V.

ACUTE SUPPURATION OF THE MIDDLE EAR—ITS NEGLECT AND PROPER TREATMENT.*

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Otitis media may be caused by a great number of different microorganisms. In the cases which have been published, every possible bacterial exciting cause has been found, sometimes in pure culture and sometimes as mixed infections. Saprophytes, also, have occasionally been found in the discharge, but in such cases we seem to have a secondary infection complicating the primary cause of the suppuration.

PATHOLOGIC ANATOMY.

In all cases where the middle ear is infected through the tube, we observe, first, a swelling of the tubal membrane which soon leads to obstruction of the tube. This swelling soon spreads to the mucous membrane of the middle ear and the tympanic cavity, as well as to the entire middle ear, viz., the meso- and hypotympanum, the attic, the antrum, and in many cases the pneumatic cells of the mastoid process become filled with an infectious viscid or hemorrhagic exudate. After a short time, sometimes a few hours only, suppuration is present, and the purulent inflammation of the mucous membrane of the tympanic cavity and drum leads to extensive exudation in the middle ear cavity. The pus finally breaks through the tympanic membrane and drains outward. During the earlier stages of the perforation, the secretion is chiefly of a bloody color, and not until later does it become clear, especially in influenza and typhoid otitis.

If the process runs a normal course, in about one week the secretion becomes a mixture of pus and mucus; the pus be-

*Read by invitation before the British Medical Association, at the eighteenth annual meeting, Liverpool, 1912.

comes ropy and more and more replaced by mucus, owing to the daily decrease of the secretion. The swelling of the mucous membrane of the tympanum and tympanic cavity decreases. The hole in the drum, in normal cases, closes after the secretion has ceased and complete *restitutio ad integrum* results, both anatomically and functionally. Sometimes in children, after a few weeks, the macerated epidermal crust is thrown off, leaving a fresh, normal, smooth and shining epidermal layer which has formed under it.

SYMPTOMS.

The prominent symptom, especially at the beginning of the disease, is the sudden, spontaneous and severe pain in the ear. This pain is often excruciating, and the patient is restless and sleepless. Sometimes, this severe pain is preceded by a sense of fullness and obstruction in the ear, as well as unilateral headache.

The loss of hearing reaches a high degree (speech, 1-2 m.) in the typical genuine otitis media suppurativa. Towards the end of the disease the hearing returns, and in uncomplicated cases becomes normal after the disease is cured.

At the beginning of the otitis media suppurativa, we usually find considerable fever, sometimes 40 degrees C. and higher. When the discharge of pus takes place, after the perforation of the tympanum, the temperature falls in cases running a normal course. An unfavorable symptom is a sudden, spontaneous fall of the temperature to normal or subnormal in the early stages of the inflammation, unless accompanied by a subsidence of all other symptoms of the disease. This is observed in cases of early intracranial affection, and is sometimes found in individuals lacking power of resistance or weakened by severe and general suffering from otitis media suppurativa. In early childhood, uncomplicated otitis media suppurativa often begins with vomiting and chills.

The condition of the tympanic membrane.—The otoscopic findings are a more or less pronounced swelling and redness of the tympanic membrane, which may involve the entire drum. In some cases, although the entire membrane may be inflamed, certain parts are involved to a greater extent, i. e., deep red color, severe swelling and bulging. Often extensive formation of vessels is observed. When the epitympanum

alone is involved (Kümmell), the inflammatory symptoms are limited to the upper part of the tympanic membrane, i. e., to Schrapnell's membrane and the upper posterior quadrant, and often lead to bulging of the upper posterior part of the drum membrane (Politzer).

The deep red color of the tympanic membrane is by no means a reliable indication of the degree of the otitis media. Sometimes in a simple otitis media, and even in a myringitis, the tympanic membrane is of a deep red color, and greatly bulging. Owing to the bulging, the line of the handle of the hammer is entirely invisible. In cases of otitis media due to influenza, especially, the membrane may be of a deep red color even in very mild cases, and this may be accompanied by an elevation of the epidermis in the form of vesicles. On the other hand, the tympanic membrane may show a pale red color, even with a large collection of pus in the middle ear (empyema), and under certain circumstances may show only a radiate and peripheric vascular injection. In general, the intensity of the redness and bulging of the tympanic membrane decrease slightly with the progress of the purulent softening of the exudate in the middle ear. If the acute otitis media has led to an empyema of the middle ear cavities, especially of the tympanic cavity, without a perforation, the membrane sometimes appears opaque and grayish yellow, and will show only a slight injection of the radiate vessels of the tympanic membrane.

