covery takes place, so that treatment by massage, etc., must on no account be relaxed, but kept up for long periods.

PATHOLOGICAL ANATOMY.

In several cases the nerves have been examined after death, and well-marked evidence of neuritis has been found. Thus Korsakoff and Serbski,¹¹ in a case of septic origin, found degenerative neuritis in both sensory and mixed nerves, the changes being most marked at points furthest from the nerve centres; the ulnar, median, phrenic, and vagus nerves were much degenerated, and there was slight degeneration of the abducens. Lindemann,¹² in his case in which vomiting was the apparent cause, found well-marked general polyneuritis. In a case of Mader's,¹³ commencing with persistent vomiting of pregnancy, there was found extensive neuritis of the sciatic, tibial, and peroneal nerves, and pigmentary atrophy of the extensor muscles of the thigh; but by Marchi's method no changes were found in the spinal cord. Finally, in Solowieff's¹⁴ case associated with vomiting in pregnancy, there was neuritis of the phrenic, vagus, peroneal, and median nerves.

REFERENCES.

- ¹ *Peripheral Neuritis*, p. 357. ² *Pittsburg Med. Journ.*, 1880-81, vol. i, p. 41. ³ *Deut. med. Woch.*, 1894, p. 935. ⁴ *Univ. Med. Mag.*, Philadelphia, May, 1893. ⁵ *Rev. de Méd.*, 1887, vii, p. 596. ⁶ *Obstet. Journ. Great Brit.*, 1880, vol. viii, p. 678. ⁷ *Lancet*, 1880, vol. i, p. 54. ⁸ *Charité Annalen*, 1862. ⁹ *Lancet*, 1880, vol. ii, p. 699. ¹⁰ *Ibid.*, Feb. 27th, 1897. ¹¹ *Arch. für Psych.*, Bd. xxiii, Heft 1. ¹² *Centralbl. für allg. Pathol.*, 1892, August 20th. ¹³ *Neurolog. Centralbl.*, 1895, p. 871. ¹⁴ *Centralbl. für Gynäk.*, 1892, p. 492.

A CASE OF MALIGNANT TUMOUR OF THE BRAIN ORIGINATING IN THE MIDDLE EAR:

SYMPTOMS SIMULATING TEMPORO-SPHENOIDAL ABSCESS: OPENING OF MASTOID ANTRUM AND CRANIUM: PARTIAL REMOVAL OF TUMOUR: CESSATION OF RESPIRATION UNDER CHLOROFORM: TRACHEOTOMY: DEATH TWO AND A HALF MONTHS AFTER OPERATION.

BY

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HISTORY OF CASE PREVIOUS TO FINAL OPERATION, BY DR. BARR.

THE patient was a boy 12½ years of age. He was first brought to me on the 29th March, 16 months before his death, owing to severe pain in the right ear. This had existed intermittently for about three months. The pain occurred in such severe paroxysms that, in the words of the father, "the boy shook all over"; it was most intense at night, but might be absent two or three days at a time, returning without any special cause. On the supposition that it was of dental origin a tooth had been extracted without any effect. While the pain was his only spontaneous complaint, I was informed on inquiry that there had been a very slight discharge from the ear for three months. The hearing on that side was so defective that a watch, ordinarily heard 40 inches from the ear, was perceived at a distance of only half an inch; he had also a buzzing sensation in the affected ear. The tissues in the neighbourhood of the ear were quite healthy and the lymphatic glands of the neck were free from swelling.

Although subject to headaches and rather dull at his lessons, the boy had been considered quite healthy up to the occurrence of the pain; he had, however, prior to that, fallen on the ice, against which his head came with violence. It may be mentioned that his father's aunt was said to have died from a cancerous disease.

In the external auditory canal, but not protruding from it, there was a mass resembling a polypus; it differed from an ordinary aural polypus in its being exquisitely painful to the touch of a probe, which also caused more bleeding than usual. I removed the growth by means of a wire snare, under chloroform; its texture seemed to be peculiarly strong and tough, more like a fibrous polypus than the more common mucous variety, and the bleeding which followed was unusually severe. The growth undoubtedly sprang from the bony walls of the

tympanum; the tympanic membrane being almost entirely destroyed. The after-treatment consisted in the occasional application of chromic acid to the thickened tissue forming the root and the use of antiseptics, including diluted spirit. In the course of a few weeks he went back to school, and was soon after rather unfortunate in receiving a blow on the affected ear, which for the time being produced faintness and sickness.

