

reported. While there have been many failures, the successes have been considerable, quite enough to warrant surgical interference in suitable cases.

TREPHINING FOR ARRESTED DEVELOPMENT.—As a rule it is better to leave these cases alone. Extravagant claims and promises have been made by some surgeons, but they have not been realized in practice.

TAPPING OF THE LATERAL VENTRICLES AS A DEFINITE SURGICAL PROCEDURE.—In November, 1888-89, I first

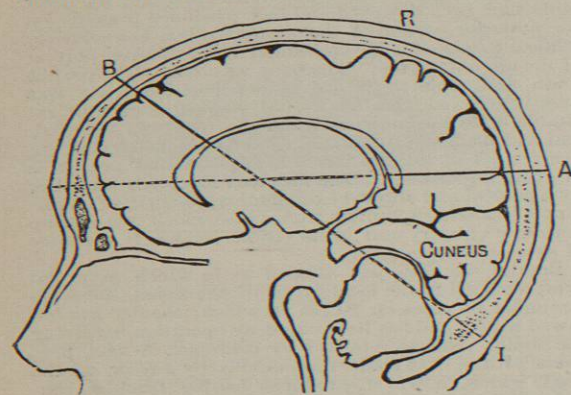


FIG. 1033.—(Drawn by Dr. John M. Taylor.) Antero-Posterior Section of the Head One-Half Inch from the Middle Line. B, Fissure of Rolando; I, inion; A and B (solid), the lines of puncture, the dotted lines showing their imaginary continuation to the opposite fixed points.

proposed the tapping of the lateral ventricles as a definite surgical procedure. Since then it has been done scores of times and as a rule with benefit. I had hoped that it would serve the same purpose as coeliotomy for tuberculous peritonitis. The few cases in which this fatal disease has been thus treated have proved that it is of little use. But it has been of great use as a palliative measure for the relief of the intense headache accompanying especially tumors pressing on the veins of Galen and the straight sinus. Moreover, the operation has dispelled the idea that opening the lateral ventricles is necessarily fatal. In a paper read at the International Medical Congress in Berlin in 1890 (*Lancet*, September 13th, 1890, New York *Medical Record*, September 20th, 1890), but unfortunately published only in abstract, as the original was lost by the secretary, I quoted many cases of such a lesion followed by recovery.

Operative Technique.—In doing the operation it is clear that we must avoid the motor zone, Broca's centre for speech, and any other well-defined centres for the special senses, and also the regions of the large blood-vessels of the brain, the middle meningeal, and the middle cerebral arteries. A number of experiments on the cadaver led me to point out three practicable routes for the purpose. They are all, of course, only provisional, until experience shall show us a better one.

First, from a point from one-half to three-fourths of an inch on either side of the median line, and one-third of the distance from the glabella to the upper end of the Rolandic fissure. This is high enough to avoid the frontal sinuses, and is in advance of the motor area. A three-quarter-inch trephine opening having been made and the dura having been incised crucially, a grooved director should be thrust slowly into the brain tissue in the direction of the inion. The director will traverse the first frontal convolution. At a depth of two to two and one-fourth inches the normal ventricle will be reached. Should it be distended, it would be reached at a less depth.

Secondly, trephine, etc., as before, midway between the inion and the upper end of the Rolandic fissure, one-

half or three-fourths of an inch from the median line. This is high enough to avoid the cuneus, the wounding of which would produce hemianopsia. The director should now be slowly thrust into the brain toward the inner end of the supraorbital ridge on the same side. The director will traverse the precuneus, and the normal lateral ventricle will be reached at a depth of two and one-fourth to two and three-fourths inches from the scalp. A distended ventricle will, of course, be reached at a shorter distance.

Thirdly, trephine, etc., as before, at a point an inch and a quarter behind the external auditory meatus, and one inch and a quarter above Reid's "base line." This will expose the second temporal convolution. It is possible that this may be the site for hearing of the opposite ear, but it has been punctured in a number of cases of abscess in the temporo-sphenoidal lobe without apparent injury to hearing. The director should be carefully thrust into the brain in the direction of a point vertically over the opposite meatus, and two and one-half or three inches above it; when at a depth of two or two and one-fourth inches the normal lateral ventricle would be reached, either at the beginning or in the course of the descending cornu. I have advised the use of the director rather than the hypodermic needle, for the reasons already stated in the section on abscess of the brain. The fluid having been found, a bundle of horse hairs or a drainage tube should be inserted for a suitable length of time. In order to prevent possible loss of the drainage tube in the cranial cavity, it may be passed through a button-hole opening in the flap, and, if necessary, be secured to the flap by a stitch. To regulate the amount of drainage through the tube it may be closed by a disinfected wooden plug. In this a V-shaped slot may be cut, and the size of the slot will regulate the rapidity of the drainage. Whether the drainage shall be continued for more than twenty-four hours, a longer experience must decide.

