HILUS TUBERCULOSIS AS AN IMPORTANT CAUSATIVE FACTOR IN PULMONARY TUBERCULOSIS IN ADULTS.

BY

D. J. GAIR JOHNSTON, M.B., CH.B., D.P.H.,
BIRKENHEAD.

THE term "hilus tuberculosis" is used for convenience, and in a comprehensive sense, to include tuberculosis of all or any of the different groups of bronchial glands. An almost universal distribution of tuberculous infection in the human subject has been found by so many observers that it is now accepted as a proved fact. The present investigation has been carried out with a view to determining how far it is possible to diagnose tuberculous infection from clinical signs and symptoms only, and whether there is any direct connexion between such infection and pulmonary tuberculosis. The period of observation extended over ten years, and involved the examination of over 20,000 children between the ages of 5 and 14, and the re-examination at intervals of three to six months of all those showing definite evidence of departure from the normal. The first thing that impresses itself on the observer who has examined even a few hundred healthy chests is that there is no fixed normal. The normal varies within fairly wide limits, and a long apprenticeship is required to establish confidence in deciding which cases fall within the normal and which are definitely outside it.

The mass of evidence obtained, often apparently very contradictory, was very perplexing during the earlier period of the investigation, but slowly the accumulated evidence of years tuned the mind to a more or less definite line of thought, which appears to offer a reasonable explanation for all the varying phases and stages of the infection. The physical examination followed the usual lines, and does not require to be given in detail. It is advisable, however, to emphasize the necessity of using the very lightest percussion if the finer shades of dullness are to be successfully determined. Tidal percussion should always be mapped out, although, at the apices, it was found to be less valuable in children than in adults, and the same may be said of Krönig's sign. The "reflex bands of dullness" (Clive Riviere) afford a most reliable sign of invasion of the lung parenchyma. They are not always easy to make out, but when present are very significant. They were repeatedly looked for in children, but very seldom found, probably because definite invasion of the lung parenchyma in children is relatively rare. Granular breathing is highly suggestive of tuberculous infection, and can sometimes be heard over a whole lung; but it does not necessarily mean that the tubercle bacilli have invaded the lung tissue.

The process of weeding out all cases showing evidence of tuberculous infection, and the exclusion from school of the worst cases for suitable periods, was productive of much good. This is shown by the following comparative figures:

Years.	Tuberculous infection.
1913	15.4 per cent.
1914	14.9 "
1920	9.1 "
1921	7.2 "
1922	4.8 "
1923	4.6 "

The period 1914-20 covers the war period, when the work was entirely suspended.

A careful survey of the teeth, tonsils, and cervical glands was made, and pathological evidence of parasternal and paravertebral glands looked for. An attempt was made to correlate the condition found with evidence of tuberculous infection; also what, if any, connexion existed between physical signs of enlarged bronchial glands, and the distance down the spine to which definite tracheal breathing extended. The following table shows the percentage of

children, out of a total of 1,918 examined, who were found to be defective in each of the eight conditions stated:

	A.	B.
1. Teeth	27.7	13.3
2. Tonsils	8.0	4.3
3. Adenoids	4.7	2.0
4. Nose (chronic catarrh)	22.2	14.3
5. Cervical glands	90.7	45.5
6. Family history of phthisis	20.1	7.8
7. Defective nutrition	50.7	26.8
8. Deformities of chest	4.0	0.9

A refers to cases of tuberculous infection; B refers to all cases.

These figures seem to show a definite connexion between septic conditions of the nasopharynx and the prevalence of tuberculous infection. The age incidence worked out at 33 per cent. at 6 years; 46 per cent. at 9 years; and 21 per cent. at 13 years.

Although a well-marked case of hilus tuberculosis is easy to detect, the less well-defined cases are difficult. The following may be regarded as a typical well-defined case:

A boy, aged 9 years, was on examination found to be pale and flabby, but fairly well nourished; he gave a history of frequent colds, and of cough and lassitude for a prolonged period. Over the chest and neck, particularly on the right side, there were numerous prominent veins; the right supraclavicular glands were palpable and the right paravertebral dullness was definitely increased. At the apex of the right upper lobe expiration was greatly prolonged, and there was blowing respiration over the right interscapular region, with tracheal breathing extending to the sixth dorsal spine.

