

FORMS OF CEREBRAL TUBERCLE.

CLINICAL LECTURE DELIVERED IN THE ROYAL INFIRMARY OF EDINBURGH BEFORE
THE UNIVERSITY CLASS OF CLINICAL MEDICINE.

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GENTLEMEN,—Cerebral tubercle, regarded from the stand-point of morbid anatomy, presents itself, as is no doubt within the knowledge of you all, in two forms, which in regard to their structural characters are quite distinct from each other. The symptoms produced by the two forms of the disease cannot, however, be so easily differentiated, and the exact diagnosis in consequence is frequently a matter of some difficulty. The clinical features offered by the two main types referred to are nevertheless in many points dissimilar, and a determination as to the probable nature of the lesion may be attained during life with a considerable degree of certainty. The subject has been much before us in connection with a case lately in ward 25, and, with the hope of being able to place before you the various difficulties surrounding cases of cerebral tubercle, as well as the means of solving the problems which they present, it will form the subject of lecture to-day.

D. J., a little school-girl, ten years of age, was admitted to ward 25 on January 4, 1892, complaining of headache and giddiness, with dimness of sight. The little patient's father and mother are both alive; the former is in robust health, but the latter is weakly. She is the thirteenth of fourteen children, of whom all are alive except two sisters, who died of bronchitis in infancy, and a brother, who died in his fifteenth year of some pulmonary affection. She has never been a strong child. She has suffered from scarlet fever and measles, and at the age of sixteen months she broke the bone of one of her thighs in consequence of a fall. Her social surroundings are by no means good. Her father's work usually keeps him in the west of Scotland, and her mother is employed away from home most of the day, during which time the house is under the charge of a little girl of twelve.

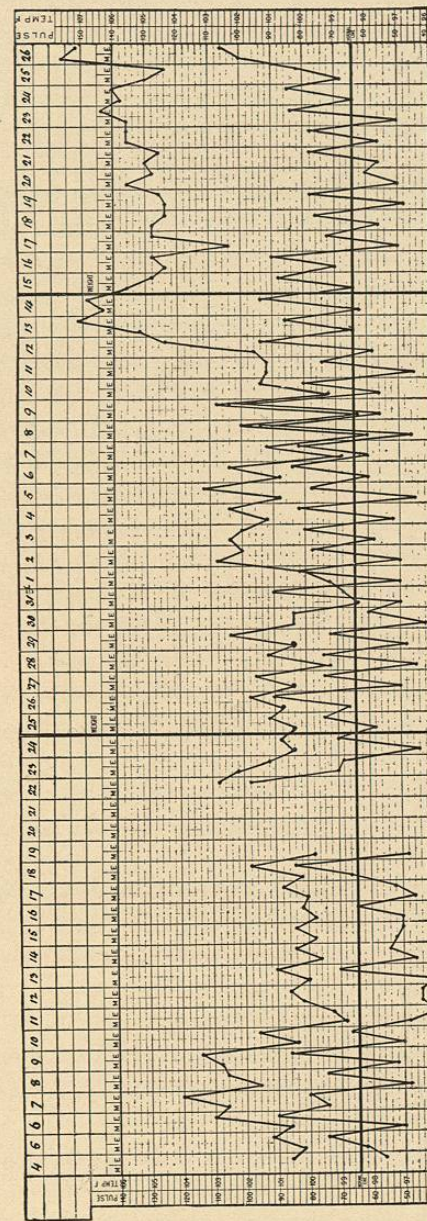


FIG. 1.—The pulse and temperature are recorded on the "Graphic Clinical Chart" of my friend Dr. Handford, of Nottingham. The upper tracing represents the pulse, and the lower the temperature variations.

The present illness appears to have begun during last summer, when the little patient was often feverish and perspired profusely, losing at the same time a good deal of weight. Notwithstanding these symptoms, she attended school with comparative regularity, and seems to have enjoyed a holiday of two weeks which she spent in the country during August. Early in October, when she was standing in the street, the head of a boy who was running past came violently into collision with her forehead. She was stunned by the blow, but did not fall, and, after resting a short time, was able to walk home. From this date, however, she always suffered from headache, and very frequently complained of giddiness; she attended school, nevertheless, with regularity until her sight became so bad that she could not see. The feverish attacks were at the same time more marked, and they were accompanied by great flushing of the skin and considerable breathlessness.

