

TWO CASES OF TUMOR OF THE PONS¹

BY PHILIP ZENNER, A.M., M.D.

CINCINNATI

PROFESSOR OF NEUROLOGY IN THE MEDICAL DEPARTMENT OF THE UNIVERSITY
OF CINCINNATI

The two following cases are reported because they appear to me to be of much interest.

CASE I.—T. D., age five and one half years, was brought to me January 10, 1907, by his father, a physician living in Kentucky. He had had convulsions on several occasions when ill, the last time at the beginning of an attack of measles, when three years old. Otherwise he had been well.

The history of his illness is as follows:

On December 15, 1906, it was observed that the eyes were crossed. December 25, he cried with pains in the head. Since then he vomited occasionally, was constipated, was often drowsy and tired, and frequently sighed and yawned. The headache was not constant, but appeared to be increasing in intensity. The squint at first would come and go but was persistent the two weeks before I saw him. His physician states that the first week after symptoms appeared the pulse had been 60 to 65, but since then it had been mostly eighty.

At the time of my examination there was paralysis of the left abducens. Though the father stated that the child often stumbled, no other paralysis could be detected. The gait appeared to be normal, as were also the reflexes and optic disks.

The pulse was 96, temperature normal, appetite good, urine 1,020, no albumin, no sugar.

The boy was brought to me again on March 20, 1907. The symptoms had persisted. The headache was more continuous, but appeared to be less severe. He vomited less frequently. He was more drowsy and tired, so that he scarcely played at all. He could not bear noises, was emotional, and cried frequently. It was often observed that he appeared to choke in swallowing fluids. For two months some weakness of the right side had been observed, and this was on the increase. He was restless in sleep, and during sleep would occasionally have hemispasm, which would occur on the left (the non-paralyzed) side even more fre-

¹ Read at the thirty-fifth annual meeting of the American Neurological Association, May 27, 28 and 29, 1909.

quently than on the right. For some weeks he had had painful micturition, and passed only four to six ounces of urine daily. Examination of urine negative.

The examination on this date revealed a right hemiparesis, but the movements of the arm and leg were rather awkward than lacking in power. There was Babinski right, but no noticeable increase in the tendon reflexes. The tongue deflected toward the right. As to the face, at one time it would appear as though the left side was better innervated, at another time the right. The paralysis of the left abducens was unchanged. There was now distinct double optic neuritis with small hemorrhages into the retinae.

The child was brought to me the third time April 15, 1907. He had been getting progressively worse. His headache was more severe, his vomiting was more frequent, and his disability was increasing. There was still painful micturition, though the quantity of urine was normal, and there was nothing otherwise abnormal about it. On two occasions there had been strong retraction of the head.

At the time of this examination there was a more distinct hemiparesis. The right arm and leg were stiff and awkward, but there was also manifest loss of power, especially in hand and foot, and there was an increase in the tendon reflexes of the right arm. There was no increase of the tendon reflexes of the leg, but there was still Babinski right. The tongue deflected to the right. No facial paralysis could be determined, but there was not much facial expression. There was no impairment of sensation. Abducens paralysis as before. There was now very pronounced choked disk in each eye. Vision of left eye had quite recently become impaired. Vision of right eye normal. Hearing normal right and left. There was no pain on percussing the skull.

Hitherto there had been some wavering in diagnosis. After this examination I expressed the opinion that there was a tumor involving the left hemisphere of the cerebellum pressing upon the pons, and urged an operation. On account of a degree of uncertainty as to the exact seat of the tumor, and the doubtful issue, the father after first consenting, finally declined an operation.

On May 3, 1907, the father brought the boy to Cincinnati for an operation, as he believed that the child could otherwise live but a few days longer. He had had frequent attacks of retraction of the head and very severe headache; his swallowing had been worse, speech had become indistinct, and he could not sit up, for he could not hold up his head. When he tried to sit up the head would fall to one side or the other.

There was now, in addition, a lessening of the corneal reflex in the left eye, and to some extent in the right, and a distinct ankle clonus right. The mind had remained clear throughout.

At this time I stated to the father that the rapid increase and

severity of the pontile symptoms made it very doubtful whether they were due merely to pressure of a tumor from without. But inasmuch as there was doubt, he decided to give the child his one chance, if there were any.

