HEREDITARY COMBINED NEURINOMAS AND MENINGIOMAS

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Von Recklinghausen’s disease, in the form of multiple neurofibromatosis affecting not only peripheral nerves but cranial and spinal nerve roots, has frequently been demonstrated to show marked hereditary tendencies. Even when this disease, unaccompanied by widespread neurinomatosis, manifests itself only in the form of bilateral acoustic nerve tumors, it has been shown to be hereditary. In the remarkable report of a family by Gardner and Frazier, they traced the bilateral deafness as a true Mendelian dominant through five generations comprising 217 persons.

Cushing and Eisenhardt,1 in their classical monograph on meningiomas, have brought together in a most exhaustive manner the reports from the literature of cases of multiple meningiomas, and combined neurinomas and meningiomas occurring in the same patient. It is, indeed, with one of the two examples presented by these authors in Chapter V of their book, entitled “Combined Neurinomas and Meningiomas,” that we are dealing in the present report. Stanley G., the subject of Case I, Serial No. 311, in Chapter V of their monograph, was referred to the care of one of us by Dr. Cushing upon his retirement from active neurosurgical practice. The present paper is a continuation of the remarkable history of this patient, and that of his only child. For the sake of completeness, we are taking the liberty of repeating the earlier history of Stanley G., as reported by Cushing and Eisenhardt, and will then report further upon our own experiences with this unique father and daughter.

CASE REPORTS

“Case I. Serial No. 311. Multiple psammomeningiomas involving cerebral dura, roentgenologically verified, and symptomatically associated with bilateral auditory disturbances presumably due to bilateral acoustic neurinomas. Suboccipital exploration with surgical verification of multiple tumors supposedly meningiomas in the right lateral recess adjacent to the porus acusticus. Recovery with fairly stationary condition after 5 years.

“July 17, 1932. Admission of Stanley G., a Jewish medical student, 24 years of age, complaining of headaches and impaired hearing. The family history revealed a tendency toward familial psychoneurosis.

“Past History.—For a period of at least ten or twelve years the patient had
noticed a tendency to flushing and sweating of the right half of the body. A large lipoma was removed from the suboccipital region in 1922. For five years, progressive impairment of hearing and for four years inequality of pupils had been observed. An advancing right-sided deafness with tinnitus had been present for two years and tinnitus referred to the left ear for a year and a half. Some impairment of vision also had been noted for two and a half years; and latterly he had experienced colour hallucinations on stooping. Unsteadiness in gait with a tendency to deviate to the right and backward with attacks of weakness and trembling had been of recent occurrence. Despite a negative Wassermann he had received a thorough antiluetic treatment.

"Physical Examination.—This disclosed: (1) a left relative hyposmia; (2) bilateral choked discs of 2 diopeters; (3) anisocoria, right pupil wider than left; (4) nystagmus poorly sustained; (5) hypaesthesia of the right trigeminal skin field; (6) slight palsy of the right face; (7) impaired hearing in the right ear with sluggish vestibular response to caloric test (normal reaction on left); (8) a definite right-sided tendency to flushing and hyperhidrosis; (9) positive Romberg with falling backward and to the right; (10) slight sensory loss over right arm and leg; (11) increased deep reflexes on the left; (12) a smooth cranial hyperostosis palpable in the left frontal bone with enlargement of the temporal artery.

"X-ray films showed unmistakable evidence of multiple psammomatous meningiomas bilaterally situated and involving the cranial vault. They were chiefly parasagittal in situation, more particularly on the left side in correspondence with the palpable hyperostosis.

"Diagnosis.—It was clinically apparent that there was a growth in the right cerebellopontile angle, probably an acoustic tumor associated with bilateral parasagittal meningiomas over the cerebrum. Ventriculograms disclosed moderate dilatation of the lateral ventricles with slight depression of both frontal horns.

"Operation.—July 25, 1932. Novocaine. Suboccipital exploration. The usual bilateral exploration was made. A tense cerebellum was disclosed and on exploring the right recess normal-appearing 9th, 10th, and 11th, and 7th and 8th nerves were seen. Closely adjacent to the porus acusticus were two tiny tumors supposedly meningiomas about 1 cm. in diameter, apparently attached to the dura. The first proved on supravital examination to be a psammoma; the other was not examined. It was thought to be another meningioma (cf. infra). The operation was then concluded.

"Subsequent Notes.—Convalescence from this procedure was protracted and stormy due to extreme vertigo and vomiting on the slightest change of position. In view of these distressing symptoms it was thought best to postpone an attack upon the meningiomas involving the forebrain. On August 20, 1932 he was discharged.