On admission it was noted that the patient, a slenderly-built and imperfectly-developed child, persistently lay on her back in a sleepy state, with her brows knitted. The temperature was then nearly normal, but, as will be seen from the accompanying chart (Fig. 1), it afterwards showed a rise in the evenings, with a remission on the following mornings. The tongue was furred, there was little appetite, and persistent constipation. The pulse varied considerably in frequency, but was always regular and of low tension. Examination of the heart revealed no morbid phenomena. The respiration was somewhat jerky, but on physical examination nothing abnormal could be detected, with the exception of a few scattered crepitations. No symptoms of disease were present in connection with the urinary and integumentary systems.

With regard to the nervous system it was observed that ordinary sensibility was unimpaired. The senses of smell, hearing, and taste were in no way modified. The acuity of vision was diminished, and the visual fields were lessened in both eyes. Ophthalmoscopic investigation showed that both retinæ were hyperæmic, and that there was early optic neuritis. There was internal strabismus of the left eye, pointing to paralysis of the abducent nerve of that side; but, although the movements of the arms and legs were very much enfeebled, there was no evidence of complete motor paralysis elsewhere. The organic and superficial reflexes had undergone no change. The knee-jerk was increased on both sides, and ankle-clonus was elicited easily. The co-ordinating functions were quite intact; the trophic and vaso-motor functions were but little affected at the time of her admission, the

flushing and perspirations being probably accompaniments of the febrile condition. The mental functions were tolerably good.

The patient was sent to us as a case of tubercular meningitis, and at the time of her admission the symptoms seemed so far in accordance with the opinion arrived at by the physician who recommended her that this was the provisional diagnosis. The course of the disease, however, during the two weeks following the admission of the little girl, led us to modify our views as to the nature of the cerebral affection, and to conclude, as you will hear, that the case was one of tubercular tumor.

After the lapse of a week the condition of the poor child changed for the worse; she became listless, and gradually sank into a soporose state. Her mother, being dissatisfied with the course of the illness, removed the patient on January 19, but, finding that it was impossible to give her due care and attention at home, brought her back to the ward three days afterwards. During the next fortnight a gradual increase was observed in the gravity of the symptoms. The little patient became more comatose. Sensibility was lost on the left side of the face, and the mouth was drawn to the right side, showing that the trigeminal and portio dura were implicated. The arms and legs became almost completely paralyzed, pointing to some interference with both motor tracts. The pupils became unequal, the breathing assumed the characteristic cerebral type, bed-sores supervened, and on the 26th of February the poor little child passed quietly away. Up to the time of her death the pupils reacted perfectly to light; there was no paralysis of the third or fourth nerves, and there was no tendency to ptosis. The patient was never absolutely comatose, and even during her last hours could be roused up.

Before proceeding to make any comments on the case you will perhaps allow me, as briefly as possible, to lay before you the recognized pathological and clinical facts as to tubercle of the brain. Tuberculosis affecting the brain presents, as already remarked, two different kinds of lesion,—on the one hand, tubercular meningitis; on the other, tubercular tumor. We shall, in the first place, glance at the anatomical characters of the former.

In *tubercular meningitis* the lesions found after death are most pronounced at the base of the brain. Lymph, usually glairy, but sometimes purulent, is seen between the optic tracts in front and the crura cerebri behind. The inflammatory change is usually seen also over the pons and bulb; it extends along the great vessels, and often spreads by means of the Sylvian fissure so that the convexity of the brain may

undergo changes. The velum, as a rule, is thickened, and the same change almost invariably occurs in the plexuses. The fluid in the ventricles is increased in quantity, and is usually somewhat turbid, or even distinctly purulent. In consequence of the increased amount of fluid in the cerebral cavities, the convexity of the brain is flattened, while as a result of the inflammation the base becomes soft.