The following case is also of interest:

A girl, aged 13 years, was examined because she had persistent cough, was very short of breath, and did not feel well. Physically she was of the large flabby type so often associated with tuberculosis. Examination revealed numerous fine crepitations all over both lungs; the heart was normal. A bad prognosis was given, but in three months the lungs showed no abnormality.

There was no other case in the series quite like this one, but a fair number showed signs confined to one side, with weak breath sounds and definitely diminished tidal percussion and expansion, suggesting pressure by enlarged bronchial glands. Granular breathing was a fairly common accompaniment.

An attempt, involving the special examination of 300 children, was made to gauge the diagnostic value of tracheal breathing. Four groups were taken, as follows: A, no evidence of tuberculous infection; B, slight but definite changes at an apex; C, definite physical signs at an apex; D, definite areas of localized crepitations.

Distance heard.	A.	B.	C.	D.
7th cervical or 1st dorsal ...	80	58	27.4	26.6
2nd dorsal to 3rd dorsal ...	12	24	26.0	20.0
4th dorsal to 7th dorsal ...	8	18	46.6	53.4

Experience shows that tracheal breathing does not commonly extend beyond the first dorsal vertebra in strictly normal cases, and this observation supports the view that it is heard more frequently beyond the first dorsal vertebra in infected cases.

Many of the children showed physical signs which in an adult would be regarded as definite evidence of pulmonary tuberculosis, yet their history, and often the final examination, entirely belied that assumption. The condition would remain, year after year, with little or no change, and the child might, and not unfrequently did, enjoy good health. In some cases all the physical signs entirely disappeared. It was not uncommon to find, on routine examination, the following signs at an apex: retraction, delayed movement, impaired resonance, broncho-vesicular breathing, and increased vocal resonance. In addition, cough and lassitude were complained of, and even a family history of pulmonary tuberculosis was obtained. In such circumstances it is difficult to divorce the mind from the opinion that there is definite tuberculous invasion of the lung parenchyma, yet numerous such cases have been observed for years, during which, in many cases, the children enjoyed reasonably good health, and finally left school with the physical signs more or less unchanged. At first it was assumed that the physical signs indicated a healed lesion, and they were regarded seriously; but as years went on that explanation, although very tempting, simply would not fit the cases. If a healed lesion of such dimensions existed, then some evidence of destruction of lung

tissue and its replacement by fibrous tissue would remain, but in quite a number of cases all the physical signs entirely disappeared, including the retraction. Such a history does not suggest a healed lesion, and the clinical picture was not in conformity with a simple apical collapse.

A girl, aged 6 years, was examined and the physical signs were retraction, impaired resonance, and broncho-vesicular breathing at the apex of the right upper lobe; she had also palpable cervical glands, increased paravertebral dullness, spinal telangiectasis, and tracheal breathing to the seventh dorsal vertebra. In six months there was no retraction and no dullness. After a further six months the physical signs were reduced to weak inspiration and prolonged expiration and tracheal breathing to the fifth dorsal vertebra. Six months later the lungs were normal and tracheal breathing was heard only to the first dorsal vertebra.

Here we have definite physical signs at an apex, accompanied by definite signs of glandular enlargement, and both clearing up simultaneously.

The examination of a boy, aged 6 years, revealed the following signs: impaired resonance and broncho-vesicular breathing at the apex of the right upper lobe; also dullness, cavernous breathing, bronchophony, and numerous crepitations in the right axilla. After an interval of seven years the signs at the right apex were unchanged, but modified at the right axilla. The left axilla now showed marked bronchial breathing and numerous crepitations. One year later the only signs were impaired resonance and broncho-vesicular breathing in the left axilla. At the first examination the symptoms were cough, lassitude, cold night sweats, and slight staining after coughing. The cough persisted throughout, but the other symptoms were less evident. The cervical glands were much enlarged and tracheal breathing extended to the sixth dorsal vertebra. The patient was a typical street arab, received the minimum of parental care, and was up at 7.30 every morning delivering milk. If there was definite invasion of the lung parenchyma it is difficult to believe that he would have improved, as he certainly did, in spite of such adverse conditions.

Another case is that of a girl, aged 9, who was under observation for one year as a case of hilus tuberculosis. She suddenly became ill, and on examination revealed the usual right apical signs, greatly aggravated. A pneumonic patch was suspected, but the advent of a measles rash made the position clear. Within a week the apical signs returned to their original condition; the aggravation was evidently due to an acute infection of already infected glands.

