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INTRACRANIAL TUMORS

AMONG THE WIDE VARIETY of neoplasms that may develop in the human body, the tumors of the central nervous system constitute a special group. Some of these tumors present predominantly in the young, others occur at any age; their bizarre symptomatology usually demands considerable perspicacity and experience from the part of the clinician. The roentgenologic investigations may prove of considerable usefulness in the diagnosis of neoplasms of the central nervous system, but angiograms, pneumoencephalograms, ventriculograms, or even simple roentgenograms require skillful technique and learned interpretation. The histopathology of these tumors is anathema even to experienced tumor pathologists; not only is there considerable difference of opinion in respect to histogenesis, but also in respect to histotechniques and, more than usual, in respect to exact diagnoses. Finally, the surgical treatment of these tumors is a specialty in itself and the indications and hazards of radiotherapy are not widely recognized. We hope that the publication of this CANCER SEMINAR may contribute to the dissemination of some of this knowledge.

This CANCER SEMINAR was held at the Broadmoor Hotel, in Colorado Springs, on September the 8th, 1956; it was attended by 328 radiologists, pathologists, surgeons and internists. Dr. Eugene P. Pendergrass, Professor of Radiology, University of Pennsylvania, surprised the audience with his extraordinary ability to extract from the roentgenograms a wealth of information. Dr. James W. Kernohan, Chairman of the Section of Pathologic Anatomy, Mayo Clinic, enlightened the discussion with his authoritative views on neuropathology. Our third guest was Dr. K. J. Zülch, Director of Neurology, Max Plank Institute for Brain Research and Professor of Neurology, University of Cologne, Germany. Dr. Zülch is the author of several books on the different aspects of brain tumors; his discussions were particularly versatile. We were particularly fortunate to be able to add to this team of experts the authoritative comments of a distinguished visitor, Dr. J. J. Richmond, radiotherapist to the St. George's Hospital, of London.

Under the auspices of the *Liga Contra el Cancer*, this CANCER SEMINAR was held again, for the benefit of a Spanish speaking audience, at the *Hospital Curie*, of Havana, Cuba on October 27th, 1956. The roentgenologic interpretation was presented by Dr. Philip J. Hodes, Professor of Radiology, University of Pennsylvania, who delighted the Cuban audience with his extemporaneous Spanish. Dr. Isaac Costero, Pathologist of the Institute of Cardiology of Mexico City and foremost exponent of the Spanish School of neuropathology, presented his witty arguments in colorful and forceful language. The recordings of the audience participation in Havana did not reach us in time to be included in this publication.

We wish to give our thanks again to all those who have made these CANCER SEMINARS possible, either by offering problem cases, submitting their impressions or diagnoses, or participating in the discussions. We owe to Dr. Kernohan and to Dr. Isaac Costero the beautiful photomicrographs that illustrate this issue. To all of them, as well as to our guest participants, goes the credit for the success of these educational exercises.

J. A. del REGATO, M. D.
Colorado Springs, July, 1957

1. *Chromophobe Adenoma (?) of the Third Ventricle*

Contributed by KARL T. NEUBERGER, M.D. of Denver, Colorado

THE PATIENT was a 38-year-old man in March, 1954 when he complained of right temporal pain which had been present for years but had recently become severe; his memory had deteriorated, and he had become disoriented and occasionally unconscious. On examination there was bilateral papilledema, more marked on the left. The spinal fluid proteins were 187 mgrs. per cent.

Dr. Pendergrass: The roentgenogram in the postero-anterior projection revealed: 1) marked dilatation of the lateral ventricles; 2) a large soft tissue mass has replaced the normal thin septum pellucidum. The mass occupies a major portion of the lumen in the right lateral ventricle extending, to a lesser degree, into the left lateral ventricle. 3) The normal shelf-like contour of the thalamus has been replaced by the tumor mass invading the floor of the right lateral ventricle. 4) The right anterior clinoid process is clearly visualized; the left is eroded. It was noteworthy that the patient's papilledema was recorded as being more marked in the left eye.

The roentgenogram in the lateral projection shows: 1) marked dilatation of the lateral ventricles, 2) extending upward and into the lateral ventricles is an irregularly defined mass almost eight centimeters in circumference, 3) whereas usually, in the presence of such dilated lateral ventricles, one expects to see air in the third ventricle; in this patient the third ventricle is barely perceptible. Just the slightest amount of air is demonstrated anteriorly near the foramina of Monro. The rest of the third ventricle is occupied by a huge soft tissue mass; 4) the sella turcica is not well visualized. What can be seen seems slightly deossified suggesting the presence of increased antracranial pressure.

The clinical findings indicate that this patient has a slowly growing tumor. From the roentgenogram observations it might have been started in the third ventricle where it could have continued to grow for many years until finally it became large enough to occlude the foramina of Monro causing increased intracranial pressure. The midline distribution of the mass suggests the possibility of a tumor or cyst arising in the septum pellucidum. Usually, the latter are more clearly defined and less lobulated in contour. Also, they far less commonly obliterate entirely the third ventricle. Arising anteriorly these lesions often separate the lateral ventricles which has not happened in this patient. Also, lying anteriorly, tumors or cysts arising in the septum pellucidum usually obliterate the anterior portion of the third ventricle rather than its posterior segment.

Dr. Pendergrass's impression: MALIGNANT TUMOR OF THE THIRD VENTRICLE invading the basal nuclei and extending more to the right of the midline than to the left. The lesion will probably prove to be an EPENDYMOMA.

Roentgenologic Impressions Submitted by Mail:

Colloid cyst of third ventricle	31
Ependymoma of third ventricle	15
Pinealoma	10
Tumor of the Septum Pellucidum	9
Others	20

Dr. Regato: Dr. Paul C. Swenson, of Philadelphia, Dr. Harry Hauser of Cleveland, and Dr. Ben Felson of Cincinnati, all submitted an impression of colloid (or paraphyseal) cyst of the third ventricle. Dr. Fred Hodges, of Ann Arbor, suggested an astrocytoma of the right frontal lobe.

Operative findings: In April 1954, surgical intervention took place through a four-sided left parietal opening; the dura was opened, the lateral ventricle punctured and the corpus callosum incised. The septum pellucidum was thickened and gray-pink in color. A biopsy resulted in considerable bleeding and led to the necessity of a subtotal removal for hemostasis. The removed grayish fragments weighed 8 grams. The dura was sutured and the bone flap held in place by periosteal stitches.

Dr. Kernohan: This is a very difficult case and presents several problems of differential diagnosis. Tumors in the third ventricle are not common. Few actually arise there, but tumors invade the ventricle from neighboring tissues. Paraphyseal or colloid cysts are almost the only tumors in this cavity, and the present tumor is obviously not a colloid cyst. Gliomas of the thalami or hypothalami occasionally extend into the ventricle, but again this is not a glioma. Occasionally, one sees ependymomas arising from the ependymal lining of the walls of the third ventricle. I do not believe that this tumor is an ependymoma, but we will be discussing ependymomas later on today, and I will not take up time now to belabor this point. Oligodendrogliomas are often associated with ependymomas, and because of the rather monotonous histologic appearance of the cells in this case and the presence of spicules of calcium they must be considered even if only to be excluded. The classic picture of an oligodendroglioma as described and depicted by Bailey and Cushing is a tumor made up of large numbers of small cells. The nuclei are uniform and are surrounded by a clear zone with the cells packed closely together, giving the section the appearance of the cross-section of a plant, or, as I have described them, a "honeycomb" appearance. This is missing here, and I don't believe that this tumor is an oligodendroglioma.

Tumors occasionally extend from below upward into the third ventricle. The two most common ones are adamantinomas of the hypophysial stalk and adenomas of the pituitary gland. This is not an adamantinoma, but I believe it to be a chromophobe adenoma of the pituitary.

Chromophobe adenomas are the most common tumors of the pituitary, eosinophilic adenomas are fairly infrequent, less than 10 per cent of our cases, and basophilic adenomas are rare. Eosinophilic adenomas produce gigantism if they appear before puberty, or acromegaly if they appear after bone growth is completed. Many of the tumor cells of the eosinophilic adenomas have pink cytoplasm, and with special stains these cells contain eosinophilic granules.

Chromophobe adenomas are usually larger than eosinophilic adenomas. They commonly grow up out of the sella turcica, stretch and compress the optic nerves, and may extend into the frontal or temporal lobes. Occasionally they extend backward to the pons and often expand laterally into the gasserian ganglia. They often grow upward and compress the floor of the third ventricle, and only occasionally they grow into the cavity of the third ventricle. They

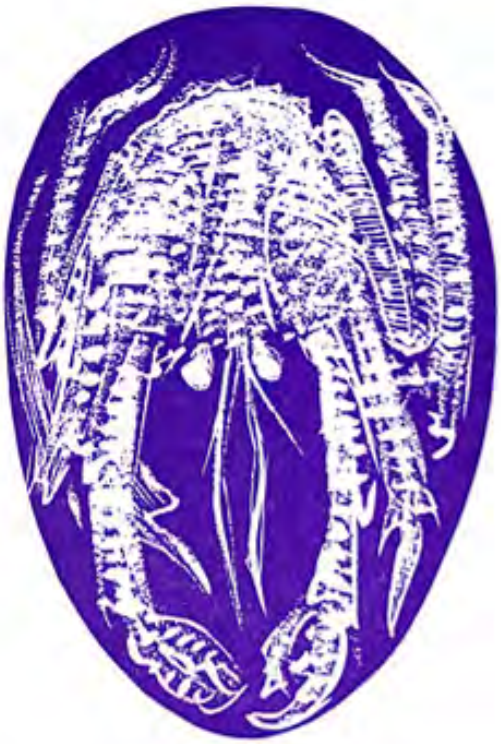

Fig. 1—Roentgenogram showing marked dilatation of lateral ventricles and large mass replacing septum pellucidum.

are nodular or tuberous in shape and usually are encapsulated. The cells making up these tumors have a nongranular cytoplasm, the nuclei are hyperchromatic, larger than those of oligodendrogliomas and usually are quite uniform throughout the tumor. There are three architectural types of arrangement of the cells. The most common type is where the cells are growing in a diffuse manner: for example, diffuse sheets of relatively small, uniform, polygonal cells with relatively little stroma and few blood vessels. The next type is one in which there is a sinusoidlike arrangement which simulates an ependymoma. The third and least common appearance is one in which the cells grow on a core of connective tissue containing a capillary or small blood vessel. This is called the "papillary" type. In all three types the cells are similar, but they have different arrangements and relations to each. Deposit of calcium are rare in the pituitary tumors which I have seen, especially in sufficient amounts to be visualized in roentgenograms.

In most cases, as pituitary adenomas grow, the remnants of the normal gland are compressed into a narrow band of tissue in the capsule of the tumor. This leads to a deficiency of pituitary function and depression of some other endocrine glands so that in women the first symptom is often amenorrhea, and in men impotence with atrophy of the seminiferous tubules and of the prostate gland. Chromophobe adenomas entirely within the third ventricle are extremely rare.

Dr. Kernohan's diagnosis: CHROMOPHOBE ADENOMA OF THE PITUITARY growing out of the sella.

Histopathologic Diagnoses Submitted by Mail:

Ependymoma	65
Oligodendroglioma	32
Pinealoma	12
Others	13

Isaac Costero, M. D., Mexico City (In Havana): The regularity of the cells with their heavily stained nuclei, their distribution in small regular lobules and the sinusoid appearance of the capillaries in the stroma would permit to classify this tumor as an adenoma of the pituitary. This would be the common chromophobe variety which has powerful invasive potential; this might explain its location in the third ventricle. Specific silver staining could have shown the absence of neurogenic elements; the technique of Bensley might have been useful in revealing the lack of specific hypophyseal granulations.

Dr. Regato: Dr. Carlo Sirtori, of Milan, Dr. Raffaele Lattes, of New York, Dr. Calixto Masó, of Havana, Dr. Webb Haymaker, of Washington, Dr. J. H. Childers of Galveston and Dr. H. K. Giffen of Omaha offered a diagnosis of oligodendroglioma. Dr. U. Gastaminza of San Sebastian, Spain, proposed meningeal angiosarcoma; Dr. R. Khanolkar, of Bombay, preferred pinealoma.

C. Oberling, M. D., Paris (by mail): There is a striking resemblance between this tumor and the embryonic pineal gland (see fig. 228 of article by Henchen in Treatise by Heincke-Lubarsch). For this reason I believe that one should consider a pineal tumor rather than a hypophyseal one.

Luis Benitez-Soto, M. D., Mexico City (by mail): The location in the third ventricle, the close relationship to a great number of vessels, the highly cellular and epithelial appearance of the cells with uniform nuclei and the absence of mitosis or monstrosities make us feel that this is a tumor arising from the ependymal epithelium. Because these tu-

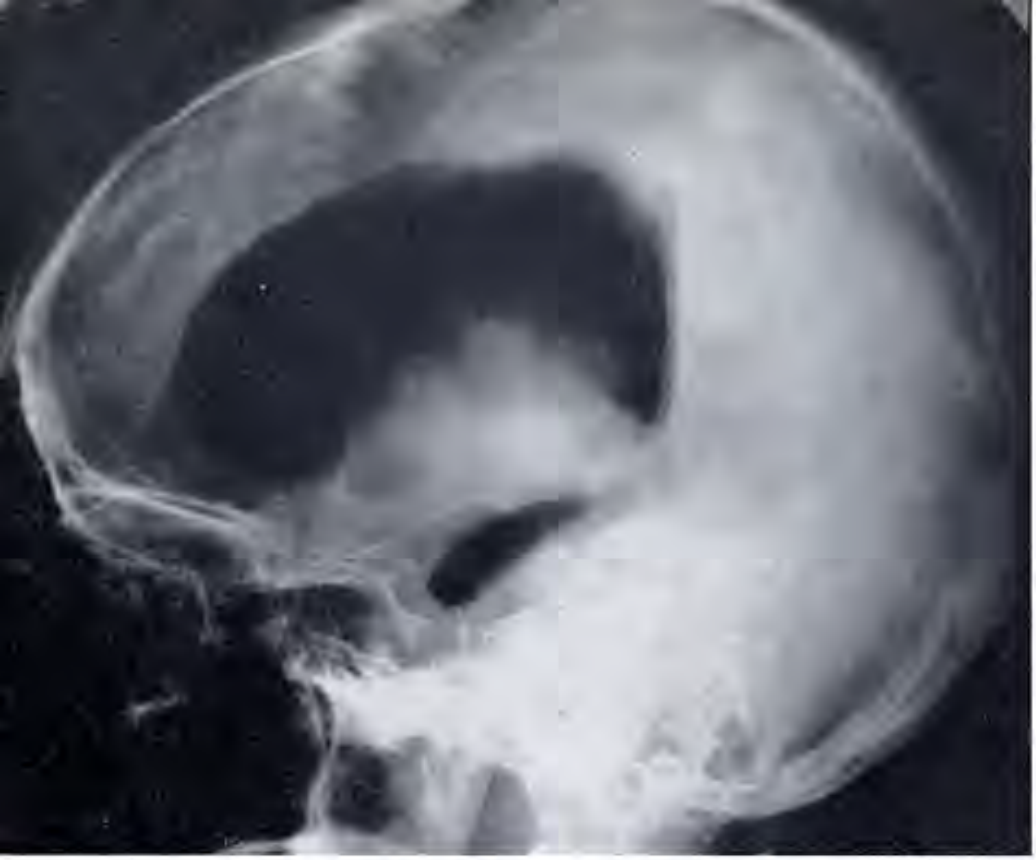

Fig. 2 — Lateral view showing mass extending into third ventricle.

mors keep their epithelial appearance and seem to be related to glioblastomas we like to call them glioepitheliomas.

Subsequent history: Following operation the patient remained unconscious until death, in May 1954. Postmortem examination revealed periventricular hemorrhages and multiple pulmonary infarcts.

Dr. Zülch: First of all may I thank you, doctor del Regato, for the invitation which honors me and has given me so much pleasure. The work of this CANCER SEMINAR has impressed me so much that I have decided to use this medium in our country.

In regards to this case, I think that on the basis of the clinical history no neurologist or neurosurgeon could make a diagnosis of the nature of the lesion. From a radiologic point of view it would have been important in this case to decide whether or not we were dealing with a cyst, for most neurosurgeons today would not attempt to go into an adenoma of the third ventricle, but they would certainly want to remove an ependymal cyst, with consequent cure of the patient. From the morphologic point of view, doctor Kernohan's diagnosis points to the interesting problem raised a few years ago by Antoni, the Stockholm neurologist who maintained that a good many ependymomas were truly pituitary tumors. Histologically it seems to be pretty difficult to make that differential diagnosis, and I was wondering whether one could rely upon the blepharoblasts. We made a blepharoblast stain in this case, it seemed to be positive and consequently in favor of an ependymoma. This type of ependymoma, as Doctor Kernohan pointed out, differs a little from the usual one; we have always found that ependymomas of the lateral ventricle near the foramen of Monro and those of the third ventricle do not have the normal arrangement; yet, I think that on the basis of the blepharoblasts, one should classify these as ependymomas. Microscopically, you may also think of spongioblastoma of the hypothalamus which may give quite a similar picture, but they usually occur in younger persons.

J. J. Richmond, M. D., London: I would like to say how delighted I am to be in Colorado Springs and to be a guest at this CANCER SEMINAR which I am sure is going to

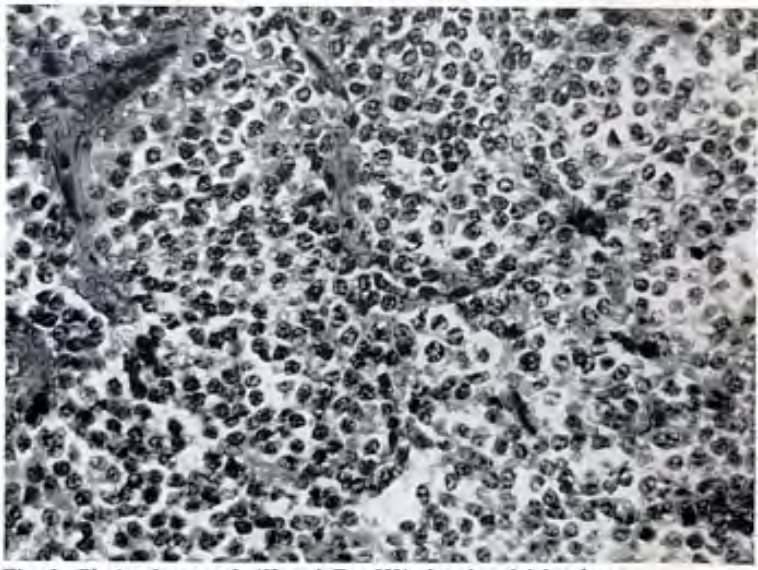

Fig. 3—Photomicrograph (H and E, x325) showing fairly characteristic arrangement of a chromophobe adenoma of the pituitary. Note numerous uniform nuclei with little stainable cytoplasm and paucity of blood-vessels. Cells show no relationship to each other or to vessels.

develop into a most fascinating and interesting clinical discussion. I, too, think it is an excellent arrangement to have radiologists, pathologists and surgeons meet to discuss the common clinical problems of malignant disease and I am mighty sorry that we do not have similar meetings in my own country.

I am very intrigued with Dr. Kernohan's pathological diagnosis of chromophobe adenoma in this case. It must be very unusual to have such an extensive space-occupying lesion with so little evidence of sellar extension, but I know occasionally this does occur; nevertheless, I think that the pathological features might be consistent with a diagnosis of oligodendroglioma. I would like to ask if any radiotherapy was given to this patient.

Dr. Regato: We have no record that radiotherapy was given.

L. Lowbeer, M. D., Tulsa, Oklahoma: Did the autopsy show any relation between the tumor and the pituitary gland?

K. T. Neubuerger, M. D., Denver, Colorado: I did not do the autopsy myself. To my knowledge there was no connection between this lesion and the pituitary.

Dr. Pendergrass: From the radiologic standpoint we do recognize suprasellar lesions that invade the third ventricle. One can see these lesions without any evidence of destruction of the dorsum sellae. They penetrate through the diaphragma sellae and do not give the usual changes that one sees with pituitary adenomas. From the radiologic standpoint, we would be hard put to make a diagnosis of chromophobe adenoma or a suprasellar lesion of the stalk variety. I am not familiar with the pituitary tumors that develop outside of the pituitary itself. There is another differential procedure that one could use and that is arterial angiography; in the suprasellar lesions one gets widening of the carotid siphon, and this helps us a great deal in differentiating the third ventricle tumors from suprasellar and pituitary lesions.

M. Wheelock, M. D., Chicago, Illinois: I was one of the few who selected pinealoma because of the location and the presence of large numbers of lymphocytes. I would like to hear Dr. Kernohan's own reasons opposing that interpretation.

Dr. Kernohan: There had been several cases reported in the literature of pituitary tumors arising primarily in the third ventricle and having no connection whatsoever with the sella or with the pituitary gland. There have been three cases reported in the last fifteen years and I think that this might be a fourth case in that category. I didn't think that this was a pinealoma: the pinealoma cells have definite solid pink cytoplasm; these cells were vacuolated cells. There was a little stroma surrounding the islands of tumor cells, as in pinealomas, but I didn't think there were enough lympocytes around to support the diagnosis of pinealoma. There are three types of pinealomas; the one to which we are referring is the so-called infantile type which has large epitheloid-like cells surrounded by strands of connective tissue in which lymphocyte-like cells are embedded.

M. Berthrong, M. D., Colorado Springs, Colorado: I would like to ask Dr. Kernohan one more question. Have pituitary cells been found normally, or in embryological studies, in the location from which you feel this tumor may be arising?

Dr. Kernohan: No, I don't think so. Pituitary cells have been found along the connection between the nasopharynx and the pituitary fossa; they occur along the infundibulum, up along the pituitary stalk, along the floor of the third ventricle, but I never heard of any being described in the third ventricle itself.

M. Wheelock, M.D., Chicago, Illinois: May I ask two questions? First of all, was the pineal gland found to be uninvolved at autopsy, and what is the origin of these extra pituitary tumors, from whence are they derived?

K. T. Neubuerger, M. D., Denver, Colorado: I can answer the first question; the pineal gland was found to be normal.

Dr. Kernohan: I haven't any idea where the pituitary tumor would come from in the third ventricle or where the cells come from. The only thing I know is that there have been three cases reported in that region and that I thought this was another one.

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2. Chemodectoma Destroying the Petrous Pyramid of the Temporal Bone

Contributed by Joseph F. Kuzma, M. D. and Joseph M. Lubitz, M. D., Milwaukee, Wisconsin

THE PATIENT was a 58-year-old man in February 1952 when he complained of increasing asthenia and loss of weight. In 1938 he had suffered a left-sided hemiplegia. In 1942 he had a hemorrhage from the left ear; mastoidectomy was done. In 1945 he developed left sided facial and laryngeal paralysis. During the past year he had suffered several falls and bony fractures. On examination he appeared emaciated, semicomatose, with left facial paralysis and tongue deviating to the left; there was bilateral Babinski. Blood serology was normal; hemoglobin was 8 grams per cent.

Dr. Pendergrass: Radiographically the single anteroposterior roentgenogram submitted for diagnosis revealed: 1) old mastoidectomy defect in the left temporal bone; 2) diffuse clouding plus bone destruction involving the left petrous pyramid; 3) erosion of the left carotid canal, and 4) erosion of the left jugular foramen.

The clinical findings indicate that this patient had a slowly growing tumor which must have been present for at least 14 years. Radiographically the entire temporal bone and base of the skull in the region of the middle fossa are infiltrated and destroyed. Whereas extensive bone changes of this character may be observed in the presence of infection, (petrositis, or petrosal osteitis) the duration of the patient's complaints plus the focal character of the petrosal destruction indicate a malignant tumor rather than infection.

Usually carcinoma of the mastoid is a more aggressive process; it may produce similar bone destruction. The chronicity of this patient's complaints plus the hemorrhage argue in favor of a non-chromaffin paraganglioma, called also glomus tumor. Far more common in females than in males (four to one) these lesions have been confused with metastatic hypernephroma.

It is noteworthy that glomus jugulare tumors may arise from foci in the mediastinum, neck, and base of the skull where cells of this type occur normally. Worth recording is the fact that cerebral angiography may reveal the highly

vascular character of glomus tumors revealing their identity pre-operatively.

Dr. Pendergrass's impression: Malignant tumor invading the petrosal pyramid and base of the skull; probably a GLOMUS JUGULARE (non-chromoffin paraganglioma). A carcinoma of the mastoid seems less likely.

Radiologic Impressions Submitted by Mail:

Glomus jugulare	34
Meningioma	12
Carotid aneurysm	10
8th nerve tumor	10
Others	18

Dr. Regato: Dr. Bertram C. Pear, of Denver, Dr. Ethyl Blatt, of Cincinnati, and Dr. Harry Hauser, of Cleveland, also submitted an impression of glomus jugulare. Dr. B. J. Hill, of Ann Arbor, suggested cholesteatoma.

Subsequent history: The patient was treated medically until his death in February 1952. Autopsy revealed the presence of a gray and firm tumor in the left cerebellopontine angle, measuring 4 cm in diameter, compressing the pons, the cerebellum and the 8th and 9th left cranial nerves. The petrous portion of the temporal bone was eroded.

Dr. Kernohan: This is an unusual tumor to be found in a collection of lesions of the central nervous system. This type of tumor is not found inside the cranial cavity but may arise from the carotid body, the tympanic nerve, the adventitia of the superior bulb of the jugular vein, and so forth. Some of these tumors, especially those arising from the glomus jugularis extend into, invade or erode the bone.

Through the years, various names have been applied to them such as "paraganglioma," "carotid body tumor," "nonchromaffin paraganglioma" and so forth. More recently, Dr. R. M. Mulligan described a series of these tumors in dogs, identified them as having arisen from the chemoreceptor (chemodector) cells and named them "chemodectoma." This is a most suitable name and designates the cell type from which they arise.

Chemodectomas, as a rule, do not grow to be very large, are usually encapsulated, grow slowly and rarely if ever metastasize. They do not function and in this they differ from their prototype in the adrenal—the pheochromocytomas. Most of them have a fairly characteristic appearance, with strands of connective tissue extending upward from the capsule and separating the tumor cells into islands, as in this case. The cells are similar to those of the chromaffin system except that they have no affinity for chrome salts or for most of the dyes used in special stains. I have been unable to obtain impregnation of the cells with either silver or gold. The tumor cells vary in shape: some are polyhedral and some are rounded with a granular acidophilic cytoplasm. The nuclei are rounded or oval, vary in size and contain fine, loose chromatin. In some, very large or giant nuclei may be seen, and it is these bizarre nuclei with deep-staining chromatin that seem to have given rise to the idea that some of these chemodectomas are malignant. I have not had much personal

Fig. 1 — Roentgenogram showing mastoidectomy defect and destruction of petrous pyramid.

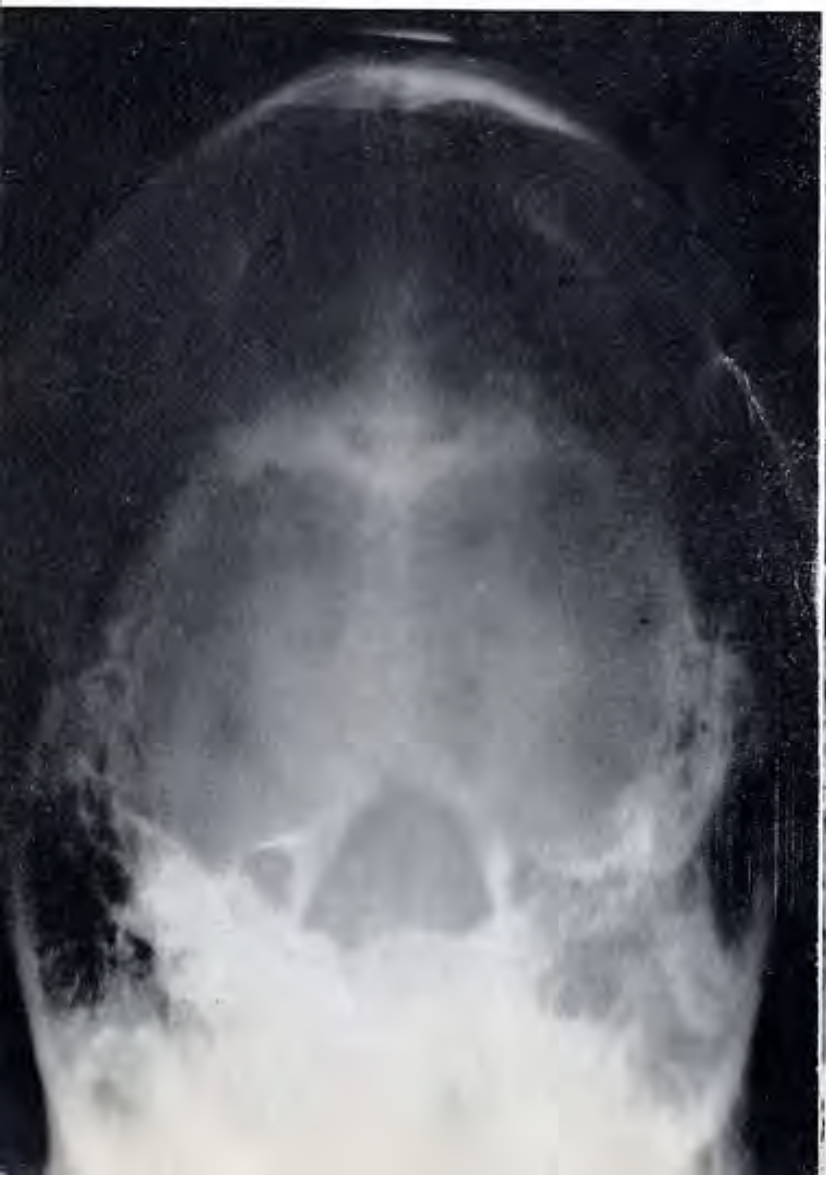

Fig 2—Cross section of tumor in left cerebello-pontine angle.

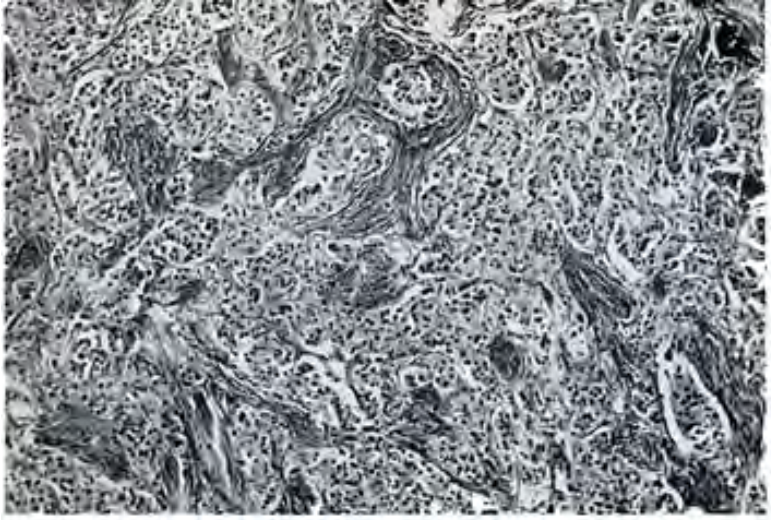

Fig. 3—Photomicrograph (H and E, x100) showing islands of tumor cells, somewhat resembling glial cells, showing strands or bundles of connective tissue. Characteristic picture of chemodectoma.

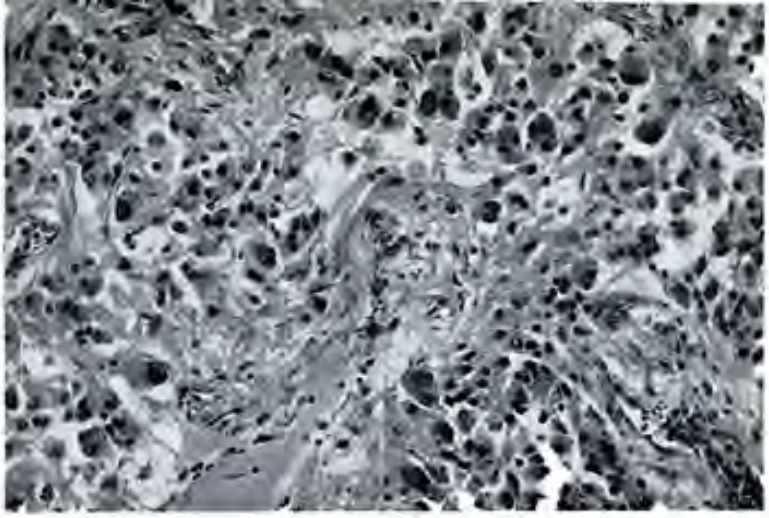

Fig. 4—Photomicrograph (H and E, x185) showing cells varying in size and staining intensity. Some cells have processes, some have more than one nucleus. Some nuclei are large and hyperchromatic; there are no mitotic figures.

experience with chemodectomas, but a few years ago, J. R. Pettet reviewed the cases which had accumulated in our material and found 47 such cases. In none of these cases did the tumor metastasize. The greatest danger from these tumors is in attempting their removal, for they are usually intimately attached to the wall of the blood vessel from which they arise and interference with these vessels commonly causes cerebral damage and not infrequently death.