Such changes are not in themselves characteristic of tubercular meningitis; they are to be seen also in other forms of cerebral inflammation. The distinctive lesions in the special variety of meningitis at present under our consideration are tubercles, which in the vast majority of cases are of the gray miliary type, but sometimes, although rarely, present the features of the yellow caseating kind. These tubercles are commonly isolated, but in some cases are aggregated in little masses. They are to be seen most frequently on the pia mater in the sulci, on the blood-vessels, and on the plexuses. The great feature of the lesions in tubercular meningitis is therefore the tendency to spread over a considerable area, and to produce extensive changes in the brain.

We must in the next place turn our attention for a short time to *tubercular tumors*. These are usually seen to be rounded masses of caseous aspect and firm consistence. The central part of such a tumor is yellower and harder than the outer portion, which is always grayer and softer. The growth of such tumors appears to proceed by extension along the lymphatic sheath of the blood-vessels, which are obliterated, and this is probably the reason why the inner portion is more solid than the outer layers. Tubercular tumors may become encapsuled or calcified. Tubercular disease of the brain, when it assumes the form of tumor, has, therefore, as might be expected, a more limited distribution than when it is seen as meningitis; but the fact that in a certain proportion of cases tumors and meningitis are found associated together must not be overlooked.

Let us now glance very briefly at the clinical features presented by the two principal forms of cerebral tubercle. In cases of tubercular meningitis a *premonitory phase* may sometimes be seen. More commonly, however, after the disease has progressed to such a stage as will not allow its nature to fail of recognition, it is remembered that, before the development of its pronounced characteristics, many less definite symptoms had been present without attracting special attention. Such a premonitory stage is marked by irregular pyrexia, attended by flushing, pallor, and sweating; digestive disturbances, such as loss of appetite and constipation; nervous troubles, more especially lack of energy,

irritability of temper, and interference with sleep, shown by grinding of the teeth, crying aloud, and lying with open eyes during slumber; and, along with these symptoms, decrease of weight, depending mostly upon loss of the flesh of the trunk and limbs, is rarely absent.

It is still customary, when considering the symptomatology of tubercular meningitis in its fully declared condition, to divide the clinical history into three classical, although conventional, stages.

The *primary stage* is frequently ushered in by rigors, followed by pyrexia; the pyrexia, however, is inconstant. It is of importance to observe that during this phase the pulse is infrequent, full, and regular. Another point, not without considerable significance, is that the skin at this period is almost always dry, even in those cases which have been marked by profuse perspirations during the prodromal phase. Head-ache is a prominent symptom, and may be detected, even when the patient is unconscious, by the sufferer raising the hand to the head. Giddiness is often complained of, yet it is obvious that it may escape notice. Vomiting is one of the most constant features of the disease. Convulsions may be present, or rigidity of the neck and back may be seen, and the boat-shaped abdomen, produced by tonic contraction of the recti with falling in of the flanks, is often to be observed; vasomotor disturbances are shown by a tendency to flushing of the skin, and by the tache cérébrale, which, although not pathognomonic of this disease, is more common in it than in any other. In addition to these more general symptoms, there may be some with a greater tendency to be focal, such as contortions of the face and squinting. Hyperæsthesia is commonly found, and it may affect the nerves of ordinary sensibility, or of the special senses, producing such symptoms as photophobia. The great features of this phase may be summed up by terming it "the stage of excitement."

The *secondary stage* is marked by a deepening of most of the symptoms, but some of these undergo considerable modification. During this stage the pulse is usually irregular on account of interference with the centres in the base of the brain. The respiration also assumes an irregular rhythm in most cases, so that it has some resemblance to, but is not identical with, the form of breathing known as Cheyne-Stokes respiration. It is probable that this cerebral breathing, as it is usually called, is in part caused by the loss of the influences of the higher tracts of the brain, but it seems likely that in this, as opposed to true Cheyne-Stokes breathing, there must also be some local irritation of the centres in the bulb leading to irregular discharges of nerve energy. Sensory changes, mostly in the direction of diminished

activity, are common, and may affect the nerves of ordinary or of spinal sensibility. Dimness of sight is often observed, and on examining the fundus of the eye the disk is found to be hyperæmic or œdematous. Alterations in the motor functions are even more frequent than sensory disturbances, and, like them, are almost always paralytic. The motor oculi and patheticus are especially liable to suffer, the latter, so far as is known, never being affected alone. When the third nerve is paralyzed alone there is ptosis, with divergent squint and dilated pupil; if the fourth is also implicated the eyeball is turned upward as well as outward. Other cranial nerves may be interfered with in the course of the disease, and different results are produced according to the lesions which are present.

