ABSTRACTS

DISCUSSION ON THE CAUSES, EARLY RECOGNITION, AND TREATMENT OF NON-TUBERCULOUS MENINGITIS.*

Abstract by A. LOGAN TURNER, M.D.

IN opening the Discussion, Dr Hugh Thursfield pointed out that, although the practice of lumbar puncture had added greatly to our knowledge of meningitis, it had by no means solved all the problems. Meningitis might be conveniently considered as a condition in which three stages could be recognised, each stage representing a different phase of the same process. Thus, in "meningismus," a condition characterised by fever, vomiting, stupor, squint, muscular rigidity and delirium, the physician recognised the first stage of a meningitis, in which the defensive mechanism of the tissues was sufficient to ward off the attack and render it abortive. Examination of the cerebro-spinal fluid gave no indications of inflammation of the meninges.

Serous meningitis constituted the second stage, in which the cerebro-spinal fluid no longer remained quite clear, but contained a slight excess of albumin and an equally slight excess of cells, either of the lymphocytic or polymorphonuclear variety, but sterile on culture. If the primary focus was promptly dealt with, the patient had a good chance of recovery. In the third stage there was evidence in the fluid of bacterial invasion either in films or by cultivation. The proof that these three stages represented different phases of the same process was partly clinical and partly experimental.

The diagnosis of meningitis depended not on clinical signs alone nor on the examination of the cerebro-spinal fluid, but on the consideration of both. It was difficult to attain certainty even when the fluid offered some clinical evidence of irritation. The indications on which he had learnt chiefly to rely in the more doubtful cases were a slight increase in the protein content and in the number and character of the cells. Clinically, the difficulties were chiefly in the differentiation of tuberculous meningitis from other causes of meningeal irritation, and further, in the recognition of the earlier stages of the infection. The irritation which accompanied the lesions of poliomyelitis in some instances, or of the early stages of encephalitis, produced disturbances in the fluid and in the clinical symptoms which might give rise to difficulty. On the whole, however, few mistakes were made and these were more in the direction of failure to recognise the existence of the meningitis which accompanied the last stages of a severe illness.

Sir WILLIAM MILLIGAN pointed out that of the various intracranial complications of otitic origin, meningitis was the most difficult to recognise in its early stage, and yet early diagnosis was most essential if successful treatment was to be carried out. In young children especially, among

* *Sections of Medicine, Otology, Neurology, and Laryngology, Royal Society of Medicine*, 10th December 1924.

whom meningitis was so often basal in type, the onset of the infection was frequently insidious. The fact that the meningeal infection started from the immediate area of the primary focus of disease was a point of cardinal importance. The free and early removal of the infected area would frequently suffice to ensure the immediate disappearance of threatening meningitis, and it was the first essential in dealing with cases of otitic meningitis, whether serous or purulent.

While the infective process might remain outside the resistant dura mater for a time, pathological changes were taking place on its inner surface. The resistant arachnoid membrane might successfully repel the passage of organisms throughout the interval of time during which nature asserted herself by the marked increase in the fluid within the arachnoid cavity in the immediate neighbourhood of the focal lesion. This constituted the commencing stage of a serous or protective meningitis, a type which tended to spread slowly, largely owing to the intricate configuration of the subarachnoid trabeculated spaces.

At the commencement, the cerebro-spinal fluid was clear and under pressure, but later became turbid, sometimes very turbid, as the result of the increasing pleocytosis. With an increase of albumin and globulin, and with an absence of the normal reduction of sugar, the fluid was nevertheless sterile. He could not agree with the dictum expressed by G. J. Jenkins, that a meningitis secondary to and due to septic disease of the ear must be regarded as a septic meningitis, whether or not an organism had been found in the cerebro-spinal fluid. The fluid thrown out must be regarded as a protective effort on the part of nature, and so long as the fluid remained sterile, the case should not be classified as one of septic meningitis. The duration of the sterile period depended upon the success attending removal of the focus of infection, whether extra- or intracranial.

While reliance was placed upon the results of lumbar puncture, the procedure was not the most reliable, as the fluid was not necessarily homogeneous throughout its whole extent. Tapping in the immediate neighbourhood of the infection would at times show a fluid much richer in cellular content than that obtained through the lumbar theca. While lumbar puncture was most valuable as an aid in diagnosis and invaluable as a therapeutic agent in serous meningitis, it should never be regarded as an effective means of securing drainage in meningitis purulenta.

Clinically, three types of meningitis might be recognised : (1) meningitis benigna or serosa, (2) meningitis semi-maligna, and (3) meningitis maligna. In the first, prognosis was good ; in the second, grave ; and in the third, very grave. All authorities admitted that in cases usually described as septic lepto-meningitis, organisms were frequently not found, and many of the reported recoveries were in cases in which a turbid or purulent lumbar fluid contained no organisms. Meningitis maligna was the end-result of the semi-maligna type, but there was a *vast* difference in the outlook. In the semi-maligna the exudate was purulent but without organisms, in the maligna the intensity of the process was such that organisms had gained an entrance into the subarachnoid space, demonstrating the persistence or virulence of the infection.

Only from 2 to 3 per cent. of cases with organisms in the cerebro-spinal

fluid ever recovered, whatever was done, whereas a considerably greater percentage of cases without organisms was cured, although there were pus cells present. The percentage of recoveries would materially increase if the profession recognised that what was so commonly described as septic meningitis was, in a proportion of cases, amenable to treatment.

When the clinical picture, which included the persistence of pain in the suppurating ear, suggested the probable presence of meningitis, no time should be lost in exposing the dura mater in the neighbourhood of the infection, in puncturing it and in withdrawing fluid for examination. Many lives were undoubtedly lost by drawing erroneous inferences from the state of the fluid obtained by lumbar puncture.

Dr C. WORSTER-DROUGHT emphasised the signs which he had found most useful in practice for establishing the early diagnosis of meningitis. The symptoms were pyrexia, headache, generalised and of increasing intensity, and vomiting: all were practically constant. The most valuable physical sign was rigidity of the posterior cervical muscles and, in his experience, was the first sign to develop. It was best elicited by laying the patient on his back, while the examiner placed his hand beneath the head and drew it gently forwards. In the presence of meningitis, the head could not be brought forwards more than two inches beyond the line of the long axis of the body; more often, indeed, it could not be flexed past this line. The sign was sometimes present within five to six hours of the onset of the meningitis, and almost always within twelve hours. Head retraction was almost useless as an early sign of meningitis, as it seldom developed before the third or fourth day. Kernig's sign appeared slightly later than rigidity of the posterior cervical muscles. It was of no value in children below the age of two years. No reliance whatever could be placed upon the state of the superficial and deep reflexes for the purpose of early diagnosis. Retention of urine, when present, was an important symptom; it sometimes occurred within twenty-four hours of the onset of the illness.

While these signs served for the early recognition of meningitis, the diagnosis could only be established by the examination of the cerebro-spinal fluid.

Two principles ought to govern the treatment of all forms of non-tuberculous meningitis, namely, the establishment of adequate drainage and the application of a specific immune serum in as close contact as possible with the inflamed tissues. The routes of drainage were lumbar puncture, cervical puncture, puncture of the cisterna magna, and of the lateral ventricles. In otitic meningitis he could not fail to be impressed with the success of translabyrinthine drainage.

In order that the specific immune serum should act with most power, it was necessary to introduce it directly into the subarachnoid space, and so as to make good the loss in concentration sustained by absorption into the blood-stream, it should be used at intervals of not longer than twenty-four hours' duration. When there was evidence of associated systemic infection, the intrathecal should be supplemented by intravenous administration. The serum should be polyvalent for the specific organism obtained from the cerebro-spinal fluid: and later, a univalent serum could be substituted if the actual type of organism was determined.

