tempting to pick up an object there is trembling or rapid oscillation. A patient may be unable to lift even a glass of water to the mouth. The tremor may be marked in the legs and in the head, which shakes as he walks. When the patient is recumbent the muscles may be perfectly quiet. On attempting to raise the head from the pillow, trembling at once comes on. (*b*) *Scanning Speech.*—The words are pronounced slowly and separately, or the individual syllables may be accentuated. This staccato or syllabic utterance is a common feature. (*c*) Nystagmus, a rapid oscillatory movement of both eyes, constitutes an important symptom.

Sensation is unaffected in a majority of the cases. Optic atrophy sometimes occurs, but not so frequently as in tabes. The sphincters, as a rule, are unaffected until the last stages. Mental debility is not uncommon. Remarkable remissions occur in the course of the disease, in which for a time all the symptoms may improve. Vertigo is common, and there may be sudden attacks of coma, such as occur in general paresis.

The *diagnosis* in well-marked cases is easy. Volitional tremor, scanning speech, and nystagmus form a characteristic symptom-group. With this there is usually more or less spastic weakness of the legs. Paralysis agitans, certain cases of general paresis, and occasionally hysteria may simulate the disease very closely. If the case is not seen until near the end the diagnosis may be impossible. Buzzard holds that of all organic diseases of the nervous system disseminated sclerosis in its early stages is that which is most commonly mistaken for hysteria.

Much more puzzling, however, are the instances of *pseudo-sclérose en plaques*, which have been described by Westphal. The volitional tremor, the scanning speech, and the spastic condition are present, but no lesions have been found post mortem. The movements in this form are more violent, but nystagmus does not occur. Some of the cases may possibly be examples of general paresis. In children the condition may with difficulty be separated from Friedreich's ataxia.

The *prognosis* is unfavorable. Ultimately, the patient, if not carried off by some intercurrent affection, becomes bedridden.

Treatment.—No known treatment has any influence on the progress of sclerosis of the brain. Neither the iodides nor mercury have the slightest effect, but a prolonged course of nitrate of silver may be tried.

VI. CHRONIC DIFFUSE MENINGO-ENCEPHALITIS

(Dementia Paralytica; General Paresis).

Definition.—A chronic, progressive meningo-encephalitis associated with psychical and motor disturbances, finally leading to dementia and paralysis.

Etiology.—Males are affected much more frequently than females. It occurs chiefly between the ages of thirty and fifty-five. Heredity is a

factor in only a few cases. An overwhelming majority of the cases are in married people. Statistics show that it is more common in the lower classes of society, but in this country in general medical practice the disease is certainly more common in the well-to-do classes. An important predisposing cause is "a life absorbed in ambitious projects with all its strongest mental efforts, its long-sustained anxieties, deferred hopes, and straining expectation" (Mickle). The habits of life so frequently seen in active business men in our large cities, and well expressed by the phrase "burning the candle at both ends," strongly predispose to the disease. Among other factors of importance are syphilis, excesses *in baccho et venere*, injuries, and chronic lead-poisoning.

Morbid Anatomy.—The essential histological changes in the cerebral cortex are thus summarized by Bevan Lewis: (1) A stage of inflammatory change in the tunica adventitia of the arteries with excessive nuclear proliferation, profound changes in the vascular channels, and trophic changes induced in the tissues around.

(2) A stage of extraordinary development of the lymph-connective system of the brain, with a parallel degeneration and disappearance of nerve elements and the axis cylinders of which they are denuded.

(3) A stage of general fibrillation with shrinking and extreme atrophy of the parts involved.

The macroscopical changes are: (*a*) Increase in the cerebro-spinal fluid, œdema of the pia, and thickening and opacity of the meninges, which are adherent in places and tear the cortex on removal. The dura is sometimes thickened, and pachymeningitis hæmorrhagica interna may be present.

(*b*) The convolutions are atrophied, usually in a marked degree, and in consequence the brain looks small. This is particularly noticeable in the frontal and parietal regions. On section it cuts with firmness. In extreme cases the gray matter may be obscurely outlined. The grade of sclerosis varies much in different cases. The white matter may be firmer in consistence, but it does not show such important changes. The ventricles are dilated and the ependyma extremely granular. In addition, there are frequently areas of softening or hæmorrhage associated with chronic arterio-sclerosis.

(*c*) Spinal cord. Changes occur leading to increase in the connective-tissue elements and frequently to degeneration of the pyramidal tracts secondary to the cortical lesion. The posterior columns may also be involved, and occasionally the distribution of the sclerosis is that of the amyotrophic form.

