

and the posterior or larger pocket, formed in the following manner (see Fig. 1690, 1, 2, and 3). After the mucous membrane of the tegmen tympani has been reflected over the chorda tympani, it ascends again to reach the upper edge of the drum membrane, in order to form the inner or mucous layer of the tympanic membrane; therefore the chorda tympani nerve is found at the free edge of a fold of mucous membrane which, with the membrana tympani, forms a groove opening downward (Fig. 1690, 3). Since the chorda tympani clings to the inner surface of the neck of the malleus, this groove or pocket is divided into two compartments, named as already mentioned. They were first described by von Troeltsch in 1856. He asserted that the posterior one contained in its structure traces of the fibrous layer of the tympanic membrane, but this is denied by Gruber and Bochdalek. The posterior pouch is about 3 mm. high and 4 mm. broad. This pouch is best seen when the tympanic membrane is viewed from within, but it can also be seen from without when the tympanic membrane is thin and well illuminated.

The anterior pouch lies in front of the malleus, and is much smaller than the posterior pouch. Its inner wall is composed of mucous membrane only. It contains "all the elements which proceed from or enter the Glaserian fissure."

There is a third or middle pouch of the tympanic membrane described by Prussak and Gustav Brunner (Fig. 1691, 4). This cavity is bounded behind by the neck of the hammer, below by the upper surface of the short process of the malleus, in front by the membrana flaccida, and above by a ligamentous band, the *ligamentum mallei externum*, which is inserted between the *margo tympanica* and the *spina mallei*. This cavity is separated from the anterior tympanic pouch by the upper blind end of the latter abutting on the neck of the hammer; posteriorly, it communicates with the tympanic cavity by a good-sized opening, above the position of the posterior tympanic pouch. This pouch, being thus placed in communication with the tympanum, may become filled with mucus or pus, and consequently ruptured.

Charles H. Burnett.

- ¹ Archiv f. Ohrenheilkunde, Bd. xi., pp. 99-113.
- ² Trautmann: Archiv f. Ohrenheilkunde, Bd. viii., 1873.
- ³ Trautmann: *Loc. cit.*, p. 28.
- ⁴ Kessel: Archiv f. Ohrenheilkunde, Bd. viii., 1874.
- ⁵ Gruber: Studien über das Trommelfell, Wien, 1867.
- ⁶ Gewebelehre, p. 707.
- ⁷ Helmholtz: Mechanism of Ossicles of the Ear and the Membrana Tympani.
- ⁸ Gruber: *Op. cit.*, p. 35.
- ⁹ Archives of Otolaryngology, 1885, p. 46.
- ¹⁰ Gustav Brunner: Monatschr. für Ohrenheilk., No. 1, 1872.
- ¹¹ Monatschrift f. Ohrenheilkunde, No. 3, 1872.
- ¹² Archiv für Ohrenheilkunde, Bd. xi., 1876.
- ¹³ Dr. C. J. Blake: Transactions American Otolaryngological Society, vol. 1, p. 543.

EAR DISEASES: ACUTE CATARRHAL OR NON-SUPPURATIVE INFLAMMATION OF THE MIDDLE EAR.—GENERAL CONSIDERATIONS.—In the beginning of an acute inflammation of the middle ear, and not infrequently for a considerable length of time after the apparent onset of the attack, it is impossible to determine whether the case should be classified as one of a suppurative or as one of a non-suppurative character. It is only after the acme of the disease has been reached, and after it has been ascertained what is the character of the inflammatory product that is poured out into the tympanic cavity, that we are warranted in classifying the particular case under observation as belonging to the one or the other category. If the inflammatory product is composed merely of serum, intermingled or not, as the case may be, with a few blood and lymphoid corpuscles, it is generally customary to speak of such an attack as an acute catarrhal or non-suppurative inflammation of the middle ear. But if the product under consideration quickly assumes a purulent character, and especially if the membrana tympani gives way and allows it to flow out into the external auditory canal for a period of one or more days, it is proper to designate such a case as one

of acute suppurative inflammation of the middle ear. It is difficult to resist the belief that in both of these types or varieties of middle-ear inflammation the underlying cause is an infection; some milder forms of bacteria serving as the exciting factors in the non-suppurative variety, while in the other variety the more virulent micro-organisms must be held responsible for the suppuration and for the actual destruction of tissue.

An acute catarrhal inflammation of the middle ear is a very common affection in the northern and middle zones. A large proportion of the cases designated by the laity as cases of "earache" will be found to belong in this category of acute catarrhal inflammations of the middle ear.

