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## DISEASES OF THE BRAIN AND ITS MENINGES, INCLUDING THE CRANIAL NERVES.

THE study of brain diseases, we must confess, has not made the strides that might have been expected after the numerous and varied researches that the last decades have seen. For this our present very imperfect knowledge of the anatomy, and still more our doubts as to the physiological functions of the different parts of the brain must be held largely responsible. The structure as well as the physiological functions of the human brain are, up to the present time, so little understood that we are far from having any sure basis upon which to lay the foundations of a cerebral pathology. No small progress has been made from an anatomical standpoint through Stilling's method of serial sections, a method which Meynert, Henle, Wernicke, and others have not been slow to use, in their admirable researches, to which important additions have been made by the embryological studies of Flechsig, and by the method of "arrested development" used by Gudden and his pupils (atrophy method; *Degenerationsmethode*, Schwalbe); but with all this we have only here and there single stones which we have not as yet been able to combine for the construction of a harmonious whole. Brilliant from a physiological standpoint as was the discovery of Fritsch and Hitzig (1870) of the electrical irritability of the cortex, and of the existence of motor regions therein, unexpected as were the results which the experimental method of Munk brought to light, extraordinary and interesting as are the conclusions based upon the clinical and post-mortem observations of Charcot and his school—all these, wide-reaching and admirable as they were, are far

from having given us a full understanding of the functions of the different parts of the brain, and an explanation of the disturbances to which they are subject. Constant and untiring work is still needed, and the best results are promised from the intelligent combination of clinical observation with pathological research. The pathology of the brain can not be better advanced than by the patient clinical observation of cases during life and a careful autopsy after death. In institutions where not only the fullest opportunities are afforded for clinical observation and for the systematic conduct of post-mortem examinations of the brain, but where also the best men are found to supervise the work, in these will cerebral pathology make the greatest strides.

We shall divide our description of cerebral diseases into three parts. In the first we shall take up the diseases of the meninges, in the second those of the cranial nerves, while the third will embrace the diseases of the brain in the stricter sense, i. e., those of the white and gray matter of the hemispheres and of the central ganglia.

## PART I.

### *DISEASES OF THE MENINGES OF THE BRAIN.*

THE meninges are relatively more frequently affected by disease than the brain substance itself, and quite a considerable number of the cases which we commonly call diseases of the brain are really to be classed as affections of the meninges. Since these diseases can develop under the most varied conditions, and can be primary as well as secondary, they are of great practical importance, and we must try to distinguish most carefully between the different forms which they assume.

A clear understanding of the pathological processes in these diseases will be facilitated by some remarks upon the anatomy of the meninges.

The outermost, tough, fibro-tendinous membrane, called the *dura mater*, forms at the same time the inner periosteum of the cranial bones. It has an outer, rough, and an inner, smooth surface. For the nerves as they emerge from the skull this membrane supplies sheath-like coverings, among which that of the optic nerve (*vagina optici*) is the most conspicuous. The blood-supply of the *dura* is derived from branches of the meningeal arteries. That it possesses its own nerves is doubted by some (among them *Luschka*), affirmed by others (*Ruedinger*, *Alexander*). It is most probable, however, that it is the *trigeminus* which chiefly provides for the innervation of the *dura*.

The second membrane, the *arachnoid*, is delicate and contains no vessels. Its outer surface is smooth and looks toward the subdural space, while the inner is rough and turned toward the *pia mater*. The so-called *subarachnoid space* (*Fig. 1*), which is situated between the *arachnoid* and *pia*, contains between the meshes of the *subarachnoid* tissue the serous *cerebro-spinal fluid*.

The third membrane, the innermost, the one which lies directly on the surface of the brain, is called the *pia mater*. It dips down into the depths of the *sulci*, forming a continuous lining of those parts of the brain-stem which are covered by the *cerebrum* and

cerebellum, and seems to penetrate through the so-called fissures into the interior of the brain. These processes, which are called telæ choroideæ, present peculiar villous formations, very rich

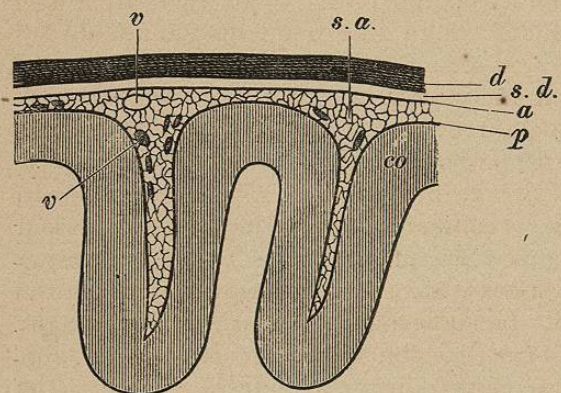


FIG. 1.—CROSS SECTION THROUGH THE CEREBRAL CORTEX AND ITS MEMBRANES.

co, Cortex; p, pia mater; s. a., subarachnoid space; s. d., subdural space; d., dura mater; v. v., blood vessels.

in capillary vessels, and therefore of a deep-red color (plexus choroidei). The covering or ependyma of the ventricles is not a part of the pia mater, but is simply a layer of epithelial cells. The nerves of the pia mater belong to the sympathetic.

The diseases of the meninges of the brain consist mainly of inflammatory processes affecting either the pia or the dura mater.

We shall study the diseases of the two membranes separately.

