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A REPORT OF THREE PRE-FRONTAL TUMORS¹

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The following cases are of interest both because of the symptoms present and because of the large size of the growths.

CASE I. C. J. L., age 59, male, white, bookkeeper, consulted the writer October 23, 1909.

Family History.—The family history was negative save that both the patient's mother and maternal grandfather had died of disease of the heart.

Personal History.—The patient had had the ordinary diseases of childhood. He had always been delicate but had not passed through any serious illness confining him to bed. At the age of nineteen, however, he had had a hemorrhage apparently from the lungs which followed severe muscular exertion.

In November, 1904, he was thrown from a wagon, striking upon the left side of the back of the head. He became unconscious and was taken to the Pennsylvania Hospital. There was some bleeding from the left ear. He remained at the hospital one week. Subsequently he was apparently well and experienced no ill-effects from the accident. His wife, however, thought that since the accident he held his head inclined somewhat toward the left.

In June, 1906, and again in January, 1907, he suffered from a moderate hemoptysis and he at various times complained of pains which he referred to his chest.

Present Illness.—In the summer of 1909 he was obliged to do an unusual amount of work and became much exhausted. He noted that he could not do his work as well as formerly. This

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was observed by his employers, who relieved him for a time from his duties. Subsequently he resumed the latter for a time but felt that his efficiency had not been improved.

On October 12, while at his home, he suddenly suffered from a seizure during which his left leg jerked. His wife, who was nearby, thinks that the left arm was also involved. He was not unconscious. Afterward the left side felt strangely; as he expressed it, it was in some way affected. He did not complain of headache nor was there any history of vomiting. Mentally he seemed somewhat obtuse and was distinctly slow in his replies.

Examined October 23, the following notes were made:

Station normal. Gait normal, save that he walks with a decided droop of the left shoulder. There is no weakness of either leg. The grip is good with either hand; somewhat less in the left than in the right, though not disproportionately so. He disclaims any sensation of weakness in the left side. There is no astereognosis. The tongue is protruded in the median line and is slightly tremulous. The lips are protruded firmly. The angles of the mouth are retracted equally well. Palpebral fissures are equal, pupils are equal and respond promptly to light and accommodation. The knee jerks are both somewhat plus. There is no ankle clonus and no Babinski sign.

The general visceral examination revealed a double mitral murmur with sharp first and second sounds and a pulse of low tension. An examination of the chest by Dr. S. Solis-Cohen revealed some retraction both above and below the clavicles on both sides; also dulness over the upper portion anteriorly. No rales could be made out but expiration was somewhat harsh and prolonged. The Moro test made subsequently gave positive results.

An examination of the urine was negative.

On October 26, Dr. H. F. Hansell made an examination of the eyes and reported that there was no evidence whatever of increased intracranial pressure, that both fundi were normal and that there was no contraction of the visual fields; further that the muscles of the eyes were normal and that the pupils were equal and responsive.

On the same date Dr. S. MacCuen Smith made an examination of the ears and reported that he could find nothing abnormal; he did not think it likely that the hemorrhage from the left ear which occurred at the time of the fall from the wagon had been due to a fracture.

On October 28 he was again reexamined by myself. His wife reported that he had been in a "dreamy" state of mind and that he seemed to have no idea of time. She states, for instance, that he remained in the toilet for as long as three quarters of an hour when formerly he would remain but a few minutes; also that it takes him a very long time in the morning to dress; that he will

brush a piece of clothing or one part of a garment mechanically and for a long time. He is distinctly dazed and she thinks at times confused. She cannot trust him to go out alone. He does not seem to know what he wants to do. His wife adds also that at table he eats mechanically. He now eats in large quantity where formerly he was a light eater. He often forgets what he is doing; at times he does not seem to know just where he is; sometimes loses himself in his own house.

He does not retain his urine well; he not infrequently soils his clothing. His wife states further that he does not seem to notice the change in his condition; that he does not manifest any anxiety about himself. He does not worry and assumes no responsibilities regarding his affairs.

No seizures or convulsive movements have occurred since his previous visit. In reply to questions the patient now says that he has headache and that he has had it for three or four days. Asked to indicate its position, he places his hands on the top of his head. There has been no vomiting.

The patient's appearance is that of a person who is slightly dazed and his expression is somewhat vacant. The general physical examination reveals the same facts as before; no modifications of reflexes, no local weakness and no changes in gait or station. His pulse rate is 72.