Dr. Kernohan's diagnosis: CHEMODECTOMA.

Histopathologic Diagnoses Submitted by Mail:

Meningioma	30
Carotid body tumor	21
Tympanic paraganglioma	18
Glomus jugulare	18
Chemodectoma	17
Ganglioneuroma	3
Oligodendroglioma	1
Others	7

Isaac Costero, M. D., Mexico City, (in Havana): Paraganglioma.

Dr. Regato: Dr. Rupert Willis, of Leeds, Dr. Francisco León and Dr. Pardo-Menéndez, of Havana, also submitted a diagnosis of glomus jugulare. Dr. Carlo Sirtori, of Milan, and Dr. H. C. Stoll, of Buffalo, suggested meningioma. Dr. Leo Lowbeer, of Tulsa, made a diagnosis of non-chromaffin paraganglioma but thought that a meningioma should be considered.

Dr. Zülch: This case offers a very interesting clinical history. The patient suffered a homolateral hemiplegia fourteen years previously. We would like to know more about this hemiplegia. We thought that this could be a chromaffin tumor, but we were not able to show any chromaffin cells.

J. J. Richmond, M. D., London: I would like to comment on the diagnosis of glomus tumor. Recently Dr. F. C. W. Capps presented a series of these cases under the auspices of the Faculty of Radiologists, at the Royal College of Surgeons, in London; as far as I can remember there was not one of those cases which had showed evidence of metastasis.

K. T. Neuhuerger, M. D., Denver: I wish to remind you that we had a case of non-chromaffin paraganglioma, with multiple metastases in the abdominal cavity, in the CANCER SEMINAR of tumors of the large intestine.

R. M. Mulligan, M. D., Denver: I would like to tell an anecdote connected with the name *chemodectoma*. In 1949 doctor Lattes was engaged in preparing a manuscript for a paper on tumors of the aortic arch and carotid body and in which he emphasized that they might be multiple in origin. I asked doctor Lattes if he ever thought of giving a common name to these so-called carotid body tumors, glomus jugulare tumors, and what have you. He said he had not, and encouraged me to seek one. When I returned to Denver I found a real Greek scholar in the person of my colleague, doctor Neuhuerger. The word "chemoreceptor" is a bastard word in the sense that it comes from both the Greek and the Latin. We decided that it would be better to have an all-Greek word. The Greek word for "to receive" is "decesthi," doctor Neuhuerger rapidly informed me, and hence from *chemia* and *decesthi*—we came out with *chemodectoma*. I personally feel that it is a respectable name and I am very pleased that the Mayo pathologists have adopted it.

Dr. Regato: It was worthwhile indeed to have this recorded. Doctor Berthrong, how do you like that word—chemodectoma?

M. Berthrong, M. D., Colorado Springs, Colorado: I don't like it.

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3. Angioma Arteriovenosum Involving an Entire Cerebral Hemisphere

Contributed by P. J. Hodes, M. D., Philadelphia, Pa. and J. O. Perritt, M. D., Wilmington, N. C.

THE PATIENT was a 20-year-old man in May, 1948, when he complained of frontal pain; there had been progressive weakness of the left arm and leg which had become spastic and practically useless. On examination there was a moderate atrophy of the left limbs with hemiplegic gait, left-side foot drop and left facial paralysis. There was a Babinski, hyperactive reflexes and clonus on the left; no tinnitus, no convulsions, no speech difficulties. On auscultation of the right temporal region a loud bruit could be heard.

Dr. Pendergrass: Radiographically the single lateral roentgenogram submitted for diagnosis revealed: 1) an irregular mass of vessels demonstrated by cerebral angiography in the fronto-temporal region; 2) the internal carotid artery is half again as large as the normal; 3) within the vascular mass may be identified small vessels, vessels of average size, and very large vessels; 4) the vascular mass is fairly well defined; 5) the hypophyseal fossa, though abnormally large, does not reveal evidence of active bone erosion; 6) calcific debris may be identified in the brain at the site of the erosion. Of unusual interest were the abnormalities described in the routine roentgenograms of the skull. The latter revealed in the postero-anterior and basal projections definite erosion of the floor of the middle fossa and the greater wing of the sphenoid. As a rule, the presence of bone erosion is indicative of active growth; rarely is it demonstrated in the presence of arterio-venous malformations. When bone erosions develop in patients with arterio-venous malformations, almost always are they localized to the foramen through which course the abnormal blood vessels.

As a rule, the brain compensates for most arterio-venous malformations. Thus, displacement of mid-line structures is uncommon except in the presence of complicating hemorrhage. The fact that most arterio-venous malformations do not reveal symptoms until adult life has suggested that these lesions take on active growth characteristics, in adults, which were not present in early life.

Calcific debris, particularly phleboliths, may be seen in routine roentgenograms of the skull in patients with arterio-venous malformations. As a rule, these patients present petit mal or grand mal, at night, rather than during the day. Rarely do they go on to produce the advanced neurological deficits described in this patient.

Whereas usually it takes four to six seconds for blood to span the arterial capillary and venous phases in patients with arterio-venous malformations the shunting of blood is so active, one or two seconds may find the cycle completed. Indeed, in one of our patients with nocturnal petit mal, the presence of arterio-venous malformation was first suspected when instead of revealing a normal cerebral blood flow of about 750 cc per minute, the patient revealed a cerebral blood flow of almost 1500 cc per minute.

One cannot gainsay the possibility that the lesion here demonstrated is a highly vascular meningioma or a malignant vascular tumor of the hemangioblastoma or hemangiosarcoma type, the latter arising more commonly in the posterior fossa. Meningiomas usually have a dual blood supply, from the internal and external carotid arteries. The patient whose roentgenogram is here presented reveals the internal carotid artery only. The fact that it is unusually dilated suggests that it has been carrying large quantities of blood to this vascular mass for a long period of time.

Dr. Pendergrass's impression: A highly vascular deep-seated TUMOR IN THE FRONTO-TEMPORAL REGION, probably an ARTERIO-VENOUS MALFORMATION. A malignant arterio-venous abnormality or even a highly vascular meningioma cannot be entirely disregarded.

Radiologic Impressions Submitted by Mail:

Arterio-venous aneurysm	30
Hemangioma	21
Vascular malformation	15
Craniopharyngioma	13
Others	7

Dr. Regato: Dr. Philip J. Hodes, of Philadelphia, submitted arterio-venous malformation. Dr. Paul C. Swenson, also of Philadelphia, preferred an arterio-venous aneurysm. Dr. Frank Gorishek, of Denver, submitted hemangioma. Dr. Fred Hodges, of Ann Arbor, suggested a craniopharyngioma.

Operative findings: In May, 1948, a right fronto-parietal craniotomy was done. A large cirsoid mass appeared to invade the entire right hemisphere; all the cortical vessels appeared hypertrophic. Ligation of the carotid was attempted but abandoned because of excessive fall in pressure. A gross diagnosis of angioma was made.

In the next six years the patient suffered increasing convulsive seizures and mental failure, he started to lose the vision of his left eye and to have headaches. On October, 1954, a hemispherectomy was decided upon to eliminate seizures and improve mentation. Opening of the skull resulted in massive hemorrhages, a carotid ligation was done, the blood pressure dropped. Adhesions and bleeding interfered with the operation which was abandoned after eight hours and twenty-seven pints of blood. The patient remained in decerebrate rigidity. Due to transfusions, gastrostomy feedings, antibiotics and a wealth of nursing care, the patient remained alive for five weeks, until November, 1954. At autopsy the meninges were found discolored and adherent to the brain. There was recent softening of the left frontal lobe. The vascular changes extended into the basal ganglia and hypothalamus; some vessels being 1.4 cm in diameter. Some calcifications were noted. There was almost complete infarction of the parietal and temporal lobes.

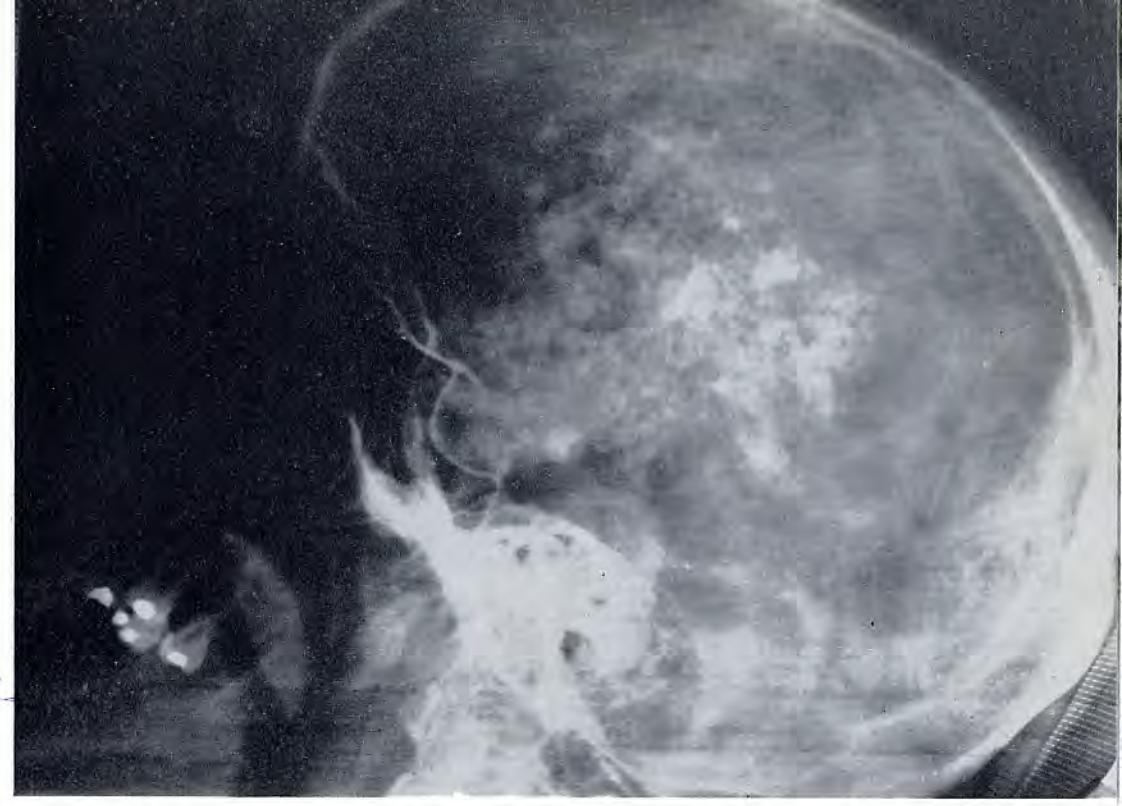

Fig. 1—Lateral cerebral angiogram showing irregular mass of vessels of varying size and calcific debris overlying the fronto-temporal region.

Dr. Kernohan: I believe that this mass in the meninges and cerebral cortex is not a neoplasm but that it is a mass of blood vessels. Some of these vessels are arteries, some are veins and some contain elements of each in their walls. One is markedly dilated and forms an aneurysm. Many of the vessels contain thrombi, some of which are recent, some are old and organized, and still others have deposits of calcium salts. In an occasional vessel there seems to me to be enough calcium to be visualized in a roentgenogram. In my experience, thromboses occur only rarely in cerebral angiomas, but my experience is not extensive with this type of malformation.

One of the best studies of blood vessel tumors of the brain of which I am aware is by Cushing and Bailey in 1928. In this study, they suggested a simple, and on the whole, a satisfactory classification. They divided their tumors into (A) vascular malformations and (B) vascular neoplasms. A little more than one half of their tumors were malformations, and they divided their series of malformations into (1) telangiectasis, (2) angioma venosum, and (3) angioma arteriale. Since this specimen, which we are discussing this morning, is a mixture of both arteries and veins, I would suggest, as Turner and I did in 1941, that a fourth group should be added, namely, angioma arteriovenosum. Preferably, this should or could be substituted for angioma arteriale, since tumors made up entirely of arteries must be exceedingly rare. The table is a classification of these tumors suggested by us, and you can see that it is essentially the same as Cushing and Bailey's.

Vascular Malformations and Vascular Tumors

I. Vascular malformations (18 cases)
   - (a) Telangiectasis
   - (b) Angioma (hamartoma)
     1. Angioma venosum
     2. Angioma arteriovenosum (angioma arteriale)

II. Vascular neoplasms (28 cases)
   - (a) Capillary
     1. Capillary hemangioma (2 cases: 7.1 per cent*)
     2. Hemangio-endothelioma (10 cases: 35.8 per cent)
     3. Capillary hemangioblastoma 2 cases: 7.1 per cent)
   - (b) Cavernous
     1. Cavernous hemangioma (7 cases: 25.0 per cent)
     2. Cavernous hemangioblastoma (2 cases: 7.1 per cent)
   - (c) Sarcomatous
     1. Hemangiosarcoma (5 cases: 17.9 per cent)

*Percentages are of the 28 cases of vascular neoplasm.

Dr. Kernohan's diagnosis: ANGIOMA ARTERIOVENOSUM.

Histopathologic Diagnoses Submitted by Mail:

Arterio-venous aneurysm	50
Hemangioma	34
Vascular anomaly	20
Oligodendroglioma	1
Others	3

Dr. Regato: With great variations in nomenclature and in spelling, the experts agreed to some kind of vascular lesion in this case.

Dr. Zülch: I think this case is very clearly one of arteriovenous aneurysm. Unusual, I think, is the hemiplegia and hemiatrophy; this is a very rare occurrence as far as I know.

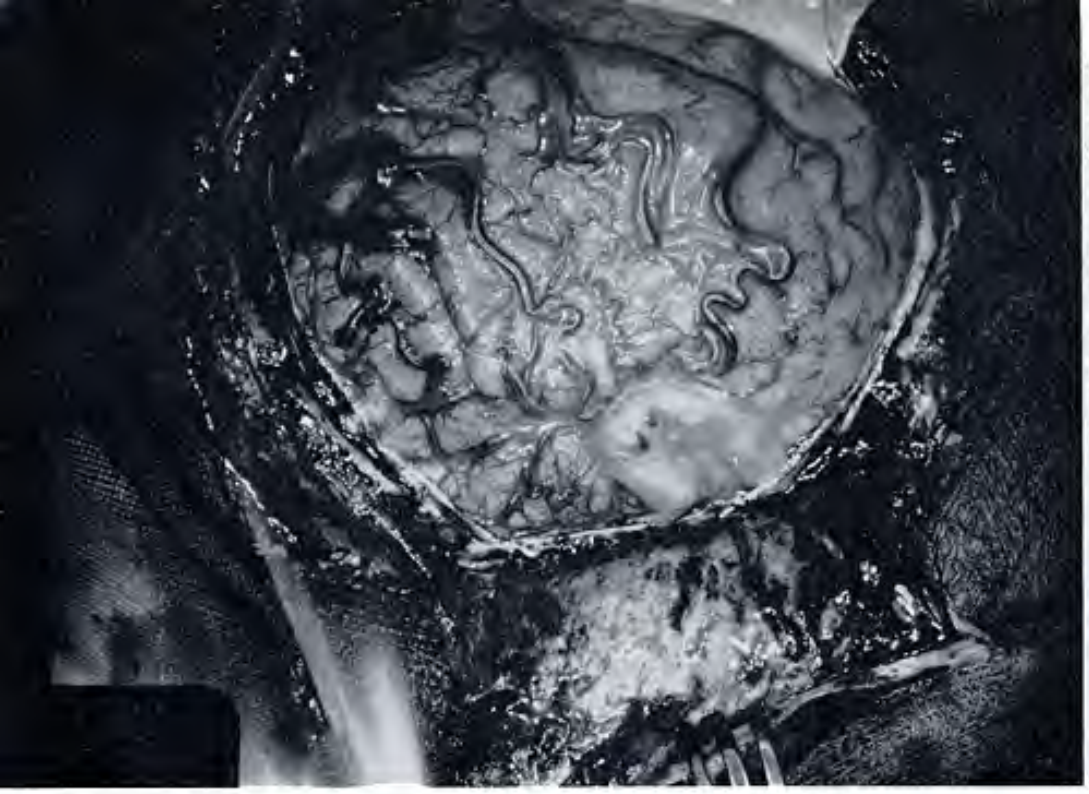

Fig. 2 — Fronto-parietal craniotomy revealing cirsoid appearance of vessels on right hemisphere.

Fig. 3 — Very low power photomicrograph showing tangled mass of blood vessels on the cortex. Some vessels are arteries, some are veins, some contain elements of both. One vessel is markedly dilated: it is either an aneurysm or a varix.

Dr. Pendergrass: I would like to ask doctor Kernohan if he differentiates between these tumors and the ordinary overgrowths of vein and arteries.

Dr. Kernohan: If you mean by a tumor a *mass*, this is a tumor. It is not a tumor if you mean a *neoplasm*. Its growth is only the expanding dilating blood vessels, and I look on it more as an anomaly, a hamartoma type of thing, rather than a neoplasm.

A. B. Smith, M. D., Kansas City, Missouri: We know that one of the differential points in arterio-venous malformations versus tumors is the lack of displacement of the midline structures even in very large vascular anomalies, but we had no antero-posterior view of this case. I would like to know if doctor Pendergrass remembers whether or not there was any displacement.

Dr. Pendergrass: I can't answer that question.

M. Berthrong, M. D., Colorado Springs, Colorado: Seeking such malformations in the literature, one often has to turn to the syndrome described clinically as Sturge-Weber's syndrome. I wish doctor Zülch would make some comment about this clinical syndrome, and whether or not it correlates with any specific pathological entities.

Dr. Zülch: I think that these malformations ought to be classified separately from the angiomatas. In the Sturge-Weber we have angiomatous malformations of the vessels in the leptomeninges, and accumulation of small capillaries and veins all over that part of the brain which is covered by this lesion, with a secondary calcification of the brain cortex underneath; there are some interesting correlations even between the nevus flammeus of the face and the location of these calcifications and the whole angioma in the leptomeninges.

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4. Gemästocytic Astrocytoma of the Corpus Callosum and Frontal Lobes

Contributed by F. P. Bornstein, *M. D.*, El Paso, Texas

THE PATIENT was a 59-year-old man in June, 1955, when he presented psychopathic manifestations; in the previous six months he had suffered from occipital, cervical and left maxillary pain, auditory and visual hallucinations and progressive lethargy. On examination he was restless and inattentive; there was bilateral papilledema and suggestive Kernig. The spinal fluid pressure was 540-160 mm and the fluid showed 115 mgrs per cent protein, positive Pandy and negative Kolmer.

Dr. Pendergrass: The postero-anterior roentgenogram reveals: 1) lateral ventricles of normal size; 2) lateral ventricles irregular in outline and displaced; 3) the calcified pineal lies in the midline (this may be more apparent than real because the head is rotated); 4) an irregularly defined collection of air is obliquely placed, well to the right of the midline in the region of the calcified pineal. Whether or not this is a portion of the third ventricle remains a moot question.

The lateral projection reveals: 1) the head is tilted laterally giving one the false impression that the temporal horn is displaced upward; 2) the anterior half of the lateral ventricle is distorted and abnormally wide; 3) some air is seen in the third ventricle but the latter is poorly demonstrated; 4) the fourth ventricle appears to be normal.

The most prominent features in this air study are the poorly filled lateral ventricles demonstrated in the saggital plane. A midline anteriorly placed tumor in the region of the corpus callosum infiltrating in character would explain the lateral displacement of the lateral horns. The variable increased intracranial pressure suggests intermittent blocking of the intraventricular foramen or the foramina of Monro.

Dr. Pendergrass's impression: An aggressive INFILTRATING GLIOMA OF THE CORPUS CALLOSUM involving one or perhaps both frontal lobes.

Radiologic Impressions Submitted by Mail:

Fronto-parietal tumor	35
Glioblastoma	32
Tumor of Corpus Callosum	13
Others	15

Dr. Regato: Dr. Harry Hauser, of Cleveland, also suggested a glioblastoma of the left frontal lobe. Dr. Wendell Stampfli, of Denver, also suggested a glioma. Dr. Ethyl Blatt, of Cincinnati, submitted her impression of astrocytoma of the left frontal lobe.

Subsequent history: The patient developed transient twichings and myoclonic movements, he lost his vision and his tongue deviated to the left side, he finally lost contact and in June, 1955 he expired.

At autopsy a soft, yellow-brown mass, 3 cm in diameter and well delimited was found in the left frontal lobe. A second mass was found in the corpus callosum extending laterally into both frontal lobes inferiorly.

Dr. Kernohan: This is an unusual tumor. I think that it is an astrocytoma made up, for the most part, of swollen or plump astrocytes. This type of cell is usually referred to as "gemästete astrocyte" and the tumor is a "gemästete" or "gemistocytic astrocytoma." Gemästete astrocytes are frequently seen around infarcts of the brain, occasionally as a reactive process to inflammation or degeneration. However, in these conditions, I don't believe that they are as numerous or as hyperplastic as they are in neoplasms, and because of this I think that we are dealing in this case with an astrocytoma. It is an unusual tumor because there is a well-marked inflammatory reaction, but I do not believe that the entire process is on an inflammatory basis. Gemästete astrocytes have abundant acidophilic cytoplasm with very short processes, which can be demonstrated by special stains. The cells often have two, three or more eccentric nuclei. Most gemistocytic astrocytomas are slowly growing neoplasms, but occasionally they are more malignant. We have graded these tumors on a basis of 1 to 4 with grade 1 the least malignant and grade 4 the most malignant. This tumor which we are now considering 1 have graded 3 because of the considerable variation in size, not of the cells, but of their nuclei, the number of mitotic figures, the areas of necrosis and the fairly sharp line of demarcation from the neighboring brain, more especially in some area than in others. Cell processes are less well developed in this tumor than in most, and I expect this is because the cells are more rapidly growing. Proliferation of the endothelial cells of the intima of some of the blood vessels is well marked, but there is little proliferation of the cells of the adventitia. There is considerable variation in the changes in the blood vessels of malignant astrocytomas: in some the endothelial proliferation is marked, in others it is the adventitial cells that have proliferated, and in some, both types of cells proliferate. There seems to be a fairly good correlation between the vascular changes and the amount of necrosis present in these tumors.

Dr. Kernohan's diagnosis: GEMÄSTOCYTIC ASTROCYTOMA.

Histopathologic Diagnoses Submitted by Mail:

Gemästocytic astrocytoma	36
Astrocytoma, grade III	15
Glioblastoma multiforme	18
Spongioblastoma	3
Oligodendroglioma	1
Others	2

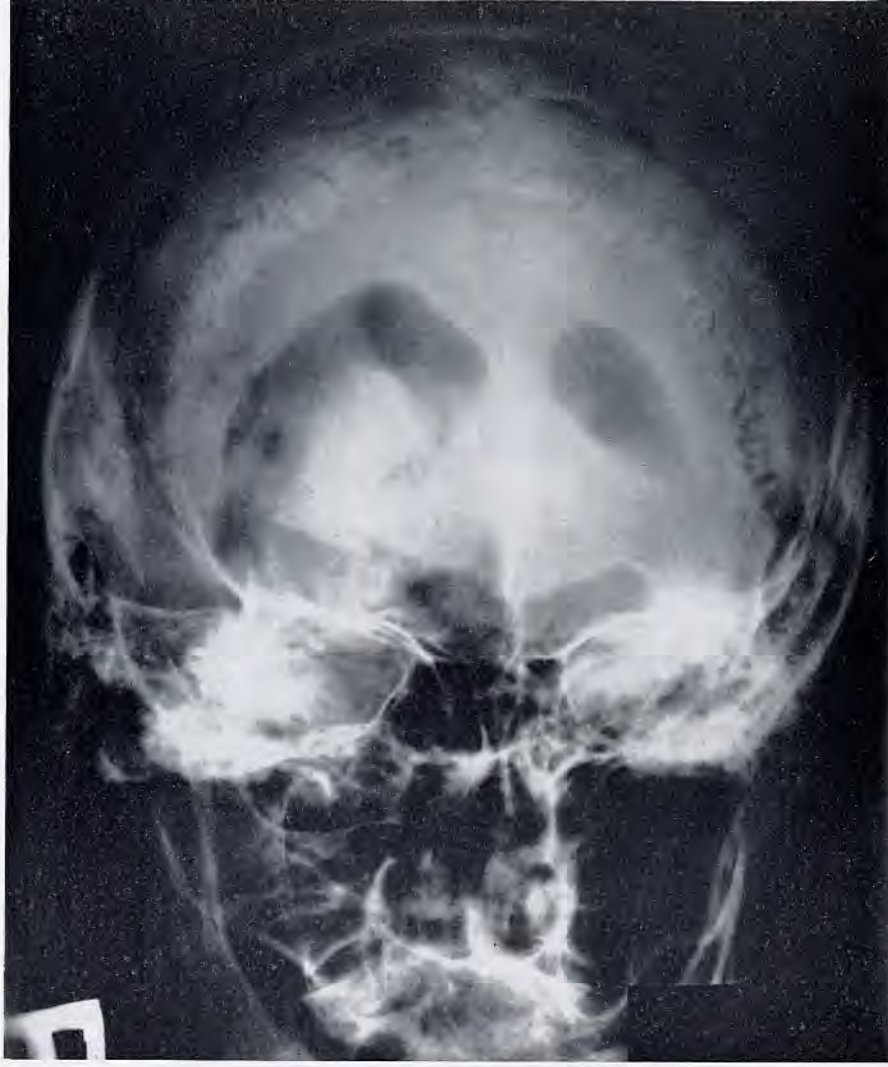


Fig 1—Roentgenogram showing irregularity and displacement of lateral ventricles.

Isaac Costero, M. D., Mexico City, (in Havana): Glioblastoma multiforme (malignant glioma). The vast areas of necrosis and devastation and the proliferation of the vessels are all characteristic. In this case the astroblasts in evolution towards astrocytes predominate, allowing recognition of the variety known as gemästocytic. The silver stains show that all the varieties of glioblastoma multiforme contain the two types of glioblasts: small fusiform spongioblasts which stain lightly, and large pyriform chromophile astroblasts which have a vascular prolongation and are grouped in gliovascular systems. The tissue cultures make manifest the spongioblastic components, the permanent transition between the two varieties of glioblasts and the astroblastic nature of the gemästocytes.

Dr. Regato: Most experts agreed to the diagnosis of gemästocytic astrocytoma or astrocytoma grade I; Dr. Raffaele Lattés, of New York, and Dr. A. Severance, of San Antonio, submitted a diagnosis of glioblastoma multiforme or astrocytoma grade IV. It seems that in the grading of astrocytomas we may find as much divergence as in the grading of pedestrian tumors.

Drs. M. B. Dockerty, D. C. Dahlin and E. H. Soule of Rochester wrote: "If fat stains are not strongly positive on this tissue, the diagnosis is gemästocytic astrocytoma. Such extensive infarction is unusual for a glioma but such gliosis is even more unusual for an infarction!"

Dr. Zülch: This patient was fifty-nine years of age, too old for an astrocytoma and well within the age in which glioblastomas occur. One has to make a differential diagnosis with a subdural hematoma, but I think the clinical history is not very suggestive of the latter. If the histologist gets only a very small piece of this tumor, he may be led to think that it is a benign tumor. I think that the extensive amount of necrosis, and the features that doctor Kernohan has already so well pointed out, tend to show that this is a malignant tumor. And even if you call it an astrocytoma one is never sure that it is not an astrocytoma undergoing maglignant transformation into a glioblastoma.

J. J. Richmond, M. D., London: It has always been my impression that the histopathology of the gliomas is constantly changing, changing in degree of malignancy; I think there is evidence available to show that many astrocytomas of high differentiation, that is of grade 1, subsequently change to grade 3 or 4 tumors. I know that many pathologists will not hold with this idea but I would like very much to have doctor Kernohan's views on the subject.

Dr. Kernohan: Some gliomas remain quite constant throughout their life history; others, a fair number of them, change. One of the technicians in my laboratory has an astrocytoma discovered 18 years ago, grade 1 at that time. Six to eight years ago she was operated upon because the aqueduct was being occluded. A month ago she was again re-explored because she was having further trouble; the biopsy at this time showed it to be a grade 2. Many authors feel that we need many biopsies and many sections from a tumor to be sure that we are dealing with a uniform tumor. I have been in the habit of classifying the tumor on its most malignant component, because in a very short time the malignant part will dominate the entire picture.

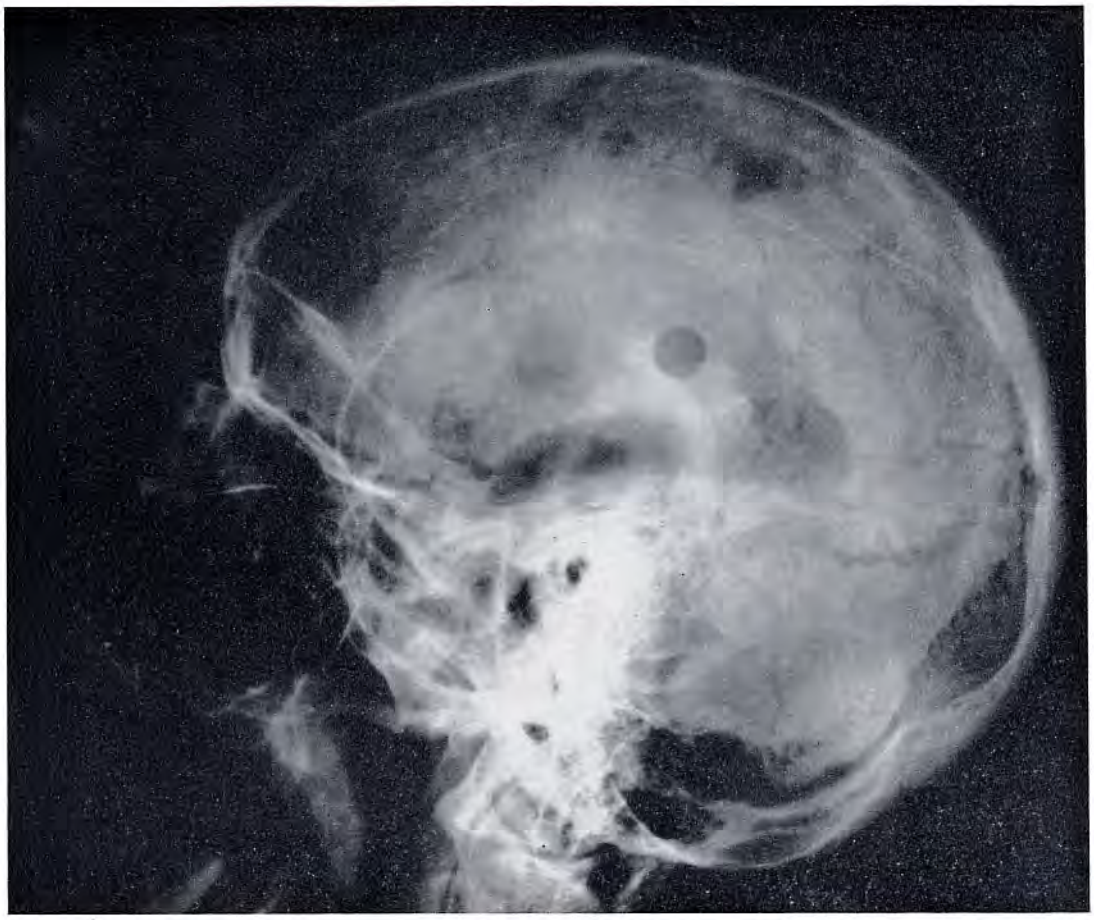


Fig. 2—Roentgenogram showing distortion of anterior half of lateral ventricle.

so that I would be inclined to grade them, for instance: astrocytoma grade III with a grade I component.

Dr. Regato: I was under the impression that what is called a gemästocytic astrocytoma falls into the definition of astrocytoma grade I; do you grade a gemästocytic astrocytoma as such, I to IV, or would you, after making a diagnosis of gemästocytic astrocytoma consider it as a grade I?

Dr. Kernohan: About 85% of our gemästocytic astrocytomas are grade I, about 10% are grade II, about 3 to 4% grade III, and 1% or thereabouts grade IV.

Dr. Regato: So that actually the diagnosis of gemästocytic astrocytoma should always be qualified by a grade.