The expected perforation is generally indicated by a circumscribed yellow discoloration and marked bulging of the tympanic membrane. If it has taken place, we see an opening which is more or less round, allowing a free passage to the pus; or it may be a fissure, the edges of which approximate, just allowing the pus to escape. If the secretion is mopped out, it will sometimes be impossible to see the site of the perforation. We usually recognize it by the oozing of the secretion, though it may be ascertained by the use of Siegle's speculum. Sometimes the perforation is situated at the top of the mastoid process.

The size of the perforation varies. In the fulminating type of otitis media suppurativa accompanying acute infectious diseases, especially scarlet fever, we find comparatively large openings and in rare cases extensive destructions.

In advanced stages of suppuration the mucous membrane of the tympanic cavity resembles the tympanic membrane in redness, swelling and moisture. Later, that of the tympanic membrane decreases, and the epidermal layer becomes dry. Now, the perforation in the membrane is distinctly visible, even if such was not the case previously. The margin of the perforation is thicker than the surrounding tympanic membrane, but finally becomes of the same thickness. As soon as the perforation heals, the margin is grayish white.

The test of the function of the ear shows in every case a considerable decrease in sound conduction. At the beginning of the inflammation the sense of hearing is greatly diminished. At this time it is even possible to elicit a slight, spontaneous nystagmus to either side when looking in that direction, evidently in consequence of the pressure due to the secretion. It disappears with the appearance of the perforation.

DIAGNOSIS.

Even in the early stages of the disease the diagnosis of otitis media suppurativa can be made without any special difficulty, in most cases, from the anamnesis and the characteristic symptoms, viz., sudden appearance of violent pains in the ear, difficulty in hearing, fever, and the condition of the tympanic membrane.

From the standpoint of differential diagnosis, only the simple otitis media comes into consideration. Great bulging of the tympanic membrane, teatlike bulging of the upper posterior quadrant, especially circumscribed yellowish discoloration, and great loss of hearing, provided the hearing was normal previously; these symptoms speak against a simple otitis media and in favor of an otitis media suppurativa, as does the continuous pain, which at times becomes very severe. Attacks of pain with intervals free from pain speak more for a simple otitis media. High fever indicates otitis media suppurativa. In children up to the age of eight years, and especially in babies, we are unable to test the sense of hearing objectively and exactly. We may, however, make a test by means of instruments making a loud noise, or by means of sounds familiar to children, e. g., a bell, jangling of keys, sounding glasses and high pitched tuning forks, and thus ascertain approximate-

ly the degree of diminution of hearing. In some cases direct examination of the antrum (transillumination, X-ray examination) is of great service.

Little children complain of severe pain which they refer to the affected ear, but which is caused by late dentition, acute inflammation of the pharyngeal lymphatic glands, tonsillitis or the swelling of the pharyngeal tonsils. In some cases intense pains in the ear are an early symptom of an acute infection, usually following an affection of the mucous membrane of the oropharynx. At the time of puberty, violent pains in the ear sometimes indicate the beginning of an otosclerosis, if the otoscopic findings are negative.

In the stage of suppuration the odorless, profuse, pulsating and purulent secretion, and later on the odorless mucopus, speak for otitis media purulenta as opposed to otitis externa. If at the same time we find furunculosis of the external auditory meatus (otitis externa furunculosa), we may find it difficult at the first examination to make a diagnosis of whether we have to deal with a simple inflammation of the meatus, or with one complicated by an otitis media suppurativa, especially if we find multiple furunculosis of the external auditory canal with considerable purulent secretion.

In such cases the differential diagnosis is made on the basis of the following points:

(1) There is no fever in otitis externa of older children and adults; in small children we sometimes observe a moderate rise in temperature. If, therefore, in doubtful cases the anamnesis shows that the ear disease started with a high fever, we may assume, also, the existence of an otitis media.