Of the three proposed routes my preference is for the lateral opening. This route has a great advantage in that by it we can explore for abscess of the temporo-sphenoidal lobe, and also for effusion into the ventricles, by the same trephine opening. The drainage could be

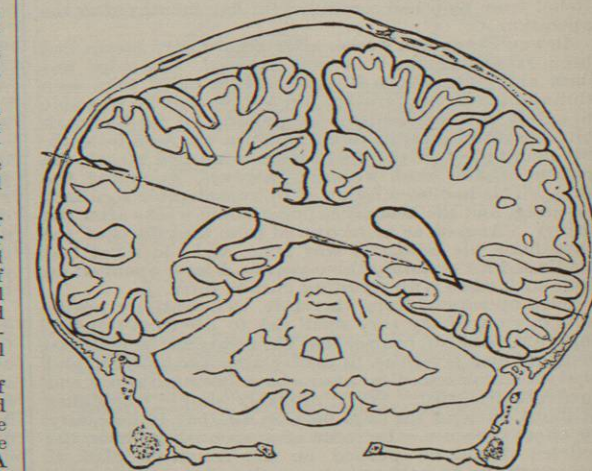


FIG. 1034.—(Drawn by Dr. John M. Taylor.) Transverse Section of the Head One Inch and a Quarter Behind the Meatus. The continuous line shows the line of puncture, the dotted line its imaginary continuation to the opposite side of the skull.

either favored or hindered by the patient lying with the operated side down or up. Should prolonged drainage prove to be wisest, the posterior route might be the best one. The anterior route would hinder drainage, and as an additional disadvantage there would be a

visible scar. As to a choice of which side it is best to operate on, we should select the side of the diseased ear, if there be such disease, or if not, then that side which is tender to either pressure or percussion, or both.

After the above was written my attention was called to the fact that Wernicke, so long ago as 1881, proposed to tap the ventricles, and that Zenger renewed the proposal. At the time of writing my paper I was wholly unaware of their propositions, and in referring to them I find that, while I must disclaim priority for the suggestion, I may claim that I have established exact rules for the operation and described its precise technique.

January 11th, 1889, in my clinic at the Woman's Hospital, I first performed the operation. I found it easy, and the rules I laid down proved to be correct. The patient was a fat and hearty boy, of four, suffering, it was thought probable, either from tumor or chronic meningitis with effusion, most likely a tumor of the cerebellum pressing on the straight sinus or the veins of Galen. There were no symptoms by which it could be more accurately located. His head had begun to enlarge about the early part of December, 1888, and measured twenty-one and three-eighths inches in circumference (exactly the measurement of my own head), with a biparietal diameter of six and one-fourth inches. At Christmas he became blind. For this he was brought to Prof. George Strawbridge, to whose courtesy I owe the case. There was great choking of both discs and threatened blindness. The general health was good, and the temperature was normal. As the approaching blindness from the increased intracranial pressure was the immediate danger, I decided, with Dr. Strawbridge's assent, to tap the ventricles, and selected the lateral route. I removed a one-half inch button of bone, one inch and a quarter behind the left meatus and one inch and a quarter above Reid's base line. The dura pulsated and bulged. In the dura as in the skin, I made a small crucial incision. I then slowly introduced a hollow needle (of the size of No. 5 of the French catheter scale), into which I had already pushed three doubled horse hairs nearly to the end. I introduced it toward a point two and one-half inches above the right meatus. At a depth of an inch and three quarters from the dura I suddenly felt a marked diminution of the pressure, and said to the class that I believed I had entered the ventricle, and in a moment the fluid began to escape. This fluid was found to contain sugar and albumin. It was slightly turbid, with small flakes in it.

The horse hairs were now pushed in as the tube was pulled out. About three ounces of fluid escaped during the operation. An ample sublimate dressing was applied. During the first week from two to four ounces escaped daily, and the choking of the discs diminished from 2.30 to 1.09 mm. in each eye, the decrease being *measurable from day to day*. At the end of the first week I explored for a possible tumor by thrusting a probe in two directions into the left occipital lobe to the depth of three and a half inches. Finding no tumor I made a small opening, by a simple gouge, in the occipital bone, below and to the left of the inion. Through this I probed the left lobe of the cerebellum to a depth of two inches, and then obliquely across into the right lobe two and a half inches, but found no tumor. There was no reaction from these procedures, and the wound healed promptly. At the end of the second week the choking was reduced to 0.96 mm. As in spite of the drainage the swelling was subsiding very slowly, and Dr. Amy S. Barton, who kindly examined the eyes for me, reported that there was beginning atrophy of the nerves. I removed the horse hairs and introduced a small rubber tube into the ventricles. For a week this gave vent to from four to eight ounces of fluid daily. Except a temporary rise of temperature, no reaction followed. At the end of four weeks, as the boy's general condition had deteriorated, especially when from choking of the tube the drainage was poor, I removed another similar half-inch button at a corresponding point above and behind the right ear. I then explored the right occipital lobe as far as to the

