Is it not most probable that the decrease is largely due to an acquired or hereditary immunity which is steadily raising our resistance to the onset and course of the disease, and that the cases of tuberculous families which undoubtedly exist are only examples of massive infection during infancy and childhood in which the resistance is overcome?

It has gladdened the existence of many patients leaving here when this view has been put before them, and they are advised that with proper precautions there is no reason why their progeny should inevitably contract the disease; and the hope thus instilled must assist in the fight against infection in this preventable disease.

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THE SYMPTOMS AND COURSE OF TUBERCULOUS MENINGITIS IN ADULT CONSUMPTIVES.

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THE classical picture of tuberculous meningitis in childhood may be drawn in three stages, (1) the prodromal stage with apathy, nausea and irregular rises of temperature, (2) the stage of brain irritation with increasing headache, cervical rigidity, Kernig's sign, delirium, slow pulse, convulsions, increased reflexes, transitory contractures and "cris hydropcephaliques," and (3) the stage of paralysis with sopor, coma, paralyses of the ocular muscles, hemiplegiæ, aphasia, rapid pulse, retention of urine and severe constipation. Observations and accounts of each sign of the disease in childhood are so numerous that our knowledge in this matter is quite exhaustive; but this is not the case with regard to the symptoms and course of tuberculous meningitis in adults.

In Denmark this subject, as far as I can find out, has not been studied. French writers, including Jaccoud, Chantemesse, Le Gendre and Masselot, have recently published papers on this subject, and in England, Gairdner and Fussell have reported isolated cases. A large work on the subject in Swiss-German has been published by Seitz, and Kreisman and Jaquet have reported a couple of cases.

French clinicians, more than others, seem to have noticed differences in the symptoms and course of the disease in adults and children. In his thesis of 1884, Chantemesse does, indeed, show a tendency to regard the disease in adults and children as giving rise to the

same clinical picture, but he notes that in adult consumptives meningitis is apt to run a rapid course, so that the symptoms cannot be grouped in different stages. He reported a series of cases showing that in adults abnormal forms of the disease may occur.

Jaccoud and later Le Gendre and Masselot have emphasised this difference. Jaccoud describes three main types: (1) the normal type which resembles that of childhood, but which differs therefrom by the absence of the prodromal stage; (2) the abnormal type which is observed in consumptives, and which again may be classified according as the course of the disease is remittent and insidious or rapid and violent; (3) the latent type which is found in elderly persons whose disease is not diagnosed *ante mortem*, and which is characterised by protracted "embarras gastrique," followed by the sudden onset of violent symptoms. In his paper, published 1912, Masselot distinguished various types in adults, and drew special attention to a latent form with quite ill-defined symptoms, observed in consumptives and elderly persons.

In the scanty English literature on the subject, the absence of prodromal symptoms and the ill-defined character of the disease in adults are commented on, but I have not been able to find a comprehensive review of the symptomatology of this disease in adults. The German literature is also scanty, but Strümpell in his text-book recognises the difference between infantile and adult tuberculous meningitis, and describes the course of the disease separately in the two. He notes that, in addition to the symptoms of the disease in adults, children may exhibit certain other symptoms which are peculiar to early life. He maintains that prodromal symptoms are found in adults.

In his monograph on tuberculous meningitis in adults, Seitz pointed out in 1874 that it was advisable to drop the habit of distinguishing between cases of tuberculous meningitis according as they occurred in patients previously well and in the subjects of masked or fully developed phthisis, and he recorded a couple of cases, associated with advanced phthisis, which he regarded as typical. The chief symptoms in these cases, which were observed only for a short period, were partial loss of consciousness, drowsiness, various paralyses and some degree of cervical rigidity. It will thus be seen that French and German clinicians show little unanimity in this matter.

In his paper, published in 1910, Jaquet recorded seven cases of tuberculous meningitis in patients between the ages of 41 and 68, and he insisted that these records showed a remarkable uniformity, and that the clinical picture of senile tuberculous meningitis exhibits only ill-defined characteristics. He forgot, however, to emphasise the fact that phthisis was present in every case, and in all but one was far advanced. Thus, while his attention was focused on the advanced age of the patient and its influence on the course of the disease, he omitted to consider the influence of manifest phthisis on the symptomatology. The lack of unanimity noticeable in publications on this subject is probably in part due to failure of various writers to classify their material according to age and the presence or absence of phthisis. If the material is classified in the following manner: (1) tuberculous meningitis in children (well-known), (2) tuberculous meningitis in adults (a) with more or less extensive pulmonary tuberculosis

or (b) with previously good health, we may hope to isolate the factors which a concomitant pulmonary tuberculosis adds to the symptomatology and course of the disease. At the instance of my chief, Dr. C. H. Würtzen, M.D., I have attempted to throw light on this matter by an analysis of the material available at the tuberculosis department of the Oresunds Hospital.

