due to bronchitis may have had a tuberculous basis.

Summary

The previous radiological history of 100 consecutive cases of pulmonary tuberculosis in which the patient was over the age of 55 years was investigated.

Fifty had been x-rayed before: 23 (46%) of these films were clear and 27 (54%) showed no abnormality.

In films considered abnormal, inactive tuberculosis, "unresolved pneumonia," and "bronchitic changes" were the most common abnormalities found.

Only three patients were under the age of 50 when previously x-rayed, and 38 patients had been x-rayed within five years of diagnosis.

In an older person if any suspicion of pulmonary tuberculosis arises it is essential to carry out an x-ray examination of the chest even if a recent film has been reported clear.

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REFERENCES

- Glasgow Corporation (1958). *Glasgow's X-ray Campaign Against Tuberculosis*, 1957.
 Lees, A. W., and Munro, I. B. (1954). *Brit. med. J.*, 1, 496.
 Medlar, E. M. (1955). *Amer. Rev. Tuberc.*, 71, Suppl. [No. 3, Pt. 2], p. 220.
 Nash, F. A. (1955). *Lancet*, 2, 1302.
 Pagel, W., and Woolf, A. L. (1949). *Amer. Rev. Tuberc.*, 59, 311.
 Robins, A. B. (1953). *Amer. J. publ. Hlth*, 43, 718.
 Simmonds, F. A. H. (1953). *Tubercle (Lond.)*, 34, 314.
 Springett, V. H. (1951). *Brit. med. J.*, 2, 144.
 Wilkins, E. G. (1956). *Ibid.*, 1, 883.
 Wraith, D. G., and Owens, R. (1956). *Brit. J. Tuberc.*, 50, 326.

IDIOPATHIC HYPOPARATHYROIDISM WITH NORMAL URINARY CALCIUM

BY

L. SYMON, F.R.C.S.Ed.

Neurosurgical Registrar, Aberdeen Royal Infirmary

AND

ISOBEL M. BETT, B.Sc.

Department of Clinical Chemistry, Aberdeen University

The association of symmetrical calcification of the basal ganglia with hypoparathyroidism was reported by Eaton and Haines (1939), and is now well recognized. In these cases, low levels of serum calcium accompany high levels of serum phosphate, in the absence of any evidence of renal insufficiency, generalized bone disease, or abnormality of fat absorption. Calcium is absent from the urine; indeed, its reappearance there is the yardstick of treatment recommended by Albright and Reifenstein (1948). These authors further note, however, the rare occurrence of cases in which calcium in normal quantities was present in the urine. Such a case is here recorded.

Case Report

The patient, a man aged 21, was resident in North-west Scotland and came of a family of four, with two sisters aged 25 and 8 years, and one brother aged 15 years. None save the patient gave any history of epilepsy or other neurological or endocrine disease. Radiographs of the skull of his brother and younger sister were normal. His father, aged 55, and mother, aged 48, were in good health and gave no history of neurological or endocrine disease, and

their skull radiographs showed nothing abnormal. His father's two brothers, aged 61 and 50, and his mother's three brothers, aged 58, 50, and 44, were all reported to be in good health. They and the patient's elder sister were either abroad or in inaccessible parts of Northern Scotland. Radiographs of these relatives were not obtained. The patient himself had suffered from recurrent convulsions at the age of a few weeks, attributed to birth trauma. Throughout his childhood, up to the age of 8 years, he had occasional epileptiform seizures. Thereafter he had suffered from such seizures only in response to febrile illness. There had been two such occasions in adolescence, while his first admission to another hospital and transfer to Aberdeen (December, 1957) had resulted from such a convulsion occurring in the course of influenza. For long he had been thought to be suffering from idiopathic epilepsy.

There was nothing to suggest deterioration in his general health or intellectual capacity. His memory was good, his mother had noticed no change in his personality, and he was working successfully as a stone-mason.

Examination revealed a co-operative, pleasant young man, rather slow in conversation though his speech was normal. He was easily amused, and other patients found him odd or simple without clear foundation for their opinions. Assessment of intelligence on the Wechsler adult scale gave an intelligence quotient of 90. He seemed of at least dull average intelligence, while his memory and reasoning ability appeared to be normal.

Bilateral lens opacities were detected by slit-lamp examination. The optic fundi were normal. Bilateral horizontal nystagmus was more pronounced to the right. There was no tremor of the limbs, but fine tremor of the tongue and of the eyelids on closure was constantly present. No jaw-jerk was elicited. Normal tone was present in arm and leg muscles. His performance of fine repetitive hand movements appeared to be slightly impaired.

Romberg's sign was negative. Though his gait was brisk he swung his arms considerably less than normal. He admitted no paraesthetic phenomena, nor were any abnormalities of sensation detected.

The Chvostek and Trousseau signs were initially negative, but after several days in hospital, with a much reduced milk intake as compared with his home diet, these signs became unequivocally positive, although no apparent change in the serum levels of calcium and phosphate had occurred. Trousseau's sign was elicited as recommended by Albright and Reifenstein (1948), an arm tourniquet being elevated to just above the systolic blood pressure for three minutes. Erb's test, invoked because of initially negative clinical tests, gave a cathodal opening contraction at 4.5 mA.

General examination revealed no abnormality; blood pressure was 120/70. The teeth generally were of poor development, very carious, with much gum infection. The nails and hair appeared normal, and the skin was of average texture.

Investigations

Radiographs of the skull (Figs. 1-3) showed extensive irregular calcification in the basal ganglia of both sides and calcification in both dentate nuclei. There was also some hyperostosis of the frontal and parietal bones. The long bones, hands, chest, and abdomen showed no radiological abnormality. There was no subcutaneous or renal calcinosis. Radiographs of the teeth confirmed their poor development. Many of them were mere stumps with evidence of apical infection. The lower incisors had particularly small roots (Figs. 4-6). The trabeculae of the lumbar spine were noticed to be prominent, but there was no evidence of generalized increase in bone density. On admission the serum calcium was 6.2 mg./100 ml. and the serum phosphate 6.1 mg./100 ml. Serum acid and alkaline phosphatases were found to be 1.5 and 10 King-Armstrong units respectively. Total serum protein was 8.3 g./100 ml. (albumin/globulin ratio 1.6/1). The blood urea was 37 mg./100 ml., and plasma CO₂ combining power 66 vols./100 ml.