On October 30 the patient was again examined. In reply to questions he again says that he has headache which he now refers to the frontal region and to the vertex. He is, as before, slightly dazed and confused. He answers questions slowly.

No sensory anomalies are noted and there is no involvement of the sphincters save that he sometimes urinates involuntarily; there is also marked delay in micturition.

The patient now passed from under my immediate observation, but from his family and family physician, Dr. Frank Lehman, of Bristol, Pa., it was learned that his mental condition slowly and steadily became more pronounced. He gradually became very somnolent, more confused and incompetent; could no longer feed himself, became bed-ridden and stuporous and finally died of exhaustion on December 4, 1909. Upon one occasion only had he vomited.

An autopsy was performed at his home by Dr. John Funke, pathologist of Jefferson Hospital; the autopsy was limited to removal of the brain.

A horizontal section of the brain just below the level of the corpus callosum revealed a large tumor in the right frontal lobe. It was situated well beneath the cortex and did not involve the basal ganglia or capsule. The anterior limb of the capsule and head of the caudate nucleus appear to have been slightly displaced by pressure. The tumor is of irregular rounded shape, measuring 5 cm. in its largest diameter. A microscopic examination reveals it to be a round cell sarcoma.

CASE II. C. B., female, age 18, single, white, was admitted to the Jefferson Hospital, November 2, 1909.

Family History.—The family history is practically negative. The father died of disease of the heart; two brothers of causes unknown; while the mother and one brother are living and in

FIG. 1. Case I.

good health. There is no history of renal, pulmonary or malignant disease in the family.

Personal History.—The personal history is also largely negative. The patient has always enjoyed good health until the onset

of the present trouble. Does not remember ever having had any of the infectious diseases of childhood. Menstruation began at the age of fifteen; was regular and painless.

Present Illness.—The first signs of the present illness began four weeks before admission to the hospital. The patient was seized with a very severe headache which began in the frontal region, but soon spread over the head. The headache became constant and was accompanied by vomiting. At times the patient would vomit only once a day and at other times she would vomit almost an entire day. The headaches were subject to severe exacerbations which were often ushered in by a chill—apparently a “nervous chill”—and accompanied by a sensation of chilliness. She also suffered frequently from dizziness and this became so severe that if standing or walking, she would frequently be obliged to sit down. Two weeks before admission she began to suffer from pain in the left upper extremity, the pain extending from the fingers to the elbow. Subsequently she also had pain in the left leg and this leg she states was somewhat painful on pressure. She rapidly lost strength. Her appetite continued good and her bowels regular. There was no history of convulsive seizures. Mentally she was dull and apathetic. She lay still in bed, not speaking unless spoken to; was somewhat somnolent. When roused spoke slowly but was able to give a tolerably clear account of her case.

Condition on Admission.—The patient was a fairly well-developed and well-nourished girl of eighteen. Her face had rather a dull and heavy expression. The skin was dry and warm. The subcutaneous fat was abundant, the musculature was firm and respiration, pulse and temperature were normal.

Station was almost though not quite normal. It was a trifle unsteady, especially with eyes closed. Her gait was normal save that she tended to deviate toward the left.

There was a slight flattening of the lower half of the right side of the face. This flattening was not marked but it was quite distinct. When her facial muscles were called into play, the mouth would be distinctly drawn to the left; occasionally also slight muscular twitchings were noted on the left side. Together with the weakness on the right side of the face, there was present a slight though unmistakable weakness of the left arm and left leg; that is, there were present the signs of a crossed hemiplegia, slight in degree. There was no tremor nor was there any ataxia. The tendon reactions were equal and normal upon both sides. A Babinski was absent upon both sides. The cutaneous reflexes were present on both sides. The sphincters were normal.

An examination failed to reveal the pain upon pressure in the left leg of which the patient complained. It did, however, reveal hyperesthesia over the left arm and over both legs. It also revealed typical areas of painful hyperesthesia under both breasts

and over both groins; also a limited area over the left parietal region. No other sensory anomalies were discovered. Tactile, temperature and pain sensations in regions elsewhere than the regions described were normal. Stereognosis was normal in both hands.

An examination of the eyes on November 3, 1909, by Dr. Le Fevre reveals a slight exophthalmos; also a pseudo-ptosis, though there is not present a true paralysis of either levator. Only one quarter of the normal visual acuity is present. Both the pupils dilate to 5 mm., but do not react to light and but slightly to accommodation and convergence. Accommodation is not paralyzed and the extraocular muscles do not seem to be involved. Both nerve heads are swollen, the left more than the right, the swelling amounting to several diopters, the exact number being impossible to determine on account of the patient's failure to fix. Both retinae are edematous with engorged and tortuous veins. Nystagmus is not present.