Four months afterwards he was again brought to me with a similar growth, this time protruding from the external orifice of the ear. It was in like manner removed with the snare, cauterised, and treated antiseptically. Shortly after going home on this occasion he was again unfortunate—contracting scarlet fever, which laid him up for two months.

Finally, on 29th April of last year, he returned with a recurrence of the growth, which protruded as before from the external orifice of the ear. A more radical operation was now performed, and the growth was not only removed from the external auditory canal, but opening the mastoid antrum and the other cavities of the middle ear (which were found occupied by these growths) I cleared them out as thoroughly as possible with a gouge. During all those months severe pains in the ear and also in a less degree in the head occurred intermittently, and the sensitiveness of the interior of the ear was so great that nothing could be done without chloroform. The discharge from the ear had also continued.

Soon afterwards graver symptoms manifested themselves; these were persistent vomiting for several days, increased headache, intensified on the right side, followed (in a few days) by subnormal temperature and pulse, great drowsiness and stupor, ocular paralysis, and optic neuritis, clearly pointing, as was thought, to temporo-sphenoidal abscess. The eye symptoms seemed at this time, as observed by Dr. Ernest Thomson, to be very characteristic of abscess in that region. The following is Dr. Thomson's report:—

In the right eye there is complete ptosis. On elevating the drooped lid it is found that the eyeball is rotated outwards and very slightly downwards. The pupil is dilated *ad maximum*, and does not respond at all. The eye moves freely outwards, very slightly downwards, and not at all in any other direction. In the left there is no ptosis. Pupil active both directly and consensually. The eye moves freely in all directions, except outwards, in which direction the movement is very limited. Diplopia is not now admitted, although complained of previously. Ophthalmoscopic examination shows in the right optic neuritis, with swollen papilla, oedema of surrounding retina, and engorged and twisted veins. Left nerve slightly hyperæmic, with a little blurring of the edge, but not prominent to any extent.

Diagnosis of Eye Conditions.—Right optic neuritis of intense character, commencing left optic neuritis, paralysis of all the branches of the right third nerve. Paresis of right fourth nerve. Paresis, almost amounting to paralysis, of left sixth nerve. From the fact that the right pupil is dilated completely there is probably irritation of the sympathetic fibres to the iris.

It will be generally admitted that these symptoms, taken in connection with the existence of a purulent ear disease, pointed to temporo-sphenoidal abscess, and it was decided, after a consultation with Dr. James H. Nicoll, to trephine the skull in the usual situation of temporo-sphenoidal abscess. The operation was performed on May 19th, 1896, by Dr. Nicoll, assisted by myself, Dr. J. G. Connal, and Dr. Fred Adams, Dr. Connal administering the chloroform.

DESCRIPTION BY DR. J. H. NICOLL OF FINAL OPERATION AND OF SUBSEQUENT EVENTS.

On May 19th I saw the case with Dr. Barr, and we agreed in the opinion that the symptoms as just now detailed by Dr. Barr indicated a lesion in the temporo-sphenoidal lobe. As to the nature of that lesion we were also at one in thinking it probably an abscess, and not a tumour, and this for the following reasons: (a) The boy had, and had had for three months, the most common exciting cause of intracranial abscess in the form of a purulent otitis. (b) The rapidity and progressiveness of the development of the symptoms of intracranial lesion, a matter of five or six days in all. (c) Apart from these considerations the symptoms themselves afforded no sufficient evidence on which to decide between the two probabilities—abscess and tumour. That being so, it was natural to think it more probable that the lesion was the common one, abscess, and not a rarity in the shape of a malignant tumour causing both aural and intracranial symptoms.

