TUMORS OF THE PINEAL BODY

WITH AN ACCOUNT OF THE PINEAL SYNDROME, THE REPORT OF A CASE OF TERATOMA OF THE PINEAL AND ABSTRACTS OF ALL PREVIOUSLY RECORDED CASES OF PINEAL TUMORS

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Tumors of the pineal body are rare, and their symptoms often vague. Like hypophyseal tumors, pineal (or epiphyseal) tumors, may give the general symptoms of brain tumor, with certain focal signs, and in addition, by interfering with physiological function, may bring about distinct and characteristic disturbances in nutrition. When these two separate and distinct classes of symptoms, namely, the neurological and metabolic, are present, the diagnosis becomes reasonably certain and operative removal becomes a possibility.

The pineal body arises from a diverticulum of the roof of the third ventricle. As seen in the 3 to 4 months' embryo, it is a pear-shaped body, which in section shows a number of radiating compartments (lobuli), containing the parenchyma of the gland, irregularly separated by connective-tissue and vessels, which sink in from a connective-tissue capsule.

Its connections with the rest of the mid-brain are extremely difficult to trace out, especially the rudimentary prolongation of the tænia thalami, which possibly has to do with an early optic relationship.

Its embryonal character accounts for its being the site of teratomata.

The interior of the gland contains neuroglia cells, round or oval ganglion cells, and parenchyma. Marburg has found a structure which he considers to be a vestige of the parietal nerve represented in saurians. Cajal has described nerve fibers similar to sympathetic fibers. Ependyma cells are numerous in the gland. In the interior of the gland they are cubical, but gradually change as one proceeds toward the habenulæ, or the *"Schaltstück,"* to the posterior commissure. Here cylindrical or goblet cells are found. In the interior of the compartments there are few glia nuclei. The majority of the cells are small and polygonal, and the plasma stains very slightly. The nuclei vary from light to dark, and contain small and large granules. Cyst formations are found frequently at the base where the glia is thickest.

After the seventh year the normal pineal undergoes a process of involution. The tænia habenulæ consist almost entirely of sand. The connective tissue cells lose their form and nuclei and undergo hyaline degeneration. The ganglion cells disappear, the glia cells persist, and the

division between the lobes is lost, the connective tissue is increased. The glia prolongations become much more frequent, calcium salts appear in the hyaline portions (corpora arenacea) and the cysts enlarge and are more numerous. Some are apparently lined with ependyma (ependyma cysts). These dilated cysts were noted by Virchow, who spoke of them as hydrops cysticus glandulæ pinealis.

As for the glandular cells, they become more vacuolated, the nuclei more prominent and pigmented.

In the involution process, the ependyma cysts may become enlarged.

Little is known of the physiology of the pineal body in man. Phylogenetically considered, it seems to be in part a rudiment of a third (parietal) eye, which is found at the present time practically only in one Australian lizard (*Hatteria punctata*). Its anatomical connections with the optic paths argues for its having been at one time a light-perceiving organ. Cajal doubts this, however, and asserts that this body is one of the many blood glands of the body.

Injections of the gland substance by von Cyon brought about irregular alterations in the force and frequency of the heart-beat, chiefly slowing it. Von Cyon also found that injections of salts, similar to the pineal sand salts, produced analogous results. This investigator has drawn the conclusion that certain substances in the pineal serve as fixatives for certain salts which have some relationship to the activities of the hypophysis, either causing these salts to be utilized by other structures, or causing them to be laid down as concretions, pineal sand, etc.

Further, electrical stimulation of the pineal, in herbivorous animals, causes a contraction of the sac-like body with movement in the cerebrospinal fluid of the third ventricle. It thus may be regarded as regulating in some measure the pressure of fluid in the third ventricle. As it is a mooted question, however, whether the pineal body in man normally contains any muscular fibers, its influence on the fluid in the third ventricle is entirely speculative.

Finally, the glandular tissue in the pineal undoubtedly exercises some influence on nutrition. The histological evidence points to the facts that this structure contains elements which ally it to the blood-glands — the chromaffin system — and that like other members of this series, the hypophysis, thymus, thyroid, adrenals, etc., it plays a part in trophism. It forms one of the links in the interacting chain of this system, and a disturbance in its functions throws the combination equilibrium somewhat out of balance.

We have seen, however, that a marked involution of the gland takes place at the time of puberty, and hence if trophic disturbances are to be referred to this structure they probably are confined to childhood. We shall return to the interdependent relations of the pineal and others of

the series, especially of the hypophysis, in that portion of our paper dealing with the interpretation of the trophic symptoms found in pineal tumors.

The accompanying section (Fig. 1) may serve to recall that the pineal gland lies just beneath the splenium of the corpus callosum, being separated from it by the velum interpositum. It lies on the anterior corpora quadrigemina, from which it is also separated by a layer of pia mater, usually derived from the velum interpositum. Normally it is not more

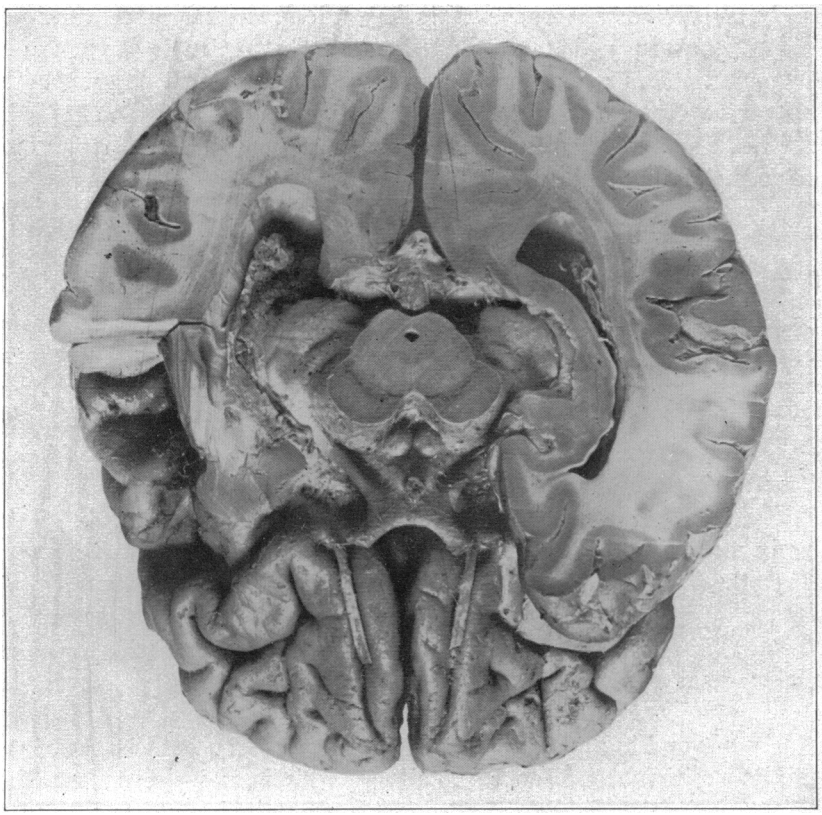

Fig. 1.—Section of brain showing situation of pineal body, especially in relation to the aqueduct and corpora quadrigemina.

than one-third to one-half an inch in length, and is attached to the midbrain on either side. It forms, in part, a roof to the third ventricle posteriorly. The free edge of the tentorium of the cerebellum lies below and behind. The deep cerebral veins run in the velum interpositum, and, just about the tip of the gland, unite to form the large cerebral vein of Galen, which passes out of the brain at the great transverse fissure, below the posterior extremity of the corpus callosum and the corpora quadri-

gemina, to enter the straight sinus. The position of the aqueduct of Sylvius is especially to be noted in relation to hydrocephalus. Laterally, at the base, the optic thalami are in close proximity.

It thus lies close to the communications between the third and fourth ventricles, to the cerebellar and pontine spaces, and is in direct contact with the large venous channels that drain the central region of the brain.

Hence, in enlargements of the pineal, circulatory disturbances will develop first, with the formation of varying degrees of hydrocephalus. Often the hydrops develops with great rapidity, though it may do so very slowly, and is undoubtedly conditioned by at least two independent factors, namely, pressure on the veins of Galen, and obstruction to the aqueduct of Sylvius. Then again, there are reasons for believing that growths in this region further stimulate the production of cerebrospinal fluid, in which case an additional factor for hydrocephalus development comes into consideration.

SYMPTOMS OF PINEAL TUMOR

I. NEUROLOGICAL SYMPTOMS

Symptoms of increased intracranial pressure, due to the hydrocephalus, are always present, and are among the first noted. The majority of the cases show what seems to be a fairly rapid development in symptomatology, although this particular brain area will tolerate growths up to a certain size without many signs. As soon as the growth gets beyond this — usually described as walnut size — the symptoms augment, and bring about death rapidly.

Headache is usually the first symptom, sometimes preceding the others by six months or a year, at other times appearing only a month or so before the fatal termination. The headaches vary, being mostly occipital, although they have been referred to a number of positions. They usually become diffused finally. They have the general characteristics of brain-tumor headaches, and, like them, show variations in intensity. Neuralgic, shooting pains also occur. Severe exacerbations are accompanied by attacks of vomiting and giddiness. Sometimes if the head be held in a definite position relief can be obtained. This is to be correlated with Weisenburg's remarkable case of movable tumor of the third ventricle.[1]

Papillary edema soon develops, and some of the patients have applied for relief on account of failing eyesight. The grade of the papillitis has varied greatly, but half of the patients have become blind.

Abnormal drowsiness or sleepiness has been characteristic in many, even in the early stages. It is probably a symptom of increased intracranial pressure, and furnishes, we believe, another proof that local pressure in the third ventricle, acting on the thalami, may be a cause of drowsiness, as well as increased pressure in the lateral ventricles acting on the cortex.

1. Weisenburg, T. H.: Brain, 1910, xxxiii, 236.

The hydrocephalus alone may later give rise to such motor phenomena as increased muscular tonus, weakness without paralysis of the extremities (principally the lower), increased tendon reflexes, even ankle-clonus and Babinski's sign. Isolated spacities due to hydrocephalus are the exception rather than the rule in pineal tumors. Almost invariably when the tumor has reached a sufficient size, or when it lies in such a position as to block off the aqueduct, pressure on the contiguous structures — corpora quadrigemina, floor of the aqueduct, superior cerebellar peduncles, etc. — introduces very significant neurological signs other than those due to the hydrocephalus.

Pressure on the corpora quadrigemina is almost inevitable, so that some ocular and pupillary signs, similar to those of third ventricle and corpora quadrigeminal tumors, are characteristic and constant. Isolated eye palsies occur with great frequency, and occasionally are very early signs. Nystagmoid movements, or nystagmus is not infrequent. Paralysis of associated movements, indicating pressure on the coordinating mechanisms in the posterior longitudinal bundles, are frequent and occur in varying combinations.

Of these, conjugate palsies, those for upward movements, have been noted with special frequency. This is in conformity with the widely accepted teaching that the nuclei for the superior recti muscles lie anteriorly in the general oculomotor grouping. Tsuchida controverts this anatomical teaching. Not all of the cases reported, however, have been well enough studied to draw positive conclusions. Partial skew deviations occur, the Magendie-Hertwig syndrome being among them.

Pupillary disturbances, also significant, are probably due, not only to the optic nerve changes, but also to pressure on the coordinating pupillary paths in the superior decussation of the anterior corpora quadrigemina, and also possibly to pressure on the posterior commissure, which is made up of the axis cylinders of the mesencephalic axone of the reflex oculomotor path. The pupils are usually widely dilated; they are frequently unequal, and are sluggish to light and in accommodation. One case is on record of dilatation of one pupil and contraction of the opposite one.