Another type of case which caused difficulty was that of the child in whom was found an area of localized crepitations. This consisted of small patches of lung area, always in the lower or middle lobe, where crepitations could be heard. The crepitations were very fine, almost consonating, and heard at the end of inspiration only; they were very persistent under all conditions. The respiratory sounds were generally weak, owing to the modifying influence of the fluid in the air cells, and impaired resonance was found over the larger patches. Almost every such child was obviously below par, had a persistent cough, and complained of lassitude; important confirmatory evidence was volunteered by the teachers that such children were educationally backward and often absent from school. The localized patches of crepitations persisted for months, sometimes for years, but they generally cleared up without leaving any permanent evidence. Poor health accompanied the crepitations, but improvement always followed the clearing up of the local conditions.

Some Illustrative Cases.

Case 1.—The patient, a boy aged 8, gave a history of recent symptoms of pleurisy with cough and lassitude for a month. There were a considerable number of crepitations in the left lower lobe. Six months later the crepitations were still present, tidal percussion was definitely lessened, and impaired resonance and prolonged expiration were found at the apex of the right upper lobe. The left supraclavicular glands were palpable and there was definitely increased paravertebral dullness. An examination in ten months showed no abnormality. His weight increased by 12½ lb. in eighteen months.

Case 2.—A girl, aged 11, had an extensive patch of crepitations in the right axilla, which persisted for three years, but ultimately cleared up without leaving any permanent evidence. Her weight increased by 31 lb. during the period.

Case 3.—A boy, aged 13, had bronchial asthma accompanied by weak breath sounds over the whole of the left lower lobe, as well as retraction of lung and diminished tidal percussion. There was weak inspiration at the apex of the right upper lobe down to the third rib, and tracheal breathing to the sixth dorsal vertebra. The increase of weight in two years was 14 lb.

Case 4.—A boy, aged 12, had numerous crepitations in the left axilla between the sixth and eighth ribs, extending from the nipple line to the posterior axillary line. Tidal percussion was

diminished. At the apex of the right upper lobe there was retraction, impaired resonance, weak inspiration, and prolonged expiration. The cervical glands were much enlarged and the patient had a persistent cough. At the end of one year the signs at the right apex remained, but the other signs had cleared up.

These cases demonstrate the persistence of the local crepitations over a number of years, accompanied by evidence of pressure by enlarged bronchial glands. All showed a steady, but somewhat irregular increase in weight, and in none was there any sound justification for believing that the lung parenchyma was invaded by tubercle bacilli. All the signs and symptoms are more reasonably explained as being secondary to pressure by enlarged bronchial glands, the crepitations being probably due to interference with the free circulation by infected broncho-pulmonary glands.

The apical signs were found at the right apex only in 62 per cent. of cases, the left only in 6 per cent., and in both in 32 per cent. On the other hand, the localized crepitations were found in the left lower lobe in 58 per cent. of cases, and in the right in 42 per cent. Cough and/or lassitude were present in 87 per cent., nutrition was below normal in 83 per cent., and at 13 years of age the average weight was 10 lb. below the average.

It might be argued that such conditions may be true for children, but are not likely to be found in adults. A year's duty in the Ministry of National Service, when many thousands of adults of all classes of society were examined, afforded an excellent opportunity to test this point. As deputy commissioner in charge of a large industrial area I personally examined all cases showing definite evidence of departure from the normal, and found that the conditions at the apices of the upper lobes, and the localized crepitations in the lower lobes, closely resembled those so familiar in children. A similar opportunity for repeated examinations was not available, but the broad fact remains that such cases were by no means uncommon, and occurred in men who were presumably well and carrying out their ordinary duties. In private practice one frequently finds cases which show physical signs and symptoms highly suggestive of definite pulmonary tuberculosis, without the infection having passed beyond the bronchial gland barrier; and that when invasion of the pulmonary parenchyma does occur it is not infrequently due to the rupture of infected bronchial gland contents into a bronchial tube.

Reports of Cases.

Case 1.—The first case is that of a lady in whom the presence of tuberculous bronchial glands was diagnosed two years prior to an acute exacerbation. She complained of great shortness of breath, violent and persistent cough, and great lassitude. There was no sputum. The physical signs at the apex of the right upper lobe were slight retraction and delayed movement, impaired resonance, broncho-vesicular breathing, but no adventitious sounds. The physical signs varied from time to time, but the symptoms persisted. During the exacerbation she developed an evening temperature; numerous crepitations were heard in the right infraclavicular region, and the other physical signs were aggravated. In spite of these very suggestive signs, I formed the opinion that there was no invasion of the lung parenchyma. A month's rest in bed brought the patient back to her original condition. She was afterwards examined by a leading authority on tuberculosis, who reported that "the right apex was becoming aggressive," and advised her to winter abroad. This she did, and was examined there by another specialist in tuberculosis, who, after an x-ray examination, agreed that the infection was confined to the bronchial glands, there being no evidence of pulmonary tuberculosis.