Dr. Kernohan: Either that or you would call them spongioblastoma or glioblastoma multiforme. But they look like the grade I's except that they have more marked pleomorphism, mitotic figures, vascular changes and areas of necrosis.

L. Lowbeer, M. D., Tulsa, Oklahoma: I would like to ask doctor Kernohan about his experience with the rare group of malignant gliomas which grow to the outside of the cerebral cortex into the subdural space. The tumor within the subdural space has a large capacity for swelling of the glial tumor cells, whereas the same kind of structure only more exaggerated is formed, with gemästocytic astrocytes. We had an astrocytoma grade IV, which outside of the cerebral cortex area, had a totally different structure and was composed exclusively of tremendously swollen and obviously malignant cells. It was probably due to different biologic growth potentialities in the subdural space as contrasted to growths within the cerebral medulla.

Dr. Kernohan: I haven't much experience with that phenomenon, but I have seen it once or twice; occasionally they do tend to swell up when they get in the subdural space. On the other hand, we have a fair number of gliomas that have grown into the subarachnoid space, become implanted throughout the meninges; the diffuse meningeal gliomatosis and the diffuse tumors that grow around the cortex, for instance, are almost identical with those seen in the cerebrum. In other words, the spread hasn't changed the picture very much. I haven't had much experience with those growing outside the dura, although we have one or two that have been growing in the temporal muscles, having been seen there during the course of an operation, and in that place the tumor cells look not unlike those of the original tumor that had been removed before.

F. P. Bornstein, M. D., El Paso, Texas: In this particular case, in addition to two solid tumors in the brain there were numerous small tumor nodules in a submeningeal location. I would like to ask doctor Zülch how often in his material he sees multiple tumors and whether he thinks these are metastatic or multicentric tumors.

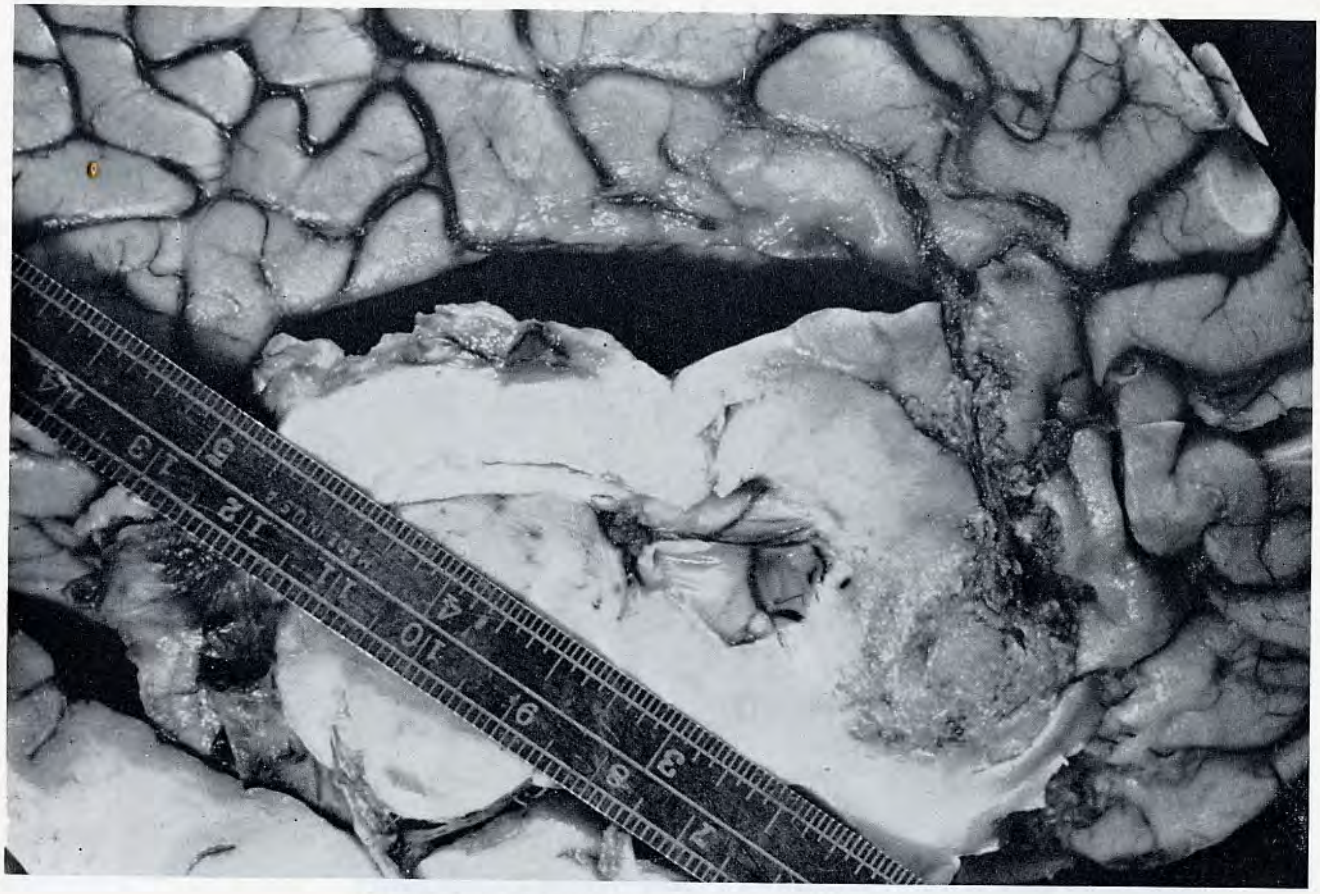


Fig. 3—Tumor of the corpus callosum extending anteriorly.

Dr. Zülch: There are a good many ways in which you can show that these are metastatic. For instance, you may have clearly metastatic dissemination after operations. And on the other hand you find some definitely spontaneous metastasis as shown by Cairns and Russell. We had some curious observations of our own which made us think that we had a purely multifocal origin of tumors, as in a case of oligodendroglioma which had about thirty to forty different spots all over the brain. And some other cases of typical glioblastomas where we found one tumor in the frontal lobe and another one in the occipital lobe. I am not sure, I don't know. But there are certainly cases of artificial dissemination and of spontaneous dissemination of gliomas and some curious cases where you find purely multifocal origin.

K. M. Earle, M. D., Galveston, Texas: We have just reviewed over 500 gliomas which we had followed up to death in over 72%; most of our gemastocytic astrocytomas had a poor prognosis. We tried to use different classifications and then compared them, and we found that in the astrocytic group of gliomas we could identify really only

Fig. 4 — Photomicrograph (H and E, x 190) showing cellular tumor containing swollen or gemästete astrocytes. There is proliferation of adventitial and intimal cells of blood vessels and many glial fibrils.

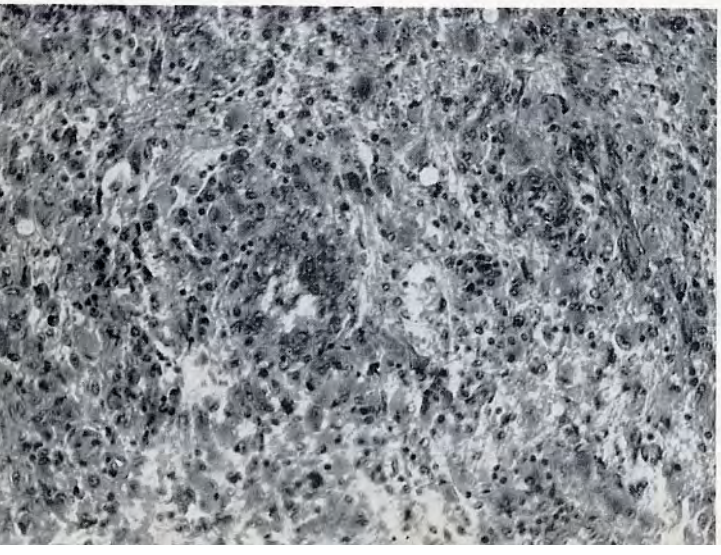
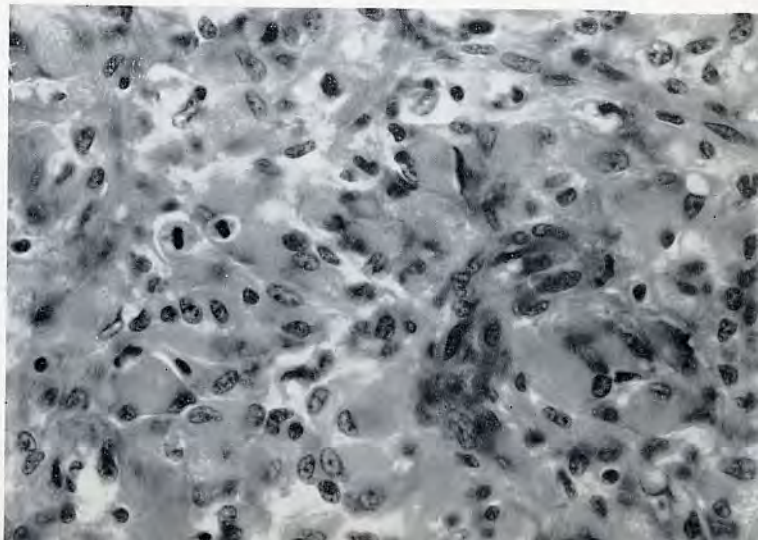


Fig. 5 — Photomicrograph (H and E, x 450). Gemästete astrocytoma with more than average number of cells, hyperchromatic and pleomorphic nuclei as well as mitotic figures; grade 3.



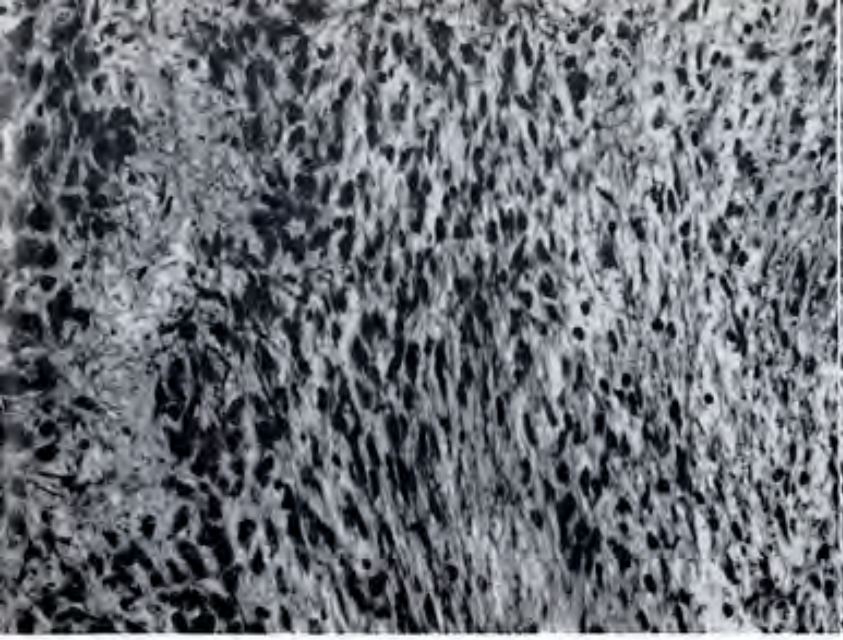


Fig 6—Photomicrograph (Rio-Hortega, x 190) showing spongioblastic zone with some perivascular elements with astroblastic character (courtesy of Dr. I. Costero).

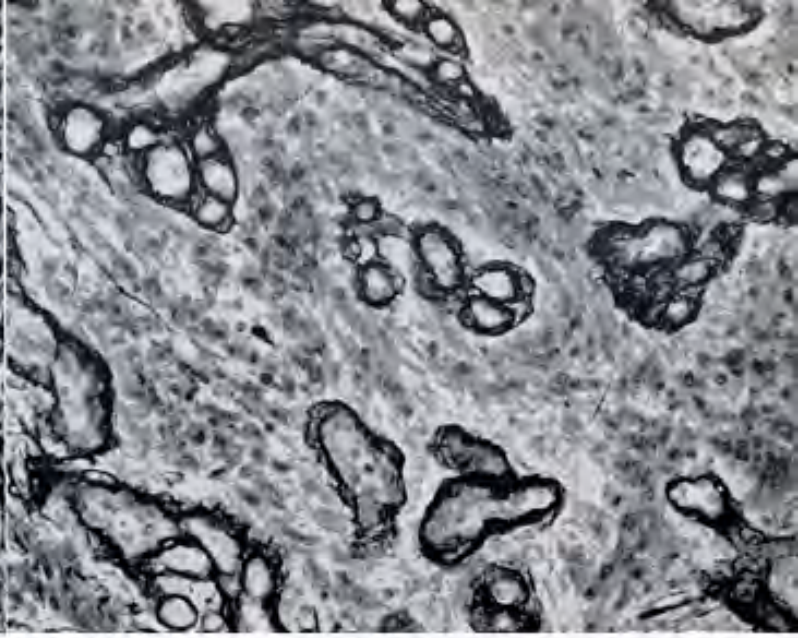


Fig. 7—Photomicrograph (Rio-Hortega, x 190). Another aspect of spongioblastic zone demonstrating characteristic vascular proliferations (courtesy of Dr. I. Costero).

three groups on the basis of their prognosis: those that had a good prognosis, the fibrous, the grade I groups, then those that had a definitely malignant prognosis, which doctor Kernohan would call grade III or IV, and then the highly variable group, which we call poorly differentiated. The gemästocytic ones fell in the highly variable group; most of them averaged a survival of one to three years as opposed to the fibrous ones, most of which lived from five to ten years.

J. C. Evans, M. D., Pittsburgh, Pennsylvania: I wanted to ask doctor Kernohan if he had seen any correlation between the gemästic change and previous irradiation. We recently had a case that was operated on for an astrocytoma three years after excessive irradiation and showed this change. Unfortunately, we had no biopsy before treatment.

Dr. Kernohan: I haven't much experience with post-irradiation effect. Just recently we had a very fine example of the phenomenon you mentioned. The patient died a month following Cobalt therapy; the cells were enormous, the largest cells I have ever seen in a glioma, whereas the original biopsy material removed at surgery was nothing like that. But my experience beyond that is not very extensive.

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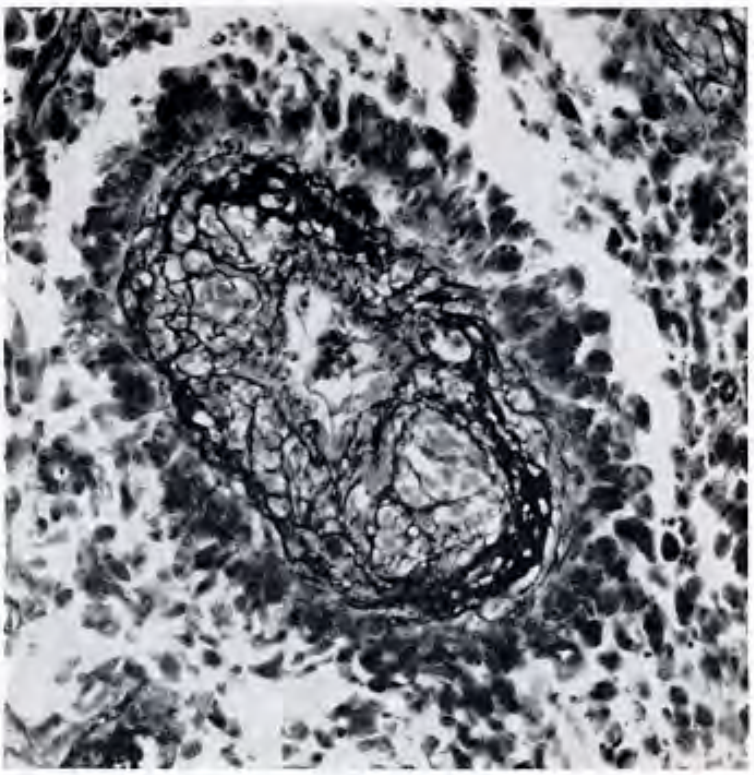


Fig. 8 — Photomicrograph (Rio-Hortega, x 190). Astroblastic zone. The pyriform astroblasts have a process oriented towards the vessels, forming a typical glio-vascular system (courtesy of Dr. I. Costero).

5. Papillary Ependymoma of the Lateral Ventricle

Contributed by Norman E. Pond, M. D., Lackland Air Force Base, San Antonio, Texas

THE PATIENT was a 2-year-old boy in July, 1955 when he showed an arrest of his normal development: his ability to speak regressed, he became irritable and presented apparent mental aberrations. A neurological examination revealed no abnormalities. The routine laboratory examinations were not contributory.

Dr. Pendergrass: Radiographically the single lateral roentgenogram submitted for diagnosis revealed: 1) air in the spinal canal and 4th ventricle which suggests this child did not have increased intracranial pressure; 2) a large soft tissue mass, containing calcific debris, in the parietotemporal region; 3) the posterior portion of the body of the lateral ventricle is abnormally dilated; 4) the temporal horn is abnormally dilated; 5) the occipital horn is abnormally dilated; 6) the tumor mass seems to lie within the lateral ventricle at its bend where normally one finds the choroid plexus; 7) what can be identified of the anterior horn of the lateral ventricle seems depressed and somewhat irregular.

The focal dilatation of the temporal and occipital horns in the lateral ventricle plus the presence of air around the tumor mass itself argue in favor of intraventricular disease. Among the latter may be included, in their order of frequency, ependymomas, intraventricular epidermoids, and adenomas of the choroid plexus.

Cranial epidermoids, often referred to as cholesteatomas because they contain large amounts of cholesterol, may occupy any portion of the skull or brain. In the bones of the calvaria they cause characteristic sharply demarcated defects which are easily identified by the experienced roentgenologist. Within the brain too they produce rather classical abnormalities which are well circumscribed and contain irregular streaks of filigree-like lacework, somewhat spongy in texture as the result of the presence of the more radiolucent cholesterol which contrasts sharply with the adjoining brain tissue. Sometimes calcific debris may be identified within the main soft tissue mass. Noteworthy also is their common occurrence within the ventricular system in a manner not unlike that demonstrated by the infant whose roentgenogram now concerns us. Thus, no one can gainsay the possibility that we are dealing with an intraventricular epidermoid.

Of considerable interest is the location of this patient's mass. Intraventricular in origin, it arises in the region of the glomus of the choroid plexus and seems to extend anteriorly. Rarely does the choroid calcify in children of two years of age; this tumor mass contains a great deal of calcific debris. The mass itself seems less lacy and more radio-opaque than the usual intraventricular epidermoids. Because of this one must consider the possibility of an adenoma of the choroid. We suspect the growth may have invaded the frontal lobe. The presence of this inordinate amount of calcific debris in this patient's tumor might more readily be explained if it were ependymal in origin.

Dr. Pendergrass's impression: 1) an intraventricular tumor, probably a MALIGNANT ADENOMA OF THE CHOROID; 2) an intraventricular EPIDERMOID seems less likely.

Radiologic Impressions Submitted by Mail:

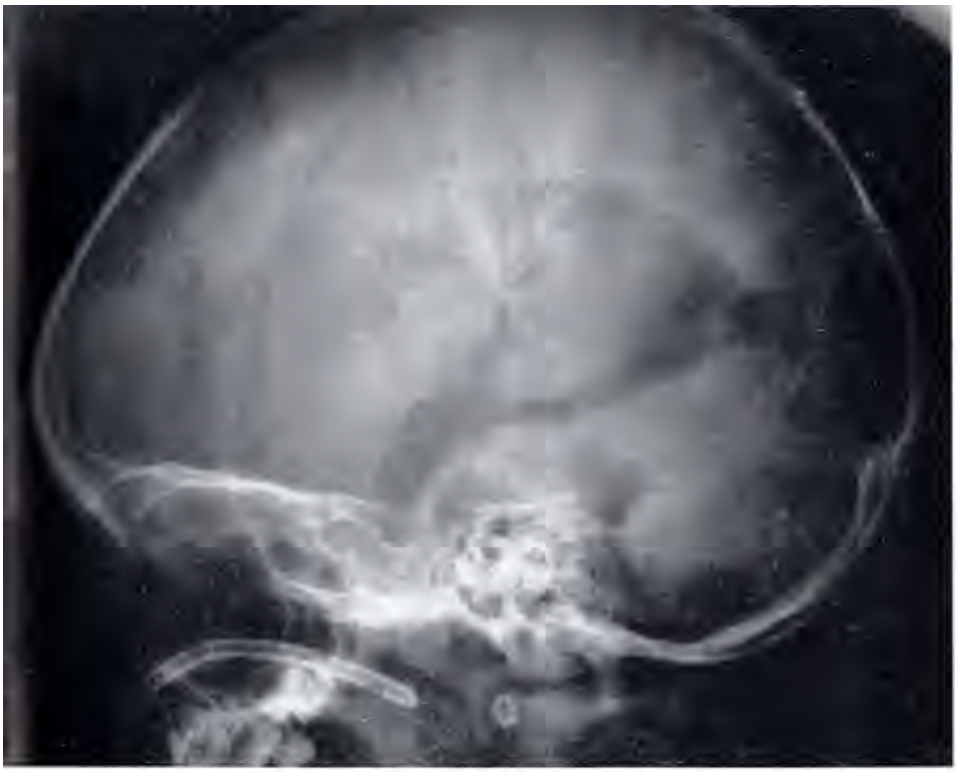
Choroid tumor	25
Ependymoma	18
Toxoplasmosis	19
Others	22

Dr. Regato: Dr. Paul C. Swenson, of Philadelphia, suggested tuberous sclerosis; Dr. Ethyl Blatt, of Cincinnati, submitted toxoplasmosis; Dr. Fred Hodges, of Ann Arbor, suggested papilloma of the choroid plexus; Dr. Ben Felson, of Cincinnati, suggested ependymoma of the right lateral ventricle.

J. Frenkel, M. D., Kansas City, Kansas: I wonder if, as a pathologist, I may make a remark about the radiologic diagnosis of toxoplasmosis. The pathogenesis of these calcifications depends on inflammation, inflammatory necrosis and infarction necrosis of brain tissue. The diagnosis cannot be made if calcification is found in tissue which is not normally present. Furthermore, usually these calcifications are multiple, they are dispersed, at the age of two years they are larger. Chorioretinitis, also is almost always present.

Operative findings: In July 1955 a right parieto-occipital craniotomy was done. A tumor, papillary in appearance and gritty to palpation was found, posteriorly, in the right lateral ventricle; it was removed.

Dr. Kernohan: This is a beautiful example of the papillary type of ependymoma. Ependymomas are not common in the cerebrum in children; they occur more frequently in the fourth ventricle in this age group. Ependymomas are the most common type of glioma in the spinal cord but uncommon in the brain. Only rarely do they contain enough calcium to be visualized in a roentgenogram. There are three types of ependymomas. The classic type is one in which the tumor cells form canals similar to the central canal of the spinal cord. The most common is the so-called cellular type, in which the cells do not form canals but tend to radiate around blood vessels forming small pseudorosettes in which there is a ringlike arrangement of nuclei, while the cell bodies or projections fill the center of the ring. These tumors have large numbers of nuclei and cells presenting a somewhat monotonous appearance. Mrs. Kernohan and I coined the term "cellular type" to designate this variety of tumor. Since it does not signify malignancy, the term is perhaps unfortunate, but no one has suggested a better term and when they do I will be more than happy to adopt it. The third and least common type of ependymoma is the papillary variant. This is infrequently seen in the brain but is the most common glioma found in the cerebellopontine angle. Calcium is rarely found in tumors in either of these locations. Because of



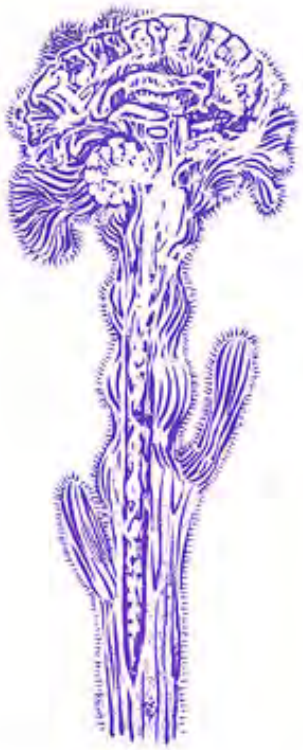


Fig 1—Roentgenogram showing a large mass containing calcific debris in the temporal region. The temporal and occipital horns are abnormally dilated.

the nature of the stroma and the deposition of calcium in this stroma, we must consider this tumor as having arisen from the choroid plexus. On the basis of the criteria which I have established for myself, I do not believe that this is a papilloma choroideum. In all the ependymomas which I have seen arising from the choroid plexus the tumor cells contain droplets of mucus, and there is no mucus in the tumor cells in this case. Perhaps this criterion is too rigid or erroneous, and this may be an ependymoma having origin in the choroid plexus. In the case we are considering this morning the ependymal cells are fairly regular in size, low columnar and attached to a core of connective tissue which contains blood vessels or capillaries. The calcium, for the most part, is laid down as concentric or laminated masses similar to psammoma bodies. In a few places it is in much larger masses, but even here there is a semblance of laminations. I suspect that if one did special studies on these masses, one would find that they contained not only calcium but also hemosiderin. In this respect, as well as in their architecture, they resemble the masses commonly found in the choroid plexus of a normal adult or elderly patients.

Dr. Kernohan's diagnosis: PAPILLARY EPENDYMOMA.

Histopathologic Diagnoses Submitted by Mail:

Papilloma of choroid	65
Papillary ependymoma	38
Meningioma	3
Pinealoma	2
Oligodendroglioma	1
Others	5

Isaac Costero, M. D., Mexico City, (in Havana): The histologic picture is that of a papilloma of the choroid plexus, which presents a structure similar to that of the normal tissue. When it is found in an ectopic situation it is also designated as papillary ependymoma.

Dr. Regato: Dr. Francisco León and Dr. Calixto Masó, of Havana, and Dr. L. Benitez-Soto, of Mexico City, also submitted papillary ependymomas. Dr. James B. McNaught, of Denver, Dr. Ruppert A. Willis of Leeds, Dr. Lowbeer of Tulsa, Dr. Dorothy Russell, of London, and Dr. Rubén Farias of Mérida, submitted papilloma of the choroid plexus.

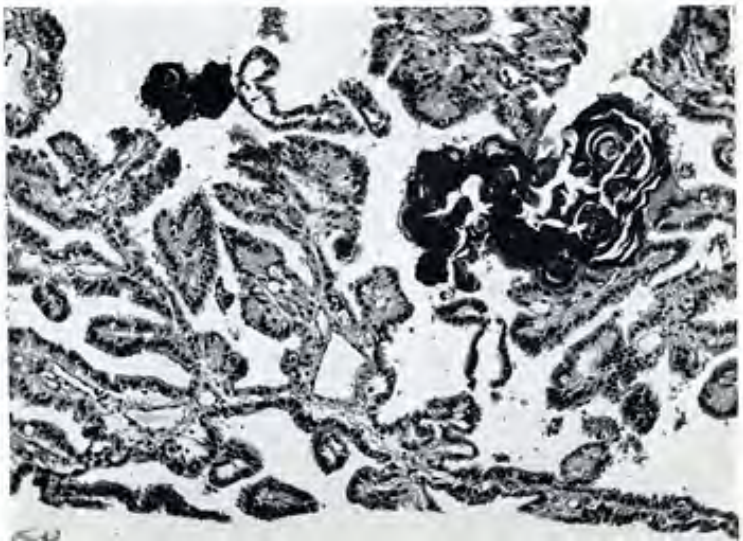
Norman E. Pond, M. D., San Antonio, Texas: At this time the child is developing normally. The neurological examination is still negative as it always has been, and they have done an electro-encephalogram which is also negative. I wonder if doctor Kernohan would like to say something about the possibility that this tumor might seed down the spinal canal.

Dr. Kernohan: These tumors do occasionally seed down around the spinal cord but not very often, and I would think it would depend on how careful the surgeons were in aspirating the remnants of the tumor.

Dr. Zülch: I think that these tumors seed very rarely, but also you may have meningiomas of the same region which might be quite similar.

This is a very typical case, although it occurs in a very young subject. Some other cases occurring in small children have been reported (van Wagenen). I recall one of our cases in a baby of two years with this type of tumor in exactly the same location. That points to another fact, the curious observation that these tumors have a preference

Fig. 2—Photomicrograph (H and E, x 120) showing cuboidal ependymal cells growing in a connective tissue stroma which contains blood vessels or capillaries. There are also concentric masses of calcium. Tumor simulates choroid plexus.



for the glomus, and secondly that they are often located on the left side. At first I wouldn't believe that, but I went through the cases reported in the literature and there is really a very curious preference for the left side by these papillomas of choroid plexus of the lateral ventricle. I think we must congratulate the neurosurgeon for the success of his treatment.

Richard M. Mulligan, M. D., Denver: We know that samoma bodies are fairly frequently seen in papillary carcinoma of the thyroid and cystadenocarcinoma of the ovary. Do you have any figures on how frequently papillary carcinoma of the thyroid and serocystadenocarcinoma of the ovary metastasize to the brain?

Dr. Kernohan: They are quite rare in our experience, but then our experience is quite limited.

S. M. P. Ashe, M. D., Denver: Doctor Dobos and I had a chance to examine a papilloma of epidermoid nature arising from the floor of the third ventricle. There was no exterior evidence of it; it was not a cranial pharyngioma but one which grew internally, went out the right foramen of Monro and into the lateral ventricle. A very interesting tumor.

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6. Brain Metastases from Alveolar-Cell Carcinoma of the Lung

Contributed by E. A. Brucker, Jr., M. D., Madison, Wisconsin

THE PATIENT was a 50-year-old man in October 1955 when he complained of headaches and blurry vision of six months duration. He was a chronic alcoholic with paranoid tendencies; he had been found to present patchy pulmonary lesions that had been treated as tuberculosis. Examination revealed bilateral papilledema and retinal hemorrhages; reflexes were normal, there were no sensory changes. The spinal fluid pressure was 230-160 mm and the fluid showed 39.2 mgr of proteins and 658 mgr of chlorides per cent.

Dr. Pendergrass: The roentgenogram of the chest reveals: 1) extensive parenchymal disease involving both lungs; 2) a large cavity in the right upper lobe; 3) marked bilateral hilar adenopathy; 4) disseminated small masses, spheroid in configuration, suggesting metastatic disease.

This pulmonary picture is most unusual. In spite of the large cavity it does not look like tuberculosis alone; nor does it suggest one of the other granulomas such as those of fungus origin. Usually granulomas do not produce multiple small spheroid densities of the type that here suggest metastatic disease. The hilar adenopathy also causes us concern; they are more consonant with the lymphomas, the collagen diseases, sarcoid, or even carcinoma of primary and secondary origin.

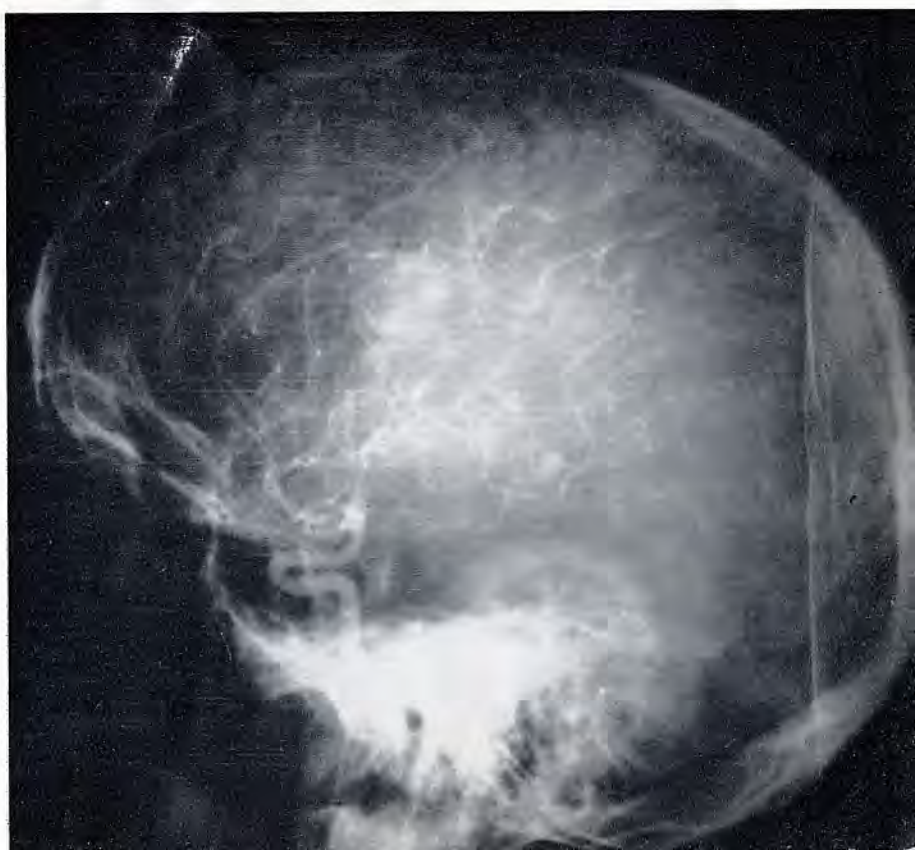
The complexity of this pulmonary picture leads us to believe that this chest harbors a combination of pulmonary diseases, perhaps a granuloma (tuberculosis), complicated by a bronchogenic carcinoma, metastatic disease, or even one of the lymphomas.