(2) If in a case of otitis externa we cleanse the meatus and make a passageway by inserting a thin ear speculum, we will obtain a normal or slightly diminished aural acuity, if the drum is not too thickly covered with epidermis. If, however, there also exists an otitis media suppurativa, the hearing will not be improved after cleansing the external auditory canal.

(3) In children of four years or older, the bony auditory canal gives a good indication. The otitis externa always is confined to the membranous auditory canal. We find, therefore, after we have inserted an ear speculum through the narrowed part of the canal, that the bony auditory canal is of normal width and the tympanic membrane is unaltered. If,

on the other hand, we are dealing with an otitis media and a stenosis of the auditory canal caused by an affection of the antrum and the mastoid process, inspection of the bony auditory canal will show a sinking of the posterior upper wall, and the swelling of the external auditory canal is more pronounced in the bony part than in the membranous.

COURSE.

We distinguish three stages of the disease:

(1) The initial stage. This begins with the appearance of the ear symptoms and ends shortly afterwards, sometimes after a few hours, at the longest after three to four days, with perforation of the drum and purulent discharge in the external auditory canal. The violent pain and the fever usually last until the drum perforates and evacuation of the pus externally takes place.

(2) The second stage is characterized by suppuration. The patient is free from pain and the temperature is normal or slightly elevated. During the first few days there is a profuse purulent secretion. After about eight days the daily quantity of pus decreases spontaneously, and later on ceases. The secretion lasts for two to three weeks. During the last few days the secretion consists of almost pure mucus. The thicker and creamier the pus is and the more mucus the secretion contains and the less intense the secretion, the greater will be the danger that the secreted material will remain in the tympanic cavity or in the depths of the auditory canal, where it will either dry up or undergo putrefaction. The hearing will improve with the decrease of the suppuration.

(3) In the final stage, after the secretion has ceased, that is, one to two weeks later, the perforation will gradually close. Larger perforations require a longer time for healing; yet even with comparatively large perforations there is no danger of an opening remaining in the tympanic membrane, provided that the disease ran a normal course.

In all cases of otitis media suppurativa in individuals whose ears were normal up to the time of the disease, and where the disease appeared during the course of ordinary diseases, on the basis of chronic catarrhal processes in the nasopharynx, the prognosis is good for complete restoration of the ear, both

anatomically and physiologically, provided the patient was treated correctly and did not suffer from any intercurrent disease.

The cases of otitis media suppurativa on the basis of chronic catarrhal processes in the middle ear have a tendency to recover with permanent changes on the tympanic membrane and diminution of hearing.

The same is true of cases of otitis media suppurativa due to adenoid vegetations in the nasopharynx and catarrhal changes in the eustachian tube, but they will last longer.

Finally, we must deal with the danger of persistent changes in the middle ear due to an organization of the mucous secretion during the final stage of suppuration. These are the cases where the otitis media suppurativa gives rise to a chronic adhesive process. There is the danger of permanent changes on the tympanic membrane in all cases which require repeated paracenteses, as well as in all cases in which there is ulceration of the tympanic membrane at the perforation, due to the poor state of nutrition of the patient (cachexia, anemia, chlorosis, etc.). Finally, there is the danger of persistent changes on the tympanic membrane in cases of recurrent otitis media suppurativa, which is often observed as a special type of otitis during infancy. The earlier attacks will recover with complete restoration of the tympanic membrane, but the later relapses will lead to a cicatrization; and after the sixth to the eighth relapse, healing will take place with a persistent perforation.

This is due to the fact that during the course of the disease the lamina propria of the tympanic membrane will gradually become atrophic, especially in the region of the perforation.

We must not forget that in any severe case of otitis media the purulent inflammatory stage may be followed by a catarrhal purely inflammatory stage.

All cases of otitis media suppurativa acuta which appear during the course of acute infectious diseases, have a tendency to become chronic.

This is especially true of the otitis of scarlet fever and of measles during infancy, as well as of otitis media suppurativa appearing during the course of diphtheria and of typhoid. Tubercular otitis media suppurativa, also, shows a striking tendency to become chronic, as do the otitis media suppurativa

of the early stages of lues, and all cases of the disease appearing in otherwise weak, dyscratic or marasmic patients. A certain, though not great, tendency towards chronicity is to be found in cases of otitis media suppurativa of early infancy as well as of old age.