Later in the day I operated. In the first place I still further enlarged the very free mastoid opening previously

made by Dr. Barr so as to freely open the bony channel of the sigmoid sinus. This was largely occupied by a firm, greyish granulation-like tissue. The operation had then lasted about ten minutes. At this point the patient's respiration gradually became shallow, and finally ceased. The pulse remained perfectly good. The patient was evidently in a condition of apnoea from cerebral pressure. Artificial respiration was begun. No stimulant was given, nor was the foot of the table raised. After some minutes I performed tracheotomy on the suggestion of the chloroformist, Dr. Connal, who found this an aid to artificial respiration. For over one hour the patient's condition remained unchanged. So long as artificial respiration was kept up the pulse and colour remained good, but on stopping the artificial respiration from time to time there was not the faintest attempt at spontaneous breathing.

It was then decided to open the skull at all hazards, and explore the temporo-sphenoidal lobe. This I did while artificial respiration was still being carried on. On removing a large trephine crown of bone, about $1\frac{1}{2}$ inch directly over the external auditory meatus, the dura mater bulged markedly. In the dura I made a crucial incision. The cerebral cortex bulged at once in the opening, evidently under great pressure. At this point, one hour and ten minutes after the breathing had failed, the first faint effort at spontaneous respiration occurred.

I explored the temporo-sphenoidal lobe with the trocar. No pus was got, but, at a short distance under the cortex, a hardish mass was detected. I divided the cortex, and displaced it to either side and exposed a firm greyish mass of tissue similar in appearance to that which had been exposed in the groove of the sigmoid sinus. With a small elevator a portion of this was removed.

The patient was now breathing regularly, and there had occurred a marked contraction of the previously dilated right pupil. I enlarged the aperture in the skull by means of gouge forceps, and removed a considerable portion of the intracranial tumour. This was readily distinguished by the sense of touch from the soft brain around. After evacuating the larger part of the then intracranial portion of the growth it became clear that the tumour sprang from and widely permeated the petrous bone. I therefore gave up the attempt to remove more and applied an aseptic packing and dressing. By this time the patient, to whom no chloroform had been administered during the time apnoea set in, was moaning and struggling to get at our hands working at his head.

Further History.—For some days the symptoms were relieved, the headache, drowsiness, and vomiting having ceased. After that time, however, the headache returned, as formerly, more marked in the right side, and the right pupil again dilated. At the end of a fortnight optic neuritis occurred in the left eye, rapidly followed by atrophy and blindness. Soon after this the left side of the face became paralysed, and this was followed by paresis of the left arm. During the two and a half months he survived the operation there was no return of the semi-comatose condition developing before the operation, and on only one occasion was there any return of the vomiting. On two occasions towards the end of the first month after the operation I shaved off portions of the growth which had fungated through the large cranial opening, and were giving rise to hæmorrhage.

On June 18th, a month after the operation, he was removed home to Saltcoats, and the further report is by Dr. Campbell, whose patient he was. Dr. Campbell notes on June 19th, "Hearing, taste, and smell perfect. Intellect clear. No pain. Temperature normal. Complete blindness. Paralysis of left side of face and of left arm." For the following six weeks his condition varied little except that the old pain in the head occasionally returned, and on one occasion he had a recurrence of the vomiting. About a week before death he became gradually completely deaf. Four days before death drowsiness returned, and gradually merged into coma with a steadily rising temperature which, just before death, on August 2nd, reached 107° .

NOTE ON THE ANÆSTHESIA BY DR. J. G. CONNAL.

There was nothing in the condition of the heart or lungs to contraindicate chloroform; indeed, I had on three pre-

vious occasions given chloroform to this same patient (one of these operations being rather protracted), and on each of these occasions he had taken the chloroform well. It will be noticed that the condition of the patient before this last operation was one of advancing and deepening coma.

