

posture is wanting. The general condition is not favorable, and, although the appetite may be voracious, the assimilation is not equal to the preparation of the aliment for absorption. The face has a rather old look, and is wrinkled; the voice is feeble and sibilant. Some of these subjects are, however, capable of slight mental development, but they do not acquire any higher capacity for speech than the automatic use of a few words, and, if they reach manhood, the mental powers are only those of a child, the voice having the same characteristics. As regards the special senses, odór and taste are more often preserved, while hearing is imperfect. Disorders of vision and of the cutaneous sensibility are common. Numbness, tingling, and pains are felt in the extremities. Motility is impaired to a less or greater extent. There may be a general paresis, which is more pronounced in one member, but rarely complete paralysis. There are great differences in the cases: some can not stand without support; others walk, but the gait is hesitating; they stumble at every obstacle, and seem constantly to be about to pitch forward, owing to the weight of the head. Epileptiform attacks occur in many of the cases from time to time. The nutrition is bad, notwithstanding a voracious appetite; they suffer from constipation, and have an excessive flow of saliva from the mouth; the skin is dry and the eyelids are puffy. If the anterior fontanelle is very large, strong compression will put the patient into a somnolent, even a comatose state.

Course, Duration, and Termination.—The course of the disease is chronic, its march irregular. At times considerable progress is made; then the case remains stationary for some time, even for years. A majority of the cases terminate within the first year; others are prolonged to the fifteenth year, even beyond this. The more voluminous the head, the more rapid the progress of the case, as a rule. Spontaneous cures have been effected by the discharge of the liquid, either by a wound or through the nose. Cures may be effected in slight cases when recognized early, but such a result is exceptional, the usual termination being death. The fatal result is reached by convulsions and coma, unless previously by some intercurrent diseases.

Treatment.—The author has had good results from the use of iodide of potassium, but it was a case of effusion probably, limited to the ventricles. Flying-blisters, the internal administration of digitalis, ergot, and purgatives, with the occasional use of iodide of potassium, carried to slight iodism, are the remedies best adapted to the cases of slight extent, which may be conducted to a favorable termination. The use of the finest aspirator-needle may now be justified, in view of the spontaneous cures which have followed accidental discharge of the fluid. Care being taken to avoid the longitudinal sinus, the ventricle may be entered with safety, and the operation is easily performed. When sufficient fluid is withdrawn, the cranium should be gently but firmly compressed.

TUBERCULAR MENINGITIS.

Definition.—By this term is meant an inflammation of the cerebral meninges, caused by the presence of tubercular granulations.

Causes.—Tubercular meningitis occurs most frequently in children from two to six years of age, and in adults from twenty to thirty years, and is about equally distributed between the sexes. Children of the well-to-do classes are apt to suffer from this disease, and those whose nervous system preponderates over the digestive and muscular. The "gelatinous children of albuminous parents," as the phrase goes, possess a special susceptibility to tubercular meningitis—the pale, thin-skinned, blue-eyed, precocious children of pale, flabby, and delicate parents. The changeable weather of winter and spring disposes to the development of the disease. All the circumstances comprehended in the term *bad hygiene* promote the occurrence of this malady, especially insufficient light, bad air, and improper food. None of these causes could produce this disease in the absence of the tubercular matter. It is extremely rare to find the tubercular deposits limited to the pia mater—in thirty-eight examples of the disease there were but two in which the deposit was thus limited (Jaccoud). Tubercular meningitis is transmitted by inheritance in the limited sense that the diathesis is inherited: in one member of a family so tainted it may be meningitis, in another phthisis, in a third ulceration of the intestine.