Facial palsies, slight and usually unilateral, have been observed. These are difficult to correlate.

Occasionally the tumor has pressed as far laterally as the geniculate bodies, and the posterior corpora quadrigemina on one or both sides. This probably accounts for the auditory symptoms, consisting of buzzing or crackling in the ear, or distinctly advancing deafness.

The superior cerebellar peduncles have also been involved in the direct pressure of these tumors with the causation of a series of interesting cerebellar signs. These have led to the false diagnosis of cerebellar growths. It should also be recalled that internal hydrocephalus apart from tumors can cause these symptoms.

Giddiness and dizziness have been constant, sometimes appearing very early. Staggering gait has been an early sign in nearly one-half of the patients; this has been the typical cerebellar gait, with marked pulsions; sometimes lateropulsion or retropulsion tendencies have preceded the development of the characteristic gait. Barany tests in one case (Bailey and Jelliffe) have shown implication of the vestibular paths, presumably in their mid-brain course.

Cerebellar asynergia and adiadokochinesis are comparatively recently described signs, and have been noted in the more recently reported cases (Marburg, Bailey and Jelliffe).

Ataxia, unilateral or bilateral in both extremities, but more particularly in the upper, is present in many cases. Occasionally only a tremor is noted.

Less constantly the symptoms of excessive thirst, polydipsia, with polyuria, have been recorded. These probably are symptoms due to still more remote pressure on the fourth ventricle, and properly should not stand in the foreground of the picture.

Glycosuria has been noted in a number of cases.

II. METABOLIC SYMPTOMS

To Marburg is due the credit of bringing into view a series of anomalies of metabolism, noticeably adiposis, associated with tumors of the pineal bodies. In a thorough discussion of the subject, he has called attention to the possible interrelations of the functions of the pineal and those of the pituitary bodies. Such relationship has been recorded before, but Marburg was the first to show that injury to the pineal might disturb metabolism. It has not yet been definitely established, but it seems probable for certain growths, particularly teratomata, that Marburg's contention is correct.

The symptoms which may come from pineal injury are, (a) adiposis, (b) early sexual maturity, and (c) cachexia.

A. ADIPOSIS

This has been recorded in a number of cases of pineal tumor. The increase in fatty tissue is apparently independent of the nature of the tumor, as it has not been confined to teratomata as Marburg originally thought, and as has been unduly emphasized by Frankl-Hochwart. It was present in our case to a definite degree. Schmidt's case of tumor (1837), not mentioned by Marburg, is recorded as "in exceedingly good state of nourishment"— *üppig*. Other cases are those of Nothnagel, Müller, Daly, Kny, Marburg, Frankl-Hochwart, and, less certain those of König, Falkson, Coats, Oestreich and Schlawky, Hempel, and Joukovsky.

Disease of the hypophysis also causes adiposis and consequently it is difficult to determine in many cases whether the pineal or the pituitary is at fault as there is almost invariably present marked third ventricle hydrocephalus. Pressure is extended to the infundibulum, and therefore on the hypophysis. In some of the cases the hypophysis has been much compressed, but in other cases — particularly in one reported on by Marburg — this structure has been normal. An appeal to statistics, however, cannot be made, since no notes have been made on the structure of the hypophysis in a number of the cases reported.

Fröhlich[2] and Erdheim[3] first brought into prominence the fact that adiposis might be due to hypophysis disturbance, and following them it has been established that definite metabolic syndromes are connected with increased and diminished functional activity of this structure. It is certain that (1) *hyperpituitarism* is associated with acromegaly, polyuria, and glycosuria, when the hypophysis is the site of a specific tumor — an adenoma (Benda[4]); (2) *hypopituitarism* is associated with adiposis, and disturbances in the organs of generation (dystrophia adiposogenitalis, Fröhlich), and that (3) *apituitarism* is associated with cachexia and grave trophic disturbances throughout the body, usually leading to death.

As far as the adiposis is concerned, it is certain that hypopituitarism is the usual condition that brings it about. Aschner's[5] experiments on dogs, in which he was able to keep the animals alive for from eight days to nine months, resulted in a definite retardation of growth, hypoplasia of the genitals, shortening of the skull, adiposis and apathy. These results are quite analogous to those found in man, when the hypophyses become atrophied or destroyed.

Whereas Fröhlich originally thought that the adiposis was due to a tumor of the hypophysis, and Erdheim maintained that it resulted not alone from such but from any new growth that encroached on the hypophysis, and stimulated an unknown center which he placed in the infundibular portion, it seems fairly well established that the adiposis is related to an injury or a destruction of the posterior lobe, and the infundibular portion of the hypophysis. Fischer's[6] recent summary presents the evidence, and reconciles many conflicting views of the previous investigators.

The chief obstacle to differential physiological diagnosis is the internal hydrocephalus. This is usually very marked in the third ventricle, and the infundibulum may be swollen and puffed out like a cyst, a condition

2. Fröhlich: Wien. klin. Rundschau, 1901, 47, 48.
3. Erdheim: Wien. Akad. Sitzsb., 1904, cxiii, abt. III.
4. Benda: Deutsch. klin., 1903.
5. Aschner: München. med. Wchnschr., 1909, lvi, 2668.
6. Fischer, B.: Hypophysis, Akromegalie und Fettsucht, Wiesbaden, Bergmann, 1910.

well seen in Knoblauch's case of glioma of the third ventricle. The swollen infundibulum can be seen also in our case. Such a hydrocephalus can unquestionably lead to adiposis. Nothnagel's early quadrigeminal case is to be thus interpreted. Müller's, Knoblauch's and Fischer's cases of dystrophia adiposogenitalis were due apparently solely to infundibular swelling with pressure on the hypophysis, although in these cases the hypophysis has not always been normal, as was that of Marburg. Fischer[6] calls attention to the fact that whereas in Marburg's case the hypophysis was reported as normal, yet there was "infundibular hydrocephalus."

The whole situation is in need of more extended study to determine whether pineal tumors alone can produce adiposis, apart from third ventricle hydrocephalus.

The anatomical situation of the hypophysis and its complicated histology render it difficult to correlate the mechanical and the histological features. Whether small or large amounts of pressure on the infundibulum or the pars intermedia, or the posterior lobe, or on the peduncles, will cause hyperactivity or hypo-activity cannot as yet be determined, nor can it yet be said what the actual state of functioning of the pars nervosa may be under varying conditions of pressure of hydrocephalus of the third ventricle.

The situation at present seems to be that adiposis is a frequent sign of hypopituitarism, and has been found as a result of a number of disturbances due to tumors of the pars nervosa of the pituitary, to tumors of the anterior lobes, to tumors in the region of the pituitary, to a bullet lodging in the pituitary, and finally, and most pertinent to this inquiry, to marked internal hydrocephalus of the third ventricle due to general causes of hydrocephalus, such as compression of the aqueduct by cerebellar tumors, by quadrigeminal tumors, by pineal tumors, and by tumors of the third ventricle.

In concluding this question we may say that there is some evidence to the effect that pineal tumors may cause adiposis, either through the disturbed function of that body, or else by acting on the hypophysis by means of hydrocephalus.

B. SEXUAL SPHERE

Next in importance to the increased fatty growth is the early development of the sexual characters. Gutzeit in 1896 called attention to this, and since this time the observations of Huebner, Frankl-Hochwart and Ogle have brought additional evidence. This early sexual development has shown itself as an enlargement of the penis, increase in the genital hair, or general hairiness of the body, increased libido, usually manifested by early masturbation, and, in some cases, changes in the voice.

Our own patient showed no changes in the organs, but the voice had changed. It was, however, high-pitched rather than deep. There were

some silky hairs on the boy's chin, though the general impression gained was one of feminism.

In other cases the menses have been interfered with. In Schmidt's case, already alluded to, menstruation had ceased at the age of 22. Conception had taken place at 15.

The interpretation of these changes in the sexual sphere is as difficult as that of adiposis. In the typical examples of dystrophia adiposogenitalis there is a lack of sexual development, and in some of the case histories this general syndrome of hypopituitarism is evident, but in others, and chiefly in those referred to, notably in children, sexual hypertrophy rather than atrophy is in evidence. Thus contradictions appear. If diminished hypophysis functioning is to account for the adiposis, this will not account for the increase in sexual precocity.

Possibly here the type of tumor introduces new elements that must be reckoned with, and whereas adiposis may be a more general factor dependent on hypopinealism, or on hydrocephalus, the sexual precocity may be due to the specific type of tumor, namely to teratomata, or possibly also to adenomata.

An analogous situation in the hypophysis has been noted by Fischer,[6] in which instance an adenoma caused an acromegaly with adiposis — a combination of hyper- and hypopituitarism.

Thus Oestreich and Slavyk are inclined to regard the early sexual ripening as analogous to an acromegaly (hyperpinealism). Further, Askanazy suggests that teratomata may be regarded as "false conceptions," in which one might expect, primarily at least, an increase in the pineal secretory functions.

Viewed from the point of view of mechanical pressure, there are no facts at our command regarding the relationship of hydrocephalus of the third ventricle to precocious sexual development. As already outlined, such pressure symptoms develop along the lines of genital atrophy.

One further possibility for a hypophyseal explanation presents itself. It may be that the precocious sexual development may be an early irritative sign of a purely nervous character acting through the pars nervosa sympathetic system, which is very rich, and that later increase in pressure brings about degeneration or atrophic phenomena. Further, Cushing's hypothesis which assumes that dyspituitarism results from lessened pituitary secretions in the cerebrospinal fluid, which results from pressure on the infundibulum, may be the explanation of these sexual changes.

C. CACHEXIA

Whether this has any relation to the pineal, or is a symptom of the hydrocephalus, or of the tumor itself, cannot yet be determined. Attention should be directed to it, however.

REPORTS OF CASES

Having called attention to these features of the pineal syndrome, we would present the history of the following patient, who had a teratoma of the pineal body; we then present abstracts of all the available cases: Marburg collected forty-four in 1909, Pappenheim thirty-seven in the same year. We present histories of fifty-nine cases, some of which are found in the literature of the early part of the last century, which have been overlooked. As we have seen no complete summary of these cases ever presented in any language (Chirone has collected a few) we have felt justified in making such as an addendum to our own paper.

AUTHORS' CASE

History.—R. S., a boy aged 12, of German-American parentage, entered Dr. Pearce Bailey's service at the New York Neurological Institute Sept. 2, 1910, because of failing memory and difficulty in walking. The clinical picture was at first suggestive of juvenile paresis (Fig. 2).

The family history was entirely negative, save that his paternal grandfather had died of paresis in Middletown State Hospital.

His personal history was practically negative. At the age of 5 he broke his right leg in two places, since which time he has always had a stiff leg.

In the early part of 1900, his parents noted that he was not so bright or as quick as formerly; that his school work was not so good as it had been, for he had been a very bright boy. He had grown very rapidly and was markedly fat. His writing for August, 1909, and May, 1910, shows that he had developed during this time a distinct tremor of the hand. In June, 1910, he had a severe attack of vomiting, and his mother ascribed the onset to this "bilious attack." About July, 1910, his mother noted that his right leg was stiffer than usual, and he could not walk so well. In August his legs seemed to give out, and he staggered as he walked and would frequently fall, pitching to one or the other side. His voice had also began to be high-pitched, and a little more feeble, and talking seemed difficult. He was more sleepy than usual, much more quiet, reserved and apathetic, though responsive. His gait became much worse and he occasionally had incontinence of urine. No further character changes were noted by the family, save depression and a tendency to cry. He did not complain much of headache, although he had had some; he felt that the head was heavy; it was hard for him to concentrate his attention. He had had no diplopia nor convulsions.

Examination.—On admission examination showed a boy large for his age, very fat, pale and almost waxy. He had no genital hair, but the chin was slightly downy.

