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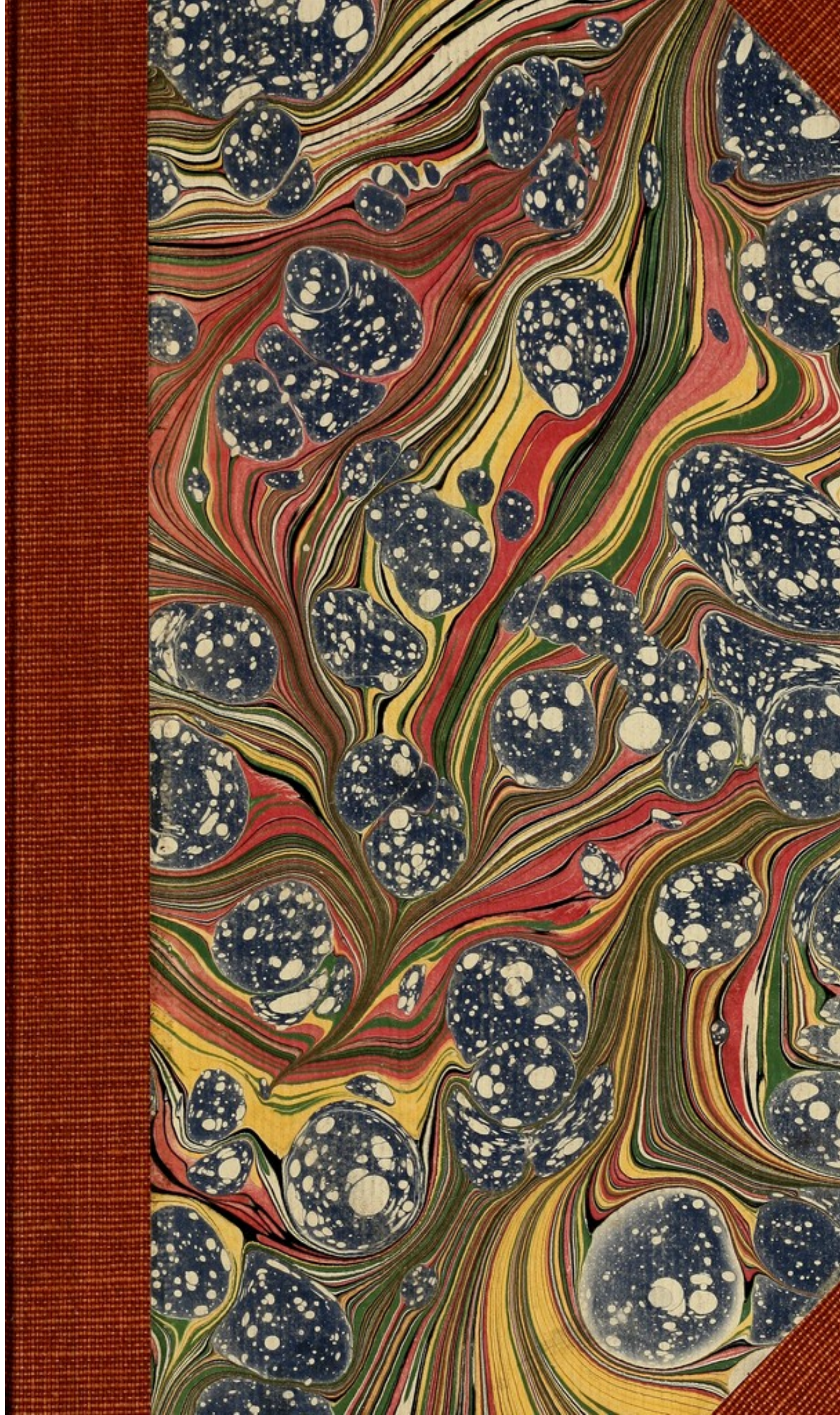
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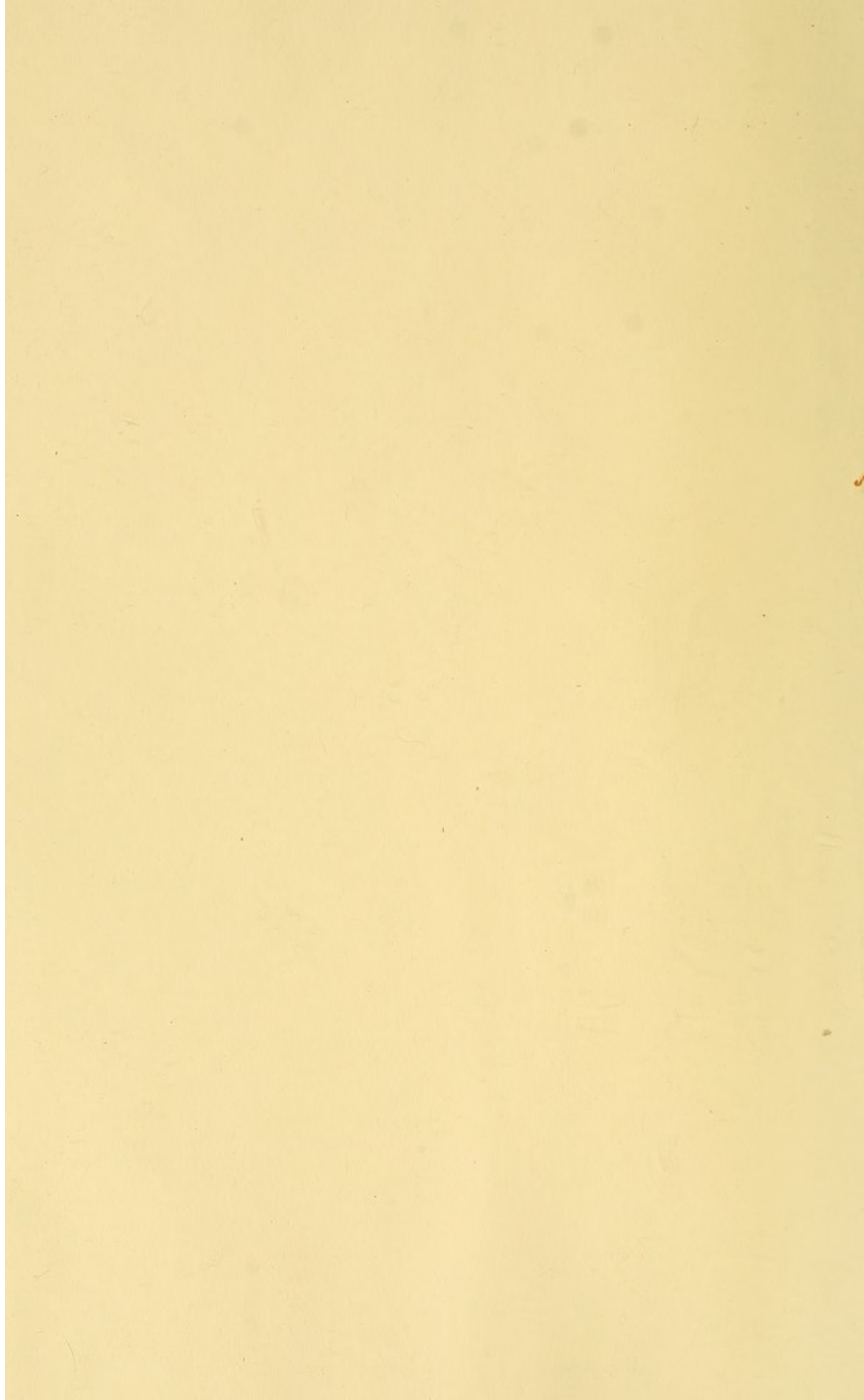
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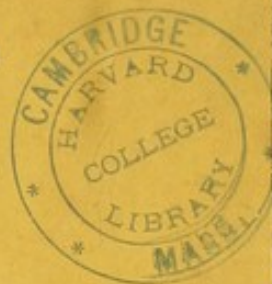


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R E P O R T

ON



INTRA-CRANIAL TUMORS:

THEIR SYMPTOMATOLOGY AND DIAGNOSIS,

WITH

ILLUSTRATIVE CASES.