COMPLICATIONS.

In discussing the normal course of acute otitis media suppurativa, we saw that the inflammation, after the second week, is limited to the tympanic cavity and the antrum. We saw, also, that in normal cases the disease will involve the mastoid process and the eustachian tube only during its earlier stages. Complications are due to the fact that the mastoid process and the tube will take part in the inflammation during the later stages also, or that it extends beyond the limits of the anatomic middle ear and involves its vicinity. We distinguish therefore

- (a) Intraaural complications.
- (b) Extracranial complications.
- (c) Endocranial complications.

Mastoiditis suppurativa is to be classed among the intraaural complications. Influenza otitis and typhoid otitis have a certain predisposition towards mastoiditis. Otitis caused by the streptomucosus, especially otitis caused by mucosus infection, is characterized by the rapid formation of an exudate which fills the entire middle ear, including the cells of the mastoid. Rapid softening of the bone is a characteristic feature of typhoid and influenza otitis. Mastoid processes with meningeal structure have a special tendency towards mastoiditis suppurativa. This leads to mastoid empyema through direct spreading of the pus. Diploetic mastoid processes are not so often attacked by the disease. In them, mastoid suppuration usually appears by metastasis. Rapid destruction of the bone is favored by rachitis during infancy, preceding constitutional diseases, as well as tuberculosis and lues. In tuberculosis, mastoiditis usually appears late and often has its origin in a tubercular periostitis of the mastoid cortex. Retention of secretion in the tympanic cavity also favors the development of mastoiditis suppurativa from acute otitis media suppurativa. There is especially danger of mastoiditis in those cases in which the upper part of the tympanic cavity is primarily affected, and in which a small perforation in Schrapnell's membrane

provides the only drainage, also in cases of mesotympanic otitis, in which the perforation is to be found in the pars tensa of the tympanic membrane, but not in the level of the membrane, but rather in the mastoid protuberance.

Attention is called here to the fact that in the latter cases, the mastoid protuberance should be destroyed by paracentesis.

Pyorrhea of the tube is to be considered as a complication of acute otitis media. It occurs in cases of tubercular otitis media suppurativa, as well as in cases of simple otitis in which the patients have large adenoids.

There is great danger of affection of the middle ear and of labyrinthitis suppurativa in cases of fulminating otitis media suppurativa which appear during the course of scarlet fever, measles, diphtheria and typhoid. Metastatic infectious neuro-labyrinthitis may be caused by mumps or influenza.

Cases of hemorrhagic labyrinthitis are sometimes to be found in cases of otitis media suppurativa with peracute leukemia. The temporal relation between the otitis and the labyrinthitis varies greatly. If the two appear simultaneously, we have to deal with a panotitis. Usually, however, the purulent labyrinthitis is preceded by the otitis media suppurativa. In rare cases of meningitis cerebrospinalis, the labyrinth suppuration may be followed by the otitis. In the acute stages of tubercular otitis media, a labyrinth suppuration is not to be found.

Among the extracranial complications, special attention must be called to the burrowing abscesses. These cases also depend largely on the character of the infection, for in a comparatively large number of extracranial complications and burrowing abscesses, the streptococcus mucosus can be found.

The abscesses appear more especially in cases of pneumatic mastoid processes, in which the corticalis of the pneumatic mastoid is thin. In infancy, the formation of subperiosteal abscesses takes place with a striking rapidity. Their development is especially favored by rickets and scrofulosis in the patient. Sinking abscesses burrowing towards the external surface of the base of the skull are found especially in tubercular patients.

Among the endocranial complications of acute otitis media, we must give first place, on account of their frequency, to pachymeningitis and extradural abscess. They are found more

frequently in the posterior than in the middle cranial fossa. If the extradural abscess is in the region of the sinus, we call it a perisinus abscess.

In the second place, we must mention sinus phlebitis, sinus thrombosis, pyemia, toxemia, and bacteremia.

About 50 per cent of all cases of inflammatory sinus phlebitis may be traced etiologically to an acute otitis media suppurativa. In the first year of life, however, sinus phlebitis complicating otitis media is rather rare. It is quite frequently found between the ages of ten and twenty, when it decreases in frequency but increases in danger as a complication.