Between 1910 and 1919 inclusive, 30 cases of tuberculous meningitis were observed in persons over the age of 16. Although the diagnosis was practically certain in every case, and the symptomatology was remarkably uniform, my analysis deals only with the 14 cases in which the diagnosis was confirmed by post-mortem examination. The ages of the patients were as follows:—

16—20 years	...	3 cases	35—40 years	...	4 cases
20—25	„	1 case	40—45	„	1 case
25—30	„	1 „	45—50	„	0 „
30—35	„	3 cases	50—55	„	1 „

Twelve of these patients were in the third stage, and the remaining two in the second stage of pulmonary tuberculosis. The three following cases are typical:—

A woman, aged 45, was admitted on October 7, 1911, in the third stage of pulmonary tuberculosis. There was fever with hæmoptysis; when this ceased, the temperature fell, but did not reach normal. She began to improve steadily and to get about till, on February 10, she complained of violent, fluctuating headache, not confined to any special part of the head. In spite of anti-neuralgic drugs, the headache persisted for some days. On February 15 the headache was slight, but on February 17 she began to experience severe pain in the forehead with vomiting. The pulse was 84. During the next few days the headache persisted, but neither cervical rigidity nor Kernig's sign was demonstrable, and the pulse was not slow. The abdominal examination was negative. Nausea and vomiting gradually diminished, and on February 22 it was noted that some improvement had occurred during the last few days. On February 23 she was rather drowsy, and in the afternoon she became partially unconscious. Her pulse was 84, she slept well, there was no nausea, and only slight headache. But there was squint, no reaction of the pupils to light, increased reflexes, Babinski's sign, and incontinence of urine. There was no cervical rigidity or dermatographia, and Kernig's sign was only just positive. The action of the bowels was normal. Death occurred on February 25.

Obviously in this case it was impossible to group the symptoms in three well-defined, successive stages. Increase of the reflexes was demonstrable after the sopor, the pulse-rate did not show the typical shifting from slow to rapid, the paralyses of the ocular muscles were synchronous with the exaggeration of the reflexes, the headache was intermittent, instead of continuous, cervical rigidity—supposed to be a cardinal symptom—never occurred, and the disease only lasted fifteen days, although, when the prodromal symptoms are included, it is supposed by Strümpell and Petréu usually to last from three to six weeks.

A lad, aged 17, was admitted on September 5, 1919, in the third stage of pulmonary tuberculosis. His temperature was normal, and during the first month he improved greatly. Then he began to lose weight, his general condition was less satisfactory, and he sweated profusely. On December 1 he complained of slight headache, his appetite dwindled, and during the following days he was very drowsy, occasionally groaning, and complaining a little. But for the first week he was perfectly conscious, there was no cervical rigidity, Kernig's sign was absent, and there was no other sign of meningitis than a marked tendency to vomit, which was greatest when he sat up in bed. His drowsiness persisted, but it was not till the ninth day after the onset of the headache that Kernig's sign was demonstrable, and slight cervical rigidity, with an intermittent tendency to squint, was detected. He became unconscious on the tenth day, and died two days later.

In this case, too, the symptoms were vague, and the whole course of the disease ill-defined. Death occurred as early as three days after the onset of severe symptoms.

A woman, aged 33, was admitted on October 12, 1915, in the third stage of pulmonary tuberculosis. Even on admission she suffered from slight headache. This increased during the next few days, but grew less when migrainin was given, and on October 18, six days after admission, the headache had disappeared. Now, however, she began to suffer from vomiting after meals, and on October 20 the headache recurred, and she became drowsy. There was no cervical rigidity, Kernig's sign, retraction of the abdomen, squint, teeth-grinding, nor other sign of meningitis. The pulse was 88. Consciousness was gradually lost, and she continued to lie in a drowsy condition, but even during the next few days there was no cervical rigidity, Kernig's sign, nor other evidence of meningitis until October 21 when her respiration assumed the Cheyne-Stokes type. Next day albuminuria developed, and death occurred on October 23.

