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PART I.

ORIGINAL COMMUNICATIONS.

ART. XII.—*Trephining in Mastoid and Tympanic Disease.* By W. I. WHEELER, F.R.C.S.I., M.D., and Master of Surgery of the University of Dublin; Member of the King and Queen's College of Physicians; Surgeon to the City of Dublin Hospital, and Lecturer on Clinical and Operative Surgery; Consulting Surgeon to the National Institution for the Blind of Ireland; Ex-President of the Royal College of Surgeons, and of the Surgical Section of the Academy of Medicine in Ireland.

EARLY in last year I read before the Surgical Section of the Academy of Medicine in Ireland an epitome of cases which came under my care and were treated by trephining, for mastoid and tympanic disease.

The favourable manner in which this paper was noticed by the *Edinburgh Review* induces me to record the particulars of another more recent case, successfully treated for similar disease; while, at the same time, I will avail myself of the opportunity to enlarge more fully both upon the cases there individualised as well as upon various interesting phases of the same subject taken generally. Otorrhœa, or discharge from the ear, whether from disease of the osseous structures or from other causes, must necessarily be of interest to the practical surgeon, knowing as he does that such affection is fraught with imminent danger, momentarily imperilling existence.

Truly, were we in want of proof of this, further than already exists in the literature of the subject, there are citable cases in this city and its suburbs wherein patients have succumbed from this affection, from want of timely interference on the part of the attendant, either to deal with the disease himself, or from his failing to obtain the assistance of someone competent to do so.

It is, however, to discharges caused by disease of the osseous structures that I intend more particularly to refer. The mastoid process and cells appear to be most frequently the seat of disease; and the commonest causes for this, as well as for disease of the tympanum in childhood are—measles, scarlet fever, smallpox, and scrofula. The mucous membrane at this time is generally affected and much thickened, and in the hitherto undeveloped state of the mastoid process the mucus is retained in the horizontal part, which is bounded by the squamous portion of the temporal bone externally and above by the lamina of the tympanic wall. Hence, when disease occurs in the mastoid cells in early life, the cerebrum is the part of the brain which becomes engaged, the cerebellum in more advanced years. When the mastoid cells are fully developed we find them separated from the cerebellar dura mater and wall of the lateral sinus only by a thin plate of bone, perforated by a number of small veins which open into the interior of the latter; they also approach the posterior wall of the external auditory meatus. This anatomical arrangement has led to the assertion that the most frequent starting-point of disease of the mastoid cells is in the external auditory meatus (*diverticulum premastoidium* of Baritz and Renault), or *sinus mamillaris*. The extent to which the cellular cavities of the mastoid bone extend is extremely variable—in rare cases they extend even beyond the masto-occipital suture. This cellular portion of the occipital bone was found by Hyrtl (three times in 600 skulls) to form an elevation on the under-surface, situated half-way between the mastoid process of the temporal bone and the jugular process of the occipital bone. To this protuberance he has given the name of *processus pneumaticus*, its cavities being filled with air derived from the tympanum. The close proximity of the floor of the tympanum to the subjacent jugular fossa, and the contained sinus of the internal jugular vein, points to the danger of perforating this vessel, which has occurred in disease of the osseous walls of the tympanum similarly with regard to the carotid canal and artery. The thin plate of bone which separates the mastoid cells from the wall of the lateral sinus,

where the latter grooves the mastoid bone, easily allows the implication of the walls of the sinus in mastoid or tympanic disease, and as a consequence thrombosis would probably supervene.

To those forms of purulent discharge from the ear which are combined with encephalic symptoms, Itard gave the name of cerebral otorrhœa. He named two varieties, one in which the pus was formed at first in connexion with the brain or its membranes, and the second in which the cerebral disease was secondary to that of the ear. To these two forms he gave the name of primary and consecutive (cerebral otorrhœa) respectively. He regarded the former as much the more frequent. His views, although supported by Abercrombie, Brodie, Voillemier, and others, have lost ground almost completely.

It will be *à propos* here to consider the different ways in which suppurative inflammation of the dura mater follows carious disease of the osseous structures, petrous portion of the tympanum, cavity of the labyrinth (carious disease of), and the wall of the external auditory meatus, &c. : —

1. Through the internal auditory meatus, in which are prolongations of the membranes.

2. Through the hiatus Fallopii.

3. Through the aqueduct of the vestibule.

4. Through the tegmen tympani, always thin in the normal state, and sometimes deficient over a limited area, so as to place the lining membrane of the tympanum in direct contact with the dura mater.

5. Through the fissura petro-squamosa—the dura mater sometimes sending in a vascular process its entire length into the tympanum and mastoid apophysis, and by means of which the central envelope is placed, with regard to its nutrition, in more intimate relation with the middle ear.