The superficial reflexes present no constant condition; they are sometimes increased, at other times diminished. The knee-jerk, as a rule, is but little altered, and, if changed, the modification is as commonly in the direction of diminution as of exaggeration; ankle-clonus is very rare indeed, even in cases of complete paralysis. This seems to favor the view that the paralysis is dependent on rapid disintegration of the cerebral tissues without time having elapsed for the development of the secondary changes in the motor tracts, upon which increase of the knee-jerk and the presence of ankle-clonus probably depend.

Among symptoms produced by changes in the higher centres may be mentioned aphasia, delirium,—taking the form of illusions, hallucinations, or delusions,—and coma. During profound unconsciousness the patient often utters a loud shriek,—the hydrocephalic cry,—which is probably caused by irritation of the motor apparatus for vocalization, and has certainly nothing to do with volitional impulses. The general tendencies of this phase may be given by terming it, as is commonly done, the "stage of compression."

The *tertiary stage* is characterized by exceedingly variable pyrexia, very frequent but usually quite regular pulse, and extremely irregular breathing. Profound coma is present, with wide-spread sensory and motor paralysis. The optic disks are swollen and œdematous. There is great wasting of the trunk and limbs, but no reaction of degeneration. The main characters of this phase are embraced by the term usually applied to it,—the "stage of paralysis."

The clinical features of tubercular tumors of the brain are for the most part similar to those produced by other kinds of new formations. It must not be forgotten, however, that these are found in patients presenting some of the characteristics of the particular diathesis with which they are associated, and, as tubercular tumors are most com-

monly found in the base of the brain, the symptoms which result are referable to lesions of the structures in that region.

The temperature in cases of tubercular masses in the brain may present many different kinds of curve. As you might expect from the underlying diathesis, there is a well-marked tendency to diurnal variations, but this may be quite overshadowed by the pyrexia produced by the meningitis or encephalitis which may be present along with the tumor. The pulse may have no special characters during the earlier period of tumor formation, but towards the end there is a great tendency towards extreme frequency. (See chart, Fig. 1.) The rhythm of the respiration is usually disturbed in the later stages, presenting the features of cerebral breathing, or even assuming the characters of the Cheyne-Stokes type.

Headache, giddiness, and vomiting are, along with optic neuritis, the most frequent symptoms of cerebral tumor. The optic neuritis may be combined with dimness of vision, but this is not always the case. The other special senses may be affected, but, as with amblyopia, so in their case it is often impossible to attach any special significance to such changes. Such vague *general symptoms* point to the probability that a tumor is present in the brain, but they do not prove it.

The *focal symptoms*, which are in some cases of brain tumor entirely absent, consist of localized sensory and motor changes, which by their distribution give evidence as to the tracts involved, or of alterations in the special functions belonging to particular regions, by which the position of the lesion may be determined. One great law, often shown to you in the work of the wards, is that lesions of the cortex have a tendency to produce, in the first place, spasmodic effects, while changes in the deeper layers, if they give rise to any local symptoms at all, are more likely to cause paralytic effects from the outset. When there is paralysis of a limb there is almost always increased myotatic irritability,—an exaggeration of the knee-jerk and the development of ankle-clonus being rarely absent.

From the brief sketch laid before you of the clinical features of tubercular meningitis and tubercular tumors, it must be obvious to you that in many respects the symptoms have more than a superficial resemblance. In both conditions there may be headache, vomiting, and optic neuritis, and more or less pyrexia is usually present in each. The main differences between the clinical effects of the two lesions are that in tubercular meningitis the course of the disease is shorter, there is more tendency to the development of distinct stages, the symptoms are more extensive, there is an implication of the cranial nerves one

after another, and there is not such an intense degree of optic neuritis. When paralysis of the limbs occurs, it is a sudden process, without increase of the myotatic irritability, in most cases. In short, the symptoms produced by the cerebral lesions are not so definitely localized as in the case of tubercular tumors. It may be added, moreover, that, while both lesions may be associated with pyrexia, the course of the temperature is more definite in meningitis, and the elevation is attended in most cases by a dry skin.