An examination of the hearing, smell and taste reveals negative findings.

Speech is slow though not otherwise affected. Mentally, though the patient answers her questions fairly well, she seems dull and heavy.

The general visceral examination is negative. The tongue is dry and coated but reddened at the tip and edges. While the buccal mucous membrane is pale, the fauces are normal and the tonsils are not enlarged. There are no palpable lymph nodes and there is no enlargement of the thyroid gland. Examination of the lungs, heart and blood-vessels is negative. The abdomen is somewhat distended and tympanitic and tenderness appears to be present on deep palpation over the spleen and liver. These organs are, however, not enlarged.

Examinations of the urine and of the blood were negative.

Because of the very positive character of the symptoms, a decompressive operation was urged but at the time declined.

Reexamined upon subsequent occasions, it was found that the paresis noted in the left extremities varied at times. On December 6, for instance, it was much less perceptible than previously. The hyperesthesia over the left arm and leg had, however, become more marked. A typical Babinski sign had also been added to the other symptoms already present. There was no change, however in the tendon reflexes.

Reexamined on December 6 by Dr. Le Fevre, it was noted that the pupils now fail to react both to light or to convergence. Both pupils are equal, being about 6 mm. in diameter. There is an absence of converging power and a failure to abduct either eye past the primary position. Abduction is limited one half in both eyes. There is a slight rotation in the vertical axis. Vision has become much diminished. There is light perception but she

can no longer count fingers. The right nerve head is swollen four diopters; the left nerve head six diopters. In other words there is present a marked double optic neuritis, palsy of both external oblique muscles and paresis of all the other ocular muscles. Nystagmus is not present.

Consent to operation was finally obtained. Because of the

FIG. 2. Case II.

symptoms of crossed or alternate hemiplegia, slight though they were, it was thought not unlikely that the tumor was in the right pontine angle, and accordingly on December 8, Dr. F. T. Stewart made a free sub-tentorial exploration on the right side, but no tumor was found. Though the hemorrhage was not excessive,

the patient did not rally from the shock of the operation and died on the following day.

At the autopsy it was found that "the left hemisphere is distinctly larger than the right. The anterior portion of the parietal lobe just anterior to the Rolandic fissure, bulges, but on pressure this bulging disappears; the convolutions are somewhat flattened. On separating the hemispheres, slight bulging is noticed on the mesial surface of the left frontal lobe just anterior to the genu of the corpus callosum. The pia and arachnoid are somewhat adherent to the brain substance along the mesial edge of the left hemisphere."

A horizontal section of the cerebrum revealed a large tumor deeply imbedded in the left prefrontal region. It measures 4.3 cm. in its greatest diameter. It evidently interfered by pressure with both the anterior portions of the caudate nucleus, of the lenticula, and of the anterior limb of the capsule. The slight paresis of the right lower face was clearly a distance symptom as was also the slight and transitory weakness of the left leg and arm. Just why the last mentioned symptom should have been present and upon the left side is somewhat difficult to explain.

A microscopical examination revealed the tumor to be a round cell sarcoma.

CASE III. M. S., age 32, white, single, male, merchant, was brought to the writer for examination by his family physician, Dr. Louis Jurist, on December 7, 1909.

Family History.—The family history was negative save that several members were nervous and that a younger brother had died of tuberculosis.

Personal History.—Patient was apparently well at birth. In childhood had measles and scarlet fever from which he apparently made good recoveries. Had typhoid fever at about fifteen; again made a good recovery without sequelæ. Some years ago while riding a bicycle at Atlantic City, struck his testicles, bruising them severely. They became much swollen and the left testicle subsequently atrophied. He was confined to bed for about five weeks.

About March 1, 1908, he sprained his ankle but was well again in a few days. He has had no other accidents. There is no history of any infection.

One evening, in July, 1908, while sitting on the steps of a club house, he suddenly "fainted." He lost consciousness and when he came to found that he had bitten his tongue. He did not soil his clothes. He says, however, that he has passed water into his bed several times in his sleep during the past year; that recently in the day time while riding in a train, he lost control over his bladder and wet his clothes. He says that he felt the desire but could not relieve himself quickly enough; says he knew what was happening. About two months ago he was in a

barber's chair being shaved. He told the barber to hurry as he felt that his bowels would have to be moved. In a moment or two he asked the barber to stop but before the latter could do so, his bowels had moved into his clothes.