Non-Tuberculous Meningitis

Dr J. G. GREENFIELD said that the problem presented itself to the clinical pathologist in two extreme forms; in one, the decision had to be made as to whether meningitis was, or was not, present, the patient showing signs of meningitis when the cerebro-spinal fluid was clear: and in the other, when the fluid was turbid in a patient with little or no evidence of meningitis.

In regard to the first problem as to whether meningitis was impending, the presence of a few polymorphonuclear cells in the cerebro-spinal fluid was a warning that danger was at hand. It was necessary to be very sure that the fluid was normal in every way before it could be said that meningitis was not imminent. In two cases of cerebral abscess reported by Hadfield, only twelve cells were present in the fluid at the first puncture in each case, but of these 70 per cent. in one case and 75 per cent. in the other were polymorphonuclears. In Greenfield's experience, even 30 per cent. of polymorphonuclears was a danger signal.

In very early meningitis, the protein was often normal, but in spite of this fact, hæmolysin and complement might be present. The combination of these constituents with a normal protein level was almost characteristic of meningitis. The hæmolysin test was treacherous, as it might often be negative in cases in which by all the rules it should be positive, for the simple reason that the patient's blood contained no hæmolysin. It was much better, therefore, to test for the presence of complement only, by simply mixing the cerebro-spinal fluid with sensitised red-cells and incubating at blood temperature. Apart from the cytology, this test appeared to be the one which gave the first evidence of meningeal involvement. It was dependent on increased meningeal permeability, and a very small area sufficed for the passage of complement from the blood into the cerebro-spinal fluid. The chief value of the test lay in the fact that it was found when there was no appreciable increase of protein and only a slight cellular excess.

Cases with little evidence of meningitis but showing a turbid cerebro-spinal fluid, presented, in his experience, the greatest difficulty. Fluids of this kind were particularly frequent in cases of empyema of the cranial air sinuses and of abscess of the brain resulting from them. Obviously there was pus somewhere, and some of it had found its way into the subarachnoid space. There was a danger that the meningitis might become generalised or, indeed, had already become so, or it might be limited to the region of the abscess. Would an examination of the cerebro-spinal fluid solve the question?

The only test which gave any indication in such cases as to whether or not the meningitis was generalised was the chloride percentage, and it was of real value. The value of the test was based primarily on Mestrezat's work and on Greenfield's own experience in seventeen cases of head wounds. In eight patients who died, seven died from meningitis, and in them the chlorides fell to below 680 mgm. before death. In one case in which the patient recovered, there was pus and gram-negative diplococci in the spinal fluid, but the chlorides remained at the normal level of 725 to 750 mgm. He had been so impressed with this series of cases that since then he had carefully watched the chlorides in every case of meningitis, and no patient had died when the chlorides remained at their normal level.

Prognosis, it was true, rested to a large extent on the presence of bacteria in the cerebro-spinal fluid and on the virulence of the invading organism when it could be ascertained. But in the large group of cases in which on lumbar puncture, no organisms were grown or only a few colonies of a less virulent type, then the indication as to whether or not the meningitis was generalised was obtained through the chloride percentage. It was of as little use to estimate the chlorides in a clear fluid as it was to test a turbid fluid for complement. Each case and each specimen should be taken on its own merits. Sometimes it was possible to say within five minutes if the meningitis was generalised, but sometimes an examination for an hour was not sufficient to decide the matter.

Mr W. M. MOLLISON, who approached the subject from the rhinological side, pointed out that while the diagnosis of rhinogenic meningitis presented no material difference from that of otitic origin, the former, as a rule, ran an extremely rapid course. Treatment was of little avail once the disease was established. In spite of the fact that in post-operative meningitis of nasal origin the prognosis was bad, recoveries had been reported. In order to obviate the risk of a post-operative complication, it was advisable to take certain precautions. No nasal operation should be performed while the patient had an acute cold. When operating on the sinuses, all the cavities which contained pus should, if possible, be dealt with at one sitting. The nasal cavity should never be plugged for more than twelve hours. The middle turbinal should be handled very gently and the olfactory sulcus should be avoided.

Meningitis which arose spontaneously in connection with nasal disease usually occurred in the course of a chronic affection, and in the majority of cases some other intracranial complication coexisted, such as an extra-dural or cerebral abscess or thrombosis of the cavernous or superior longitudinal sinus. The frontal and sphenoidal sinuses were most often the seat of the primary disease.

Meningitis as a sequel of intranasal operations was of chief moment to the rhinologist. In some instances the operation lit up a pre-existing but unsuspected pachymeningitis, and occasionally the onset of the meningitis was delayed for months. The prognosis in the post-operative type was bad, although some recoveries had been reported.

Mr W. STUART-LOW also emphasised the necessity of careful preparation of the patient before operation. The throat, nose, and ear should be rendered as aseptic as possible by the use of antiseptics, by the extraction of carious teeth, the removal of tonsils and adenoids, and in the ear by the systematic employment of suction to extract the discharge. In the mastoid operation he had found advantage in the use of normal aseptic horse serum as a first dressing. It induced a free out-pouring of fluid from the freshly exposed bone, and by thus flushing the wound, encouraged leucocytosis.

Mr SYDNEY SCOTT laid stress on the fact that meningitis might occur with no clinical indications whatever until some days had elapsed. Early lumbar puncture was, therefore, essential in all cases in which there were grounds for suspecting the condition. He had come to realise that in a

surgical case with infection in the upper air passages or in the ear, with any rise of temperature for which no obvious cause could be found, lumbar puncture should be performed.

He was convinced of the efficacy of lumbar puncture as a therapeutic agent in cases of meningitis, and he had never seen a case recover without its repeated application. He could recall thirteen cases of pyogenic meningitis, proved to be so by examination of the cerebro-spinal fluid, in which recovery took place after that procedure. The organisms in the fluid in these cases had always been either streptococci or pneumococci. He would not allow a longer interval between puncture than twenty-four hours as a general rule: he often preferred twelve or eighteen hour intervals, and he repeated the process as long as improvement was manifest, until the cells and organisms disappeared and the patient was free from pyrexia and pain.

The contribution made by Mr DAVID NABARRO dealt with his experience of varieties of meningitis met with in children. He pointed out that many cases commenced as a septicæmia, and if this view were correct, the child required general treatment as well as that directed specially to the meningeal infection. He referred also to the difficulty which sometimes arose in determining the exact nature of the organism which was present in the cerebro-spinal fluid. He illustrated his remarks by quoting the case of a child in whom the intracellular-cocci resembled the meningococcus, but which were regarded by Dr Atkins of the Lister Institute as more closely resembling the gonococcus. Finally, it was found to correspond exactly to the *Diplococcus crassus*. In another child, opinions differed as to the presence of pneumococcus or a rare form of streptococcus. In Dr Nabarro's opinion, patients rarely recovered from pneumococcal meningitis, while the proportion of recoveries, at Great Ormond Street, from the streptococcal form was small.

Dr CARNEGIE DICKSON believed that very probably the meningococcus attacked the ventricles of the brain by way of the choroid plexuses through the blood-stream, to which the organism might obtain access from the ethmoid or sphenoidal sinuses, or the roof of the naso-pharynx, rather than by direct spread through the bone to the meninges. At 100 post-mortems on meningitic cases, he had been struck by the fact that inflammatory reaction in the ventricles was, almost always, in excess of the lesion on the surface of the brain. In the use of immuno-therapy in cases of meningococcal meningitis, Dr Charles Gray had used serum from patients who had recovered from the disease, and fairly good results had been obtained.