The lateral roentgenogram of the skull is a cerebral angiogram exposed during the arterial phase which reveals: 1) an abnormal cluster of blood vessels in the posterior frontal region measuring approximately 1.5 cm in diameter; 2) some crowding of the carotid siphon; 3) slight uncoiling of the anterior cerebral artery where it courses around the corpus callosum, suggesting minor ventricular dilatation.

The cluster of abnormal blood vessels, the crowding of the carotid siphon, and the minor changes in the anterior cerebral artery all suggest the presence of intracranial disease. Of paramount importance is the cluster of vessels which demonstrate a so-called "tumor stain." The latter are seen only in new growths, not in infections. The size of this tumor stain, and its nodular distribution suggests the process is metastatic. One of our own patients in whom a similar lesion was identified proved to have a metastatic cerebral nodule from a primary carcinoma of the sigmoid. We recognize that the tumor stain caused by various forms of intracranial disease may vary.

Dr. Pendergrass's impressions: 1) PULMONARY GRANULOMA complicated by pulmonary metastases; 2) CERE-

Fig. 1—Cerebral angiogram showing abnormal cluster of blood vessels demonstrated in the frontal region, some crowding of the carotid siphon and slight uncoiling of the anterior cerebral artery.



BRAL METASTASES probably from carcinoma of the bronchus.

Radiologic Impressions Submitted by Mail:

Tuberculoma	38
Metastatic lung tumor	24
Sarcoid	15
What a Spook!	1
Others	13

Dr. Regato: Dr. Ben Felson, of Cincinnati, suggested histoplasmosis; Dr. Bertram L. Pear, of Denver, preferred Boeck's sarcoid; Dr. Harry Hauser, of Cleveland, submitted tuberculoma; Dr. B. J. Hill, of Ann Arbor, suggested malignant pulmonary tumor with brain metastasis.

Operative findings: In December, 1955, a right temporal craniotomy was done. There was a large subcortical mass with cystic areas which extended towards the midline. Only biopsy was done.

Dr. Kernohan: This is another papillary tumor but is quite different from case 5. In this tumor the cells are much larger, definitely eosinophilic, and highly columnar, and contain vacuoles which suggest droplets of mucus. However, a specific stain for mucus shows that the vacuoles do not contain mucus. The stroma is much less than in case 5. As a matter of fact, it is quite sparse. The tumor cells should be differentiated from those of ependymomas of the choroid plexus. In the latter type of tumor, the cells are not deeply eosinophilic and for the most part are high cuboidal cells rather than columnar. Both this tumor and those having origin from the choroid plexus are of low grades of malignancy. I did not see any calcium in the section which I examined; so I am not in a position to discuss this phenomenon which was noted in the roentgenograms.

There is a very abrupt line of demarcation between the neoplasm and the surrounding brain except where the tumor cells extend into the brain along the perivascular spaces. This is quite unlike primary tumors of the brain. In one place where the tumor is in contact with the brain, I thought that I could see tumor cells in the lumen of a blood vessel. I am not sure of this, but it was very suggestive. If this is so, it supports the idea that this is a metastatic tumor. The nature of the tumor cells is such that they do not seem to me to be those of a primary brain tumor. There are not many tumors in the body with a papillary arrangement and cells such as the ones we have in this case. The tumor cells are similar to those of alveolar cell carcinomas of the lung. The roentgenogram of the chest shows involvement of both lungs which is also common in this type of tumor. Alveolar cell cancers of the lungs are not considered highly malignant, but they do metastasize, although I have never seen one metastasize to the brain until this case, if it is a metastatic tumor and I believe it is.

Dr. Kernohan's diagnosis: METASTATIC ALVEOLAR CELL CARCINOMA OF THE LUNG.

Histopathologic Diagnoses Submitted by Mail:

Papillary adenocarcinoma	63
Papillary ependymoma	28
Papilloma of choroid	19
Oligodendroglioma (I love that word!)	1
Others	7

Isaac Costero, M. D., Mexico City, (in Havana): The intense acidophilia of the cytoplasms, the shape of the cells, the presence of vacuoli giving an appearance of calyciform cavities and the history of pulmonary lesions, permit us to deduce that this is a pulmonary carcinoma metastasizing to the brain.

Dr. Regato: Dr. E. F. Geever, of Bethesda, thought that the primary might be in the thyroid; Dr. J. R. Stafford and Dr. L. Brahen, of Denver, as well as Dr. H. K. Giffen, of Omaha, all submitted a diagnosis of papillary ependymoma: this was also the diagnosis entertained by the contributor.

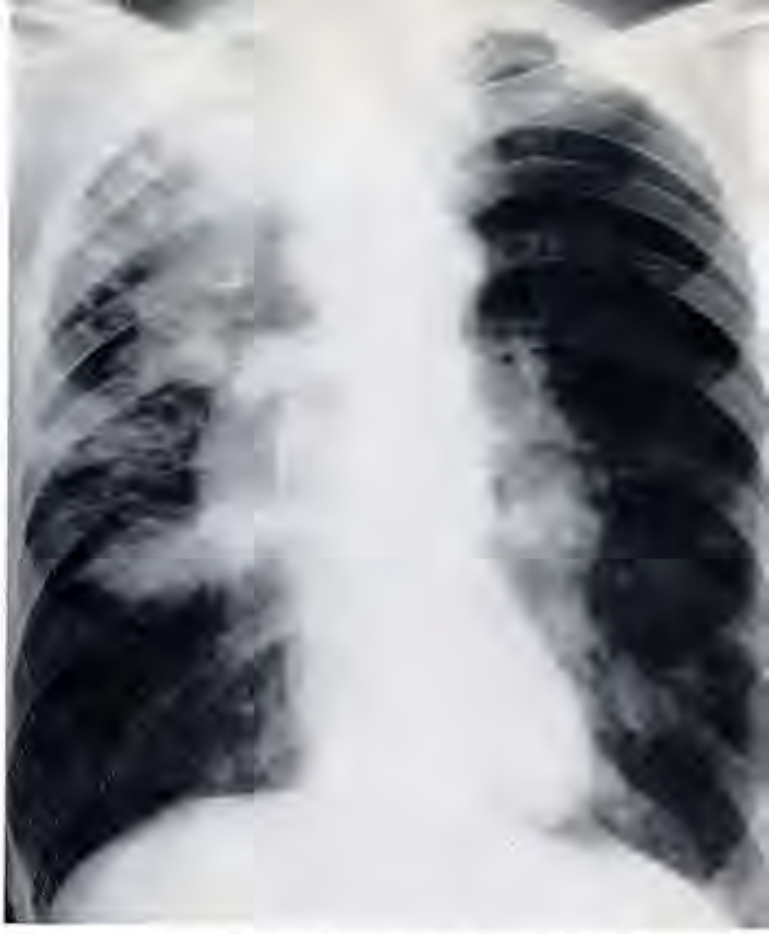


Fig. 2—Roentgenogram showing parenchymal lesions of both lungs and bilateral hilar adenopathy.

Rupert Willis, M. D., Leeds, (by mail): I feel sure this is a primary pulmonary carcinoma, probably of the multifocal type.

Subsequent history: Patient died a few weeks after intervention. No autopsy was done!

J. J. Richmond, M. D., London: I like the diagnosis of thyroid carcinoma with both the tumors in the chest and brain being secondary. I recall a patient with symptomatology very similar to this one in whom the diagnosis was only established at autopsy. I am very interested in the recurrent diagnosis of oligodendroglioma: there is an old dictum that you can't be wrong all the time!

L. Lowbeer, M. D., Tulsa, Oklahoma: I have seen a typically unilateral case of alveolar cell carcinoma of one lung which metastasized extensively to bones; there is no reason why they should not also be capable of metastasizing to the brain. The structure of this tumor suggests that of alveolar or bronchiolar cell origin. On the other hand, I am not aware of the fact that malignant tumors of such structure occur primarily in the choroid plexus.

Dr. Kernohan: No, I don't think so.

J. J. Andujar, M. D., Fort Worth, Texas: It is very interesting to note that there is a very similar tumor which occurs in cattle. I believe that metastases to brain have been reported in sheep. The process is even more infectious, and the life expectancy of the animal is shorter than that of man.

K. T. Neubuerger, M. D., Denver: We have seen one case of alveolar cell tumor with metastasis to the brain.

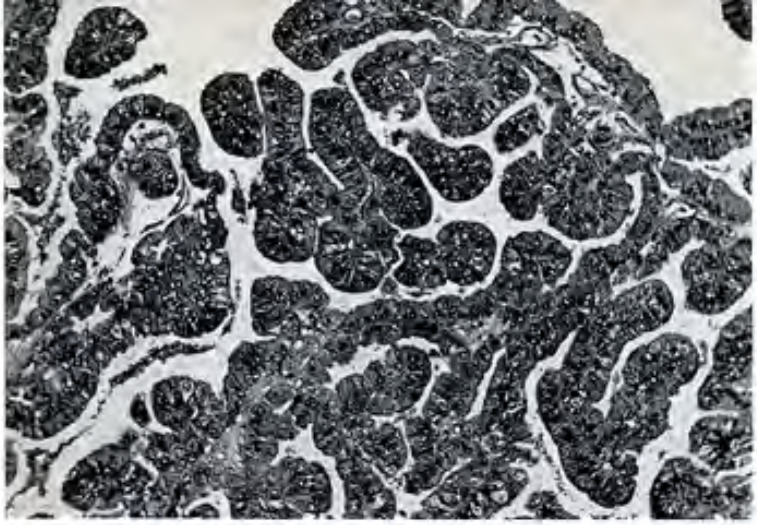


Fig. 3 — Photomicrograph (H and E, x 35). Papillary tumor with high columnar cells, many of which contain vacuoles. There is a slight amount of connective tissue stroma with blood vessels. The cells are deeply acidophilic, not neurogenic in type.

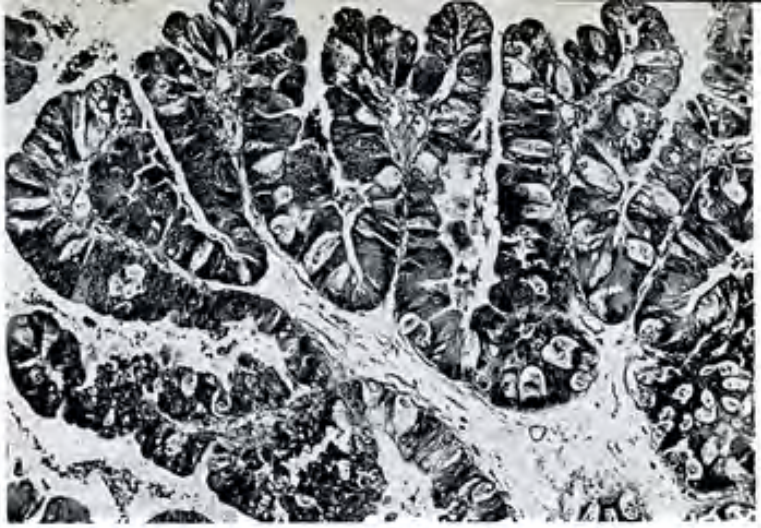


Fig. 4 — Photomicrograph (mucicarmine, x 145) showing that the intracellular vacuoles do not contain mucin.

M. Wheelock, M. D., Chicago, Illinois: We had a similar case to this one in which I made a diagnosis of papillary ependymoma following craniotomy, even though I knew there was an intrapulmonary lesion. Subsequently, the patient was operated upon, a thoracotomy was done and the pulmonary tumor was excised, and it was possible to make a diagnosis of alveolar adenocarcinoma. In reviewing the slides from the craniotomy, we altered the diagnosis and made one of metastatic alveolar adenocarcinoma to the brain rather than to carry the double primary.

Dr. Kernohan: I want to confess that I thought this was a problem of the choroid plexus, too, until I took a third or fourth look at it.

Dr. Regato: A few years ago we had a similar case; it was operated on as a primary brain tumor, nothing else was suspected at the time and the slide was sent to doctor Percival Bailey for his opinion. He returned it with the comment that it was the most typical papillary adenoma of the choroid that he had seen. By the time we heard from doctor Bailey we had an autopsy and a primary carcinoma of the lung was found.

F. C. D. Collier, M. D., Philadelphia, Pennsylvania: I would like to know what weight doctor Kernohan places upon the mucin positivity and mucin negativity in the differential diagnosis of this tumor. We have some twenty-two odd bronchiolar cell carcinomas at the hospital of the University of Pennsylvania in the last six years. Of these, none has been mucin negative. One of these was a patient who was subsequently autopsied, and although I have not reviewed the sections, my understanding is that there were several metastases.

Dr. Kernohan: Mucin stains alone are not the absolute criteria.

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7. Cellular Ependymoma with Oligodendrial Cells and Multiloculation in the Frontal Lobe

Contributed by K. M. Earle, M. D., S. R. Snodgrass, M. D., J. Kubi, M. D. and M. Schneider, M. D., Galveston, Texas

THE PATIENT was an 18-month-old baby boy in October, 1955, when he was admitted in lethargic state of decerebrate rigidity; an enlargement of his head had been noticed one month after birth. Through the anterior fontanelle 40 cc of fluid were aspirated and air was injected.

Dr. Pendergrass: Roentgenographically the single lateral roentgenogram of the skull revealed: 1) increased intracranial pressure manifest by thinning of the bones of the calvaria and spreading of the sutures; 2) a distorted and considerably dilated lateral ventricle which seems displaced posteriorly; 3) Multiloculated collections of air in the frontal region totally irregular in contour; 4) the third ventricle is barely perceptible; it lies well behind its normal position. The intraventricular foramen or foramina of Monro are demonstrated and are also displaced down and back with the third ventricle; 5) bizarre collections of air lie just above the sella turcica which cannot be identified; 6) stellate collections of calcific debris in the frontal lobe in the region of the coronal suture.

This child has a highly aggressive tumor, probably of congenital origin. Among the brain lesions that may develop during fetal life one may include the astrocytomas, ependymomas and teratomas. The fact that the air-filled, cyst-like lesions are smooth in contour does not militate against the presence of a glioma. One of our own patients in whom a cystic astrocytoma was present revealed similar smooth cyst walls.

Astrocytomas as a group more often reveal cystic changes than do the ependymomas. In the latter, however, calcific debris occurs more commonly than in astrocytomas. Furthermore, ependymomas occur more commonly in children. Intracranial teratomas being rare, this diagnosis is thus relegated to a position of lesser importance.

Whenever the head of a child enlarges rapidly obstructive hydrocephalus must be considered. In this patient this possibility is dismissed because the picture is not one of diffuse ventricular distension alone. This patient presents a mass which is displacing the lateral ventricles and third ventricle posteriorly.

Birth trauma, too, with intracerebral hemorrhage or porencephaly merit consideration. The size of the tumor mass and its aggressive clinical character would seem to exclude these possibilities.

Dr. Pendergrass's impression: FRONTAL LOBE CYSTIC GLIOMA (ependymoma, astrocytoma or teratoma).

Radiologic Impressions Submitted by Mail:

Porencephaly	36
Ventricular cyst	19
Toxoplasmosis	7
Astrocytoma	5
Others	11

Dr. Regato: Dr. Harry Hauser, of Cleveland, Dr. Paul C. Swenson, of Philadelphia, and Dr. Newman C. Nash, of

Fig. 1—Roentgenogram after aspiration of fluid and injection of air through the fontanelle, showing multilocular spaces in the frontal region.

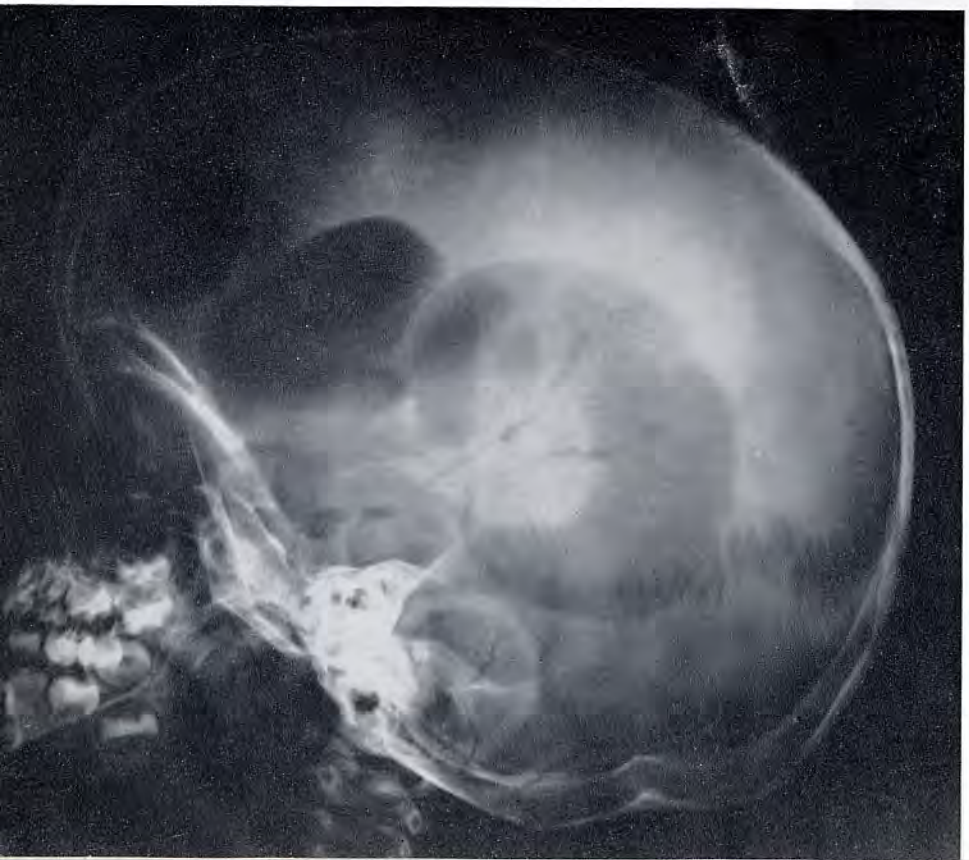

Fig. 2—Mass connected with the tentorium found in frontal lobe.

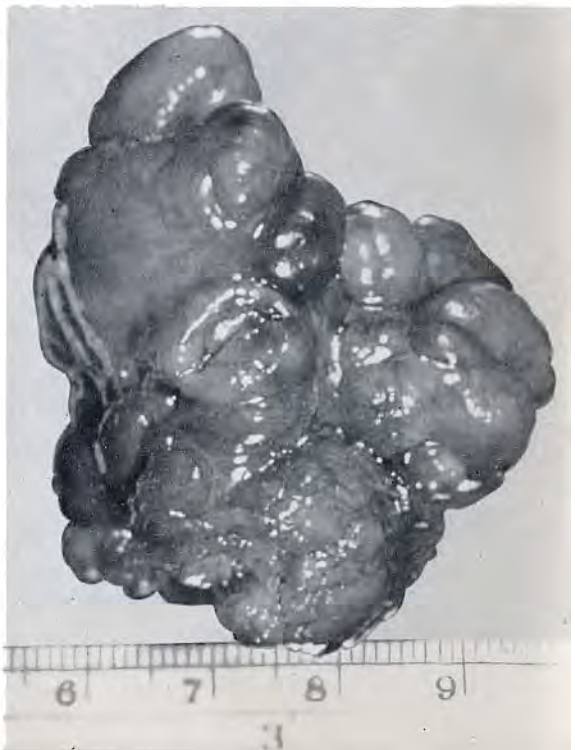

Fig 3.—External view of the right hemisphere showing areas of hemorrhage and of discoloration.

Wichita, suggested porencephaly. Dr. Philip J. Hodes, of Philadelphia, suggested the possibility of teratoma. Dr. D. A. Van Velzer, of Denver, proposed cystic astrocytoma.

Operative findings: In October, 1955, a right frontoparietal craniotomy was done. A large mass surrounded by multilocular cysts appeared to have replaced the entire right hemisphere. There were areas of hemorrhage and of yellow discoloration. A right hemispherectomy was decided upon and carried out, leaving only a portion of the thalamus.

Dr. Kernohan: This is a mixed tumor of glial origin. Such mixed gliomas are common—as a matter of fact, very common. This presents a problem in classification, and I have been in the habit of classifying them on the most prominent or dominant cell present and then mentioning the less numerous cells afterward. Another and more important concept is presented by a tumor of two different degrees of malignancy. In this latter situation I classify the tumor on the basis of the most malignant part, perhaps adding the less malignant component after the main diagnosis. The most malignant part will shortly take over the whole tumor or it will recur more quickly after partial extirpation, so that the malignant part is the dominant portion of the tumor, and it is really on the basis of this part that the prognosis is established.

The tumor is essentially an ependymoma of the cellular type. There are some cells in which the nucleus is in a clear area surrounded by the cell membrane, and these latter cells are indistinguishable from oligodendroglia cells. At one edge of the tumor there are numerous glial fibrils with some astrocytic nuclei. The ependymal cells are present in large numbers, the nuclei are quite uniform, and in one place I found a small rosette or canal—not a good

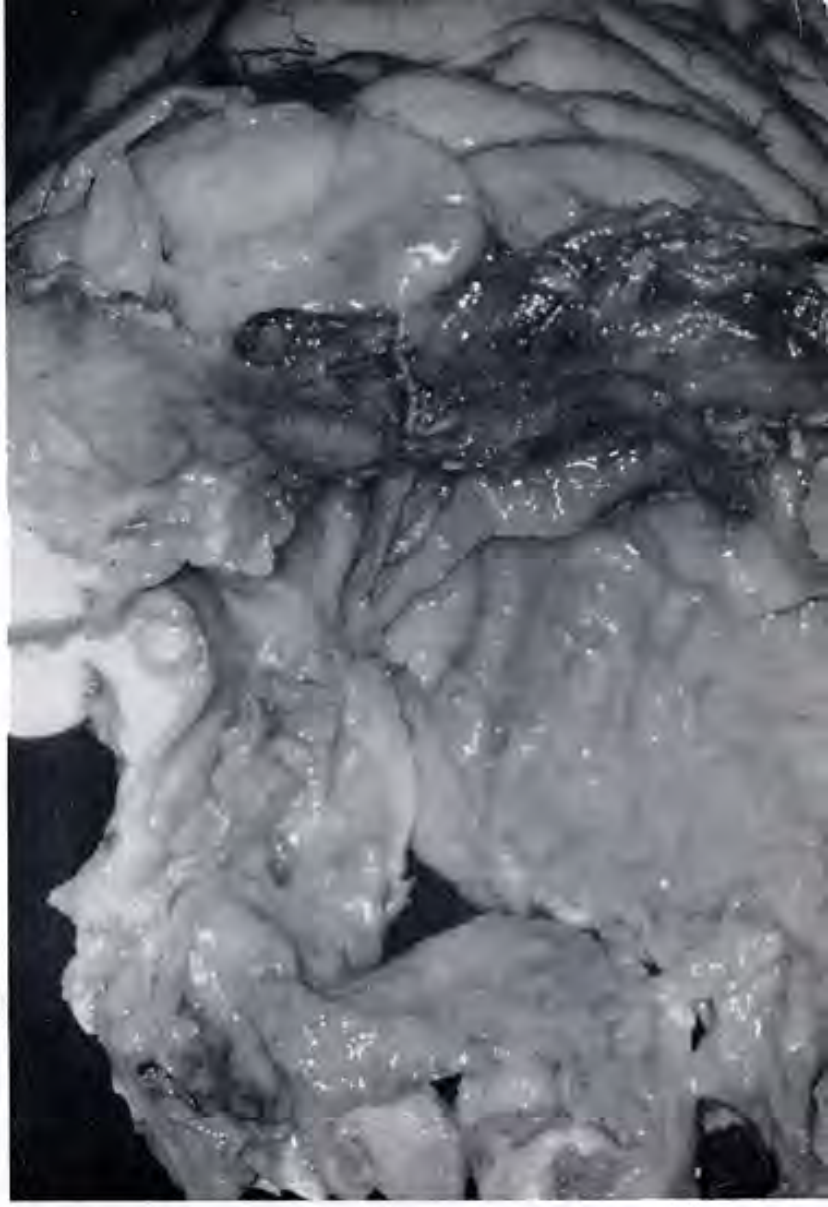

Fig. 4—View into one of the cystic areas.

one, but nevertheless quite definite. Nearby, the cells are attached to, or radiate away from, a small blood vessel or a strand of connective tissue. This radial arrangement of these cells is quite characteristic of cellular ependymomas. I could not find any mitotic figures, and so it is a relatively slowly growing ependymoma or, if you wish, it is a grade I tumor. The oligodendroglia-like cells are not numerous. My colleagues and I have found in one of our studies that more than one-third of our ependymomas contained such oligodendroglia-like cells. In some cases in which the tissue was appropriately fixed, we were able to impregnate the cells with silver carbonate. We concluded that in reality the cells were oligodendroglia. At the edge of the tumor, where I found the astrocytes, I was unable to determine whether these cells were actually part of the neoplasm or represented the reaction of the brain to the ependymoma. This degree of gliosis, if present, is low. The strands and spicules of calcium were deposited in the parenchyma as well as in the stroma of the tumor. Since ependymal cells, oligodendroglia and astrocytes all were present, one must consider the possibility of this being a malformation with neoplastic activity in the ependymal elements. I would classify this as a cellular type of ependymoma, grade I, with oligodendroglial cells. Last year Zimmerman reported to the International Congress of Neuropathology in London that in some of his experimental brain tumors the neoplastic

cells were not of one type but were really mixed gliomas. This is actually what one would expect, but it had not been produced or at least noted in previous experimental studies.

Dr. Kernohan's diagnosis: CELLULAR EPENDYMOMA with oligodendrial cells.

Histopathologic Diagnoses Submitted by Mail:

Glioma	25
Medulloblastoma	21
Ependymoma	15
Oligodendroglioma	13
Pinealoma	12
Meningioma	8
Sarcoma	5
Neuroblastoma	3
Others	6

Isaac Costero, M. D., Mexico City, (in Havana): The neoplasm is regularly divided by vasculo-connective tracts; in a small zone the tumor cells are arranged in cords which recall a tubular arrangement, there are no spongioblasts and no mitosis. These microscopic characteristics are those of an ependymoma; this diagnosis is compatible with the history of the case. The silver stains could eliminate doubts, for the ependymoma cells consistently contain argentophile blepharoblasts.

Dr. Regato: Dr. Valdés-Dapena, of Philadelphia, also submitted a diagnosis of ependymoma; Dr. L. A. Olsen, of Denver, submitted medulloblastoma; Dr. W. R. Platt, of St. Louis, preferred meningothelial meningioma; Dr. H. K. Giffen, of Omaha, proposed pinealoma; Dr. J. H. Childers, of Galveston, suggested meningeal sarcoma; Dr. Carlo Sirtori, of Milan, and Dr. H. Torloni, of Sao Paulo, submitted oligodendroglioma, and Dr. Webb Haymaker, of Washington, submitted subependymal astrocytoma, with groups of cells resembling spongioblasts.

Subsequent history: In February, 1956, the child was discharged from the hospital. In July, 1956, when fifteen months old, he weighed 22 pounds and was reported eating well; he sees and recognizes members of his family but does not sit or walk without help; he moves his left foot but not his left arm, except in his sleep.

Dr. Zülch: I think this is a typical case of cerebral ependymoma which is found very often in youth. In our material these tumors made up about 50% of all the cases of cerebral gliomas in young individuals. I have seen a case in a five month old boy which was 10 x 9 x 8 cm, almost replacing a hemisphere. The cystic degeneration is very common in these cases. As a general rule, a neurosurgeon who opens the cyst which is located near the frontal, parietal, occipital or temporal lobe, might be almost sure that he is dealing with an ependymoma or with a spongioblastoma. We have found a few, not very many, true polar spongioblastomas in that very region. In our material, most of these tumors recurred, even though they seemed to have been totally removed; they recurred after three to five years. But a good many have already survived eight to ten years. One of our patients was a girl of fifteen when such an ependymoma was totally removed. She was a university student when she noticed some little nodules in her scar and we found a fibrosarcoma all around her scar, which had begun to grow into the cerebral matter; but of the original ependymoma we found no traces.

M. Wheelock, M. D., Chicago, Illinois: I saw the ependymal elements but I thought that this tumor was an oligodendroglioma. I hoped that Dr. Kernohan might be able to make it an oligodendroglioma out of the goodness of his heart to please the persistent voter for that diagnosis.

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Fig. 5—Photomicrograph (H and E, x 220) showing ependymal type of cells with a small canal in the middle. Many of the cells have processes but some have the nuclei surrounded by a clear space similar to the oligodendroglial cells.

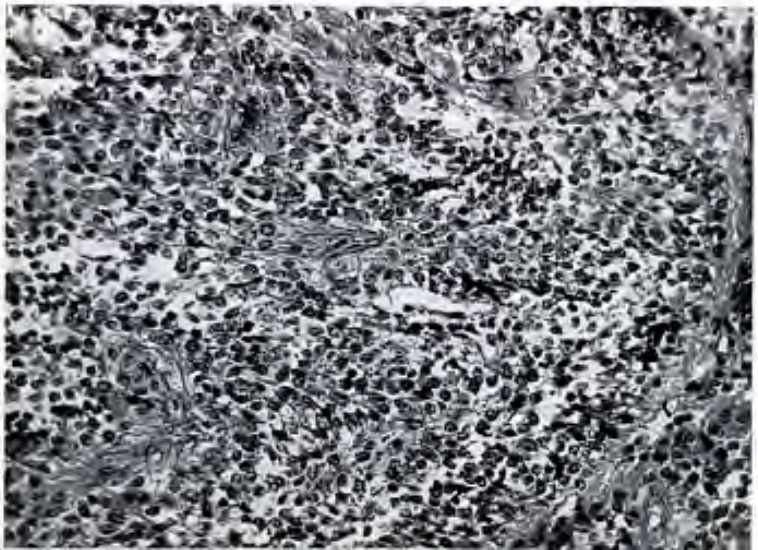
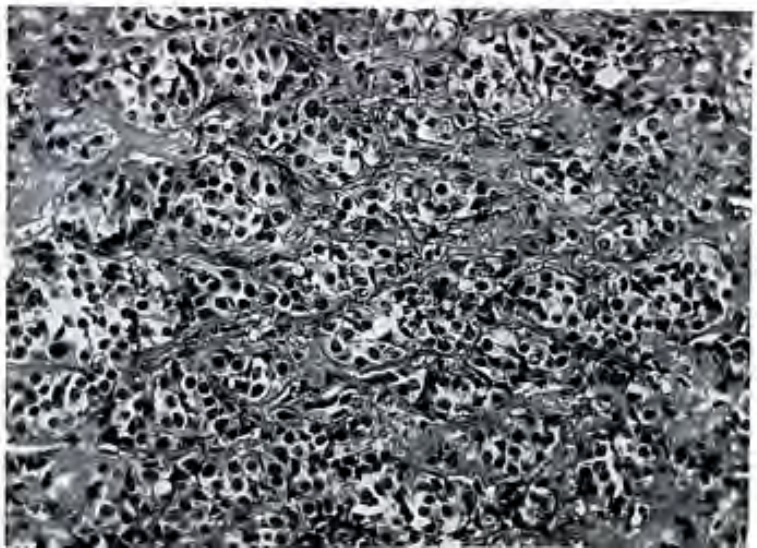
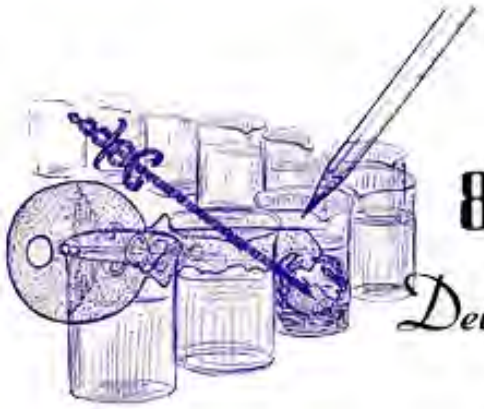


Fig 6.— Photomicrograph (H and E, x 220) showing another area with cells close together with a clear space between the nucleus and the cell membrane quite characteristic of oligodendroglia.