Pathological Anatomy.—Miliary tubercles, in the form of grayish-white granules having a translucent and somewhat gelatinous appearance, are distributed along the vessels of the pia mater. These miliary granules vary in size from a minute object just visible to the eye up to a large pin's-head, and these aggregating in a mass form a tubercle as big as a pea. The distribution of the tubercle-granules is not the same in all situations: it may be greater in the neighborhood of the arteries of the base (basal meningitis) or the arteries of the convexity; again, the principal deposits may be in the pia of the frontal or of the parietal regions. There may be but few tubercles in any situation in some cases; in others the whole membrane may be thickly studded with them. The intensity of the inflammation does not have a constant relation to the number of tubercles, for the inflammation may be great with few tubercles, and slight with a large crop of tubercles. Besides tubercle there are present the evidences of suppuration in a sero-purulent effusion, seen along the course of the vessels especially, as "yellowish stripes" (Rindfleisch). The pia mater at the base is thickly covered with a gelatinous exudation, and the membrane itself is thickened and opaque, especially about the optic chiasm and the anterior perforated space extending up into the fissure of Sylvius. There is more or less effusion usually in the ventricles, and the plexus choroïdes is the seat of an extreme hyperæmia. More or less œdema of the

cortex takes place, provided there is no effusion, but when there is effusion the cerebral substance is dry and anæmic from pressure. Miliary tubercles are also found in the cortex, and migrated white corpuscles are abundantly distributed through the cerebral tissues. The miliary tubercles, aggregated in masses, are found in many situations to have undergone caseous or fatty transformation. Tubercles are also widely distributed throughout the body.

Symptoms.—There is a period during which it is probable tubercular deposit is taking place, manifested by symptoms which may be justly called prodromal. The disturbances resulting in the symptoms of the disease are produced by the inflammation which is excited by the tubercular deposit. The prodromal symptoms are chiefly those indicative of failure of nutrition; emaciation goes on, and the strength declines proportionally; the appetite fails, and the character changes, the patient becoming irritable and morose. The child, before precocious and vivacious, becomes indifferent to former occupations and amusements. Sleep is disturbed by vivid dreams; the child grinds its teeth, cries out suddenly in the night, and walks about in a somnambulistic state. The digestive organs become disordered, the belly is swollen, diarrhœa alternates with constipation, and vomiting occurs without cause, without the presence of indigestible matters to excite it. Headache is complained of, vertigo is experienced in rising up to walk or in lying down, and pains are felt in the limbs. The ominous symptom of double vision is sometimes observed at this period. The author has heard a precocious little boy say during this prodromal period, "I see two mammas," several weeks before the developed disease came on. The stage of excitation symptoms appears in from two days to six weeks, even longer, of the prodromal period. Fever begins; the temperature rises to 102° or 103° Fahr. in the evening, and falls in the morning to 99°; the pulse varies greatly, going up to 130, 140, and falling to 80. In adults this fever of the excitation period may be wanting. At all times during the disease the pulse is very unequal in rhythm and the heart very excitable. The pulse may become slow and regular without any apparent reason, or may again become very rapid. Although the type of the fever is remittent and is often mistaken for remittent fever, it is subject to great variations. Three important symptoms besides the fever mark the onset of the excitation period—headache, vomiting, and constipation. The headache is severe, heavy, or lancinating; and, although continuous, is varied by exacerbations, compelling outcries, or rubbing the head, or other manifestations of severe suffering. As the suffering is increased by light, the head is either buried in the bedclothes or turned to the wall, or the eyes are covered by the eyelids. The vomiting occurs a few times during the twenty-four hours, and is always without apparent cause; the constipation persists obstinately; the belly is hard and retracted. During the exci-

