LITERATURE.

Strümpell. Ueber die acute Encephalitis der Kinder. Polioencephalitis acuta, cerebrale Kinderlähmung. Vortrag gehalten auf der 57ten deutschen Naturforscher-Versammlung zu Magdeburg.

Jendrassik et Marie. Contribution à l'étude de l'hémiatrophie cérébrale par sclérose lobaire. Arch. de Physiol., i, 1885.

Richardière. Étude sur les scléroses encéphaliques primitives de l'enfance. Havre, 1885.

Marie. Hémiplégie cérébrale infantile et maladies infectieuses. Progr. méd., xiii, 2me sér., No. 36, 1885.

Bernhardt, M. Ueber die spastische Cerebralparalyse im Kindesalter. Virchow's Arch., Bd. cii, 1885.

Bernhardt. Jahrbuch f. Kinderheilk., N. F., xxiv, p. 384, 1886.

Kast. Zur Anatomie der cerebralen Kinderlähmung. Arch. f. Psych., xviii, 2, 1887.

Mathieu. Progr. méd., 2, p. 29, 1888. (Cerebral Infantile Paralysis as a Consequence of Traumatism.)

Wallenberg. Veränderungen der nervösen Centralorgane in einem Falle von cerebraler Kinderlähmung. Arch. f. Psych., xix, 2, 1888.

Benedikt. Berliner klin. Wochenschr., 1888, 52.

Hoven. Arch. f. Psych., 1888, xix, 3.

Audry. Les Porencéphalies. Revue de méd., 1888, 6, 7.

Schmaus. Zur Kenntniss der diffusen Hirnsklerose. Virchow's Archiv, 1888, cxiv.

Pilliet. Arch. de Neurol., September, 1889, 53.

Strümpell. Ueber primäre acute Encephalitis. Leipzig, 1890.

Sibut. Arch. de. Neurol., 1890, xix, 57.

Sachs and Peterson. A Study of Cerebral Palsies of Early Life, based upon an Analysis of One Hundred and Forty Cases. Journal of Nerv. and Ment. Diseases, May, 1890.

Freud und Rie. Klinische Studie über die halbseitige Cerebrallähmung der Kinder. Monograph, Wien, 1891.

Chaslin. Contribution à l'étude de la Sclérose cérébrale. Arch. de méd. expérim. et d'anat. path., 1891, 2.

Sachs, B. (New York). Contributions to the Pathology of Infantile Cerebral Palsies. New York Med. Journ., May 2, 1891.

Sachs (New York). Die Hirnlähmungen der Kinder. Samml. klin. Vortr., N. F. 1892, 46, 47.

Michailowski. Étude clinique sur l'athétose double. Thèse de Paris, 1892.

Freud. Zur Kenntniss der cerebralen Diplegien im Kindesalter. Leipzig u. Wien, 1893.

*Athetosis.*

Bidon. Essai sur l'hémichorée symptomatique des maladies de l'encéphale. Revue de méd., 1886.

Bourneville et Pilliet. Deux cas d'athétose double avec imbécillité. Arch. de Neurol., xiv, No. 42, 1887.

Gerling. Ueber Athetosis. Inaug.-Diss., Kiel, 1887.

Rubino. Contribuzione clinica allo studio dell' atetosi e del paramioclono molteplice. Riforma medica, 258, 1887.

(Cf. also the text-books of Strümpell, Seeligmüller, Eichhorst.)




## BRAIN TUMORS.

**Pathological Anatomy.**—Brain tumors may be either sharply circumscribed or diffuse, in the latter case taking the place, as it were, of the brain substance proper. The most common —e. g., the gliomata, the carcinomata, and the sarcomata—occur in both varieties. The clinical manifestations of brain tumors depend upon the rapidity of their growth; this, again, upon their anatomical nature. Among the most important and the most frequent forms of tumors must be mentioned:

The glioma, a form which is peculiar to the central nervous system, but is found much more frequently in the cerebrum than in the brain stem or the spinal cord. It is formed by an increase in the cells of the neuroglia, the axis cylinders in