Neurological Status: *Smell* was normal. *Sight* was poor; 20/100 right, 20/200 left. There was marked contraction of the visual fields for white and red in each eye with some interlacing of the color-fields. The fundus examination showed a papilledema of 2 diopters in each eye. The disks were gray and not greatly blurred at the margins.

Third, Fourth and Sixth Nerves: The eye movements upward were completely lost, and the eyes could not be elevated above the horizontal, owing to a paralysis of the associated eye movements for both superior recti. The superior oblique were also affected. Mobility outward was moderately diminished in both eyes. Other movements were normal. There was occasional nystagmus which was irregular, sometimes lateral and at others rotary. The pupils were equal, 4 mm., irregular in outline and reacted sluggishly to light and during accommodation.

Fifth Nerve: Normal, motor and sensory.

Seventh Nerve: Face symmetrical; movements normal, right equal to left.

Eighth Nerve: Hearing was poor. Watch at 4 inches, right equal to left. Rinné and Weber tests normal, right equal to left. The left labyrinth was slightly more irritable than the right to the turning test.

Ninth, Tenth, Eleventh and Twelfth Nerves: Fauces, normal. Tongue protruded slightly to the right, and had a fine tremor. Speech was stumbling. Taste was normal, right equal to left.

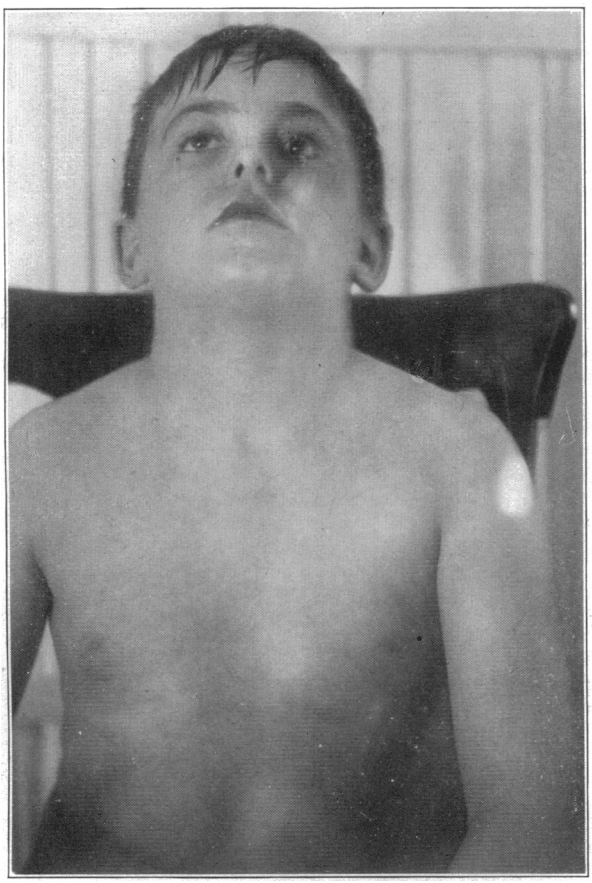

Fig. 2.—Author's patient, R. S., from photograph. Head thrown back to show eye position.

Upper Extremity: No atrophy, hypertrophy, hypotonus or spasm; muscular power good; nerve-trunks not tender; triceps and radial reflexes were lively; right greater than left. There was present a coarse static tremor of both hands, together with a good deal of ataxia; no loss of stereognostic sense; sensations uninvolved.

Trunk showed no bony or muscular anomalies. The abdominal, epigastric and cremasteric reflexes were present and equal. No asynergia. No sensory disturbances.

Lower extremities: No atrophy or hypertrophy, but there was slight hypotonus on both sides. Muscular power was fair. The knee- and ankle-reflexes were exaggerated and equal. Ankle-clonus was present on both sides as likewise were the Babinski and Oppenheim reflexes. The gait was spastic, ataxic, and stumbling, swaying more to the right than to the left: Romberg positive; marked ataxia of the legs; slight asynergia, especially walking backward; sensations normal.

The thoracic and abdominal organs were negative.

The urine was entirely normal. The blood gave a negative Wassermann reaction. The spinal fluid showed no excess of globulin, contained no lymphocytes and gave a negative Wassermann reaction.

Mental examination revealed merely a lack of retention in Ziehen's combination memory test, with marked slowing of all responses.

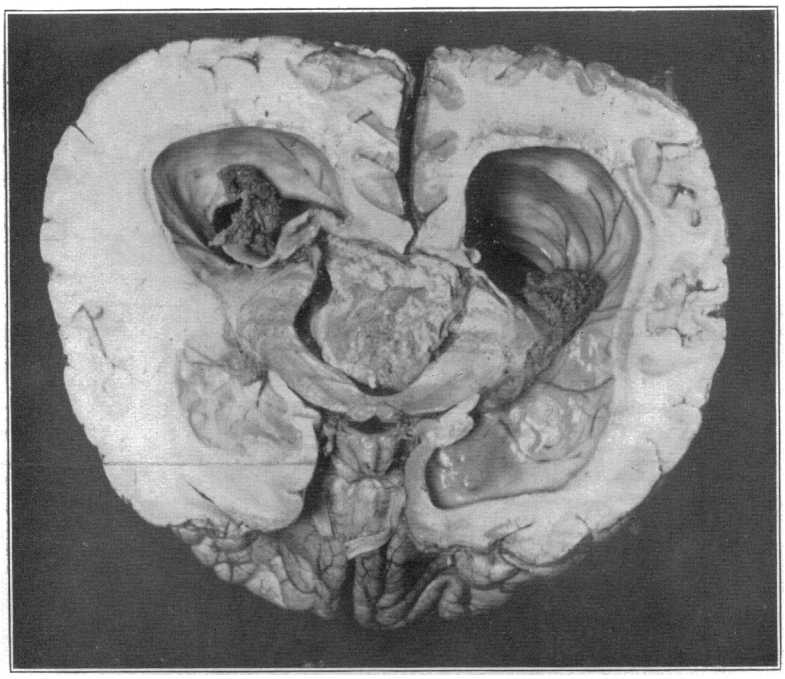

Fig. 3.—Section of brain from patient R. S., showing pineal tumor, hydrocephalus and flattened thalami, mid-brain and optic tracts, also dilatation of infundibulum.

X-ray plates of the head showed a number of shadows in the region of the pineal body, but this was not, at the time, interpreted as being due to the tumor.

A diagnosis of brain tumor was made, but the localization was not definitely decided. We considered it to lie on the left side of the brain, either deep in the substance of the cerebellum or else just above the tentorium, involving the superior cerebellar peduncle.

September 14, the left side of the face was distinctly weaker than the right, and the tongue protruded to the left. The optic disks showed the same degree of edema as before, but their color was fainter, with beginning atrophy.

Following this the patient's gait became very ataxic, so that he had to be helped in walking. Hypotonus was marked, especially in the legs. Incontinence

of urine and feces was almost constant. In the early part of October, it was noticed that when the patient attempted to look up the right eye was elevated a little more than the left (Magendie-Hertwig symptom).

Operation.—A decompression operation was decided on, and the first stage was started by Dr. Elsberg October 5. Profuse hemorrhage from a cut emissary vein caused the operation to be discontinued before the skull was opened.

October 15: Left facial palsy more prominent. Tongue protruded to the left. Arms much weaker than formerly, right much more so than left. Sensations normal. Patient too weak and ataxic to stand.

October 24: Second stage of the decompression operation performed. A piece of bone 3 by 2 inches removed, exposing the left posterior fossa. Dura very tense.

November 1: Definite left hemiparesis, with exaggeration of all reflexes; left greater than right. Patellar clonus on left ankle, left greater than right. Babinski right greater than left. Light and accommodation reactions; right sluggish, left absent. The eye movements had become very peculiar. At rest there was a slight external strabismus. Accommodation for near objects was difficult and in

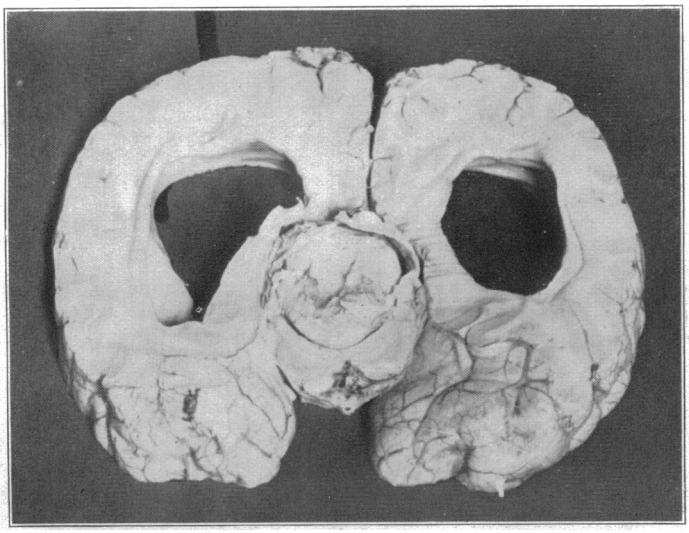

Fig. 4.—Section of brain from patient R. S., showing hydrocephalus of ventricles, tumor of pineal, and effect of pressure on the corpora and mid-brain.

attempting to produce it the eyes would move around independently of each other. All associated movements of the eyes were seriously affected. At times the right eye would rotate around an anteroposterior axis, the upper pole turning to the right. This was noticed best just as the patient opened his eyes. The left side of the tongue was slightly atrophied. The patient was extremely ataxic, being unable to get out of bed, or to feed himself.

His condition became gradually worse. The eye movements became more and more incoordinated. He did not speak voluntarily, and answered questions with difficulty and in monosyllables. The left hemiparesis continued to increase.

November 28: The third stage of the decompression operation was done and the dura opened. A large amount of cerebrospinal fluid escaped. Nothing abnormal was seen, but the patient's condition did not permit examination of the third ventricle area.

Following the operation the patient's entire left side became very stiff, spastic and rigid, so that it could not be moved. The hand was held tightly clenched,

with the thumb adducted, so that it protruded between the third and fourth fingers. The leg was in much the same condition, but when irritation (pinpricks) was applied to the leg, it flexed sharply, and could not be voluntarily extended. The foot was held in a position of marked talipes equinus. No sensory disturbances were appreciable. An examination of his mental state was impossible on account of his dulness.

The boy became progressively weaker, and died Dec. 12, 1910.

Necropsy.—Post-mortem examination performed by Dr. Casamajor, three hours after death, showed a large amount of cloudy cerebrospinal fluid. The field of operation was clean. The brain presented nothing abnormal except a marked distention of the third ventricle.

Section of the brain, after hardening in formaldehyd solution, showed a large rounded, encapsulated tumor about 1½ inches in diameter, replacing the pineal gland. The tumor was soft and consisted of sebaceous matter, hair and pieces of cartilage (teratoma). These cartilage bits are undoubtedly the structures which caused the shadows on the *x*-ray plates. All the ventricles of the brain were enormously dilated. The corpora quadrigemina were flattened in the dorsoventral direction and the aqueduct of Sylvius was almost obliterated.

Microscopical study of the degenerated fiber tracts has not yet been completed.

SUMMARY OF CASES IN THE LITERATURE

1. BLANE'S CASE.[7]—Officer in navy, who at the age of 33 had slight pain or confusion in the head. More thirsty than usual. Increased. Then came vomiting and pains in balls of eyes when he turned them to either side. He was well for a time when headaches reappeared, mostly in the occiput, sometimes diffused over the whole head. He later had some numbness and weakness of the left hand. After five years he became actively delirious, then lay in a quiet delirium or stupor for fourteen days.