tation period, changes in the character and disposition which began in the prodromal period continue and are more pronounced—an exceeding fretfulness and hostility to those to whom they were much attached, developing. Not only the special but general sensibility is exalted; all movements cause pain and loud expressions of suffering, and the least pinch, especially about the neck, excites exquisite pain. In the motor sphere the symptoms of excitation take the form of spasmodic movements of muscles, contractions, and rigidity, especially seen in the muscles of the members and of the neck. There will occur at this period also local convulsive movements, and not unfrequently general convulsions (eclampsia), with the usual phenomena. The stage of excitation due to the development of meningitis now begins to yield to the phenomena of depression due to the pressure of the fluid on the cerebral matter. Here, then, is a period during which the symptoms of irritation still linger, and the symptoms of depression are just manifesting themselves—a *mixed stage*: paroxysms of pain and spasmodic and convulsive attacks are separated by periods of somnolence, during which there may be uttered the peculiar shrill, unearthly cry or shriek called the *hydrocephalic cry*. If attempts at walking are now made, the patient's movements are incoördinate and uncertain, and indeed it is impossible to preserve the equilibrium. Torpor now becomes the settled state, but still the patient can be roused to make an imperfect or monosyllabic reply to questions, lapsing back into a somnolent state as soon as the attention is no longer attracted. At this period the ocular changes are manifest: there are strabismus and double vision; the pupils are often unequal. The countenance is pale, stolid, and expressionless. The retinal changes are very pronounced. Tubercles of the choroid can often be detected. At first the optic papillæ are swollen, blurred, and indistinct, the veins are enlarged and tortuous; but in the further progress of the case retrograde changes, ending in white atrophy of the disks, take place.* This mixed stage has a variable duration of a few days to a week or more, and is varied by illusory evidences of improvement, which often mislead the physician, and raise false hopes in the minds of the parents and friends. These appearances of improvement at this time consist in a more regular pulse, less somnolence, greater interest and attention to surrounding objects, playthings, etc. Indeed, it seems as if the morbid process were arrested, and that convalescence is about to be established; but, while the most cheerful anticipations are indulged in, formidable symptoms suddenly appear. A general convulsion, it may be, occurs, or the muscles of the neck and spine become rigid, or local convulsions affect the members; a mild delirium manifests itself; the respiratory movements become very unequal in depth and irregular in rhythm, and

* Allbutt on "The Ophthalmoscope," p. 112.

have at times a sighing character; the pulse is equally irregular, becomes slow, falling to fifty even, and there are marked variations in its volume and tension; the temperature remains elevated, but preserves its remittent type. The approaching stage of depression is now announced by the increasing somnolence, by the greater effort to excite the most transient and indefinite response; light nor sounds no longer disturb the brain; sensibility is no longer excitable; the contractions of muscles are replaced by relaxation; the urine is passed involuntarily. When the stage of depression is fully established, no indication of consciousness can be excited by any irritation, and the reflex movements of the eye are entirely abolished. The pupils now dilate; the upper lids droop over the eyes; the globe of the eye rolls from side to side (nystagmus); the pharynx becomes less and less responsive to the presence of food or drink, and finally no movements can be excited—only the slow, irregular pulse changing to a rapid and feeble pulse and the Cheyne-Stokes breathing manifest the signs of functional action. *Râles* from accumulating mucus now obstruct the breathing, the pulse becomes more rapid and feeble, a cold sweat breaks out on the skin, the abdomen becomes full and prominent, the evacuations are relaxed and involuntary, and death occurs at last by protracted failure of respiration or by a convulsion.

Course, Duration, and Termination.—The division into periods is an arbitrary arrangement, but useful as a means of indicating the variability of the symptoms and their relation to the morbid process. But the course of the disease is not always that above indicated: there are variations due to the age of the subject; and tubercular meningitis, as a secondary disease, differs from the primary affection. In acute tuberculosis the cerebral symptoms are pronounced, but they are not those of tubercular meningitis. The form of the disease occurring in adults is secondary, usually to advanced pulmonary tuberculosis. There are no prodromal symptoms. In the midst of a pulmonary disease, the patient experiences intense headache, vertigo, delirium, often of a maniacal character; there occur contractions of muscles, followed by paresis; irregularity of pulse and respiration is noted; and coma and insensibility succeed to wakefulness and delirium. Convulsions do not occur in the course of this secondary meningitis in adults.

The prodromal period in the ordinary form of the disease has no fixed duration, and may continue for three months; it is usually about three weeks, and is probably never absent if carefully inquired into. The period of excitation has a duration of about one week to two weeks; the middle period may be protracted three weeks, but usually occupies one week; the period of depression lasts from one to two weeks. Although a very few cases have been reported cured, it is held to be an incurable disease, and the termination fatal. The cases

reported cured were, it is generally supposed, examples of simple not tubercular meningitis. The consideration of diagnosis and treatment will be taken up after the study of simple meningitis of the base and convexity.