"In spite of his handicap and increasing deafness, he courageously resumed his medical course and succeeded in graduating in June 1936. He meanwhile had married and become a parent. On October 17, 1936 a thorough otological examination by Dr. Page Northington showed a total loss of vestibular response and air conduction on the right and partial loss in the left ear. In a report April 12, 1937, he stated that he was busy as an interne; that his general health was excellent, his mind active, his domestic life happy, and he was not in the least sorry for himself.

"Histological Note.—The first and smaller of the two tumors as stated was a psammomeningioma. When we came to cut the other, it proved to be a transitional type of neurinoma showing in addition to pali
sading parallel fibres of fine reticulin, numerous whorls and in one area a few ganglion cells—in short, much the same appearance shown in the Crowe tumor. Dr. Bailey has shown us sections from two unpublished examples of central neurinomatosis with meningiomatosis, certain of the tumors being transitional lesions resembling the minute Crowe neurinoma and that observed in this last case—lesions, in other words, difficult to differentiate in that they have certain architectural features pertaining to both neurinomas and meningiomas."

Subsequent History. He was followed by one of us until 1940 when his hearing disappeared completely, and visual acuity, because of chronic papilledema with associated secondary atrophy, was reduced to a point where the patient, for all intents and purposes, was both deaf and blind. The patient’s father, who was also a physician, then urged us to operate on the parasagittal tumors. By this time he had an enormous hyperostosis, and a surgical attack was made on it by a two-stage procedure at which a large extra cranial soft-tissue tumor mass was removed, then a large part of the calvarium, including multiple small and large meningiomas. During the latter part of the procedure a number of veins leading into the superior longitudinal sinus were injured. Bleeding, however, was immediately controlled by the placement of a large chunk of muscle which was held in readiness for just such an occasion, and the wound was closed.

Following this operation, apparently because of the injury to these veins, the patient showed bilateral signs suggestive of superior longitudinal sinus thrombosis. Upon his discharge from the hospital a small draining sinus developed in his wound, from which bits of wax were discharged. After a number of these pieces came away, the wound healed. He made a slow recovery from his operation and in the course of about six months had a restoration of vision sufficient so that he was able to read newspapers with the aid of telescopic lenses, and while his life consisted largely of a wheel-chair existence, he enjoyed his family and friends, and kept in remarkably close touch with world and medical events. However, about a year after the operation he had a sudden unexplained fever with temperature rising to 105°F, and a correspondingly high leucocyte count. After a few days he went into coma and died on February 24, 1942. Unfortunately no postmortem examination was permitted.

Case II. Solitary spinal cord meningioma removed in 1949, when patient was 15 years old, followed, five years later, by bilateral auditory disturbances presumably caused by bilateral acoustic neurinoma. Suboccipital exploration with surgical verification of multiple tumors in both lateral recesses, histologically diagnosed as meningiomas.

July 6, 1949. Admission of daughter of Stanley G. with chief complaint of numbness and instability of both legs and feet.

History. This was a 15-year-old schoolgirl whose past history was not remarkable except that her basal metabolic rate was somewhat low, and she had been taking thyroid extract to correct this. In May, 1949, about two months before admission to the hospital, she began to be aware of numbness in both feet, gradually ascending up to her knees and involving the left side more than the right. This was associated with weakness of her legs and instability of gait. Her left knee began to give way suddenly and unexpectedly while walking, and she had several rather severe falls. Except for a feeling of numbness between her shoulder blades, there was no pain and no history of tingling, paresthesias, or incontinence, although transient episodes of urinary urgency had occurred in the two weeks prior to admission.

Physical Examination. The patient was a healthy-looking, pleasant, intelligent,
rather plump little girl. Her vital signs and general physical findings were normal. Neurologically the examination disclosed a paraparesis, with hyperactive knee and ankle jerks, and bilateral positive Babinski signs. On sensory examination, a sensory level below which pain, temperature and touch were diminished, was noted at about the 10th thoracic dermatome. Position sense was intact in her toes, but vibratory sense was lost up to the pelvis. No percussion tenderness of her spine was noted.

Laboratory Data. Routine studies of the blood and urine were negative. Roentgenogram of the thoracic spine was normal. Measurements between the pedicles were normal on the roentgenogram. Lumbar puncture revealed a partial block,

and myelograms with 6 cc. of pantopaque proved the block to be at the level of the 5th thoracic vertebra. The inferior margin of the defect showed a double curve “like a mitten and thumb.”