tentorium and falx, but found no tumor. I therefore tapped the ventricles from the right side by a drainage tube. Following this, there was a brief but sharp rise of temperature to 104° F., which, however, quickly subsided. Four days later I washed out the ventricles from side to side by eight ounces of a warm boric acid solution (gr. iv. to $\frac{3}{4}$ i.), evidently to the boy's comfort, and with no results of a deleterious character. The boy died fifty-two days after the first operation. The autopsy showed that at the site of the drainage tubes, even after so long a time, there was not the slightest trace of inflammation either on the cortex or in the ventricular cavities, and the cerebro-spinal fluid evacuated at the autopsy was less turbid than that evacuated at the operation. There was not any perceptible trace of the various punctures. The cause of death was a tumor of the cerebellum. The probe had penetrated it, but as its density was about the same as that of the brain, its presence could not be appreciated.

The case showed clearly that the rules which I formulated for the operation are exact; that the procedure is easy and safe; and that the ventricles may not only be drained, but even irrigated, without causing any deleterious results. (For bibliography see Note at end of volume.)
W. W. Keen.

BRAIN: SYPHILIS.—Syphilis of the brain may develop as the result of inherited syphilis, or during the secondary or tertiary stage of the acquired disease.

In hereditary syphilis the evidences of an affection of the brain are manifested, as a rule, during childhood. According to Fournier the disease begins generally between the ages of three and eighteen years. In rare cases, however, it is observed in early childhood. Foreexample, marked arterial changes were presented by a girl of fifteen months suffering from hereditary syphilis. In this case the dura mater was smooth and pale, the pia mater presented numerous circumscribed patches of thickening over the cerebral lobes. There was slight thickening around the large arteries at the base of the brain, and most of these vessels were thickened and hard. The basilar artery was completely plugged, and the upper part of the vertebral arteries contained tolerably soft thrombi.

On the other hand Ljunggren reports a case, beginning at the age of thirty-three years, which he attributed to hereditary syphilis.

In any event, however, hereditary syphilis is a comparatively rare source of cerebral disease. It was formerly held that, in acquired syphilis, nervous manifestations were observed almost exclusively among the very late symptoms. Many neurologists now hold the very opposite opinion, and this view is also gaining ground among syphilidologists. So far as our knowledge goes, the earliest development of cerebral symptoms was observed by Brasch, who reported the following case: The patient, aged forty-three years, was infected with syphilis in the early part of August, 1893. In the middle of September, 1893, he had an attack of right facial paralysis and headache. In the beginning of November, 1893, he suffered from dizziness and headache and the paralysis was unchanged. In the beginning of December there was difficulty of hearing on both sides, and examination showed that this was probably due to labyrinthine disease. On February 19th, 1894, he was discharged, free from symptoms. In March, 1894, there was a return of the headache, vertigo, and difficulty of hearing. May 30th, left hemiplegia developed, but improved under antisyphilitic treatment. Then the condition grew worse, bulbar symptoms set in and the patient died on October 30th, 1894.

The autopsy showed purely vascular disease most marked at the base, but also present in other vessels. The hemiplegia was due to softening in the anterior part of the right half of the pons. The microscope showed advanced endarteritis syphilitica; secondary degeneration of the right pyramid from the pons lesion down to the cord; degeneration of both acoustic nerves in their extracerebral course, and disease of both ventral nuclei; both

facial nuclei and roots were intact, but the right root exhibited, a short distance before its exit from the brain, an abundant development of spindle cells, while the peripheral nerve showed parenchymatous and interstitial changes.

While this case and other similar but less striking ones prove conclusively that cerebral lesions may develop among the very earliest manifestations of the constitutional disease, we still adhere to the older view that in the majority of cases syphilis of the brain is a late manifestation. Indeed, the symptoms of secondary syphilis very often are entirely or almost entirely absent, so that we may be compelled to rely upon the grouping of the cerebral symptoms in arriving at a diagnosis of the previous infection. Numerous cases have been reported in which twenty, thirty years or more have elapsed between the initial lesion and the outbreak of the cerebral symptoms.

In addition to the direct etiological significance of syphilis in the production of brain disease, it also seems to exert a malign influence after the constitutional disease has run its course (parasyphilitic affections of Fourrier). This is seen particularly in dementia paralytica and locomotor ataxia. In the large majority of such cases a previous history of syphilis can be elicited, but the diseases are distinguished from syphilitic affections proper both by the character of the anatomical lesions (purely degenerative) and by the utter uselessness of antisyphilitic treatment. In these diseases we assume the existence of a primary degenerative process, resulting from a chemical poison which has been produced by the syphilitic germs (metasyphilis or parasyphilis). It is not true, however, that dementia paralytica is always the result of constitutional syphilis.

Among the exciting causes which may lead to localization of the syphilitic virus in the brain may be mentioned mental overwork and prolonged worry, injury to the head, and alcoholism.