Autopsy showed some hydrocephalus; the nates and testes did not appear distinct, and the situation of the pineal gland was occupied by a hard fibrous tumor, shape and size of a nutmeg, and cut smooth. It lay a little to the right, bruising and mashing the substance of the cerebellum. The pulpy matter adhered to the tumor.

2. SCHMIDT'S CASE.[8]—This is the earliest case of value in our present discussion. It has been missed in all of the papers on the pineal gland. It is particularly interesting in that Schmidt refers the cerebral signs to the hydrocephalus, and the retropulsion signs to the quadrigemina. Further, it may be noted that disturbance of the generative system and possibly adiposis were recorded by this observer.

N. A., female, 22 years old, was received in hospital, Aug. 20, 1831. She had had somewhat intermittent headache and dizziness for about a year preceding. At the time of admission the pain had returned with great severity. Coincidently with the beginning of the headache the menses had become scanty and had ceased entirely at the time of admission.

Status on August 22: Patient was anxious and restless: consciousness clear; again she was very quiet, but collected. She had a drunken gait.

August 25: Patient was again dizzy, forced positions of the head, being unable to hold it up at times; convulsive movements in head and extremities, without loss of consciousness. Patient was extremely well nourished, *eine kräftige, fast üppige Ernährung zeigende Kranke,* confined to bed with turgid facies, and the appearance of a dement, or deeply intoxicated patient, with dilated pupils, that

7. Blane, G.: History of Some Cases of Disease in the Brain; Case of a Tumor Found in the Situation of the Pineal Gland, Tr. Soc. Imp. Med. and Surg. Knowl., 1800, ii, 198.

8. Schmidt, P.: Beiträge zur Diagnostik der Krankheiten des Gehirns, Med. Ztg., 1837, vi, 32. Case 2. Enormitas glandulæ pinealis, p. 33.

reacted very slowly to light. Patient could hardly answer questions; but according to the nurse knew her surroundings, and at times talked and ate with appetite; incontinence of urine. Patient made constant retropulsion movements. Lying in bed, she bent her head back; on being forced to stand, she required three persons to prevent her from falling backward, the head being thrown backward continuously.

September 10, she died, after a seizure, during which she ground her teeth violently.

Autopsy showed marked hydrocephalus (4 ounces water in ventricles). A pear-shaped tumor, about 2½ by 1¾ by ½ inches, rose-red in color and about the consistency of the brain white matter, was found occupying the position of the pineal. The tumor had occupied the third ventricle in part. Thalami, corpora striata, chorioid plexus and cerebellum were normal. The corpora quadrigemina on the contrary were much flattened, and practically obliterated. No note on the hypophysis. Schmidt refers to some interesting older cases which do not give enough details for our purposes.

3. STANLEY'S CASE.[9]—M. B., female, aged 4, had been restless and nervous for three weeks, and she had begun to mope a week previously. Four days before

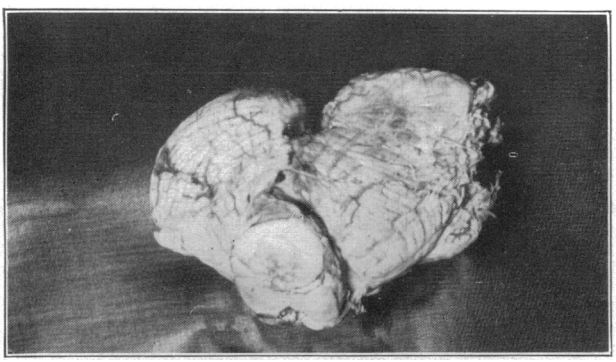

Fig. 5.—Tumor from patient R. S., at cerebellar junction. The tumor sits in a narrow cup at the front of the figure.

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Stanley saw the child she had fallen insensible, remaining so until she died four days later. She had vomited frequently while unconscious. Pulse was 60; the left pupil was fixed and contracted, the right irregularly dilated. No other data. On necropsy a distended pineal gland the size of a hazel-nut was found. It had pressed against the nates of the corpora quadrigemina and laterally against the optic thalamus. The former, as well as the pons, were softened from the pressure.

4. SIMON'S CASE.[10]—Female, 35 years old, had headaches, loss of sight in right eye three years, intense headaches. Not under observation several months; no further clinical notes, and no definite history of the lesion of the pineal beyond title.

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9. Stanley, S.: Dropsy of the Pineal Gland, Lancet, London, 1837, p. 935.

10. Simon, E.: Hémorrhagie de la glande pinéale, Bull. Soc. anat., Paris, 1859, xxxiv, 306.

11. Friedreich: Psammoma Kystomatosum hæmorrhagicum der Glandula pinealis in Combination mit Medullarsarkom, Arch. f. path. Anat. (Virchow), 1865, xxxiii.

5. FRIEDREICH'S CASE.[11]—F. K., 59 years old, hanged himself. He had been depressed for some time, had been drinking heavily, and had had severe headache for over a year and sleeplessness. Cherry-sized tumor of pineal was found.

6. BLANQUINQUE'S CASE.[12]—D. M., male, aged 39, September, 1868, was taken sick with headache, which became frequent and finally almost continuous by January of the following year. He then noted diminution in his vision. In July he had epileptiform convulsions. His attacks continued, and he became weaker and weaker, showing a marked memory defect. January, 1870, he was confined to bed; his legs would not carry him; he had no paralysis, however. Blindness was complete, pupils widely dilated; papillary atrophy; conjugate deviation below and to the right but no oculomotor palsies. He died in a convulsive attack.

Necropsy showed marked hydrocephalus; veins of Galen engorged with blood; tumor size of pigeon's egg; psammoma pressing on posterior corpora quadrigemina of the right side.

7. MASSOT'S CASE.[13]—G. B., aged 19, a man with polyuria and polydipsia of gradual onset; he drank 25 to 28 liters of liquid a day. Three months after entering the hospital he had an epileptiform convulsion; two months later he had violent headaches, which continued, mostly frontal and temporal; then left internal strabismus, with loss of ability to look up, diplopia and slight diminution in vision. The mental processes became retarded. Patient grew progressively weaker, and his legs could not support him. Sensibility was intact. Vomiting then set in. His memory gradually failed, and six months after his entrance he died in coma.

Autopsy showed hydrocephalus, particularly of the left ventricle, a hard mass in front of the corpora quadrigemina, occupying the position of the pineal. The tumor entered the third ventricle. It was 3.3 by 3.0 by 2.8 cm., and was a carcinoma of the pineal.

8. BOUCHUT'S CASE.[14]—G., 2 years of age, female, entered hospital in poor physical condition. Her head was large, the fontanelles markedly dilated, and pressure caused pain. There was conjugate deviation of the eyes; the pupils were slightly dilated, and sluggish to light. There was commencing atrophy of both disks. The upper extremities were contracted. The child did not talk and was semistuporous. She had had some indefinite convulsive seizures before admission to the hospital. Two weeks after entry she died in coma, with convulsions, during which she had nystagmus.

Necropsy showed marked hydrocephalus. There was a cystic pouch in the posterior portion of the third ventricle. The iter was flattened or obstructed by the walls of the cyst, and it had pressed on the corpora quadrigemina. It was a cyst of the pineal gland.

9. SCHEARER'S CASE.[15]—S. S., a 16-year-old girl, had epilepsy from childhood; no neurological history. Necropsy showed sclerosis and a small tumor of the pineal the size of an almond.

10. WEIGERT'S CASE.[16]—Teratoma of the pineal gland. Boy 14 years old. No history. The tumor had grown mostly forward into the third ventricle. There was some hydrocephalus.

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12. Blanquinque, P.: Tumeur de la glande pinéale. Gaz. hebd., 1871, p. 532.

13. Massot, M.: Note sur un cas de tumeur cérébrale avec polyurie, Lyon méd., 1872, x, 373.

14. Bouchut, M.: Obs. II. Kyste séreux du troisième ventricle, Gaz. d'hôp. 1872, xliii, 353.

15. Schearer: Enlargement of the Pineal Gland and Selerosis of Brain in a Case of Chronic Epilepsy with Amentia and Aphasia, Edinburgh Med. Jour., 1875, xxi, 297.

16. Weigert, C.: Zur Lehre von den Tumoren d. Hirnanhänge, Virchow's Arch. f. path. Anat., 1875, lxv, 212.

11. DUFFIN'S CASE.[17]—W. C., a groom, aged 25; negative history; two months prior to admission had dragging at back of neck and occasionally pain in occiput to forehead; deep-seated aching in orbits; attacks of vertigo and unsteadiness in gait. Objects swam about, but without definite direction. Headache gradually increased, and there was gradual impairment of sight. A month later, he saw double. At time of admission headache was intense; giddiness was excessive; he could not stand, and when supported staggered like a drunken man; closure of eyes aided his gait; head was retracted; lower limbs normal; subjective noises in ears; good intelligence; pupils were large, equal, and reacted sluggishly to light; slight right internal squint; swollen disks, right greater than left; slight facial palsy. Three weeks after admission, drowsiness was marked and a nocturnal delirium set in; later there was continuous mild delirium, with coma and death.

Necropsy showed hydrocephalus, with clear greenish serum in the ventricles. Tumor 2 by 1½ inches, chiefly in third ventricle, pressing on the thalami, and also on corpora quadrigemina, encroached on right superior cerebellar peduncle; some absorption of the optic thalamus; tumor had penetrated into aqueduct of Sylvius. It was a glioma of the pineal, apparently.

12. NIEDEN'S CASE.[18]—E., a 35-year-old woman, complained of seeing badly, and double vision, at times with marked giddiness; occipital headache of late. She spoke slowly and gave the impression of weak-mindedness. There was paresis of the right trochlearis, with diplopia, especially on looking down, and to the right; papillæ normal. Two months later, seen in another hospital, the patient was in a delirious state, and she shortly died.

Necropsy showed large walnut-shaped cystic pineal gland, filling up the entire third ventricle.

13. FALKSON'S CASE.[19]—O. B., aged 16, complained of difficulty in seeing and double vision, the latter developing shortly before coming to the clinic. He was a strongly built boy of middle size in a good state of nutrition; face full-blooded, especially the nose; eyes showed slight paresis of the superior recti of both eyes, and left rectus internus paresis. Hearing was markedly affected; he was forgetful, slow in his movements; no other motor or sensory disturbances. He was very drowsy and would go to sleep while being treated. Shortly before his death papillary changes were noted.

There was flattening of the convolutions and marked hydrocephalus interna and externa. The chief part of the tumor was in the third ventricle, 5.8 by 3 by 4.7 cm. Cyst of pineal; thalami excavated; compression of corpora quadrigemina.

14. NOTHNAGEL'S FIRST CASE.[20]—A 21-year-old man had had epileptic attacks from childhood, occurring two or three times a year only. Attacks ceased one year before beginning of latter difficulty, which came on with vomiting which became continuous. The patient did not complain of headache, but was forgetful and mentally dull, and had vertigo. He gradually lost strength and commenced to walk with staggering gait, and could hardly stand. A few months later his eyes became immobile, and the pupils were dilated. Two years after the beginning of the symptoms he was taken into the clinic. The patient was a medium strong man, blind, with fixed gaze, somewhat thin, semicomatose, but was aroused when spoken to; could tell his name, etc. No palsies were apparent, but the patient was unable to stand up or sit up. He died in coma.

Necropsy showed hydrocephalus, sarcoma of the pineal, involving the quadrigemina, pushing into the third ventricle, involving the posterior end of the optic

17. Duffin, A. C.: Tr. Lond. Clin. Soc., 1876, ix, 183.

18. Nieden: Fall von Tumor (hydrops cysticus) glandulæ pinealis, Centralbl. f. Nervenh. u. Psychiat., 1879, ii, 169.

19. Falkson: Ein Chondrocystosarcom im dritten Ventrikel, Virchows Arch. f. path. Anat., 1879, lxxv, 550.

20. Nothnagel: Topische Diagnostik der Gehirnkrankheiten, 1879, p. 206.

thalamus, posteriorly reaching the cerebellum. The aqueduct was apparently dilated.