Upon one occasion he walked into a post at his place of business and in various ways betrayed either gross inattention to his surroundings or marked failure of vision. It was noticed also that his capacity in business had suffered decidedly and that he had also become increasingly indifferent to business. He was finally persuaded to consult Dr. George E. de Schweinitz, which he did on November 30, 1909. Dr. de Schweinitz discovered a double optic neuritis and at once referred him to his family physician. Though warned as to the extremely serious nature of his condition, he did not give the latter an opportunity to make an examination until some two or three days had elapsed. He failed to appreciate the gravity of his condition; and the anxiety of his relatives made no impression upon him.

Present Condition.—In answer to questions, he states that he has had headache off and on, but that he has not had any headache for the last two weeks. Thinks he has not suffered from headache to any marked degree. About five years ago he suffered from dizziness. Has not suffered from dizziness lately. During the last few weeks he has had ringing in the ears. For about two weeks he has noticed that he cannot read as well as before.

The patient's answers to questions are somewhat variable and he is at times distinctly confused. He smiles readily and seems quietly pleased. He manifests no anxiety as to his condition. He asks no questions.

Physical Examination.—His gait is normal; there is no difficulty of station and he maintains his weight equally well upon either leg alone. A little intention tremor is present in the hands but it rapidly disappears. The grip is normal. The knee jerks are double plus; the left more so than the right. The right tendo Achillis jerk is prompt and perhaps a trifle plus. The left tendo Achillis jerk is decidedly plus. There is no ankle clonus, no Babinski or other reactions upon either side. The plantar reflex is a little more active upon the right side than upon the left, the toes being flexed more decidedly. The biceps and triceps reactions both are plus; a little more so on the left side than on the right. Jaw jerk active but not plus. The palpebral fissures are unequal, the right being a trifle larger than the left. The right eyeball is a little more prominent than its fellow. The naso-labial folds are equal. The angles of the mouth are retracted equally and the tongue is protruded normally; it is also held steadily without tremor. The countenance is somewhat full as though the features were slightly tumid.

There are no sensory anomalies, though the patient complains of a slight numbness of the fingers of both hands.

A small lipomatous mass, about an inch in diameter, freely movable, is found in the flexure of the left elbow. A similar though smaller mass is found in the flexure of the right arm. A small lipoma is also found in the right hypochondrium and another small lipoma on the outer aspect of the upper third of the right thigh. There is also a small scar in this situation from which a former lipoma has been removed.

The patient weighs 170 pounds. His height is five feet ten and a half inches.

The general visceral examination was negative.

Dr. de Schweinitz reported "Double choked disc, the surface of the swelling being about 3.50 to 4 D., about .50 D. higher on the left than on the right side; no hemorrhages and no macular figure, but the veins exceedingly dark. Vision is reduced to two-sevenths of normal in the right eye and two-thirds of normal in the left eye. The field of vision shows that there is a little tendency, in addition to general contraction, to symmetrical cuts on the nasal side, as if there might be a basal lesion to account for this, although of course exactly the same sort of cuts would be produced by the neuritic process. An interesting observation is the distinct exophthalmos of the right eye. Measured with Hertel's instrument, the proptosis is 20 mm., as compared with about 14 mm., or practically normal, on the left side."

The diagnosis of a probable frontal tumor was made and the patient was admitted to Jefferson Hospital on December 8. Here the previous findings were confirmed. Especially was this true of his mental condition. Thus it was noted that he dresses and undresses slowly, that he plays with the water in the wash basin and forgets to wash himself. Again, when he attempts to take a bath, he allows the water to enter the tub, may get into the tub, may stand in it and then may get out again, forgetting to bathe. At one time a brother came to see him and immediately afterwards he asked that his brother be sent for; he had forgotten that his brother had just called. He was also somewhat somnolent.

There is no history of any disease of the ears nor has the patient suffered from any affection, as far as can be learned, of the nasal passages, that is, there has been no history of recent cold or catarrhal discharge. Dr. S. MacCuen Smith made an examination of the ears and of the various sinuses of the skull. His examination failed to reveal any infection of these structures.

A Nogouchi-Wassermann test was made and proved negative.

On December 10 he was seen by Dr. M. Allen Starr in consultation and at this time the slight predominance of the tendon reactions upon the right side, noted at previous examinations, was not evident. Subsequently the difference in the tendon reactions of the two sides was again noted.

On December 11 a free decompression was made in the right temporal region by Dr. John H. Gibbon.