PATHOLOGICAL ANATOMY.—Syphilis may attack the bones of the skull and all of the structures within the cranial cavity, the vessels, meninges, or brain tissue, either singly or in combination. The lesions are usually multiple in character.

One of the most frequent forms of cerebral syphilis is a lesion of the vessels, which attacks usually the vessels at the base of the brain or their large branches. The disease may begin independently in these vessels or it may spread from adjacent foci of disease in the meninges.

Heubner, who was the first to call attention to specific lesions of the cerebral vessels, describes them in the following words: The vessel becomes less transparent and somewhat whitish, finally grayish white; it then becomes cylindrical in shape and very rigid. Upon transverse section the lumen of the vessel is found narrowed by new-formed tissue which develops between the elastic lamella of the tunica intima and the endothelial layer. The new tissue consists at first of endothelium cells which continue to proliferate and change into a firm connective tissue consisting of spindle and stellate cells into which round cells emigrate from the nutrient vessels of the artery.

While this endarteritis of Heubner has also been observed by other writers, changes of a periarteritic and mesarteritic character have been frequently described.

According to Baumgarten, the process begins, as a rule, in the outer layers of the vessels as a gummatous periarteritis, while the intima is only affected secondarily by proliferation of cells. He found little yellowish tumors (from the size of a poppy seed to that of a cherry pit) upon the arteries, meninges, and cerebral nerves; they consisted of granulation tissue and were associated with endarteritic changes in the intima. Gummatous arteritis has also been observed by other writers.

Koester claims that the process starts from the vasa vasorum of the external layers of the artery, and that the leucocytes emigrating therefrom form inflammatory foci in the muscular coat. The affection begins, therefore, as a mesarteritis while the endarteritic prolifera-

tions develop secondarily by immigration of cells from without.

According to Abramov, all three layers of the vessels are attacked independently of one another. Dilatation of the vessel may be produced by destruction of a circumscribed part of the vascular wall from proliferation starting either in the external or in the internal layer. If the proliferation starts in the tunica intima, a dense accumulation of elastic tissue is produced, due to splitting of the fenestrated membrane. Abramov came to the conclusion that the microscopic findings are insufficient to prove the syphilitic character of the vascular disease, unless gummy nodules are found in the walls of the vessels.

Hyaline degeneration has also been described in the small vessels of the brain.

Gummata constitute another frequent form of syphilitic lesion of the brain. As a rule, these tumors start from the meninges or the prolongations of the latter into the brain substance. In exceptional cases, the gumma is located in the central ganglia or other parts within the brain, but it is probable that even in these cases they start from prolongations of the pia mater.

In the large majority of cases the tumor is situated on the meninges of the convexity and at the base of the brain. They vary in size from that of a pin's head to that of a walnut or even hen's egg. The miliary form is rare and may be mistaken for miliary tubercles.

Gummata belong to the class of infectious granulomata, *i. e.*, they are composed of granulation tissue or densely aggregated round cells. The connective-tissue stroma is very scantily developed. The smaller tumors may exhibit a uniform grayish or grayish-red color, but the larger ones are speckled with yellowish foci. A few stellate and spindle-shaped cells are found among the round cells. The yellowish foci are the result of simple necrosis of the round cells or caseation, and this is due to the relatively small number of vessels and the consequent poor nutrition of the parts. Some of the cells are also apt to be converted into firm connective tissue, which traverses the tumor in broad bands.

In cerebral syphilis we also find a diffuse gummy inflammation of the meninges, and this may or may not be associated with the presence of circumscribed gummata. This process is situated most frequently at the base of the brain and is often most marked over the optic chiasm. The pia mater in this locality is found thickened in varying degrees; in places the thickening is quite soft, in other parts it is firm and dense. This process surrounds the nerves at the base and sometimes compresses them, or the round-cell infiltration may spread into the tissue of the nerves. The process may also extend into the vessels of the circle of Willis. Usually the cortex is adherent to the pia mater, and the former is torn when an attempt is made to detach the meninges.

Gummy meningitis is also not uncommon at the convexity of the brain, but here it is more apt to start from the dura mater. This is perhaps owing to the fact that gummy tumors start not infrequently from the inner surface of the vault of the cranium. Apart from the specific lesions which we have just described, the brain may also exhibit secondary lesions, such as hemorrhage and spots of softening, varying in extent according to the character of the primary lesion.

The heterogeneity of the lesions of cerebral syphilis is increased still further by the fact that the spinal cord may also be the site of syphilitic processes.

Some writers also maintain that syphilis may give rise to ordinary, non-specific inflammatory processes in the brain, such as Virchow's encephalitis of childhood, spots of softening, and chronic disseminated foci of inflammation. None of the reported cases, however, seems to be entirely free from doubt.