6. Occasionally by means of a slit for the dura mater, situated between the epiotic and opisthotic elements, near the aqueduct of the vestibule.

7. Through the canals of Verga and vascular canals of Maas; the latter are behind the superior semicircular canals, and connect the middle ear with the middle cranial fossa.

Having thus briefly related the majority of the sources through which disease may travel to the brain and its membranes, I will detail the history of the last three cases of carious disease of the mastoid cells under my care, which I trephined :—

CASE I.—D., a man nearly seventy years of age, young, however, for his years, and who stated he was but fifty-six years of age, was admitted into the City of Dublin Hospital under my care in February, 1881, suffering from a purulent discharge from his right ear, which passed through the upper part of the membrana tympani, where Revinus describes a notch closed by a valve, and which was formerly called the hiatus Revinianus. This is, however, denied by most anatomists, and really corresponds to what Shrapnell has correctly designated the membrana flaccida, in contra-distinction to the membrana tensa, which comprises all the rest of the membrane. This lax portion is the most frequent seat of perforation. The patient had pain round the mastoid process, and on tapping it considerable pain, especially at a point corresponding to the posterior root of the zygoma, but inferior to the latter. When the ear was syringed and cleansed further discharge would flow by getting the patient to forcibly blow his nose. The otorrhœa was of comparatively recent duration. He stated he was quite well four months previous to admission, when he had an attack of fever, which, he said, was typhus. On recovering from this the purulent discharge commenced. He had some pain at the back of his ear, but it was never much. Having come to the determination that disease existed in the mastoid cells, I made up my mind to operate, and on the 3rd March, the patient being under the influence of ether, I made an incision from the upper part of the mastoid process in the direction of the posterior root of the zygoma and a little above it, and continued this in a semicircle downwards, close to the pinna, and a little below the external auditory meatus, and dissected all back towards the mastoid process. I then placed the crown of a trephine on a level with the external auditory meatus, and removed the piece of bone shown in the accompanying Plate, Figs. A and D. The disease on its internal surface is evident. The upper portion, it will be perceived, is eaten away. By the removal of this piece of bone the mastoid cells were opened, the tympanum also, and the dura mater exposed. Pus did not flow from the wound for twenty-three hours, when the discharge from the ear lessened, and finally ceased. For two or three days after the operation he had some pain down the right side of his neck, which was relieved by opiate fomentations. In one month from date of operation the wound was closed, and he left the hospital perfectly well. I saw him within the last week. He is in excellent health, following his avocations as a gardener.

CASE II.—M. F., a man, forty-one years of age, was admitted on the 27th day of November, 1882, into the City of Dublin Hospital under my care. He had always been healthy. Some thirteen or fourteen years ago he had a running from his right ear, which stopped suddenly. He thought no more about it, nor did he, at the time, adopt

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MR. WHEELER ON TREPHINING IN MASTOID AND TYMPANIC DISEASE.

A. Internal Surface of Bone, removed from DOOGAN.	D. External Surface of Bone, removed from DOOGAN.
B. Internal Surface of Bone, removed from M. F.	E. External Surface of Bone, removed from M. F.
C. Internal Surface of Bone, removed from HURLEY.	F. External Surface of Bone, removed from HURLEY.

any treatment for it. In the beginning of last November he got a severe cold, and had acute pain in the region of his mastoid process; the entire side of his head became painful; he could not bear to have it touched, and got no sleep for more than eight days. He was told it was erysipelas; and after about a week, during which period he suffered intensely, a purulent discharge came from his ear. He then got some relief. Before his admission, I am informed that during the acute symptoms he was dull, and did not answer questions asked of him, until repeated two or three times—in fact, he lacked response. This patient exhibited all the signs of osseous disease—pain all over and surrounding the mastoid process, otorrhœa, deafness, large perforation of the membrana tympani; added to these the history I have above detailed. Having carefully considered the case, it was evident to me that the line of treatment calculated to relieve him was trephining. And confident of disease existing, and pus being present without sufficient exit, on the 7th of December I made an incision such as I have described, and selected a trephine somewhat smaller than that used in the former case. I placed the lower part of the crown on a level with the external auditory meatus, and thus opened the mastoid cells and the tympanum, and exposed the envelope of the brain—the dura mater; the pus actually welled up. Nothing could have been more satisfactory. The bone shown at Fig. B is a good specimen of carious disease. Two points of suture closed the wound above, the lower edges were kept separate by a small piece of lint, a hot flannel fomentation was placed over the wound, and the side of his head covered with oil-silk. The patient was then removed to bed. Pus continued to flow through the wound; the discharge from the ear lessened. The patient's temperature on the night of the operation was 98.8° ; his pulse was 88 per minute. He stated that he was not suffering pain, and he slept well subsequently to the operation. He left hospital completely recovered, and is now well.