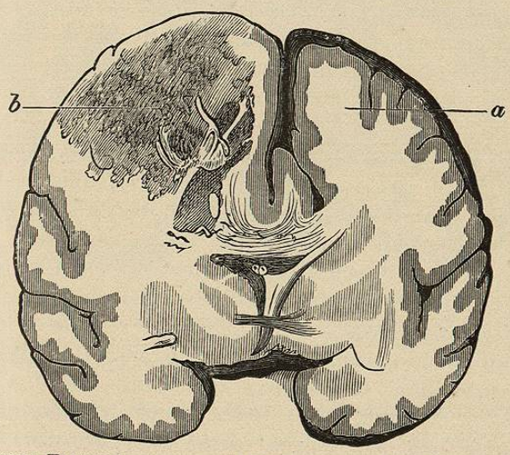


Fig. 86.—Glioma Telangiectaticum. (After Ziegler.) Frontal section through the brain. *a*, right centrum semiovale. *b*, glioma in the left hemisphere.

the involved region first becoming swollen, and the nerve fibers then destroyed. If the newly formed cells are small and comparatively few in number, and if their fibril-like processes form a dense network, then the tissue of the growth is firm and solid; if the cells are numerous the tissue is softer. On section, the glioma looks gray, grayish-red, or yellowish, sometimes variegated, and if, as is not uncommonly the case, it contain areas of hæmorrhagic softening, the tumor may be filled with opaque more or less fluid masses. The diameter of a glioma may measure from three to eight centimetres. The

transition into the adjoining substance of the brain may be gradual or abrupt, and the tumor appear macroscopically sharply defined. The affected part of the brain is enlarged, but keeps its normal configuration while the ventricles are often dilated (Fig. 86).

The tumor nearest related in texture to the glioma is the sarcoma; it occurs in soft nodes, which, on section, present a marrowy, grayish-white appearance. It is seen much more frequently at the base than at the convexity of the brain, and not uncommonly is found to originate from the dura, from the periosteum of the skull bones, or from the skull itself (osteosarcoma). According to the character of the cells, we distinguish a round-cell sarcoma, a spindle-cell sarcoma, a fibrosarcoma, etc. In size they may vary from that of a walnut to that of a man's fist, and may be solitary or multiple.

The carcinoma, which appears usually in the brain or in the dura as fungus duræ matris secondarily to carcinoma of the breast, lung, or pleura, is found especially in the ventricles as a soft tumor (cf. Fig. 87), displacing the neighboring brain substance, and giving rise to hydrops ventriculorum.

Clinically of great importance are the tubercles and the syphilomata (gummata), which, although they show macroscopically as well as histologically much similarity, can with certainty be distinguished by the presence or absence of the tubercle bacilli. They also may be either sharply defined or may infiltrate the tissue; they appear on section as yellowish, cheesy tumors consisting in part of granulation tissue. The "solitary tubercles," which may reach the size of a hazelnut, are single or multiple; they occur by preference in the pons, in the cerebellum, and in the cortex. Syphilomata more frequently originate in the dura mater, and thence invade the brain substance.

The psammomata, which, coming also from the dura, are characterized by calcareous concretions imbedded in them; the cholesteatomata, which on section have a lustre like that of mother-of-pearl; the lipomata, often found in the corpus callosum; the enchondromata, which originate especially from the bones of the base—all these are clinically of little importance, as they produce, owing to their relatively small size, either only insignificant or no symptoms at all. Hence we may well omit them in our description.

At the autopsy we can often demonstrate the consecutive



changes produced by a general compression of the brain. The skull bones themselves in young people may appear perforated and riddled with holes, there may be gaps in the dura or signs of inflammatory irritation, certain areas may be rough and thickened, presenting a velvety appearance, the convolutions, flattened and pressed against each other, have lost their distinctness, the pia looks dry and anæmic. Certain alterations of shape seem always to occur if the pressure reaches a con-

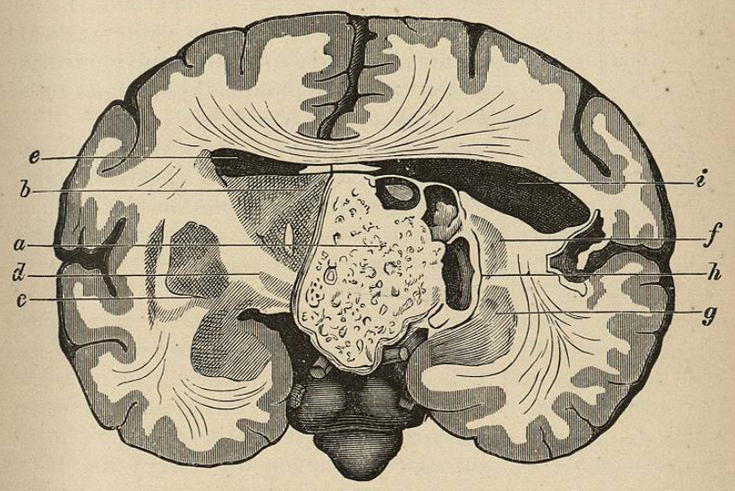


Fig. 87.—Papillary Carcinoma in the Third Ventricle. (After Ziegler.) Frontal section through the brain. *a*, tumor with cysts. *b*, right thalamus. *c*, lenticular nucleus. *d*, internal capsule. *e*, caudate nucleus. *f*, left thalamus. *g*, lenticular nucleus. *h*, internal capsule. *i*, dilated lateral ventricle.