In quite a considerable number of cases it has been demonstrated that syphilis has given rise to degenerative processes in the nuclei of various cerebral nerves (nuclei of the ocular muscle nerves, glosso-pharyngeal nucleus, trigeminal and acoustic nuclei).

SYMPTOMS.—It is evident from our brief résumé of the

pathological anatomy of cerebral syphilis that the symptoms must vary greatly in character. Nevertheless, there are certain prodromal symptoms which may be common to various forms and localizations of the disease.

The most prominent prodrome is headache. This is always present when syphilis attacks the bones of the skull, but is also frequent when the osseous structures are unaffected. For months it may be the sole symptom. The pain is usually of a boring, pressing, often agonizing character, with marked nocturnal exacerbations, as a rule, though it is not very infrequent to find the pain equally severe during the day. The pain is often so severe that it gives rise to persistent insomnia; but the latter symptom may also be present for a considerable period independently of the occurrence of pain. In not a few cases the headache is associated with attacks of dizziness and sometimes with vomiting. Sometimes the only prodrome noticeable for quite a while before the advent of other symptoms is an inexplicable fear "that something is going to happen," and this feeling sometimes causes great mental depression.

Paralysis of one or more of the ocular muscles may also be an early symptom. Sudden development and almost equally rapid disappearance of these paralyses are very characteristic of syphilis. Indeed, the sudden occurrence of ocular palsies in an adult, in the absence of other cerebral symptoms, should always lead the physician to make a very thorough examination into the question of their syphilitic origin.

Individual cases of syphilis of the brain present such a varied and heterogeneous history that it becomes extremely difficult to give a general description which will be applicable to any considerable group of cases. A tolerably well-defined symptomatology attaches to syphilis of the cerebral vessels, which we will first describe.

This form of disease is often preceded by headache, of the variety described above, which may last for a variable period, sometimes even for months, before the special symptoms develop. When the vessels supplying the pons or medulla are implicated, glycosuria or albuminuria may be associated with the headache. A characteristic phenomenon of a small series of cases is a peculiar drowsiness which may continue for several months and may precede or follow other evidences of disease of the vessels. The patients go about as if "in a haze"; their movements, both mental and physical, are slow and deliberate, as if consciousness, before struggling to the surface, had to overcome some unusual resistance. In some cases, deep coma develops from which it may be impossible to arouse the patient for days and days, or this condition may alternate with periods of delirium.

In a considerable proportion of cases the symptoms referable to disease of the vessels develop quite suddenly (sometimes as rapidly as in cerebral embolism) or within one or two days. The clinical history is then the same as that of embolism or thrombosis from other causes. The patient often develops hemiplegia, associated quite frequently with aphasia, if the paralysis is on the right side of the body. Aphasia may also be the sole symptom of an attack of this kind. In the majority of cases under our observation consciousness was retained either entirely or partially during the attack. Sometimes the duration of the paralysis is very brief and the patient is rapidly restored to the *status quo ante*. The entire seizure may be represented by a feeling of weakness or a sensation of numbness and tingling on one side of the body.

The hemiplegic attacks may be repeated from time to time. A patient under my observation had five attacks, in one of which both sides of the body were paralyzed in rapid succession. In cases of this kind, pseudo-bulbar symptoms are very apt to develop.

As a rule, the patient eventually suffers from symptoms indicative of other forms of syphilitic affections of the brain.

Gummy meningitis of the base of the brain also merits separate consideration. In this form likewise headache is a prodromal symptom and resembles in character the form described above. The headache is attended not

infrequently with vertigo, which may appear either in paroxysms—the usual course—or may be more constant. Morbid conditions of sleep alternating with periods of excitement are also not uncommon prior to the onset of those symptoms which point more directly to a basilar affection. These conditions may also persist after the later symptoms have been fully developed. As a general thing they are manifested by semi-consciousness, from which the patient may be easily aroused or during which he performs various automatic actions. The return to complete consciousness may be quite rapid. At times the coma is quite complete and it is impossible to arouse the patient. In a case under our observation the patient remained completely unconscious for a week; this condition was unattended by stertorous breathing and the pulse was normal.

One of the most characteristic features of syphilitic basilar meningitis is the implication of the cerebral nerves, and chief among these is the motor oculi communis. In many cases both nerves are involved, and in the majority of cases a great part of the entire nerve supply is affected. As we have already stated, a single muscle alone may be paralyzed, and this is particularly apt to be the levator palpebræ superioris.

The trochlear and abducens nerves are attacked with much less frequency than the motor oculi. The pupils sometimes exhibit inequality; myosis or mydriasis may be present in one or both eyes. The Argyll-Robertson pupil has been observed frequently and is sometimes the sole indication, for a long period, of a cerebral affection. In one case under our observation, the right pupil was normal while the left showed the Argyll-Robertson symptom.

