CEREBELLAR ABSCESSES OF OTITIC ORIGIN IN NINE CHILDREN

EIGHT RECOVERIES AFTER CANNULATION

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CEREBELLAR ABSCESSES in nine children have been treated surgically by the author during the past seven years. In each instance the symptoms of abscess became manifest after mastoiditis and mastoidectomy. Operative treatment was the same for all cases, and was delayed as long as possible without jeopardizing life from increased intracranial pressure, to allow the abscess wall to thicken and the acute symptoms of meningitis and cerebritis to subside. Slowing of pulse or respiration with increasing restlessness and stupor were the warning signs that surgical interference was imperative. No lumbar punctures were made, for fear of medullary herniation. Medication was avoided, especially with barbiturates or narcotic drugs which would produce added anoxic insult.

Under local anesthesia, a one-half inch trephine opening was made over the suspected cerebellar lobe with a Hudson bur, midway along a line between the occipital protuberance and the mastoid tip (Fig. 1). The dura was incised one-fourth inch to allow insertion of a blunt cannula with a side opening. The cannula was inserted into the abscess allowing its contents to escape. Usually, the first pus was thin and watery and the last thick and stringy. The abscess cavity was never washed out; the wound was always closed tight with silk.

Brief abstracts of each of the nine cases of cerebellar abscess in children are appended; certain details of the cases illustrate pertinent considerations in successful diagnosis, preoperative, surgical, and postoperative treatment of this condition.

ABBREVIATED CASE REPORTS

Case 1.—Judith S., age four, was admitted to hospital with painful swelling behind left ear; swelling had been discharging for two months. Child had been nervous, weak and without appetite since tonsillectomy a year before. Mastoidectomy was performed day following admission—a large quantity of pus was found and a small dural exposure was made. Extreme hyperemia of all structures made operation difficult but recovery was fairly uneventful until one month later, when child refused food, vomited, and temperature remained at 101° F. for a week. Spinal fluid showed 1,575 polymorphonuclear cells, with cocci in chains. Numerous spinal taps were made during the following month. Cultures were negative.

When first seen by the author, nine weeks after mastoidectomy, the child was listless, vomiting, and showed marked ataxia of the left arm. Optic disks were rosy. Seven days later the child became comatose, there was early papilledema and considerable ataxia of left arm and leg. At operation, resistance of abscess wall was felt at depth of 3 cm., and penetration with the cannula allowed green pus to extrude. Culture: *Streptococcus haemolyticus.* One ounce escaped before the child became livelier and the needle was

withdrawn to avoid traumatizing the cerebellum when the child moved. During a rapid postoperative recovery the child's papilledema disappeared within a week and the ataxia within a month. After five years of apparently normal health the child was again admitted to hospital with a stiff neck and high fever. Pneumococci were recovered from blood and spinal fluid and four days later patient expired from septicemia and meningitis.

Case 2.—Margaret L., age eight, was admitted to hospital, seven weeks after an opening of both eardrums, with painful and discharging ears. After a double mastoidectomy the child continued to be drowsy, with nausea, headache and weakness of left arm.

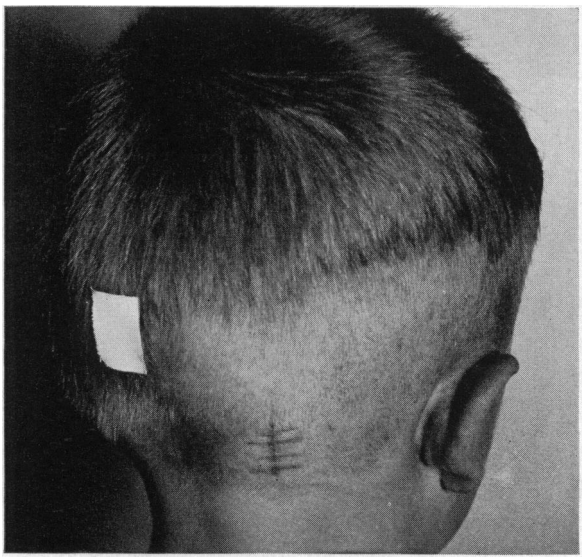

FIG. 1.—Billy H., Case 9: Showing recent scar over trephine opening. Patch of adhesive marks occipital protuberance.

Right mastoid region was reopened 12 days after mastoidectomy, the dura uncovered, and the right temporal lobe needled for a suspected abscess without obtaining pus. Several spinal punctures around this time showed 50 to 100 cells, mostly lymphocytes.