Case 2.—A boy, aged 17, was under observation as a case of hilus tuberculosis for one year. A sudden acute illness developed, and examination revealed impaired resonance and broncho-vesicular breathing at the apices of both upper lobes, particularly the right; also blowing, respiration in the interscapular regions, and tracheal breathing to the sixth dorsal vertebra, but no adventitious sounds. The pulse rate was 120, respiration rate 30, and the temperature 102° F. or more in the evening, 99° F. in the morning. He had cold night sweats, a very violent cough (no sputum), and the clear bright eyes of tuberculous toxæmia. His condition was very grave for several weeks, and, although an assurance was given that the lungs were free at the moment, there was definite risk of acute pulmonary tuberculosis. Gradually the whole condition quietened down without showing any evidence of pulmonary invasion, and he has enjoyed good health for over two years, working long hours every day.

Case 3.—A girl, aged 14, in whom hilus tuberculosis had been diagnosed three years prior to her illness, suddenly developed what was supposed to be a cold; two days later, however, examination showed absolute dullness over the whole left lower

lobe, with bronchial breathing, bronchophony, and patches of crepitations irregularly scattered throughout the lung. The evening temperature was 100° F., morning temperature 99° F. or normal; the pulse rate 80, and respiration rate 21. The patient had severe cough (no sputum), cold night sweats, and the clear bright eyes of tuberculous toxæmia. She remained seriously ill for a month, but in two months she was convalescent, and in three months the affected lung showed no abnormality.

Cases 2 and 3 are in marked contrast. In Case 2 there was acute tuberculosis of the bronchial glands only, and every evidence of acute toxæmia. In Case 3 the toxæmia was obviously less, although the lung was extensively involved. This would seem to suggest that in Case 2 there was a definite acute tuberculous infection, whereas in Case 3 the condition was probably caused by an enlarged and adherent tuberculous gland suddenly opening into a bronchial tube, distributing its contents, largely consisting of caseous material with a minimum of tubercle bacilli, into the corresponding lung. This would account for the much more favourable prognosis in the so-called "acute pneumonic phthisis," as compared with the more deadly "bronchio-pneumonic" type, in which there is diffuse and profuse infection, probably from acutely inflamed glands, either by an extensive retrogressive spread, or by the passing of large numbers of virulent tubercle bacilli into the blood stream.

Case 4.—A male, aged 37, was under observation for two years suffering from periodic attacks of bronchial asthma, with violent and persistent cough and great lassitude. Repeated examinations revealed crepitations over large areas of the lungs, sometimes in one situation, sometimes in another, and occasionally almost entirely absent. No definite clinical signs of enlarged bronchial glands or of tuberculous invasion of the lung parenchyma were present. There was an old history of pleurisy; the sputum was negative. The patient was suddenly taken acutely ill, and a large consolidation was found at the apex of the right upper lobe, extending to the third rib, and tubercle bacilli were found in large numbers in the sputum. In view of the fact that the lung parenchyma showed no previous evidence of tuberculous invasion, old or new, it is hardly likely that a large consolidation, extending to the third rib, could have occurred in such a brief period, except by a sudden mass infection from such a source as an infected gland.

Case 5.—A male, aged 47, gave a history of persistent cough and lassitude for one year prior to his illness; repeated examinations of the lungs were negative. It is of interest to note that the "reflex areas of dullness" were absent. He was suddenly taken ill with influenza-like symptoms, but a physical examination showed, at the apex of the left upper lobe, delayed movement, impaired resonance down to the third rib, broncho-vesicular breathing, and fine crepitations over the whole affected area. The evening temperature was 100° F., morning temperature 99° F. or normal, and the pulse rate 90 to 100. Although absent before, the reflex areas of dullness were now most obviously present, and the sputum was positive. In three months he was sent to a sanatorium, and the x-ray report was as follows: "There is definite infiltration about the left middle zone and at the left apex. Probably, too, the right upper lobe can be looked upon as slightly abnormal. But on the whole the chest seems to be but moderately slightly involved with tuberculosis."

