stronger solution than they can be used as lotions, hastens the removal of the thickening of the tissues. Frequently the employment of one substance in strong solution, whilst using another as a vaginal lotion, is more beneficial than the employment of either of these substances alone.

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**ON DISEASE OF THE INTERNAL EAR;
EXTENDING THROUGH THE MEDIUM OF THE AUDITORY NERVE, TO
THE MEDULLA OBLONGATA AND BASE OF THE BRAIN.**

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It has been shewn by numerous observers, that diseases of the ear are not unfrequently the source of mischief to the brain or its membranes. In a paper published in the thirty-fourth volume of the *Medico-Chirurgical Transactions*, I have attempted to show that there are three ways whereby disease is propagated from the ear to the brain, namely,—

1. From the external meatus and mastoid cells to the lateral sinus and cerebellum.
2. From the tympanic cavity to the cerebrum.
3. From the labyrinth to the medulla oblongata and base of the brain.

In the present communication, I purpose treating of the third class of cases only.

It is very rare to find disease originating in the labyrinth, it being generally communicated to that cavity from the tympanum. One of the most common affections of the ear is catarrhal inflammation of the mucous membrane lining the tympanum, a disease which has hitherto been included under the term otorrhœa; this affection of the tympanum does not, however, frequently terminate in ulceration, and therefore it is a case of comparative rarity to find the attachments of the stapes to the fenestra ovalis destroyed, and this bone entirely disconnected or discharged from the ear. That the latter result does, however, sometimes occur, is shown by the discharge of the ossicle during life, and by the existence of some of the cases to which I am about to draw attention. The stapes being once removed, there is a communication between the tympanic cavity and that of the vestibule, and the disease of the tympanum is liable to extend inwards. When this is the case, the membranous labyrinth is destroyed by suppuration, and the auditory nerve becomes involved in the disease. Sometimes the substance of the nerve is wholly destroyed along its whole length, at others it is simply inflamed and thickened; but whichever of these changes occurs, the disease from the labyrinth is prolonged to the base

of the brain, where the most serious lesions ensue. Thus in some cases pus is effused between the arachnoid and pia mater, over the whole surface of the base of the brain, surrounding the nerves in their cranial course; the substance of the pons Varolii or medulla oblongata may be destroyed by suppuration; or an abscess may form between the arachnoid and pia mater. In some cases, the disease extends a considerable distance down the medulla spinalis.

The fenestra ovalis being left open by the removal of the stapes is not, however, the only medium whereby disease from the tympanum extends to the labyrinth. If the inner wall of the tympanum be examined, it will be found that the outer arm of the horizontal semicircular canal frequently projects into the cavity of the tympanum, where it forms a slight protuberance, which is covered by mucous membrane. In cases of ulceration of the tympanic mucous membrane, this small portion of bone is sometimes implicated. In one of the following cases, a carious orifice was found in it, which, although not larger than the size of the head of a small pin, was sufficient to allow the disease to extend to the labyrinth, and thence to the auditory nerve and base of the brain.

In the paper before alluded to, I have shown that the formidable symptoms in cases of disease of the brain, originating in the ear, generally terminate in death with great rapidity. In the four cases which follow, the only symptom previous to the appearance of those with which life terminated, was the presence of a discharge from the ear. I feel that it is impossible to lay too much stress upon the importance of paying serious attention to all cases in which there exists a discharge from the ear. I have already pointed out the several diseases of which this discharge is symptomatic;¹ and there is scarcely one of them that is not liable to terminate in disease of the bone, and ultimately of the brain, if allowed to proceed unchecked by remedial measures.

CASE I. Disease in the Tympanic Cavity extending through a Carious Orifice in one of the Semicircular Canals to the Labyrinth, and thence by the Auditory and Facial Nerves to the Base of the Brain.

On March the 28th of the present year, I was called in by Mr. Such, of Dalby Terrace, City Road, at the request of Mr. Coulson, who had also seen the patient, to see a German gentleman, aged 26, the history of whose case I found to be as follows. He was of a strong and robust constitution, and had generally enjoyed the best health; indeed, even when I saw him, he had the appearance of a stout healthy man. Between four and five years previously, he complained of occasional pain in the right ear, usually followed by discharge, which discharge by degrees became constant. Three weeks before I saw him, he suffered from a severe attack of pain in the head, which disappeared upon the occurrence of an increased quantity of discharge. Nothing particular occurred until ten days previous to my visit, except a sleepless state at night, when he was suddenly seized with a violent pain in the head, which was not diminished by any of the remedial measures that were resorted to; and this pain by degrees extended to the back of the neck, and as low even as the sixth dorsal vertebra.

