OTITIC BRAIN ABSCESS.[1]

By Edward Bradford Dench, M.D.,
PROFESSOR OF OTOLOGY IN THE UNIVERSITY AND BELLEVUE HOSPITAL MEDICAL COLLEGE, NEW YORK; AURAL SURGEON TO THE NEW YORK EYE AND EAR INFIRMARY; CONSULTING OTOLOGIST TO ST. LUKE'S HOSPITAL AND THE NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL, NEW YORK.

The study of cases of intracranial suppuratioa complicating otitis media is always interesting. It has been my pleasure to bring before the society at various times cases of this character. In presenting 2 cases at this meeting, I have taken the liberty of appending an analysis of 102 cases of cerebellar aad 100 cases of cerebral abscess, with special reference to the symptomatology, the route of infection, the presence or absence of optic aeuritis, and the valuc of various methods of operative procedure. Unfortunately my own 2 cases terminated fatally. One was a case of cerebellar abscess aad the other a case of abscess ia the iaferior frontal convolution.

Cereaellar Anscess. The case of cerebellar abscess occurred in a young boy, thirteen years of age, who entered the hospital suffering from what seemed to be an acute exacerbation of a chronic suppuration iavolving the right ear. The patieat had severe pain, some œdema over the mastoid, extending down into the neck, a discharge from the ear, and somc headache. A radical operation was done upon the right ear, and an epidural abscess over the sinus was found. No grafting was employed. The patieat did well for two days, when he was found to have a polymorphonuclear leukocytc count of over 84 per cent. and a leukocytosis of 33,600. There was also some elevation of temperature, and on dressing the wound a suppurating siaus was found extending down the aeck. This was drained by a counter-opening and the patieat seemed to progress satisfactorily for a day or two, when his temperature again rose to about 104°, and he became lethargic, stupid, and complained of somc headache. An examination showed no muscular paralysis, and thc optic disks aormal. Owing to the fact that there was ao evidence of suppuration within the cerebrum, and because there had been an epidural abscess about the sinus at the time of the primary operation, it seemed to me that the most probable site of suppuration was an abscess of the cerebellum. The patient was again placed upon the operating table, and an incision made in the cerebellar dura in froat of the lateral sinus. Considerable turbid serum was evacuated, and a probe could be passed into aa abscess cavity in the cerebellum. The cerebellum was thea explored behind thc sinus, the dura incised, and a director inserted into the posterior

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opening could be made to touch a probe passed into the opening in front of the sinus. Gauze packing was introduced into both openings, and the patient returned to bed. He died within twenty-four hours after the operation.

In this case there had been absolntely no evidence of intracranial suppuration until the patient's temperature rose suddenly and he became dull and stupid. Without question, the cerebellar abscess had existed for some time. Had symptoms been present at the time of the radical operation undoubtedly he might have been relieved by operation.

As we can only learn the symptomatology of a given disease from the study of the histories of a large number of cases, I thought that it might not be out of place to analyze 102 cases of cerebellar abscess with special reference to the symptomatology. These cases have been collected for me by my assistant, Dr. Charles E. Perkins, to whom I wish to express my sincere thanks.

Route of Infection. In a study of these cases the first point to be noticed is the method of infection. The route of infection was through the petrous portion of the temporal bone in 30 cases, through the lateral sinus in 30, in 4 the infection seemed to travel through the mastoid, in 3 the cerebellar abscess was secondary to a cerebral abscess, while in the remaining cases the route of infection could not be made out. It would seem, therefore, from these statistics, that cerebellar abscess occurs with about equal frequency as the result of infection of the lateral sinus and of infection of the petrous portion of the temporal bone, that is, through the internal auditory meatus, or through the aquæductus cochleæ and aquæductus vestibuli. The cases secondary to an abscess of the cerebrum are, naturally, exceedingly rare.

Symptoms. When we come to the consideration of the general symptoms, it is interesting to note that the most prominent and constant symptom is headache. This occurred in 71 of the cases, and was seldom localized; it was simply complained of as a general headache, and was not referred to any particular region of the skull.

Another prominent symptom of cerebellar abscess is vomiting, which occurred in 54 cases, in which a record is made of the presence or absence of this symptom. In 1 case the notes state that there was "no vomiting." In 1 of the cases which came under my own observation vomiting was present, although it was not very severe, and occurred rather early; in 3 other cases it was not noted.

Vertigo was present in 30 of the 102 cases. In 5 of these the patients had a tendency to fall to the side opposite the lesion. This was present in the case which I reported last year. In the case which I have just reported the patient could not walk at the time when the cerebellar symptoms first appeared, and consequently the character of the vertigo is not noted.