Dr ROBERT HUTCHISON, in closing the debate, spoke of the fallaciousness of many of the clinical signs of meningitis. On several occasions he had seen rigidity of the neck muscles in acute rheumatism in children, and in a degree closely simulating that in meningitis. The cases of the latter affection seen by the physician were not those arising from a septic focus, but were rather expressions of a general infection or a septicæmia.

Abstracts

THE EAR.

A Plea for the Earlier Operative Treatment of Acute Otitis Media. F. HOLT DIGGLE, O.B.E., F.R.C.S. (*Brit. Med. Journ.*, 22nd November 1924.)

Early paracentesis before spontaneous rupture if possible, or after this event, if the site or size of the perforation is such as to render drainage ineffective, leads to rapid cessation of discharge in a great number of cases. The extreme virulence of the infection, or the presence of some meatal obstruction may prevent this satisfactory result in other cases. The question of opening the mastoid process must not be held to depend on the presence of tenderness or swelling in that region—these are indications that the inflammatory condition has extended to the periosteum. There may be infection of the anterior and deep cells to a degree beyond the possibility of spontaneous repair without such signs being present. Of greater value as diagnostic helps are bulging and redness of the postero-superior part of the membrane and of the adjacent part of the meatal wall. Special mention is made of the class of case in which the patient is quite unconscious of an ear discharge, although the otologist finds a small amount of pus against the membrane.

T. RITCHIE RODGER.

Zinc-Ion Treatment of Acute and Chronic Middle Ear Suppuration. VIGGO SCHMIDT, Copenhagen. (*Acta Oto-laryngologica*, Vol. vi., fasc. 3-4.)

A historical survey of electrolysis and ionisation is given, and the author's technique of ionisation of the middle ear cleft is described with an analysis of cases treated.

His summary of results suggests the value of the treatment in acute, subacute, and chronic suppurative otitis media; also in the improved epithelialisation of radical mastoid cavities and by employing a negative electrode in the rhinopharynx in the healing of persistent tubal suppuration. H. V. FORSTER.

Otorrhagia from Paracentesis of the Ear in a Hæmophilic. A. TRIMARCHI. (*Arch. Ital. di Otol.*, Vol. xxxv., p. 353, October 1924.)

A workman, aged 25, with normal previous history, took an acute attack of tonsillitis. He painted his throat with rather strong iodine, and immediately had severe pain shooting to the tongue and up to the ear. Following this there were symptoms of acute coryza and earache.

On examination the right ear drumhead was red and bulging. The left ear was normal; some congestion of larynx. Paracentesis of the right drum was performed which gave exit to blood and pus. A

gauze drain was inserted. Half an hour later the ear was still bleeding copiously. The gauze was removed and the meatus repacked with gauze soaked in adrenalin.

It was learned at this stage that the patient had all his life been inclined to bleed for a long time after slight injuries. His brother had the same tendency but his sister had not. He was given calcium lactate and horse serum, but in spite of this the patient continued to bleed for three days and became pale and weak. The ear was again firmly packed and the bleeding gradually ceased. The patient then began to have mastoid pain and slight fever. On removing the packing it was found that the edges of the wound had become adherent but the drumhead was bulging. Paracentesis was carried out with a thermocautery point without bleeding. From this point the convalescence was uneventful. J. K. M. DICKIE.

Unusual Forms of Extension in Purulent Otitis Media, with Special Reference to Involvement of Cranial Nerves. Dr H. FRIEDENWALD and Dr M. L. BREITSTEIN. (*Laryngoscope*, Vol. xxxiii., No. 11, p. 820.)

Two interesting cases are recorded, the first that of a man aged 29, with profuse discharge from the left ear. A simple mastoid operation disclosed a sclerotic mastoid and a large zygomatic cell. There was no connection between the middle ear and soft tissues through the cortex. On the night of the operation the patient was hoarse, and an examination showed the uvula pointing to the right with no movement of the left half of the palate. The tongue protruded to the left. In a week a large swelling developed in the pharynx extending upwards to the nasopharynx and downwards into the hypopharynx. On incision about 3 drams of pus came out. The larynx was visible the next day, the left cord and arytenoid being completely fixed. He improved rapidly and was discharged, but shortly afterwards an indurated swelling developed in the left posterior triangle; in the nasopharynx a swelling was seen anterior to the left Eustachian orifice, and in the middle of this swelling was a bead of pus. Two months after, apart from protrusion of the tongue to the left and complete paralysis of the left cord, the patient was quite well.

The second case was that of a young man operated on for a streptococcal mastoiditis of the left ear. The temperature kept up and the discharge from the meatus continued to be profuse. Photophobia developed with some pain in the left eye and diplopia. The author saw the case now for the first time and there was left parietal headache and paralysis of the left external rectus; no changes in the fundi. No operation was advised and the ear healed completely in three months with disappearance of diplopia and headache.

On the basis of these two cases the authors have made an extensive study of the various methods of unusual spread of infection from the mastoid and of Gradenigo's symptom complex. The result has been a very interesting and instructive paper, discussing the subject in detail and giving a full bibliography. ANDREW CAMPBELL.

The Indications for the Labyrinth Operation. R. BÁRÁNY, Upsala. (*Acta Oto-laryngologica*, Vol. vi., fasc. 3-4.)

The author mentions the following conditions for which operations on the labyrinth are performed:—

(*a*) Septic labyrinthitis secondary to middle-ear disease.
(*b*) Septic conditions invading the labyrinth from within the skull.
(*c*) Non-septic disease of the labyrinth.
(*d*) Tumours of the auditory nerve and brain.
(*e*) Cases of oto-sclerosis.

He reviews first of all the work of earlier writers. Jansen employed special illumination for his operations in this area, and gave a comparatively full list of indications. It was Hinsberg who referred to the danger of meningitis after the radical mastoid operation on patients with latent labyrinth disease. After our knowledge had been increased by the functional tests and histological work, Neumann formulated a detailed list of indications for labyrinth operation, which, however, further clinical experience and advanced knowledge have proved to be too rigid.

The important work of Zange well represents the present state of affairs.

The author proceeds to examine the difficult subject of septic labyrinth disease under two headings: (1) Labyrinth disease with retention of some function in the vestibule and cochlea; (2) cases with complete elimination of labyrinth function. When this has been done he takes up the subject of labyrinth operations for other conditions. He mentions the possibility of improving the hearing by operating upon the labyrinth when there is deafness following meningitis. For cases of severe vertigo before proceeding to labyrinth operation we should try the effect of medicinal treatment, lumbar puncture, or even exposure of the dura mater of the posterior fossa. He describes his method of operation on the labyrinth in cases of vertigo where other methods fail.

This is done in two stages; first of all the aditus is closed by a piece of fat, and the mastoid filled with fat. Six weeks afterwards the fat is removed from the mastoid, but the drum cavity being shut off the labyrinth can be opened without fear of infection from the middle ear. He suggests this method too when it is decided to operate for acoustic tumours by the trans-labyrinthine method. He refers in passing to

Cushing's success with such tumours because this operator removes the contents by intra-capsular spooning, avoiding the shock, hæmorrhage, and damage to nerves consequent on complete removal. Concerning operations for oto-sclerosis he also suggests shutting off the middle ear, and refers to the use of a magnifier under which it might be possible to open the bony labyrinth without injuring the membranous contents by bone dust and bleeding. H. V. FORSTER.

The Indications for Labyrinth Operation according to Experiences gained at the Sabbatsberg Clinic. GUNNAR HOLMGREN, Stockholm. (*Acta Oto-laryngologica*, Vol. vi., fasc. 3-4.)