## CHAPTER I.

### INFLAMMATION OF THE INNER SURFACE OF THE DURA MATER, PACHYMEINGITIS INTERNA HÆMORRHAGICA, HÆMATOMA DURÆ MATRIS.

The origin of the extravasations of blood which at the autopsy are often found on the inner surface of the dura, and which can be easily scraped off with the knife, is not altogether understood. Some (Virchow, 1856) hold that the primary affection is an inflammation, and the hæmorrhage takes place secondarily into the newly formed, highly vascular connective tissue, while others look upon the hæmorrhage as primary; and, indeed, recent observations (Sperling) seem to be very much in favor of this latter view. If extensive hæmorrhages occur, after spreading over more or less of the inner surface of the dura they become encapsulated, and are then

called *hæmatomata duræ matris*. Such a hæmatoma may contain from three hundred to four hundred grammes of extravasated blood, may attain the size of a man's fist, and so exert a deleterious pressure upon the brain. The walls are sometimes smooth, sometimes rough; the contents are not always sanguineous, but may be serous or purulent. They are most commonly situated at the vertex near the falx cerebri, sometimes also in the frontal region, very rarely at the base. The arrangement of the hæmatoma in layers, which is seen on section, proves that the whole process consists of extravasations which have occurred at different times. In the least-marked cases only a delicate reddish membrane is found, presenting reddish or brownish specks, and is easily stripped off from the dura. Only gradually the different layers are developed, the one nearest to the brain, of course, being always the most recent, the one lying on the dura the oldest. Between the layers are the hæmorrhages. If it happens that the most recent layer is perforated by the hæmorrhage there occurs free extravasation of blood between the dura and the arachnoid—that is, an intermeningeal hæmorrhage.

**Ætiology.**—In the ætiology, diseases of the heart and kidneys, but especially chronic diseases of the brain, play by far the most important part. The lesion is seen in almost all affections which lead to an atrophy of the brain; further, it may be met with in infectious diseases—for instance, in typhoid fever, scarlet fever, acute rheumatism; also in conditions of what we may call blood-dissolution, as in the general hæmorrhagic diathesis. Frank C. Hoyt, of New York, has called attention in this connection to a lowering or complete paralysis of the vasomotor tone, which according to him is associated with structural changes in the blood-vessels (*Medical Record*, 1892, 41). Among the exciting causes are traumatism of the cranial bones and inflammation in the neighboring parts—for instance, in the petrous portion of the temporal bone. Of predominating importance, as an ætiological factor, is the abuse of alcohol. Almost in all autopsies on old drunkards we find a more or less well developed pachymeningitis interna, which has recently also been experimentally produced in dogs by continued doses of alcohol (Leyden). The fact that statistics have established that men, and more especially old men, are by preference affected by this disease also seems to point to alcohol as the principal cause.

**Symptoms** may be entirely absent. This is the case when the hæmorrhage, or the newly formed membranes are not of sufficient extent; but if symptoms are present, then among the most important we find headache, which may persist for years, but which of course in itself, even if we have a history pointing to this disease, as, for instance, the abuse of alcohol, is never sufficient to justify the diagnosis. With a sudden rise of intracranial pressure we always have apoplectiform attacks, in which consciousness is lost for a variable time, and in which the patient may die without regaining consciousness. Vomiting, slow pulse, and a very conspicuous narrowing of the pupil are not wont to be absent. Repeatedly peculiar dreamy conditions have been observed after such a coma, during which the patients seem completely dazed and the urine and fæces are passed involuntarily. If the hæmatoma lies over the motor area, epileptiform convulsions and hemiplegia may result, serious motor disturbances, limited to one side, which may entirely disappear in a short while, or may last for months. Unilateral nystagmus and choked disk have been reported by some (Fuerstner). The further course depends upon the absorption of the clot or the occurrence of a further hæmorrhage, as the case may be. The repeated development of severe cerebral symptoms, after striking and rapid improvement, speaks under certain circumstances for the existence of hæmatoma of the dura, because it is just this frequent change in the condition of the patient which is characteristic of the course of the disease. Months and even years may thus pass without a fatal result, and much more rarely than one would be led to expect is it possible to make a positive diagnosis during life, because all the symptoms which we have mentioned can be found just as well in other cerebral affections, in hæmorrhage, embolism, new growths, etc., and the only thing we have to fall back upon is the history, if this be one of alcoholic excesses. The paroxysmal appearance of new symptoms is not to be overlooked, inasmuch as it confirms to some extent the diagnosis of pachymeningitis. However, under all circumstances the task is a difficult one. The cases described by French writers (e. g., Puech, *Progrès médical*, 1889, 17) under the name *apoplexie progressive* are instances of this affection.

**Prognosis.**—The prognosis for recovery is of course absolutely bad if thickening has reached any degree worth mentioning; and when we have to deal with a large hæmatoma

which encroaches considerably upon the intracranial space the prospect for life is, to say the least, not hopeful. On various anatomical grounds death can occur suddenly and unexpectedly.

**Treatment** can only be of any value in the earlier stages, but unfortunately the disease is usually not recognized then. Interdiction, or at least restriction, of the use of alcohol, if this plays a part, energetic antiphlogistic treatment in the form of local bloodletting, the ice-cap to the head, counter-irritation by inunctions of mercurial ointment, and active purgation (calomel) would surely give us good results; but, as we have said, these means are, as a rule, used too late, and as a matter of fact the progress of the disease is usually not altered by any therapeutic measures.

The most common new growths of the dura mater are sarcomata (endothelioma, fungus duræ matris) or osteomata. Fibromata and lipomata are but rarely met with. They are only of pathological and not of clinical interest, since they do not give rise to typical symptoms.

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