Now, in the clinical history of the patient whose case we have just been considering, the prodromal symptoms resembled those of tubercular meningitis, and the gradual development of the soporose state pointed in the same direction. The presence of profuse perspirations, however, caused us to hesitate, for, even in cases of phthisis pulmonalis, if meningitis supervenes the sweating ceases. The course of the nervous symptoms finally negatived the first impression that the case was one of meningitis. The comparatively slight degree of headache, the absence of any hydrocephalic cry, the limitation of the paralytic symptoms,—particularly in regard to the restriction of these to the fifth, sixth, and part of the seventh nerves of one side,—all these points led us finally to conclude that we were dealing with a tubercular tumor involving the roots or pressing upon the trunks of the fifth, sixth, and seventh nerves. The facts that the arms and legs were paralyzed, that both knee-jerks were exaggerated, and that there was ankle-clonus on both sides, seemed to indicate either that the mass implicated both motor tracts or that more than one tumor was present.

The post-mortem examination was performed the day after death by my colleague Dr. Russell. The heart weighed four ounces; there was hypertrophy of the left ventricle, which was firmly contracted, but no other change.

The lungs were firmly adherent to the thoracic walls; the right weighed ten ounces, and the left six ounces. The right lung had a mass of enlarged caseous glands at its root, and at the lower part of the posterior edge there was a caseous area separated from the lung-tissue. Above this the lung was somewhat fibroid, and presented projecting tubercles, some of which were perivascular and peribronchial. Probably most of these tubercles were in the lymphatics. Throughout the rest of the lung there were sparsely-scattered tubercles. The left lung presented numerous tubercles scattered throughout the pulmonary tissue.

The liver weighed twenty-nine ounces. It had some tubercles on its surface, and was adherent in patches to the under surface of the

diaphragm in consequence of old perihepatitis. On section, it showed a few tubercles. The spleen weighed three and a half ounces, and, like the liver, had tubercles on the surface and adhesions to the neighboring viscera. The pulp was firm, the Malpighian bodies prominent, and there were scattered tubercles throughout the organ.

The kidneys each weighed two and a half ounces, and were healthy, although somewhat congested.

The intestines showed extensive tubercular disease. At the junction of the large and small intestine there was a large transverse tubercular ulcer, and a similar ulcer was observed in the first few inches of the colon. There were numerous small ulcers in the small intestine as far up as the duodenum, and the lymphoid follicles were enlarged throughout.

A prevertebral gland in front of the sixth dorsal vertebra was found to be in a purulent condition, and under this abscess the bone was bare. In other words, there was vertebral caries.

The brain weighed forty-eight ounces. The membranes were healthy, but there was some milkiness about the optic chiasma. No tubercular structures could be seen upon the surface of the brain, but on making sections at different levels it was found that there was a tubercular mass extending from the upper part of the pons as far as the upper part of the bulb. This new formation showed in its typical form the hard yellow structure in the central and older part, and the softer gray texture in the outer and younger part of the mass. The sections made at different levels of the pons and bulb showed, as may be seen in the accompanying figures (2, 3, 4, 5, and 6), which are copies of rough tracings obtained by means of transparent paper, that the mass in the course of its growth had spread into widely different regions of the pons.

Dr. Russell expressed the opinion that the tubercular process had taken its origin in the intestines, and had extended, by means of the bronchial glands, to the lungs, whence it had spread to the brain.

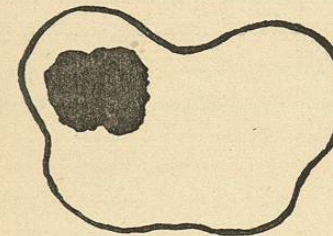
The result of the post-mortem examination in this case fully justified in most particulars the diagnosis to which we had been led, and made clear why there had been paralysis of both arms and legs, with increase of the myotatic irritability. The paralysis of the fifth, sixth, and seventh nerves on the left side was produced by the implication of the nuclei of these nerves by the mass in the lower region of the pons, which at this level extended far into the left half.