The author remarks how the work of Bárány on caloric nystagmus, in 1906, gave labyrinthology a firmer ground to work on. It was thought one could recognise the clinically benign from the malignant forms of labyrinthitis. The influence of the Vienna School under Politzer at that time is reflected by the authoritative way Neumann formulated indications for operations on the labyrinth. Voss was the first to attack this position in 1908, when he published a few cases of labyrinthitis serosa where a total temporary disappearance of vestibular irritability was followed *after* recovery in some cases by normal reactions. Development since then has gone in a conservative direction, and clinical investigations have been much assisted by histology. A paper by Zange is highly recommended. This worker only operates unreservedly and immediately upon the labyrinth if an intracranial complication is approaching or is fully developed. Robert Lund who is even more conservative, has published a most comprehensive work on the subject.

After this introduction the author proceeds to examine his own material from the Sabbatsberg clinic under the following heads:—

(i.) *a.* Labyrinth operation performed to assist the performance of deeper operations.

b. To drain infected labyrinths.

(ii.) Cases of inflammatory labyrinth affections where the labyrinth operation has not been performed.

Under No. (i.) *a.* The author thinks that labyrinthectomy of a reacting labyrinth for intracranial tumours, meningitis, or for abscess at the apex of the petrous bone might be avoided.

Under No. (i.) *b.* There is a large group of 81 cases, forming the chief material for consideration in this article.

The author compares his cases with those of Lund and is in favour of treatment rather less conservative than Lund's.

He makes two important statements in italics:—

1. "In cases of chronic diffuse purulent labyrinthitis an operation is in my opinion indicated when there is an open suppurating

labyrinthine fistula with or without signs of intracranial or other complications."

For these patients the post-operative risk is very small.

2. "In every case of acute diffuse labyrinthitis with complete loss of function there ought to be an immediate labyrinth operation."

He is in favour of local anæsthesia for operations on the labyrinth. Sterilisation of an intact infected labyrinth by electro-coagulation is even mentioned as a future possibility. With regard to fractures of the basis cranii, a damaged labyrinth should only be operated upon when meningitis is imminent; here a radical drainage operation is called for.

Finally, under a separate heading, operation on the labyrinth wall for otosclerosis with the help of a binocular microscope is mentioned and its possibilities discussed. H. V. FORSTER.

Experimental Investigations on Conduction of Warmth to the Labyrinth of the Ear and on the Caloric Nystagmus. Y. MEURMAN, Helsingfors. (*Acta Oto-laryngologica*, Vol. vi., fasc. 3-4.)

The writer remarks on two theories of the origin of caloric nystagmus. (1) That of Bárány who traces it to the change in the specific weight of the endolymph; (2) That of Kobrak who, carrying out experiments by minimal irritation, attributes the caloric nystagmus to change in volume of the blood vessels.

He then proceeds to describe his own experiments on the human cadaver, where a thermo-element was passed into the labyrinth by way of an opening in the lateral part of the anterior vertical semicircular canal and introduced as far as the ampulla of the horizontal canal. The labyrinth is filled with almond oil or glycerine and a mirror galvanometer employed. Minimal caloric stimulation is used.

Experiments were also carried out on the living where, using strong convex glasses, the effect of rotation on the caloric nystagmus was noted.

The writer concludes in favour of Bárány's theory.

H. V. FORSTER.

The Symptomatology of Elimination of the Eighth Nerve in Multiple Sclerosis. G. ENGELHARDT, Ulm. (*Zeitschrift für Hals-, Nasen-, und Ohrenheilkunde*, Vol. viii., Part 2, p. 192.)

The writer laments the paucity of records of this condition, giving clinical and pathological data throughout. He narrates very fully a case of his own in which, as the patient is still alive, the morbid anatomical details are not yet available. The case shows the variability in the symptoms which is a very marked feature in multiple sclerosis.

JAMES DUNDAS-GRANT.

The Ear

Plea for an International Investigation into Otosclerosis and Allied Forms of Deafness. Dr J. S. FRASER. (*Laryngoscope*, Vol. xxxiii., No. 12, p. 891.)

The author makes a most interesting review of the present knowledge of the etiology and pathology of otosclerosis. About 70 per cent. of cases occur in females and probably over 50 per cent. give a family history of deafness. There may be a congenital weakness or developmental error in the causation of the disease and puberty seems to be the age of onset. Do previous attacks of otitis media influence or cause the onset? The author is a supporter of this view, and he pleads an excellent case in support. Various views of the pathology are given briefly and a short survey of the theories as to the cause of deafness, but spongification of the labyrinth capsule is held to be the cause of deafness and tinnitus. An uncomplicated case of otosclerosis can be easily diagnosed, but if there is suppuration or an adhesive process it is not so easy.

Apart from the removal of tonsils, septic teeth, and other possible septic foci, and attention to diet, very little treatment is at present advised; however, there is a growing desire to avoid a gloomy prognosis and prescribe lip reading. The most encouraging reading is the history of a patient who was diagnosed ten years ago as suffering from unilateral otosclerosis. The diagnosis was confirmed by the author recently, but she could hear a loud whisper in the affected ear at 12 feet and the other ear was normal, a case where the deterioration in hearing was very slight or nil. This patient had been treated with autogenous vaccine at intervals during the whole ten years. Having previously heard of this case, the abstractor has treated two cases by vaccine only, during the last eighteen months, with satisfactory results from the patients' point of view; they both state the hearing has improved, but it is difficult to demonstrate, and, moreover, too early to judge of the results. The author suggests that an international investigation be organised, preferably in America, as it is the least unpopular country in the world at present. A number of pertinent questions are asked in the conclusion, which can be answered, if only partly, by a scientific investigation of the kind suggested. The article is well illustrated. ANDREW CAMPBELL.

Observation on the Origin of the Striæ in the Floor of the Fourth Ventricle and on the Autonomic Nuclei of the Cochlear Nerve. Dr R. LORENTE. (*de Nó. Revista Espanola de Laringologia Otologia y Rhinologia*, Anno xv., No. 2, Madrid.)

The author has drawn the following observations from his researches—that the striæ of the floor of the fourth ventricle are a complex formation in which intermingle fibres from two distinct origins,

the acoustic nerve and the cerebellum. In small mammals the acoustic tubercle contains cells with long non-medullated axons which form a secondary path across and below the floor of the ventricle and which are analogous to the striæ acusticæ or "bodenstriæ" in the human subject. The secondary paths connected with the acoustic nuclei are the trapezoid body or path of Flechsig, the path of Held, the striæ acusticæ of v. Monakow and the cochleo-ventricular tract. From the Purkinje cells in the cortex of the cerebellum several systems of fibres pass out to the vestibular nucleus in the bulb, and one of them traverses the postero-medial triangular area to enter into the striæ acusticæ. The latter formation is therefore shown to contain fibres from both the acoustic nerve and from the cerebellum in the case of mammals, but in birds only the cerebellar portion has been identified.

Close to the acoustic tubercle is a collection of cells whose axons pass out centrifugally with the cochlear nerve to end in the labyrinth, constituting an autonomous supply to that organ. F. C. ORMEROD.

A Contribution to the Study of Occupational Deafness. G. TENAGLIA. (*Arch. Ital. di Otol.*, Vol. xxxv., p. 268, August 1924.)