¹ On the Nature and Treatment of those Diseases of the Ear which have hitherto been designated Otorrhœa and Otitis. Transactions of the Provincial Medical and Surgical Association, vol. xviii, 1851.

About the same time, there was paralysis of the right facial nerve. For several days, there had been a considerable shivering fit about two o'clock P.M. On the evening of the 28th, at which time I saw him, he was suffering from great pain at the back of the neck; he was very restless, especially at times, but he talked quite sensibly; the right facial nerve was paralysed; he squinted; the pulse was 85. The external meatus was nearly filled by a polypus; the discharge was very fetid, and abundant. A large blister was ordered to the nape of the neck; the ear to be frequently syringed with hot water; and, as he was very sensitive to the action of mercury, a quarter of a grain of grey powder, with three grains of extract of henbane, were administered every two hours.

March 29th, 9 P.M. The mercury has already caused great tenderness of the gums. The symptoms have materially increased; the pain at the back of the head this morning was very great; the squinting continues, and he sees double. At three o'clock to-day he became insensible; he can, however, be roused by a loud voice, when he speaks rationally for a minute or two; he then relapses into a state of incoherency. Pulse the same as yesterday; respiration oppressed and slow; face and head congested and blue; discharge from the ear abundant and fetid. Leeches ordered to be applied below the ear.

March 30th. Slight relief followed the application of the leeches, but he soon became rapidly worse. The right side of the body was paralysed, the breathing became stertorous, the face livid; he gradually became insensible, and died at 8 P.M.

AUTOPSY, twelve hours after death. The cerebrum was healthy, excepting that there was a considerable quantity of chocolate-coloured fluid in the lateral ventricles. The cerebellum was also healthy. The arachnoid surface of the dura mater, covering the superior and mastoid parts of the petrous bone, was in a healthy state; but, upon removing it from the surface of the bone, it was, over two small portions of both parts, softer than natural, and these portions covered orifices in the diseased bone. It was, however, quite manifest that the disease had not extended from these parts of the ear to the cerebrum or cerebellum. Upon removing the brain, there was evidence of the existence of very extensive disease at its base. Purulent matter was deposited between the arachnoid and pia mater, from the roots of the olfactory bulbs anteriorly, to the medulla oblongata posteriorly. In some parts, this pus was of a dark colour, and in others, as over the pons Varolii, the arachnoid membrane was ulcerated. The seat of the principal disease was the right side of the pons Varolii, the substance of which was ulcerated to the depth of a line to a line and a half, over a surface as large as a sixpence. All the nerves were surrounded by pus, and the substance of the facial and auditory nerves of the right side was so soft as to be scarcely distinguished from purulent matter. Upon examining the petrous bone, the dura mater around the meatus auditorius internus was observed to be softened, and detached from the bone, which was quite denuded. The portions of the auditory and facial nerves in the meatus internus were in a state of suppuration. The whole of the petrous bone was removed for careful dissection, so as to afford facilities for tracing the disease from the ear to the brain. The external meatus contained two polypi, one of which, as large as a small pea, was at-

tached by a broad base to the posterior wall of the meatus, about its middle; a smaller one, about the size of a grape-seed, was also attached to the posterior wall of the meatus, nearer to the membrana tympani. Upon separating the membranous meatus from the bone, an orifice between two and three lines in diameter was observed in the latter, so that a communication existed between it and the mastoid cells. There was, however, no orifice in the membrane; so that the discharge from the ear did not come from the mastoid cells, but, as will be seen, from the meatus only. The membrana tympani was perfect; but it was quite white, and much thicker than natural. The cavity of the tympanum contained a considerable quantity of fetid pus; its lining fibromucous membrane was destroyed by ulceration at several points. In this cavity there were also two portions of carious bone, one of which projected towards the cavity of the cerebrum, and was in contact with the outer surface of the dura mater; the other looked towards the cavity of the cerebellum, and was also in contact with the dura mater; the latter membrane being at both points, as stated above, thick and soft. The ossicles were present, and the stapes adhered with its usual degree of firmness to the margin of the fenestra ovalis. Upon laying open the cavity of the vestibule, it was found to be full of dark-coloured pus, having a fetid odour; the semicircular canals were also full of matter, having similar characters; and the walls of the superior canal were carious at two or three points. This purulent matter extended through the posterior wall to the meatus auditorius internus. The point now to be decided was, how the disease from the tympanum had extended to the labyrinth. In the other three instances of this disease which I had heard of, the stapes had been removed by ulceration, and the fenestra ovalis had been the medium of communication between the cavities. In the present case, however, the only aperture whereby the disease in the tympanum could have extended to the labyrinth, was a small carious orifice, not larger than a small pin's head, which existed between the posterior part of the tympanic cavity and the outer crus of the horizontal semicircular canal; this part of the canal forming, as is well known to anatomists, a slight bulging in the wall of the tympanic cavity.

