

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 Bochdaleck. 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. xl., 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. xl., 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

into this upper part of the tympanum posteriorly are the aditus, mastoid antrum, and mastoid cells. In the anterior wall of the lower or main portion, at about its centre or a little below, is the orifice of the Eustachian tube, and on the medial wall are the two fenestræ of the labyrinth—the fenestra rotunda, closed by a membrane, and the fenestra ovalis, closed by a membrane on which rests the foot plate of the stapes. Two important nerves are liable to be involved in an inflammatory process in the middle ear—the facial and the chorda tympani. The facial courses along the posterior and medial wall, usually being enclosed in its bony canal; sometimes, however, it is covered only by mucous membrane, thus exposing it to any inflammation that may be present. The chorda tympani runs free, arching over the middle portion of the cavity from behind forward, near the upper margin of the membrana tympani. Involvement of the latter in an inflammatory process would be of comparatively little moment, while inflammation of the facial might be a more serious matter. The anastomoses between the vessels of the tympanum and those of the labyrinth afford a means whereby exudation may take place within the labyrinth, injuring the hearing and sometimes giving rise to inflammation and suppurating disease in these parts. And then again the intimate relationship between the tympanic cavity and the membranes of the brain must be borne in mind; the paths of communication between the two being often so numerous as to afford the most favorable conditions for pyogenic infection of the structures within the cranial cavity. In children it is not uncommon to find, as a result of the incomplete ossification of the petro-squamosal suture, an opening of considerable size in the roof of the tympanic cavity, in consequence of which the dura mater is in contact with the mucous membrane lining the tympanum or may even dip down into this cavity. In such cases an acute inflammation of the middle ear would encounter but little resistance in spreading to the intracranial tissues and might there cause more or less serious disturbance.

BACTERIOLOGY.—Research has been made by a number of careful observers, both in this country and abroad, in this interesting and important department of medicine, for the purpose of determining, if possible, the specific micro-organisms, or particular combination of organisms, which produce this form of tympanic inflammation; but, so far as can be determined with any degree of accuracy, no special microbe or constant combination of microbes is to be held responsible for this disease. It was at one time considered that the streptococcus was the most constant etiological factor in the serious and fatal cases of ear disease, but recent statistics have shown that the staphylococcus was present in about as many fatal cases as the streptococcus. During the past four years, at the Rhode Island Hospital, the pus examined has shown, in the milder forms of inflammation, a great variety of organisms, various combinations, and some which could not be classified. In the more severe cases, in which septic intoxication was pronounced, pure cultures of staphylococcus were found in the majority of cases; the streptococcus being present, however, in a larger number of the cases in which the mastoid was involved. In comparing the two principal kinds of infection, the staphylococcus and the streptococcus, from a symptomatic standpoint, it was found that in the cases in which the Staphylococcus pyogenes aureus was present in pure cultures, the symptoms were more acute, and the bodily temperature was higher; the pain in the region of the ear was more intense and continued longer after perforation of the drumhead had been established either spontaneously or by artificial means; the discharge of pus was more profuse, the pus itself being more acrid, as manifested by excoriations of the tissues of the external ear and, after opening of the mastoid process, by erosions of the skin about the wound and by the frequent sloughing out of the stitches; and, finally, the general course of the disease was more rapid, demanding operation sooner, on account of the extension of the disease into the mastoid cells. On the other hand, an invasion by staphylococci

seemed to be less often accompanied by swelling and redness of the mastoid integuments than was the case when the infection was due to the streptococcus. In a carefully prepared report of one hundred and one cases by Dr. J. Orne Green the examinations show the great variety of micro-organisms which are present in this disease. These statistics show practically the same variety and classification as had previously been shown by most of the careful and experienced observers. Dr. Green's principal object in his report was to show the character of the original infection of the tympanum before an opening of the drumhead had exposed the cavity to secondary infection. After making the canal as nearly aseptic as possible the drumhead was incised and the artificial culture was made from the first drop of pus. In seventy-three out of the one hundred and one cases pure cultures were reported as follows:

Staphylococcus (albus, 8; aureus, 9; variety not stated, 19)	26
Streptococcus	19
Pneumococcus	10
Bacillus diphtheria	2
Bacillus pyocyaneus	3
A capsule bacillus	3
Leaving 28 cases of mixed infection, or 28 per cent.	

Flesch and Haug found gonococcus.