Operation, July 8, 1949. A complete laminectomy of thoracic vertebrae 4, 5 and 6 was performed and a typical, well encapsulated, intradural, extramedullary tumor was found adherent to the dura mater and indenting the spinal cord, chiefly from the right side. The tumor, together with the dura mater to which it was attached, was removed in one piece. The specimen measured 2.5 by 1.5 by 1 cm.

Histological Note. On microscopic examination the picture was that of a classical psammomatous meningioma, with typical multiple whorls, many of which contained lime salt deposits (Fig. 1).

Subsequent History. Immediately following operation the patient showed an increase in her neurological signs in the form of increased weakness, disturbances of

Fig. 1. Case II. Low-power photomicrograph of the spinal cord tumor, showing multiple psammoma bodies and whorls typical of meningioma.
bladder, and sensory changes. This led us, after 24 hours, to reexplore the wound for fear that a postoperative clot may have occurred. The suture line in the dura mater was carefully opened and the cord was inspected. The arachnoid seemed to be free. The cord was not edematous, nor did it seem soft and mushy. There appeared to be no evidence of thromboses of the vessels on the surface of the cord, so that we were left without explanation as to the reason for the increased signs. For purposes of decompression the dura mater was left open on this occasion.

Within the next week the patient made an excellent recovery, and except for slightly exaggerated reflexes and persistent Babinski signs, she walked out of the hospital well, for all intents and purposes.

Although she occasionally wrote one of us, from which we learned that she completed high school, went on to college and eventually married a young soldier, she was not seen again until July 14, 1954, when she was complaining of the symptoms that led to her second operation. Since the young couple was extremely limited in their financial means, and since as a soldier’s wife she was entitled to service at the Walter Reed Army Hospital in Washington, D.C., where she had already been seen once, it was there that the following developments took place.

July 16, 1954. Admission to Walter Reed Army Hospital.

History. The patient’s present illness began about ten months prior to her admission, in August, 1953, when she noted an echoing of her own voice in her head and some bilateral tinnitus. The symptoms gradually increased in severity but never became disabling. Three months prior to her admission she had measles, and

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Fig. 2. Case II. Low-power photomicrograph of the biopsy specimen removed from the posterior fossa at operation.
her recovery was accompanied by an onset of staggering gait, marked increase in
deafness and tinnitus, and numbness of the left side of the face. She also suffered,
for the first time, from intermittent headache chiefly in the left occiput and left
mastoid areas. Generalized headache occurred when she turned her head suddenly
in either direction. Diplopia developed in all but the far left lateral gaze. Since the
onset all these symptoms progressively increased in severity.

*Physical Examination.* The patient walked with a lurching gait, constantly
veering to the right. She was very deaf to air conduction in both ears, but seemed to

![Fig. 3. Case II. Basilar view of brain post mortem showing the two cerebellopontine angle tumors.](image_url)

perceive higher frequency sounds better than the lower ones. Caloric testing revealed
no response to ice-water circulation on either side. There was no evidence of neuro-
fibromata or stigmata of von Recklinghausen’s disease anywhere on the skin of
her body. Slight diminution in the sense of smell was detected in the right nostril.
Bilateral long-standing papilledema was evident without accompanying hemor-
rhages or exudates. Visual fields were grossly normal. A partial right 6th nerve
paresis was present. The left corneal reflex was diminished as compared to the
right. Hypalgesia and hypesthesia were present over the entire distribution of both
trigeminal nerves, more marked on the left. No motor trigeminal weakness was
demonstrable. A moderate peripheral 7th nerve weakness bilaterally was also seen,
more marked on the right. Gross motor weakness of the left upper extremity and
hemihypalgesia involving the entire left side of the body were detected. Bilateral Babinski signs were demonstrated, which have been present since the removal of her spinal cord tumor. There was no ankle clonus, and Hoffman sign was negative bilaterally. Coarse nystagmus on left lateral gaze and fine nystagmus on upward gaze were seen. Deep tendon reflexes were within normal limits, but were more active on the left than on the right side. Abdominal reflexes were absent on the right. Post-pointing and rebound phenomena were demonstrable bilaterally, more marked on the left. She seemed to fall, however, to the right on Romberg testing.

*Laboratory Data.* Routine laboratory tests were negative. Roentgenograms of her thoracic spine showed the old laminectomy of thoracic 2 to 5, with residual contrast medium within the skull, apparently in the basilar cisterns to the left of the sella turcica. Roentgenograms of the skull revealed asymmetry of the petrous bones, and the right side showed some erosion at the tip. Both internal auditory meatuses appeared to be enlarged, that on the right being larger than the one on the left.