ACUTE MENINGITIS.

Definition.—*Acute meningitis* consists in an inflammation of the pia mater and arachnoid, chiefly the former. It may be limited to the base—*basilar meningitis*, or to the convexity—*meningitis of the convexity*.

Causes.—Meningitis is derived by contiguity of tissue from disease in neighboring parts—disease of the internal ear, erysipelas of the face, malignant pustule, caries of the bones, traumatic injuries. It is then entitled *secondary meningitis*. It sometimes arises during the course of inflammation of serous membranes, acute rheumatism, puerperal fever, pyæmia, Bright's disease, by that which was formerly called a metastasis, and hence was designated *metastatic meningitis*. The primary form with which we are now chiefly concerned arises from the causes inducing congestion and overaction of the brain, as excessive intellectual effort, prolonged wakefulness, exposure to the direct rays of the sun, and alcoholic excess. The most common cause of meningitis is the deposit of tubercle, but this has been discussed in the previous chapter. The primary form is a rather uncommon malady. The disease is more frequent in men than in women, and is less common in children.

Pathological Anatomy.—In the basilar form, the inflammatory changes are confined to the base, and consist of intense hyperæmia, followed by purulent and fibrinous exudation, covering the parts at the base as far back as the pons, and forward to the optic chiasm, and surrounding some of the nerves. The choroid plexus is intensely hyperæmic, and the ventricles may be distended with fluid, compressing the hemispheres and flattening the convolutions. The ependyma of the ventricles becomes granular or undergoes thickening. Hydrocephalus is by no means present in all cases. In the meningitis of pyæmia and other septic maladies the fluid exuded is largely purulent, and migrating white corpuscles are found in great numbers in the exudation in the ventricles. In meningitis of the convexity the inflammation is excited by extension from the bones of the cranium, from caries of the petrous portion, from panophthalmitis, from erysipelas of the head, and carbuncle of the upper lip, etc., and is of the character manifested by the same process at the base. Pus is extensively infiltrated, especially along the course of the great vessels. The migrating white corpuscles invade the gray matter of the cortex, and pus-cells are contained in the fluid of the ventricles in large numbers. Although the morbid process may be confined to the convexity, yet in most cases the base is more or less invaded.

Symptoms—There may or may not be a prodromal period, characterized by a rather violent headache, vertigo, and cerebral vomiting, lasting for a few hours or a day or two. The real onset of the disease is rather sudden, and, like other acute inflammatory diseases, begins with a decided chill followed by high fever—by a more intense and sustained fever than in other cerebral maladies. The pulse may be 100, the temperature 103° or 104° Fahr. The face is flushed, the eyes are injected and swollen. There are from the beginning an intense headache, vertigo, nausea, and vomiting. When the morbid process is confined to the base, the mental symptoms may be very insignificant, and consist of confusion of mind, or mild delirium toward evening or on awaking from sleep, but usually there are hallucinations and illusions, active delirium, sometimes furious and maniacal, and these are proper to meningitis of the convexity. During the period of excitation there are hyperæsthesia of the skin and contractions and spasms of the muscles of the extremities, and those innervated by the cranial nerves—hence the ocular defects and disturbances, twitchings of the facial muscles, rigidity and contraction of the spinal and cervical muscles, etc. The symptoms of excitation are soon succeeded by depression. Early, besides the muscular incoördination and consequent ataxic aphasia, there occurs a true aphasia from deposits along the middle cerebral and consequent compression of the supposed language center. Delirium is succeeded by somnolence, gradually deepening into coma; exalted sensibility (hyperæsthesia) yields to loss of the senses of touch and pain; spasms and contractions of muscles are replaced by paralysis. The pupil dilates. Early in the disease ophthalmoscopic examination discloses choked disks and swollen veins, but the papillæ rapidly undergo atrophy. The eyelids drop down upon the eyes, and are swollen and prominent; epistaxis often occurs. With the increasing pressure on the medulla oblongata, the pulse falls, then grows rapid and feeble, but the temperature continues at 103° or 104° Fahr. The respiration becomes irregular, sighing—of the Cheyne-Stokes type—and increasingly shallow.