Patient was first seen by the author the day following reopening of right mastoid region. Child was semicomatose; pulse 60, temperature 99.6° F. Atonia and ataxia in left arm with early choking of optic disks. At operation upon the left cerebellar lobe, 45 cc. of thick greenish pus were allowed to escape from abscess whose wall was encountered at a depth of 3 cm. Pulse rose from 74, preoperatively, to 134, postoperatively, and child seemed improved. Culture: *Streptococcus haemolyticus.* After 11 days of stormy convalescence the child became unconscious, cyanotic, and pulse rate dropped to 60. Twenty-five cc. of glucose were administered, and patient immediately became conscious. After seven years this patient was getting along well in school and no neurologic abnormalities could be found.

Case 3.—Harry C., age five, was readmitted to hospital, 15 days after a left mastoidectomy, with complaint of vomiting and headache, but did not appear acutely ill. Pulse 100; temperature normal; R.B.C., 3,150,000; W.B.C., 17,200. Spinal tap revealed clear fluid under increased pressure, with 76 cells. Culture: Staphylococcus. Following spinal tap, the child complained of neck pain, its head was retracted and its condition became rapidly worse.

Seen by author on following day, the child was drowsy but cooperative, his pulse varied around 60, the fundi showed early choking of the disks, and there were marked

ataxia and atonia of the left arm. The neck was not rigid but the head was thrown back because of pain several times during examination (cerebellar fits). At operation, cannula was introduced directly into cerebellar lobe to a depth of 6 cm. without encountering resistance. Cannula was introduced slightly upward without meeting abnormal resistance, but when introduced slightly downward encountered resistance at a depth of 5 cm. On withdrawing slightly, about 2 to 3 cc. of thin, flaky pus escaped.

FIG. 2.—Left to right: Margaret L., Adelore W., Bruce R., Gloria D., Mary R., Sally L., standing on the foot on the same side as the cannulated cerebellar abscess.

The condition of the patient seemed to be somewhat improved postoperatively, but the child continued to throw its head back because of pain. On the second postoperative day breathing suddenly stopped following a spell of extreme restlessness and death followed shortly afterward.

Case 4.—Adelore W., age 11. At age five patient underwent bilateral mastoidectomy following a three months' fever following scarlet fever. Admitted to hospital six years later with vomiting, severe headache and photophobia. Neck rigid. Temperature, 100.6° F. During secondary right mastoidectomy, dura and sinus were exposed and appeared healthy. A right facial paralysis was noted on reaction from anesthesia, and after operation temperature became normal, but the boy was increasingly drowsy and a right rectus palsy developed. Optic disks were elevated 2 to 3 diopters.

First seen by the author 12 days after secondary mastoidectomy, the boy was alert and cooperative but his speech was slurred. Paralysis of right sixth and seventh nerves was noted. There were marked atonia and ataxia in the right arm. Bilateral papilledema, 3 diopters. W.B.C., 16,250, 76 per cent polymorphonuclears. Temperature, 98.6° F. Pulse, 70. At operation, cannula inserted into center of right cerebellar lobe encountered pus at depth of 2 cm. Cannula removed after 20 cc. of pus had been extruded. Culture: *Streptococcus haemolyticus.* Recovery was uneventful except for a persistent slight right facial weakness, and four years later child was apparently in perfect health.

Case 5.—Bruce R., age ten. After several years in which patient was troubled with right earache with discharge in the wintertime, he was admitted to hospital with headache, earache and discharging right ear. Culture: *Streptococcus haemolyticus.* Child was discharged from hospital one week after right mastoidectomy and recovery

seemed normal for three weeks, after which the boy complained of headache and ran a spiking temperature. Blood culture showed no growth. W.B.C., 22,800; polymorphonuclears, 84 per cent. Four weeks after the mastoidectomy another mastoidectomy was performed on the same side. Temperature became normal but drowsiness increased, accompanied by headache.