The usual explanation of this sort of case is that an old lesion has been suddenly lighted up by an attack of influenza. In the first place, there was no old lesion, and, secondly, there was no influenza. The symptoms could, and there is every reason to believe that in this case they did, arise from the shock of a sudden invasion of the lung parenchyma. This would quite obviously give rise to influenza-like symptoms. On the other hand, a sudden invasion from a bronchial gland would account more satisfactorily for all the details of the case, including the preceding persistent dry cough and the large area so quickly affected. The patient's splendid recovery with the minimum of physical signs remaining also seems to support this view. The final sanatorium report was: "His physical signs—never very well marked since admission—are less than ever."

Since writing the above I have again had this patient under treatment. On April 26th, just over one year since his first illness, he complained of cough, did not feel well, and had a temperature. Examination was completely negative. Four days later there was a sudden invasion of the whole left lower lobe, very similar to that of Case 3. This relapse gives further support to the original diagnosis.

No attempt is made to discuss the controversial question of path of infection, but merely to state clinical facts, as observed over the long period of fifteen years.

CONCLUSIONS.

1. Hilus tuberculosis can be demonstrated clinically in a relatively large percentage of children.

2. In spite of much clinical evidence suggesting pulmonary tuberculosis in children actual invasion of the lung parenchyma is relatively rare.

3. The natural tendency in all cases is towards a cure, although in many cases physical signs will remain which, in adult life, will be regarded as old healed lesions.

4. Pressure from enlarged bronchial glands can be demonstrated clinically; it has the effect either of restricting the free flow of air into a lung or of interfering with the free circulation of blood in the lungs, and giving rise to localized areas of oedema, rarely to general pulmonary oedema.

5. Rupture of adherent caseous glands into a bronchial tube is a not uncommon cause of pulmonary tuberculosis.

The diminished death rate from pulmonary tuberculosis is probably due mainly to the lessened risk of infection from "open cases" in the homes, and to the more prompt recognition of early cases. It is unlikely that a further appreciable decrease will occur unless a serious attempt is made to deal with the large number of potential cases *before*, not *after*, the lung parenchyma has been invaded by the dreaded tubercle bacilli.

TONSILS AND ADENOIDS: THEIR MEDICAL AND SURGICAL ASPECTS.*

BY

J. ARNOLD JONES, O.B.E., F.R.C.S.ED.,

SURGEON IN CHARGE, EAR, NOSE, AND THROAT DEPARTMENT, ROYAL MANCHESTER CHILDREN'S HOSPITAL; SURGEON, ST. JOHN'S EAR AND THROAT HOSPITAL, MANCHESTER.

INTRODUCTION.

THE subject of "tonsils and adenoids," which has been chosen for discussion to-day, might well be described as a "best-seller," for there is no medical topic which the laity of these islands discuss with more frequency, more verve, and more ignorance than this, not excepting appendicitis itself; while professional opinion, always with us in a small trickle, sometimes attains the level of a flood, as witnessed by the spate of letters in the *British Medical Journal* early this year. The subject may be said to have reached its apotheosis with the publication of Irwin Moore's monumental work last year.

For the purposes of this discussion I shall confine my remarks to those conditions produced by chronic sepsis and hyperplasia of these lymphoid masses—that is, to the clinical and pathological conditions generally meant when a patient is said to be suffering from "adenoids and tonsils." Acute conditions and such rarities as calculi of the tonsils will not come within my purview. The palatine tonsils and the third or pharyngeal tonsil, commonly referred to as adenoids, form part of Waldeyer's ring—that group of lymphadenoid tissue in the nasopharynx and pharynx which surrounds the entrance to the respiratory and alimentary passages.

The function of the tonsils is still *sub judice*; various theories have from time to time been put forward, but it would seem most reasonable to regard them as organs for the defence of the respiratory and digestive tracts during the early years of childhood. As StClair Thomson succinctly puts it:

"The ages in which they are most in evidence, their situation, their structure, the recognized emigration of lymphocytes through their epithelium, their frequent enlargement with an infectious process, the frequency with which, when their resistance is overcome, they appear to be starting-points for infection, their lasting hypertrophy after prolonged or repeated infections, experimental observations which show that they serve as ports of entry for infection and their normal involution at puberty, all appear to confirm this view."

* Read in opening a discussion in the Section of Diseases of Children at the Annual Meeting of the British Medical Association, Manchester, 1929.