BY ROBERTS BARTHOLOW, M.D.,

PROFESSOR OF MATERIA MEDICA AND THERAPEUTICS IN THE MEDICAL
COLLEGE OF OHIO; LECTURER ON CLINICAL MEDICINE AND
PHYSICIAN TO THE HOSPITAL OF THE GOOD SAMARITAN;
LECTURER ON MORBID ANATOMY AND PATHOLOGIST
TO THE CINCINNATI HOSPITAL, ETC.

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*Non minus certo etiam a minutissimis morbi circumstantiis
indicationes curativas possit Medicus desumere, quam ab iisdem
sumpsit diagnostica.*

SYDENHAM. OB. MEDICAE PRAEF. ED. TERT.

The above is a true and correct copy of the
original as it appears in the records of the
County of [illegible] State of [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]

INTRA-CRANIAL TUMORS: THEIR SYMPTOMATOLOGY AND DIAGNOSIS.

I published in the *American Journal of the Medical Sciences*, for April 1868, a paper on "Tumors of the Brain," based on three cases under my charge the previous year, in the wards of the Good Samaritan Hospital. A brief abstract of this paper appeared in the *British and Foreign Medico-Chirurgical Review*, and the cases, together with a full synopsis of my commentaries on them, were translated into German and published in *Schmidt's Jahrbucher*, for February 1869.

The attention which my former paper attracted, has encouraged me to undertake further investigations in this interesting field. Some additional cases have happened under my own observation; I have availed myself of other cases which have occurred in this city, and I have laid under contribution the clinical and pathological records of the Cincinnati Hospital. I have thus collected ten cases of intra-cranial growth as a basis of the present paper.

CASE I.—*Tumor of middle fossa involving pons, 3d, 4th and 5th pair of left side, and left crus cerebri.*

History.—John Murphy, aged 27, a native of England, and unmarried, was admitted to Cincinnati Hospital, service of Prof. Comegys, April 22, 1869. Has been a soldier and was recently discharged from service in California, most probably on "Surgeon's certificate." Is a dissipated man. Denies having had syphilis. He states that he has suffered two years with more or less headache. Several months ago he consulted Prof. Hamilton, of Columbus, for defects of vision. (In answer to my inquiry Dr. Hamilton informs me that he has no recollection of the case.)

He sought admission to the hospital for violent headache and general *malaise*.

Condition on Admission.—He is well nourished and of good muscular development. He walks like an intoxicated man, having a difficulty in maintaining the vertical station. He attributes this to weakness. His left eye is partly closed and is prominent. He uses the right in vision only. It is ascertained that he has ptosis and diplopia and divergent strabismus. The hospital record states that the pupils are of unequal size, the left being dilated and, there is reason to believe, motionless. Unfortunately no record was made, if observations were, of the state of sensibility of the cornea and face. His principal complaint is of pain in the head of a very violent character. He refers the pain to the base of the skull and left frontal region. Cannot hear well with the left ear. An unhealthy ulcer is found in the scalp over the left parietal protuberance. Appetite good; bowels constipated. The action of the heart is normal and the pulse is reported as "slow and full."

Progress of the Case.—On the morning of the 24th some difficulty of speech was observed; he answered questions slowly and imperfectly. After this date his strength rapidly declined, and he fell into a condition of stupor. On the evening of the 26th he became delirious; the report stating that the delirium is of the low muttering kind. On the following morning he appeared to be more stupid, and could not be roused sufficiently to answer questions. On the 28th he was in a profound coma, with stertor and puffing expiration. Died at 11 A. M.

Autopsy.—I made the autopsical examination on the morning succeeding his death. I omit all details, except those in regard to the cerebral lesion.

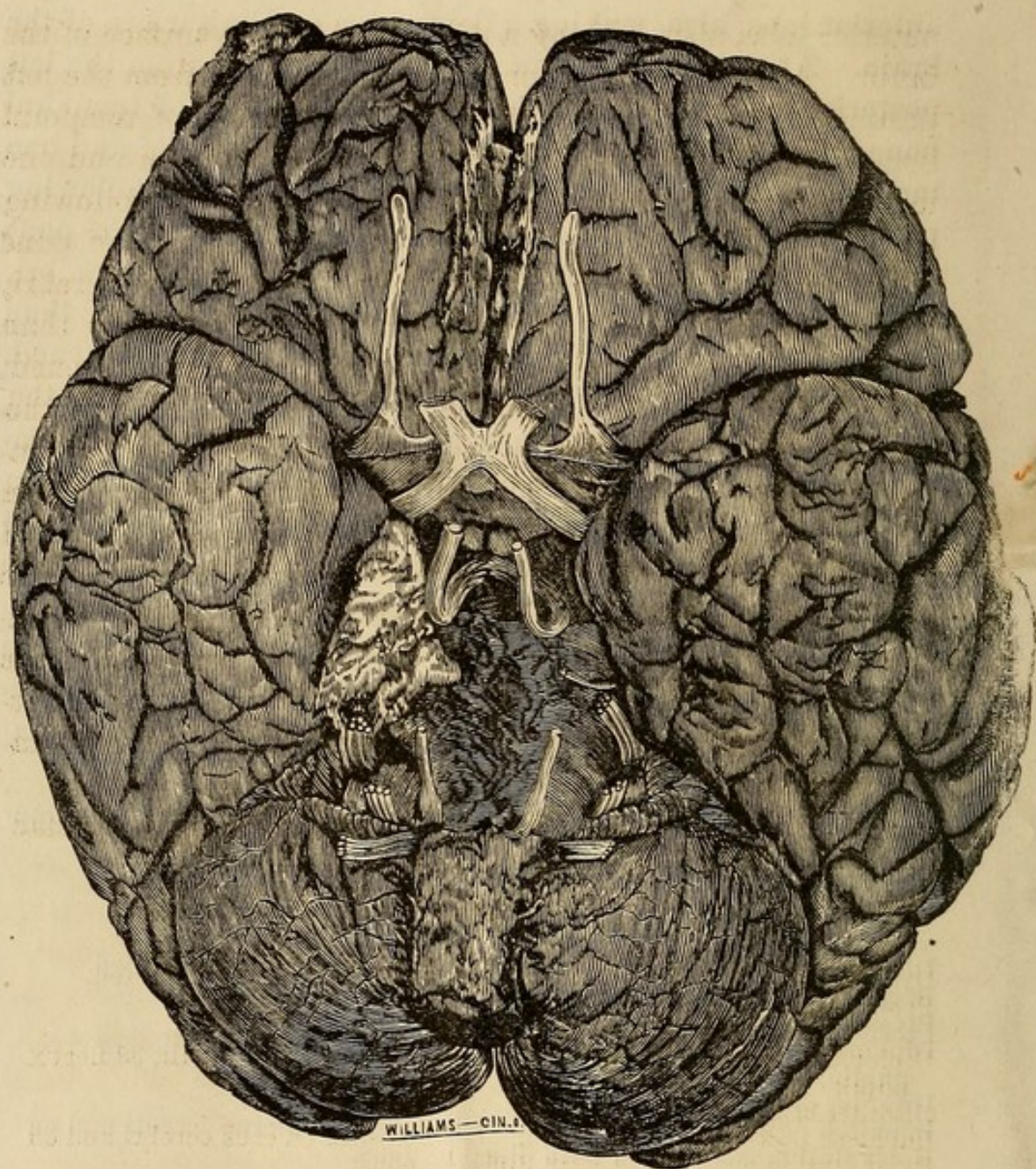
Slight effusion in superior sub-arachnoid space. Some soft gummatous tumors—three in number—developed from parietal layer of arachnoid, overlying the superior and lateral surface of left posterior lobe, and indenting the convolutions at this point. A similar mass, at the extremity of the right

anterior lobe, also, making a depression on the surface of the brain. At the base a tumor is found springing from the left posterior clinoid process and petrous portion of temporal bone. The tumor is two inches in its long diameter and one inch in vertical depth. It directly involves the following parts: 3d, 4th and 5th nerves of left side; left side of pons in two-thirds of its extent anteriorly, and left crus cerebri, which is pressed aside. The third nerve is much larger than its fellow of the opposite side, is reddish in color and softened. With the crus cerebri the nerve is pushed over toward the other nerve. The fourth nerve has disappeared, being embraced in the neoplasm. The fifth nerve is also included in the posterior part of the tumor, is much enlarged, softened in texture, but can be separated by a careful dissection. The part of the pons impinged on is so soft as to be almost diffuent. Three bony tumors, small in size, are attached to the falx major. No other alterations of the brain calling for remark. Blood coagula were found in left nares in considerable amount.