When first seen by the author the boy was lethargic but cooperative, complaining of frontal headache. The neck was not rigid. There was no papilledema, although the optic disks were rosy. Coarse nystagmus on looking to the left, with the slow component to the right. Transient right facial weakness, especially noted on smiling. Ataxia on the right in the finger-to-nose and finger-to-finger tests. Atonia of the right arm. No abnormality noted in the deep and superficial reflexes. W.B.C., 14,500; polymorphonuclears, 95 per cent. At operation, cannula encountered resistance as of tentorium at a depth of 3 cm. Cannula reinserted slightly downward and toward mastoid tip, striking no resistance but obtaining pus at a depth of 4 cm. Ten cc. of thick greenish-yellow pus allowed to extrude itself. On inserting the instrument 1 cm. farther, a resistance was felt as of the bottom of the abscess cavity. When no more pus escaped, the cannula was withdrawn. Culture: *Streptococcus haemolyticus.*

There was immediate improvement in the headache, but the boy continued to be drowsy. After three weeks the wound was opened and about 5 cc. of pus found outside the dura. Following this the patient made a progressive and uneventful recovery. Three years after operation neurologic examination was entirely normal, the boy was getting good grades in school, was active in athletics and had no complaints of any kind.

Case 6.—Gloria D., age six, was admitted to hospital with pain and swelling behind right ear after complaining for two months of recurring earache on right side. Right mastoidectomy revealed considerable pus. Culture: *Streptococcus haemolyticus.* Convalescence was uneventful, but a month later the child was readmitted to hospital after ten days of headaches and fever. Child was listless, uncooperative, and weakness of right arm was noted. Papilledema, 6 diopters. Secondary mastoidectomy with needling of right temporal lobe did not reveal pus. Sulfanilamide was given but discontinued because of increasing stupor.

When first seen by the author the girl was semiconscious but cooperated enough to raise her arms. The right arm was ataxic and could not be supported voluntarily because of atonia. The grip was fair in both hands. Moderate neck rigidity. Diminished knee jerks. Marked choking of disks. W.B.C., 12,500. Temperature, 98.6° F. Pulse, 65. At operation, definite resistance was found at a depth of 2 cm. On pushing the cannula through this resistant tissue, yellow pus was encountered and one ounce drained. When no more pus would flow, the cannula was withdrawn. The tension on the dura was markedly decreased following this procedure. On discharge two weeks after operation, there was no evidence of atonia or ataxia, although a decreasing papilledema was still present. When last seen, two years after operation, the neurologic examination was entirely negative. The child was doing well at her studies and was said to be an excellent tap dancer.

Case 7.—Mary R., age seven, was admitted to hospital after six days of pain and discharge from right ear. Temperature, 101.5° F. During mastoidectomy 11 days later, pus under pressure was found. Culture: *Streptococcus haemolyticus.* Temperature dropped to normal following operation but child became drowsy and vomited.

Patient was first seen by the author ten days after mastoidectomy. Right arm was ataxic. Photophobia was noted but optic disks appeared normal. At operation, abscess cavity was entered at depth of 3 cm. and 10 cc. of thin pus escaped. Aspiration with a 20 cc. syringe produced 5 cc. of thick, slimy pus before needle clogged and was withdrawn. Culture: *Streptococcus haemolyticus.* Patient improved but remained irritable, vomited occasionally and showed ataxia of right arm and nystagmus. Fundi remained normal and mastoid wound healed completely.

Three months later child was again admitted to hospital because of increasing head-

ache, vomiting and atonia of right arm and leg. Examination showed bilateral choked disks of 3 to 4 diopters, right rectus palsy. The child appeared to be myxedematous. Extreme ataxia and atonia in the right arm and leg. During secondary operation very marked resistance was encountered at a depth of 5 cm. with the cannula directed toward the left pupil. This was at first thought to be tentorium, but on pushing the instrument further a cavity was entered and two ounces of thick greenish-yellow pus escaped. When dropping of the pus through the cannula slowed up, aspiration with a syringe was attempted, but without obtaining more pus. Culture: *Streptococcus haemolyticus.*

This child was discharged six days after operation. The irritability disappearcd immediately. One month after operation the myxedematous appearance had disappeared, the optic disks were flat and only a trace of ataxia and internal strabismus remained. A year later no neurologic abnormalities could be noted and the child was getting along well in school.

Case 8.—Sally L., age five, was admitted to hospital with left-side earache, vomiting and temperature of 100° F. History of bilateral headaches for over three years. The ear had been opened the day before admission and sulfanilamide was given for four days after admission. Roentgenograms showed second degree left mastoid involvement and complete left mastoidectomy was performed ten days after admission. Culture: *Streptococcus haemolyticus.* Temperature continued to range from 99° to 102° F., and the girl became increasingly irritable and irrational. She was drowsy but presented no abnormal neurologic signs except neck rigidity. Spinal fluid examination showed no increase in pressure; 285 polymorphonuclears; Pandy, four plus. Spinal fluid culture, staphylococcus, atypical. Sulfanilamide was again administered and several transfusions given. Although the temperature became normal, the child grew increasingly drowsy with generalized twitchings, suggesting a tuberculous meningitis to one observer.