ETIOLOGY.—Undue exposure to cold while the body is in a heated condition, and especially to a draught of cold air, is by far the commonest cause of an acute catarrhal inflammation of the middle ear. Ducking and diving under water (especially salt water) is also occasionally a cause of such an attack, although in the majority of instances the result is a suppurative rather than a non-suppurative form of inflammation. Water may also enter the tympanum in the treatment of the nasal cavities by means of the nasal douche or the posterior nares syringe, or even when water is drawn into the nostrils by the patient himself. Finally, the disease may develop as a consequence or accompaniment of certain infectious diseases such as scarlet fever, measles, smallpox, whooping-cough, and cerebro-spinal meningitis.

SYMPTOMS.—*Pain.*—Adults suddenly find themselves seized with an agonizing pain in one, rarely in both, ears. If they are of an observing turn of mind, they will recall the fact, when they are thus seized with pain, that the throat felt sore and thickened for a few hours before the attack began. This, however, is not always the case. The pain is usually sudden in origin and goes on increasing in intensity until the rupture of a distended veinlet in the vicinity of Shrapnell's membrane, or of an epidermal sac containing blood-stained serum, or perhaps even of the membrana tympani itself, puts an end to the tension of the sensitive parts.

A Sense of Fullness in the Ear.—A marked sense of fullness or of stuffiness in the ear is another very annoying subjective symptom of this disease. It is likely to last as long as there is any appreciable swelling of the walls of the Eustachian tube.

Tinnitus Aurium.—This symptom, common to affections of the tympanum, is often a violent one in acute inflammation. In the first stages it is usually of a puffing or blowing character.

Resonance of One's Own Voice.—This symptom, sometimes termed *autophony*, is to many patients very annoying. It disappears with the subsidence of the swelling of the inflamed tympanic mucous membrane.

Impairment of the Hearing.—The extent to which the hearing is affected varies greatly in the different cases, and bears no fixed relationship to the degree of hyperemia and infiltration manifested by the visible portions of the membrana tympani. In most cases the hearing is not sufficiently impaired—even when both ears are involved—to exclude the patient from the pleasures of ordinary conversation. Now and then, however, the degree of impairment is very marked, and in these particular cases it is difficult to resist the belief that the labyrinthine cavities and structures are more or less involved in the inflammation.

Constitutional Disturbance.—In adults there is usually no rise in the body temperature and very little if any acceleration of the pulse rate; but in young children there may be well-marked feverishness, with a temperature reaching as high as 103° or even 104° F. In some cases the child may manifest an unnatural drowsiness, but in others the opposite mental state—that of excitableness and fretfulness—will be observed.

APPEARANCES PRESENTED BY THE MEMBRANA TYMPANI.—The picture presented by the drum membrane varies according to the stage which the disease has reached at the time when the examination is made. If the mem-

brane is seen at an early period of the attack, before pain has become the prominent symptom, the peripheral portions, especially the upper, and the region of the manubrium mallei will show evidences of congestion and beginning infiltration (Fig. 24, Plate xxv.). Farther along in the attack it may be found that the epidermis, in the vicinity of Shrapnell's membrane, has been pushed outward in the form of a bleb by exuded serum or even by pure blood that has escaped from a ruptured blood-vessel. In other cases the exudation remains confined chiefly to the tympanic cavity; in which event bulging of the drum membrane—more noticeably of its posterior half—will be the most conspicuous alteration. Finally, if the examination is made at a time when a watery, perhaps blood-stained, fluid is escaping from the orifice of the external auditory canal, it will be seen that all the usual landmarks have disappeared and that at the farther (inner) end of the canal nothing but a soaked epidermal surface, of very irregular form, can be distinguished.

DIFFERENTIAL DIAGNOSIS.—There are only two other pathological processes which might perhaps be mistaken for the disease which is now under consideration. These are an acute eczematous inflammation of the inner half of the external auditory canal, involving the dermoid aspect of the membrana tympani, and an acute suppurative inflammation of the middle ear. So far as the eczema is concerned, the previous history of the case, the absence or the insignificance of the pain, the small degree of the impairment of the hearing, the probable absence of tinnitus, and the marked hyperemia and infiltration of the skin covering the inner half of the external auditory canal,—all these facts will warrant us in assuming that we are dealing with this malady and not with an acute inflammation of middle-ear origin. On the other hand, no degree of familiarity with the pathological pictures presented by the membrana tympani and no degree of care in studying the other data furnished by the case in hand will enable the expert otologist to predict, with any degree of certainty, whether the disease will eventually prove to belong to the non-suppurative variety or whether it will assume the more serious characteristics of an acute suppurative inflammation. Fortunately, it is not a matter of any great practical importance that he should be able, at this comparatively early stage of the inflammation, to differentiate between the two. In either event he would employ the same plan of treatment; a change being called for only when it becomes clear that he is dealing with a disease the essential nature of which is an invasion of infective micro-organisms.