The author has made a series of observations in workers in a factory where large steel conduit pipes were made. The operations consisted in curving the metal sheets in a rolling mill assisted by a certain amount of hammering, and secondly in rivetting the edges with pneumatic hammers vibrating from 700 to 1200 times a minute. The noise in the workshop was tremendous. The author became deafened in a few minutes in the rivetting room and could not hear the voice of his guide. The noise from the rolling mill, while extremely loud, was of lower pitch than that of the rivetting, which was lacerating and stupefying in its intensity. Some of the rivetting was done from inside the cylinders, and the noise in this work was even more terrible than in the rest of the workshop. The work was in eight-hour shifts, interrupted by two hours for dinner. At the end of each day the rivetters were completely deafened and stupefied, but some of this passed off in a few hours.

In the examination the author has excluded any who had any pathological condition in the nose or throat. He examined 25 workmen and tested them on coming to work in the morning and again at the end of their eight hours of work. In all, bone conduction was shortened. In 21 Weber's test was indefinite, and in the rest it was referred to the better ear. Rinne's test was negative in 6 and positive in 17, though markedly shortened. The watch was not heard at all in any workers who had been in the factory for several years. In others it was perceived, though very feebly. Low voice and Politzer's acoumeter were perceived in most cases only immediately at the ear,

in some they were not heard at all. In the examination with tuning forks there was a distinct diminution in the duration of perception of the whole series, with an accentuation for the high tones between the third and the fourth octaves. The diminution was not uniform but irregular, and showed, here and there, gaps for certain tones. With the Galton whistle the upper tone limit was well preserved, except in a few who were advanced in years in whom there was a slight lowering of the limit. The severity of the deafness was in direct relation to the length of service and the nature of the work, that of the rivetters being the worst. After the eight hours of work there was a marked diminution in the duration of perception of the tuning forks, more especially in the younger workers and those with a smaller number of years of service. However, in those who had worked for many years the difference between the morning and evening perception was insignificant.

The author also examined sixty textile workers. In this work there were 300 looms in action and there was a continual loud noise, the prevailing tone of which was rather low. The author noted a certain amount of deafness which disappeared soon after leaving the factory. In this occupation there was also an eight-hour day with a two-hour interruption. Examinations were made in all cases at the commencement of the day, and in a few in the evening as well, but no particular difference was noted between the two periods. In the functional tests normal results were found in all but about seventeen, in whom perception was somewhat reduced.

Five military radio-telegraphists of four or five years' service were also examined with normal findings.

The author states, on the authority of Gradenigo, that the first turn of the cochlea is by far the most delicate, and subject to degeneration in experimental work. This corresponds to the tone scale between *sol*^{3} and *do*.^{5} According to Gradenigo also the resonance tone of the external auditory canal is in the fourth octave, and therefore this will contribute to rendering the internal ear particularly sensitive to sounds of this pitch, and those sounds are the first which are badly perceived in occupational deafness. He concludes that in order to produce lesions in the internal ear like those of occupational deafness, (1) the acoustic injury must be continuous and incessant for years so as to exhaust the resisting power of the means of defence of the organ. (2) There must be a special acute tone between the third and fifth octaves, corresponding to the zone of greater sensitiveness and vulnerability of the lamina spiralis of the cochlea. The low tones and the very acute ones are not those that damage the perceiving elements. (3) The sounds must be decidedly intense.

J. K. M. Dickie.

Abstracts

Testing the Sensitivity of the Ear by Thermophone. F. W. KRANZ. (*Physical Review*, Vol. xxi., No. 5, No. 1, July 1923.)

Of all the recent attempts in the direction of audiometry in absolute units, that by use of the thermophone would seem theoretically to be the most free from sources of error. In the thermophone, the variations in pressure giving rise to the sound wave are produced by an alternating current flowing through a piece of thin platinum foil stretched across a closed chamber which is in air-tight communication with the auditory meatus. Each alternation of the current causes a heating effect in the foil. The surface of the latter is so large as compared with its mass that it is presumed the heat is communicated instantaneously to the air in the chamber, causing an expansion for every passing of the current. The energy content of the sound waves set up is measured directly by the energy of the current flowing in the foil. The pitch of the sound is determined by the frequency of the alternations of the current.

Kranz's measurements of minimum audibility for different pitches with the thermophone give the same form of curve as those obtained by Wein, and by Fletcher and Wegel with the telephone receiver, and his absolute values are approximately a mean between the rather wide limits of these two sets of observations. All show that the curve of sensibility of the ear, as obtained by taking the average of a larger number of normal people, rises steadily for frequencies of 128 dv. to 512 dv.; after which it remains approximately at one level up to 4096 dv., when it again falls. The individual variations in sensitivity of "normal" ears in different individuals, and at different pitches, which amount to as much as a ratio of 1 to 1000 in absolute units, have to be interpreted in the light of Fechner's law; this states that if the increase of the sensation is proportional to the increase of the stimulus divided by the absolute intensity of the excitation, then the sensations will stand in the same ratio to the stimuli as do the logarithms to their numbers.

Kranz's method of plotting the curve of minimal audibility by a series of observations, in each of which the intensity remains the same whilst the pitch is constantly varied, seems to have distinct advantages over the more usual method of testing normal audibility by varying the intensity, the pitch remaining the same. Curves were obtained for thirty normal ears. They showed remarkable individual irregularities, not only being different for different individuals, but often for the two ears of the same person. In several cases the sensitivity changes by a factor of 200 to 1000 with a change of pitch of a semitone. As he remarks "an acceptable theory of the mechanism of audition must explain such abrupt changes." The resonance theory alone does this.

With regard to these extraordinary islands of relative deafness in

apparently normal hearing individuals, the author remarks elsewhere that decreased acuity of hearing for certain limited portions of the tone scale is not a criterion of deafness with respect to ordinary intensities. Once the threshold of such a range of decreased acuity is attained, it takes comparatively little energy to cause the deficiency to disappear apparently completely. G. WILKINSON.

Gaps and Tonal Defects of Familial Degenerative Character. G. GRADENIGO. (*Nineteenth Congress of Ital. Soc. of Laryngol. and Otol.*, October 1922.)

The author in this paper refers to complete loss of hearing in one or more well-circumscribed regions of the tonal scale. When the deaf regions are found between two normally functioning regions he calls them "gaps" or "lacunæ," and "defects" when the deaf regions are at one of the extremities of the scale. He believes that our hearing power is not equal along the whole scale of sounds. If we measure the minimum energy necessary to produce the stimulus in the various segments of the scale we find that much less energy is needed in the central scale than at the two extremities. The most sensitive part of the scale ranges from *do*,[4] *i.e.*, 2000 v.d., to *sol*,[13] *i.e.*, about 1500 v.d. The auditory gaps and defects that we encounter clinically can be divided into two main groups: (1) Those following destructive processes in certain parts of the cochlea, and (2) those that do not depend upon an inflammatory cause but have a family degenerative character.

The author deals more particularly with the second group. In all the cases of tone defects following cerebro-spinal meningitis the vestibular apparatus was more or less seriously damaged. This is an important symptom differentiating it from the second group. We can recognise analogous conditions in congenital syphilis. The hereditary degenerative type of tone defects is much rarer than the first group; in fact there are only 4 cases reported in the literature.

In his long professional activity the author has met with 28 cases of progressive deafness belonging to twelve families. In the 28 cases the familial character of the affection was manifest in 22. There were 15 men and 3 women. The middle ear was always intact. In the more numerous group of these cases the upper part of the scale was lacking. The hearing, which was well preserved in the lower part of the scale, stopped sharply with a limit between 500 and 1000 v.d. The hearing was completely absent above this limit. In some others there was a complete loss at the lower end of the scale as well. The functioning region was normal or almost normal. In the second group of cases there was lacking a small area at the superior extremity of the scale in the ultramusical zone, *i.e.*, from 4000 to 6000 v.d. This is similar to the ordinary old-age deafness except that the defect extends lower down

in the scale. In a third group there was a circumscribed gap between 1500 and 3000 v.d. with the rest of the scale normal. There was a fourth group consisting of one case with a gap in the lower part between 48 and 192 v.d.