8. Chemodectoma (Glomus Jugulare) Developing in the Middle Cerebral Fossa

Contributed by B. Fralson, M. D., F. Toomey, M. D., E. Blatt, M. D. and S. Lavas, M. D., Cincinnati, Ohio

THE PATIENT was a 77-year-old man in November, 1954, when he gave a history of cough and expectoration of two years' duration, followed by anorexia, weight loss, dyspnea, right facial paralysis and right hypoacousia. On examination he appeared emaciated and presented a paralysis of the right side of the face and of the soft palate; there was also right hypoacousia and deviation of the tongue to the right. There was emphysema of both lungs.

Dr. Pendergrass: The postero-anterior roentgenogram of the skull revealed: 1) marked deossification of the right petrous pyramid of the right temporal bone; 2) the calcified pineal is in the mid-line; 3) minor mucous membrane thickening is noted in the left maxillary sinus.

This patient must have had a lesion which invaded the right cerebello-pontine angle for focal bone destruction of this type almost always is meaningful. The problem is not one of localization; rather it is one of deciding what caused the bone damage.

In 1955 we reviewed the records and roentgenograms of 195 patients with proven cerebello-pontine angle tumors. Of these, 141 had 8th nerve tumors, the vast majority being neurinomas. Of the remaining 54 patients with cerebello-pontine angle lesions 21 had meningiomas, 17 gliomas, 7 cholesteatomas, 3 hemangioblastomas, 2 cartilaginous tumors, 1 benign cyst, 1 dermoid, 1 aneurysm. One patient had metastactic disease of the petrosal pyramid.

Considering the roentgen findings in the 8th nerve tumors alone, 85 per cent revealed bone changes in the apex of the ipsolateral petrous pyramid. About one-half of the patients with meniglomas and cholesteatomas revealed similar bone destruction.

In the glioma group, however, only one patient revealed similar roentgen findings. Thus, statistically, the petrosal erosion in this patient suggests that he had an 8th nerve tumor; if the roentgen findings alone are considered.

There are features in this case that make one hesitate in offering an unqualified diagnosis of acoustic nerve tumor. This is a man; the disease is more common in women. This patient is 77 years old; these patients are usually closer to fifty. Almost invariably tinnitus and deafness or impaired hearing are the primary complaints; impaired hearing was merely one of the clinical findings in this individual.

The bone changes in this patient's petrous pyramid are also disquieting. Usually 8th nerve tumors cause bone defects that look roentgenographically more like actual bone destruction. Not infrequently fragments of bone may be seen where once was located the internal auditory canal. In this patient the bone merely appears deossified, "washed out" so to speak. The internal auditory canal is not demonstrated, so radiolucent is the deossified bone.

The mastoid does not seem diseased; therefore one can rule out an infection or a primary mastoid carcinoma as the cause for this patient's complaints. This patient could have a meningioma in the region of the cerebello-pontine angle; usually these lesions produce new bone proliferation or cause erosions not unlike those demonstrated in patients with 8th nerve tumors. A cholesteatoma could explain the findings in this patient; indeed it is an excellent possibility.

One cannot help but be influenced by the patient's cough, anorexia and emaciation. The latter, plus the invasive nature of his cranial nerve involvement, suggest the possibility of a malignancy which has extended to the petrosal pyramid. It is only fair to say that whereas there was but one patient with metastatic disease in our series of cerebello-pontine angle tumors, we have seen invasion to the base of the skull, including the petrosal pyramid, far more often than our cerebello-pontine angle tumor data would indicate. Aneurysms, too, may cause bone erosion at the apex of the petrosal pyramid.

Dr. Pendergrass's impression: 1) PRIMARY TUMOR OF THE 8TH NERVE; 2) METASTATIC TUMOR.

Radiologic Impressions Submitted by Mail:

Neurinoma of 8th nerve	25
Metastatic carcinoma	21
Tumor of nasopharynx	18
Cerebello-pontine tumor	9
Others	15

Dr. Regato: Dr. Harry Hauser, of Cleveland, also proposed tumor of the 8th nerve. Dr. B. L. Pear, of Denver, and Dr. P. C. Swenson, of Philadelphia, qualified it as an acoustic neuroma. Dr. Philip J. Hodes, of Philadelphia, suggested that this is not the usual cerebello-pontine angle tumor but that it appears to be a malignant tumor.

Subsequent history: The patient was increasingly unable to take food and was rapidly weakened. In November, 1954, he expired. Autopsy revealed a tumor of the right petrous pyramid which had eroded the bone and protruded into the middle cerebral fossa. There was compression atrophy of the nerves arising from the main stem; the eighth nerve passed through the tumor.

Dr. Kernohan: This tumor seems to be a variant of the one we saw in case 2. It is, I believe, another chemodectoma, but somewhat different from the other case. In this one, we have more granular cytoplasm in the cells, and because of this we must consider a granular cell myoblastoma. It seems to me that the division of the tumor cells into islands, the location of the tumor in the petrous bone and the loss of hearing are all against it being a granular cell myoblastoma. This, like some other chemodectomas which I have seen, is very vascular, and an angioma of some sort should be considered even if only to be dismissed.

In this case the cells are larger and more loosely packed, so that we can see their outline better than in the previous case. In spite of this, I was unable to stain the processes of the cells by any of the usual methods which I had available.

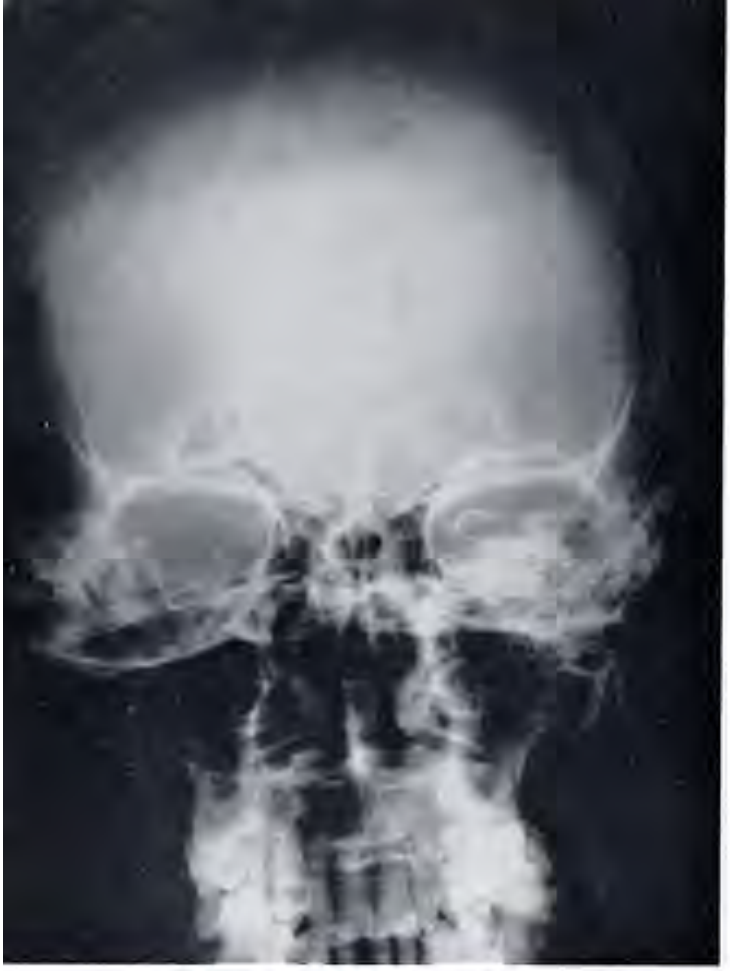


Fig. 1—Roentgenogram showing marked deossification of the right petrous pyramid.

Some of the nuclei of the cells are large and hyperchromatic. I found several mitotic figures, so one must consider the question of malignancy. Experience is limited with such tumors and no criteria of malignancy have been established, but the presence of pleomorphism and mitotic figures is very important in some tumors (gliomas), while in others it is of lesser significance. The best I can do at this time is to eye the tumor with suspicion and watch for further developments.

The stroma of this tumor impregnates very well by the Gömöri reticulin method, but this did not help in identifying the tumor cells themselves. As a matter of fact, these cells reminded me very much of the capsular cells of the sympathetic ganglia. They have a close resemblance to these capsular cells in that it has been very difficult to stain the endocapsular cells, studies of which have been impeded because of this lack of staining.

Dr. Kernohan's diagnosis: CHEMODECTOMA.

Histopathologic Diagnoses Submitted by Mail:

Metastatic carcinoma	36
Glomus jugulare	16
Metastatic melanoma	10
Astrocytoma	9
Meningioma	9
Glioblastoma multiforme	5
Hemangioendothelioma	4
Ependymoma	4
Malignant Schwanoma	3
Chordoma	3
Sarcoma	3
Acoustic neuroma	2
Rhabdomyosarcoma	2
Myoblastoma	2
Fibrosarcoma	2
Carcinoma of prostate	1
Pituitary adenoma	1
Oligodendroglioma	None!

Dr. Regato: Dr. Mark Wheelock of Chicago, Dr. Dorothy S. Russell, of London, and Dr. V. R. Khanolkar, of Bombay, also submitted a diagnosis of glomus jugulare. Dr. C. Sirtori, of Milan, and Dr. Raffaele Lattes, of New York, designated it as non-chromaffin paraganglioma. Dr. R. B. Haukohl, of Milwaukee, Dr. E. F. Geever, of Bethesda, and Dr. S. A. Smith, of Salt Lake City, Dr. Rafael Estrada, of Havana, and Dr. H. Torloni, of Sao Paulo, all considered this as a metastatic carcinoma.

M. C. Dockerty, M. D., D. C. Dahlin, M. D. and E. H. Soule, M. D., Rochester, Minnesota (by mail): Chemodectoma, more active than Case 2: large nucleoli and occasional mitoses. The brain is likely involved and the tumor may metastasize.

C. Oberling, M. D., Paris, (by mail): Tumor formed by cells with long vascular stems; this makes me think of an ependymoblastoma, but one could also make a diagnosis of pseudopapillary astrocytoma. I am very affirmative that this is not a paragangiloma.

Dr. Zülch: We have a few cases quite similar to this one from the gross pathology standpoint, and which produced the same radiographic picture. These were cylindromas, of which we had six in four thousand cases. We

Fig 2 — Postmortem view of the base of the skull showing destruction caused by tumor on the right petrous portion.

believe that they start somewhere near the tip of the pyramid, possibly in the eustachian tube, but the clinical features and the histology are quite different.

J. J. Richmond, M. D., London: I was wondering what might be significant about this patient's age; he is 77, and could therefore be subject to secondary malignant disease; a radiographic erosion would strongly suggest that. Dr. Kernohan seems to be very confident that this is a glomus jugulare tumor. Do these tumors occur at that age?

Dr. Kernohan: They are usually seen, as far as I recall, in younger individuals, but I don't think that age should rule them out.

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Fig. 3—Photomicrograph (H and E. x 105) showing chemodectoma with alveolar arrangement of cells; there are more tumor cells and less stroma than in Case 2.

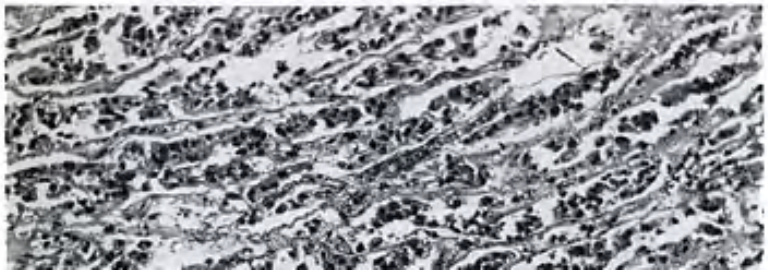
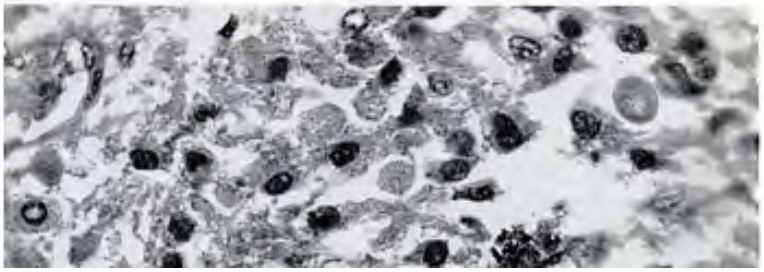


Fig. 4—Photomicrograph (H and E. x 400). In this section the cells show a granular cytoplasm; the nuclei are pleomorphic and there are several mitotic figures.



9. von Recklinghausen's Disease with Medullary Ependymoma, Acoustic Neurilemoma, Multiple Intracranial Meningiomas and Single Skin Neurofibroma

Contributed by MARK M. BRACKEN, M. D., Pittsburgh, Pennsylvania

THE PATIENT was a 23-year-old woman in June, 1952, when she complained of severe cervico-occipital pain, tinnitus and hypoacousia. Five years previously she had developed a flaccid paralysis of the lower extremities, loss of sphincter control and interscapular pain; a spinal cord tumor had been suspected and she had been treated by laminectomy and roentgentherapy without benefit of biopsy; her condition had remained stationary. On examination there was paralysis of lower extremities, bilateral papilledema, bilateral hypoacousia and right sided mydriasis; a single subcutaneous nodule was thought to be a supernumerary nipple.

Dr. Pendergrass: The roentgenogram in the lateral projection revealed: 1) a normal appearing sella turcica; 2) large irregular calcific deposits in the region of each choroid plexus; 3) some air in totally distorted lateral ventricles; 4) large venous sinuses in the frontal region which may be normal.

In the antero-posterior projection the following were observed: 1) marked asymmetry of the lateral ventricles, the right being somewhat depressed and the left displaced upward and laterally; 2) the calcific deposits observed in the lateral projection are here identified within the lateral ventricles; the latter are asymmetrical; 3) the right internal auditory canal seems eroded and much larger than the left. The left internal auditory canal also seems eroded.

It is noteworthy that numerous calcific deposits are identified in areas other than in the lateral ventricles. These are irregularly distributed throughout the brain substance and the fax cerebri. This patient has multiple lesions of the cerebrospinal system. There are several lesions scattered throughout both cerebral hemispheres involving also at least the right eighth nerve and perhaps also the left eighth nerve.

Had the clinical complaints developed first in the brain and then extended to the spine, one would have considered the possibility of a glioma of the cerebrum extending or metastasizing into the posterior fossa and then into the spinal cord. Instead the cord lesion occurred first and, because of this, one is inclined towards the diagnosis of meningiomatosis, neuofibromatosis, or a combination of both. The skin nodule might have been a neurofibroma instead of ectopic breast tissue. Bizarre calcifications may often occur in association with meningiomas; the pacchionian granulations particularly are calcified often in this respect. We have seen calcifications in patients with von Recklinghausen's neurofibromatosis.

Dr. Pendergrass's impressions: 1) MENINGIOMATOSIS. 2) NEUROFIBROMATOSIS, plus meningiomatosis.

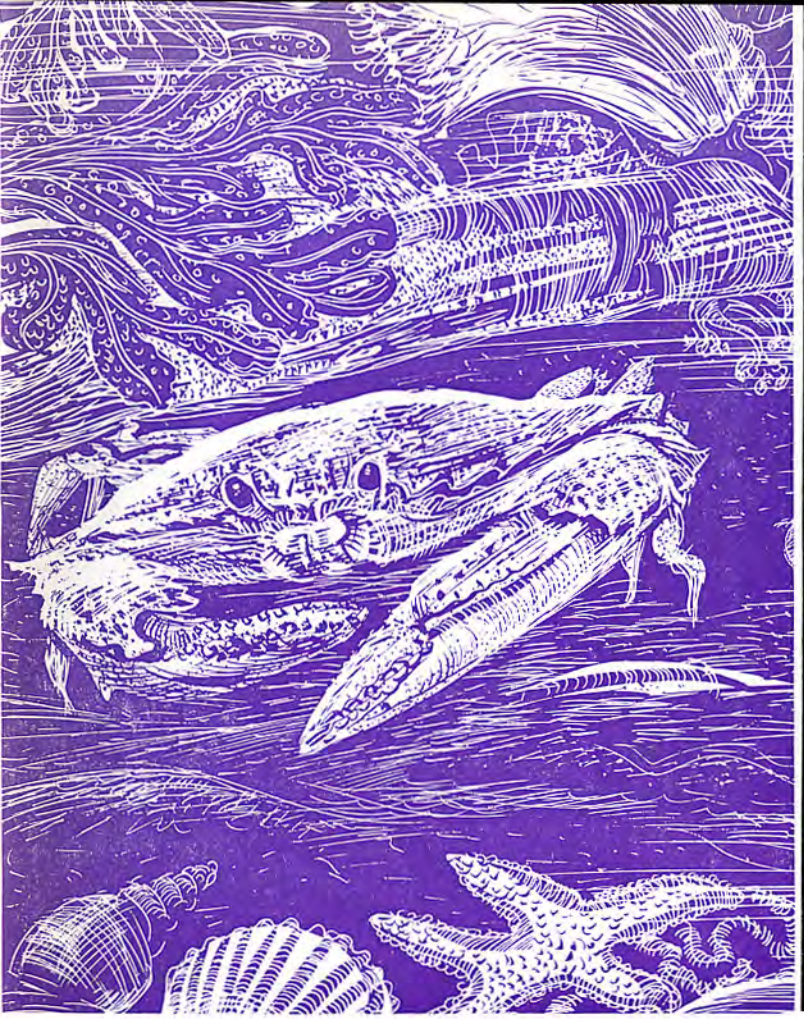
Radiologic Impressions Submitted by Mail:

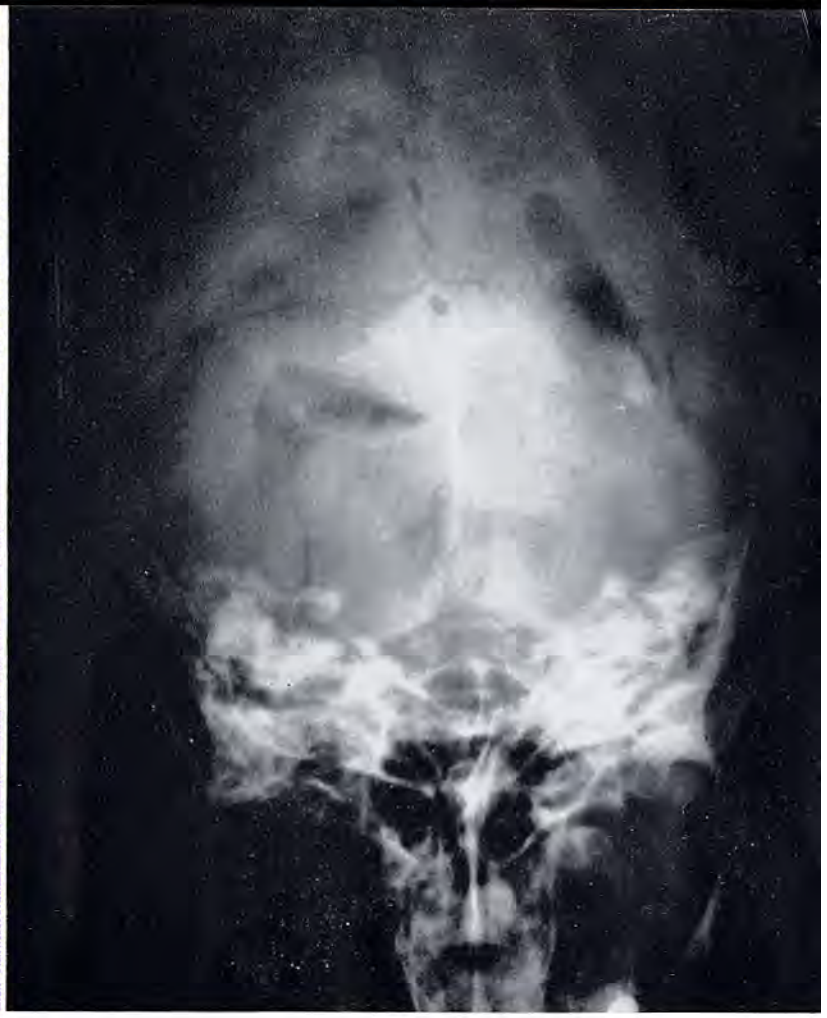
Neurofibromatosis	29
Acoustic neuroma	16
Meningioma	11
Others	23

Dr. Regato: Dr. Ben Felson, of Cincinnati, wrote: This is an easy one, neurofibromatosis with bilateral acoustic neuromas, cord tumors and assorted cerebral tumors, probably neurofibromas, meningiomas and even gliomas. Dr. J. A. Campbell, of Indianapolis, submitted: von Recklinghausen's disease with neurofibromata of both 8th nerves and possible cerebral ganglioneuroma.

Subsequent history: The patient was observed for one year during which blurring of vision appeared and deafness became complete. On September, 1953, a right parieto-occipital craniotomy was done: a large tumor was found which had to be removed in several fragments. During the next five months gradual loss of vision took place together with increasing signs of intracranial pressure; ventriculostomies were done.

Dr. Kernohan: There are at least two types of tumor in this case. One type is again a cellular ependymoma in which the cells assume a radial arrangement around some of the blood vessels, and in one or two spaces, the cells attempt to line the space as they would the ventricles. There were no canals or papillary arrangement of the cells. There is considerable pleomorphism of the nuclei and some hyperchromatic nuclei, but I was unable to find mitotic figures. I would classify this as a cellular type of ependymoma, Grade 2. I was unable to see any oligodendroglia-like cells. In spite of the fact that there are processes to some of the cells, no glial fibrils are present with the various glial stains and the cells do not impregnate by the Cajal gold chloride and sublimate method. There are quite





large areas of necrosis, some of which show deposition of calcium salts. In spite of the necrosis I was unable to find any proliferation of the walls of the blood vessels, although many were hyalinized. Since this tumor is almost completely surrounded by nervous tissue, I suspect that this is an intramedullary ependymoma. The other tumor has all the characteristics of a neurilemoma with the delicate elongated nuclei, the interlacing bundles of fibrils, occasional palisading of the nuclei and some xanthoma or so-called foam cells. There are several foci of necrosis and some very small deposits of calcium, both of which are unusual in neurilemomas.

There is a third small typical neurilemoma partially lateral to the ependymoma, which is probably a small neurilemoma attached to a posterior nerve root. Both these neurilemomas contain the Antoni type A cells in which there is the dense tumor with the interlacing fibers and palisaded nuclei, but in the larger tumor there are also the Antoni type B cells with the loose reticulated appearance of the cells. It is most unusual to find gliomas and neurilemomas in the same patient except in cases of Recklinghausen's disease. Since we have one glioma (ependymoma) and two neurilemomas in this case I would like to suggest that this is a case of Recklinghausen's disease. I have seen in this condition neurilemomas (peripheral and central), meningiomas, astrocytomas and ependymomas all in the same patient. Intramedullary gliomas (usually ependymomas) are common in the spinal cord and are usually associated with syringomyelia above or below the tumors.

Dr. Kernohan's diagnosis: 1) EPENDYMOMA AND NEURILEMOMA of the spinal cord; 2) Acoustic NEURILEMOMA; 3) Probable von RECKLINGHAUSEN'S DISEASE.

Fig. 1—Roentgenogram showing marked asymmetry of the lateral ventricles and calcific deposits.

Histopathologic Diagnoses Submitted by Mail:

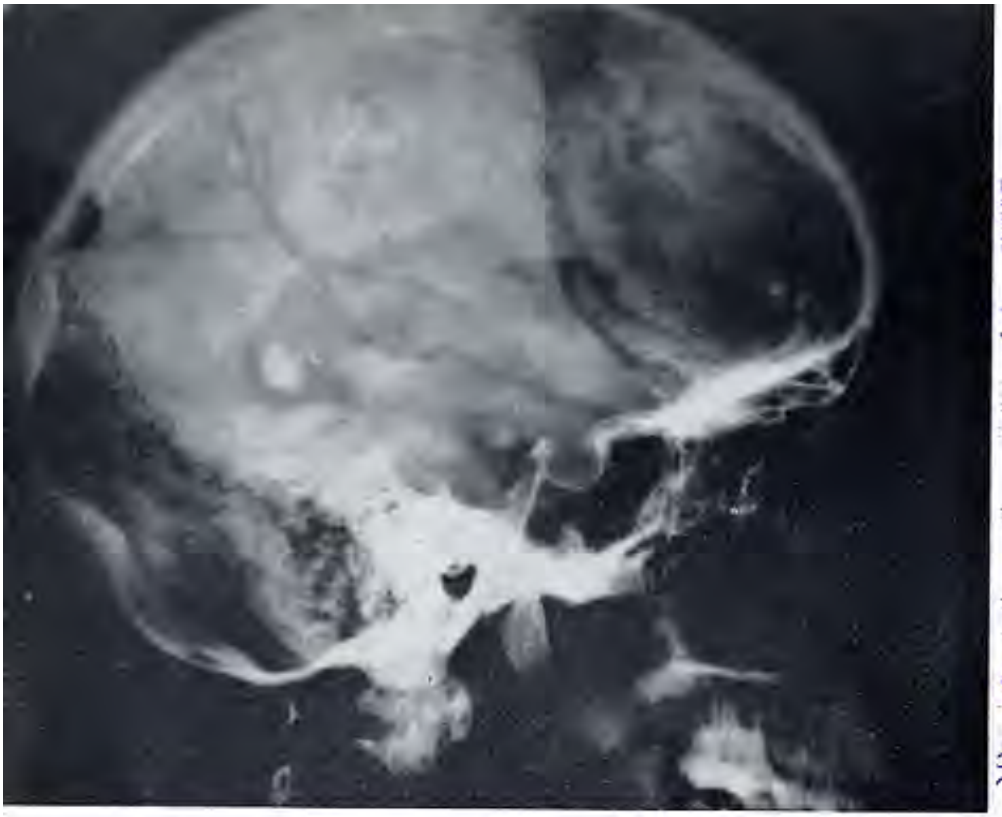
Neurofibromatosis	45
Neurilemoma	31
Neurofibroma	19
Acoustic Neurinoma	12
Meningioma	8
Spongioblastoma	5
Others	15

(Participants in this Cancer Seminar were sent a slide with a section from the spinal cord and another from the acoustic nerve. A great number of the participants failed to recognize the different nature of the two specimens.)

Dr. Regato: Some of the experts recognized the presence of two tumors: Dr. Dorothy Russell, of London, and Dr. Morgan Berthrong, of Colorado Springs, saw a medullary ependymoma and a Schwannoma. Dr. Webb Haymaker, of Washington, D. C., and Dr. V. Pardo, of Havana, reported an ependymoma and a neurinoma. Dr. A. O. Severance, of San Antonio, diagnosed an ependymoma of the spinal cord and a neurilemoma of the 8th nerve, and Dr. Mark C. Wheelock, of Chicago, saw a neurinoma and a glioma.

M. B. Dockerty, M. D., D. C. Dahlin, M. D. and E. H. Soule, M. D., Rochester, Minnesota (by mail): Two tumors, an ependymoma and a benign neurofibroma. The patient probably has von Recklinghausen's disease and may at necropsy reveal bilateral neurofibromas of the 8th nerve and one or more meningioma. When we see an 8th nerve tumor in a patient under 35 years of age we worry about the syndrome of multiple parenchymatous brain and spinal cord tumors along with neoplasms of the "covering membranes and emerging nerves".

Isaac Costero, M. D., Mexico City, (in Havana): The slide contains two tumors: one is radicular and consists of



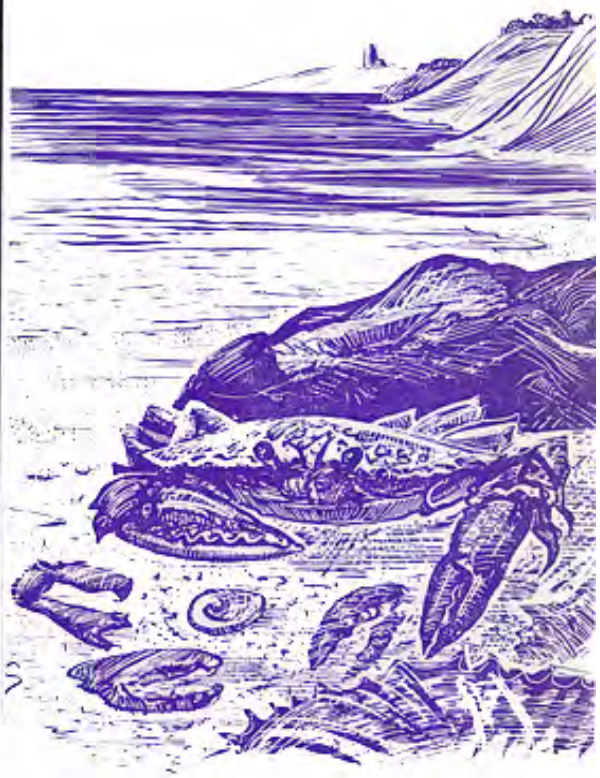


Fig. 2—Roentgenogram showing calcific deposits in the region of the choroid plexus and distorted lateral ventricles.

fasciculated tumor, of nerve fibers, classifiable as a NEURINOMA because of 1) the diffuse arrangement of the argirophil fibrils which do not attain the formation of strong collagens; 2) the tendency of the nuclei to form pallisades and 3) the dissociating, at first, and later degenerative effect of the tumor over the nervous fibers. The second tumor presents the character of POLAR GLIOBLASTOMA of the English school (an entity often repudiated): more precisely, this is a SCHWANNOID OLIGODENDROGLIOMA, according to the ideas of del Rio Hortega.

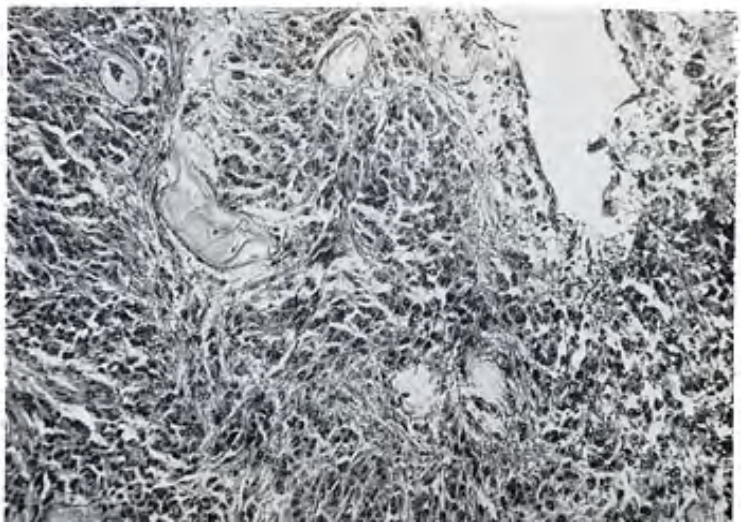
These tumors are probably developing on the basis of neurofibromatosis which would tend to assimilate them, yet when they are cultured outside the body they behave differently.

Subsequent history: The patient developed meningitis and in February, 1954, she expired. Autopsy revealed the presence of a subcutaneous neurinoma on the anterior abdominal wall, meningiomas of the choroid plexuses, meningiomatosis of the cranial dura, tumors of both acoustic nerves and avascular malformation of the spinal cord with tumor.

Dr. Zülch: We saw an ependymoma with a root neurinoma of the spinal cord and another neurinoma in the second section. In that part of the spinal cord which was left around the tumor, we saw practically all the vessels changed. All of them were enlarged and had very broad walls which looked sort of hyaline; to our knowledge this results from irradiation. This fact may be equally interesting to the radiologist as it touches the question of the damage to the cerebrospinal tissue by radiation, a fact which has been recently recalled by Arnold and Bailey in

Fig. 3—Post-mortem photograph showing gross appearance of ependymoma of spinal cord.

Fig. 4—Photomicrograph (H and E, x 125) showing intramedullary glioma. Fairly good example of ependymoma with ependyma-lined space. Note the cell processes and the relationship of the cells to some blood vessels.



this country. We have followed this work and found quite interesting cases in our collection where we could verify in man the observations made by Arnold and Bailey in their experimental animals. Arnold and Bailey think that the primary lesion is a delayed radionecrosis of the white substance, whereas Scholtz, who described these about a decade or more ago in detail, has always stressed the view that the observed changes are due to primary vascular lesions.

Dr. Regato: I am glad Dr. Zülch brought this up. The central and peripheral nervous system of man have long been considered as radioresistant. However, experimental studies with the spines of monkeys have shown that irradiation could result in degeneration of cells and paralysis. Using highly penetrating and narrow beams of radiations, Arnold and his collaborators have recently studied the effects of radiations on the brain of monkeys. They observed a demyelinating process which progressed to actual necrosis of the myelin, glial cells and axons which form the white matter. Because their beam of radiations was a narrow one, they felt certain that the effects were direct and not the consequence of vascular changes.