In the first years of life we rather frequently meet with pachyleptomeningitis suppurativa in acute otitis media. In adults it is not so frequently a complication. Three types must be noted:

(1) Meningitis purulenta cum otitide media acuta, in which the meninges are affected simultaneously with the middle ear.

(2) Meningitis tuberculosa, of which there is always the danger in tubercular acute otitis media suppurativa.

(3) Meningitis secondary to acute otitis media suppurativa in older people, where the meningitis suppurativa appears acutely after an apparently favorable course of the acute otitis media. It usually ends fatally, sometimes after the primary disease has apparently gotten well.

In general we may say that there is greater danger of a meningitis in otitis media of the epitympanic type. In these cases the cavum epitympanicum is the primarily or exclusively affected part of the ear. The drainage of epitympanic otitis media is always difficult, and we are confronted with the special danger of a retention of secretion in the middle ear which greatly favors the extension of the purulent process to the meninges. In such a case, the disease usually extends into the middle cranial fossa, and in this connection the anatomic construction of the tegmen tympanicum is of importance. If it is either thin or dehiscient, the purulent process may make its way more directly and rapidly from the middle ear to the meninges than if the upper tympanic cavity were shut off from the dura by a compact bony covering. In cases of thin or dehiscient tegmen tympanicum, we will sometimes find intrameningeal abscesses of the middle cranial fossa during the course of the acute otitis media suppurativa. Purulent brain abscesses are very rare in acute otitis media suppurativa. Most cases of this

kind in the literature will not stand criticism. Usually, it is a case of chronic otitis media suppurativa with an acute exacerbation.

If the acute otitis media is not treated, there is the danger of pus retention with its consequences. The stagnant pus becomes putrid and fetid. There is eczema of the auditory canal and inflammatory swelling of its lining, with granulations at the perforation, which may become occluded. The pus in the tympanic cavity is forced into the mastoid process. There is no doubt that some cases of purulent mastoiditis are caused mechanically by the stagnation of pus in the cavities of the middle ear. Moreover, the pus may exert considerable pressure on the walls of the tympanic cavity. The head feels heavy, there is pain in the temporal region, the tegmen tympani becomes inflamed, and finally extradural abscess and meningitis occur.

In other cases, the pressure upon the lateral wall of the labyrinth becomes very great, and we observe spontaneous nystagmus and vertigo.

In neglected cases of otitis media suppurativa, the hearing will always be greatly diminished, and the danger increases with the duration of the suppuration, since the hearing will remain diminished after the disease gets well. If a neglected case recovers spontaneously—and we cannot deny the possibility of spontaneous recovery of an acute otitis media—the stage of suppuration will frequently be followed by a long catarrhal stage. In consequence of the organization of the exudate, the otitis media suppurativa may be followed by the formation of bands of connective tissue in the middle ear, i. e., a chronic adhesive process, which in turn results in a degeneration of the organ of Corti and labyrinthine deafness. It may be briefly stated that complications of acute otitis media suppurativa are increased by neglect of the disease.

It has already been stated that a permanent pyorrhea may follow an incorrectly treated tubal suppuration.

TREATMENT.

In the first stage, we content ourselves with purely symptomatic local treatment.

Violent earache is sometimes considerably diminished by instillations of a 3 to 5 per cent carbolic glycerin solution or an

adrenalin solution. If the auditory canal is wide, so there is no fear of a stenosis from epithelial maceration, we may instil a warm (40° C.) solution of aluminium acetate. Instillations of solutions of cocain, novocain and alypin have a good, though only temporary, effect. We use a tampon dipped in a 20 per cent solution, which is inserted as far as the tympanic membrane. The local application of cold (ice bag, etc.) is recommended during the first stage of the inflammation, while hemagogues are usually of no help. Rest in bed and a good evacuation of the bowels are ordered. Alcohol, strong coffee or tea are forbidden.

If the pain is very severe and is accompanied by fever, it will soon be seen that all anodynes are of no avail. In such cases it is advisable not to wait for spontaneous perforation, but to make an immediate paracentesis. A lance pointed knife mounted in a Politzer handle is used. The tympanic membrane is incised from below upwards, making the opening back of the umbo, and as long as possible.