The optic nerve is not infrequently the site of disease and may exhibit the appearances of choked disc or simple optic atrophy. In the majority of cases these processes are due to an extension of the syphilitic lesion directly to the optic chiasm or nerves, or to compression of these parts. In a considerable number of cases hemianopsia is observed. This may persist unchanged or there may be a gradual development of complete blindness, the latter being limited generally to one eye. Temporary amaurosis, sometimes lasting only a day or two, is observed not so very rarely in this form of the disease.

In comparatively rare cases the other cerebral nerves may be affected, either separately or, more frequently, in varying combinations. The olfactory and trigeminal nerves are especially apt to be involved. The paralyses due to lesion of these nerves are always peripheral in character.

As we have already seen in the section on Pathological Anatomy, gummy meningitis is very apt to be associated with lesions of the vessels of the circle of Willis. When this happens, the clinical history is complicated by the symptoms described on page 244. The hemiplegia produced under such circumstances is combined, more frequently than in paralysis due to other brain lesions, with hemianesthesia and hemianopsia. The morbid conditions of sleep and unconsciousness, to which we have already referred, are frequently present in this form of the disease, and general impairment of the mental faculties is not uncommon.

Gummy meningitis of the convexity of the brain is often found independently of lesions of other parts of the organ. This process starts with comparative frequency from the inner table of the skull or the dura mater, and may or may not complicate a well-defined gummy tumor. As in the other forms of cerebral syphilis, headache is a prominent prodromal symptom. In not a few cases the headache is attended with localized tenderness on percussion of the skull. The most significant symptom of this form of disease is cortical or Jacksonian epilepsy. This symptom may begin with a sensory aura in the arm, leg, face, or tongue, which is soon followed by muscular twitchings. At the outset the convulsions are limited to one side of the body and for a considerable period may involve only one or more groups of muscles. But after they have lasted for a variable period

they may become much more general and finally may extend over the entire body. As a rule, it is found that the convulsion spreads in a definite manner from one group of muscles to another, and that the mode of progression remains the same in subsequent attacks. Consciousness is often retained throughout the seizure, though it is generally lost when the convulsion extends to both sides of the body. After each attack slight paralysis may develop temporarily in the affected parts. It grows most pronounced after repeated attacks and finally may remain permanent. The convulsions sometimes recur with such frequency that the status epilepticus develops. In not a few cases this condition is the immediate forerunner of death.

Like other cerebral symptoms of syphilis, cortical epilepsy and paralysis may disappear suddenly and may remain absent for many months, even without antisyphilitic treatment.

The monoplegias due to meningitis of the convexity sometimes develop prior to the epileptic attacks. Furthermore, the monoplegia may be converted suddenly into hemiplegia on account of extension of softening downward into the white matter of the hemispheres.

The symptoms described above are due to localization of the lesion in the motor zone. Meningitis of other parts of the cortex will produce symptoms corresponding to the functions of those parts. The most frequent symptoms are aphasia and hemianopsia. The aphasia is often ephemeral in character and may even last only a few minutes at a time. It is apt to be attended or preceded by convulsive twitchings on the right side of the body, starting usually from the muscles of the face and tongue. After a variable period the aphasia usually becomes permanent.

Hemianopsia, due to an affection of the occipital lobes, is not very rare. This symptom is apt to be attended by visual hallucinations, which are referred to the blind side of the field of vision. When the meningitis is more diffuse and extends over a considerable part of the convexity of one or both sides, mental disturbances may be the chief feature in the clinical history. In such cases the first symptom noticeable may be a change in the character of the patient, who becomes morose, peevish, irritable, loses judgment in business affairs and exhibits decided lapses of memory. There may be a pronounced melancholy tinge at an early stage. In rarer cases, maniacal attacks, sometimes attended with destructiveness, are observed very early. Ideas of grandeur may be noticed at times, but, as a rule, they are not very persistent or well defined, and they do not last as long as in general paresis. Headache may be a prominent symptom and usually exhibits the well-known syphilitic characteristics. Speech sometimes becomes slow and labored, and there may even be tremor of the tongue and twitchings of the lower facial muscles. The dominant symptom, however, is the mental failure, which usually progresses more or less rapidly, but sometimes shows very pronounced remissions. Paralysis of various cerebral nerves is quite common, likewise sudden attacks of temporary aphasia. Convulsive or apoplectic seizures are also frequently observed and serve to increase the resemblance to general paralysis of the insane. Indeed, the latter disease is found in such an immense proportion of cases among syphilitic subjects that it may be difficult or even impossible to distinguish it from cerebral syphilis.

Gummy tumors, when solitary and uncomplicated with other lesions of the brain or vessels, present the same clinical history as do other varieties of tumor, except that exacerbations and remissions of the symptoms are much more frequent in the former (*vide Brain, Tumors of*, in the present volume). In addition, choked disc is comparatively rare in gummata, while it is a frequent attendant of other varieties of tumor.