PATHOLOGY.—From the anatomical make-up of the epitympanic recess we can readily understand what a perfect incubator for micro-organisms this space must make when in a state of inflammation. With the large surface of mucous membrane—which, as has been said, "if spread out would be as large as a silver quarter,"—enclosed within a cavity no larger than a dried pea, we can imagine that when hyperæmia and infiltration of the mucous membrane take place, as must happen in acute inflammation, considerable pressure must result and, in consequence, the circulation and nourishment of the parts must be greatly interfered with. This, together with the pressure of the surfaces of the folds of mucous membrane upon each other, results in necrosis of the epithelial surfaces and even—as the disease progresses—of the subepithelial tissues. As soon as swelling begins there is thrown off an exudation consisting of pus cells, mixed later with blood and mucus, in which are found the bacteria previously spoken of. The purulent exudate is formed over the whole surface of the mucous membrane, extending into the orifice of the Eustachian tube and into the mastoid antrum and cells. It is often diffused into the tissue substance itself, and small abscesses have been found between the mucous membrane and the surface of the bone. When the inflammation takes place in the presence of scarlet fever the infection seems intensely virulent and tissue necrosis takes place very rapidly. This is especially noticeable in the rapid perforation of the drumhead. In some cases the necrosis extends to the ossicles and to the walls of the tympanum quite early in the disease. As was stated in an earlier paragraph, the epitympanic recess is sometimes quite cut off from the lower part of the tympanum. When this happens the swollen mucous membrane is forced outward above the short process of the malleus, pushing out Shrapnell's membrane, or the posterior upper portion of the membrana propria. Sometimes, before perforation takes place, the protrusion of the mucous membrane pushes this flaccid portion outward to such an extent that it will hang down over the membrana propria, obscuring it more or less and being often mistaken for a polypus. But it is quite unlike a polypus, as will be seen if care is used in the examination, and, furthermore, if incised, it will discharge pus. In some cases in which this point of bulging is incised, there will take place, after the lapse of a few days, a prolapse of the mucous membrane. This last condition is even more apt than that described above to be mistaken for a polyp. If this nipple-like projection continues for a number of days after incision and after proper treatment has been carried out, the case must be closely watched for other indications of mastoid involvement, as this is one of the important symptoms of that complication. Sometimes, instead of forming this polyp-shaped mass,

the pus dissects its way between the membranous portion of the canal and the bone, and forms an abscess. In children it is quite common for this dissection of pus to continue along the posterior wall of the canal, between the bone and the periosteum, and to find its way out upon the outer surface of the mastoid process, where it forms a post-auricular abscess. In these cases it has been the experience of most surgeons, who have looked for it, to find pus in the mastoid cells. The pus, after reaching the post-auricular region, frequently finds its way into the glandular and cellular tissues of the neck. The most common course of the disease, however, is to extend downward from the epitympanic space, in the direction of least resistance, into the lower part of the tympanum, involving the tissues in this region, and causing marked bulging of the drumhead proper, with swelling, inflammation, and œdema of its tissues. In these cases the perforation is more frequently located in the posterior half of the drumhead, about half-way between the tip of the manubrium and the posterior margin, or a trifle higher up, near the incudo-stapedial articulation. Early in this form of the inflammation the Eustachian tube becomes closed by swelling of its lining mucous membrane. Doubtless in many cases, if the tube could be kept open, the more serious complications of the disease might be avoided.

ETIOLOGY.—The causes of this disease are many and varied. The primary causes may be divided into two general classes: *External*, including traumatic and climatic; *Internal*, including inflammatory and circulatory. The secondary cause, in both classes, is pyogenic infection.

Among the external traumatic causes are the *direct*—as by operative procedures on the drumhead or in the middle ear; by violence to the parts, *e.g.*, by forcible removal of foreign bodies; by forcible syringing; by a direct stab wound of the drumhead; by boxing the ear; by greatly increased pressure upon the drumhead—*e.g.*, by compressed air, as in tunnelling and mining, in diving, and in concussion of the air by an explosion or by the firing of a cannon; and, finally, by scalding, by local irritants, by caustics, etc. Among the *indirect* causes are contusion of the skull, as from a blow or a fall.