15. GOWERS' CASE.[21]—R. P., aged 24, after exposure to the sun as a policeman, developed a headache which became severe. He had it less severe for a month; there was slight mental dulness and paralysis of one sixth nerve; patient dozed most of the time, attention being aroused with difficulty; partial paralysis of right external rectus only. The pupils were equal. Two weeks later the patient did not answer questions and gradually became deaf. Double optic neuritis occurred; a week later incontinence of urine developed; pulse became infrequent, 50 to 60. There was a rise of temperature to 100. The patient stayed in semicoma, the right side of the face gradually becoming paralyzed. He died after nine weeks from exhaustion.

Necropsy showed a sarcoma between the optic thalami posteriorly, in front of the corpora quadrigemina, which were damaged, 1½ by ¾ of an inch in size. The pineal body was gone; the left corpora quadrigemina were destroyed, tumor extended into iter.

16. WERNICKE'S CASE.[22]—Wernicke speaks of a patient affected similarly to Blanquinque's.

17. TURNER'S CASE.[23]—Museum specimen. No case history.

18. FEILCHENFELD'S CASE.[24]—L., aged 18, Feb. 2, 1885, was admitted to hospital; ten months previously had headache, vertigo and vomited; became apathetic and showed great weakness of the lower extremities; had jerky movements of the entire body, becoming so bad as to interfere with his eating and drinking; frequent diplopia and involuntary urination and defecation. Patient had complete paralysis of the ocular muscles, the eyelid alone being movable. Pupillary reactions showed the right pupil wider than the left; double choked disk; slight left facial palsy. Upper extremities showed slight ataxia, also in lower with diminution of motor power; sensibility intact; skin and patellar reflexes present; clonus right side. Patient had gradually rising temperature and died in a comatose condition.

Necropsy showed marked hydrocephalus; aqueduct not dilated. A softened part about the size of a 20-mark piece (or a 5-dollar gold piece) at origin of middle and superior cerebellar peduncles, incorporated with swollen, sarcomatous pineal tumor; also involving the anterior end of the corpora quadrigemina.

19. PONTOPPIDAN'S CASE.[25]—A. S., aged 31, received in the clinic last of May; had had headache and vertigo for two months; for fourteen days suddenly worse, with mental dulness, unable to walk or stand and had involuntary excretions. On admission patient was mentally dull, with tremor of extremities; some loss of motor power in the left; pupils dilated, reacting slowly; movements of eye diminished in all directions; papillary margins indistinct; patient showed tendency to lie on one side; could walk if supported, with tendency to retropulsion (gait cerebellar). During stay in hospital, there was increasing dulness, increased sweating, opisthotonos, epileptiform cramp, optic neuritis, conjugate deviation of eyes to right.

Necropsy: Marked hydrocephalus. Walnut-sized sarcoma of pineal lying on corpora quadrigemina, compressing them.

20. SCHULZ'S CASE.[26]—N. N., male, aged 28, began to have severe headaches in 1883. In March, 1884, he was seen by a physician. He had been compelled to

21. Gowers: Cases of Cerebral Tumor, Lancet, London, 1879, i, 363, Case 3.

22. Wernicke: Lehrbuch der Gehirnkrankheiten, iii, p. 299.

23. Turner, F. C.: Spindle-Cell Sarcoma of the Pineal Body, Containing Glandular and Carcinomatous Structures, Tr. Path. Soc., London, 1885, xxxvi, 27.

24. Feilchenfeld, L.: Ein Fall von Tumor cerebri, Neurol. Centralbl., 1885, iv, 409.

25. Pontoppidan, K.: Ein Fall von Tumor der Zirbeldrüse, Neurol. Centralbl., 1885, iv, 553.

26. Schulz: Tumor der Zirbeldrüse, Neurol. Centralbl., 1886, v, 439.

stay in bed since January for bad headaches, especially in the occipital region. Holding the head forward seemed to relieve them. There was a sensation of bursting in the head; failing sight, especially left; papillæ at that time not swollen, but margins not sharp. Status at that time: Strongly built man with somewhat staring eyes, percussion on occiput painful; pupils normal, no motor or sensory symptoms. Patient was better until April, when he began to stagger in his walk, and could not go alone. In September he began to grow worse; the exophthalmos was more marked, and the right eye had a tendency to turn outward.

In 1885 the tendon reflexes of the upper extremities began to increase somewhat. Swallowing was precipitate. The patient had to hold his head forward. December, 1885, patient was in bed; no fever, head forward, chin on chest, face red, somewhat cyanotic, eyes injected, exophthalmos, pupils equal, reacting, no ocular palsies, no facial palsies, no palsies of leg or arm, light paresthesias of feet and right arm; unable to walk; marked increase of knee-jerks and clonus on both sides; headache was intense. Patient died.

Necropsy: Marked hydrocephalus; glioma of the pineal, walnut-sized, fairly hard, which lay on the corpora quadrigemina, compressing and somewhat shoving them apart.

21. REINHOLD'S CASE.[27]—O. D., male, aged 19, always sickly, much headache and vertigo, easily tired; seven months previously there was swelling of the testicles, which changed from one side to another, occasional painful urination and polyuria. Jan. 4, 1884, the patient was awakened by severe giddiness and headache, and on the days following was chilly and weak; headache remitting, appetite poor; five days later there was vomiting, and on the twelfth the patient entered the hospital where the vomiting continued, and headache increased. The disks were normal at this time. On January 19, he had a mild convergent strabismus, due to weakness of the left rectus externus; pulse slowed to 60; increase of skin and tendon reflexes of lower extremities; patient said that he did not see so well as formerly; then a slight right facial palsy gradually developed, and lack of coordination of the ocular and lid movements looking downward; slight exophthalmos, pulse slow. On January 31, patient had a convulsive seizure, mostly of right side of body. The movements of the eye muscles became less and less, and nystagmus-like movements began; pupils were equal; facial involvement increased, and there was slight impairment of hearing. February 6 double ptosis occurred; paresis right abducens was more marked, the left eye not being movable beyond the middle line. Sleepiness and mental dulness became more and more marked; patient smeared himself with feces. February 15 he was unconscious, pupils immobile, pulse 42, involuntary urination; two days later, another attack, with respiration of 10; two days later, pupils unequal, left larger than right, patient semicomatose. Patient died February 20.

Necropsy: Hydrocephalus, flattening of the mid-brain and pontine region, hazel-nut-sized cystic tumor of the pineal, just above posterior commissure. The corpora quadrigemina were pushed backward, flattened, and pushed apart, the aqueduct being shut off. The left middle cerebral peduncle was also compressed, and both abducens nerves flattened.

22. COATS' CASE.[28]—J. M., boy aged 13; meager history; came in on September 30, and died October 13; was very drowsy; could be awakened and would look around languidly and then go to sleep again; had been drowsy about five months; no fits; some weakness of the right internal rectus, and slight droop of left eyelid; mouth slightly drawn to the left; could walk stiffly and incoordinately only by being supported; urinary incontinence; epileptiform fit just before death.

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27. Reinhold: Ein Fall von Tumor der Zirbeldrüse, Deutsch. Arch. f. klin. Med., 1886, xxxix, 1.

28. Coats, J.: An Adenoid Sarcoma with Cartilage Originating in the Pineal Gland, Tr. Path. Soc., London, 1887, xxxviii, 44.

Autopsy: Hydrocephalus, tumor 1⅞ by 1⅜ by 1¼ inch, pushed into third ventricle, aqueduct and fourth ventricle; flattening of thalami; small pieces of cartilage.

23. DALY'S CASE.[29]—W. O., male, aged 23, developed headache and photophobia after a supposed lightning stroke in October, 1885. He was seen three weeks after this occurrence. He then walked with a staggering gait (drunken), being worse on closure of the eyes. The arms were free, and the tendon reflexes were normal. Vision was dimmed, pupils dilated, equal, contracting sluggishly to light and accommodation. Double optic neuritis with swollen disks existed. The patient vomited constantly. Ten days later he developed palsy of the left external rectus, and nine days after that, right facial palsy. During this month and the next he had spasmodic contractions of the muscles of the limbs and trunk from time to time. He was confused and pugnacious. In February, 1886, the hearing in both ears was defective; the patient was almost blind and had occasional fits. He could stand and walk only with assistance, but there were no palsies. His appetite was enormous, and he gained greatly in weight (5 stone or 70 pounds). His intelligence diminished; he became entirely deaf, and lost control of bladder and rectum. He died in coma in May, 1886.

Necropsy showed an alveolar carcinoma of the pineal 2 by ¾ by ½ inches, lying on the corpora quadrigemina, which were soft and flattened. No mention is made of hydrocephalus.

24. NOTHNAGEL'S SECOND CASE.[30]—S. R., male, aged 17, in 1883 fell from a ladder, was unconscious a few hours, vomited and had headaches; was sick for several weeks with fever, headache, vertigo and constipation. On recovery he still had headaches. Three months later he had attacks of vertigo; he swayed and fell, usually backward. His gait disturbance became very marked, he walked with wide-spread feet, and uncertainty. He had some increased urination and thirst. Patient also noted that his head was growing larger. The pupils were dilated; left more than right; reaction slow; ocular, facial and tongue muscles intact; hearing good, papillæ pale, edges indefinite, Romberg marked. Fifteen months later he again entered the clinic. At this time the pupils were equal, dilated, reaction to light and accommodation slow; patient blind in right eye, little sight in left; gait uncertain; patellar reflexes increased on both sides; no clonus; no sensory disturbances. Later he had vertiginous attacks. Three months later he was again studied with the history that vertigo and headache still continued, and convulsive seizures developed. These were epileptiform in character. During this time the patient had developed into a large, strongly built, strikingly fat young man; musculature was weak; memory and intelligence not impaired.

In 1885 he was totally blind. In 1886, the papillæ were atrophic, pupils wide, reacting slowly, later very wide and non-responsive to light or accommodation. Nystagmus on looking to right; later on looking upward. Smell later diminished; other cranial nerves normal. The gait retained its stumbling, staggering (drunken) character. The knee-jerks were increased, clonus developed in August, 1885, and then spasticity became marked. No sensory anomalies. Ringing in the ears had occurred early. In August, 1887, he commenced to discharge cerebrospinal fluid from the right nostril, after a period during which he vomited frequently. The amount varied from 12 to 110 c.c. a day for seventeen days. When checked the symptoms of pressure increased (compare Meyer case) to coma, involuntary urination, defecation, slowing of the pulse, etc. The patient died in October, 1887, four years from the date of the initial symptoms, after the fluid had ceased to flow for thirteen days.

Necropsy showed marked hydrocephalus; the aqueduct was choked, and in the place of the corpora quadrigemina there was a hard, hazel-nut-sized tumor 0.5

29. Daly: A Case of Tumor of the Pineal Gland, Brain, 1887-1888, x, 233, Case II.

30. Nothnagel, H.: Geschwülst d. Vierhügel; Hydrocephalus, Abfliessen v. Cerebralflüssigkeit durch die Nase, Wien. med. Bl., 1888, xi, 162.

by 1.3 cm., which had compressed the aqueduct. It had sunk into the quadrigemina, spreading them apart. It was a glioma, apparently, of the corpora quadrigemina.

25. GAUDERER'S CASE.[31]—A 12-year-old boy, exceedingly well nourished, somewhat pale, had been noted the previous summer to be restless; he slept badly and had an aural discharge. Four days before admission he complained of headache, fatigue, and occasional vomiting, but continued going to school, until an increase in the symptoms brought him to the clinic.