Throughout these observations, it has been assumed that the disease originated in the tympanic cavity, and extended to the vestibule and meatus. The grounds for my holding this opinion are various. *In the first place*, it is so rare for disease to commence in the vestibule, that I have never met with an instance; had it originated there, it is most probable that it would have ended fatally ere it reached the tympanum. *In the second place*, the tympanic cavity is more frequently the seat of disease than any other part of the ear; and the presence of the portions of necrosed bone which were not detached, indicate long-standing disease. It is certainly possible for the affection to have begun in the external meatus; but in opposition to this opinion is the general result in such cases, namely, that the disease extends to the mastoid cells and cerebellum, and there would also most probably have been a larger amount of disorganisation in the meatus itself.

CASE II. *Ulceration of the Mucous Membrane of the Tympanum, extending by Removal of the Stapes to the Labyrinth, and thence to the Brain, through the medium of the Auditory Nerve.*

For the particulars of the following case, and for the opportunity of making a careful inspection of the diseased parts, I am indebted to my friend Mr. Avery.

James Warner Smith, aged 17, sailor, was admitted into the Charing Cross Hospital on the 14th of January, 1846. The history given was, that at five years of age he had an attack of measles, after which he was troubled by a considerable amount of discharge from the left ear, and from which he was never afterwards entirely free for any length of time; occasionally it was very trifling, and it was not offensive. With this exception he had enjoyed good health. Three months ago, when off the Cape of Good Hope, he was up aloft during a gale, and lost his cap; considerable pain in the left ear followed this accident, the quantity of the discharge increased, and it has not since then disappeared. The pain was not constant, appearing at intervals of a week or two; sometimes a little blood was discharged from it. When he came on shore, what he called a "fresh-water damp" gave him a fresh cold, the pain in the head and ear becoming more violent. Thinking the malady arose from the ear, he consulted Mr. Curtis, who treated the matter lightly, although he then suffered from a considerable amount of pain and fever. He was ordered injections, drops, ointments, etc., but not getting better, he came to the Charing Cross Hospital, and was admitted under Dr. Chowne, on the 14th January. At the time of his admission, he complained of constant pain in the left ear, and the left side of the head as far as the vertex. There was also pain on the right side, but not so violent as on the left. The muscles of the right side of the face were constantly twitching and drawing his features to that side. Some intolerance of light was also observed. From the left ear there was an abundant offensive secretion. There was no tenderness over the left mastoid process.

Jan. 16. Has had a violent paroxysm of pain in the night, but he is better this morning, and the twitching has subsided, excepting in the right eyelid. Calomel and opium were administered. *Jan. 22.* He appears much better, slept well; pain has abated. *Jan. 24.* The pain has returned as violent as ever. *Jan. 27.* Was delirious during the whole of the day. *Jan. 29.* Delirium continues; intense pain in both sides of the head; discharge from the ear abundant; the head drawn backwards. *30th.* The delirium has left him, but he is exceedingly drowsy, and is roused with difficulty. The movements of the limbs and their sensation unaffected; the pupils acted properly. *Feb. 1.* The drowsiness has vanished; has had no delirium, and has passed a good night; still complains of considerable pain in the ear and over the eyes. He remained in much the same state until the 5th, when he gradually sank, without coma or any cerebral symptoms of any marked character. The retraction of his head continued to the last; he was quite sensible before he died.