siderable degree; thus a pressure in one hemisphere exerting itself from above downward changes more especially the shape of the insula and the portions of the temporal and parietal lobes which cover it in (Wernicke). This effect must be attributed not only to the increase in volume of the tumor, but also to the increased amount of the fluid in the ventricles, the hydrops ventriculorum (internal hydrocephalus) which almost constantly accompanies tumors. No doubt this internal hydrocephalus itself is due to pressure on the venous trunks in the brain, and it occurs, therefore, earlier, and is more marked if the large venous trunks coming from the tela choroidea are pressed upon by the tumor (Wernicke).

On the cranial nerves signs of pressure have also been

noted. The optic tract, the oculo-motorius, the abducens (Türck) have been found compressed by tightly stretched vessels, and an exudation into the sheath of the optic nerve has been observed (Leber). In some cases we find a more or less widely spread softening in the parts surrounding the tumor, in others this may be entirely absent; if the softening is of a hæmorrhagic character, this must be attributed to a cutting off of the arterial blood supply produced by the cerebral compression and to venous stasis. Sometimes, in the neighboring vessels, there develops an arteriitis obliterans with its sequelæ (C. Friedländer). Cranial nerves in the immediate neighborhood of carcinomata and syphilomata are found to be infiltrated with the tumor elements (Wernicke).

**Ætiology.**—The ætiology of brain tumors is entirely obscure: we do not know in the least whether certain external influences increase the predisposition to tumors in the brain or not, just as we are entirely ignorant of the ætiology of tumors in general. Although the common idea exists that traumatism may be the starting point for a new growth, it is difficult to understand the connection; certainly, however, this factor plays an infinitely smaller part in tumor than in brain abscess, and the occurrence of a brain tumor following an injury is probably for the most part accidental. No doubt, in some kinds, hereditary predisposition must not be disregarded, as in carcinomata and tubercles, but even this loses some of its significance, because malignant brain tumors, especially carcinomata, are usually secondary, as we have said. Nothing remains, then, but to inquire how far age and sex influence their occurrence. With reference to the former, it is supposed that some brain tumors, such as tubercles, predominate in the young, while carcinomata and sarcomata are chiefly found in older people; others—e. g., myxomata and sometimes gliomata—are congenital (Virchow). As to sex, older and more recent authors (Lebert, Friedreich, Hasse) agree that males are more liable to brain tumors than females, and Wernicke has calculated that the proportion is about three to two.

**Symptoms.**—The symptoms we are wont to observe in brain tumors are due to the mechanical influence which the tumor exerts by general or local compression of the skull contents, and, further, to destructive or irritative actions which depend upon certain vital peculiarities of the growth, the irritation mostly accompanying the infective neoplasms. One or



the other of these just-mentioned factors will influence the clinical picture of the disease in a more or less characteristic manner, and as one or the other is more prominent the whole aspect of the disease will vary.

With reference to the former, the increased intracranial pressure, if it appears acutely, we have first a displacement, then an increase of tension, in the cerebro-spinal fluid. In chronic processes the latter does not necessarily occur, but as the skull cavity gradually becomes encroached upon, some of the fluid may be absorbed or the brain become atrophic. As the intracranial pressure becomes higher the circulation in the brain and its membranes is retarded. What is the cause of this retardation, whether the diminution in the tone of the vessel walls produces such an increase in the tension of the cerebro-spinal fluid that by compression a narrowing in the capillaries is produced, or whether fluxionary hyperæmias come into play, we are not able to decide definitely. At any rate, if the blood current in the interior of the skull frequently undergoes a slowing, there is a tendency to increased transudation and lymph formation, and with it a danger of œdema of the brain (cf. von Bergmann, Die Lehre der Kopfverletzungen, Stuttgart, 1880, pp. 316–364).

The symptoms to which this increase of the intracranial tension gives rise, and which one has frequently the opportunity of studying in the course of brain tumors, may be divided into general and focal. The former, for the knowledge of which we have to thank especially Leyden, Manz, and Duret, usually appear in a regular sequence and are always the same for the same degree of pressure.