About ten minutes after the beginning of the operation I noticed that the breathing was becoming shallow and embarrassed—though the pulse at the wrist was full and regular. The operation was discontinued, the patient was turned on his back (with face upwards), and the tongue pulled forwards; but notwithstanding this, the breathing became shallower and shallower, and finally ceased. Artificial respiration was at once resorted to, and air entered the lungs quite freely—but so soon as artificial respiration was discontinued, matters were as before—there was no voluntary attempt at breathing. It was perfectly evident that there was no laryngeal or tracheal obstruction to the free entrance of air into the lungs, but after some time a little mucus gathered at the back of the throat, and it was considered advisable to perform tracheotomy. This was done by Dr. Nicoll, but still there was no respiratory effort, and we were confronted by the difficulty that the patient made no attempt to breathe, whilst all this time his pulse was good. The patient's face was now of an ashy grey colour, and, as showing the degree of apnoea, the anal sphincter relaxed. For one hour and ten minutes we performed artificial respiration, when it was suggested that the skull should be trephined. Dr. Nicoll rapidly did this, though working under the great disadvantage that he operated while we were keeping up the artificial breathing. As soon as the disc of bone was removed from the skull there was a bulging of the membranes, and now for the first time the patient made a voluntary effort to breathe—shallow at first, but shortly after that a deeper breath. The pulse, which had been good all this time, was now noted to be a little weaker.

Dr. Nicoll was meantime removing portions of the growth and soon respiration was quite established—indeed, it was not long before the patient began to cry out and to raise his hand to his head. The right pupil, which had been much dilated before and during the operation, now began to contract, and the operation was finished without a further administration of chloroform.

The anæsthetic employed was Duncan and Flockhart's pure chloroform, and the method adopted was the drop method on the open mask. I do not think I had used much more than one drachm of chloroform from the time the patient was placed on the table till the operation had to be suspended on account of the apnoic condition supervening.

What should have given rise to the condition impeding voluntary respiration might be a matter for some speculation, but it was probably due to intracranial pressure leading to oedema of the brain and distension of the ventricles. The fact that, immediately after the trephine opening was made, the membrane bulged outwards, and then a voluntary effort at respiration set in so markedly as to leave no doubt on the matter, seems to point to this conclusion.

It is acknowledged that chloroform has a definite risk in cases like this, and Professor Macewen has emphasised this in his work on *Pyogenic Disease of the Brain and Spinal Cord*.

THE CHARACTER OF THE GROWTH AND OTHER OBSERVATIONS, BY DR. BARR.

The growth is of very considerable size, firm in texture, and attached chiefly to the floor of the middle fossa of the skull. It consisted of two portions, one external to the skull (Fig. 1) being the extension through the operation openings above and behind the ear of the main growth within the cranium. In this direction the growth became very exuberant after the opening of the skull, so that during the two and a half months which intervened between the last operation and the death of the patient, portions had to be sliced off more than once by Dr. Nicoll. The chief mass, however, was situated within the skull, and is seen to be somewhat bifurcated (Fig. 2) on its upper and inner aspect. It appears to be closely attached to the upper surface of the dura mater, which seems almost intact. In the central part of the base of the skull some of it is also visible underneath the dura mater. While the growth permeates the neighbouring structures no actual destruction of bone or fibrous tissue had taken place. The

Fig. 1.—Outer aspect of tumour, showing the fungating extensions through the operation openings in the side of the skull.

Fig. 2.—Inner aspect of tumour.

mass is no doubt connected with a similar growth in the middle ear where the disease really originated. From the middle ear it probably first sprouted outwards into the external meatus in the form of a polypoid-looking excrescence corresponding with the fungus hæmatodes of Toynbee. The clinical history shows that the extension upwards into the

middle cranial fossa was probably a much later event and followed also by more rapid progress.

Sections of the growth (Figs. 3 and 4) have been submitted to several pathologists, and opinion seems to be fairly equally divided as to whether this tumour is to be regarded as a very soft and cellular carcinoma or a sarcoma of the so-called "alveolar" type. Clinical considerations, I think, rather favour the view of its being sarcomatous. In the first place,

Fig. 3.—Microphotograph of section of tumour. $\times 150$ (Dr. Leslie Buchanan.)