Course, Duration, and Termination.—The cases of meningitis present great variability in their course and in their duration: some are characterized by remissions—apparent improvement continuing for days, and followed by relapses. Again, the course and duration of other cases are much affected by the cause of the meningitis and the character of the coexistent malady. The duration may be stated as varying from one week to eight weeks. The usual termination is in death. Cures may be effected in which permanent damage has happened, and a sense or a member remains only partly capable of function ever after. Perfect cures have been reported, but a doubt of their genuineness must always be entertained. Before and immediately succeeding death the temperature may rise to 105° and 106° Fahr.

Diagnosis.—This question includes the differentiation of the several forms of meningitis, and the separation of meningitis from acute tuberculosis, typhoid fever, tumor and abscess of the brain, encephalitis, cerebral hyperæmia, uræmia, and disease of the labyrinth. Tubercular meningitis is differentiated from the other forms by the history, by the simultaneous appearance of tubercular deposit in other organs, especially pulmonary tuberculosis, and by the presence of tubercles in the choroid. Acute hydrocephalus is distinguished from meningitis by the less degree of fever, by the predominance of the stage of depression, and, in the apoplectic and convulsive forms, by its more speedy termination, and by the absence of symptoms due to the implication of the cranial nerves at the base. Meningitis in its various forms is distinguished from acute tuberculosis and typhoid fever by the symptoms of excitation of the brain, especially the convulsions, and subsequently by the ocular and other paralyzes, the alterations of the retina, by the absence of the rose-spots, the absence of diarrhœa, and the presence of constipation. Meningitis is distinguished from tumors of the brain by its more rapid progress, more diffused symptoms, and the presence of fever; from abscess, by the absence of a period of latency after the symptoms of an inflammation; and by the diffusion of the symptoms of depression. From cerebral hyperæmia, meningitis is differentiated by the higher temperature, longer duration, and the symptoms of depression succeeding to a stage of excitation. In uræmia the temperature is usually below rather than above normal; the urine is scanty and contains albumen, and there is or has been dropsy. Labyrinthine disease, even inflammation of the middle ear, may closely simulate meningitis, but the existence of ear-symptoms and the absence of paralysis indicate the source of the symptoms, which also begin with great violence.

Treatment.—The head should be kept elevated; the room dark and quiet, to exclude all sources of cerebral excitement. An ice-bag should be put to the head, the hair being previously removed. If a robust subject, leeches should be applied to the mastoid bone and to the nape of the neck. An active purgative should be administered at the outset. If the temperature is high, the wet-sheet should be used two or three times a day, unless mental excitement is produced by it. If the patient is calm under its use, and if the temperature is lowered by it, the best results may be expected from it. The author has witnessed admirable results from the administration of the tincture of aconite-root (two drops) and the deodorized tincture of opium (five drops) every two hours during the stage of excitation. Bromide of potassium (3 ss.) and fluid extract of ergot (3 ss.), every four hours, are appropriate remedies to diminish the vascular excitement, but, in the author's experience, are not so successful as aconite and opium. If there be much cerebral excitement, good results are obtained from the

fluid extract of gelsemium, which may be added to the other remedies (℥j every two hours). If the convulsions are numerous, bromide of potassium must be administered freely, and chloral given by the rectum. During the whole duration of the disease up to coma, Lugol's solution (four to ten drops *ter in die*) should be administered, or the iodide of potassium if better borne. This remedy is especially serviceable in the tubercular form. During the stage of excitation, mustard-plasters should be applied to the forehead and neck several times a day, allowing them to remain on but a minute, or even less, until slight rubefaction is produced. The author must decidedly condemn the practice of severe and protracted counter-irritation so often pursued in cerebral maladies. The remedies above advised must be discontinued when depression of function occurs—except the iodine solution or iodide of potassium. The best results are then obtained by small doses of quinine, with belladonna tincture or extract (two grains of quinine and one sixth grain of belladonna extract every three hours). An occasional or spasmodic administration of these remedies will not suffice—they must be persisted in. During this period careful alimentation is very necessary, and wine may be sometimes very serviceable, but its administration must be watched. The author feels it his duty to condemn the use of mercury in this disease. Experience has shown that it has no power to check the inflammation, and ptyalism enhances all the dangers.