Nystagmus was noted in 17 of the cases. This symptom would therefore, seem to be a rather uncommon complication of cerebellar abscess.

The pulse was slow in 40 of the cases in which any record of the pulse is given. The slow pulse would naturally be an indication of an intracranial complication, and the pulse rate could not be taken as a differential sign in locating the abscess in the cerebellum or in the cerebrum. In 26 of the cerebellar cases the temperature was subnormal, while in 5 the temperature was high.

Retraction of the muscles of the neck was noted in 12 cases.

Stupor occurred in 44 of the cases. This stupor varied from a mental lethargy to a state of hebetude, and, in marked cases, to coma. This symptom is ordinarily present, to some degree, in all cases of intracranial suppuration, the degree of the stupor usually depending upon the degree of intracranial pressure.

The condition of the muscular reflexes was noted in 10 cases only. In 6 the knee-jerk was increased on the affected side, and in 1 case there was slight increase on the opposite side. In 3 cases the knee-jerk was absent. In the other cases the condition of this reflex is not noted.

Regarding the condition of the pupils, in 9 cases the pupils were noted as "unequal." In 5 the pupil on the affected side was dilated, and in but 1 case was the opposite pupil dilated.

Strabismus was noted in 9 cases. In 1 case the eyes were turned to the opposite side, in 7 the character of the strabismus was not noted, and in 1 case it is marked as "internal" strabismus. As the sixth nerve is the nerve usually affected in these cases, strabismus, when present, is usually internal.

Respiratory symptoms were noted in 9 cases. In 3 respiration is noted as "Cheyne-Stokes," while in 6 respiration ceased at the time of operation, and it was necessary to complete the operation under artificial respiration.

Regarding the condition of the fundus oculi, out of the series of 102 cases optic neuritis was present in 34 cases, absent in 37 cases, and in 31 cases the condition of the optic papillæ is not stated.

The analysis of these symptoms, while perhaps not of great value, will, I think, serve to establish more clearly in our minds the characteristics of cerebellar abscess.

Mortality. Regarding the mortality of cerebellar abscess, out of the 102 cases death occurred in 69, while 33 patients recovered.

Operative Treatment. The method of operation practised in these cases was as follows: Out of the 102 cases collated, in 45 the abscess was opened behind the lateral sinus; 25 of these resulted in cure, and 20 in death. In 11 cases the abscess was opened in front of the lateral sinus; in 4 of these cure ensued, and in 7 death occurred. In 46 cases the method of operation was not stated; in 4 of these cases cure ensued, and in 42 death resulted.

The method of operation in any of these cases must depend upon the probable route of infection. I say "probable," because in many cases the avenue of infection can only be surmised. I think we can lay it down as a fairly good rule, however, that, unless at the time of operation the surgeon can trace the route of infection from the lateral sinus, an exploratoy opening in the cerebellum should be made anterior to the sinus, in view of the fact that if evidences of infection hy way of the sinus are absent the most probahle channel of infection has heen either through the internal auditory meatus or through either the aquæductus vestibuli or the aquæductus cochleæ. In either of these latter events the abscess could be more easily evacuated hy incising the cerebellar dura in front of the lateral sinus. In some cases the lateral sinus is located sufficiently far backward to permit of a free incision in the cerebellar dura in front of it. In other cases, in which the sinus lies far forward, it is almost impossible to make an incision of any length through the cerebellar dura in front of this vessel, and the posterior route must be chosen. In a numher of cases—as in the case reported herewith—it may seem wise, after evacuating the abscess by the anterior route, to make a counteropening through healthy cerebellum behind the sinus, in order to secure perfect drainage.

Cerebral Abscess. I have also to report a casc of cerebral abscess which occurred in my practice two years ago. The patient was a woman, aged forty-seven, who gave a history of an acute inflammation of the left ear ten years previously. There had been no aural symptoms during this interval until about two weeks before I saw her, when she had an attack of the grip, accompanied by pain in the left ear. The left ear had been discharging about ten days prior to the time I was called to see her. Upon my examination, the left drum membrane was found to be bulging and red. There was a small perforation in the upper portion of the drum membrane, affording insufficient drainage. There was no evidence of any previous middle-ear suppuration, as far as I could determine from my examination of the ear. At the time of my first examination the left mastoid was excessively tender. A free myringotomy was performed. A smear of the discharge showed the Friedländer bacillus. As the mastoid tenderness did not disappear in spite of incision of the drum membrane, a complete mastoid operation was done forty-eight hours after I first saw the patient. The mastoid cells were found to be extensively involved and the lateral sinus covered with granulation tissue. The sinus wall was extremely thin, and just below where it was covered with granulations the sinus was accidentally wounded in removing the overlying bone. The hemorrhage was easily controlled and the mastoid wound dressed in the ordinary manner. The patient did perfectly well for six weeks, at which time the mastoid wound had almost entirely healed. During this period the temperature had been practically normal, and