With many of these cases the tone scale appeared normal with the tuning forks, but with Stefanini's electro-telephonic acoumeter the gaps were discovered. The author also uses the church organ in testing the hearing. In all these patients the deafness was noted from the early years of life. In the families of the patients there were other persons with deafness but of different clinical forms. Discussing the cause of the nature of the lesions the author thinks it probable that there were lesions in the cochlear nuclei, and from the study of these cases he thinks it probable that there are at least five bundles of fibres in the cochlear nerve corresponding with different zones in the tone scale. He looks upon the condition as analogous to the defects in vision in disseminated sclerosis. J. K. M. DICKIE.

NOSE AND NASO-PHARYNX.

Solitary Nasal Polypi and Latent Antral Sinusitis. H. CABOCHE. (*Annales des Maladies de l'Oreille*, etc., March 1924.)

The type of polypus described, also called choanal, is single, unilateral and inserted by a long pedicle. The pedicle comes from the region of the middle meatus. This fact, and further, that in seven out of eleven cases seen by the writer sinusitis was present clinically, in the frontal, ethmoidal, or antral cells, demonstrates that the condition was associated with disease of the anterior sinuses, very rarely with the posterior group. Radiography was of value in arriving at the diagnosis in these cases. The writer advises snaring or punching away the polypus, but he is unable to decide whether operation on the sinus affected should be carried out, and whether radical or not, though he admits that the polypus tends to recur. GAVIN YOUNG.

A Study of the Mechanism and Treatment of Rhinorrhœa with Sneezing—a Local Manifestation of some Metabolic Disorder with an Analysis of 34 Cases. LOUIS HUBERT, M.D. (*Annals of Otology, Rhinology, and Laryngology*, Vol. xxxiii., No. 3, September 1924.)

Hubert classifies the causes of rhinorrhœa and sneezing as follows:

(1) Nasal disorders—(*a*) anatomical abnormalities, (*b*) nasal disorders.
(2) Anaphylaxis—(*a*) pollen, (*b*) protein: (1) food, (2) animal emanations, (3) bacteria.
(3) Intestinal disorders.
(4) Endocrin disorders—(*a*) hypothyroidism, (*b*) hyperthyroidism.
(5) Emotional disorders.

Nose and Naso-pharynx

In many cases no one cause is responsible and frequently two or more factors may be associated with the etiology. Only those cases which presented no apparent nasal disorder and no true hay fever were selected for study. Hubert considers that the accumulation of waste products from lowered metabolism, in persons suffering from hypothyroidism, acts as an irritant to the terminal filaments of the fifth cranial nerve supplying the nasal mucosa, while in subjects of hyperthyroidism it is the toxic products of the increased metabolism which act as the irritants. Cannon, of the Harvard University, has shown that during excitement there is an increased output of epinephrin, which in its turn increases metabolism. Rhinorrhœa from emotional disorders may therefore be due either to the stimulation of the secretory centres in the medulla, or to the increased output of epinephrin with increased metabolism.

Dr Hubert did not make use of the basal metabolism test in the classification and treatment of his cases but relied on the clinical examination.

Patients with a moist, flushed skin, more or less tachycardia, palpitation, and nervousness are tentatively regarded as belonging to the hyperthyroid group, whilst those with a dry skin, slow pulse, and mental dullness were classified as suffering from hypothyroidism. A large number could not be classified until the effects of treatment had been noted. Hypothyroid subjects were given $\frac{1}{10}$ gr. thyroid extract thrice daily, whilst hyperthyroidism was treated with quinine hydrobromate, 3 to 5 grs. in cachets, twice or thrice daily. It was found that quinine hydrobromate was also useful in those cases of rhinorrhœa due to emotional causes.

Thirty-four cases were examined, and of these 8 were males and 26 females. The average age was twenty-seven years, with variations from nine to seventy years. Duration of symptoms varied from three months to six years with an average of twenty-three months. There were 5 cases characteristic of hypothyroidism, 2 classifiable as hyperthyroidism, whilst 27 cases could not be clinically classified.

Of the 5 hypothyroid subjects 3 showed marked improvement under treatment whilst 2 were improved. One of the hyperthyroid cases was markedly improved and 1 improved. Ten of the unclassifiable cases were markedly improved, and of these 8 were treated with thyroid extract and 2 with quinine. There were 14 unclassifiable cases improved—8 with thyroid extract and 6 with quinine. The remaining 3 unclassifiable cases were not improved. For the purpose of recording results of treatment Hubert considered patients to be "markedly improved" when all rhinorrhœa and sneezing had ceased even after cessation of treatment for some time, whilst those in whom the symptoms only disappeared during the exhibition of treatment were regarded as "improved."

F. Holt Diggle.

Abstracts

Some Aspects of Nasal Accessory Sinus Disease. J. K. MILNE DICKIE, M.D., Ch.B., F.R.C.S. Edin. (*Canad. Med. Assoc. Journ.*, November 1924.)

The author confines his remarks to the symptoms and diagnosis of nasal accessory sinus disease, more particularly of the latent forms. The paper is based solely on personal observations of verified cases in the last few years. All doubtful cases have been excluded.

There were 14 cases of acute antrum suppuration, and in 10 of these there was pain in the cheek; in 3 it was felt in the eyebrow and not in the cheek; in 4 it was felt in the forehead as well as in the cheek; and in 1 there was no pain.

Chronic hyperplastic catarrh of the antrum is often very difficult to distinguish from chronic suppuration with polypi. Proof puncture of the antrum will not necessarily reveal the hyperplastic catarrhal condition, as the washing is not infrequently clear. Illumination does not always help in this condition. When there are nasal polypi, and when on puncturing the antrum the fluid will not wash through even though the needle is definitely in the antrum, the cavity can be safely presumed to be filled with polypi.

In chronic antral suppuration the lining was found at operation to be polypoid in 10 cases out of 36. In 16 of the 36 cases there were nasal polypi, and from this it is suggested that a history of recurrent nasal polypi should lead to a routine investigation of the antrum.

Chronic latent antrum suppuration may be present for years without giving rise to any symptoms definite enough to bring the patient to a rhinologist for treatment. The patient may have noticed only some phlegm in the throat, and may give a history of chronic bronchitis. The resemblance between the clinical pictures of latent antrum suppuration and tuberculosis of the lungs is very striking in many instances. In 1 case the sputum was so copious as to lead to a diagnosis of bronchiectasis.

Nervous symptoms were extremely common. Neurasthenia, debility, extreme nervousness, and emotionalism were frequently noted. Among the most extreme symptoms of this kind were paranoia in 1 case, 1 case of exophthalmic goitre which cleared up soon after the antra were dealt with, and several cases of chorea and asthma.

Pain was one of the predominant symptoms in 15 out of 30 cases of chronic antrum suppuration. In only 2 of these was it felt in the cheek. In the others unilateral headaches with maximum intensity in the occipital region were the commonest variety. Severe neuralgic pain referred to one of the branches of the trigeminal occurred in several cases.

In 11 cases of combined antral, frontal, and ethmoid suppuration, 8 had pain as a leading symptom.

Nose and Naso-pharynx

In diagnosis a thorough routine examination of all patients with history of chronic catarrh in any part of the upper respiratory tract will reveal a surprising number of latent paranasal sinus suppurations. The author never attributes nasal catarrh to a deviated septum, hypertrophied turbinates or even a small adenoid mass without first excluding sinus suppuration as far as possible. AUTHOR'S ABSTRACT.