The post mortem appearances account in the most satisfactory manner for the symptoms observed during life.

SYMPTOMS.	LESIONS.
Divergent Strabismus. Proptosis. Ptosis of upper eyelid. Diplopia. Dilated and motionless pupil. Disorder of motility. Impaired power of co-ordination. Erect station maintained with difficulty. Unhealthy ulceration of scalp. (Anæsthesia of face and cornea?) Epistaxis.	Sixth pair not antagonised. Injury to motor oculi, 3d nerve. Pressure on crus cerebri and on pons. Injury to 5th nerve.

Unfortunately no observations were made as to the state of the cutaneous sensibility—the senses of pain, touch and temperature. The 5th nerve being so decidedly injured, anaesthesia must have existed in the parts supplied by this nerve.



CASE I. Tumor of the Pons. involving left crus cerebri, 3rd nerve, 4th nerve, 5th nerve, and left side of pons. In transferring the photograph to wood, the position of tumor was reversed but otherwise it is an exact representation of the specimen.

It will be seen that the crus cerebri is pressed aside, that the 3rd nerve is impinged on, that the 4th is included in the new growth, that the fifth is in part embraced by it also, and that a deep excavation exists in the pons. In consequence of the pressure the 3rd nerve was enlarged and softened.

There were no symptoms observed during life, due to the gummatous tumors, which indented the convolutions of the extremity of the right lobe, and of the convexity of the left hemisphere. Bony masses in the falx are too commonly present without producing recognisable symptoms, to have any importance ascribed them in the clinical history of this case. The symptoms here were unmistakably due to the tumor at the base.

The accompanying wood cut, well exhibits the position of the tumor and the parts impinged on by it. (The specimen is to be found in the Museum of Cincinnati Hospital, Series IV., Specimen II.)

CASE II. The details of this case having been published in my previous paper, I content myself with a statement of its most important diagnostic points.

This patient had had for two months before admission to the Good Samaritan Hospital, most violent and persistent headache, vertigo, epileptoid seizures and difficulty in standing and walking. On his admission was supposed to be intoxicated. He reels and staggers in walking, and manifests a strong tendency to backward movements. His eyes prominent; sight dim; hearing dull. His face is swelled and highly sensitive; he bleeds at the nose. Muscles of the face parietic so that his countenance is blank and expressionless. Voice pitched in a high key. No difficulty in swallowing. No vomiting.

The perception of light gradually diminished, so that he finally became amaurotic, his pupils being dilated and motionless. The hyperaesthesia in the distribution of the fifth nerves, increased. His disorders of locomotion increased so that he could not be got to walk, and fell backward when the attempt was made to push him along. His mind became enfeebled. He had periodical attacks of fury. During his stay in the hospital, his principal suffering was from headache, which he referred to the occiput and to the distribution

of the fifth pair. He passed out of the house and nothing was learned of his subsequent history.

The neoplasm in this case, was probably situated in the middle fossa, and involved the body and peduncles of the cerebellum and the pons. In order to show the relation of the symptoms to the supposed lesions, I place them in parallel columns.

SYMPTOMS.	LESIONS.
Proptosis. Dilated and motionless pupils.	Irritation of 3rd pair.
Amblyopia. Amaurosis.	Irritation of Tubercula Quadrigemina. Structural alteration of retina.
Hearing dull. Face blank. Paresis of facial muscles.	Irritation of Seventh and Eighth nerves.
Hyperaesthesia of face, injected conjunctivae, bleeding from the nose.	Irritation of Fifth nerves.
Walking and standing difficult.	Irritation of Cerebellum and Pons Varolii.
Backward movements.	

As the defects of co-ordination and the dimness of vision, preceded for a considerable time the symptoms referable to irritation of the cranial nerves, it is tolerably certain that the tumor did not extend much beyond the posterior boundaries of the middle fossa.

CASE III. One of the cases published in my previous paper. The following is an abstract of its principal features:

Symptoms commenced sixteen months before admission to hospital. He had headache, nausea and vomiting. Vomited frequently after this, generally every day, and without much effort, the abdominal muscles being little engaged. Subsequently he began to have disorders of motility; his walk became tremulous and unsteady, and he was accused of intoxication.

On admission to the Good Samaritan Hospital, he presented the following symptoms: right palpebral opening wider than the left; speech thick and stuttering, but no paralysis of the tongue; pain in the head especially in the occipital region; some tenderness of scalp; sense of smell and taste unaffected, totally deaf in right ear; vision dim and uncertain. An ophthalmoscopic examination by Prof. Seeley, disclosed the following state of the eye:

"Size of pupils normal; reflex and accommodative movements normal. Ophthalmoscope reveals congestion of both papillae, evidenced by the deep pinkish tint, caused by the development of a large number of capillaries and entire want of definition of papillae except portion of external border. In addition, there is slight exudation along the track of some of the vessels on right papilla. Veins and arteries of both retinae enlarged. No hemorrhage along their course." In addition, there was present a decided ataxia of the ocular muscles on right side, (bilateral nystagmus.) Well marked ataxia existed in the muscles of the right lateral half of the body, but no diminution of sensibility in any part; on the contrary, heightened sensibility. No diminution in power in the ataxic muscles.

This patient, also, passed from observation, and his subsequent history could not be learned.

Further History.—This patient, fortunately for my purpose returned to the Hospital two weeks ago, July 15, and is now in my charge. The symptoms noted two years ago continue, but are much more pronounced. Both pupils are dilated and motionless; pain in left side of face and head constant; totally deaf in right ear; vertigo present whether lying down, sitting up or walking. Intelligence intact. He has great difficulty in swallowing and in talking. He cannot command the muscles of the tongue and lips in order to articulate distinctly. The power to pitch his voice in ordinary conversation, is disordered, and the inflections are in consequence extreme. Constant epigastric uneasiness, nausea and vomiting. The ataxia of the ocular muscles and of the right side, not so marked as two years ago but the disorders of motility are much more decided. He has great difficulty in walking; he reels and staggers like an extremely drunken man. Sensibility to pain more acute on right side as shown by the esthiometer. Muscular strength preserved.

It is quite possible to fix with considerable certainty upon the position of the neoplasm in this case. To exhibit its probable relations in the most striking manner, I place the

symptoms and supposed lesions in parallel columns as in the former cases. The subsequent history as given above, is in confirmation of my diagnosis publicly emitted two years ago.

SYMPTOMS.	LESIONS.
Regurgitation of food. Stammering.	Irritation of 9th, 10th and 11th nerves.
Deafness on right side	Injury of 8th on right side.
Ataxia in muscles of right side and heightened sensibility on same side.	Irritation of pons and medulla.
Amblyopia.	Congestion of retina.

A case almost exactly similar to this in respect of the symptomatology, has been reported by Dr. F. Bateman, in Beale's Archives of Medicine, for April 16, 1867. In this case there was observed first an ataxic condition of the muscles of the right hand, which was followed by headache, weakness of legs, and a staggering gait, *as if intoxicated*. Next embarrassment of speech came on; then dimness of vision, and finally complete blindness. In this case a steatomatous tumor was found encroaching on the right lobe of the cerebellum, the right side of the medulla oblongata, the right crus cerebelli and the right side of the pons Varolii.

In case III the adventitious product producing the symptoms narrated must have occupied the same position.

CASE IV. This case, also, appeared in my former paper. I present an abstract merely of its most important characteristics.

When admitted to the Good Samaritan Hospital he presented the following symptoms.

Violent *tic douloureux* on the left side; congestion of the eye, and dilated and sluggish pupil on same side. Subsequently he had difficulty in maintaining the erect posture; a staggering gait. He referred his suffering chiefly to the distribution of the fifth pair on left side; but he had also a dull aching in his head. The congestion of left eye increased; the pupil dilated and motionless. The left nostril also became red and swollen and frequent hemorrhages took

place from it. Perception of light was at length lost. Prof. Seely made an ophthalmoscopic examination and ascertained that serious structural alterations had taken place in the retina. Prof. E. Williams also made an ophthalmoscopic examination, which revealed an "enlarged and tortuous condition of the retinal veins and blurred appearance of the optic papillae, with structural retinal changes, etc." Vomiting and obstinate constipation finally came on; he had dysphagia and his speech became thick and stuttering; taste abolished. Convulsions of a very violent character, preceded by stupor and followed by maniacal excitement, occurred at irregular intervals. A great degree of hyperaesthesia was found to exist in the whole right side of the body after the first convulsion. An herpetic eruption appeared on upper lip, and ulcers invaded the corneae.