Here, then, was a case failing to exhibit a single one of the cardinal signs of meningitis. Yet the necropsy showed typical tuberculous meningitis with a large serous effusion in the ventricles of the brain. The most prominent symptom was drowsiness and the duration of the meningitis was only about eleven days.

The remaining cases closely resembled the above three, and only in one case were there spasmodic contractions of the legs accompanied by considerable restlessness. The fact that the patient was addicted to alcohol may possibly account for these symptoms. Otherwise convulsions were never seen, and in no case did motor aphasia occur—although Finkelnburg in Lewandowsky's text-book refers to this symptom as common in tuberculous meningitis. Nor was hemiplegia ever seen. Such focal symptoms as squint were observed twice. As a rule, the patients did not lose consciousness till near the end, but in a few cases partial loss of consciousness was the first symptom.

Delirium was characterised by its quietness. The typical changes in

the pulse-rate were anything but constant, they may have been obscured by the pre-existing pulmonary disease so often associated with a rapid pulse. In some cases, but not uniformly, retention of urine and fæces occurred. In several cases, however, the action of the bowels and bladder was normal till death. The two cardinal symptoms, cervical rigidity and Kernig's sign, were not, as the above cases show, invariably present. In several cases cervical rigidity was present one day, and completely absent the next. Headache was undoubtedly the most constant symptom, and meningitis should always be suspected when a consumptive complains of persistent headache. But in several cases the headache was intermittent, not persistent. Vomiting was a common symptom. As the above cases show, the symptom which dominates the clinical picture after the disease is well developed is drowsiness.

In none of these cases was lumbar puncture attempted, and in all the 30 cases of tuberculous meningitis treated in the hospital, this procedure was adopted only in three because it was not considered of therapeutic value. With regard to the differential diagnosis, the only condition liable to be confused with tuberculous meningitis is the terminal phase of pulmonary tuberculosis, notably when this runs an acute course, marked by profound toxæmia. The following case shows how difficult this differential diagnosis can be:—

A girl, aged 18, who had been ill for four to five months, was admitted to hospital with high fever. She was much exhausted and was found to be in the third stage of pulmonary tuberculosis. The right pupil was larger than the left, and the liver extended one finger-breadth below the costal arch. After a week she began to be delirious and drowsy, but there was no headache or cervical rigidity. The reflexes of the lower limbs were lively, the pulse was 120, and the temperature fluctuated between 38° C., and 39° C. She lay with her legs drawn up to the abdomen, the muscles of which were firmly contracted. The necropsy showed no sign of meningitis.

In this case, which resembles my third case of meningitis, the symptoms were evidently due to the profound general toxæmia. Of course, the differential diagnosis can easily be made by lumbar puncture. It might be supposed that the number and severity of the symptoms, as well as their course, would vary somewhat according as the disease was limited to miliary tubercles of the pia mater with a slight effusion about the base of the brain, or was further complicated by internal hydrocephalus. I have investigated the records of the necropsies and found that in eight of the 14 cases hydrocephalus was present, being considerable in four cases and slight in the other four. It was present in the second and third case just recorded, but not in the first. On the whole, a comparison of the clinical records with the post-mortem findings failed to show any definite influence of hydrocephalus on the symptoms and course of the disease.

I do not think tuberculous meningitis in adult consumptives can be regarded as latent. There is one change in the patient's condition, namely drowsiness, which is very striking. Like Jaccoud, we have found the course of the disease to be insidious and remittent, and we also agree with

Masselot in placing tuberculous meningitis in consumptives side by side with that of elderly persons. Our conception of the disease corresponds on the whole with Jaquet's, but in regarding the peculiarities of the course of the disease in adults as being determined solely by their age, his arguments seem inadequate.

Seitz's views, already quoted, were probably influenced by the fact that only in three or four of his 62 cases had there been signs of phthisis previous to the patient's admission to hospital. It is difficult for us to be dogmatic in regard to the question whether there are prodromal symptoms in adults or not, for the prodromal stage, if it exists, is so ill-defined that it is apt to be masked by the ordinary symptoms of phthisis, merging unnoticeably into the general clinical picture.

My investigations point to the following conclusions which coincide with what has been taught in the past at this hospital: (a) There is a definite difference in the clinical picture of tuberculous meningitis in children and in adult consumptives; (b) the extent and distribution of the disease appear to have little effect in determining the severity of the symptoms; (c) in some cases the terminal stage of toxæmia in pulmonary tuberculosis may evoke a clinical picture indistinguishable from that of tuberculous meningitis without the aid of lumbar puncture.

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