Symptoms.—(*a*) *Prodromal Stage.*—This is of variable duration, and is characterized by a general mental state which finds expression in symptoms trivial in themselves but important in connection with others. Irritability, inattention to business amounting sometimes to indifference or apathy, and sometimes a change in character marked by acts which

may astonish the friends and relatives may be the first indications. Instead of apathy or indifference there may be an extraordinary degree of physical and mental restlessness. The patient is continually planning and scheming, or may launch into extravagances and speculation of the wildest character. A common feature at this period is the display of an unbounded egoism. He boasts of his personal attainments, his property, his position in life, or of his wife and children. Following these features are important indications of moral perversion, manifested in offences against decency or the law, many of which acts have about them a suspicious effrontery. Forgetfulness is common, and may be shown in inattention to business details and in the minor courtesies of life. At this period there may be no motor phenomena. The onset of the disease is usually insidious, although cases are reported in which epileptiform or apoplectiform seizures were the first symptoms. Among the early motor features are tremor of the tongue and lips in speaking, slowness of speech and hesitancy, and inequality of the pupils.

(*b*) *Second Stage.*—This is characterized in brief by mental exaltation or excitement and a progress in the motor symptoms. "The intensity of the excitement is often extreme, acute maniacal states are frequent; incessant restlessness, obstinate sleeplessness, noisy, boisterous excitement, and blind, uncalculating violence especially characterize such states" (Lewis). It is at this stage that the delusion of grandeur becomes marked and the patient believes himself to be possessed of countless millions or to have reached the most exalted sphere possible in profession or occupation. This expansive delirium, as it is called, is, however, not characteristic, as was formerly supposed, of paralytic dementia. Besides, it does not always occur, but in its stead there may be marked melancholia or hypochondriasis, or, in other instances, alternate attacks of delirium and depression.

The facies has a peculiar stolidity, and in speaking there is marked tremulousness of the lips and facial muscles. The tongue is also tremulous, and may be protruded with difficulty. The speech is slow, interrupted, and blurred. Writing becomes difficult on account of unsteadiness of the hand. The subject matter of the patient's letters give valuable indications of the mental condition. In many instances the pupils are unequal, irregular, sluggish, sometimes large. Important symptoms in this stage are apoplectiform seizures and paralysis. There may be slight syncopal attacks in which the patient turns pale and may fall. Some of these are *petit mal.* In the true apoplectiform seizure the patient falls suddenly, becomes unconscious, the limbs are relaxed, the face is flushed, the breathing stertorous, the temperature increased, and death may occur. The epileptic seizures are more common than the apoplectiform and may occur early in the disease. A definite aura is not uncommon. The attack usually begins on one side and may not spread. There may be twitchings either in the facial or brachial muscles. Typical Jacksonian epilepsy may occur. In a case which died recently under my care, these seizures were among the early symptoms and the disease was regarded as cerebral syphilis. Paralysis, either monoplegic or hemiplegic, may follow these epileptic seizures, or may come on with great suddenness and be transient. In this stage the gait becomes impaired, the patient trips readily, has difficulty in going up or down stairs, and the walk may be spastic or occasionally tabetic. This paresis may be progressive. The knee-jerk is usually increased. Bladder or rectal symptoms gradually develop. The patient becomes helpless, bedridden, and completely demented, and unless care is taken may suffer from bedsores. Death occurs from exhaustion or from some intercurrent affection.

Diagnosis.—The recognition of the disease in the earliest stage is extremely difficult, as it is often impossible to decide that the slight alteration in conduct is anything more than one of the moods or phases to which most men are at times subject. The following description by Folsom is an admirable presentation of the diagnostic characters of the early stage of the disease: "It should arouse suspicion if, for instance, a strong, healthy man, in or near the prime of life, distinctly not of the 'nervous,' neurotic, or neurasthenic type, shows some loss of interest in his affairs or impaired faculty of attending to them; if he becomes varyingly absent-minded, heedless, indifferent, negligent, apathetic, inconsiderate, and, although able to follow his routine duties, his ability to take up new work is, no matter how little, diminished; if he can less well command mental attention and concentration, conception, perception, reflection, judgment; if there is an unwonted lack of initiative, and if exertion causes unwonted mental and physical fatigue; if the emotions are intensified and easily change, or are excited readily from trifling causes; if the sexual instinct is not reasonably controlled; if the finer feelings are even slightly blunted; if the person in question regards with a placid apathy his own acts of indifference and irritability and their consequences, and especially if at times he sees himself in his true light and suddenly fails again to do so; if any symptoms of cerebral vaso-motor disturbances are noticed, however vague or variable."

There are cases of cerebral syphilis which closely simulate dementia paralytica. The mode of onset is important, particularly since paralytic symptoms are usually early in syphilis. The affection of the speech and tongue is not present. Epileptic seizures are more common and more liable to be cortical or Jacksonian in character. The expansive delirium is rare. While symptoms of general paresis are not common in connection with the development of gummata or definite gummatous meningitis, there are, on the other hand, instances of paresis which follow syphilitic infection so closely that an etiological connection between the two must be acknowledged. Post mortem in such cases there may be nothing more than a general arterio-sclerosis and diffuse meningo-encephalitis, which may present nothing distinctive, but the lesions, nevertheless, may be caused by

the syphilitic virus. There are certain forms of lead encephalopathy which resemble general paresis, and, considering the association of plumbism with arterio-sclerosis, it is not unlikely that the anatomical substratum of the disease may result from this poison.