Autopsy. "Anterior portion of right hemisphere of cerebellum firmly adherent to cranium; lying anteriorly to and below the right hemisphere a firm nodulated tumor which was enveloped in a distinct capsule attached to, but easily separated from, the membranes. * * * Tumor had compressed right half of the medulla oblongata towards the median line, implicating the right pneumogastric nerve. Imbedded in the substance of the cerebrum, above and behind the tumor, was a pyriform cyst, two inches in its longitudinal diameter, and one and a half inches in its short, the apex of which extended into the crus cerebri. Surrounding brain substance of semi-fluid consistence."

The symptoms observed during life were chiefly those produced by the tumor, which impinged on the medulla oblongata. The pneumogastric was not alone subjected to the irritation, for a tumor of the size and occupying the situation of that in this case must necessarily have affected, by reason of contiguity, the glossopharyngeal, hypoglossal, spinal accessory, facial and auditory. The ante-mortem indications pointed unmistakably in this direction. There are some anomalous circumstances in this case, however, which require examination. The nodulated tumor and the cyst were both

on the right side, yet the ocular troubles and the hyperaesthesia in the distribution of the fifth, were for a long time experienced on the left side. Schroeder Van Der Kolk* and Luyst† both describe commissural connections between the nuclei of the fifth pair, and hence an irritation in the neighborhood of the point of origin of these nerves might be propagated to the peripheral terminations of either. The same exists between the *tubercula quadrigemina*. It is exceedingly probable, however, that organic alterations had taken place in the left 3rd and 5th nerves, not described and possibly not observed, by the pathologist making the examination. In order to exhibit the exact relation between the symptoms and lesions I have them in parallel columns :

SYMPTOMS.	LESIONS.
Headache—convulsions.	Tumor at base of brain.
Tic Douloureux; alterations of nutrition of eye, of integument of face; epistaxis	Irritation of nuclei of fifth nerve.
Hyperaesthesia of right side of body; walking and standing at first uncertain, afterwards impossible; convulsions.	Pressure of neoplasm on right side of medulla oblongata.
Amaurosis; dilated and motionless pupils.	Irritation of tubercula quadrigemina; structural alterations of retina.
Dysphagia; loss of taste; regurgitation of food; obstinate constipation.	Pressure on ninth, tenth and eleventh nerves.
Delirium of maniacal character; hebetude of mind; stupor.	Cyst in right posterior lobe; congestion of veins.

CASE V.‡ David Proctor, aged 31. During month of January of present year, suffered with paroxysmal headache, coming on every two or three days—the pain being located in the right frontal region, but the scalp of that side of the head was tender. Right pupil dilated; double vision. There was also some unsteadiness in his gait. He recovered sufficiently to resume work, but the pain returned in March. On the 8th of March he was in bed, groaning with pain, in the same situ.

*On the Minute Structure and Functions of the Spinal Cord and Medulla Oblongata. Syd. Soc. Trans.

† Recherches sur le Systeme Nerveux Cerebro-Spinal, sa Structure ses Functions, et ses Maladies. Paris 1865.

‡ I am indebted to Dr. Aug. Hoeltge for the particulars of this case.

ation as before. The pain came on in paroxysms every few minutes and in the intervals he was able to give an intelligent account of his symptoms. His pupils were then natural and the diplopia, observed in the former attack had disappeared. After a few days of comparative ease, the headache returned with great violence on March 13th. He was then unable to lie down, as he could not bear the pressure of the pillows on the back of his head, which was very tender. There were also, spasmodic contractions of the muscles of the neck with each paroxysm of pain. He became comatose and died at 1 p. m. of same day.

Autopsy. "On removing the brain, adhesion was observed between the dura mater, and the anterior portion of the right middle fossa, which required considerable force to separate; and calcareous deposits were found on the external surface of this membrane, corresponding to the adhesions. * * * * Attached to the inner surface of the membrane at this point, was a hard fibrous tumor the size and shape of a small peanut, which extended into the brain. The whole right lobe around this, and involving the cerebral mass, was of the consistency of a thick cream, of a dull whitish color, so that on removing the brain a portion of this stuck to the membrane."

In this case there were fewer characteristic symptoms than in those already detailed. The tumor being small in size and situated in a locality where no important nerves are found, could not cause disturbances of function which result from the irritation of a tumor at the base. The symptoms observed during life were largely due to the softening of the middle lobe. Rostan* has dwelt with great particularity on obstinate headache as a symptom of softening. There were beside this, symptoms of irritation of third pair—dilatation of pupil and double vision, but these disappeared after a time.

*Recherches sur le Ramollissement du Cerveau. Deux. Edit., Paris, 1823, p. 12.

SYMPTOMS.

Headache.
Double vision; dilated pupil.
Disorders of motility. At first
staggering gait; afterwards,
spasms of muscles of neck.

LESIONS.

Tumor of Dura Mater and softening
of middle lobe.
Irritation of third nerve.
Softening of middle lobe. (Extend-
ing to crus cerebri ?)

Dr. Hoeltge, in his excellent report of this case, raised the question whether the softening of the middle lobe was caused by the tumor. Dr. J. W. Ogle* describes several cases of fibrous tumor of the dura mater, in which the brain substance adjacent was softened to a considerable extent.

CASE VI.† Thomas Bay admitted to Cincinnati Hospital March 25, 1869, fisherman by occupation. Had good health until four years ago, when he suffered from intermittent fever, which lasted during the summer. Had another attack during the following summer, but for two years has been healthy, until the day before his admission, when he experienced a chill. Such was the account which he gave to Dr. Ritchey the Interné, but on making further inquiry I learn that he had been wandering up and down the river bank for several weeks in an aimless way indicative of mental derangement. Since his death further particulars of his history have come to light. It appears that two years ago he received a blow on the head with a loaded whip. After this his mind became deranged, and he wandered from home, his friends being ignorant of his situation.

Condition on Admission.—States that he had a chill this morning, and that he is unable to retain his urine. His speech is hesitating; he is frequently unable to complete a sentence for lack of words; his lower jaw meanwhile working up and down in a peculiar way. He is a man of good muscular development, and presents a rather healthy appearance. Pulse, 74; respiration, 20. No disorders of sensibility or of motility were observed. Although the account he gave of

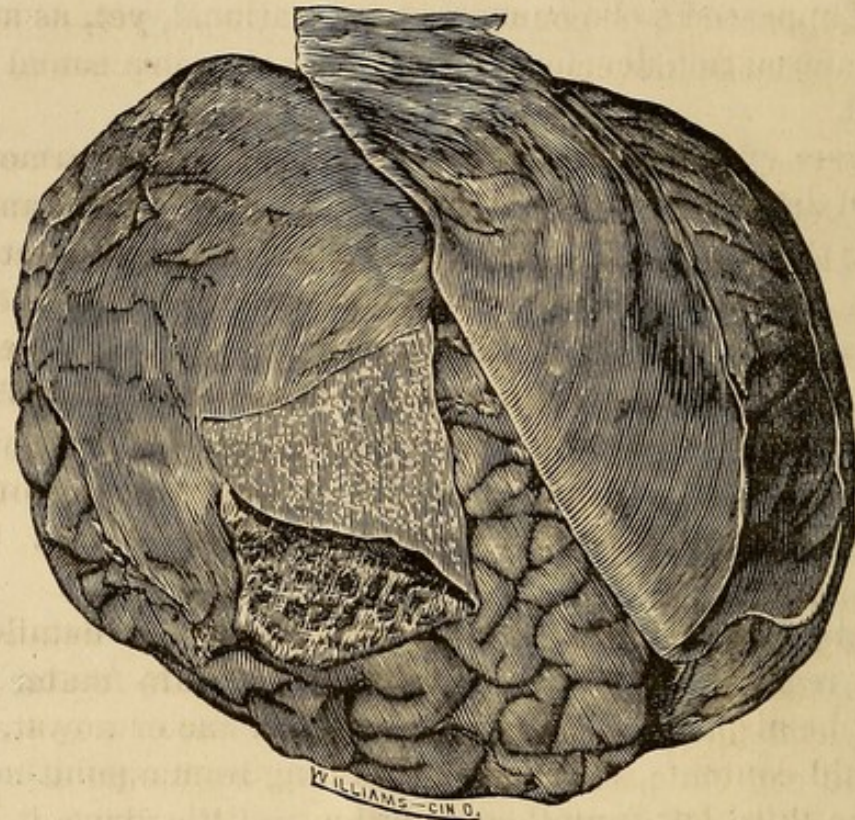
*British and Foreign Medico-Chirurgical Review, April, 1865.