On May 4, Dr. Ransohoff operated for tumor of the left hemisphere of the cerebellum. He failed to find anything, and the child died a few minutes after he was removed from the table.

The whole duration of the disease from the first appearance of symptoms was less than five months. Doubtless the child would have lived but a short time longer if no operation had been performed. The specimen was sent for examination to the Pathological Institute of the State of New York. The following is the report of Dr. Chas. I. Lambert.

The basal nuclei, midbrain and hindbrain corresponding to a Meynert's dissection was received in Kaiserling's fluid (No. 1). The specimen is mechanically somewhat distorted, due to tumor growth and fixation, the basal nuclei being flattened ventrally and the cerebellum dorsally. The medulla, pons, midbrain and crura have been somewhat telescoped on one another, especially in the neighborhood of the midbrain and crura, resulting essentially from a tumor growth in the pons. The right crus is torn almost completely through transversely, the left partially so, and both are considerably swollen. The pons itself is swollen and bulging and has a stiff jelly-like consistency. The basilar artery is overlapped by the adjacent bulging margins (see stained section). The left inferior margin of the pons is considerably more swollen than on the right side. The lower part of the medulla, including the olives, is rather firm and moderately swollen. Of the cranial nerves the left optic is compressed (perhaps fixation), the right is free; the third nerves are intact, the fourth were not found, the fifth are present, the sixth have been torn away, the seventh and eighth pairs are present and free from apparent involvement, as well as the remaining ones.

The right cerebellar lobe is fairly well preserved, the middle portion of the left and the posterior aspect of the vermis have been in part removed and the exact relations here have been obscured.

A transverse section was made through the middle of the pons and cerebellum through the roots of the fifth pair of nerves. The markings of the pons usually seen on its cut surface are obscured and are only seen in its more dorsal part. The cut surface of the tumor, particularly in the pons, presents an unusually moist and translucent, glossy appearance, much resembling an edematous condition. The tegmentum presents a slightly hemorrhagic appearance due to petechial hemorrhages. A transverse slice was taken at this level for sectioning. Other transverse cuts were made through the brain stem, but nothing beyond a diffuse tumor involvement of the normal tissues was observed.

SUMMARY

A portion of the forebrain and hindbrain, including the basal nuclei, mid and hindbrain received in Kaiserling's fluid No. I. A diffuse tumor without demonstrable capsule or boundaries involves the entire pons almost symmetrically, but more especially the left side, also extends laterally into the arms of the cerebellum. Moreover, it probably extends forward and backward of the pons borders. The adjacent structures have been considerably compressed, especially the midbrain. The fourth and sixth pairs of nerves were not found. A slice was taken through the tumor about the middle of the pons and cerebellum for cell study.

Sections from this block were stained with hematoxylin and eosin, hematoxylin and picro-fuchsin and Mallory's neuroglia stain; the former for cytological studies, the second more especially for the conjunctival elements and the latter particularly for the neuroglia.²

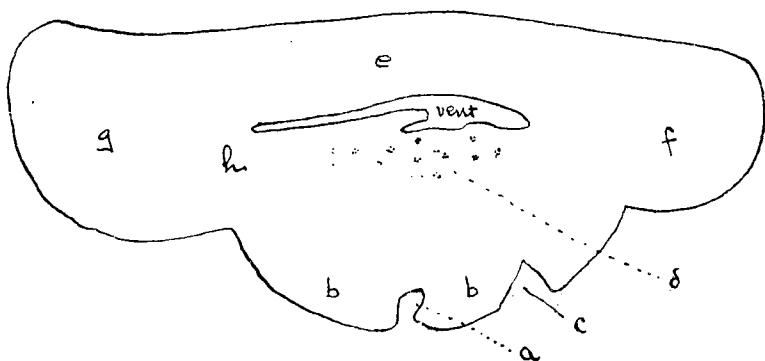


FIG. 1. Outline of whole section. *a*, Basilar artery; *b*, Pons tissue, etc.; *c*, Incision; *d*, Hemorrhages; *e*, Vermis; *f*, Right arm; *g*, Left arm.