Fig. 4.—Microphotograph of section of tumour. $\times 300$ (Dr. Leslie Buchanan.)

the age of the patient is distinctly opposed to the idea of carcinoma. It is, as is well known, extremely rare to meet with carcinoma in a child 11 years of age, while, on the contrary, sarcoma probably occurs more frequently in children and young persons. Then again, so far as my experience goes, carcinoma affecting the ear has a different clinical character from that of the present case. Carcinoma of the ear has usually its starting point in the cutaneous lining of the external meatus, appearing at first as a trifling eczematous-looking erosion or as a furuncle. From such a beginning it extends not only to the middle ear and cranial cavity, but also outwards to the auricle, the mastoid process and the glandular structures in the neighbourhood of the ear. These external structures, especially at the junction of the lower part of the auricle with the side of the head, become the seat of swelling, great induration, followed sooner or later by ulceration, leading to serious destruction of the temporal bone and soft structures, with comparatively early implication of the facial nerve. In the case before us we had, on the contrary, no such involvement of the external

tissues, nor of the external meatus, nor of the bones, nor of the facial canal (unless as a late feature of the case); neither had we such destruction of tissue as is associated with the carcinomatous growth. One symptom is, I think, common to and prominent in both carcinoma and sarcoma of the ear alike, namely, pain in the ear beginning at the early stage, intense in character, and continuous throughout. Such pain, occurring in an ear with the objective changes just mentioned, should, I think, suggest malignancy. There is no doubt however that carcinoma may also arise in the middle ear, especially in connection with previously existing purulent disease. Such important authorities as Schwartz, Lucae, and Kidd report cases of epithelioma originating thus in the middle ear.

It must be confessed that up to the opening of the cavities of the middle ear the growth was regarded by me as a simple inflammatory product. I was perhaps beguiled into this opinion by the fact that during my attendance upon this patient there happened to be another case under my care presenting a fibrous-looking growth, springing apparently from the osseous walls of the middle ear, and likewise singularly recurrent in tendency. In that case on several occasions, twice under an anæsthetic, I snared and curetted the growth, which was examined at the pathological department of the Western Infirmary, with the result that there was no reason to believe it other than a simple product of inflammation. The ultimate result showed the correctness of this, as eventually there was complete recovery. Such recurrent fibrous growths, which we occasionally meet with in the ear, may really be of the nature of a fibrous sarcomatous tumour, which is known to have a longer and milder course than the round-celled variety, the latter being more malignant, spreading rapidly, and invading the cavity of the cranium. May the case before us not have been in the early stage a simple inflammatory neoplasm, developing subsequently into a sarcoma?

It may be asked, May this growth not have originated primarily in the intracranial cavity, extending thence to the middle ear? That malignant disease of the ear may be the result of extension from neighbouring structures, such as the parotid gland or dura mater, is proved from recorded cases. For example, Pomeroy reports a case in which a myxo-sarcoma extended without doubt from the middle and posterior fossæ of the skull through the tympanic cavity into the external meatus. In such cases, however, the phenomena pointing to intracranial disease manifest themselves at an early stage, and the aural symptoms appear later on; the contrary held good in the case before us.

Records show that malignant disease of the ear is comparatively rare. Bürkner's statistics indicate that carcinoma of the ear occurs only in the proportion of 1 in 3,000 cases of ear disease; with regard to sarcoma of the ear the proportion is still less. It is worthy of note that in the recorded cases of the latter I have found that most of them presented, as in this one, a polypoid-looking growth in the external meatus when first brought under notice.

REFERENCES.

Two cases of angio-sarcoma and myxo-sarcoma of the middle ear, by Wm. Milligan, in the *Archives of Otolaryngology*, vol. xxv, No. 3, 1896. A case of round-celled sarcoma, by Orne Green, in the *Archives of Otolaryngology*, vol. xiv. Case of round-celled sarcoma, by Hartmann (in which the growth extended from the middle ear to the cranial cavity), in *Archives of Otolaryngology*, vol. viii. A tumour described as fungus hæmatodes of the ear, described by Toynbee in his *Diseases of the Ear*, page 386. Gruber reports three cases of round-celled sarcoma in children in his *Diseases of the Ear*, English translation, 1893, p. 540. Hang, in *Archiv für Ohrenheilkunde*, vol. xxx, reported a case of myxo-sarcoma of the tympanic cavity and mastoid process in a girl aged 18. Pomeroy reports in the *American Journal of Otolaryngology*, vol. iii, p. 98, a case of intracranial myxo-sarcoma coming from the middle and posterior fossæ of the cranium through the tympanic cavity and external meatus. Schwartz, Lucae, and Kidd report an epithelioma arising in the middle ear in connection with purulent disease protruding into the canal and mistaken for granulation tissue and polypoid growths. Politzer's treatise, English translation, 1894, should be consulted at pp. 543-545. See also *Clinical Contribution to the Study of Malignant Tumours of the Middle Ear*, by A. F. Rasmussen and G. Schmiegelow, in *Archives of Otolaryngology*, vol. xv.