It was no part of my intention to-day to add anything with regard to prognosis or treatment; but it may be advisable very shortly to refer

to these aspects of the subject. In cases of tubercular meningitis, while the prognosis is in all stages very unfavorable, and, in those cases which have developed coma, almost hopeless, it is to be remembered that recoveries have not infrequently taken place even in patients whose condition seemed desperate.

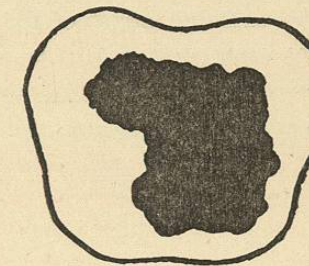
The prognosis in all cases of cerebral tumor must be guarded, and

FIG. 2.



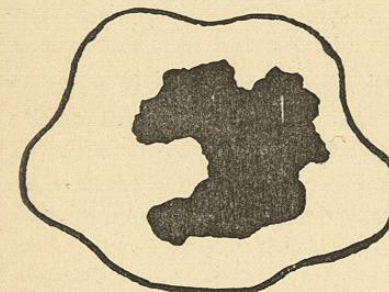
Section through the upper end of pons.

FIG. 3.



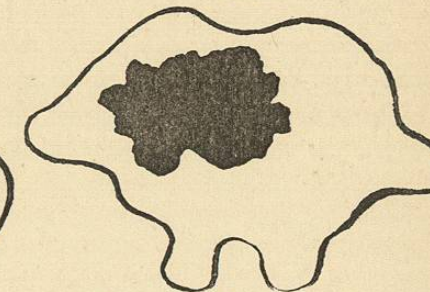
Section through upper half of pons.

FIG. 4.



Section through middle of pons.

FIG. 5.



Section through lower half of pons.

FIG. 6.



Section through upper end of bulb.

THE TRACINGS ARE PLACED WITH THE DORSAL SURFACE UPPERMOST. THE PARTS COLORED BLACK ARE THE DISEASED PORTIONS.

the most important principle to be laid before you is that, next to tumors of syphilitic origin, those of a tubercular nature are the most likely to undergo favorable changes. Occasionally the progress of a tubercular tumor becomes arrested, and a regression may even occur.

In regard to the treatment of tubercle of the brain little need be said at this time. For tubercular meningitis, absolute rest, the promotion of sleep, the application of ice to the head, the internal use of mercurials or iodides, and careful attention to every symptom as it arises, are the principal means at our disposal.

In cases of tubercular tumor the question of surgical interference does not often present itself, since the lesion, as we have seen, is most commonly in the base of the brain. The method of treatment most likely to cause an arrest of the morbid process is the use of tonic remedies along with cod-liver oil and iodide of iron, together with careful attention to every hygienic means.

VERTIGO: ITS TYPES AND TREATMENT.

CLINICAL LECTURE DELIVERED AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL.

BY C. L. DANA, M.D.,

Professor of Nervous Diseases in the New York Post-Graduate Medical School;
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THESE three patients are suffering from vertigo. The first one is seventy years of age, and was well up to a short time ago, when she suffered for the first time from vertigo. The vertigo was of the form we call "objective," or that form in which things around the patient seem to be moving. Shortly afterwards she developed a tremor of her hands and some weakness of the extremities. The arms are extensively involved in this, and there is slight tremor of the head, and slight nystagmus. After suffering from this tremor for two or three months, the vertigo became troublesome whenever she moved around much. It was accompanied by a peculiar humming noise, not in the ears, but in the *head*, a symptom which we call "tinnitus cerebri." She also complains of considerable disturbance of the stomach.

The second patient is forty-seven years of age, is married, and has had several children. She enjoyed good health up to last November, when she had an attack of acute Bright's disease, lasting two months. After recovering from this, she continued to be pretty well until two or three weeks ago, when she began to suffer from sudden and paroxysmal attacks of vertigo. The stomach is not much disturbed, she is not particularly anæmic, and she has none of the ordinary symptoms of uræmia. It is difficult to make some patients understand just what you mean by dizziness. She describes her condition as a "sudden coldness in the head, and then a sudden heat."

The third patient is thirty-three years old, is married, and has had several children. She is of a nervous temperament. She was well up to a year and a half ago, when she had a miscarriage, since which time