In the former stain (hematoxylin and eosin) the characteristic outline features of both pons and cerebellum are well seen, although somewhat distorted by the tumor growth and subsequent fixation. The pons tissue adjacent to the basilar artery (Fig. 1, *a*, artery; *b*, pons—compare with section) shows how the new growth has overlapped and imbedded this vessel. The nick to the right (Fig. 1, *c*) is through the incision made into the left pons arm at the time of autopsy. In this section the normally apparent transverse striation of the pons fibers, with the bundles of pyramidal fibers cut across is not seen, but is suggested in the neuroglia stained section. In the tegmental portion of the pons numerous small petechial hemorrhages are seen. These are of recent origin,

² The sections through an accident in imbedding appear cracked through the middle and are reversed on the slides, the right should be left and vice versa, as scratched on the slide.

as the normal morphology of the blood elements and absence of pigmentary changes would suggest.

Microscopically.—The cell types and character of the tumor matrix, the manner of growth and extension, and its relation to normal tissue elements, denote a glioma of a diffuse variety.

The area of maximum cell richness and tumor growth is in the pons itself, especially on the left side, the tumor process fading in intensity toward the periphery of the pons and cerebellum. Evidence of cellular activity and tumor growth in many places may be traced not only into the cerebellar arms on either side, especially the left, but even into the subdivisions and folia of the

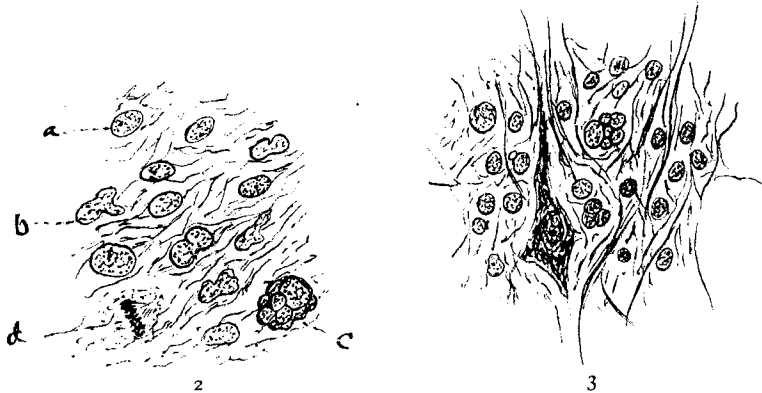


FIG. 2. A schematic picture of the tumor tissue and nuclear types. *a*, Oval forms; *b*, Lobate, etc.; *c*, Blackberries; *d*, Mitotic figure.

FIG. 3. A schematic drawing suggestive of the character of the fibrillar stroma, relation to nuclei and nerve cells.

cerebellum. In Fig. 1, at points indicated by *g*, *e*, *f*, such indications of tumor growth may be seen; only at occasional intervals islands of fairly normal tissue are seen, as in the left arm at *h*.

Study of the tumor tissue under the oil immersion shows a large variety of nuclear forms and divisions. A description of any one part of the tumor is fairly characteristic of the tumor as a whole. The richness in number and variety of nuclei is most apparent in the pons itself, the most probable center of the tumor growth.

For the most part the nuclei are round or oval and fairly rich in chromatin. Besides these there are a large variety of nuclear forms, from the oval to the angular and lobate forms or giant cells, whose nuclei, eight or ten in number, resemble a "blackberry" in their grouping. Numerous mitotic figures are seen in the various phases of indirect cell division, as many as two, three and even four having been seen in some of the microscopic oil-

immersion fields. Among these are numerous atypical mitoses with irregular and asymmetrical forms. In large part at least the tumor cells multiply by simple direct division.

The cytoplasm of the tumor as seen in the (hematoxylin and eosin) specimen stains a pale pink.

In the neuroglia stained preparation the nuclei are not so well stained, but the tumor's fibrillar matrix is somewhat better demonstrable and is seen to consist of a rather fine fibrillar stroma resembling normal neuroglia rather closely in its open mesh-like appearance. The nuclei appear to lie in the interstices of this mesh; only a few appear to have a definite cell body resembling the Deiters' or spider cell variety. In the neuroglia stained section the striation due to the pons fibers is plainer and medullated nerve fibers are easily seen.