†I am indebted to my colleague, Dr. Carson, for most of these particulars.

himself appeared to be connected and rational, yet, as subsequent information developed, he was not then in a sound state of mind.

Progress of the Case.—At 2 o'clock, p. m., he became restless and delirious; tossing from side to side, flexing and extending the limbs, and keeping his head in almost continual motion. Right pupil was greatly dilated, and insensible to light; and the left pupil, at first nearly natural in size, became dilated as much as the right and also insensible. At 7 o'clock breathing is very labored and stertorous; pupils greatly dilated; considerable œdema of the lids of left eye; left forearm and hand cold and clammy; right arm and hand warm. Died at 7:45, p. m.

Autopsy by Dr. Carson, Pathologist.—I omit all details, except as regards the brain. "Raising the dura mater from the left hemisphere, a body, apparently a sac or a cyst, with semi-fluid contents, was found extending from a point not far from the third left frontal convolution, a little above it, however, diagonally across to the posterior part of the left hemisphere. It measured six and one-half inches in length, two and one-fourth in width at widest point, and of average thickness of three quarters of an inch. It was attached to dura mater by a band three quarters of an inch in length, and several fibrous cords, the remainder lying free; impressions of the convolutions of the brain on its lower surface.



CASE VI.—*Cyst of the Arachnoid.*

The mouth of the cyst is laid open to expose contents—ragged lymph adherent to the walls.

The convolutions were flattened, and the position of the cyst was plainly marked across the brain. On section of one extremity a sero-purulent, cloudy-looking fluid to the extent of about two ounces flowed from its cavity; a whitish fibrinous, and a dark chocolate colored mass were presenting at the mouth. Pia mater healthy, and also the substance of the brain. Left lateral ventricle smaller than the right; unusual amount of serous effusion at the base of the brain.”

The accompanying wood-cut, taken from a photograph of the brain and cyst, gives an accurate representation of the position of the neoplasm. As Dr. Carson suggests, the explanation given by Rokitansky of the mode of formation of these cysts, is probably the true one.

“Spontaneous extravasations of blood into the sac of the arachnoid are by no means uncommon. They mostly happen

on the convex surface of the hemispheres. * * * Lying beneath the dura mater that covers one of the hemispheres, is found a sac or cyst, which resembles in form a flattened cylinder, somewhat curved from before backward, in correspondence with the arch of the cranial vault. * * The sac adheres by its outer surface to the dura mater, but its inner wall is free, or nearly free, from any connection with cerebral arachnoid, and is consequently more or less smooth, and moist. Its adhesion with the dura mater, too, is but loose; it partly sticks on and partly is connected with the membrane by a few small vessels. * * * Loose shreds of plastic lymph hang on the inner surface of the walls, and (which is remarkable) principally on the wall which adheres to the dura mater; within these the sac contains a more or less thick fluid, of a dark and various color, like chocolate, or plum sauce, rust, or yeast. In course of time the lymph is gradually removed, the inner surface of the sac becomes smooth and polished, and the contents are changed into a colorless, thin, clear, serous fluid. The corresponding hemisphere becomes plane or slightly hollowed, its convolutions flattened, and its ventricle narrowed.”*

Calmeil† had long ago indicated this mode of formation of these cysts of the arachnoid, relating several illustrative cases.

Ogle‡ refers to eight cases—two of them preparations by Schröder V. Der Kolk, in which cysts of the same kind existed in the cavity of the arachnoid.

It is highly probable that the attacks of intermittent fever were symptomatic of the cerebral leison.

A specimen illustrating the mode of formation of these cysts, is to be found in the Museum of the Cincinnati Hospital. The following entry in the Museum Record, by Prof. Taylor, explains the character of the specimen :

“Cyst formed by false membrane between dura mater and pia mater. The cyst contained transparent yellow serum; no

* Pathological Anatomy. Amer. Ed., vol. 3, p. 253-4.

† De La Paralyse considerée chez les Aliénés. Paris, 1826, p. 379.

‡ British & Foreign Medico-Chirurgical Review. July 1865, p. 223. Op. Cit.

evidences of extravasation. The hemisphere was much compressed by the cyst. Beneath the dura mater of opposite hemisphere was an extensive but thin, recent extravasation of blood.

"The patient was found in the street insensible, and died soon after entering the hospital. He had been engaged in active employment but a day or two before death."

(Series IV. Specimen IX. In my enumeration this is case X.)

After a time the brain accommodated itself to the pressure and irritation, and active symptoms ceased. Some failure of mental power occurred, and a peculiar difficulty of speech was recognized on his admission to the hospital. Although the cyst did not impinge directly upon the third frontal convolution, yet this part was interfered with by the pressure which diminished the cavity of the left lateral ventricle.

No disorders of motility or of sensibility occurred.

There is no history of cephalalgia.

In Calmeil's cases mental derangement existed. In all of the cases narrated by Ogle, in which reference to the state of the mind is made, disorders of intellect are noted. Rokitansky expresses himself decidedly on this point, affirming that these cysts "uniformly induce a marked degree of feebleness of intellect."

SYMPTOMS.

Feebleness of intellect.
Hesitation of speech; sometimes
loss of memory for words.

LESIONS.

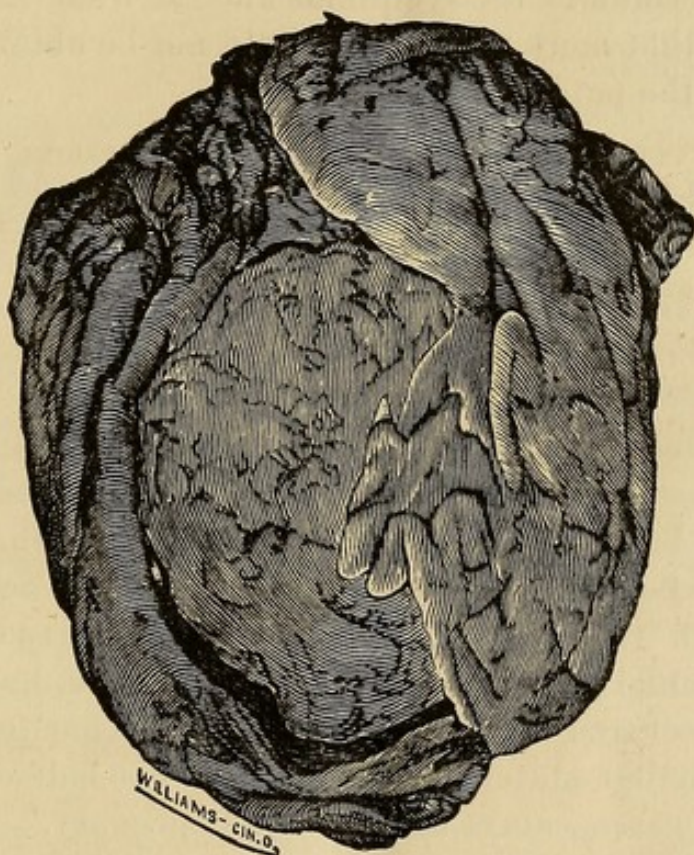
Cyst of the arachnoid.
Pressure upon and flattening of
convolutions of superior part of
left hemisphere.