DIAGNOSIS.—Of course, the first element in diagnosis is the recognition of previous infection with syphilis. In many cases this is a very simple matter, but in numerous instances the symptoms at the time of the original infection were so slight, and such a long interval has elapsed

before the outbreak of cerebral symptoms, that it may be extremely difficult to make a positive diagnosis. Moreover, in negative cases we must not forget that many patients attempt to deceive the physician in regard to the contraction of venereal disease. In doubtful cases careful search must be made throughout the entire body for any traces which may have been left over by the original disease.

Headache is an important sign at the beginning of cerebral syphilis, in whatever part of the brain tissues the lesion may be located. The pain exhibits the characteristics described in the previous section, but it must be remembered that the nocturnal exacerbations are sometimes absent.

The occurrence of cortical epilepsy in a syphilitic subject is also very significant. It must not be forgotten that this may start with either convulsions or paralysis, although the former are a much more frequent initial symptom. Unlike ordinary epileptic attacks, these seizures are often unattended with unconsciousness.

Another important sign of cerebral syphilis is the heterogeneous character of the symptoms (paralysis of the cranial nerves, hemiplegia, aphasia, convulsions, etc.), a fact which is naturally due to the varied character of the lesions present in the brain. In many cases the secondary manifestations of the constitutional disease are very slightly marked, so that they may have been unnoticed by the patient, and, as the initial lesion is often disregarded, he may be unaware of his infection with the specific virus. But so significant are the heterogeneity and anomalous distribution of the symptoms that the existence of syphilis should be suspected in every case of nervous disease in which the symptoms appear to be due to an organic affection but are grouped in an irregular and anomalous manner. Buzzard says: "I should not take much account of this absence [of syphilitic symptoms], if there were other reasons for strongly suspecting syphilis, for we are continually meeting with cases in which the symptoms caused by lesion of some part of the nervous system constitute of themselves the only testimony to the specific nature of the disorder, and experience shows these to be quite as pathognomonic as affections of the skin." The brilliant results which are often obtained by vigorous antisyphilitic treatment may also prove a valuable aid in diagnosis. It is true that, in rare cases, very favorable results are also obtained by such treatment in non-specific cases, but we can hardly expect such pronounced changes as are seen in syphilitic affections.

Another very important characteristic of the symptoms of cerebral syphilis is their remarkable changeableness. For example, an attack of aphasia may last only a few minutes or hours, or an attack of hemiplegia may disappear within a day or two. In no other disease, with the exception of hysteria, is this ebb and flow of the symptoms noticed in such a marked degree.

In making a diagnosis of syphilis of the cerebral vessels, as distinguished from other syphilitic lesions of the brain, special stress should be laid upon the absence of irritative symptoms. The localization of the lesion in the individual arteries will depend upon the same factors as in ordinary cerebral embolism and thrombosis. The problem is frequently complicated, however, by the coincident affection of several vessels, and perhaps by the existence of other syphilitic lesions.

The diagnosis of gummy basilar meningitis is based chiefly on the prominence of paralyzes of various cerebral nerves, in addition to the other evidences of cerebral syphilis. It should be borne in mind, however, that in rare cases the syphilitic lesion appears to be confined to the cerebral nerves themselves (multiple neuritis). In basilar meningitis, however, the cerebral-nerve paralyzes are complicated sooner or later by other symptoms, such as hemiplegia, hemianesthesia, etc.

The most significant symptom of meningitis of the convexity is the development of cortical epilepsy. Hemianopsia, attended by visual hallucinations, is also a very characteristic symptom. The occurrence of tem-

porary aphasia is also apt to be the result of syphilitic lesions of the convexity. In addition to these special focal symptoms, we usually find the general symptoms which have been described in the section on Symptomatology.

When the syphilitic changes in the brain are very diffuse, especially when they involve a large part of the convexity of one or both hemispheres, mental symptoms are often prominent, and it may be difficult to distinguish the condition from dementia paralytica. The latter affection runs a progressive course and ends fatally in a few years. In cases of cerebral syphilis proper treatment may result in very marked improvement and occasionally in recovery. Inequality of the pupils is much more common in dementia paralytica, but in rare cases of cerebral syphilis pupillary changes are found for years before the outbreak of other symptoms. In cerebral syphilis the focal symptoms are prominent and the dementia, while it is more stable in character, does not lead gradually to complete dementia. True ideas of grandeur are comparatively rare in syphilitic dementia, and are frequent in dementia paralytica. On the whole the evidences of an organic disease of the brain are much more decided in cases of cerebral syphilis than in dementia paralytica.

PROGNOSIS.—However mild the symptoms of cerebral syphilis may be at the outset of the disease, the prognosis is always serious. It is true that a considerable proportion of cases recover, but the danger of relapse is always to be kept in mind. There seems to be some ground for believing that when the original syphilitic infection runs a mild course, subsequent cerebral manifestations are apt to be severe in character. This may be owing to the fact that antisyphilitic treatment is not carried out very vigorously or persistently unless the symptoms are severe. Nungazzini, on the other hand, claims that malignity of the morbid process and early death are characteristic of many cases of early syphilis of the brain.