AUTOPSY, thirty-six hours after death. Upon removing the dura mater, the surface of the arachnoid was observed to be remarkably dry; the vessels of the pia mater were more than usually injected. On the convex surface of the hemispheres there were two or three small yellow patches beneath the arachnoid. The lateral ventricles each contained at least three ounces of clear limpid fluid, and in the posterior corner of the right, and in the inferior one of the left, were

two patches of bright yellow lymph as large as half-a-crown, covered by a thick, creamy, purulent fluid. The third ventricle contained a dark clot of blood, as large as a small walnut, which could be traced into the fourth ventricle, where there was also a small coagulum; the commissura mollis was broken down. Surrounding the lower part of the commissure of the optic nerves, and covering the crura cerebri, pons Varolii, medulla oblongata, and upper part of the medulla spinalis, was a layer of pure yellow lymph and pus, nearly half an inch thick; it embraced the nerves at the base of the brain as far as their passage through their general foramina. The parts in direct contact with this layer were very soft. Under the pia mater, where the right anterior lobe rests on the orbital place of the frontal bone, there was a patch of effused blood, the size of a shilling. The dura mater covering each petrous bone was healthy; the exterior of the bone did not present any appearance of disease. Upon examining the cavity of the ear, the membrana tympani was found to have been destroyed by ulceration; all the ossicles had disappeared. The tympanic cavity was full of the most offensive purulent matter, and its lining membrane was ulcerated. The fenestra ovalis was open, and in the cavity of the vestibule matter was found, having similar characters to that in the tympanum. The whole of the natural membranous labyrinth had been destroyed. The auditory nerve was tumefied, and of a dark livid colour; it had evidently been the medium whereby the disease in the ear had been communicated to the base of the brain.

CASE III. Disease in the Tympanic Cavity extending to the Labyrinth, and thence to the Medulla Oblongata, and Base of the Brain.

The following case occurred in the practice of Mr. Streeter, and was by him laid before the Westminster Medical Society, on the 13th of January 1844.

The patient was a lady, aged 42, who had been deaf in the right ear since the age of seven, but from what cause was not known. Two or three months ago, she became affected with a severe headache, for which a blister behind the affected organ was applied. Nothing serious, however, was thought of the matter until the 17th of December previous, when the pain increased very much in severity, being of a maddening character, and almost producing delirium. The portio dura was paralysed, as was evident on the patient's being requested to put out her tongue. There was a severe pain also down the spine, which was attributed to a fall which she received on getting out of bed. The pulse did not warrant active depletion, but two or three leeches were applied behind the ear, a large poultice was placed over the face, the ear was gently syringed with warm water, and saline medicines were ordered. On the 18th, she had had some sleep in the night, but complained of an almost intolerable pain in her back. The catamenia now appeared, and the cause of the pain remained obscure. She was quite sensible, the pupils acted, but the cornea on the affected side had commenced to ulcerate. The opposite ear had become a little deaf, and there was a slight discharge from the right ear. It was also thought that a ball could be observed in the membrana tympani; calomel and opium were administered. The following day (19th) she had slept better, and remained somewhat improved until five or six o'clock in the evening of the 21st, when she was suddenly seized with coma, in

which state she remained until two the following morning, when she died.

AUTOPSY. On examining the brain, there were found slight sub-arachnoid effusion and vascularity of the surface of the brain. There was also some increase of vascularity in its interior. There was no effusion in the ventricles.

An abscess was found in the tympanum and labyrinth, and there was a counter-abscess, about the size of a large pea, in the condensed arachnoid and pia mater tissues, occupying the fossa where the facial and auditory nerves proceed from the junction of the medulla oblongata with the pons Varolii and cerebellum. There were inflammation and thickening from effusion of pleura of the arachnoid and pia mater, investing the right side of the upper portion of the medulla oblongata and adjoining part of the right lobe of the cerebellum, to about the extent of a square inch, but there was no softening nor apparent lesion of the proper cerebral tissue beneath.

The exact condition of the tympanic cavity and labyrinth is not detailed in the above notes by Mr. Streeter, but there can be no doubt that the disease, most probably ulceration of the mucous membrane, had extended to the vestibule either through the fenestra rotunda or ovalis, or by means of an orifice occurring in the osseous external semicircular canal. The state of the portis dura and portis mollis nerves is not indicated, but judging from the records of other cases of a similar character to the present, these nerves must have been either partially or wholly destroyed, or had undergone some morbid change, and they doubtless were the medium through which the disease had advanced from the ear to the base of the brain.

CASE IV. This case is taken from M. Itard's work.¹ A man, aged 22, complained of toothache, followed by febrile symptoms, five weeks previous to his death. On the twelfth day of the attack, discharge took place from the right ear, and remained until he died.

AUTOPSY. Over the convex surface of the brain, and in its substance, were a number of small purulent deposits; the cerebellum was also similarly affected, but in a less degree. The auditory and facial nerves were in a state of suppuration, and almost wholly destroyed; pus was found in the internal auditory meatus, the vestibule, cochlea, semicircular canals, and tympanic cavity.

¹ *Traité des Maladies de l'Oreille.* 1821. Tome i, p. 254, Obs. 22.