CASE VII.* The subject from whom this tumor was removed in this case, died in the city prison in charge of Dr. Tibbals. She was brought to the prison as a vagrant, having been found by the police in Washington Park. When Dr. Tibbals first saw her, she was unconscious, passing urine and faeces involuntarily. She came out of this condition of

*I am indebted to Prof. P. S. Conner for these particulars and for the specimen. Cincinnati Hospital, Series IV., Specimen 9.

stupor; ate food heartily; attended to her natural wants; gave an account of herself to those about her. This marked improvement lasted 48 hours, at the expiration of which time she was seized with convulsions and died. The account does not state the condition of the pupils, or of vision. Subsequent inquiries have developed, that neither was altered from the normal state.

At the autopsy there was found in the left anterior lobe, a tumor of the size and shape of an ordinary orange, encephaloid in character and self-circumscribed. The cerebral substance posterior to the tumor, was somewhat softened. An exostosis projected from the inner table, making a conical depression in the hemisphere nearly an inch in diameter, and



CASE VII. *Encephaloid tumor of left anterior lobe.*

half-an-inch in depth, immediately over the tumor. As the size of the left anterior lobe was not increased, it is plain that a quantity of cerebral matter equivalent to the dimen-

sions of the tumor, must have disappeared. The gray matter of the most superior part of the convexity has been thinned by the exostosis, and the upward pressure of the tumor, but the lateral convolutions have not been interfered with, the third and the insula being intact. It is obvious then that the tumor has developed at the expense, chiefly, of the central white matter.

The accompanying wood cut taken from a photograph, gives an accurate representation of the tumor. The under surface of the lobe is represented in order to show the size and character of the tumor.—(Cincinnati Hospital Museum, Series IV., Specimen 9.)

Following the method adopted in the other cases, I place in parallel columns the symptoms and the lesions. It is to be regretted that more particulars could not be obtained during the life of the patient.

SYMPTOMS.	LESIONS.
Impaired intellect. Convulsions, (Epileptoid.)	Tumor of left anterior lobe.

Dr. Mackenzie Bacon* who has examined all the post-mortem records of the London hospitals for a period of ten years, finds that "primary cancer of the brain," is an exceedingly rare accident, the deposits found in this organ being usually secondary. His returns show that but 10 of 73 cases of cancer of the brain were primary, and he thinks that this proportion may be still further reduced by a more accurate definition. On the other hand, Ogle who has notes of 25 cases of intracranial growths of a cancerous nature, finds that 13 of them occurred in the brain alone, and Charlton Bastian† makes a similar statement. "In about one-half of the total number of cases, cancer of the brain is primary."

CASE VIII.‡ An able-bodied servant girl, 20 years of age, was admitted to Cincinnati Hospital in a partially comatose state.

*On Primary Cancer of the Brain—London, Churchill, 1865. (Pamphlet.)

†Reynold's System of Medicine, Vol. II, page 489.

‡This case has been reported by Prof. E. Williams, M. D.

The incomplete history obtained, was as follows:

Four months before her admission, fell down stairs and sprained her ankle, (Vertigo ?) Had been vomiting for several months occasionally before her fall, and without evident cause, and this continued up to the time of her admission. At length she became unable to hold anything in her arms, and could not walk well. "Two days before she was brought to the hospital, it was ascertained that she could not see, hear, or speak, and slept most of the time. When brought in, her face was slightly flushed; she walked slowly with head and body bent forward; pupils widely dilated and insensible to light; all the special senses impaired and she can only be made to understand by signs. She protrudes the tongue with difficulty, and always to the right. Pulse 46. Respirations 15."

She was transferred to the charge of Dr. Williams, ophthalmologist. I quote his full and accurate description of the symptoms as observed by him.

"An ophthalmoscopic examination revealed a well-marked neuro-retinitis in both eyes, but more advanced and intense in the right. The optic papilla were greatly swollen, opaque and the limits not capable of being distinguished from the surrounding retina, which was itself opaque and streaked with numerous ecchymoses. * * * The vessels of the papilla and retina, to near the equator, were veiled with grayish opacities, and often interrupted so as to look like dotted lines. At the junction of the optic disk and the retina, there was a marked bend in all the vessels, where they mount up over the swollen papilla. The veins are extremely tortuous, both perpendicularly to, and parallel with the plane of the retina. * * The only difference in the two eyes is one of degree, the characteristic changes of neuro retinitis in the right eye, being more marked and further advanced, and all perception of light abolished."

Dr. Williams also ascertained "that there was complete anaesthesia of the right side of the face, and that the eye could be touched without exciting any sensation. The sense

of smell was impaired, but hearing and taste were unaffected. She experienced pain and heaviness over the eyes, but not in the back of the head, and this pain was increased by coughing, straining, jolting and percussion of the head with the fingers."

The autopsy by Dr. Taylor disclosed "a tumor about three inches in length lying under the left anterior lobe of the cerebrum, and extending from the falx cerebri, to which it was adherent, over the cribriform plate of the ethmoid, involving the left olfactory nerve, backwards and diagonally across the sella turcica to the right petrous bone, where the end of it pressed on the fifth nerve of the right side at its point of exit from the posterior fossa. There was thus direct pressure on the left olfactory, the optic chiasm, the cavernous sinus and ophthalmic branch of the fifth nerve, as well as upon the main trunk of the trigeminus at the seat of the Casserian ganglion."

The autopsy thus strikingly confirmed the diagnosis of Dr. Williams, who had indicated the existence of a tumor at the base pressing on the optic chiasm and the fifth nerve of the right side.

To exhibit more satisfactorily the relation between the symptoms and the lesions in this case, I place them in parallel columns.

SYMPTOMS	LESIONS.
Pain in the frontal region. Vertigo	Tumor of frontal region.
Anaesthesia of right side of face.	Pressure on right fifth nerve.
Impaired sense of smell.	Pressure on left olfactory.
Amaurosis; pupils dilated and motionless.	Alterations of retina; congestion of retinal veins, etc.

CASE IX.—T. B., now in Good Samaritan Hospital, aged 27, Irishman, and by occupation a laborer. At the beginning of the year 1867 had nausea and vomiting for two months. Began to have headache in May, 1867, which has continued steadily ever since, increasing in severity. The pain is now felt in the forehead and occiput and is generally a dull and heavy pain, with, however, daily paroxysms of intense violence. In August, 1867, had double vision which lasted about

four months and then disappeared. At the time his headache commenced, he began to experience dimness of vision, and, after a time, he became unable to see his way. Together with these disorders of vision he experienced numbness and tingling with loss of power in the left half of the body so that his walk became uncertain. Has never had a convulsion or fit of any description.

Present State.—He presents a peculiar expression of countenance, owing to the prominence of the eyes and the dilatation and immobility of the pupils. He walks unsteadily. When he rises to walk, he fixes his head by a strong effort of the cervical muscles, the veins swell, and his face becomes suffused. He sways a little from side to side and staggers when permitted to walk alone, but when supported walks more firmly. He complains of numbness and tingling in his left hand and foot. The masseter and temporal on the left side are constantly agitated by short and rapid involuntary movements. The movements of the ocular globes are ataxic (nystagmus.) He has a constant and unpleasant vertigo; it is not affected by position, or by closing the eyes; but rapid walking increases it. His headache is now felt chiefly in the frontal region; it is dull and continuous, but occasionally he has paroxysms of great violence. The respiratory movements do not affect the pain in the head. Tactile sensibility, as measured by the aesthesiometer, is the same on the two sides. No hyperaesthesia in the distribution of the fifth pair. Taste normal in the anterior and in the posterior part of the tongue. Smell impaired, especially on the left side. The condition of the organs of vision is thus described by Prof. Seely, Ophthalmologist to the Hospital:

“No strabismus in any direction; considerable nystagmus; pupils widely dilated, but the movements are good, though in left only reflex. Vision in right eye is sufficient to recognize the window and even the sash. Ophthalmoscopic examination shows that the media are clear, the papillæ grayish white, with irregular outlines and not well defined; the central vessels of the retina are abnormal, the arteries small,

veins large in proportion and readily compressible, the slightest pressure being sufficient to render them bloodless; both sets are veiled in center of papillæ, and bordered for a little distance by exudation; the two papillæ present nearly the same picture. Vision in the right eye is apparently confined to the inner part of the retina."