Here he lay in bed, was somewhat apathetic, with a fixed expression, and answered questions slowly, but clearly. He complained of frontal headache and pain in the neck in forward movements of the head. Pressure on the neck was painful. The pupils were medium wide, reacted sluggishly to light; no facial palsies; patient's movements were slow and careful; abdominal reflexes active, no complete sensory examination; patellar reflexes absent, but plantar and cremasteric reflexes present.

The patient continued in this condition with slowed, small, and, at times, irregular pulse. He lay sleeping most of the time but could be aroused, and gave pertinent answers. There was slight opisthotonos. There was beginning neuritis in the right eye two weeks after entrance to the clinic. The patient's stupor gradually increased from day to day, slight fever developed and patient died in coma fourteen days after coming into the clinic.

Necropsy showed marked hydrocephalus, including the infundibulum; the corpus callosum was pressed on; the corpora quadrigemina were partly destroyed by a cystic teratoma of the pineal (walnut-sized), 3.5 by 2.5 cm., which projected partly into the third ventricle, and also compressed the thalami.

26. KNY'S CASE.[32]—J. H. W., male, aged 32, in April, 1881, had a sudden sticking pain in occipital region which gradually spread over the skull during the course of the year; since July, 1882, ringing in the ears and painful thumping on the inside of the skull. The pain would exacerbate at times, and be accompanied by vertigo, blackness before the eyes, general tremor and clouding of consciousness for hours. In the fall of 1882 the patient's vision become dimmed, so that by November he could not read, and a month later could not get about. Double choked disk was then present. The patient was transferred to the medical clinic where attacks became stronger, resembling epileptic convulsions, with immobile pupils, but the condition remained about the same, up to 1884 when nystagmus developed and slowed speech. In 1885 his intelligence suffered. In 1886 he was still well nourished, abdomen very fat, lay apathetically on the back; marked divergent strabismus, dilated pupils, immobile to light, and marked lateral nystagmus were present. The patient could not stand; fell backward; no palsies; sensibility normal; patellar reflexes normal. In the last months there was increasing stupor, involuntary urination and defecation; patient remained fat to the end; pupils widely dilated; bulbi extending, divergent; epileptiform attacks; sudden rise in temperature and death.

Necropsy: Marked hydrocephalus, walnut-sized sarcoma of pineal; the corpora quadrigemina only slightly compressed. Vena Galeni widely dilated.

27. ZENNER'S CASE.[33]—G. W., boy aged 13, began to have intermittent headaches in July, 1891, usually coming on each morning, letting up during the day. They were mostly temporal, less often occipital or frontal. Not infrequently there was vomiting. He then commenced to stagger while walking (drunken gait); his head was drawn back to the left side; vision soon became impaired, and by November he was blind. His hearing grew progressively bad; speech began to

31. Gauderer, L.: Zur Casuistik der Zirbeldrüsentumoren, Inaugural Dissertation, Giessen, 1889.

32. Kny: Fall von isolirtem Tumor der Zirbeldrüse, Neurol. Centralbl., 1889, viii, 281.

33. Zenner: A Case of Tumor of the Pineal Gland, Alienist and Neurol., 1892, xiii, 470.

be indistinct and finally became unintelligible. In October he began having peculiar tonic paroxysms, with periods of unconsciousness, which lasted from one to thirty minutes. He was confined to his bed by November, becoming more and more stuporous, soiling his bed. Then there developed slight contraction of the left arm.

In March, 1892, patient was emaciated with rapid pulse, in a semi-stuporous state; no paralysis, but marked contracture of arms; pin-prick felt; pupils dilated, immobile to light; eye movements apparently free; double optic neuritis. The patient did not speak at all. He died in tetanic spasms in April, 1892.

Autopsy showed a marked hydrocephalus, and a large gliosarcoma of the pineal gland, 1¾ by 1¼ inches in size, lying mostly in the ventricles.

28. SCHMID'S CASE.[34]—J. K., male, aged 21; tuberculous patient with fever; no mental or neurologic signs for four months preceding death; under hospital observation.

Necropsy showed gelatinous tumor of pineal resting on corpora quadrigemina. Size not given.

29. KÖNIG'S CASE.[35]—Accidentally found tumor at autopsy in a man aged 45; psammo-sarcoma, gelatinous, large as a chestnut, with dilatation of third and fourth ventricles and posterior cornua.

30. GUTZEIT'S CASE.[36]—A boy aged 7¾ years, who for about eight months before his death was taken with frontal headache and vomiting; isolated attacks of vomiting had occurred previously. A month later (January, 1893), he had double vision, staggering gait, and drowsiness. In March he had disturbance of hearing, saw spots before his eyes. The patient was "strongly built and in a good state of nourishment." He wanted to eat all of the time, was somewhat stuporous, and yawned a great deal. His movements were uncertain, ataxic; pulse was retarded; optic neuritis, and paresis of the left rectus internus were present; patient could not look downward; had strong horizontal nystagmoid movements on looking up. Pupils were small, unequal, left smaller than right; immobile to light and to accommodation. Hearing was diminished. Incontinence of feces and urine was present; now and then spasms in facial muscles; pubic folds well developed.

Necropsy: Teratoma of the pineal, 4 by 3.25 cm., with marked hydrocephalus of the ventricles. The tumor extended into the third ventricle, pushing the thalami aside. The corpora quadrigemina were markedly flattened.

31. HOESSLIN'S CASE.[37]—E. K., boy, aged 9, had had marked thirst and polyuria for some time. He drank from 20 to 24 quarts of water a day. At first consultation he had no cerebral symptoms. Some time later, in April, he began to have severe headaches, and frequent vomiting; he staggered and swayed so that he could not walk. Visual defects then developed; no paralyses, but strength of lower extremities was much reduced; the gait was stumbling; the pupils widely and equally dilated; the eyes could be directed to the left, right and down; but the motion up did not go beyond the horizontal. There were also isolated palsies of both superior recti, superior oblique and of the sphincter, and choked disks on both sides. The patient gradually grew weak, and became blind; convulsions set in, and he died following an attack. The diabetes insipidus had diminished some weeks before his death.

Necropsy showed marked hydrocephalus, and a walnut-sized sarcoma of the pineal, which reached over the corpora quadrigemina, and the fore part of the cerebellum, and was attached to the former structures. It was very soft. The corpora quadrigemini were hardly recognizable, being completely flattened and

34. Schmid: Ueber latente Hirnherde, Arch. f. path. Anat. Berl. (Virchow), 1893, cxxxiv, 71 (93), Case xxxii.

35. König: (From Chirone.) Dissert. München., 1894.

36. Gutzeit: Ein Teratom der Zirbeldrüse, Königsberg Dissertation, 1896.

37. Hoesslin, v. R.: Tumor der Epiphysis Cerebri; Diabetes insipidus; Oculomotoriuslähmung, München. med. Wchnschr., 1896, xliii, 292.

softened on the upper surface. The aqueduct of Sylvius was deformed—disfigured. The fourth ventricle was dilated.

32. LORD'S CASE.[38]—Case of syphilitic enlargement, 2.1 by 1.6 by 0.9 cm.; woman insane seven years; epileptiform attacks and fits of violence; eventually left hemiplegia; later, right leg; for a long time demented and in stupor; two accessory gummatous growths.

33. CAMPBELL'S CASE.[39]—1. Patient female, aged 33, epileptic; died of tuberculosis; no brain lesion; pineal 1.0 by 1.3 by .08 cm., a cyst. No history.

34. CAMPBELL'S CASE.—2. Patient, female, epileptic; no history.

35. RUSSEL'S CASE.[40]—1. Female, aged 23, with fracture of base of skull. Post-mortem examination showed cyst of pineal 3/8 inch in diameter. No history.

36. RUSSEL'S CASE.—2. Another museum case. No history.

37. GARROD'S CASE.[41]—Boy, aged 16, died of diabetes. Cyst size of pea. No symptoms; brain normal.

38. LAWRENCE'S CASE.[42]—Patient, 16-year-old boy had cough and headache two days before death; delirium a week before, with pupils widely dilated, and irresponsive, nystagmus, blurring of right optic disk, limbs in constant athetoid movements, no convulsions.

Necropsy showed tuberculous meningitis and swollen gliomatous pineal, 1.4 by 0.7 cm., pressure on upper side of cerebellum.

39. OGLE'S CASE 1.[43]—Diffuse sarcoma of half cortex.

40. OGLE'S CASE 2.—Dr. Ogle's second case is of interest in this respect, as he was one of the early observers to call attention to the changes in the generative organs. The patient was a boy, F. W., aged 16, who had been sick for a couple of months before admission to the hospital. His manner had become strange; he was given to masturbation, and inclined to sleep a great deal. He was well nourished. His gait was staggering, but the reflexes were normal; there was no tremor and no paralysis anywhere; the back, especially the back of the neck, was held stiffly. Ten days after admission the pupils were only slightly active to light and were large, but variable in size; the boy saw perfectly. There was some loss of power in the external rectus of the right eye. About a week later, both external recti were inactive, the pupils widely dilated and inactive to light, and the boy quite blind. Although no choking of the disk was to be seen, there was slight pallor and blurring as from optic neuritis of slight degree; no other cranial nerve involvement; some priapism. The knee-jerks were at first present, but later disappeared; there were no changes in temperature. The penis was of large size, fully equal to that of a lad of 16 or 17 years; pubic hair was fairly plentiful, but the testicles did not seem enlarged.

Until his death, the patient had frequent attacks of vomiting, and frequent fits, marked especially by opisthotonos; but the most striking symptom was sleepiness. He would sleep night and day almost continuously, but could easily be aroused by a question, and by slight shaking, and then would answer with perfect readiness and intelligence, but would fall asleep again if left alone.

Necropsy showed a globular tumor 1 inch in diameter, projecting into the third ventricle, the thalami were pushed apart and hollowed. The corpora quadrigemina were obviously flattened. The tumor was a teratoma.

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38. Lord: The Pineal Gland, Tr. Path. Soc., London, 1899, l, 18.

39. Campbell: Notes on Two Cases of Dilatation of the Central Canal or Ventricle of the Pineal Gland, Tr. Path. Soc. London, 1899, l, 15.

40. Russel: Cysts of the Pineal Body, Tr. Path. Soc., London, 1899, l, 15.

41. Garrod: Pineal Cyst, Tr. Path. Soc., London, 1899, l, 14.

42. Lawrence: Tumor of the Pineal, Tr. Path. Soc. London, 1899, l, 14.

43. Ogle, C.: Sarcoma of Pineal, Tr. Path. Soc., London, 1899, l, 4.

41. HEUBNER'S CASE.[44]—Heubner showed a photograph of a 4½-year-old boy, with body development of an 8- to 9-year-old boy—large penis, scrotum and testes, as in puberty; pubic hair strongly developed; laryngospasm early in life; speech slow in development; after 7½ months this became normal. The increase in growth had taken place in one year, and choked disk had developed at the same time. Mild paretic symptoms appeared, owing to rapidly developing hydrocephalus.

The symptoms were thought to be due to a hypophysis tumor; *x*-ray showed a shadow. Necropsy revealed a pineal tumor, the shadow being due (?) to thinning of bone from hydrocephalus (see case of Oestreich and Slawyk).

42. OESTREICH AND SLAWYK'S CASE.[45]—P. M., boy aged 4, had attacks of a convulsive nature at the age of 12 months. At about 3 years the child, previously active, was quiet and shy, and cried a great deal. The child began to grow rapidly, the penis particularly. Four weeks before entering the clinic the gait was uncertain and difficult. There seemed some mental confusion, the child staring forward and answering no questions. This behavior would come on in attacks lasting a day or so.