The most conspicuous and earliest to appear is the headache. The patient complains of nothing but his head, which feels heavy and dull. Every movement causes pain, and this becomes at times so violent that the patient feels as if he were losing his reason. The pain seems diffuse and can not be localized. It is in front on the forehead, behind over the occiput, to the right, to the left; it torments him everywhere, and the lightest tap with the finger anywhere upon his head is intensely disagreeable. Sometimes there comes an hour or two of relief, although the patient feels by no means well and is never without pain even in sleep. The seat of this pain which is due to the general increase of the intracranial pressure produced by the tumor, is not known. It is, however, not likely to be in

the substance of the brain itself, unless it be perhaps in the corpora quadrigemina and the thalami. We should rather look for its position in the dura, which derives its nerve supply from the trigeminus (cf. page 61). If the fibres of this nerve are compressed by the tumor in the posterior fossa, then there is not the vague pain taking in the whole head, but another well-defined headache referred by the patient to the back of the head and neck only, a trigeminal or occipital neuralgia which is not a general but a focal symptom. This double significance of the headache may become a very valuable point in the topical diagnosis. Entire absence of headache is rare, and we fail to find this symptom only when the growth of the neoplasm is slow. Its occurrence with unwonted vehemence has repeatedly been noted in aneurisms situated near the dura. Occasionally it disappears when definite focal symptoms become established, and it naturally is more obscured in the later stages of the disease, when the patient becomes somnolent. Its existence is then only apparent from the fact that the half-unconscious sufferer frequently puts his hand to his head and moans.

A second general symptom is afforded by the epileptiform convulsions, which either affect the whole body or are confined to one side and during which consciousness may or may not be completely lost. They are by no means so frequently associated with brain tumors as headache, still their occurrence is common enough to be of diagnostic value (cf. Bremer and Carson, Amer. Journ. Med. Sci., September, 1890). They, too, may constitute a focal symptom, as is, for instance, not rarely the case in cortical tumors of the frontal or parietal lobes, which partly exert local pressure, partly irritate the cortex. We must not suppose that these two symptoms, although they are both of an irritative nature, always go hand in hand. Either one or both may be present, sometimes the one as a general, the other as a focal symptom. Convulsions occur in about fifty per cent of all cases of brain tumors. Well-marked hysteroid convulsions have been observed by Schönthal in a case of tumor in the corona radiata of the frontal lobe (Berlin. klin. Wochenschr., 1891, 10).

The psychical changes constitute a third general symptom, which, however, disturbs less the patient himself than his friends. A certain slowness in thinking is occasionally noticed in the patient, at first temporary, but later more constant—an



inability to appreciate properly the commonest details of daily life which had never been before remarked in him. At the same time the features become dull and lose their animated expression, his movements slow and awkward, he grows careless in all his doings, and this listlessness about everything going on around him may be carried to such an extent that he lets his urine and fæces pass from him without showing any concern or attempting to satisfy his needs in a proper manner. Gradually he begins to show occasional signs of bewilderment. Things that he meets with every day he no longer recognizes. His own house seems strange to him, he forgets the way to his dining-room or bed-room, and has to be shown there, etc. He even forgets how to read and to write, how to solve the simplest mathematical problems which would not give the slightest difficulty to an eight-year-old child, and gradually he becomes more and more demented, until this condition passes into one of deep coma and death. In other cases the intelligence seems to remain intact for a long while, and only the weakness of memory strikes one. The friends of the patient become alarmed on noticing that he forgets things which he has said or done only one or two days or even a few hours before, that he does not remember the visits of the physician who comes daily, but complains of not having seen him for a long time. Yet although he may be troubled with bodily pain, the patient may seem at the same time cheerful, inclined to jest, and to look at things from the humorous side, and it is not until later that the other mental defects also begin to show themselves, and not infrequently the physician is not consulted until the friends discover that the patient is no longer capable of conducting his own affairs. Actual speech disturbances do not usually occur. Certain peculiarities of speech which do come on and make it different from that in health are due to the extensive loss of memory of the patient, owing to which he has difficulty in finding the right expressions, and often mixes them up, etc. This makes him uncertain in speaking. He talks slowly, and his deliberation becomes quite noticeable.

In consequence of the increased intracranial pressure, not rarely disturbances in the sensorium occur. The patient is in a dazed condition, has a constant desire to sleep, and is drowsy. The pulse is often slow at first (forty-five to fifty-five beats per minute) and irregular, similar to that which we may observe in apoplexy. This retardation is finally followed by an