Latent Nasal Accessory Sinus Disease. E. WATSON-WILLIAMS. (*Lancet*, 1924, Vol. ii., p. 1280.)

The author describes an interesting case in a man, aged 42, in whom nasal accessory sinus disease was suspected but no evidence found. He became depressed, unable to work, and his vision began to fail. He was admitted to hospital with a mucoid post-nasal discharge. Vision was: R. 6/12, L. 6/24. Visual fields much contracted. Wassermann negative. The right and left antra were found to contain thick pus, the culture giving *Staphylococcus aureus*. The right sphenoidal sinus contained sterile mucus. Colloidal silver was injected into all the cells. Mental condition improved, but vision remained the same, and, later, his mind relapsed to its dull, clouded condition. He refused operation and was not persuaded thereto for some six weeks. Double per-nasal antrostomy was then performed, and he made a complete and uneventful recovery, vision returning to 6/6.

MACLEOD YEARSLEY.

The Existence of Multiple Sphenoidal Sinuses and their Clinical Importance. Prof. PIETRO CALICETI. (*Annali di Laringologia ed Otologia, Rinologia e Faringologia*, Anno XXV., No. 3, May 1924.)

The normal sphenoidal sinuses are described as two, right and left, lying in the anterior part of the sphenoid bone and separated by a sagittal septum. They reach their complete development about the age of 20-25, and are of very variable dimensions. Small and medium sized sinuses are not of much clinical importance, but the larger sinuses are of very considerable interest. There are various prolongations which the author describes as: (*a*) The anterior which occupies the root of the smaller wing and the base of the anterior clinoid process; there may also be another offshoot round the optic canal. (*b*) The palatine process is at the antero-inferior corner of the sinus and lies on the roof of the pterygo-palatine fossa. (*c*) A pterygoid cavity extends into the root of the pterygoid process and may extend into the great wing. (*d*) A posterior prolongation may reach back as far as the pons Varolii or even to the margin of the foramen magnum. Besides these prolongations there are observed skulls with more than two sinuses, and three cases are recorded to show three different arrangements.

In the first case there were the two normal sinuses of fair size, and lying immediately above them in the upper portion of the body of the sphenoid were two other sinuses of smaller size. The latter were completely shut off from the inferior ones and opened by separate ostia into the nasal cavities. They lay in very close relation with the optic chiasma and the olfactory tracts.

The second type showed the two usual sinuses with a single sinus lying immediately above them and in front of the sella turcica. This sinus lay in very close relation with the optic canal and its contents, and lay rather more to the left than to the right side. It opened into the spheno-ethmoidal recess just above that of the left inferior sphenoidal sinus.

In the third case there were two large anterior sinuses which opened normally, and behind them and separated from them by a complete bony septum were two other large sphenoidal sinuses. These were separated from one another by a continuation of the septum between the two anterior sinuses. They lay below and behind the sella turcica, and no sign of any orifice could be found.

The author considers that the multiplicity of the sinuses and their varying size may be due to the varying amount of resistance to the ingrowing process from the nasal cavity presented by the sphenoid bone. The clinical importance of recognising the fact that there may be more than two sinuses is very great. F. C. ORMEROD.

Through-and-Through Drainage in the Treatment of Frontal Sinusitis. SAM E. ROBERTS, M.D., F.A.C.S. (*Annals of Otology, Rhinology, and Laryngology*, Vol. xxxiii., No. 3, September 1924.)

Roberts considers that the three principal reasons for the failure in drainage operations on the frontal sinus are; an inadequate nasal opening; closure by cicatricial contraction of an apparently adequate intranasal opening; and failure to free the sinus of infected polypoid tissue and carious bone.

A comparatively small nasal opening is ample if it remains patent, and polypoid tissue in the sinus will ultimately disappear with free ventilation and drainage.

Roberts adopts the "Lothrop" technique, in which the frontal sinus is exposed by a small opening in its anterior wall, all diseased tissue is curetted away and the naso-frontal canal enlarged by rasps and burrs.

The rasp, it is advised, should be directed towards the septum so as to avoid injury to the surrounding ethmoid cells if healthy.

A rubber catheter, usually a 20-French, is inserted through the fronto-nasal canal from the external wound into the nose. About an inch of the tube projects externally, and the intra-nasal portion, some

three or four inches in length, is made to project backwards towards the post-nasal space.

A safety-pin in the external portion anchors the tube, which in its frontal portion is here and there fenestrated. The tube and sinus are irrigated before leaving the operating table, and this is repeated every hour for the first twenty-four hours. After the first day the irrigations are continued every four hours and once at night. The patient, as a rule, leaves the hospital at the end of a week but continues with the irrigations and reports at the hospital daily. At these visits the intra-nasal portion of the tube is brought forwards by the surgeon, so as to prevent the formation of adhesions anteriorly, and the sinus is irrigated.

The tube is retained for, at least, three weeks, and in chronic or severe cases up to five or six weeks.

After the tube is removed the soft parts are allowed to fall together and retained in position either with strapping or a single stitch. Attempts at dilatation with bougies are contra-indicated.

F. Holt Diggle.

THE LARYNX.

Fracture of the Larynx. Thomas F. Mullen, M.D., Pocatello, Idaho. (*Annals of Surgery*, Vol. lxxx., pp. 660-669, December 1924.)

Fracture of the larynx is not uncommon, although few cases have been recorded. The author considers that a considerable number of simple fissures are undiagnosed and treated as simple contusions of the neck. That this condition is not more common is attributed to the elasticity of the tissues involved, the protection afforded by the lower jaw, and to the mobility of the larynx.

As a rule, the thyroid is the cartilage involved. Amongst 75 cases recorded the thyroid was found to have been fractured in 29, and the cricoid in 11 cases. Fractures due to spreading or compression of the anterior angle of the thyroid cartilage are probably the most common. Fracture of the cricoid, and multiple fractures, are usually accompanied by severe injury to the adjacent structures, *e.g.* the vagus or other nerves, or the large blood vessels.

Ætiology.—Direct or indirect force may act in producing these injuries. Indirect force causing such fractures may be applied in blowing a wind instrument, or in attempting to dislodge a foreign body from the throat.

Associated with the fracture may be bleeding—abscess formation or necrosis of the cartilages. In the compound fracture there is the danger of infection.

Symptoms.—The usual symptoms are local pain on swallowing or on palpation of the neck, along with tenderness and swelling, and

some interference with phonation, mastication, and deglutition. Hæmoptysis indicated laceration of the mucous membrane. Dyspnœa may be marked and of extreme urgency, and asphyxia may even occur in patients who are apparently convalescent, and may be accompanied by sudden and extensive emphysema.

Laryngoscopic examination may reveal a pale œdema or congested swelling with hæmorrhages, and stenosis of the glottis may be caused by enormous swelling of the ventricular bands. The symptoms may rapidly progress to a fatal issue before anything can be done, or may be delayed even until after the patient has apparently recovered from the original injury.

Prognosis.—Every case is of serious nature, and any opinion as to the final result must be reserved. Death occurred in from 70 to 80 per cent., multiple fractures giving the highest percentage. In the event of recovery the voice may be permanently altered, and hoarseness may persist for a very long time.

Treatment.—The patient should be kept quiet, with complete silence and abstinence from food, nourishment being given per rectum. The surgeon should be prepared at once to deal promptly—by means of tracheotomy—with any urgent dyspnœa.