The immediate effect of the operation was to somewhat diminish the amount of swelling without improving the vision.

FIG. 3. Case III. Extensive destruction is shown in the right frontal lobe; also in the adjacent portion of the left frontal lobe; there is also a large area of softening adjacent to and involving the anterior portion of the right lenticula, and another in the caudate nucleus.

The latter continued slowly but unmistakably to fail. On December 22 he was seen by Dr. George W. Jacoby. The symptoms noted previously were confirmed. Finally consent was secured for a radical exploration of the right frontal region.

This was undertaken by Dr. Gibbon on December 26 and resulted in the removal of a large tumor weighing $7\frac{3}{4}$ ounces. The histological examination revealed it to be an endothelioma.

The following are the notes on operations performed by Dr. Gibbon:

The first operation, December 11, 1909, was one of simple decompression for the purpose of preserving what remained of the sight, while a further attempt was being made to definitely locate the tumor.

Under chlorid of ethyl-ether anesthesia, preceded by morphia and atropin, a subtemporal decompression was done. The opening was nearly circular and measured $2\frac{1}{4}$ inches in diameter. The dura was divided along the lower half of this opening and allowed to retract to the upper portion. There was very marked intracranial pressure but no area of hardening could be felt and pulsation was distinct. An excellent exposure of the temporal region was obtained by retracting the split temporal muscle. The muscle was accurately approximated over the protruding brain and the wound closed without drainage. The operation was brief and the convalescence was perfectly satisfactory.

Second Operation, December 26, 1909.—Some temporary improvement in the eye condition followed the decompression but as other symptoms of compression developed it was finally determined that an exploration of the right frontal lobe should be done. A stereoptican X-ray plate, made by Dr. Manges, showed a peculiar irregularity in the thickness of the frontal bones which we were unable to interpret. It was determined to make a keystone-shaped osteoplastic flap hinged at the line of the decompression opening. The operation was performed under morphia-chlorid of ethyl-ether anesthesia. As soon as the soft parts were divided along the middle line a number of large veins were exposed and rough bone encountered; these conditions were most marked at about the point of juncture of the frontal and parietal bones. The skull along the median line was extremely thin, at one or two points being no thicker than blotting paper. The dura was not adherent to the bone. The bone was cut with a Hudson bur and forceps. When the flap was turned back the under surface of the bone was rough and very irregular. The brain pulsated but in spite of the decompression an abnormal amount of tension was present. A large dural flap was reflected, its base being at the line of decompression. Marked protrusion of the brain took place when the dura was removed. On examining the mesial aspect of the frontal lobe a large projecting tumor could be seen and felt. The overlying brain in front of the tumor was normal though thin, and could be lifted up and the tumor seen beneath it. The tumor was found on exploration to be an enormous one, extending all the way down to the base of the skull, where it was adherent,

and over to the left side of the median line for about an inch and a half or two inches; no difficulty was experienced in separating it except at the base and on the left side. A profuse hemorrhage was expected, probably from the cavernous sinus, when the tumor was separated from its attachments below, but we were agreeably surprised to find that there was comparatively little bleeding when the tumor was removed. On examining the tumor, which

FIG. 4. Tumor removed from Case III. Dimensions of tumor: $9\frac{1}{2}$ cm. long, 9 cm. broad, 6 cm. thick, 29 cm. circumference. Weight $7\frac{3}{4}$ oz.

was the size of one's fist, the enucleation seemed to have been complete, but on exploring the cavity a small portion of the growth, which was quite free, was found. The tumor was the largest the operator had ever seen. The enormous cavity left after the removal of the growth could be considerably diminished by compressing the protruding brain at the site of the previous decompression. The skull on the left side of the median line, for

about an inch and a half, or two inches, presented much the same condition as that on the right side, but there were many elevations and depressions. It was this condition of the skull which the X-ray plate showed and which we were unable to interpret. Two gauze drains were introduced into the cavity because there was some oozing, and a similar one placed against the longitudinal sinus where there was a little bleeding. The dura was completely and accurately closed excepting at the point of drainage. The entire operation occupied one hour and four minutes and at the conclusion the pulse rate was 80 and the patient's condition excellent.

December 28, 1909.—The patient has done remarkably well since the operation. On recovering consciousness it was noted that he had a palsy, although not complete, of the left arm and leg, but in the course of six hours this had nearly disappeared. Since the operation the temperature has ranged between 100 and 101°, and the pulse rate has been very rapid, ranging between 144 and 115°. He has been perfectly quiet and slept a great deal, although his answers to questions are very much slower than formerly; at the same time they are more responsive and it would appear that his mental condition is much nearer the normal than before his operation. He has had nearly constant dribbling of urine but not the dribbling of retention. There has been considerable oozing but no bleeding. The original packs were removed to-day.