The patient was large for his age, with large bones, strong muscles and quite fat. He answered questions. Pulse was regular, 70. There was slight right convergent strabismus; slight nystagmus on side movements; pupils equal; reacted slowly and incompletely to light and convergence; typical choked disk on both sides; child apparently saw badly. Hearing was good; other cranial nerves normal. Mammary glands large; colostrum could be expressed; testicles were size of pigeon's egg; penis large, 9 cm. long at rest; pubic hair 1 cm. long and dark; gait spastic; skin and tendon reflexes active; no loss of muscular power; sensibility intact. Gradually the child became more and more dull; answered questions more and more slowly, and finally would only shake the head. Ataxic movements of both extremities then developed, and finally the child could not sit up, nor eat. Two weeks after admission clonic-tonic convulsions occurred, the reflexes became extremely active, dermographia was marked. About six weeks after admission, the child died in coma and convulsions; radiograph showed a distinct shadow, thought to be the hypophysis.

Necropsy showed a large cystic tumor lying in the third ventricle, about the size of a small apple. There was marked hydrocephalus. Anatomically it showed itself to be a psammosarcoma cysticus of the pineal gland.

The author calls attention to the possible relation of the gigantism to the gland. Askanazy diagnosed this as a teratoma.

43. NEUMANN'S CASE.[46]—A. P., aged 27, had had frontal headaches for seven weeks. Mornings he was nearly free from pain, but it mounted up after an hour or two. Five days before coming to the clinic he had begun to note a diminution of his hearing and his sight, especially of the right side. He also began to see double. Otherwise he was well.

Retinal examination showed marked choked disk, both sides, with diminution of vision; fields could not be tested. The patient was unable to raise the eyes above the horizontal line, or to the right. Movements down and to left were undisturbed. The right eye could not be moved beyond the middle line alone, but the left alone was freely movable. There was marked nystagmus both by convergence and divergence. The right pupil was wider than the left. Both dilated and did not react to light or to accommodation. Hearing was diminished on the left side, otherwise normal; gait normal; no tremors, no ataxia.

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44. Heubner: Demonst. Versamml. d. Naturforsch. u. Aerzte., Dusseldorf, Sept. 22, 1898. Allg. med. Central-Ztg., 1899, lxviii, 89.

45. Oestreich and Slawyk: Riesenwuchs und Zirbeldrusengeschwulst, Virchows Arch. f. path. Anat., 1899, clvii, 475 (Heubner's Case).

46. Neumann, P.: Ein neuer Fall von Teratom der Zirbeldrüse, Inaugural Dissertation, Königsberg, 1900.

About two weeks after admission the patient had his first attack of vomiting. The condition gradually grew worse, and the patient grew thin and sleepy, began to be dizzy in walking, and rapidly became comatose. One month after admission he died in coma, with some elevation of temperature.

Necropsy showed a tumor, mostly lying in the third ventricle, 4 by 3 by 2.5 cm. directed anteriorly to the right, and posteriorly to the left, compressing the thalami laterally, and the corpora quadrigemina below, and pushing them backward. The posterior corpora quadrigemina had almost escaped. The fourth ventricle was dilated. There was marked hydrocephalus. The tumor was a teratoma.

44. HEMPEL'S CASE.[47]—M. L., a baker, aged 24, had been previously well save for an accident to head, followed by occasional headache. His father first noted an increasing slowness in his work. The patient said that his memory was not so good as formerly, and his headaches were more frequent. For the previous year he had been weak, and his gait had become irregular, and like that of a drunken man. There was also ataxia in the arms. One day he suddenly fell down. After a few weeks in a hospital he seemed better, but fell the day of his discharge. He then grew worse and worse and was sent to the state asylum. Examination at that time showed a vacant expression, pupils medium, left larger than right, non-responsive to light, but prompt to convergence; no nystagmus and no eye palsies; tremor of tongue; slight speech disturbance; coarse tremor of upper extremities; increased patellar reflexes, double ankle-clonus; ataxic gait; no change with eyes closed; Romberg; sensibility practically normal; slight hyperalgesia. The patient remained apathetic, the tremor increased, until he was unable to write; reading was difficult; spontaneous speech was slow, not scanning, lip movements very active. The patient was stupid; could multiply and divide, but could not add nor subtract; no papillitis; slight pallor.

About two months after admission he had spasms in the left arm and leg; the reflexes were increased. He gradually developed contractures in the extremities and after five months lay in bed all drawn together; almost unable to move hand or foot; turned head and spoke slowly, could swallow liquids; rotatory nystagmus developed. He grew weaker and weaker and died, eight months after admission.

Necropsy showed marked atrophy of the body, and marked hydrocephalus of the lateral ventricles, but not of the third or fourth. In the posterior pole region there was a tumor which pressed on the veins of Galen. It was about the size of a hen's egg, with its thin end pressing into the third ventricle. It had pressed into the substance of the optic thalami. The corpora quadrigemina were totally flattened and destroyed, the geniculate bodies pushed aside, and the cerebral peduncles much flattened. The tumor was a solid epithelial carcinoma.

45. NEUMANN'S CASE[48] 1.—Patient was a woman, aged 28, first seen March, 1899, for menstrual anomalies, pressure on head which radiated to teeth and neck, principally of the left side; she was much prostrated, was very sleepy, and had a ravenous appetite. These symptoms she had had for three months; no other cerebral symptoms. There was slight difference in the pupils, left larger than right, slight exophthalmos; looking upward caused internal convergence; no diplopia; indefinite weakness of the left facial; beginning optic neuritis, right more than left. After three weeks the pupils had become widely dilated and immobile to light; right hand weaker than left; patellar reflexes both weak, left more active. The patient then had some nausea and severe headache. After a short stay at home she returned after five weeks. In May she was much worse. Headache, vomiting, dimness of vision were worse, and the patient was now

47. Hempel, K.: Ein Beitrag zur Pathologie der Glanduli pinealis, Inaugural Dissertation, Leipsic, 1901.

48. Neumann, M.: Zur Kenntnis der Zirbeldrüsengeschwülste, Monatschr. f. Psychiat. u. Neurol., 1901, ix, 337.

hardly able to stand. Immobile pupils; left eye closed; protrusion of left bulb; pulse rapid, 128. Patient died in June, clear in mind.

Necropsy showed marked hydrocephalus. A thin membrane was found in the third ventricle, lying on the corpora quadrigemina, which could be blown up, showing a bladder shape, 3 by 5 cm. The corpora quadrigemina were markedly flattened. The opening of the aqueduct was enlarged, but nevertheless not permeable because of a small, hazel-nut-shaped tumor lying just behind the posterior corpus quadrigeminum. The medulla was flattened. During life there was a large cystic, hydropic pineal gland. The tumor within the canal was a neuroglioma.

46. NEUMANN'S CASE 2.—A boy, aged 11, was well up to eight days before coming to the clinic, when he had severe headache, giddiness and vomiting, and had to leave school. In the clinic the case resembled a tuberculous meningitis; fever, slowed pulse, vomiting. There was diplopia, disappearing on convergence; no pareses. The patient soon became somnolent and died two days after coming to the clinic, with increasing temperature.

Necropsy showed enlarged brain, marked hydrocephalus, dilated third ventricle, filled with walnut-sized (4.6 by 3.4 by 3.0 cm.), reddish, cystic sarcoma of the pineal, fastened to the corpora quadrigemina and to the cerebellum and tela choroidea. The thalami were flattened. The aqueduct was pervious. There was slight development of the external genitals.

Neumann has collected and tabulated reports of twenty-two cases with a full discussion of the symptoms to this date.

47. JOUKOVSKY'S CASE.[49]—This female child was apparently dead at birth, but was reanimated. She did not cry, however. She slept twenty-four hours after the first bath, and showed no desire to nurse. There were no marked cranial anomalies. At the end of six days there was no exophthalmos, but the pupils were unequally dilated, the left double that of the right. The pupillary reflexes were absent. There was slight divergent strabismus; no nystagmus, but ptosis. The temperature was subnormal. The pulse became slower—80-70-60. The child did not vomit. The somnolence was continuous, and bathing, changing, etc., did not awake her. During the six days of her life she did not emit a cry. The movements of the body and extremities were very feeble, the arms were somewhat contracted; no loss of tendon reflexes, or of sensibility to pain. At the age of six days she died.

At necropsy 280 c.c. of clear fluid escaped. There were no cerebral hemispheres, corpus callosum nor fornix cerebri. There was only a thin, 1-mm.-thick sac of cerebral substance. In behind the sella turcica there was a cystic pineal gland about the size of an almond; it rested on the corpora quadrigemina, and obliterated the aqueduct of Sylvius. The anterior corpora quadrigemina were flattened. The cerebellum, pons, corpora quadrigemina, spinal cord, and fourth ventricle were all normal.

48. MEYER'S CASE.[50]—Meyer presented this case before the New York Neurological Society first in 1902, as a lesion of the chiasm, and escape of cerebrospinal fluid from the nose, and later (January, 1905), pathological specimens were presented. The patient, a male, struck his head while diving in 1894. In 1898 he became blind. In 1899, he had transitory attacks of numbness on the left side of the face, leaving out part of the area of the middle branch. Then followed difficulty in moving the jaw to the left. In 1900 cerebrospinal fluid began to drip from the right nostril, with some general relief. On stopping the patient would become sleepy and stuporous. At one time he showed a strong tendency to walk in a circle. In May and October, 1902, being then 22 years old, he had several

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49. Joukovsky, V.: Hydrocèphalie et tumeur congenitale de la glande pinéale chez un nouveau né, Rev. mens. d. mal. de l'enf., 1901, xix, 197.

50. Meyer, A.: Adenoma of Pineal Gland, Jour. of Nerv. and Ment. Dis., 1903, xxx, 216; 1905, xxxii, 464.

general convulsions, and he died in 1904 in status epilepticus. There were no other neurological signs reported, save slight increase in the knee-jerks.

Necropsy showed an adenoma of the pineal gland. It had pressed itself through the roof of the mid brain, behind the posterior commissure, protruding into the third and fourth ventricle, and displacing the corpora quadrigemina.

49. ASKANAZY'S CASE.[51]—Male, aged 19, in January, 1906, began to have headaches and then pains in the neck which were so severe that he could not hold his head quiet. On going to work January 10, he had an attack of giddiness and fell to the ground without any loss of consciousness. Three days later he vomited and lost consciousness for ten minutes, and was sent to the hospital where he vomited again repeatedly. He was slightly dull; the knee-jerks were increased, especially on the right side; no clonus; no Babinski; Kernig and Lasègue both positive. Lumbar puncture was negative. The patient's condition remained stationary until January 17, when he suddenly became worse. Headaches were severe, vomiting was excessive and he had an epileptiform attack lasting one minute. The right pupil was dilated, the left contracted; pulse 50 to 60. The patient died January 18.

Necropsy showed subarachnoid edema; the ventricles were not dilated. The slightly dilated third ventricle contained blood; also a coherent bloody mass which reached in the direction of the quadrigemina. It lay between the posterior commissure, and the cerebellar vermis, and was about as big as a walnut. It could be removed *in toto*. It covered the entire quadrigeminal region, reaching further left than right. It caused an area of softening in the left corpora geniculata and in the pulvinar of the left thalamus, as well as softening the corpora quadrigemina and opening the aqueduct of Sylvius. There was a bloody infiltration into the cerebellum. The tumor was a chorio-epithelioma, and the author discusses the interesting relation between chorio-epitheliomata and teratomata.

50. VERGER'S CASE.[52]—Inadequately reported case of a woman, aged 42, who was first observed in a marked state of dementia. She hardly answered questions, but ate, drank and slept; no palsies, nor ocular symptoms recorded; she had headache. Towards the close of her illness she had marked vertigo, generalized rigors and opisthonos; tendon reflexes exaggerated both sides.