PROGNOSIS.—The prognosis in this disease is almost unqualifiedly favorable. The middle ear, after the subsidence of the acute attack, returns slowly to a condition of health, and it is only in a few exceptional cases that some slight permanent impairment of the hearing remains after the attack has entirely subsided.

TREATMENT.—An acute inflammation of the tympanum usually requires active treatment, especially in adults. The practitioner should at once combat the striking symptom, that is, the pain. The first means to be tried is the hot douche. Water of the temperature of from 100° to 105° F. should be allowed to run into the ear, from a fountain syringe or the like. The stream of water should be continuous; hence, the piston syringe is of no use under these conditions. This instrument is only valuable as a means of cleaning the ear, or of removing a foreign body. In case the warm douche fails to give relief in a few minutes, and if the patient is not an infant or a very young child, from one to four or even six leeches should be applied upon the tragus, according to the severity of the symptoms and the age of the patient. In addition to this the patient should usually be confined to his room, and be in bed, while the general indications of the disease, the condition of the bowels, the skin and the pharynx, are met by appropriate treatment. Usually the leeches will soon subdue the pain, and appropriate hygiene, without drugs, will allow the case to go on to recovery. It will sometimes be necessary to repeat the leeching and to continue the

use of the douche for some days; opium may also be required, but opium without local blood-letting will be of little or no service. Some authorities speak well of the instillation of a solution of sulphate of atropine, gr. ij. ad ℥ i., and of hydrochlorate of cocaine in a four-per-cent. solution, instead of the warm douche, but these remedies will not avail, except in mild cases. Hot vapors are sometimes of service. An old remedy is a poultice applied in the canal. The "heart" of a hot onion is especially used. Such a poultice will quiet the pain in many cases, but since it favors suppuration, and may lead to suppuration of the drumhead, its use is not generally proper.

Inasmuch as the question of paracentesis of the membrana tympani will be discussed by the writer of the article on the suppurative form of acute inflammation of the middle ear, it will not be necessary for me to say anything on this subject.

As soon as the acute symptoms have subsided it will be found advantageous to practise Politzer's method of inflation daily, and to wash the pharynx freely with a saturated aqueous solution of warm chlorate of potassium, Vichy, or the like. This treatment should be persisted in until the hearing power becomes normal, as tested by the watch, tuning-fork, and the human voice.

D. B. St. John Roosa.

EAR DISEASES: ACUTE SUPPURATIVE INFLAMMATION OF THE MIDDLE EAR.—Among the numerous diseases to which humanity is liable there is probably no single one which is capable of causing so much suffering for a short time, or is more dangerous to life, than an acute suppurative inflammation of the middle ear; to say nothing of the liability of the disease to cause the impairment if not the destruction of the function of one of the most important organs of special sense, on which are largely dependent the giving of knowledge to the individual, his social position in life, and his general well-being. Yet until within a very few years this disease has been treated as though it were a necessity in every household, a condition through which every child should pass; and even at the present time this way of looking at the disease prevails to some extent.

The distinction between an acute catarrhal inflammation of the middle ear and an acute suppurative inflammation is not always well marked in the early stages of the disease; the suppurative form being doubtless in many instances the outcome of the catarrhal, in consequence of infection or of some other unfavorable circumstance.

Acute suppurative otitis media constitutes from five to ten per cent. of all ear diseases, according to the character of the climate in which the patient resides; being more prevalent in one which is characterized by frequent, rapid, and extreme changes in temperature, and by the prevalence, to a greater or less degree, of dampness. Then, again, the disease is of more frequent occurrence among the poor, among whom the hygienic conditions are especially unfavorable.

The onset of the disease is usually sudden and is attended by violent febrile symptoms lasting for from a few hours to several days; the remission of the most severe symptoms generally occurs soon after the rupture of the drumhead, an occurrence which liberates the pent-up purulent exudate. The discovery of this discharge in the auditory canal is often the first indication of ear disease and even the first circumstance which leads the physician to think of the existence of any trouble in that organ.

The anatomy of the upper portion of the tympanic cavity, known as the epitympanic recess, is especially favorable for the development of suppurative inflammation. Enclosed within this little dome are the bodies of the two larger ossicles, the malleus and incus, and the ligamentous bands which hold these in position—redundations of mucous membrane and connective tissue. Frequently this network of tissue is so developed as to divide the tympanum into two distinct parts. Opening