In the several sections numerous nerve cells are seen with a well preserved cell outline, cell body and nucleus, but on account of the tumor growth have lost their normal group arrangement and relation.

SUMMARY

A gliomatous tumor of apparently rapid growth involves the medullary portions of the pons as well as that of the cerebellum almost symmetrically, but more especially the left side of the pons, which fact is evident both macroscopically and microscopically. The tumor cell type, although there are many polymorphous varieties of nuclei, the particular fibrillar character of the tumor stroma, the manner and mode of the tumor's growth, the absence of any definite capsular membrane, the relation of the tumor parenchyma to the nervous parenchyma (*i. e.*, nerve cells and nerve fibers), as well as to the purely mesoblastic elements, would warrant the anatomical diagnosis of glioma.

Summary Comment.—A boy of five and one half years, whose illness began five months previous to death, with headaches which varied in intensity and duration till the end, with increasing drowsiness and malaise. Paralysis of the sixth nerve appeared early in the course of the disease with later a progressive development of a right-sided hemiparesis, Babinski and finally ankle clonus. Optic neuritis diagnosed six weeks before death.

On May 4, at the time of operation there was choked disc, impaired vision and partial abolition of corneal reflex most marked in left eye, retraction of the head, indistinct speech, difficulty in swallowing, hemiparesis more marked, no sensory disturbances.

Clinico-anatomically.—The growth of the tumor was evidently very rapid, judging from clinical course, as well as the number of mitotic figures. The involvement of the pons was most extensive on the left side, directly and indirectly compressing the nervous parenchyma, both cells and nerve fibers, the left-sided ocular symptoms being most probably referable to compression of the optic and the involvement of the sixth nuclei or impingement upon the root itself by the tumor mass. The right-sided bodily symptoms seem to agree with the involvement and compression of the left pyramid in the pons tumor area, although the right pyramid was almost as extensively involved and one would expect almost as great functional disturbances on the left side of the body; the subjective disturbances are probably referable to the increased intracranial tension, thus the clinical and anatomical facts are in fair agreement.

CASE II.—In this case there was no post-mortem examination, but the history and symptoms scarcely bear any other interpretation than the diagnosis of tumor of the pons. The case is notable because of the almost clock-like progression of symptoms—very rapid withal—and the paralysis of almost all voluntary muscles before the fatal termination.

S. L. was 20 years of age, had good habits, and had never had venereal disease. He had been subject to migraine, having had attacks at intervals of a month or more, and for several years had suffered at times with indigestion. Otherwise he had enjoyed good health. He lived in Alabama and came to Cincinnati six weeks before I saw him, for the purpose of enjoying a vacation, his occupation being that of clerk in a store.

The first symptoms of his illness came on three weeks before I saw him. At that time he observed double vision. Nearly two weeks later he observed some weakness in the right arm and leg. Otherwise he had felt perfectly well.

He came to me July 20, 1908, The examination revealed paralysis of the left abducens, and very slight weakness of the right extremities. The latter was seen only in a slight difference in the grasp of the two hands, and in that the movements of the right toes, ankle and knee were less facile, possibly made with less strength, than on the other side. The cremasteric and abdominal reflexes were absent on the right side and present on the left. Otherwise as regards sensation, the special senses, the reflexes, the optic disks and the urine, the results of the examinations were negative. There were no subjective symptoms.

The diagnosis tumor of the pons was made and the patient was put to bed for the purpose of applying a vigorous course of

mercurial inunctions. The progress of the case was now rapid; the increase of symptoms, if not perceptible daily, could at least be seen every few days. For instance, a day or two after his first visit to me some of the small muscles of the hand were found to be weak, a day or two later others were weak; then, as these muscles were becoming weaker day by day, other muscles higher in the arm were found to be weak, their weakness also increasing day by day, until finally the hand was completely paralyzed, and later the whole arm. During this time the same changes were going on, though more tardily, in the lower extremity; the paralysis there, too, beginning in the distal part and extending upwards. Changes were going on also in the chest muscles. Shortly after the right hemiparesis began it was noticeable that on forcible breathing the right side of the chest did not move as much as the left, and some time later did not move at all.

During the time that the right side was becoming thus completely paralyzed other paralyses were appearing, in each instance beginning as a slight paresis and gradually increasing to complete or almost complete paralysis.