aside from the fact that she did not gain flesh after the operation, there were absolutely no unusual symptoms marking her convalescence. One month after the operation, following a dressing, the temperature rose to 100°. The following day she suddealy became aphasic and the temperature rose to 102.5°. The patient was seen by several eminent physicians—one a prominent neurologist—and all agreed that the symptoms were due to thrombosis of a branch of the middle cerebral artery supplying Broca's convolution and the island of Reil. Ophthalmoscopic examination was negative. An examination of the blood showed 84 per cent. of polymorphonuclear cells, with a leukocytosis of 11,400. The temperature ranged between normal and 102° for one week, then dropped to 100°, and, although the aphasia did not improve, the general condition of the patient seemed to be better. Owing to the high polymorphonuclear count, I was inclined to believe that the patient was suffering from a cerebral abscess, and a prominent surgeon was called in consultation. He rather shared my opinion, but did not consider the symptoms positive enough to warrant exploratory operation. Blood counts, at frequent intervals, showed a leukocytosis varying from 11,000 to 17,000 and a polymorphonuclear count ranging from 79 per cent. to 85 per cent. After several consultations it was decided not to operate, and, consequently, no operation was performed until the day before death. Two days before her death the patient had a severe chill, complained of headache, and the temperature rose to 101°, but fell the next morning to normal. The day before operation the temperature was normal, but the patient complained of considerable headache. She, however, was perfectly rational. On the evening of this day the temperature began to rise, the patient complained of severe headache, and on the morning before death she had a temperature of 104°. I operated immediately, and found an abscess in the inferior frontal convolution and the island of Reil. Symptoms of meningitis were present when the patient was put upon the table, and I regarded the condition as absolutely hopeless when the operation was performed. An examination of the abscess cavity showed this to be very large, and involving the frontal lobe. The abscess was so large that it could not possibly have developed during the time that the patient was under my care. I am, therefore, inclined to believe that she was suffering from a latent brain abscess, which became re-infected at the time of her acute otitis. Had the operation been performed earlier in this case, I think the chances for recovery might have been good.

The symptomatology of cerebral abscess is far from clear. Through the efforts of my assistant, Dr. Chas. E. Perkins, I have been able to analyze 100 cases of cerebral abscess, with special reference to symptomatology. Some of my own cases are included in this list, but the report embodies chiefly the work of other observers,

as most of my own cases have been reported from time to time, and have been intentionally omitted from this list.

Out of these cases, the suppuration was on the right side in 41 cases, on the left side in 42; both ears were involved in 1 case, and in the other cases the side is not reported; 20 followed an acute middle-ear suppuration and 77 followed a chronic middle-ear suppuration. In the remaining 3 cases the duration of the suppuration is not reported.

The *route of infection* in these cases was as follows: Through the tegmen tympani in 40; secondary to epidural abscess in 6; secondary to sinus thrombosis in 6; through the mastoid antrum in 6; secondary to infection through the squama in 2, while in 9 no bone defect was found; 1 case was secondary to a cerebellar abscess (Case 48).

Symptoms. Regarding the symptoms, 77 complained of headache and in 44 vomiting was a prominent symptom. The pulse was slow in 37 cases and rapid in 1. Vertigo was present in 32 cases—a rather unusual symptom for a cerebral abscess. The temperature was high in 7 cases and either normal or subnormal in 20. Coma and stupor were noted in 31 cases. Mental dulness was noted in 20 cases and aphasia in 10 cases. Optic neuritis was present in 32 cases, absent in 20 cases, and in the remainder the condition of the optic disk is not mentioned. Nystagmus was present in 4 cases. Pupillary symptoms were present in 17 cases. General convulsions were present in 5 cases. Paralytic or paretic symptoms were present in 17 cases. In 15 cases the motor disturbance was on the side opposite the brain abscess; in 2 it was on the same side as the abscess. The degree of motor disturbance varied, from slight impairment of motion to hemiplegia. I have seen hemiplegia occur in one or two of my own cases, and it has also been noted in the reports of one or two other cases embodied in this article. In my own case, and in one of the others reported, the hemiplegia only came on after operative interference. Therefore, it might quite as well have been due to a traumatism inflicted at the time of the operation as to the original abscess. In one case, however, namely, that reported by Hansberg,[2] there was complete hemiplegia of the opposite side.