Prognosis.—The disease rarely ends in recovery. As a rule the progress is slowly downward and the case terminates in a few years, although it is occasionally prolonged ten or fifteen years.

Treatment.—The only hope of permanent relief is in the cases following syphilis, which should be placed upon large doses of iodide of potassium. Careful nursing and the orderly life of an asylum are the only measures necessary in a great majority of the cases. For sleeplessness and the epileptic seizures bromides may be used. Prolonged remissions, which are not uncommon, are often erroneously attributed to the action of remedies.

VII. TUMORS OF THE BRAIN.

The following are the most common varieties of new growths within the cranium:

(*a*) *Tubercle*, which may form small or large growths, usually multiple. They are most frequent early in life. Three fourths of the cases occur under twenty, and one half of the patients are under ten years of age (Gowers). Of 299 cases of tumor in persons under nineteen collected from various sources by Starr, 152 were tubercle. They are most numerous in the cerebellum and about the base.

(*b*) *Syphiloma* is most commonly found in the hemispheres or about the pons. The tumors are superficial, attached to the arteries or the meninges, and rarely grow to a large size. They may be multiple.

(*c*) *Glioma and Neuroglioma.*—These vary greatly in appearance. They may be firm and hard, almost like an area of sclerosis, or soft and very vascular. They persist remarkably for many years. Klebs has called attention to the occurrence of elements in them not unlike ganglion-cells. Tumors of this character contain "the spinnen" or spider cells; enormous spindle-shaped cells with single large nuclei; cells like the ganglion-cells of nerve-centres with nuclei and one or more processes; and translucent, band-like fibres, tapering at each end, which result from a vitreous or hyaline transformation of the large spindle-cells.

(*d*) *Sarcoma* occurs most commonly in the membranes of the brain and in the pons. It forms some of the largest and most diffusely infiltrating of intracranial growths.

(*e*) *Carcinoma* not infrequently is secondary to cancer in other parts. It is seldom primary. Occasionally cancerous tumors have been found in symmetrical parts of the brain.

(*f*) Other varieties occur, such as fibroid growths, which usually develop from the membranes; bony tumors, which grow sometimes from the falx, and psammoma and cholesteatoma. Fatty tumors are occasionally found on the corpus callosum.

(*g*) *Cysts* occur between the membranes and the brain, the result of hæmorrhage or of softening. Porencephalus is a sequence of congenital atrophy or of hæmorrhage, or may be due to a developmental defect. Hydatid cysts will be referred to in the section on parasites.

Symptoms.—(1) **General.**—The following are the most important: *Headache*, either dull, aching, and continuous, or sharp, stabbing, and paroxysmal. It may be diffused over the entire head or limited to the back or front. In the former case it may extend down the neck, and in the latter be accompanied with neuralgic pains in the face. Occasionally the pain may be very localized and associated with tenderness on pressure.

Optic Neuritis.—This occurs in four fifths of all the cases (Gowers). It is usually double, but occasionally is found in only one eye. A growth may develop slowly and attain considerable size without producing optic neuritis. On the other hand, it may occur with a very small tumor, more commonly in a growth at the base.

Vomiting.—This is a common feature, and with headache and optic neuritis makes up the characteristic symptom group of cerebral tumor. An important point is the absence of definite relation to the meals. It may be very obstinate, particularly in growths of the cerebellum and the pons.

Giddiness.—This is often an early symptom. The patient complains of vertigo on rising suddenly or on turning quickly. *Mental Disturbance.* The patient may act in an odd, unnatural manner, or there may be stupor and heaviness. The patient may become emotional or silly, or symptoms resembling hysteria may develop. *Convulsions*, either general and resembling true epilepsy or localized (Jacksonian) in character.

(2) **Localizing Symptoms.**—(*a*) *Central Motor Area.*—The symptoms are either irritative or destructive in character. Irritation in the lower third may produce spasm in the muscles of the face, in the angle of the mouth, or in the tongue. The spasm with tingling may be strictly limited to one muscle group before extending to others, and this Seguin terms the *signal symptom.* The middle third of the motor area contains the centres controlling the arm, and here, too, the spasm may begin in the fingers, in the thumb, in the muscles of the wrist, or in the shoulder. In the upper third of the motor areas the irritation may produce spasm beginning in the toes, in the ankles, or in the muscles of the leg. In many instances the patient can determine accurately the point of origin of the spasm, and there are important sensory disturbances, such as numbness and tingling, which may be felt first at the region affected.

In all cases it is important to determine, first, the point of origin, the *signal symptom;* second, the order or march of the spasm; and third, the subsequent condition of the parts first affected, whether it is a state of paresis or anæsthesia.