Contrary to the opinion of many writers, we have not found that the general condition of the patient has much effect upon the course of the disease, except in those cases in which there is excessive indulgence in alcoholic stimulants.

Among the various forms of cerebral syphilis the most unfavorable prognosis is presented by lesions of the blood-vessels. Even a lesion which is very slight in actual dimensions may be sufficient to interfere very seriously with the circulation in the brain. When a vessel is occluded entirely, softening in its area of distribution develops very rapidly and the function of such parts is never restored. The most serious results are observed when the basilar artery is the site of disease.

The most favorable results are seen in gummy tumors and gummy meningitis of the convexity. Symptoms which point very conclusively to gummy tumors may disappear completely under treatment. Gummy meningitis of the convexity also promises a more favorable prognosis than other localizations, but in these cases recovery is usually incomplete. This is particularly true of cases in which mental disturbances have been prominent.

Gummy meningitis at the base of the brain presents almost as unfavorable a prognosis as syphilis of the vessels, and indeed the two conditions are very apt to be associated. In many cases, however, the extent and rapidity of the improvement secured by antisyphilitic treatment are little less than marvellous.

TREATMENT.—The treatment consists practically of the administration of antisyphilitic remedies, and the earlier we resort to these remedies the more assured is a successful result. Hence the extreme importance of an early diagnosis and the advisability of specific treatment in all doubtful cases.

In our hands more benefit has been derived from the use of potassium iodide than from the preparations of mercury; but this opinion is not held by all writers. German authorities in particular usually lay more stress upon the exhibition of mercurial preparations.

Unless the patient manifests an idiosyncrasy with regard to one or the other of these drugs, the mixed treatment should always be adopted. The dosage should depend solely upon the tolerance of the patient. In some cases the effect desired is not secured until enormous doses (an ounce or even more) of potassium iodide are given in the course of twenty-four hours. The notion is quite prevalent that such large doses are dangerous to the general condition of the patient, but this opinion is not justified by our own observation. For internal administration we usually rely upon bichloride of mercury, beginning with one-thirty-second of a grain, and increasing rapidly until the desired effect is obtained. The mercury is given in solution with potassium iodide, the initial dose of the latter being usually fifteen grains, unless the symptoms are very urgent, when much larger doses may be given at once. This mixture is best given about two hours after meals and should always be largely diluted (one-half to one tumblerful of water, Vichy water, or milk). If we wish to increase the dose of the two drugs at varying rates, it is preferable to give the mercury in the shape of tablets. Sometimes it is necessary to give daily as much as one-eighth of a grain or even more, according to the indications in the individual case. It is a good plan to keep on increasing the dose until the gums become a little tender, and then an amount slightly smaller than that necessary to produce such an effect may be continued for a long time. In grave cases, when we wish to overwhelm the patient with the drug, it is better to use inunctions of mercurial ointment regardless of its effect upon the gums. If the patient is unconscious, my plan has been to administer the mercury by inunction and the iodide of potassium by rectal injections. As much as from 4 to 6 gm. of the iodide (diluted with water or milk) may be injected every four hours. When the patient recovers consciousness, the drug may again be administered in the usual way.

During the entire period of treatment, the patient should devote extreme attention to the care of the teeth and mouth. The teeth should be very carefully brushed after each meal, and the mouth rinsed several times a day with a weak solution of listerine or some other mild antiseptic.

After serious symptoms have subsided, the dose of the antisyphilitic is gradually diminished to a certain extent, but should be continued persistently (if possible, without intermission) for at least one or two years after the disappearance of all evidences of the disease.

I cannot express myself too strongly concerning the extreme importance of protracted treatment and the necessity of administering the remedies in sufficiently large doses. The dose is to be regulated solely by the amount requisite to control the symptoms in each individual case.

Apart from the use of the strictly antisyphilitic remedies, very little can be done in the way of treatment. When the pains do not yield to these drugs, opium must be resorted to, and perhaps the repeated application of blisters to the back of the neck will prove useful. Repeated convulsions are sometimes controlled by the addition of bromide of potassium to the iodide mixture. The patients should be strictly warned against the use of alcoholic stimulants in any shape, and also against indulgence in sexual intercourse. They should be kept as free as possible from excitement and overwork, and regular, easy evacuations of the bowels should be secured daily.
Leopold Putzel.

BRAIN: TRAUMATIC AFFECTIONS. See *Skull, Diseases and Injuries of*.

BRAIN: TUBERCULOUS MENINGITIS.—(Synonyms: Acute Hydrocephalus, Granular Meningitis, Basilar Meningitis, Dropsy of the Brain.)

DEFINITION.—Tuberculous meningitis is an acute inflammation of the pia mater of the brain, due to infection by tubercle bacilli, and characterized by the deposit of miliary tubercles and an effusion of pus and lymph.