THE COMPANY OF PLUMBERS.—At the quarterly meeting of the Court of the Worshipful Company of Plumbers, held at the Guildhall on September 29th, Alderman Richard Hind was sworn into the office of Master, Mr. Frederick Machin to that of Warden, and Mr. Charles Hudson to that of Renter Warden for the ensuing year.

CONTINENTAL AND BRITISH VISION TESTS FOR RAILWAY SERVANTS.

A COMPARISON.

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THE necessity for examining the eyesight of railway servants, especially in the case of drivers, signalmen, and pointsmen, has been recognised by ophthalmic surgeons in all countries for many years. Its importance has been demonstrated again and again, and now it is enforced by State regulations or bye-laws in nearly every civilised nation. All over the Continent the standard of vision is fairly uniform, in most countries the rule being that one eye at least shall have normal acuity, whilst the other one shall have from one quarter to one half the normal. In this category are included Holland, Italy, Sweden, Austria, Switzerland, and I believe Belgium. In France two-thirds of the normal is required, in Germany at least one-half without glasses. If, however, we turn to Great Britain and Ireland we find a much lower standard of visual acuity. Instead of perfection in one eye, as is the usual rule on the Continent, the man who has one quarter of the normal in his better eye is considered to be visually fit to drive an engine, to signal a train, or to guard its passengers. Why is Great Britain satisfied with a quarter when almost all Europe exacts the whole? Has Europe set up an unnecessary high standard, or is Great Britain below the level of safety? I imagine, gentlemen, that you all will agree that we in Great Britain are wrong, and that no argument is necessary to demonstrate that the guard, the pointsman, or the driver who is three-quarters blind is not fit to fulfil his duties. Such, too, is the opinion of ophthalmic surgeons in England, and acting on that opinion they have on several occasions called the attention of the Government and of the railway companies to the inadequacy of the standard. Hitherto they have done so without avail, and it is with a view to consider the causes of the great difference in the English standard as compared with the Continental, that I have brought the subject before you to-day. In the first place the ownership of the railways is, I think, an important factor. In most countries we find that they are the property of the State. Such is the case in Holland, Italy, Sweden, and Norway; whilst in Germany, France, and Denmark they are nearly all State property. In Switzerland, on the other hand, with the exception of the Jura Simplon, they are all private. So, too, in the United Kingdom the railways are entirely in the hands of companies, and of these companies there are upwards of 200, many of them keenly competing with each other for the traffic. The Government of the country takes but little interest in the way in which the lines are managed and exercises but little supervision. As long as there is no gross neglect of duty they are not responsible for accidents, and they are left to frame laws and bye-laws for themselves. Should any question arise in the House of Commons there is a solid phalanx of eighty members who are railway directors always ready to protect what they conceive to be their interests. And so the companies can have any standard they choose, or if they choose, no standard at all. In reply to a deputation of ophthalmic surgeons that waited on the responsible department of the Government in February, 1895, to urge that some supervision should be exercised in this matter the President of the Board of Trade unsatisfactorily answered that they had "no power" and that "all the leading railway companies had shown a commendable desire to do what they could, and now required their surgeons to apply tests to the eyesight." This statement is quite inaccurate, as on the majority of, if not on all, the British railways the sight testing is done by lay officials, and as is to be expected they do it about as well as the mannikin at the back of the Hôtel de Ville would do it. The President of the Board of Trade went on to say that the companies "applied substantially the same tests as were applied on the State railways of the Continent, and therefore there was no reason to think that the work would be better done by the State." Had he known the facts he would not have replied thus. These, then, are the difficulties which we

* Read at the International Conference on Railway and Marine Hygiene, Brussels, September, 1897.