CHRONIC MENINGITIS.

Pathogeny.—*Chronic meningitis* is characterized by the formation of membranous exudation, opacities of the arachnoid, adhesions between the arachnoid and pia, and such firm attachment of the membranes to the brain that, in detaching them, the brain is torn. The morbid changes in the membranes, the formation of neo-membrane, etc., take place both at the convexity and at the base. In the latter situation the cranial nerves are impinged on with the effect, first, of causing irritation, shown in pain and spasm of these nerves at their peripheral distribution; and, second, loss or depression in function, exhibited in anæsthesia and motor paralysis. The lesions of chronic meningitis are found in old cases of mania, dementia, and dementia paralytica. The only causes known to have an effect in producing this disease are injuries of the head, chronic alcoholism, and heredity.

Symptoms.—So often associated with the mental disorders above mentioned, chronic meningitis is obscured and overlooked in the more pronounced symptoms of the associated malady. There are, necessarily, two classes of symptoms to be noted—those of irritation, those of depression: the former mean pain, spasm, or contraction; the latter anæsthesia and paralysis. In the first group are headache, *tinnitus aurium*, vertigo, double vision, rigidity and contraction of the muscles

of the neck and spine, nausea and vomiting, irregular pulse, and a rhythmic breathing; in the second, impaired mind, defects of speech, or aphasia, amaurosis (double optic neuritis), weakness, paresis, or paralysis of members or of groups of muscles, weak pulse, and sighing, shallow, irregular breathing, paralysis of tongue, and paresis of pharynx, etc. The treatment is that of the acute form, except the use of the arterial sedatives.

ACUTE ENCEPHALITIS—ABSCESS OF THE BRAIN.

Definition.—By *acute encephalitis* is meant a suppurative inflammation of the brain, and which is localized, not diffused. It may be *primary* or *secondary*.

Causes.—Notwithstanding certain stimuli, long acting, have been supposed to cause inflammation of the brain, the facts do not warrant this supposition. These supposed causes are, prolonged mental effort, exposure to the sun's rays, venereal excesses, alcoholism, etc. The affection is more common in men than in women (nine to four), and occurs at all ages, but especially at the most active period in life—from puberty to fifty years of age. The secondary is probably the only form of the disease, and arises from injury and contusions of the head; disease of the nasal fossæ, frontal sinuses and orbit; caries of the cranial bones, and especially of the petrous bone, from disease of middle ear. Besides traumatism, the most frequent cause is caries of the bones. Rarely encephalitis has occurred in the course of acute infectious diseases, and more frequently from infective emboli.

Pathological Anatomy.—The points of inflammation are always circumscribed, and vary in size from an almond to an orange. They may be multiple, or occupy several parts at the same time, but this is not usual, and when so the individual collections are small. The usual position of the inflammation is in the corpora striata, optic thalami, the gray matter of the cortex, the cerebellum, the abscess forming in the white matter of the hemispheres. They are said to be more frequent in the left than in the right hemisphere. The abscesses may or may not be, but usually are encysted, or inclosed in a limiting membrane. They are irregularly circular in shape, and when not encysted the walls of the cavity are extremely irregular, masses of breaking-down cerebral matter projecting into the pus, which is also diffused into the surrounding textures. The abscess is composed of rather thick, greenish, odorless, but sometimes fetid pus and disintegrated remains of the cerebral tissue. The initial change at the site of the abscess is hyperæmia; minute extravasations take place (capillary hæmorrhages), giving to the inflamed area a dark, reddish color, whence the term *red softening*; migration of white corpuscles, diapedesis of some red corpuscles, and exudation of serum holding albumen and fibrin in solution, occur