*Operation, August 6, 1954.* A bilateral suboccipital craniectomy was performed, and the left ventricle was punctured through a separate incision and burr hole. This did not entirely relieve the tension under which the dura mater over the cerebellum was found, but evacuation of the cisterna magna made the opening of this membrane safe. The cerebellar hemispheres did not appear to be under pressure when exposed. They were of equal size and the vascular markings over them, the vermis and the tonsils were entirely normal. There was no herniation of the tonsils into the foramen magnum. The posterior third of the rim of the foramen magnum was removed. The left cerebellopontine angle was inspected first, and a large looping posterior inferior cerebellar artery was encountered. Just anterior to this a mass of grayish-white

![Image of a postmortem specimen showing multiple, adherent, small, discrete and confluent meningiomas.](image)
tumor tissue, partly adherent to the dura mater in the entire area, spreading over the region of the sigmoid sinus and going far up into the angle, was seen. Four or five pea-sized nodules of this firm, pasty, matrix-like tumor mass were removed for biopsy, but the mass of tumor itself was considered surgically unremovable since it appeared to be surrounding not only the cranial nerves from the 5th nerve posteriorly, but also many large blood vessels. The biopsy showed typical meningioma (Fig. 2).

The right cerebellopontine angle was then inspected. The angle itself was fairly clean of tumor, but down toward the 9th, 10th, 11th, and 12th nerves there was a nodule of tumor intimately associated with a loop of the posterior inferior cerebellar artery. Since the tumor obviously was on both sides, and probably crossed the midline anterior to the pons in a solid sheet, the operator felt it was foolish to persist, and left the patient with a simple decompression and biopsy.

**Subsequent Course.** The patient made a very uneventful postoperative recovery, but by the time of her discharge from the hospital on August 20, 1954, she had shown no evidence of improvement in any of her cranial nerve deficits, although some slight subjective improvement in the strength of her left hand grip was noted.

About a month after her discharge the patient was found dead in a hotel room under somewhat suspicious circumstances, and a postmortem examination was made by the Medical Examiner.

**Autopsy.** The general necropsy was without interest for this presentation.

The brain showed two fairly large-sized tumors, one in each cerebellopontine angle

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**Fig. 5. Case II. Low-power photomicrograph of left cerebellopontine angle tumor, typical of neurinoma but showing a whorl formation in the center of the field.**
The tumors were encapsulated, lobulated, and measured about 5 by 4 by 3 cm. each (Fig. 3). In addition there were multiple, almost countless, small, discrete as well as confluent tumor nodules on the undersurface of the dura mater, along the falx and superior longitudinal sinus, the lateral sinuses, and the upper and lower surfaces of the tentorium (Fig. 4). These small lesions, histologically, proved to be typical meningiomas. The two tumors in the cerebellopontine angles, however, were quite classical examples of neurinomas with palisading and parallel fibres of fine reticulin, but showed, in areas, whorl formation, and in several places ganglion cells (Figs. 5 and 6).

**DISCUSSION**

The purpose of this report was to place on record these two remarkable cases. The many implications, including the nature and the multiplicity of these lesions, their relationship to von Recklinghausen’s disease, the interrelationship between meningiomas and neurinomas, and even the light this may throw on the germ layer origin of the meninges, are so completely covered in the monograph of Cushing and Eisenhardt that it would be repetitive to present them here again.

**SUMMARY**

Two cases of bilateral cerebellopontine neurinomas combined with meningiomatosis are reported, occurring in a father and daughter. In both
patients bilateral deafness was present, and in each bilateral acoustic neurinomas were suspected. In the father a small tumor nodule in one angle was found which, in addition to typical whorl formations, also showed areas of palisading suggesting a mixed type of tumor. The rest of his many small and large intracranial neoplasms were typical meningiomas. In the daughter a meningioma from the thoracic spinal canal was removed at the age of 15, and at 20 multiple posterior fossa meningiomas were verified at operation. At postmortem examination the undersurface of the dura mater bilaterally was studded with discrete as well as confluent almost countless meningiomas, in addition to which two larger tumors, one in each cerebellopontine angle, were found which histologically were neurinomas, but contained whorls in areas suggestive of mixed neurinoma and meningioma in the same tumor, similar to the angle tumor reported in the case of her father.

REFERENCES