The paralyses that occurred, and their order, were about as follows: Paralysis of the left sixth nerve, of the right arm, leg, and right side of body, of the left seventh nerve, of articulation and swallowing, of the right sixth nerve, of the right seventh nerve, of the left side of body and left extremities, and a few days before death, of the left eighth nerve. So that finally there was almost complete paralysis of all voluntary muscles, when, as the result of the gradual failure of all vital functions, he died, September 10, ten weeks after the first appearance of symptoms.

In order to present this case more clearly to you I will give the notes taken on several occasions. The date of the first examination already given you is July 20, at which time there was paralysis of the left abducens and very slight right hemiparesis.

August 1. He is unable to move the right toes and foot, and has much lessened power at knee and hip. The small muscles of the right hand are completely paralyzed; other muscles of the right arm are much weakened. On deep inspiration right side of chest does not move as freely as the left side. There is paresis of the left facial nerve—he can not wrinkle the forehead on that side, can close the left eye but feebly, and can not move the left side of the face as well as the right. He has some difficulty in swallowing bread and like food, the difficulty appearing to be to get the bolus of food back into the fauces. There is a very slight change in his articulation of speech.

August 8. There is considerable increase in the paralysis of the left side of the face and of the right leg and arm, the arm being almost completely paralyzed. Occasional heightened muscular tonicity of the right arm and leg are observed. The

knee-jerk on the right side is somewhat in excess of that on the left. Swallowing is worse.

August 17.—Paresis of the right abducens. Paresis of the right spinal accessory—rotation and movement of the head toward the right less free than toward the left.

August 27. Great difficulty in swallowing. Speech so difficult that he has ceased to speak altogether. Feels some air hunger. There is complete paralysis of the right extremities and right side of the chest. Trace of ankle clonus right. Slight left hemiparesis; the left side of the chest does not move as freely as before in deep inspiration. In the left arm and leg there appears to be rather ataxia than weakness of muscles. The abdominal reflexes on the left side are abolished.

There is paresis of the right seventh nerve, all the branches being affected. The paralysis of the right abducens is complete. The muscles supplied by the left facial nerve, which began to get weak four weeks ago, and have now been completely paralyzed for some time, have been examined with electricity on a number of occasions with negative result. On this date these muscles respond to a weaker galvanic current and require a stronger faradic current to produce a response than do the muscles of the right side of the face.

September 7. The left hemiplegia has become quite marked. At times the right arm flexes strongly at the elbow and presses against the chest. The tongue lies motionless and shrunken on the floor of the mouth. When he opens the mouth the chin turns toward the left. There is some weakness of the sphincters of the bladder and rectum, so that their contents occasionally escape.

Hears the watch at a distance of five inches on the left side, and at ten inches on the right. (The hearing had been often tested and hitherto no difference had been noted.)

September 10. He died on this date at 11 P. M. For a number of days his pulse and breathing had been very rapid and he could scarcely swallow, so that his death had been expected daily. His hearing had continued to decrease, so that he only heard the watch in the left ear on contact. The left extremities had become almost completely paralyzed. His mind remained clear to the last.

When his speech became so difficult that he could hardly speak he began to speak in the deaf and dumb alphabet which he had acquired years before. As his left hand got weak he would point to letters on an improvised board instead of using the deaf and dumb alphabet. Then as his hand got too weak for that the bystander would point to the letter and he would nod his head yes or no. Finally he could not even nod his head.

Throughout his illness there had been no manifest impairment of sensation not even of the stereognostic sense.

The patient had been given in the beginning—for ten days—

inunctions of mercury, then he was given for a few weeks, gradually increasing and finally very large doses of iodide of potash. During the latter part of this period he complained somewhat of headache, which may have been due to the medicine. Subsequently his head much of the time was not comfortable, but one could scarcely speak of definite headache.

The patient's optic disks were examined quite a number of times, the last time twelve days before death. The result of the examination was always negative. Notwithstanding the absence of the cardinal symptoms of brain tumor, headache and optic neuritis, it seems to me no other diagnosis is possible in this case. Probably there was a soft infiltrating tumor which destroyed, and scarcely irritated, the nerve elements.