The reflexes were abolished in 1 case and exaggerated in 7.

Operative Treatment. The results of operation show 52 cases resulting in cure and 48 fatal cases.

It is interesting to note the method of operation in these cases. In 41 the abscess was opened through the tegmen, and of these 27 resulted in cure, and 14 in death; 37 cases were opened through the squama, and of these 18 resulted in cure, and 19 in death. In 22 cases the method of operation is not mentioned, and of these 7 resulted in cure, and 15 in death.

[2] Zeitschrift f. Ohrenheilkunde, 1903, p. 354.

These reports are fairly accurate, although in some cases in which the operator opened first through the tegmen and then, later, extended the operative opening to the squama, the case has been reported sometimes as "squama" and sometimes as cases opened through the "tegmen."

It would seem from this series of cases that the best results are obtained when the abscess can be drained through the tegmen. This undoubtedly depends upon the fact that when the abscess has been drained through the tegmen tympani the operator has been able to open the abscess along the avenue of infection. When this can be done—as has been pointed out by Macewen and Ballance—there is very little danger of secondary meningitis, and very little danger of hernia cerebri, because, as the result of the infectious process, the meninges become soldered together and the subdural space obliterated over a given area. If the incision through the dura and into the brain substance is made through the membranes which have thus become adherent, there is very little chance of secondary meningitis following. If, however, the abscess is opened through the healthy dura, there is great danger of secondary meningitis, which, in the majority of cases, proves fatal. In 3 of my own cases, not included in this series—in which recovery ensued as the result of operation—in 1 case only was the abscess drained primarily through the squama. In 2 other successful cases the combined method was used—that is, the tegmen tympani was removed and the opening enlarged upward and outward into the squama, thus securing more room. In 1 of these cases drainage was made directly along the course of the path of infection, and recovery followed. This patient was seen several years later, and was perfectly well. In a second patient operated upon by one of my assistants during my absence the same plan was followed, and although the dura did not seem to be diseased, the rapidity with which the patient recovered would seem to indicate that the subdural space must have been obliterated as the result of a previous inflammatory process. In 1 patient operated upon by myself, and who made a perfect recovery, drainage was instituted through the squama, and in this instance the membranes appeared perfectly healthy. There was quite a large hernia cerebri in this case, but it was finally overcome, and the patient made a complete recovery.

These statistics would go to show, therefore, that in cases of brain abscess the operator should first search carefully for the path of infection through the tegmen tympani and tegmen antri, and if such a path is found the diseased bone should be removed. If more space is needed the opening may be enlarged upward and outward through the squamous plate of the temporal bone. In incising the dura this incision should be made through the diseased dura, if possible, as here the membranes will have become adherent. In the absence of any evidence of caries or necrosis of the tegmen tympani or

tegmen ant i, the bone should first be removed here and the dura exposed, as we may find diseased dura underlying apparently healthy bone. Our statistics also show that, in the majority of cases of temporosphenoidal abscess of otitic origin, the infection takes place in one or the other of these regions. The exploration should, therefore, begin here in every case. Such an exploratory opening, if more room is needed, may be enlarged upward and outward through the squamous plate of the temporal. Unless the symptoms are very urgent, I should be inclined, in future cases, in which the dura appears perfectly healthy, to adopt the suggestion of Mr. Ballance, and, after exposing the dura over a proper area, to incise this and pack the margins of the wound firmly with iodoform gauze, deferring an exploratory incision of the brain substance for from twelve to twenty-four hours. This procedure would serve to relieve the tension, while, at the same time, it would cause an amalgamation of the various layers of the membranes of the brain, thus obliterating the subdural space. Such a soldering together of the membranes would occur in the course of twelve to twenty-four hours. The brain substance could then probably be explored with comparative safety, and the abscess evacuated without much danger of secondary meningitis. When the condition admits of delay, I believe that this plan of procedure will be the proper one to follow.

The various methods of securing drainage in a brain abscess have been discussed so many times that it is quite unnecessary to review them here.

In appending the following bibliography of cerebellar and cerebral abscess, I wish to acknowledge my indebtedness to my assistant, Dr. Charles E. Perkins, who has so carefully collated these cases for me. His painstaking tabulation of symptoms has made the above review of this number of cases possible.

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