The following are the particulars of the more recent case to which I before alluded:—

CASE III.—T. H., blacksmith, admitted into the City of Dublin Hospital, under my care, on October 17th, 1883. A strong, well-built man, about six feet high, and perhaps thirty-five years of age. He was suffering from deafness and dizziness. There was considerable swelling over the right mastoid process, accompanied by pain and redness; also the part pitted upon the application of pressure. The patient could not give any history of an injury; he had, however, suffered when a boy from scarlatina, which was followed by deafness.

I trephined him on Thursday, the 25th October, when, upon the removal of the piece of bone, matter welled out copiously, apparently

from both the mastoid cells and the tympanum. The wound healed by granulation, and from the time of the operation until the patient left the hospital, his highest temperature did not exceed 99°. He was discharged cured on the 1st December, 1883. A month ago, upon inquiring about him, I was informed that he was in active employment at Knocklong, and in perfect health. The internal and external surfaces of the bone removed are shown in Figs. C and F, in the former of which evident osseous disease is palpable.

Acute inflammation of the mastoid process, which the subject of the second case I have detailed evidently suffered from, is not common in the adult, but is more usually seen in the young. Of 67 cases collected by Mr. Buck, of New York—

13 were 10 years old or younger ;

26 „ 10 to 25 ;

9 „ 25 to 40 ;

12 „ 40 to 55 ;

7 „ 55 to 60.

The youngest was eight months old ; the eldest 62 years.

The idea of perforation of the mastoid cells dates from Vesalius, who was amongst the first to demonstrate the external structures of the mastoid process and the communication of its cells with the tympanic cavity. But it was not explicitly recommended till eighty years later, when Riolan advised its adoption for the evacuation of intra-mastoid collections of pus. The first operation of trephining appears to have been done by T. L. Petit, in the case of caries of the mastoid bone. Jasser next perforated the mastoid process, in 1776, for the cure of deafness. 98 cases of perforation have been collected by Poinot (*Dict. Méd. et Chirurg.*), in 35 of which the trephine or trepan was used ; in the remainder other instruments, gouge, drill, trocar, &c., were employed. Of the total number of cases, 15 terminated fatally ; in 2 the result is not stated ; in 5 there was no recorded result ; 5 others were under treatment at the time at which their cases were reported ; the rest were successful.

Of the 35 cases in which the trephine or trepan was used, 4 terminated fatally, while the result in the other cases has not been reported ; in the total number of cases, the result of which are differently specified, 17 per cent. were fatal, and 21 per cent. successful. Buck has collected 37 cases of suppurative inflammation in which the cases were left to nature (expectant treatment) ; 34 were fatal. It will be readily seen from the foregoing that the

operation of trephining for mastoid disease is a fairly successful one, and, on the other hand, that, from the expectant treatment in suppurative inflammation, there is little to look forward to but a fatal result. That the operation should be practised early is a self-evident fact; it is useless when pyæmia, meningitis, or phlebitis of the sinuses has appeared, although the first cerebral manifestations should not intimidate the surgeon from operating, and I doubt not but that good service will be done towards the patient by his attendant who advises operation even where no bone disease existed, but when the discharge from the tympanum has lasted for *a lengthened period*, and has not yielded to other treatment, such as syringing and enlarging the opening of the membrana tympani if necessary. Setons and issues I believe to be of little use, for although only the mucous membrane may be engaged, yet we know that a blow on the mastoid process, a severe cold, a depressing illness, may cause disease to advance to the bone, pyæmia may ensue, or death by general cerebral irritation, without the formation of abscess. A well-accomplished operation will always give free vent to pus when existing, and prevent it passing to the brain through some of the numerous channels I have recorded, and will thus save the patient. I must deprecate the operation recommended by Dr. Bagroff—namely, the use of the gouge and galvanocautery over the mastoid process; such procedure, as it appears to me, would be likely to set up irritation and inflammation. Unless, indeed, the suppuration is comparatively superficial, or discharging through a fistulous opening, I would not select to operate over the mastoid process; there one cannot remove the entire portion of the bone, on account of the proximity of the lateral sinus, and so cannot expose the dura mater, to do which I hold is very essential.

The site I would always select for operation, with the exceptions as above named, would be such as to place the lower border of the trephine on a level with the external auditory meatus, and anterior to a line dividing vertically the mastoid process. By adopting this course there will be no danger of wounding the lateral sinus, the tympanum and mastoid cells will be opened, giving full exit for discharge, the dura mater will be exposed, and should pus exist between it and the cranium, there will be ample freedom for its escape.