The symptoms in this case evidently belong to what Dr. Hughlings Jackson calls "a coarse organic lesion of brain." They are the symptoms of a slowly developing neoplasm in the neighborhood of the optic chiasm. Beside the neuro-retinitis, resulting in atrophy of the papillæ, the symptoms indicate *irritation* of certain parts. This will be better shown by a comparative statement of the symptoms and the supposed lesion.

SYMPTOMS.	LESION.
Prolonged headache; vertigo. Amaurosis Double vision. Dilated pupil.	Tumor of brain. Pressure on optic tract and chiasm (?)
Altered sensations on left side.	Irritation of third pair.
Walking unsteady. Ataxia of certain muscles.	Irritation of crus cerebri.

Before proceeding to an analysis of the cases of intra-cranial growth which I have collected, several practical points demand examination:

1. The brain is a compound organ whose different parts possess different functions.
2. The effects of irritation of these parts must not be confounded with destruction of function.

With regard to the first point I need only mention the *convolution* of Broca, the *corpora striata*, the *tubercula quadrigemina*, etc., parts possessed of special properties and powers. As an illustration of the second point, it will suffice to refer to the difference of effects which follow irritation of the fifth pair, and the destruction of the tissue of that nerve: in the one case hyperaesthesia, in the other case anaesthesia of the parts to which its terminal filaments are distributed; irritation leading to perversion of function, and destruction of the nerve causing abolition of its functions.

Furthermore, the symptoms produced by cerebral tumors are divisible into two orders:

1. Those common to morbid growths, or adventitious products in general.
2. Those peculiar to tumors in special situations.

Belonging to the first order are headache, vertigo, amaurosis, convulsions, derangement of the intellectual and affective faculties, etc.; to the second, alterations of sensibility, disturbances of the special senses, disorders of motility, vomiting, urinary disorders, etc.

I. *Headache*.—This symptom was present in seven of the ten cases herein reported, and was, probably, present in all if inquiry had been made to ascertain this fact. Headache is a very constant symptom; so much so that Ladame* believes it to have considerable diagnostic value. As an isolated symptom, it has but slight importance from the diagnostic point of view, for it is present in other disorders of the brain. Rostant† considers it an important sign in softening. In both of these conditions the headache is obstinate and persistent, increasing steadily in violence. In the case of tumor the headache is associated with other characteristic symptoms, as disorders of the special senses, etc.; whereas in softening the headache is accompanied by paralysis of the tongue and progressive failure of intelligence. In the cases immediately under my own care I have observed two kinds of headache: a constant uneasiness of a dull character; violent pain occurring paroxysmally.

The situation and character of the pain are to a limited extent indicative of the position of the tumor. In tumors at the base, the pain is referred to the occipital region, and to the temporal. This was the case in three instances narrated in this paper, in which the autopsy revealed the position of the neoplasm, and was also the case in the three in which the

* Symptomatologie und Diagnostik der Hirngeschwulste, Wurzburg, 1865.

† Recherches sur le Ramollissement du Cerveau. Deux Edit., 1823.

Also: Hasse, Krankheiten des Gehirns, in Virchow's Handbuch der speciellen Pathologie und Therapie, p. 560—*et seq.*

existence of a tumor was inferred. When the membranes or convexity of the brain is the seat of the tumor, the pain is more generally superficial; at least subjectively more superficial. Todd* entertained the opinion that when the pain varies only in intensity and not in position, the irritation is seated in some superficial part of the brain or in the membranes. Russell Reynoldst† says that the pain "is usually confined to a definite point or region of the head and persists in that locality."

Vertigo.—This was well marked in five of the ten cases detailed in this paper. This symptom varies in intensity from a slight sensation of dizziness, to such disorder of voluntary movement as to render walking or standing difficult or impossible. Vertigo is undoubtedly frequently mistaken for disorder of the co-ordinating faculty. Hammond‡ shows this in his paper on the functions of the cerebellum: "The disorder of movements which results in birds and in animals immediately after injury of the cerebellum is not due to any loss of co-ordinating power, but is the result of vertigo."

Difficulty in standing or walking, staggering as if intoxicated, and finally inability to rise from the bed, may depend on vertigo, but they may also be due to ataxia, a symptom of irritation produced by an adventitious product. Vertigo, however, is a symptom common to tumors in various situations; ataxia is produced by irritation of parts at the base. Vertigo is diminished and often relieved by closure of the eyes and lying quiet; but this is not always the case, for Case IV. had a sensation of swimming or floating away when lying in bed with his eyes closed; and Case IX. has vertigo in any position.

Amaurosis.—Feebleness of vision and ultimately complete blindness are noted in a large majority of intra-cranial growths. The gradual development of amaurosis is not conclusive of the existence of a tumor, but only that there is present "a coarse organic lesion" of some kind. In six of the ten cases

* Clinical Lectures on Paralysis, American Edition, p. 34.

† System of Medicine, Vol. 2, p. 479.

‡ Quarterly Journal of Psychological Medicine, April, 1869, p. 233.

herein recorded amblyopia or amaurosis was present. This particular disorder of vision, as far as these cases indicate, does not so often occur when the neoplasm is situated in the upper and peripheral part of the encephalic mass; but the large number of facts collected by Luys,* Ogle,† Ladame‡ and others show that amaurosis may be produced by a tumor in any part of the brain, but preferably in certain situations in the center and at the base. Graefe held that the alterations in the retina were due to the pressure of the new formation on the cavernous sinus, whereby the return of blood from the orbit is obstructed; but Lancereaux,|| who has examined this question in an elaborate memoir, shows that this explanation is not true of a large number of cases in which there does not exist pressure sufficient to cause obstruction. So far as my own cases afford any insight into this pathological question, they indicate that other causes than pressure upon the cavernous sinus must be sought for to explain the changes in the retina. In Case I. the neoplasm directly compressed the left cavernous sinus, and in Case VIII. both the right and left; but in these two cases the retinal changes were not more pronounced than in Cases II., III. and IV., where such pressure could not have existed. As has been strenuously insisted on by Galezowsky, the neuro-retinitis which occurs in these cases is due to the transmission of the irritation along the optic tract, the chiasm and the nerves to the papillae, at least in the case of tumors at the base.§ Bouchut¶ gives a number of illustrative cuts showing the retinal changes which occur in various inflammatory and chronic diseases within the cranium, and Hughlings Jackson affirms that "so far as the production of optic neuritis by intra-cranial disease is concerned, the *position of the disease seems to be of little consequence*, and there is nothing very peculiar in

* Recherches sur le Systeme Nerveux Cerebro-Spinal, etc. Paris, 1865.

† British and Foreign Medico-Chirurg. Op. cit.

‡ Symp. and Diag. der Hirngeschwulste. Op. cit.

|| Archives Generales, January and February, 1864.

§ Etude Ophthalmoscopique sur les Alterations du Nerf Optique et sur les Maladies Cerebrales dont elles dependent. Chap. II, p. 138.

¶ Du Diagnostic des Maladies du Systeme Nerveux par L'Ophthalmoscopie. Paris, 1866.

its nature, except that it is usually coarse." The development of a tumor, or of a "coarse organic lesion" of any kind, causes irritation of neighboring parts and increased blood supply; congestion of the retinal veins in common with the intra-cranial veins, follows. The changes in the retina occur more quickly and are more pronounced, if in addition to the general derangement of the cerebral circulation there exists pressure on the cavernous sinus. If the tumor involves the tubercula quadrigemina, the optic tract, or the chiasm, atrophy of the papilla must occur as a direct result; but the change which is produced under these circumstances must be considered a special symptom, due to the development of disease in a particular locality.

Convulsions.—This symptom was present so far as the information obtained will warrant the statement, in but two of the ten cases. In one of these the tumor was situated in the left hemisphere, and in the other, in the cerebellum. All authorities express the opinion that tumors of the cerebellum are more commonly attended by epileptoid attacks, than adventitious growths in other situations. Russell Reynolds* expresses himself as follows:

"As the result of an examination of a large number of cases, it may be stated that convulsions are most common when the disease is situated in the posterior lobes of the brain, or in the cerebellum, and least frequent when the anterior lobes are affected."

My facts are scarcely in accord with this statement, for in one of the two in which convulsions existed, the tumor occupied the anterior lobe. So uncommon are convulsions in cases of tumor of the pons, that Ladame formulates the fact as follows:

"If a tumor has attained sufficient size to allow of its presence being diagnosticated, and if convulsions be present, the probability is the seat of the tumor is not in the Pons Varolii."