When first seen by the author, three weeks after mastoidectomy, she was drowsy and irritable. Early papilledema was noted and the neck was rigid. There was marked ataxia and atonia of the left arm and leg when raised by examiner, the child being entirely uncooperative. Because of the irregular pulse, ranging from 42 to 60, and the desperate appearance of the child, operation for suspected cerebellar abscess was performed immediately. On incising the dura a small amount of cerebellar cortex herniated through the small nick. A cannula was inserted and penetrated the resisting abscess wall at a depth of 2 cm. One-half ounce of yellow fluid squirted out and gentle aspiration removed another one-half ounce of thick yellow pus. Culture: *Streptococcus haemolyticus.*

During the procedure the child became more rational and cooperative. Recovery was immediate and the patient was discharged five days after operation. A year later neurologic examination was entirely negative and the parents thought the child normal in every way.

Case 9.—Billy H., age four. Headache, irritability and neck rigidity had been present before a right mastoidectomy. After operation the child became drowsy and developed increasing ataxia of the right arm and leg. There was little elevation of temperature at any time.

Two weeks after mastoidectomy the patient was seen by the author and a cannula was introduced into the right cerebellar lobe allowing 45 cc. of pus, under marked pressure, to escape. Culture: *Streptococcus haemolyticus.* Recovery was uneventful and neurologic examination seven months after operation was entirely normal (Fig. 2).

Discussion.—In all the cases the principal diagnostic and localizing signs were atonia and ataxia of the arm on the same side as the abscess. These signs could be observed, whether the child was cooperative, irritable or stuporous, if the arms were lifted from the bed and allowed to fall away. In addition, various symptoms of cerebral anoxia from increased intracranial pressure were found: character change, headache, irritability, vomiting, papil-

ledema and stupor. Occasionally, differential diagnosis was difficult between a brain abscess in the cerebellar lobe on the side of the atonic and ataxic extremity and in the temporal lobe on the opposite side. With the cerebellar abscess the grip in the ataxic extremity is little different from that in the other hand. With the temporal abscess, the arm is usually paretic and the grip is weaker in the hand on the side opposite the abscess.

In waiting for a cerebellar abscess to wall off, there is a perilous balance between brain infection, on the one hand, and increased intracranial pressure, on the other. Chance, as well as judgment, may play a great part in the successful outcome of any case. The value of surgery is principally in the mechanical relief of pressure, giving the brain a better chance of conquering and surviving its infection.

After the upper attachment of the suboccipital muscles is spread with a self-retaining mastoid retractor, the trephine opening is ordinarily made about one-half inch below the transverse sinus. Care must be taken that the opening is not over or above the sinus. After nicking the dura, the cannula is gently forced into the cerebellum and directed slightly toward the mastoid tip. In only one case was the abscess found to be more centrally located. The cannula should be inserted and withdrawn very slowly to allow thick pus to escape. Pressure from within is usually sufficient to empty an abscess completely because, when the pus stops dripping through the cannula, aspiration with a 20 cc. syringe seldom obtains more pus. Still, it is well to use the syringe to make sure the cannula has not been plugged with fibrinous material. No irrigation of the abscess cavity is employed.

Any anoxic insult which might be added incident to treatment must be avoided. Operation should be performed under local anesthesia and narcotic or hypnotic drugs are contraindicated. In all of the cases outlined chemotherapy was discontinued as soon as the cerebritic stage was passed and before any surgical intervention was attempted.

Previous attempts had been made in two of the cases to needle a suspected temporal abscess through an infected mastoid wound. Such a practice proves the considerable immunity of the brain to infection, but is not a desirable neurosurgical procedure. Spinal puncture should not be made if a cerebellar abscess is suspected, for this procedure increases the danger of medullary herniation.

The only child in the series which died after operation was fighting not only an active staphylococcic meningitis, but also the untoward effects of a spinal tap, which made immediate operation imperative and prevented proper walling-off of the abscess. The other child, who died of pneumococcic meningitis after five years of good health following the drainage of a streptococcic abscess, is just another illustration of the variable immunity of the central nervous system to different types of organisms.

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