It may be necessary to aspirate through the tracheal cannula any blood and mucus which have entered the lungs. This may be carried out through the bronchoscope, following which bronchoscopic insufflation of oxygen may be found most valuable. The author records three cases—all adult males. In the first there was a compound fracture of the thyroid cartilage. Tracheotomy was performed, followed by thyro-fissure. The arytenoids were found detached and hanging by mucous membrane, with the vocal cords relaxed. The fragments of the thyroid cartilage were sutured with fine catgut, also the arytenoids, bleeding points were secured and the wound closed in layers. The patient made an excellent recovery.

In the second, the patient's throat was struck by a piece of wood from a saw causing dyspnœa, cyanosis, and emphysema extending over the neck and occiput. A low tracheotomy was performed, followed by thyro-fissure. The right thyroid cartilage was found to be fractured obliquely and comminuted. The fragments were sutured and the patient recovered with a husky voice.

The third case was a soldier, who was struck in the neck by a spent piece of shell. A few hours after the injury he suddenly became cyanosed, the swelling in the neck increased, and death occurred in a few moments in spite of immediate tracheotomy and artificial respiration.

An extensive bibliography accompanies the paper.

IRWIN MOORE.

The Larynx

Cancer of the Larynx. Z. SREBRNY, Warsaw. (*Zentralblatt für Hals-, Nasen-, und Ohrenheilkunde*, 25th December 1924.)

The author describes three cases of carcinoma of the larynx. He considers that the diagnosis of this condition by indirect methods is very difficult, and states that the word "papilloma" is very often applied to a carcinoma lying deep in the subglottic region with papilliform processes growing up through the glottic chink. In all cases portions should be removed for histological examination, and if necessary a laryngo-fissure should be performed to make sure of the diagnosis. The author considers that X-rays and radium are supplanting operation in this type of case but they must be applied at the right moment, which can only be determined by making an early histological examination. F. C. ORMEROD.

An Interesting Case of Laryngeal Stenosis. Dr E. M. JOSEPHSON. (*Laryngoscope*, Vol. xxxiii., No. 10, p. 790.)

A labourer, aged 50, complained of hoarseness and dyspnœa during eight days of acute onset with chill, fever, and coughing. On the third day the condition suddenly grew worse. There was a previous history of lues and he was dyspnœic, cyanosed and aphonic. The larynx showed a laryngitis and infiltration of the posterior half of the right cord. The Wassermann test was strongly positive but salvarsan did not alter matters. Tracheotomy relieved the respiratory distress and laryngoscopy showed a tumour bulging and displacing the right cord and obstructing the glottis almost completely. A laryngo-fissure was undertaken and a large, dense, sharply demarcated tumour occupied the right half of the larynx, displacing the true and false cords and obliterating the sinus of Morgagni. Opposite the posterior pole of the tumour was found a structure which has recently been described by the author. This consists of a sinus situated below the true cords and cricoarytenoid joint into which a group of glands opens by means of a common duct and resembles the sublingual and submaxillary glands in structure. Submucous enucleation of the tumour was performed, and at the bottom of the wound lay the arytenoid cartilage apparently undergoing dry gangrene, a result of interference with the blood supply. The tumour tissue showed microscopically that it originated as an inflammation of this laryngeal group of glands. While the luetic and tubercular origin must be kept in mind, the changes suggested that it was an undescribed clinical entity—a stenosis of the larynx caused by inflammation of a group of laryngeal glands situated below the posterior part of the true vocal cords. ANDREW CAMPBELL.

Abstracts

A Case of Intralaryngeal and Intratracheal Thyroid. G. GRADENIGO. (*Arch. Ital. di Otol.*, Vol. xxxv., p. 148, April 1924.)

The presence of thyroid tissue in the interior of the larynx or trachea is decidedly rare. The author reports two recent cases. The first was a youth of 22 who came complaining of difficulty in breathing. The vocal cords were normal and mobile. On deep inspiration a mass was seen attached by a broad base to the anterior and left side of the subglottic region about the level of the two first rings of the trachea. The surface was nodular and of reddish colour. The lumen of the trachea was reduced about one-half. The patient was treated with potassium iodide and the difficulty in breathing rapidly disappeared. Operation was refused.

The second case was a man of 60 who had never had any disturbance in his voice. In June 1922, he had had a little difficulty in breathing which gradually became worse while his voice remained normal. In September 1922, he brought up a little blood at different times. Once a small piece of tissue came up with the blood. After January 1923 there was no more bleeding. In September 1923, the disturbance of breathing had become alarming, and treatment by various internists had been ineffective. In December his breathing had become very noisy and his voice was somewhat affected. With the laryngoscope the pharynx and larynx were normal. The vocal cords were perfectly normal and below them was seen a red tumour mass. There was no ulceration and the mass seemed to be attached with a large base to the whole of the subglottic region, leaving only about one-fifth of the tube unoccupied. The thyroid gland was not enlarged. It did not appear safe to touch the tumour through the natural opening. Under local anæsthesia tracheotomy was performed. The opening was enlarged up to the lower edge of the thyroid cartilage. The tumour mass extended all over the cricoid region and the first two rings of the trachea. It was removed with a punch and the base scraped with a sharp spoon. There was very little hæmorrhage and the recovery was uneventful. Professor Tassi reported that in general it was a plexiform endothelioma with sarcomatous degeneration in places. Its origin was most probably from thyroid tissue as there was a large amount of colloid substance.

J. K. M. DICKIE.

Professional Dysphonias in Singers. CARLO BIAGGI. (*Archives Internationales de Laryngologie*, January 1925.)

This is a study of voice affections peculiar to singers.

The author divides the causes of dysphonia into three groups:—

(1) Chronic dysphonias secondary to acute forms of laryngitis.

(2) Affections due to over-use of the voice.

(3) Affections due to faulty voice production.

(1) In the first group the free edge of the vocal cord is found to be rounded and streaked with enlarged capillaries. In the more advanced cases the upper surface of the cord is grooved.

The laryngologist can, however, learn more by listening to the voice than by laryngoscopy. If the scale is correctly and clearly interpreted, the damage is limited to the mucous membrane and the subjacent musculature is not affected. In the latter case the cord tension is diminished and the high notes are in abeyance.

(2) In this group it is found laryngoscopically that there is a slight weakness of the cords. On getting the patient to sing a series of "piqué" notes, it is found that there is a lack of co-ordination in the cord movements and the voice is sometimes altered to the extent of becoming bitonal.

In the more advanced cases are found the true singer's nodules.

The author proceeds to quote a number of examples where operatic singers have strained their voices by singing parts to which their voices were not suited, and where too great a strain was placed on their vocal powers.

(3) Group 3 analyses professional dysphonia due to errors of technique.

MICHAEL VLASTO.

REVIEWS OF BOOKS

A Manual of Diseases of the Nose, Throat, and Ear. By E. B. GLEASON, M.D., LL.D. Philadelphia and London: W. B. Saunders Company. 1924.

This is the fifth edition of a manual "written to supply students and general practitioners with the essential facts of Rhinology, Laryngology, and Otology in as concise a form as possible." The volume contains 660 pages. It opens with a brief description of the ordinary methods of examination. The diseases of the nose, pharynx, larynx, and ear are then dealt with, those of each region being preceded by a short account of the main anatomical features of the region.

The arrangement of the matter is sometimes perplexing. Whilst deviation of the nasal septum is considered under the heading of "Diseases of the Nasal Septum," "ecchondroses and exostoses of the septum" are the subject of a special section interpolated between the descriptions of "hyperplastic rhinitis and hypertrophic rhinitis" and "atrophic rhinitis." Fibroma of the nasopharynx is sought for in vain in the chapter dealing with diseases of the nasopharynx. It is found