Climatic causes are exposure to cold and wet, or allowing the wind to blow for a long while in the ear. Then there are causes which are external to the middle ear, as for example, an extension of inflammatory conditions of the external auditory canal to the tissues of the drumhead, and from thence to its mucous coat, and ultimately to the entire lining membrane of the middle ear. Among these inflammatory conditions are: external otitis, both diffuse and circumscribed, eczema, hardened and impacted cerumen, and foreign bodies which have been embedded in the canal for a long time. I recall a case of a Russian who applied to me for relief from an earache. I removed from his canal a piece of lead pencil three-fourths of an inch long. When he saw it he remembered having hidden it in his ear eight years before while in the Russian army. Dr. Buck reports cases of gouty inflammations of the canal which extended to the middle ear. There is still another cause which is often placed in this category. I refer to the development of an inflammation in the middle ear from the entrance of cold water into the external auditory canal during sea bathing. In some cases this is doubtless the correct explanation of the otitis media, but, in a larger number, it is more probable that the cold water is forced into the tympanum from the naso-pharynx, during the act of blowing the nose. In a similar way solutions of salt and water and other solutions used for cleansing and for medication of the mucous membrane of the nose and naso-pharynx, in catarrhal conditions or after operations, may be forced into the middle ear. In like manner secretions of pus, or muco-pus, coming from the nasal accessory sinus, or the discharge which is present in "head colds," may be driven into the tube and tympanic cavity, if the patient is in the habit of blowing the nose violently. Inflammation of the middle ear has occasionally occurred after

nasal operations—such as straightening the nasal septum or the removal of spurs and ridges—and also from cauterization of the turbinated bodies. Now and then such an inflammation follows the operation for the removal of adenoids.

According to the published reports, there have been cases in which foreign bodies have found their way through the Eustachian tube, from the naso-pharynx, into the middle ear. I had a case in which a spear of grass, over an inch long, worked its way through the tube from the throat and set up an acute inflammation of the middle ear which continued for several months. Finally, while mopping out the ear, I discovered this dark-pointed object lying in the tympanum, and grasping it with the forceps, I pulled out through the perforation in the drum membrane what proved to be a piece of grass. Almost immediately afterward the suppuration ceased and the perforation healed.

Internal Causes of Inflammation.—In this list influenza or la grippe has been responsible for probably a larger number of cases of suppurative inflammation of the middle ear and its complications than can be attributed to any other one disease. Among the other causes may be mentioned nearly all of the exanthematous diseases, especially scarlet fever and measles. Then come "cold in the head," or acute naso-pharyngeal catarrh, diphtheria, smallpox, typhus and typhoid fevers, whooping-cough, syphilis, erysipelas, tuberculosis, diabetes, etc. In children hyperplasia of the lymphoid tissue in the naso-pharynx—or "adenoids," as they are commonly termed—is probably the most common predisposing cause. When these hypertrophied glands are present the slightest exposure to cold and wet is liable to precipitate an attack of inflammation of the middle ear; and if scarlet fever, measles, or diphtheria should supervene the chances of escaping serious trouble would be greatly lessened.

Circulatory Conditions.—There is yet some mystery regarding these conditions, but we know that in cases of pneumonia there occasionally occurs an acute suppurative inflammation of the middle ear, usually on the same side as the affected lung. There is no direct extension, so far as can be seen, but it is evident that the disturbance in the circulation of the lung does in some way influence the circulation in the middle ear, and as a result engorgement and inflammation take place. One or two cases of this nature may appropriately be cited here. A hack driver, who while in good health had been exposed to severe weather, was seized, a few hours later, with a violent pain in the ear. On examination it was found that the tympanic blood-vessels were gorged with blood and that the middle ear was filled with serum; and in the course of a few hours it became plain that a suppurative inflammation was under full headway in this tympanum. Another instance is that of a young child, who while teething was suddenly taken with earache; and this pain proved, after the lapse of a few hours, to be due to the development of a suppurative inflammation in the middle ear.

In some of these cases the inflammation may be attributed to reflex influences, while in others it seems more plausible to attribute it to a suspension of vaso-motor inhibition. But however this may be, there can be no doubt that some disturbance of the circulation lies at the bottom of these attacks of acute suppurative inflammation of the middle ear; and, if we seek for the cause of such circulatory disturbances, we shall doubtless often be able to find it in some other organ, as, for example, the lungs, the liver, the kidneys, the teeth, and the nervous system.

Dr. Downie gives the following statistics of 501 cases of tympanic involvement treated in the Children's Hospital in Glasgow:

	Cases.	Per cent.
Originated during measles	131	26.1
" " scarlet fever	63	12.6
" " whooping-cough	15	3.0
" " mumps	3	0.6
" " simple catarrh	147	29.4
" " dentition	101	20.0
Syphilitic	8	1.6
Doubtful	33	6.7