The cases which I have collected, support this statement,

*System of Medicine, Vol. II., page 480.

for in neither of these in which the neoplasm involved the pons, had convulsions occurred.

Mental Derangement.—Unequivocal evidences of mental derangement were observed in three of the ten cases herein reported. Some departure from the healthy mental state probably occurred in two others, but the facts are not sufficient to warrant an absolute statement. It is to be observed, that although mental aberration was produced by tumors of the base, as well as of the hemispheres, the resulting disorder of intellect differed in character and period of development. In the case of tumor involving the convolutions of the hemispheres, disorders of intellect followed the lesion very speedily.

When the neoplasm is developed at the base, mental derangement is produced not by direct interference with the centres of intellectual life, but is a product of the changes in the cerebral circulation leading at length to structural alterations of the cortical periphery. In coming to a conclusion as to the relative frequency of mental derangements in intra-cranial growths, the importance of these several factors should not be forgotten. The period at which a case is observed, or the length of time which it has continued without terminating fatally, will therefore be an important element in drawing conclusions from statistical data. Perrenout* having collected the opinions of various authorities on this point, some of whom are not accessible to me, I avail myself of his figures. According to him, Nasse places the proportion of cases, in which mental derangement occurs, to the whole number at 19 to 50. Andral and Durand Fardel, found that the intellectual faculties were not altered in the most of their cases. In Lebert's 90 cases, the intelligence was deranged in twenty-nine. Calmeil found that in one-half of his cases the mental faculties were affected. Russell Reynolds† simply refers to the fact that the intellectual faculties may be affected, but gives no statistical data. Ladame‡

*Etude Clinique sur le Diagnostic des Tumeurs Cerebrales. Archives Generales, 1865.

†System of Medicine, Vol. II, op. cit.

‡Symptom, und Diagnostik des Hirngeschwulste, op. cit.

holds that mental derangement occurs in about one-half of the cases, and is as frequent in tumors of the base, as in tumors of the hemispheres. This latter statement must be accepted with some reservation, for we find that disorders of mind are always present in cases of the so-called cysts of the arachnoid, which directly interfere by pressure with the gray matter of the convolutions.

II. The symptoms of the 2d class are more characteristic than those of the 1st. They enable us often to fix with great certainty and precision the fact of the existence of a growth, and the site which it occupies. They are therefore deserving of attentive consideration.

Alterations of sensibility.—In five of the ten cases herein reported, alterations of sensibility were observed in the distribution of the 5th pair, and these were all cases of tumor at the base. In two only was the nerve shown to be directly involved. In one only was the function of the nerve abolished. In four, the symptoms were those of irritation. Neuralgia of the 5th nerve, accordingly, must be regarded as a symptom of tumor at the base, and not of the hemispheres: it becomes therefore, a diagnostic mark of some importance; but it does not necessarily indicate pressure of the new formation on the nerve.

In three of the five cases in which the functions of the 5th were affected, there existed alterations of nutrition—epistaxis, herpes labialis, and ulcer of scalp; but the important negative fact observed by Dr. Williams, must not be overlooked, in which complete abolition of function did not produce any structural alterations in the distribution of the nerve.

In two cases, one supposed tumor of pons, the other case IV., hyperaesthesia existed in one half of the body.

Disorders of the Special Senses.—These are of great importance from the diagnostic point of view. I have already sufficiently alluded to amaurosis as a general symptom of intra-cranial growth. Atrophy of the optic papillæ may be caused by direct pressure on the optic chiasm, as in Case VIII., or by involving the tubercula quadrigemina; and part

of the visual field may be cut off by pressure on one of the optic tracts. The most characteristic symptoms as respects the organ of vision, are those due to irritation or destruction of function of 3rd pair. Four cases in ten, presented evidences of disorder in the function of this nerve. In one only, of these four, (Case I.) the nerve was directly impinged on by the growth; in the others the symptoms were those of irritation. The symptoms were most characteristic in Case I., the patient having divergent strabismus, ptosis, double vision, due to paralysis of the muscles to which the third nerve is distributed.* Double vision and nystagmus (the latter in two cases) are symptoms of irritation.

The *sense of smell* was abolished in three cases. In one, only, was this result due to direct pressure on olfactory nerves (Case VIII.); in the others this effect was secondary to alterations in the Schneiderian mucous membrane, produced by lesions of the 5th. Implication of the sense of smell, at an early period with coincident changes in the retina, and frontal headache, indicate a tumor of the anterior lobes, or of the pituitary body.

Hearing was affected in five of the ten cases—all cases of new formation of the base. The *portia mollis* does not appear to have been directly involved in any of them, but the loss or dullness of hearing was the result of secondary changes in the nutrition of the nerve.

The *sense of taste* was altered or abolished in three of the cases; probably in one, only, was it completely abolished. It is difficult to determine in these cases of intra-cranial growth how far the taste is affected. As this special sense is the property of two separate nerves—the glosso-pharyngeal and the gustatory branch of the 5th—their distribution being different, it will be rare to find both nerves interfered with by a single neoplasm.

* I need hardly remind the reader that the 3rd is distributed to the *levator palpebræ* and to all the muscles of the eye, except the *external rectus* and *superior oblique*.

Lussana* has attempted to show that the *corda tympani* is the true gustatory nerve. He brings forward some very striking clinical facts to prove that the special sense of taste heretofore supposed to be the property of the nervous filaments distributed to the base and point of the tongue from the glosso-pharyngeal and the 5th, resides really in the filaments derived from the *corda tympani*. If this be the case, alterations of taste should occur in those instances of intracranial growth involving the 7th nerve. Without at all assuming that my cases support the views of Lussana, it is certainly true that the sense of taste was most affected in those patients whose paretic facial muscles indicated serious functional disturbance of the 7th.

Disorders of Motility.—These are most common in cases of tumor at the base. They were observed in six of the ten cases, and were as follows:

Walking uncertain, difficult or impossible, in four.

Loss of power in one side in two.

Epileptoid convulsions in three.

Ataxia of various muscles in two.

Spasm of the muscles of the neck in one.

Paresis of the facial muscles in two.

As I have already called the attention of the reader to the fact that vertigo may produce disorder of locomotion, I need not now repeat my observations on this point.

A tumor involving the corpus striatum or optic thalamus, will cause hemiplegia. But hemiplegia may be produced by pressure on one of the *crura cerebri*, or by implication of the pons—a result, however, which is not always met with—for in Case I. the crus cerebri was pushed aside and a deep excavation made in the pons, yet the patient was not hemiplegic; he only “staggered like a drunken man.” When the seventh and the pons are implicated by a tumor, the paralysis of the face and of the lateral half of the body will be on opposite sides.

* Archives de Physiologie Normale et Pathologique, No. 1 and 2, for 18*

Vertigo, convulsions, disorders of locomotion, etc., are symptoms present in cases of tumor of the cerebellum. Vomiting, dysphagia, and obstinate constipation, accompany cases of tumor involving 9th, 10th, 11th and 12th nerves. These symptoms existed in two cases; in one of which the tumor impinged directly on the pneumogastric.

Although it is true, as I have remarked, that disorders of motility are most common in tumors of the base, yet they sometimes occur in tumors involving the hemispheres. In 28 cases reported by Ogle* paralysis was noted in 13 and convulsions in 10. More or less difficulty in locomotion is produced by the dizziness and vertigo experienced in a large degree by so many of these patients.

In two of my cases, some difficulty in the discharge of urine was noted. In a case of tumor of the pituitary gland, not published, but the particulars of which have come into my possession, non-saccharine diuresis was a prominent symptom. No facts of value have fallen under my observation, as to the influence of a tumor of the fourth ventricle on the production of sugar. A specimen (series IV., specimen 6,) is now in the Museum of the Cincinnati Hospital—"cyst lying upon valve of Vieussens"—in regard to which it is stated that there were "no symptoms." Ogle relates five cases in which the 4th ventricle was affected by the new formation, but in not one does there seem to have occurred a saccharine condition of the urine. Structural alterations, it is true, were found in the kidneys in one case, but these were apparently accidental.

* British & Foreign Medico-Chirurgical Review. Op. Cit.