Necropsy showed hydrocephalus, and a gliosarcomatous tumor the size of a hen's egg. It filled and distended the third ventricle, pressing up against the corpus callosum.

51. CHIRONE'S CASE.[53]—Chirone speaks of a figure done in wax of a hydrops of the pineal 4 by 5 cm. by P. E. Sorrentino in 1845, and preserved in the anatomical museum of the Hospital of S. M. d. Loreta of Naples. He also gives a short summary of some twenty or more cases from literature.

52. MARBURG'S CASE.[54]—B. L., girl, aged 9, always delicate and weakly, in October, 1906, began to see badly and could not write as formerly. Six weeks later she began to have rheumatic-like pains in the neck, head, arms and legs, which were relieved somewhat by medication. Examination of the fundi showed signs of pressure. In March following, headache was severe, and the patient was compelled to go to bed; vomiting took place. Two weeks later, on trying to walk she staggered, and she had such ataxia of the arms as to be unable to feed herself. The circumference of the head had increased 6 cm. from October, 1906, to October, 1907. The intelligence was not much affected. The patient began to get fatter.

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51. Askanazy, M.: Teratom und Chorioepitheliom der Zirbel, Verhandl. d. deutsch. path. Gesellsch., 1906, p. 58.

52. Verger, M.: Gliosarcoma developpé au niveau de la glande pinéale, Jour. de méd. de Bordeaux, 1907, xxxvii, 216.

53. Chirone, P.: I tumori della glandula pineale, Med. ital., 1907, v, 141.

54. Marburg, O.: Zur Kenntnis der normalen und pathologischen Histologie der Zirbeldrüse, Die Adipositas cerebralis, Arb. a. d. Neur. Inst., 1909, xvii, 217; also Wien. med. Wchnschr., 1907, lii, 1908, No. 48.

In October, 1907, the patient's measurements were 123 cm. in height, 66 cm. breast measure, 70 abdomen. The skin was smooth and dry and there was marked panniculus; weight 29.3 kg. The patient had choked disks, and slight flattening of right nasolabial fold. Otherwise the cranial nerve-findings were negative. The upper extremities showed less motor power of left side, but the right reflexes were more active. No tremor of hands, but a marked ataxia in the finger-finger, and finger-nose tests; left more than right; adiadokokinesis of both hands; abdominal reflexes both sides somewhat diminished; lower extremities showed diminished motor power; slight spasms; knee-jerks increased; ankle-clonus present on right side; Babinski sign present; ataxia of both lower limbs on knee-heel test; cerebellar asynergia. Walking alone was impossible; spastic ataxia; slight fainting attacks. October, 1907, body weight increased and heart-beat was rapid—120 to 140. Palliative trephining was done by Eiselsberg, over the cerebellum, as a cerebellar lesion was diagnosed; tumor sought for and not found. Patient died.

Necropsy showed a mixed tumor of the pineal, compressing the left pulvinar, and reaching to the anterior corpora quadrigemina. There was some hydrocephalus; hypophysis normal, as well as all other blood glands.

53. HART'S CASE.[55]—Male, aged 24, for three weeks preceding admission had severe headaches, nausea and increasing fatigability. There was stiffness of the neck, optic neuritis, with reduced vision, slowed pulse and leukocytes in the spinal fluid. As the patient had a fetid bronchial discharge a brain abscess was suspected. The patient died in seven weeks.

Necropsy showed internal hydrocephalus, soft hemorrhagic angiosarcoma of the pineal, third ventricle much dilated, partially filled with tumor fragments. Posteriorly the tumor rested on the corpora quadrigemina, infiltrating and substituting the structures in part.

54. FRANKL-HOCHWART'S CASE.[56]—Boy 5½ years old. At the age of 3 the child began to grow very rapidly and at 5 he was stout and had reached the size of a boy of 7. The boy also developed rapidly mentally, occupied himself with the question of immortality, and of the life after death. In August, 1908, he developed strabismus. In December he had headache, was very sleepy, yawned a great deal; no vomiting. In December he had scarlatina with fever, vomiting and angina, from which he recovered, but remained sleepy and apathetic, and the headache increased. From the early part of December, 1908, there was a striking development of the penis, and marked genital hair, also small hair on the skin. The patient had frequent erections and the voice was very deep.

In January, 1909, patient was as big as a boy of 9; 123 cm. long; moderate fatty deposits; bones proportionately developed; penis 7 cm. long; hair on genitals like a 15-year-old boy; pupillary reactions sluggish; abducens paralyzed both sides; rectus inferior and superior on both sides paralyzed; left internus paretic, right normal; field of vision contracted; right eye much contracted on temporal side; double choked disk; cranial nerves otherwise normal; slight tremor of left arm. The patient grew more sleepy, and the headache was worse. Urinary incontinence, vomiting and epileptiform convulsions appeared in January, and January 22 he died in coma.

Necropsy showed a definite hydrocephalus, and a walnut-sized tumor in the pineal region (5 by 2.5 by 2.9 cm.) soft and knobby, fastened to the vena magna. The third ventricle was dilated, especially above; the superior vermis was slightly flattened. The roof of the aqueduct was lacking in its anterior half. The tumor had replaced the pineal and compressed the aqueduct; the corpora quadrigemina were compressed and pushed to one side. The tumor was a teratoma.

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55. Hart, C.: Ein Fall von Angiosarkom der Glandula pinealis, Berl. klin. Wchnschr., 1909, xlvi, 2298.

56. Frankl-Hochwart: Ueber Diagnose der Zirbeldrüsentumoren, Deutsch. Ztschr. f. Nervenh., 1909, xxxvii, 455.

55. PAPPENHEIM'S CASE.[57]—L. R., aged 10, a well-nourished boy, entered the Freiburg eye clinic complaining of having had a headache for four weeks, with vomiting, for which he was compelled to go to bed. This continued up to the time of his entering the clinic, when he began to notice diminution in his vision. His head was large; pupils showed light and accommodation reflexes (?); reflexes were increased throughout; traces of a patellar clonus; no mental anomalies; choked disks were present. Shortly after a decompression operation the patient showed increasing dulness and died.

Necropsy showed external and internal hydrocephalus, and a walnut-sized tumor of the pineal gland. It occupied the posterior part of the third ventricle, lying on and involving the substance of the corpora quadrigemina. Muscle-like cells were found, but no other tissues resembling a teratoma. Pappenheim groups it as one of Marburg's compound tumors of the pineal, and terms it a neuroglioma ependymale. He collects reports of thirty-seven cases.

56. RAYMOND AND CLAUDE'S CASE.[58]—M. B., a boy aged 10, well up to the age of 7, was large for his age, and well developed mentally. In January, 1906, he commenced to have a headache localized on the right side, radiating toward the eye, the nose and the superior maxillary region of the same side. He vomited, with severe crises of pain. He grew somewhat better until July, 1907, when the headache and vomiting reappeared. He then began to grow fat, and was large for his age. He grew weak rapidly. In October the left leg was feeble; the patient could hardly raise it from the ground. His eyesight became impaired, and his eyes had a tendency to turn to the left. Lumbar puncture gave some relief. In January, 1908, blindness was complete. Vomiting was made worse by a lumbar puncture.

His parents brought him to France in May, 1909. At that time he was 138 cm. tall, looking like a boy of 13. The skin was fat. The patient weighed 39 kilos; boys of his age should weigh 25 to 26 kilos. He was apathetic, did not speak spontaneously, but answered questions well. The cranium was enlarged. The patient was muscularly weak, especially on the left side. There was light paresis of the muscles of the face on the left side. The tendon reflexes showed slight spasticity. There was a normal knee-jerk, but there was clonus and Babinski on both sides; upper extremities normal. The abdominal reflexes seemed diminished. There was bilateral optic atrophy; the pupils were dilated and immobile, and there was slight nystagmus. The genital organs were small and the testicles very small. The patient grew more and more apathetic and sleepy. In July the cranial sutures seemed to be coming apart; percussion gave a cracked-pot sound. Contractures of the neck and arms then developed. In October, 1909, the child died of bronchopneumonia.

Necropsy showed marked hydrocephalus; the third ventricle was dilated, and there was a tumor of the pineal 4 cm. in diameter. The corpora quadrigemina were not recognizable from pressure. The pons was also involved by the tumor. It was a glioma.

57. HOWELL'S CASE[59] 1.—P. L., male, aged 42, had complained of dimness of vision and occipital headaches for six months, the latter having remitted somewhat for two months. He was also giddy at times and had a tendency to fall to the left, and also to fall backward. He staggered to the left in walking. Five months after the onset he had had diplopia. On admission he had recent optic neuritis, loss of upward movement of the eyeballs, impairment of downward motion, especially in the right; pupils small and inactive to light and con-

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57. Pappenheim, A. W.: Ueber Geschwülste des Corpora pineale, Virchows Arch. f. path. Anat., 1910, cc, 122.

58. Raymond and Claude: Les tumeurs de la glande pinéale, Bull. de l'Acad. de méd., March 15, 1910.

59. Howell: Tumors of the Pineal Body, Proc. Roy. Soc. Med., 1910, iii, No. 5, 77.

vergence; left abdominal reflex diminished; cerebellar operation, with death six weeks later.

Necropsy showed considerable flattening of the convolutions; some ventricular distention; pons was widened and flattened, as also the peduncles, and ventral portion of the mid-brain. A (gliosarcomatous?) tumor extending from the posterior commissure, to the valve of Vieussens was found. The tumor occupied the aqueduct and dorsal part of mid-brain. It distended rather than infiltrated the tissues, save in the medial parts of the thalami, where there was some infiltration. The cerebrospinal, central tegumental and right tectospinal tracts showed recent degenerations.

58. HOWELL'S CASE 2.—B., male, aged 22, had nausea and slight sickness (vomiting?) for some months. For three months he had to stop work owing to vertigo, and he had some slight ptosis. For six weeks he had been getting stupid and inattentive; had tremor in hands and uncertainty of gait; headache and diplopia for two weeks; was healthy-looking, but very restless. He was somewhat deaf, was very thirsty, and drank enormously of water.

Examination showed optic neuritis, pupils equal, ectopic upward and inward, inactive to light and accommodation, loss of upper eye movements, with later oscillation on motion; downward motion incomplete; slight paresis of left external rectus; slight ptosis, slight deafness; rhythmical tremor of both upper extremities; ataxia both sides; gait uncertain; anomalous shuddering movement of upper limbs, without sensation of being cold.

Necropsy showed increased hydrocephalus, the floor of the third ventricle being bulged out as a thin walled cyst. A walnut-sized, friable tumor (gliosarcoma?) was found projecting into the dilated third ventricle from behind. The aqueduct was dilated, and so filled with the growth that its roof was disrupted, the growth had also gone down into the fourth ventricle. There were no distinct infiltrations.

59. HOWELL'S CASE 3.—F. L., male, 20 years old, had constant headaches, and weakness for five months. His legs gave way when he walked. He had failing memory and giddiness; no rotation. Examination showed smell defective, intense optic neuritis, pupils sluggish to light and convergence; oval on dilatation; loss of upward motion of the eyes, nystagmus on lateral movements; slight left facial weakness; considerable weakness in left leg and arm, and in back muscles; tendency to fall backward; some incoordination of right arm. Death after operation to relieve pressure.

Necropsy showed marked hydrocephalus, with distention of floor of third ventricle; pons and mid-brain much flattened. Tumor (gliosarcoma?) of pineal body blocking aqueduct, also forcing into it, distending it and causing it to rupture through the upper part of the roof; slight infiltration of thalami; degenerations in posterior longitudinal bundle, and ventral longitudinal bundle, tegmental tracts and both cerebellar peduncles; mesial fillet fiber degenerations.

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