Clinically we have had reports on damage done to the brain of patients who were cured by radiotherapy and who survived to present appreciable changes. In these cases, as noted by Lampe, the untoward effects are definitely connected with the intensity of the treatment given. Short, intensive treatments have resulted in the worse results, whereas long treatments, in spite of rather large total doses, have allowed control of extensive intracranial tumors without sequelae.

J. J. Richmond, M. D., London: I would like to enquire concerning the actual radiotherapy given to the spine, any details about dosage, and whether or not it was thought that the treatment had a controlling influence on the spinal tumor. I would also like to support the remarks which Dr. del Regato made concerning brain damage. I think it is such an important subject that it cannot be over-

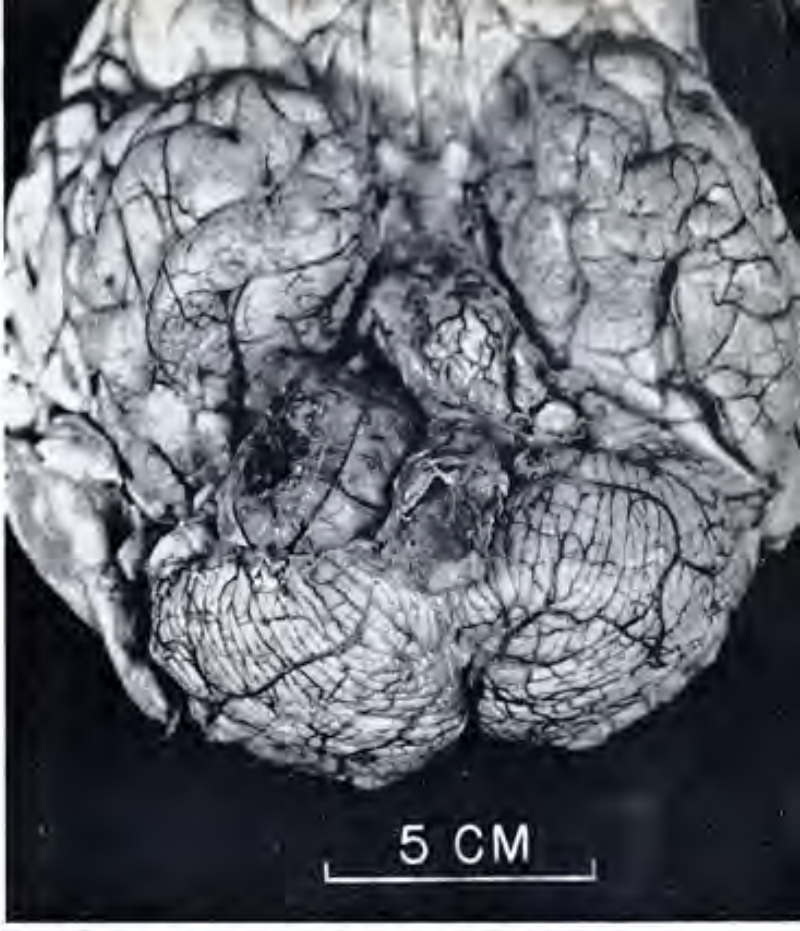


Fig. 5—View of the undersurface of the brain showing acoustic neurinomas.

stressed; there is a very definite ceiling of radiation dosage over which we are bound to get trouble.

Dr. Regato: When radiotherapy was given, this patient had already developed paresis and she had had a laminectomy for decompression; no biopsy was done for fear of damaging the spinal cord. Radiotherapy was given in two alternate series with a dose that was calculated as 2,400

Fig. 6 — Photomicrograph (Rio-Hortega, x 190) showing neurilemoma of Antoni type A, with elongated nuclei, interlacing bundles of fibers and palisading of nuclei (courtesy of Dr. I. Costero.)

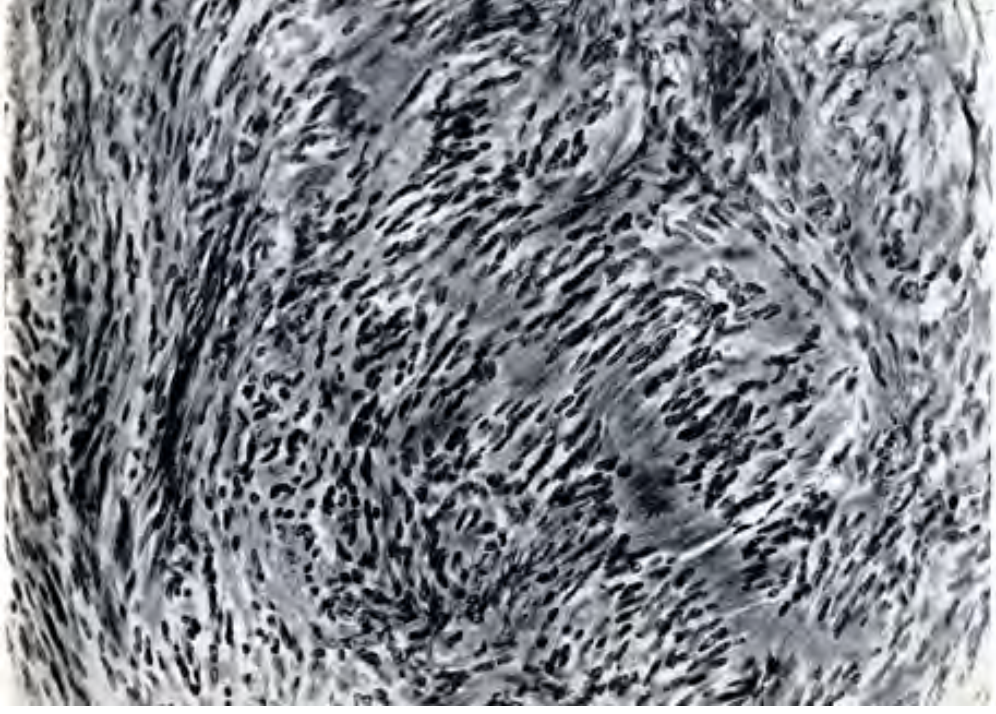


Fig. 7—Photomicorgraph (H and E, x 115) showing loose vacuolated reticular appearance of Antoni type B neurilemoma of the acoustic nerve.

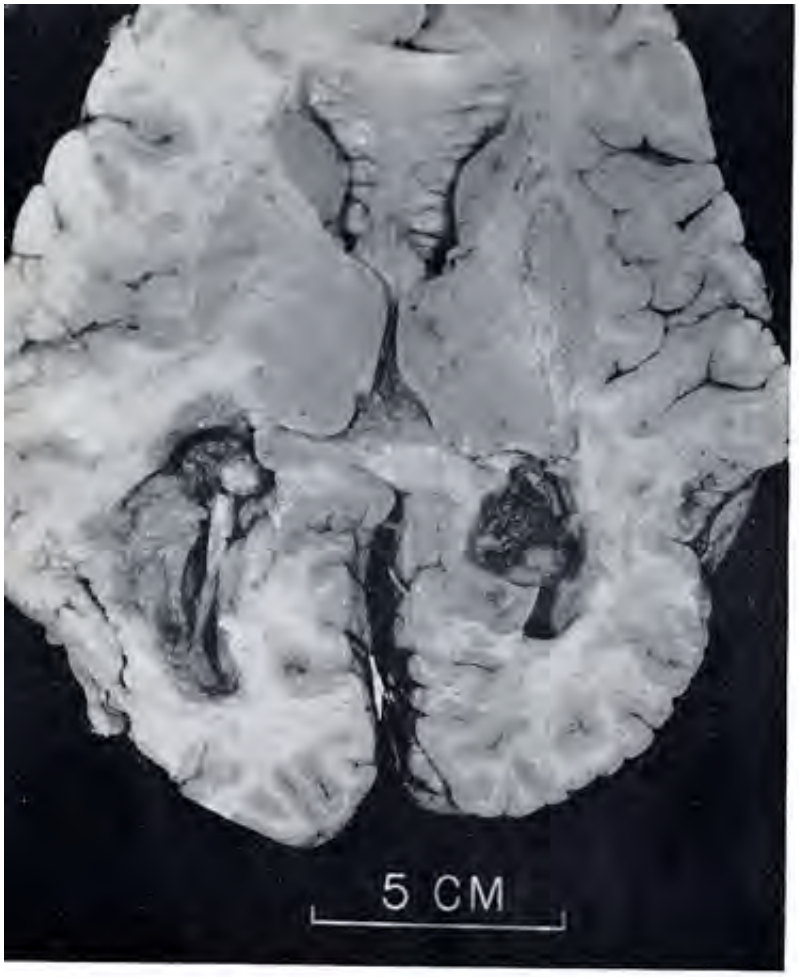


Fig. 8—Section of the brain showing gross appearance of meningiomas of the choroid plexuses.

roentgens at each series in approximately three weeks. That is the information we received. Obviously, with the large fields that were used, because of the neighborhood of bone which produces considerable secondary radiations in the 250 Kv range that was used, and because treatment was repeated, it is quite likely that the spinal cord could have been affected to show the changes noted by Dr. Zülch.

K. T. Neubuerger, M. D., Denver: The vascular changes in the second tumor have a striking resemblance to what we see in the so-called subacute necrotizing myelitis.

H. Elrick, M. D. Denver: Were there any pigmented skin lesions observed in this case?

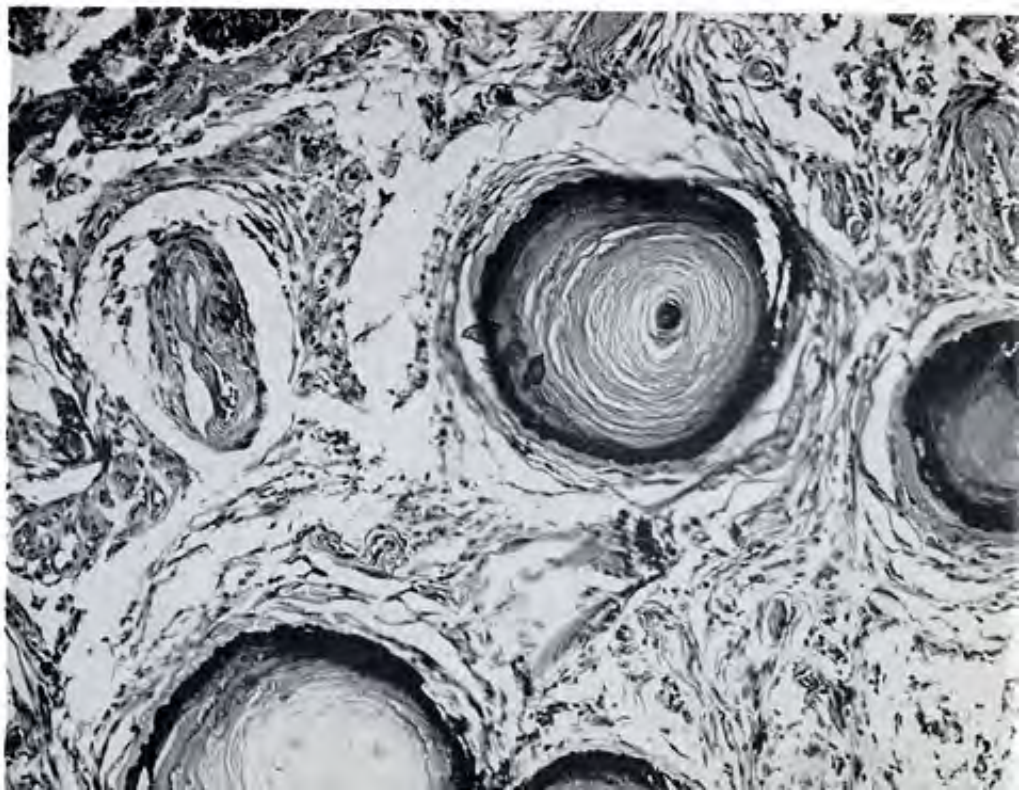
Dr. Regato: There was only one subcutaneous nodule which had been considered as a supernumerary nipple by the examining physician; there were no pigmented areas described.

Dr. Zülch: I remember having seen a family from Hamburg in which similar cases developed for three generations. They presented no marked cutaneous lesions, but had intracranial and intraspinal tumors.

D. DeSanto, M. D., San Diego, California: I would like to ask Dr. Kernohan if he has an explanation of the foam cells in the acoustic neuromas and in some other neurinomas? Are they histiocytic or does he believe that they are derived from the Schwann's cells?

Dr. Kernohan: There is considerable difference of opinion on that point. I myself think they are degenerating tumor cells rather than phagocytic cells coming in from the outside or from the adventitia of blood vessels.

Fig. 9—Photomicrograph showing meningioma of the choroid plexus (courtesy of Dr. Bracken).



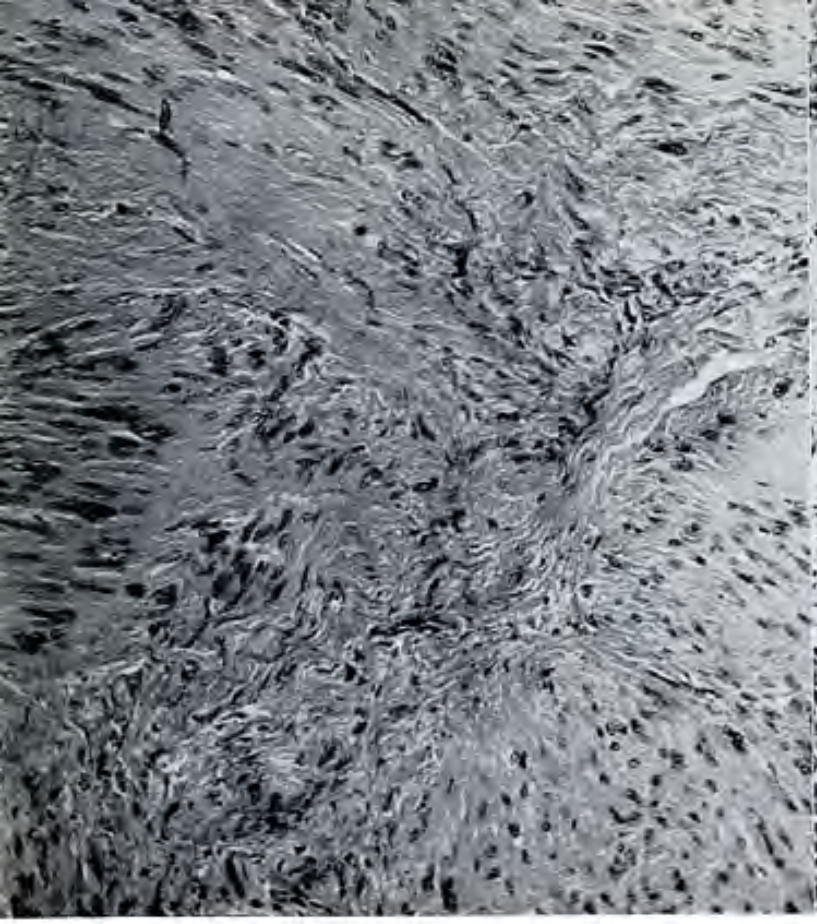


Fig. 10 — Photomicrograph showing meningioma of the meninges. (Courtesy of Dr. Bracken.)

Fig. 11—Photomicrograph showing subcutaneous neurilemoma of the anterior chest wall. (Courtesy of Dr. Bracken.)

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10. *Astrocytoma of the Cerebellum*

Contributed by KARL T. NEUBERGER, M.D., Denver, Colorado

THE PATIENT was a 3½-year-old boy in April, 1955, when he presented ataxia and occipital pains. Examination revealed the presence of adiadochokinesis, more marked on the left, and a positive Romberg sign. The spinal fluid was 220-180 mm; the fluid showed 120 mgrs of chlorides and 25 mgrs of protein per cent.

Dr. Pendergrass: The roentgenogram in the lateral projection reveals: 1) air in the posterior portions of the lateral ventricles, the temporal horns, and in the occipital horns; 2) air in the posterior portion of the third ventricle which seems normal; 3) the proximal portion of the aqueduct of Sylvius is demonstrated and seems normal; 4) subarachnoid air in the frontal region; 5) the lateral ventricles do not seem dilated.

The anteroposterior projection shows that: 1) the lateral ventricles are partially filled and do not seem dilated; 2) the lateral ventricles are separated, the left being somewhat asymmetric compared to the right; 3) there is an impression of a soft tissue mass encroaching upon the lateral ventricles, tending to separate the posterior horns; 4) the third ventricle is normal in size and appears in the midline.

The separation of the lateral ventricles plus the suggestion of a concave medial border in each lateral ventricle suggest the possibility of agenesis of the corpus callosum. Often the agenesis of the corpus callosum is associated with a lipoma. Raidographically lipomas are characterized by the presence of fat surrounded by calcific debris situated anteriorly and in the midline of the skull. Noteworthy also is the fact that usually in agenesis of the corpus callosum the ventricular defects are symmetrical. The lack of symmetry in this patient could be due to partial agenesis rather than complete agenesis of the corpus callosum. The diagnosis of agenesis of the corpus callosum might have been made much more easily if instead of having a "brow-down" lateral examination of the skull we were given a "brow-up" lateral examination of the skull. Amputation of the frontal horns, were these present, would have clinched the diagnosis of agenesis.

The fact that we were given a "brow-down" lateral exposure rather than a "brow-up" leads one to suspect that the lesion is located posteriorly perhaps in the occipital or suboccipital region. A parasaggital meningioma in the occipital region, situated deep in the hemisphere, would account for the spread of the lateral ventricles and the asymmetry noted along the medial aspect of the lateral ventricles. To a certain degree the occipital horns seem displaced upward as well as apart, suggesting a posterior fossa lesion. Cerebellar tumors usually do not cause this type of distortion of the posterior horns of the lateral ventricles unless there is actual invasion of the tentorium with extension above the tentorium. Against the latter also, is the absence of hydrocephalus.

Whereas no one can gainsay the possibility of an unusual form of agenesis of the corpus callosum one must explain the apparent asymmetry of the posterior horns. In some respects there seems to be a soft tissue mass demonstrated in the anteroposterior projection which seems intimately related to the distortion in the posterior portions of the air filled lateral ventricles.

Dr. Pendergrass's Impression: MALIGNANT TUMOR OF THE POSTERIOR FOSSA, invading the tentorium and occipital lobe.

Radiologic Impressions Submitted by Mail:

Medulloblastoma	38
Tumor of the posterior fossa	17
Astrocytoma	15
Adiadochokinesis!	1
Others	14

Dr. Regato: Dr. Fred Hodges, of Ann Arbor, suggested a cystic astrocytoma of the posterior fossa. Dr. Ben Felson, of Cincinnati, proposed tentorial sarcoma. Dr. Frank Gorishek, of Denver, preferred a medulloblastoma of cerebellum invading the 4th ventricle. Dr. James T. Case, of Santa Barbara, suggested cerebellar astrocytoma.

Operative finding: In April, 1955, a sub-occipital craniotomy was done. The lower portion of the cerebellar vermis was widened and passed through the foramen magnum. Just beneath it there was a gray-pink semitranslucent midcerebellar tumor which had invaded the roof and walls of the fourth ventricle. It was partially removed. After 10 days a new intervention was done to remove the rest of the tumor.

Dr. Kernohan: This is the most common type of glioma found in the cerebellum in children. When brain tumors in children are mentioned, one usually thinks of medulloblastomas. There have been several studies on brain tumors in children, one of the best being by Bailey, Buchanan and Bucy, who found that astrocytomas are more than twice as common as medulloblastomas. In our own experience with more than 400 brain tumors in children we found that astrocytomas were more common than medulloblastomas, and in the cerebellum alone where medulloblastomas occur this was also true (Craig). This is important, because astrocytomas are more amenable to surgical treatment and also they are often cystic. It should be noted that approximately two thirds of brain tumors in children are located in the posterior fossa and only one third occur in the tentorium. Astrocytomas of the cerebellum have a relatively good prognosis. I think this is so because they are almost all slowly growing tumors or, if you wish, grade 1 tumors. The tumor under consideration today is a grade 2 astrocytoma. In some areas, it is more cellular than most and there is also slight pleomorphism. However, no giant nuclei or giant cells are present, the blood vessels are normal and there are no areas of necrosis. There are some mitotic figures which, together with the pleomorphism and increased cellularity, cause me a little worry about the grade of this tumor. Ordinarily, I place considerable emphasis on the finding of mitotic figures and thus, in this case, I must raise the grade at least to a 2. This means that the chances of a recurrence are greater and that it probably will recur sooner.

There are several small or microscopic cysts containing an albuminous material. Some areas are loose in texture where glial fibrils are numerous, densely packed together and more difficult to see. There is a sharp line of demarcation between the tumor and the compressed, partially degenerated cerebellum. It seems to me that in dealing with tumors of the cerebellum a biopsy, at least, is important

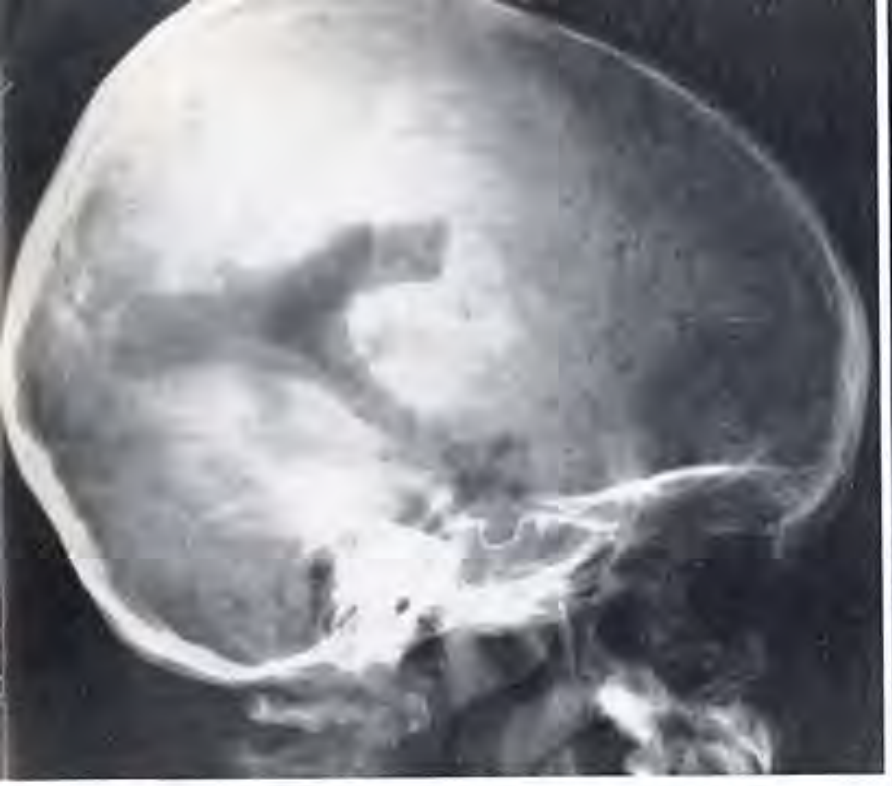


Fig. 1—Roentgenogram showing air in the third and lateral ventricles but no apparent abnormalities.

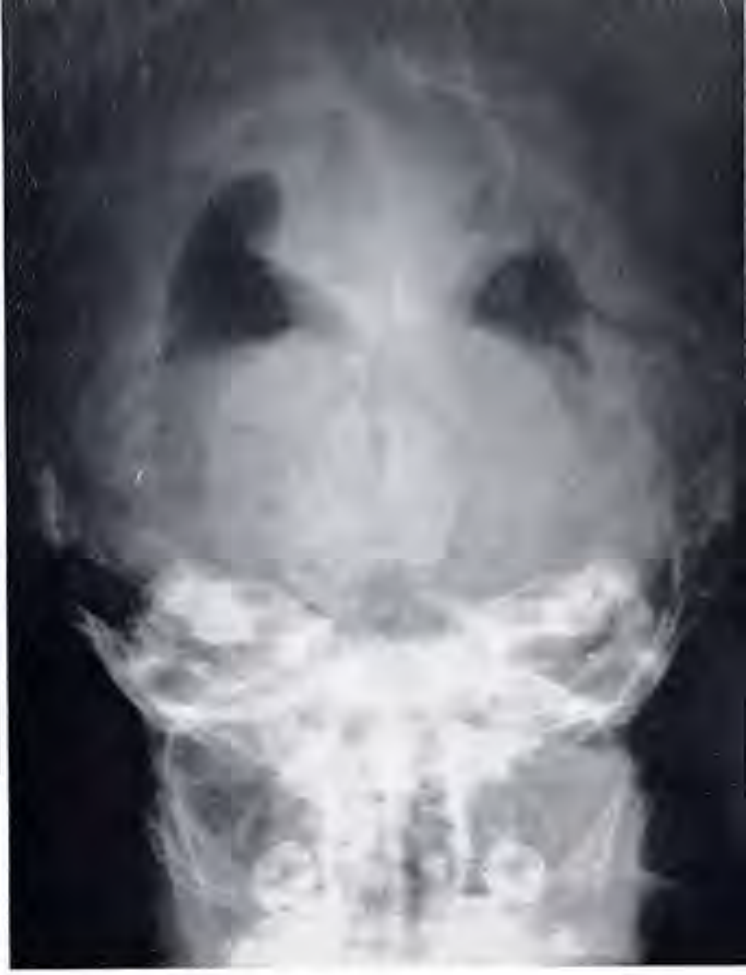


Fig. 2—Roentgenogram showing asymmetry and separation of the lateral ventricles.

because of the great difference in the outlook for children who have astrocytomas and those who have medulloblastomas. Malignant astrocytomas (so-called glioblastoma multiforme) are rare in the cerebellum of children and are not common in the cerebrum. Because of the ventriculographic findings, one might suspect a glioma of the pons and midbrain. One half of our gliomas of the pons are slowly growing astrocytomas and the other half are highly malignant astrocytomas. Removal is impossible, and operations for the purpose of drawing the cerebrospinal fluid from the ventricles by routes other than the obstructed aqueduct of Sylvius can be advocated with varying degrees of success.

Dr. Kernohan's diagnosis: ASTROCYTOMA, grade II, of the cerebellum.

Histopathologic Diagnoses Submitted by Mail:

Cerebellar astrocytoma	59
Spongioblastoma	23
Chordoma	8
Meningioma	8
No tumor	8
Oligodendroglioma	3
Others	12

Isaac Costero, M. D., Mexico City, (in Havana): This is the type of tumor which really deserves to be called a *cerebellar astrocytoma*, with the understanding that it is benign. Silver stains and tissue cultures reveal that they are made up of typical multipolar astrocytes.

Dr. Regato: Dr. Webb Haymaker, of Washington, D. C., also submitted a diagnosis of cerebellar astrocytoma. Dr. V. R. Khanolkar, of Bombay, submitted glioblastoma of spongioblastic origin. Dr. Carlo Sirtori, of Milan, designated the tumor as an astrocytic glioma. Dr. L. Benitez-Soto, of Mexico, submitted a diagnosis of oligodendroglioma. Dr. Boris Scolnik, of Montevideo, and Dr. P. Hamilton, of Denver, preferred chordoma. Dr. Pedro M. León, of Havana, submitted fibrillary cystic astrocytoma.

Dorothy S. Russell, M. D., London (by mail): Astrocytoma in cerebellar meninges, perhaps spreading from more rostral site. There are clusters of polygonal cells, of ependymal appearance, fringing part of the tumor; I cannot assess the significance of these from the available data.

Dr. Zülch: The general survival of these so-called astrocytomas of cerebellum is excellent: twenty or twenty-five years, or practically a cure (Bucy). That should raise a question as to whether we deal with a true astrocytoma in this case. Cushing and Bailey classified some of their cases as polar spongioblastomas and some as astrocytomas. Bergstrand, the pathologist of Stockholm, always stressed the fact that these were not true astrocytomas; he came to that conclusion on the basis of his silver stains. He was able to show that the form of the cells in these tumors differed widely from what was ordinarily seen in cerebral astrocytomas. We have followed this line of thinking for quite some time and I am almost sure now that we don't deal here with astrocytomas nor with true spongioblastomas, if you think of that word in the classical sense of dogmatic histogenetic classification. The cells which you find here are spindle-shaped and elongated, and have wormlike long tails; you have other cells which look like astroblasts; in other words, you have a mixture of cells. One point which always surprised me was the observation of very peculiar structures which looked like sausages and which have been described by various authors under various names; hyaline bodies, Rosenthal fibers; we find them in the majority of all midline tumors, including the so-called cerebellar astrocytoma. Since these Rosenthal fibers seem to be a special product of degeneration of the subependymal glias, I think that we really have to ask ourselves whether or not these tumors arise from the subependymal glia. If we decided that these are not astrocytomas we then come to the conclusion that they are a special variety of tumor; spongio-

blastoma is not a very good name, because spongioblastoma would mean that the tumor is high up, in histogenetic thinking, and therefore malignant. (Dorothy Russell's spongioblastomas are definitely malignant.) We have to find another name, subependymoma or some other new name.

J. J. Richmond, M. D., London: There is a tendency, when a space-occupying lesion is diagnosed in a child, to rush to the diagnosis of medulloblastoma. It has been pointed out this afternoon that the astrocytomas are, of course, far commoner in this situation in a child, and it is with these tumors that surgery probably attains its most brilliant results in children. But I would like to inquire—was it considered that the glioma was completely extirpated in this child, and if, with any doubt about it, would it be desirable to follow the surgery with irradiation?

Dr. Regato: The information we had is that the first extirpation was not complete, but a second intervention followed shortly in an effort to remove the remainder of the tumor, probably in consideration of its histological nature. As to whether such a tumor should be systematically treated by post-operative radiotherapy, we must judge by those who have long and abundant experience with it. Their impression is that taking into consideration the long survival of some of these patients in the absence of any treatment, any form of therapy should at least improve that theoretical long expectancy. In astrocytomas of the cerebrum, Pierce and Bouchard have shown that the practice of post-operative radiotherapy improves the percentage of survival as compared with a series of patients treated by surgery alone.

Dr. Pendergrass: I am completely at loss to explain the separation of the ventricles. I think we have got to look either to a second tumor or a cyst. I don't believe any patient who has had a tumor partially removed or completely removed, should be treated with radiations unless one does a complete study of that patient beforehand. We must use ventriculography, encephaloventriculography and cerebral angiography as a post-operative procedure to see just what we are dealing with. It will be after we have done this systematically that we are going to get somewhere with this question of radiation therapy. But even though you beg and beg you find it very difficult to get neurosurgeons to go through with another procedure of cerebral angiography and encephalography and that sort of thing. The reason they give is that it is attended with a certain amount of morbidity and mortality. I can tell you this, if it were a child of mine, or a member of my family, I wouldn't want any radiologist giving them radiation until they knew what they were doing.

Dr. Regato: But if the child had a medulloblastoma of the cerebellum you would not be against irradiating them, would you?

Dr. Pendergrass: Medulloblastomas tend to invade anteriorly into the floor of the middle fossa and throughout the ventricular system, so you've got to include those areas in your field or otherwise you are just going to be treating a part of the lesion, yet you may know nothing about it on the basis of operative findings.

M. Berthrong, M. D., Colorado Springs: Some years ago Dr. Bailey made the comment that he could diagnose 95% of brain tumors from the Hematoxylin-eosine stained slides, and with all the other special stains in the world he still couldn't diagnose the other 5%. I think it is probably true; I suspect it is also true that in the United States we by and large make very few of the fancier silver stains and so on for the identification of cells. I wonder if Dr. Kernohan would comment on the possible defects in our system if this is really prevalent.