January 8, 1910.—At the end of a week after the operation the patient's condition was remarkably satisfactory, temperature normal and pulse slow, and we felt hopeful of his recovery. His mental condition was better than it was before the operation and in every respect he was in good shape. About this time, however, he began to develop a rise in temperature and slept a great deal. Thinking that there might be some accumulation in the wound I explored it thoroughly with my finger but found no pus. A large quantity of necrotic brain tissue escaped at each of the recent dressings. For the last four days the temperature has remained between 105 and 107°; there has been no evidence of any accumulation and the discharge from the wound is made up of serum, brain tissue and blood. The patient died this morning. The post-mortem examination revealed considerable softening and necrosis of the left frontal lobe, together with a well-marked pachymeningitis over a limited area in the left frontal region. No accumulation of pus was found in the skull.

The symptoms present in the above cases are of unusual interest. Vague mental symptoms were present in all of them. Case I, indeed, suggested symptoms not unlike those of profound cerebral exhaustion or indeed of a beginning paresis. The headache had never been a marked feature of the case and was only elicited

by questioning. It existed only for a short time previous to his death; vomiting occurred but once and that only toward the very close of his illness. The absence of optic neuritis was also remarkable, as was also the absence of any involvement of the visual fields. The only symptom which was at all suggestive was the one attack of slight twitching of the left leg and possibly twitching of the left arm which occurred a few days before he came under observation; the attack was very brief in duration and was not attended by loss of consciousness. Occasionally psychic vesical incontinence was present.

In the second case there was early present headache, optic neuritis and vomiting, all of the symptoms being typical and marked. The feature of special interest is the slight flattening of the lower half of the right side of the face and the equally slight involvement of the left leg and arm. These symptoms, as already suggested, were in all probability due in part at least to indirect pressure. The subjective sensory disturbances in the left leg and left arm, namely, pain and the hyperesthesia of the left arm and both legs, are somewhat difficult to explain. The occurrence of typical areas of hysterical painful hyperesthesia under both breasts and over both groins is exceedingly interesting and important and must be borne in mind in considering the other symptoms present. The area of hyperesthesia upon the left parietal region was also small and resembled in other respects an area of hysterical hyperesthesia, though it was present on the same side as the tumor; the question arises whether the left hemiparesis, present for a time only, was not also hysterical in origin.

In Case III optic neuritis was pronounced. Headache was scarcely, if at all, present. Vomiting was absent. Case III is remarkable for the size of the growth which had probably existed for a long time previous to the seizure which occurred in the summer of 1908. That so large a growth could have been present and the patient still have been able even in a degree to attend to his business and ordinary affairs is very remarkable. Finally, the resemblance of the mental symptoms in Cases I and III to those of paresis is worthy of comment. Case I was placid, indifferent and did not manifest the least anxiety as to his condition. Case III was at times distinctly expansive, good-humored and not infrequently laughed and joked. Case II, though quiet, complained at times greatly of suffering; at no time was she jocose

nor was there any tendency to laughter or hilarity. Again indifference to the sphincters was not observed. Finally, there were no epileptiform seizures. The eye muscle symptoms made their appearance late and are probably to be referred directly to the frontal lobe lesion; in part they may have been due to the blindness and the absence of fixation.

In many respects the above cases conformed to the ordinary observations made in prefrontal tumors. This was particularly the case as regards the mental symptoms which were most marked in Case III, less marked in Case I and least in Case II. Psychic incontinence was pronounced in Cases I and III. Epileptiform seizures were present but once in Cases I and III and absent altogether in Case II. Optic neuritis was present in Cases II and III, and absent in Case I; the swelling was more marked on the side of the tumor in Case II and slightly greater on the side opposite the tumor in Case III. Local tenderness of the skull was present only in Case II, was on the same side as the tumor, but was parietal and not frontal.

Finally, it is interesting to note that in only one of the cases, Case II, was there present any ataxia. In Case II the patient in walking deviated toward the side of the tumor.

It should be added that no X-ray examination was made in Case I. In Case II an X-ray examination was negative. In Case III an X-ray examination was also negative save that it revealed some irregularity of the inner surface of the frontal bone upon the right side; also some apparent thinning of the bone. The possible etiological value of trauma is well illustrated in Case I.