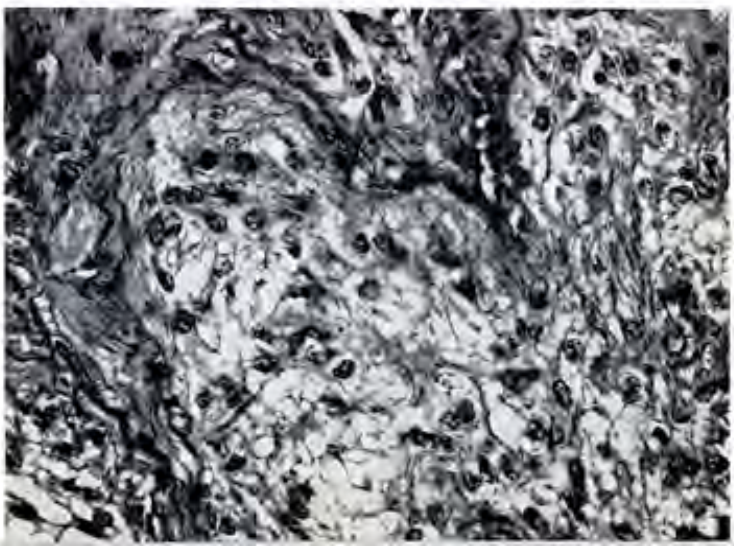
Dr. Kernohan: I feel quite strongly about it; 95% is quite conservative to make a diagnosis of tumors of the nervous system of an Hematoxylin-eosine stain. But I don't think that it is sufficient. I think at times we should use special stains to prove to ourselves that we are right. Unfortunately, some of the special stains require special fixatives on fresh tissues. In astrocytomas, for instance. If you are going to have a Cajal stain on them, and impregnate them with the gold or with any variants of the silver stains, the tissue has to be fixed immediately in the Cajal solution, which is a bromine solution, so that you have to anticipate that ahead of time. On the other hand, there is no reason why tissue could not be put in those fixatives and stained in Hematoxylin-eosine, because it works perfectly well. I prefer, in most instances, Mallory's phosphotungstic-acid-hematoxylin, which is a beautiful glial stain, or the Weigert's stain. But I agree that you can make a diagnosis, certainly as to the degree of malignancy, which is the important thing from the point of view of the surgeon and radiotherapist, on the Hematoxylin-eosine stain, better than you can with the silver stains. I don't think we should throw the silver stains or the special stains out. They have their definite place, but if the surgeon is waiting in the operating room to go in, it is rather difficult to get all the special stains to help him—he wants help right now, not next week or next month.

M. Wheelock, M. D., Chicago, Illinois: I was wondering if Dr. Kernohan would be willing to express himself on the accuracy of immediate frozen section. I face it day in and day out.

Dr. Kernohan: I am not too sure of our percentages as far as accurate diagnosis with the frozen sections, but I think it really runs quite high—90% or better. Occasionally it is necessary to change them, particularly in the oligodendrogliomas. I have difficulty in making a diagnosis of

Fig. 3—Photomicrograph (H and E, x 135) showing cerebellar astrocytoma with large numbers of glial fibrils and relatively few nuclei. Several microcysts are present.

Fig. 4—Photomicrograph (H and E, x 370) showing numerous glial fibrils. There is some pleomorphism and a few mitotic figures. Astrocytoma, grade 2, more active than usual.



an oligodendroglioma in the fresh, frozen sections. In the frozen section of oligodendrogliomas we often find mitotic figures, whereas in the paraffin sections we don't often see many of them. Where they go to, I don't know.

E. Roverud, M. D., Eloise, Michigan: I would like to ask how many of you have used teased tissue in making rapid diagnoses in brain tumors. We used that method at Columbia University; I use it now at Wayne County General Hospital and find it quite satisfactory.

Dr. Kernohan: There are three ways to make a fresh tissue diagnosis; 1) by *frozen* section, 2) by *squeezing* a piece of tissue between two glass slides (Russell), and 3) by *teasing* a small portion of tissue and either fixing it or staining it with polychromethylene blue. I don't think that it makes much difference. Each of them has an advantage over the other. The frozen section is the one we use—I like it better because it gives me architecture. On the other hand, the teased and squeezed preparations give you better outline of the cells. So, it is one of those things—you pays your money and you takes your choice!

K. T. Neubuerger, M. D., Denver: I don't think that silver stains help much in the diagnosis of brain tumors.

J. J. Richmond, M. D., London: Dr. Pendergrass is rather too pessimistic concerning the irradiation treatment of tumors of the central nervous system. Only a small proportion of the gliomas can be totally removed, and what are we going to do with the great bulk of the remainder? I think that carefully controlled radiotherapy, bearing in mind always the vulnerability of the tissues of the central nervous system to irradiation, can do quite a lot. I would like his further comments about that.

Dr. Pendergrass: I agree with what Dr. Richardson says but what we are trying to do is gather a group of cases with which you can convince anybody. I have some patients in whom I have done encephaloventriculography before and after operation, and then I have done them six months thereafter as long as the patient lived, and I have shown regression of the lesion. I have shown calcification and replacement of the scar—that is the sort of evidence we should have.

Editor's note: This patient was reported in good condition in April, 1957.

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II. *Cryptococcosis with Pulmonary, Skeletal and Cerebral Manifestations*

Contributed by Dos Algom, M.D., San Jose, California

THE PATIENT was a 26-year-old woman in July 1953, when she complained of cough and expectoration, present for five years, accompanied by weight loss, chills and fever, occasional dyspnea but no hemoptysis. She had presented pulmonary lesions with pleural effusion for which she had been treated with PAS, Streptomycin and pneumoperitoneum. Recently right supraorbital pain, nausea and vomiting had developed. She had a left sided paresis of the face and tongue and weakness of the left arm: bronchoscopic biopsy brought only inflammatory tissue, washings were negative. The spinal fluid showed 92% lymphocytes.

Dr. Pendergrass: The roentgenogram of the chest shows: 1) a massive lesion in the mid portion of the right lung; 2) a parenchymal infiltrate in the right upper lobe; 3) a few small parenchymal infiltrates in the left lung; 4) pneumoperitoneum, artificially induced.

The postero-anterior film of the skull revealed: 1) the exposure was made during the arterial phase of a cerebral angiogram; 2) the blood vessels in the region of the convexity to the right cerebral hemisphere revealed some displacement toward the midline; the vessels affected probably lie in the frontoparietal region to the right side; 3) there is minor displacement of the anterior cerebral artery, toward the left side, compatible with fronto-parietal abnormality; 4) no tumor vessels are visualized.

At first blush the displacement of the arteries in the right cerebral hemisphere away from the cerebral convexity suggested the possibility of a hematoma. However, close inspection revealed some of the Sylvian group of middle cerebral arteries still present in the periphery of this hemisphere. There seems to be a definite displacement of the middle cerebral group of vessels in the fronto-parietal region

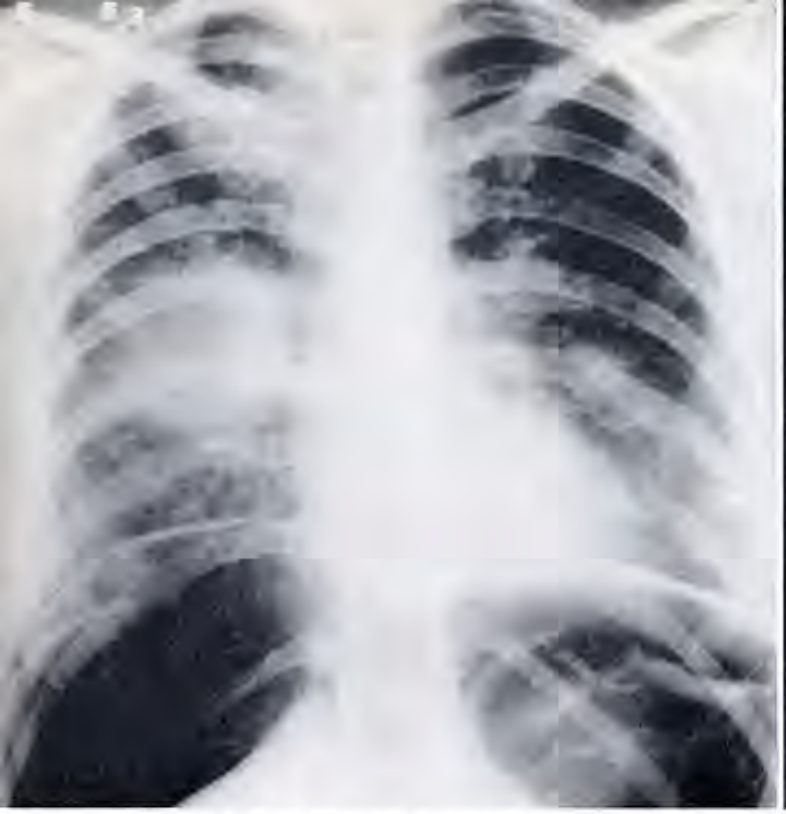

Fig. 1—Roentgenogram showing mass in the right lung and separate infiltrations of the upper lobe of right and left lung: pneumoperitoneum has been induced.

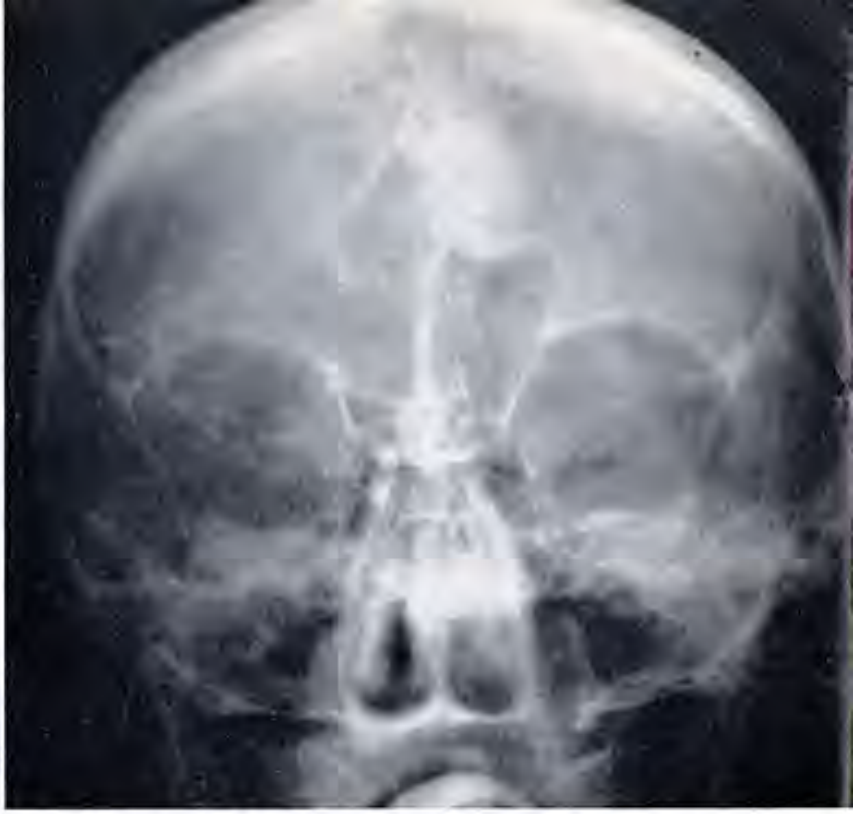

Fig. 2—Cerebral angiogram showing some medial displacement of the vessels in the right cerebral hemisphere.

plus concomitant minor displacement of the anterior cerebral artery consonant with a fronto-parietal mass lesion. The absence of newly formed tumor vessels suggests that the process is inflammatory rather than neoplastic. Faced with the presence of lymphocytes, 92% in the spinal fluid, one thinks of a granuloma near the surface of the brain.

The massive pulmonary lesions are probably related to the intracranial disease. The clinical history of treatment for tuberculosis cannot be entirely ignored yet the roentgen appearance of the parenchymal infiltrates does not suggest tuberculosis. What we now see in the chest could have been modified by treatment. We believe the lung changes are due to a granuloma. Because the patient lived in San Jose, California, we suspect the granuloma is due to coccydiomycosis rather than tuberculosis.

Dr. Pendergrass's impression: Pulmonary and cerebral GRANULOMA, possibly due to coccydia or other fungi.

Radiologic Impressions Submitted by Mail:

Coccydiomycosis	35
Tuberculosis	18
Torulosis	10
Fungus Infection	9
Malignant tumor	15
Others	11

Dr. Regato: Dr. Ben Felson, of Cincinnati, suggested either tuberculosis or coccydiosis. Dr. Wendell Stampfli, of Denver, submitted coccidiodal granuloma. Dr. J. A. Campbell, of Indianapolis, suggested coccidiomycosis or torula.

Operative findings: Swelling of the medial third of the clavicle took place; aspiration biopsy was negative for tumor or bacteria. In July, 1953, a right frontal craniotomy was done, the dura was distended and the brain bulged markedly; a cortical nodule was removed. Probing revealed another mass deeply situated which was removed by suction-cautery through a cortical opening.

The surgical material consisted of several nodular gelatinous masses which in cut section revealed yeast-like bodies.

Dr. Kernohan: This section is not from a neoplasm but is from tissue containing Torula histolytica or Cryptococcus neoformans. The Torula organisms, in all probability, came to the brain from the lesions in the lungs. A number of years ago, Dr. Walter Freeman drew attention to these organisms in the brain and emphasized the peculiar and characteristic dilation of the perivascular spaces of the cortex of the brain in cases of Torula meningitis. These organisms are different from most other yeasts in that they lie in a myxomatous matrix with very little and usually with no inflammatory reaction, which is true in this case. They have a delicate capsule, reproduce by budding and have no endospores. For the most part they are fairly uniform in size and shape, being mostly round, although ovoid forms may be seen. Since this case came to us from Dr. D. Alcott, of California, we must suspect coccidioidosis. This disease produces an acute inflammatory reaction, which only partly subsides and leads to the formation of a granuloma. Coccidioides has a thicker refractile capsule, is larger than Torula, and organisms containing endospores can usually be found.

We should also exclude Blastomyces. This yeast also brings about an inflammatory reaction, but its capsule is much heavier and more refractile than that of Torula. However, Blastomyces, like the Torula organism, reproduces by budding. One other yeast that must be considered in the differential diagnosis is Histoplasma. This organism is smaller than Torula, it produces a milder inflammatory reaction than Coccidioides or Blastomyces and, unlike Torula, it is usually contained in endothelial cells.

The following comment on the differential diagnosis in this case has been made by Dr. Lyle A. Weed: "The slide shows: 1) Large cystic areas containing spherical, oval, clipsoidal and pyriform organisms varying in size from about 2 to 8 microns; an occasional budding is found; 2) lack of inflammatory cells, for example, polymorphonuclear leukocytes, lympocytes, plasma cells, or histiocytes of any type. In *Blastomycosis*: 1) organisms are thick-walled, more uniform in size, usually larger, being from 8 or 10 to 20 microns or more. Budding is more frequently found. 2) Organisms are always in an area of inflammation which has polymorphonuclear leukocytes and histiocytes, with or without giant cells, essentially a mixture of granuloma and suppura-

tion. In *Histoplasmosis*: 1) organisms are usually smaller (2 to 5 microns), quite uniform in size and shape, oval or spherical, with a clear halo around each organism and uniformly within the cytoplasm of histiocytes; 2) inflammation is always present and is essentially a granuloma with varying amounts of necrosis (usually coagulative) and many histiocytes with or without giant cells. It may perfectly imitate tuberculosis histologically. Polymorphonuclear leukocytes sometimes are present but usually are not numerous. In *Coccidoidomycosis*: 1) Organisms vary widely in size (5 to 50 microns), but larger ones will have thick walls and evidence of formation of endospores; 2) the histology is identical with tuberculosis or histoplasmosis. Organisms have never been recorded in cystic areas as found in the case under discussion."

The present case illustrates how mycotic infections may simulate tuberculosis clinically and the importance of looking for them by culture in cases suspected of being tuberculosis. It also supports the growing concept that cryptococcosis begins as an intrapulmonary lesion which later disseminates to the central nervous system, bones, and so forth.

Several methods have been devised for the demonstration of yeasts. The current one is the periodic-acid-Schiff reaction, which stains the organisms blue. In the fresh specimen, the India ink method is eminently satisfactory, but for fixed tissues I still prefer the Best-Bodian method. These methods are a matter of individual taste and the experience in each laboratory.

Dr. Kernohan's diagnosis: TORULA HISTOLYTICA.

Histopathologic Diagnoses Submitted by Mail:

Cryptococcosis	90
Coccidrodomycosis	5
Granuloma	5
Others	7

Dr. Regato: Dr. Francisco M. León and Dr. Calixto Masó, of Havana, Dr. V. R. Khanolkar, of Bombay, and Dr. H. Torloni, of Sao Paulo, also made a diagnosis of torula.

M. B. Dockerty, M. D., D. C. Dahlin, M. D., and E. H. Soule, M. D. of Rochester (by mail): "Perhaps one has no right to diagnose a specific type of mycotic granuloma on a histologic basis. Bacteriologists, at least, object to our doing so. Indeed this Californian has coccidiomycosis without spores (on culture). However, the chronic type of inflammatory reaction plus the evidence of 'histiolysis' make us vote unanimously for cryptococcosis, in the first ballot."

Subsequent history: The lesion of the clavicle was removed and proved to be replaced by a cryptococcus granuloma. The same organism was also isolated from the spinal fluid. The patient became stuporous, convulsive; in August, 1954, she expired. At autopsy, both lungs contained innumerable cavities; there was necrosis of the mesencephalon and granulomatous meningeal reaction.

Dr. Zülch: We did a Pappenheim stain which showed the torula beautifully in blue. There are some cases of torula which have been operated upon successfully. Davis, some years ago, collected eleven cases, two of which had been treated surgically.

L. Lowbeer, M. D., Tulsa, Oklahoma: Dr. del Regato mentioned that at first a small meningeal biopsy was taken which showed only inflammatory infiltration. I believe that, if one gets a small biopsy of the meninges which shows inflammatory infiltrate of any extent, a special stain is of extreme importance. We received once such very small biopsy which seemed to show a non-specific inflammation with a lot of lymphocytes. This patient subsequently died with very characteristic features of cryptococcic meningitis. We went back to the very small biopsy and stained it with periodic-acid-Schiff reaction, and many of the cells which had been interpreted as lymphocytes were found to be cryptococcus fungi. They were extremely small and easily overlooked. Furthermore, in cases where there has been a complete block, the spinal fluid culture may be negative, whereas the culture directly from the lesions is very easily positive. One should also remember that this infection is not always fatal. We have a case under observation in which a bacteriological diagnosis was made many years ago and the patient is still alive. In occasional cases, infection may take place through the intestinal tract. We followed a patient, a very cachectic woman, with extensive ulcerative lesions of the intestines, who developed finally a cryptococcus meningeal encephalitis.

M. Berthrong, M. D., Colorado Springs: In the brain, the lesion is often characterized by almost absence of inflammatory reaction. We have seen a case in which the typical lesions were present in the meninges and brain, whereas the lesions of the lung and bone showed rather characteristic

Fig. 3—Gross specimen of toruloma of the medial head of the clavicle.

Fig. 4—Gross specimen of cryptococcus granuloma removed from cerebral cortex.

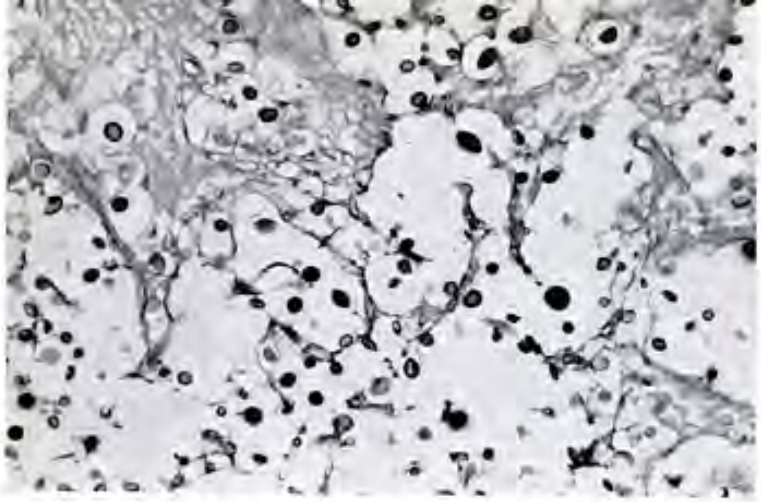

Fig. 5 — Photomicrograph (H and E, x 255) showing typical cryptococcosis without inflammatory reaction.

Fig. 6—Photomicrograph (H and E, x 750) showing budding cryptococci.

tuberculoid granulomas with numerous multi-nucleated giant cells and much more inflammatory reaction.

J. L. Snoddy, M. D., Oklahoma City, Oklahoma: We had a case of cryptococcus in the lung which was very much like the one described by Dr. Berthrong. There was very definite granulomatous reaction with dense fibrous tissue and many Langhan's type giant cells, but we had very few capsules in the cultures from the lungs; the patient is alive approximately three years after lobectomy. In the Journal of Thoracic Surgery, about two years ago, two patients were reported treated by lobectomy who had lived for some time without dissemination (Poppe).

W. R. Platt, M. D., St. Louis, Missouri: This lesion and other lesions that desquamate into the spinal fluid frequently can be diagnosed by making a Papanicolaou smear or an Hematoxylin-eosin stain of the spinal fluid, or of the contents of a cystic lesion; one may then see the medulloblasts or the torula bodies or the lymphocytes, which may permit a diagnosis.

K. Earle, M. D., Galveston, Texas: We see three or four of these a year. It has been my experience that the cryptococcus causes very little inflammatory reaction in the brain but in the subarachnoid space there may be considerable inflammatory reaction.

F. P. Bornstein, M. D., El Paso, Texas: I noticed with interest that there were 92% lymphocytes in the spinal fluid. You have to look over the shoulder of your technicians. We had a case like that, where the technician reported a great number of lymphocytes in the spinal fluid and when we looked they were really organisms and not lymphocytes at all.

Dr. Regato: I would like to look over the shoulders of the laboratory girls, Dr. Bornstein, but the Sisters won't let me!

D. Alcott, M. D., San Jose, California: I would like to say in defense of our technician that on the first spinal fluid she found the organisms; we used India ink and demonstrated them, and also cultured them. Actually, we sent Dr. del Regato a copy of the protocol in which we had eliminated the technician's findings.

M. Wheelock, M. D., Chicago, Illinois: We have seen about a dozen cases of cryptococcosis and also blastomycosis and other fungi in individuals being treated for leukemia, Hodgkin's or lymphosarcoma, with a combination of nitrogen mustard and ACTH. Some years ago an association between these fungi and other types of granulomas was suspected; I think that this should be emphasized.

J. J. Andujar, M.D., Fort Worth, Texas: I wish to emphasize the necessity for culturing these lesions. The present lesions are not exactly characteristic of the ordinary torula histolytica or the *cryptococcus neoformans*, to use its new name. I would like to know whether or not Dr. Alcott did run the culture down into the species. This organism, for example, has two features that are a little disturbing. One of them is the fact that budding is exceedingly rare and the second thing is that there is tremendous variation in size: some are just pinpoint size, others are larger even than a huge samoma body. Of course, since the organism is histolytic it often does accumulate a peculiar material around the periphery; this produces a false gigantism of an occasional torula.

D. Alcott, M. D., San Jose, California: Yes, we have run this case down by cultural methods and we are satisfied that it is a true case of cryptococcosis; we injected into numerous animals. I think where they go off on the meninges you have a little different pattern grow.

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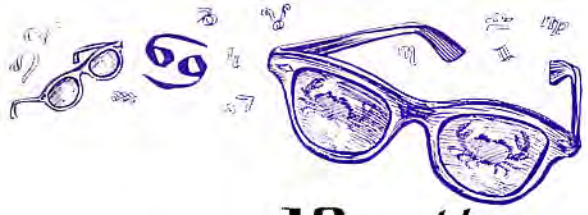


12. *Hemangiopericytoma of the Cerebellum*

Contributed by CRICHTON MCNEIL, M. D., Salt Lake City, Utah

THE PATIENT was a 42-year-old man in June, 1955, when he first suffered from frontal pain which became recurrent and was followed by diplopia, paroxysmal attacks of hiccoughs and vomiting, weight loss and unsteady gait. On examination the patient appeared sluggish and disoriented, any change of position brought emesis. There was a faint nystagmus on left lateral gaze, but no visual impairment, no tinnitus, no hypoacousia, no cerebellar signs, no Babinski.

Dr. Pendergrass: The single lateral ventriculogram submitted for diagnosis revealed: 1) slight bone atrophy of the dorsum sellae indicative of increased intracranial pressure; 2) the ventricular system is slightly dilated; 3) only one lateral ventricle is well visualized; the other is partially filled with air; 4) the foramina of Monro are well visualized; 5) the third ventricle seems slightly dilated; it is clearly defined and may be rotated upward slightly; 6) the aqueduct of Sylvius seems slightly dilated; only its proximal portion is visualized.

If one remembers that normally the cerebro-spinal fluid elaborated by the choroid plexus courses throughout the lateral ventricles into the third ventricle, then through the aqueduct of Sylvius into the fourth ventricle, emptying finally into the cisterna magna through the foramina of Lushchka and Megendie, one can appreciate what happens to the ventricular system in the presence of an obstruction at varying sites along the ventricular system.

In this patient one can see the lateral ventricles clearly, the third ventricle well and the most proximal portion of the aqueduct of Sylvius. The aforementioned structures are somewhat dilated down to and including the proximal portion of the aqueduct of Sylvius. We are unable to demonstrate the distal half of the aqueduct and the fourth ventricle. The latter suggest the presence of a posterior fossa lesion which extends into the region of the midbrain where it cuts off the aqueduct.

The patient's record states that the "pneumoencephalogram showed apparent displacement of the right temporal horn." Without additional roentgenograms made in various projections we are inclined to doubt this finding.

Dr. Pendergrass's impression: Midline TUMOR of the POSTERIOR FOSSA (1. astrocytoma, 2. medulloblastoma. 3. hemangioblastoma).

Radiologic Impressions Submitted by Mail:

Right temporal glioma	27
Right occipito-temporal glioma	23
Posterior fossa tumor	12
Meningioma	9
Astrocytoma	8
Others	21

Dr. Regato: Dr. L. Pascucci, of Tulsa, suggested midbrain tumor. Dr. Ben Felson, of Cincinnati, suggested an occipito-temporal astrocytoma. Dr. Harry Hauser, of Cleveland, and Dr. J. A. Campbell, of Indianapolis, proposed meningioma of the right temporal region.

Operative findings: In August, 1955, craniotomy was done, the right cerebellar hemisphere was found indurated. After incision of the cerebellar cortex a rather vascular tumor was found fixed to the undersurface of the tentorium. Several transfusions were necessary during operation.

The gross specimen consisted of a soft, single, lobular, apparently encapsulated mass measuring 6x4x2.5 cm, weighing 20 grams and containing several vascular spaces.

Dr. Kernohan: This section is from a tumor of a type that has received more than usual attention during the last few years. It has been called "hemangiopericytoma" by Dr. Stout. This type of neoplasm is said to arise from a cell that is attached to walls of capillaries and has been called "pericyte" by Zimmermann. Drs. Stout and Murray, on the basis of tissue culture methods, feel convinced that the tumor is made up of pericytes. The pericyte is said to have contractile qualities and is supposed to have some relationship to smooth muscle cells. On the other hand, these tumors contain cells with an epithelioid appearance, which are thought to be related to the cells of the glomus. The varied appearance of the tumor cells has suggested an intermingling of the two types of cells mentioned above. There is one quite constant feature in all of these tumors—namely, the reticulum which is brought out by one of the silver-reticulin impregnation methods. The tumor that we are considering this afternoon is a fairly typical example of a hemangiopericytoma. There are collections of somewhat elongated spindle cells with blood spaces between the groups of cells. Other areas have round epithelioidlike cells, and some areas are mixtures of these two. The tumor is extremely cellular. It is quite malignant with numerous mitotic figures. There are some areas of necrosis but little connective tissue stroma. The vascular architecture is well demonstrated with the Gömöri silver-reticulin method of impregnation. There is one outstanding feature of these tumors, and that is the remarkable variation in the cells, their shapes and appearances as well as their architectural arrangements.

One wonders how this tumor came to be present in the brain. Pericytes may be present in the brain. I am not certain, but the presence of the epithelioid cells, which are supposed to originate from glomus cells, is difficult to explain. I don't believe that a glomus has been found in brain tissue. I have seen a number of malignant hemangio-endotheliomas which I have celled "hemangiosarcoma", very similar to this tumor. Even the reticulin pattern was quite like that of the hemangiopericytoma. Dr. Mulligan described a large series of hemangiopericytomas in dogs.

Dr. Kernohan's diagnosis: HEMANGIOPERICYTOMA.

Histopathologic Diagnoses Submitted by Mail:

Hemangiopericytoma	37
Angiosarcoma	27
Meningioma	16
Meningiosarcoma	15
Hemangioendothelioma	13
Sarcoma	10
Others	21

Fig. 1—Roentgenogram showing slighlly dilated ventricular system.

Isaac Costero, M. D., Mexico City, (in Havana): This is a meningeal tumor that always presents the same typical architecture. This is a malignant neoplasm formed by cells with fibroblastic capacity similar to that of sarcomas and which, cultured outside the body, cannot be distinguished from meningiomas. For this reason we consider it as a *meningiosarcoma.*

Dr. Regato: Dr. V. Pardo, of Havana, also submitted a diagnosis of hemangiopericytoma. Dr. Rupert Willis, of Leeds, made a diagnosis of hemangioblastoma. Dr. Mark Wheelock, of Chicago, submitted hemangioendothelioma. Dr. Carlo Sirtori, of Milan, preferred angiosarcoma. Dr. V. R. Khanolkar, of Bombay, proposed meningeal fibroblastoma. Dr. Webb Haymaker of Washington, D. C. and Dr. Raffaele Lattes, of New York, preferred meningioma. Dr. Dorothy S. Russell, of London, also diagnosed it as a meningioma, hemangioblastic type.

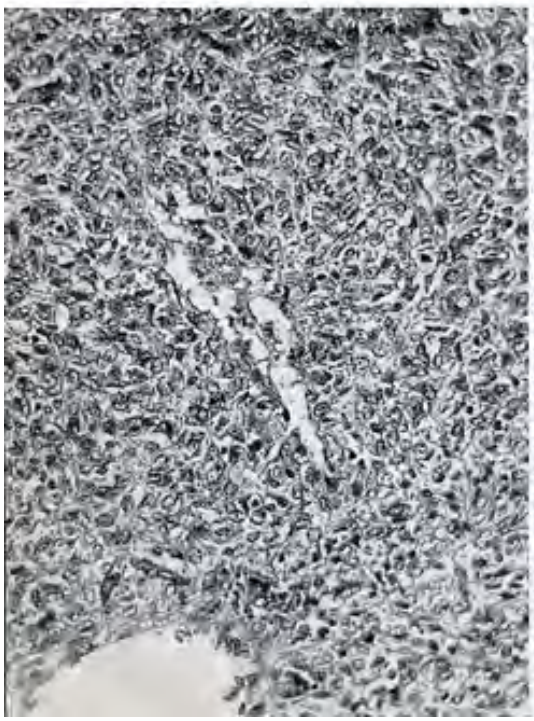
Dr. Zülch: In this case we have a puzzling radiological feature, lifting of the posterior horn, and on the other hand we have the tumor reportedly taken out from the posterior fossa. That makes me wonder whether or not this could be one of these meningiomas which extend to both fossae, to the supratentorial and the infratentorial space at the same time. The tissue itself reminded me of some tumors that I have seen which had the appearance of typical meningiomas, although they were not quite as well encapsulated as an ordinary meningioma is.

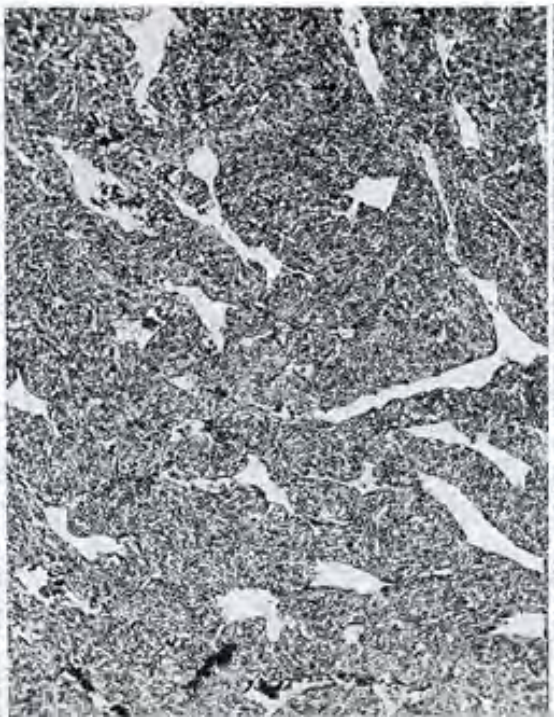
J. J. Richmond, M. D., London: Many consider hemangioblastomas relatively radio-resistant, but that has not been

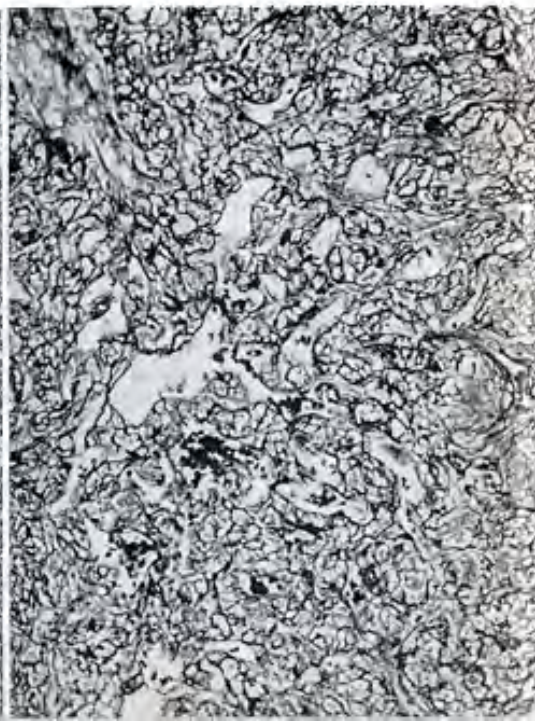
Fig. 2—Photomicrograph (H and E, x 240) of hemangiopericytoma showing highly cellular character and relationship of the cells to the walls of the blood vessels.

Fig. 3—Photomicrograph (H and E, x 100) showing the great cellularity of the tumor and the large number of blood spaces in it.

Fig 4—Photomicrograph (Gomori reticulin stain, x 175) showing large amounts of reticulin and number of blood spaces, as well as the relationship of the reticulin to the blood spaces.







my experience at all. Recently, in reviewing results of 1000 personal cases, I found that in the group of hemangioblastomas, there was 75% five-year survival.

Dr. Pendergrass: I have seen two patients who had hemangiopericytoma involving the breast. One of them was a chronic lesion, growing slowly over a period of four or five years; the other patient had a very rapid growing lesion. Both of these patients were treated by radiations. They are very unusual lesions in my experience; I was not aware until today that these lesions were also found in the brain.

L. Lowbeer, M. D., Tulsa, Oklahoma: We now have under observation a woman with a hemangiopericytoma of the skull which has perforated the skull and involved the cerebral cortex, producing cerebral symptoms. The tumor is not operable, and therefore the patient has received radiation therapy under which, for the time being, some of the symptoms have improved and the tumor has definitely been reduced in size. Dr. Stout does not believe that radiation therapy can completely eliminate a tumor of this nature.

Dr. Regato: For the most part these tumors are excised and diagnosis is made after excision; there is not really sufficient radiotherapeutic experience to compare results. Such cases as yours, Dr. Lowbeer, are very valuable, since the patient is inoperable and there is no other recourse.

Editor's note: In the fall of 1956 this patient was reported asymptomatic: he had recovered his emotional stability and central acuity, he had a slight non-disabling visual field defect and considered himself fully recovered; his wife agreed.

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13. *Voluminous Metastases of the Periphery of the Skull from Renal Carcinoma*

Contributed by H. C. Stoll, M. D., and Ru-Kan Lin, M. D., Buffalo, New York

THE PATIENT was a 48-year-old man in 1952 when he struck his head and a swelling developed under the scalp; the mass gradually increased for two years causing slight pain. In August, 1954, the tumor extended over the right temporal, parietal and occipital regions and showed marked dilatation of superficial veins; a soft systolic murmur could be heard over the mass. There was slight papilledema of the right disc, no nystagmus, strabismus or any other neurological signs.

Dr. Pendergrass: The single lateral roentgenogram of the skull revealed: 1) the examination is an arteriogram; 2) extensive bone destruction is evident throughout the entire hemicranium; 3) there seems to be a "cap" of tissue overlying the periphery of the tumor mass.

The angiogram revealed a host of abnormal blood vessels extending not only throughout the mass itself but intracranially as well. There is no semblance of normal vascular architecture. These are tumor vessels, irregular in distribution and irregular in configuration. Whereas usually blood vessels taper off in size as they extend peripherally, the blood vessels in this individual show not the slightest tendency to do so. Many of the vessels present small aneurysmal dilatations; these also characterize the vessels in the tumor masses.

The history tells us nothing concerning what vessel it was that was injected. Had the external carotid artery alone been injected one would consider the scalp, the bones of the calvaria, and the dura as potential sites of origin for the tumor mass. The external carotid artery supplies these portions of the head; logic would dictate these sites of origin if the external carotid artery had been injected directly. Usually the common carotid is injected and we presume the vascular flooding here demonstrated followed opacification of the common carotid. What we are seeing is the summation of vascular shadow coursing through the brain, the dura, the bone and perhaps even the scalp.

The most common osteolytic abnormality in the skull is metastatic disease. Second in frequency are the meningiomas. Least common are the primary bone sarcomas of the skull.

Since the character of the bone destruction and its vascularization would not be pathognomonic one would approach the diagnosis considering the law of averages. Never having seen metastatic malignancy cause such an extensive vascular tumor mass we are inclined to relegate this possibility to a place of lesser importance considering much more probable meningioma or osteogenic sarcoma.

Meningiomas often produce remarkable soft tissue tumor masses and bone deformity. Angiosarcomas and osteogenic sarcomas arising in bone do exactly the same. If the lesion proves to be metastatic one would seriously consider metastatic or multi-centric osteogenic sarcoma.

Dr. Pendergrass's impression: 1) Malignant MENINGIOMA, 2) OSTEOSARCOMA, 3) METASTATIC TUMOR.

Fig. 1—Appearance of the patient before surgical intervention.

Radiologic Impressions Submitted by Mail:

Meningioma	38
Osteosarcoma	25
Hemangiosarcoma	7
Metastatic kidney tumor	2
Wow!	1
Others	12

Dr. Regato: Dr. James R. St. John, of Santa Barbara, suggested a meningiosarcoma. Dr. Paul C. Swenson, of Philadelphia, also suggested a very vascular meningioma or a cirsoid aneurysm. Dr. Harry Hauser, of Cleveland, preferred a metastatic carcinoma, suggesting thyroid as the site of primary. Dr. Philip J. Hodes, of Philadelphia, suggested metastatic hypernephroma.

Operative findings: In August, 1954, following preliminary right external carotid ligation, 660 grams of tumor were removed from the skull, with considerable blood loss. In September, 1954, an additional 250 grams of tumor was removed following ligation of the left external carotid.

Dr. Kernohan: This is one of those bizarre cases in which it is impossible for me to get any satisfactory correlation between the nature of the tumor and the patient's story. The tumor is a metastasis from typical clear cell renal carcinoma. I tried to make it correspond to some bone tumor, any primary tumor of the brain or even some neoplasm arising from sebaceous glands, sweat glands or any skin appendage. It did not fit into any of these, and I was forced to call it a metastasis from a renal carcinoma (Grawitz tumor or hypernephroma). The tumor is quite characteristic, with the clear cells forming acini or arranging themselves along a central strand of connective tissue, giving a papillary appearance. A stain for lipoid would undoubtedly show the tumor cells to be laden with lipoid. These tumors, as a rule, are, from a microscopic point of view, not very malignant but, because of the tendency of the primary tumors to invade the renal veins, metastases often are widespread. Mitotic figures are not often seen in renal carcinomas and the prognosis of these tumors is based on the presence, as well as the degree, of invasion of the renal veins.

Renal carcinomas often metastasize to bone, but only infrequently to the skull. The long 2-year history between the time of injury and the time of operation is unique.

I will be interested in hearing about the roentgenogram of the chest, as well as the presence or absence of hematuria, and so forth.

Fig. 2—Roentgenogram showing extensive bone destruction of the skull.

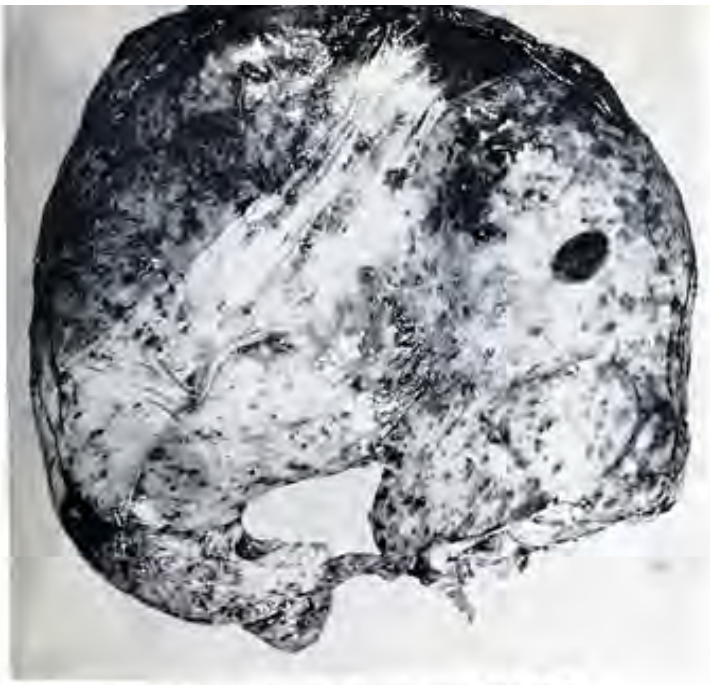

Fig. 3—Gross specimen of excised mass from skull.

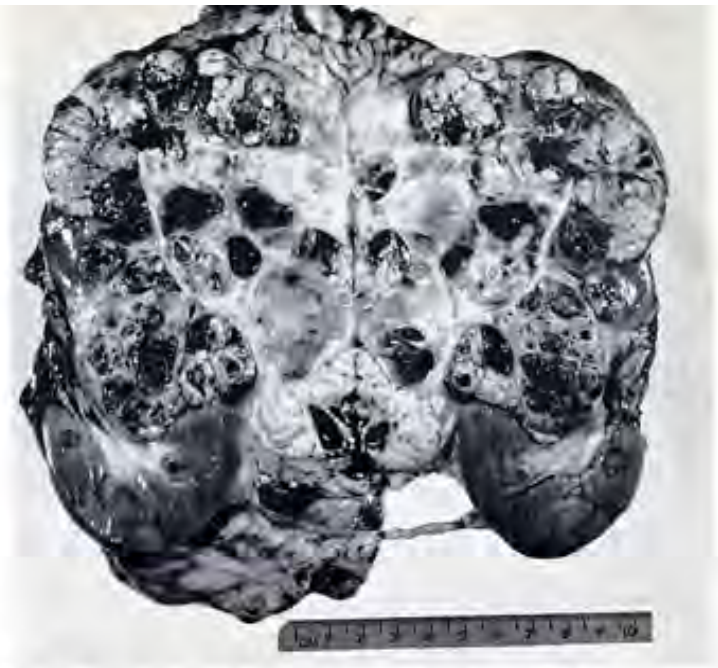

Fig. 4—Gross specimen of kidney almost totally replaced by silent tumor.

Dr. Kernohan's diagnosis: METASTATIC CARCINOMA OF THE KIDNEY.

Histopathologic Diagnoses Submitted by Mail:

Renal carcinoma	85
Hemangioendothelioma	8
Hemangioma	6
Others	12

Dr. Regato: Most authorities had no difficulty in recognizing a carcinoma of the kidney when they saw one. Dr. Rupert Willis wondered if the trauma decided the place for the metastasis.

Subsequent history: In October, 1954, a left abdominal mass was palpated. Intravenous pyelograms revealed a tumor of the left kidney. A nephrectomy was done. Postoperative roentgentherapy was administered.

H. Stoll, M. D., Buffalo, New York: This patient was seen in the second week of August of this year and he is still doing moderately well. He has no evidence of any other metastatic lesion. They were unable on two attempts at craniotomy to remove all of this man's tumor because of the severe bleeding they encountered each time. About 600 grams of the tumor was removed from the dural space, scalp and skull. The brain itself was not involved. This patient is a schizophrenic in one of the New York State Hospitals.

J. J. Richmond, M. D., London: We come across quite a number of patients who have had nephrectomy for hypernephroma and who present with a solitary metastasis, usually a skeletal metastasis in the humerus or femur. It does seem justifiable to carry out a major surgical procedure or extensive radiotherapy, because there are quite a considerable number of these patients who have survived for a long period after amputation of a limb, or, in some cases, after radiotherapy to the solitary metastasis.

H. K. Giffen, M. D., Omaha, Nebraska: Would Dr. Kernohan care to guess as to how those cells jump from the kidney to the skull? Is this a foraminal volley?

Dr. Kernohan: I don't know. I have no idea how it came about. The whole thing is a complete mystery to me. It is much like the man who first saw a white elephant and said "There ain't no such animal".

Dr. Pendergrass: I think this came to the skull by way of the vertebral vein plexus that Batson has described.

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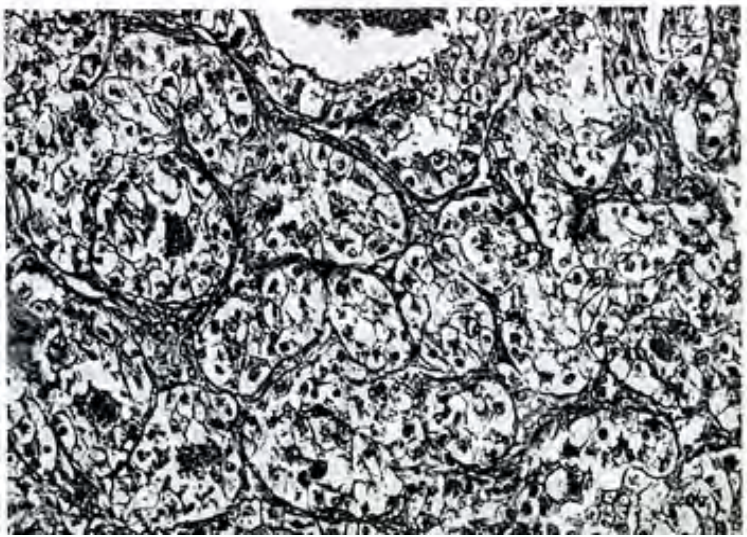
Fig. 5—Photomicrograph (H and E. × 175) showing renal carcinoma with clear cells and alveolar arrangement.



14. *Hemangioendothelioma of the Cerebellum*

Contributed by R. M. Maynard, M. D.,
A. L. Daywitt, M. D., and W. K. Welch, M. D.,
Denver, Colorado

THIS PATIENT was a 66-year-old man in April, 1956, when he complained of headaches and vomiting of six weeks duration, followed by ataxia and loss of weight. He was lethargic and apathetic, unable to stand and tending to fall to the left: there was some failure in coordination of movements, weakness in dorsiflexion of the right foot and some atrophy of the right forearm. Abdominal reflexes were absent and patellar reflexes were hyperactive, particularly on the left; Babinski on the left. No sensory abnormality, no papilledema, no cranial nerve paralysis.

Dr. Pendergrass: The lateral roentgenogram shows: 1) increased intracranial pressure manifest by slight deossification of the hypophyseal fossa; 2) slight dilatation of the lateral ventricles; 3) slight dilatation of the third ventricle; 4) a dilated aqueduct of Sylvius amputated at the level of the tentorium; 5) the pineal seems large; 6) air is distributed in the region of the clivus which cannot be identified.

In the postero-anterior projection the following are observed: 1) symmetric dilatation of the lateral ventricles; 2) the third ventricle is dilated but not displaced; 3) the air-filled lateral ventricles are not as radiolucent as one would expect. They suggest the possibility of superimposed soft tissue masses particularly on the right side.

We are told that this patient had a ventriculogram. We can see no burr holes and wonder how the air was injected. We are reasonably confident this must have been a ventriculogram, because of the obstructed and somewhat dilated aqueduct of Sylvius.

In spite of the clinical evidence pointing to the anterior fossa there is nothing radiographically which would support this diagnosis. The fact that diffuse ventricular dilatation may occasionally be observed in healthy individuals later in life gives one cause to reflect upon the significance of the dilatation demonstrated in this patient's ventriculogram.

Two findings supersede all other radiographic observations. The sella turcica is deossified which bespeaks increased intracranial pressure. The aqueduct of Sylvius is dilated and amputated at the level of the tentorium. These two observations, if correct, must mean that this patient has increased intracranial pressure due to a posterior fossa lesion.

Here, as in Case 12, one considers the various tumors which may arise at the posterior fossa in older individuals. Among these must be considered astrocytomas, medulloblastomas, hemangioblastomas, and metastatic malignancy.

Dr. Pendergrass's impression: TUMOR of the posterior fossa, probably a HEMANGIOBLASTOMA.

Fig. 1—Roentgenogram showing symmetric dilatation of the lateral ventricles.

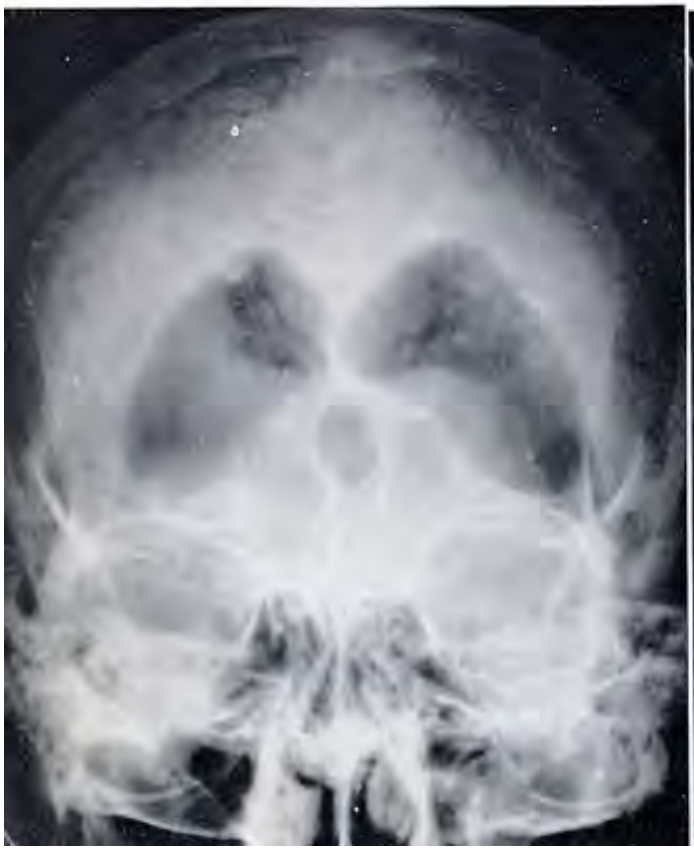
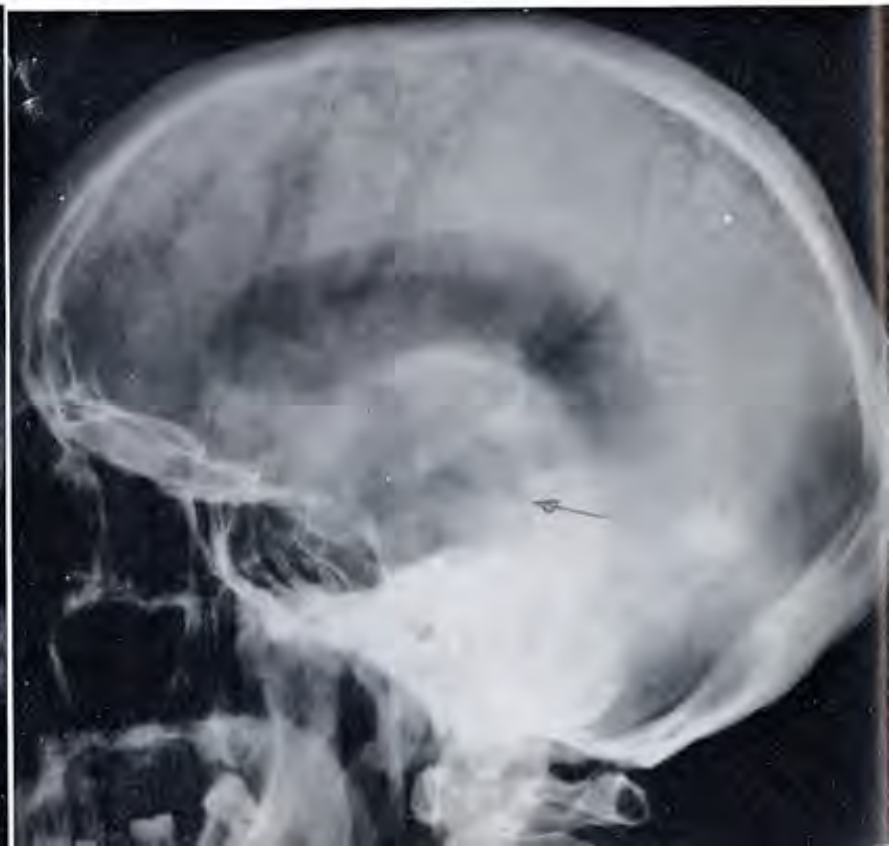


Fig. 2—Roentgenogram showing slight dilatation of the third and lateral ventricles and of the aqueduct of Sylvius.



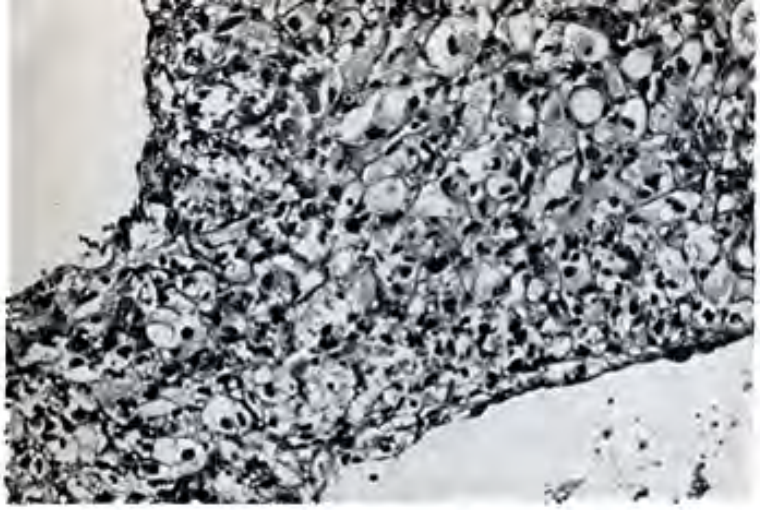


Fig. 3—Photomicrograph (H and E, x 180) showing hemangio-endothelioma. The lumina of the two blood vessels lined by endothelial cells and containing erythrocytes. Some small vessels are obliterated by lipid-laden cells.

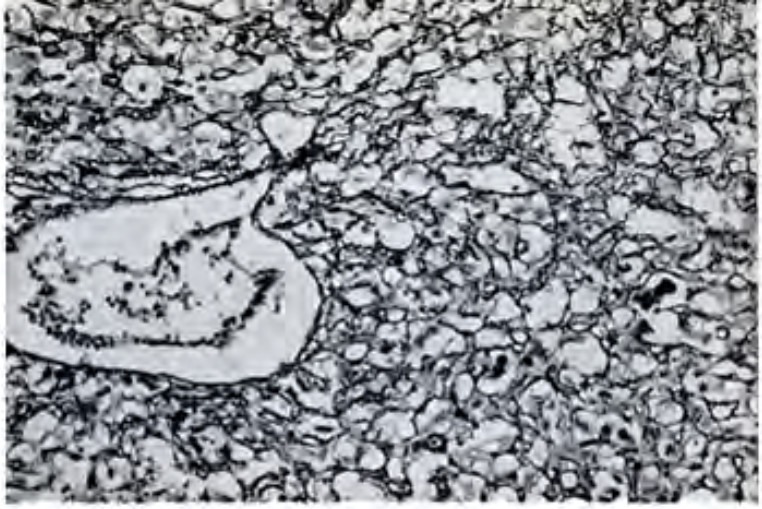


Fig. 4—Photomicrograph (Gömöri reticulin stain, x 175) showing one blood vessel and numerous small blood spaces. The reticulin radiates away from the large blood space.

Radiologic Impressions Submitted by Mail:

Cerebellar tumor	21
Cerebellar angiosarcoma	15
Pontine glioma	12
Posterior fossa tumor	12
Ependymoma	6
Others	15

Dr. Regato: Dr. J. A. Campbell, of Indianapolis, also suggested hemangioblastoma of the posterior fossa. Dr. Wendell Stampfli, of Denver, and Dr. Paul C. Swenson, of Philadelphia, proposed a cerebellar tumor. Dr. B. L. Pear, of Denver, submitted cerebellar sarcoma. Dr. D. A. Van Velzer, of Denver, designated it as a hemangioblastoma of the cerebellum.

Surgical findings: On April, 1956, a craniotomy was done. A mid line tumor was found situated anterior to the vermis of the cerebellum; it was removed.

The gross specimen consisted of three pink-red firm pieces of tissue, the largest measuring 2 cm.

Dr. Kernohan: This is a characteristic hemangio-endothelioma such as is seen in the cerebellum. These tumors are not limited to the cerebellum but are found in other parts of the brain and spinal cord. They may be found in any age group but more commonly in young adults. When present in the cerebellum, they are often associated with a cyst, and the tumor nodule occupies, as a rule, only a small portion of the wall of the cyst, so-called mural nodule. These tumors have a fairly characteristic appearance on gross examination, having a pale brick-red color and being spongy in consistency. The color is due to a large number of lipoid-laden cells in the tumor and the blood present in the capillaries. The spongy state is due to the large number of blood vessels and spaces in the tumors.

The tumor consists of a large number of small blood spaces lined by prominent endothelial cells and having lipoid-laden xanthomalike cells between the small blood spaces. The small blood spaces usually branch off from larger vessels, either arteries or veins. The diagnosis can usually be made on hematoxylin-and-eosin-stained sections, but it is advisable to have a reticulin stain, such as Gömöri reticulin method, made to confirm the diagnosis. A most beautiful picture can be obtained by doing a fat stain such as Scharlach R. followed by Gömöri reticulin method. This shows the relationship of the fat cells to the blood spaces.

This tumor merits a little discussion from the point of view of possible associated lesions. Lindau drew attention to the association of this type of cystic tumor in the cerebellum with hemangiomas in the eye, polycystic pancreas, cysts and adenomas of the kidneys, and cysts of the liver. In some of our cases, we have also found hemangio-endotheliomas in the spinal cord associated with syringomyelia. Von Hippel had previously described the hemangiomas of the eye, and so that condition is now called "Lindau-von-Hippel disease". In our material the great majority of hemangio-endotheliomas of the cerebellum are solitary lesions and are not associated with the other findings of Lindau-von-Hippel disease. This is important because there is strong evidence that Lindau-von-Hippel disease is hereditary. On this account I have opposed calling the solitary lesions of the cerebellum a part of the syndrome.

Dr. Kernohan's diagnosis: HEMANGIOENDOTHELIOMA.

Histopathologic Diagnoses Submitted by Mail:

Hemangioma	40
Hemangioendothelioma	20
Hemangioblastoma	18
Chordoma	15
Oligodendroglioma	5
Sarcoma	5
Others	8

Isaac Costero, M. D., Mexico City, (in Havana): This is the type of angioma which is usually found in the neighborhood of the cerebello-pontine angle. It is characteristic in that the inter-vascular cells are loaded with fat which transform them in typical foamy elements. This character is more topographic than histogenetic, and for this reason we call this tumor *capillary telangioma*.

Dr. Regato: Dr. L. Benitez-Soto, of Mexico, and Dr. V. Pardo, of Havana, Dr. Raffaele Lattès, of New York, Dr. Webb Haymaker, of Washington, D. C., Dr. R. B. Haukohl, of Milwaukee, and Dr. E. F. Geever, of Bethesda, all submitted hemangioblastoma.

Subsequent history: In May, 1956, the patient developed urinary retention which was relieved by catheterization. Since then there has been progressive improvement.

Dr. Zülch: This is a man of 68. He has a very short history of only six weeks. He had cerebellar symptoms, but at the same time already general pressure symptoms, and a few misleading symptoms like paresis of the right dorsiflector of the foot and atrophy of the forearm. Even taking into account that angioblastoma is a most common tumor of the cerebellar fossa, one would suspect a secondary malignant process in this case. If we pay attention to the clinical history we certainly would expect already papilledema. But angioblastomas are very peculiar in this regard, for even in those cases where we find already marked signs of pressure, these angioblastomas have no papilledema. Some of these cases have a polyglobulia and this helps a lot in the pre-operative diagnosis.

Dr. Regato: Polycythemia, associated with hemangioblastomas of the cerebellum, was not reported present in this case.

Dr. Kernohan: These tumors when they occur in young people are sometimes associated with lesions elsewhere. The hemangiomas of the cerebellum with cysts are often associated with angiomas in the retina, polycystic kidneys with adenomas in the kidneys and sometimes cysts in the liver. This is called, or referred to, as Lindau's or Lindau-von-Hippel's disease. Von Hippel originally described angiomas in the retina. I don't think that this tumor should be classified with the Lindau-von-Hippel's syndrome, since it is a solitary non-cystic lesion with nothing in the retina and presumably nothing in the pancreas. Such multiple cystic lesions are supposed to be familial and congenital, and the implications are quite serious.

Dr. Pendergrass: Dr. Regato and members of this Seminar, I do want to thank you for the privilege of having been with you. This has been a real experience for me. I would be entirely at fault were I not to pay tribute to the young men in my department who helped collect the material I have shown you today, and especially to Dr. Philip Hodes.

J. J. Richmond, M. D., London: I would like to say, just before going, how lucky I am to have had the privilege of attending this Seminar, run in such an efficient manner, which has been most stimulating. May I offer my very sincere thanks to you, sir, and to your colleagues.

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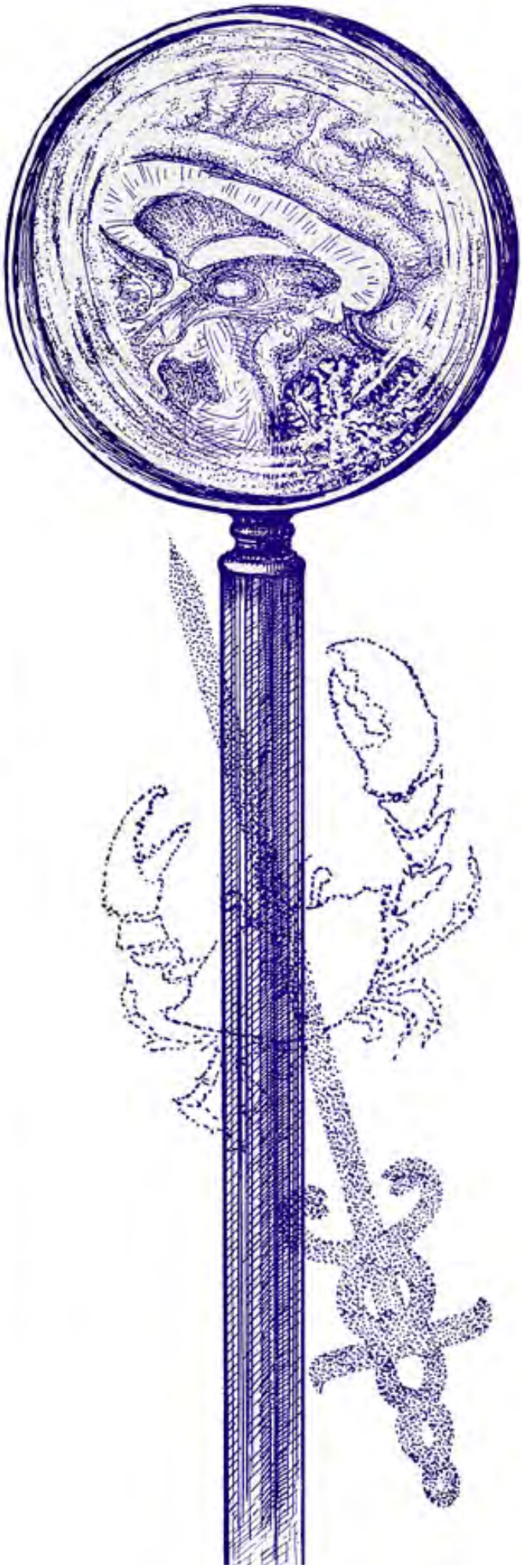
Our Guest Speakers

EUGENE P. PENDERGRASS, M. D., Professor of Radiology, University of Pennsylvania. Dr. Pendergrass graduated from the University of Pennsylvania Medical School in 1918. He is one of the outstanding figures of American Radiology and the author of numerous original contributions to this branch of medicine. Dr. Pendergrass was the guest of the Penrose Cancer Hospital.

JAMES W. KERNOHAN, M. D., Chairman of the Section on Pathologic Anatomy, Mayo Clinic, Rochester, Minnesota. Dr. Kernohan graduated from the Queen's University, Belfast, Ireland, in 1931. He is a consultant to the Armed Forces Institute of Pathology and is one of the outstanding authorities in neuropathology in the United States. Dr. Kernohan was the guest of the College of American Pathologists.

K. J. ZÜLCH, M. D., Director of Neurology, Max Plank Institute for Brain Research, and Professor of Neurology, University of Cologne, Germany. Dr. Zülch is the author of numerous publications on neuropathology and neurosurgery. An American edition of his book *Brain Tumors* is to be published, in 1957, by Springer. Dr. Zülch was the guest of the Penrose Cancer Hospital.



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