If, on the other hand, circumscribed yellowish discoloration in the tympanic membrane indicates the imminence of spontaneous perforation, it will be necessary to make the paracentesis at that place, or at least to include it in the incision, otherwise it will be a useless paracentesis.

Sometimes it may be difficult to decide whether to make the incision or to wait.

If conservative treatment fails to give relief, i. e., if the pain and fever continues, paracentesis is indicated. As to the time to perform it, we must remember not to hesitate. It is better in doubtful cases to perform it than not. There is no danger so long as the operator observes all the aseptic precautions possible in the ear. The course of an uncomplicated inflammation of the middle ear may even be shortened by the fact that the serosanguinous exudate is evacuated externally through the opening, making its absorption unnecessary. Only in cases where aseptic precautions were not observed, do we meet with the danger that the uncomplicated inflammation may be converted into an infected purulent one through infection caused by the paracentesis. On the other hand, the omission of the paracentesis at the proper time, may cause an irretrievable injury, complications dangerous to life, and even death.

Preparations for performing the paracentesis.—The auricle

is cleansed with a tampon dipped in benzene, and the head is then covered with a fenestrated sterile compress, through the opening of which the auricle is drawn. The external auditory meatus is washed with a 1 per cent solution of hydrogen peroxid. For anesthetizing, instillations of novocain-adrenalin solution is recommended. This is prepared by heating 1 cc. of a 20 per cent solution of novocain or alypin to 40° C. and adding shortly before using it five drops of an ordinary solution of adrenalin, heated. The solution should be left in the meatus ten to fifteen minutes. The ear clinic of Freiburg recommends the infiltration anesthesia of the drum by injecting a Schleich-adrenalin mixture into the tympanic cavity (Tiefenthal, Bernd).

Instillations of 5 to 10 per cent aqueous solutions of cocain, with an addition of five drops of adrenalin 1-1000, have also been recommended. Eucain (8 per cent aqueous solution) is innocuous and can be sterilized. Gray's solution is also worth mentioning (cocain. muriat. 0.5, ol. anilini, alcohol. absol., aa 5.0). Ten drops heated to 40° C. are left in the auditory canal about five minutes. Haug's solution is useful (cocain. muriat. 1.5 to 3.0, glycerin 10.0, alcohol. absol. 10.0).

The operation should be performed under aseptic precautions, since otherwise there is the danger of causing a secondary infection. If the paracentesis has been performed at the proper time, immediately afterwards there is an evacuation of a sero-sanguinous or sanguinopurulent exudate through the opening. If, on the other hand, pure pus is evacuated, it is a sign that the paracentesis was performed too late, that the inflammatory exudate has been subject to purulent degeneration to such a degree that all the cavities of the middle ear are filled with pus (acute empyema of the middle ear). Before performing the paracentesis, strips of gauze should be dipped into a warm solution of aluminium acetate, and these should be introduced into the meatus immediately after the operation, without any previous cleansing of the canal. A moist dressing is applied to the ear, and the patient should be put to bed. In cases running a favorable course, a profuse discharge of pus will be seen for the next few days. Within three to five days, the temperature will drop to normal, and there will be no pain a few hours after the operation.

If the perforation is not within the level of the tympanic membrane, but rather at the top of a mastoid protuberance,

there will sometimes be an agglutination of the opening and symptoms of retention, in consequence of purulent stagnation in the mastoid process. In such cases the mastoid protuberance should be well incised with the paracentesis needle.

With the purulent secretion the otitis media suppurativa has entered into the second stage, and it is now necessary to take care of the discharge of pus and to prevent any retention or secretory stagnation. This is accomplished in different ways. Good success is obtained by moist dressings of acetic acid or 2 per cent alsol, renewed every day during the first few days. A moist strip of gauze is inserted into the external auditory meatus for the purpose of drainage, and after twenty-four hours we usually find the entire dressing saturated with pus. Later on, gauze strips 4 to 6 cm. long and 2 cm. wide are introduced. We may apply simple absorbent gauze dressings, or gauze impregnated with antiseptics (xeroform, vioform, dermatol, aristol, or ectogenous gauze). The insertion and removal of these gauze strips may be made by the nurse, the instrument, a blunt straight or angular forceps, being first sterilized by washing in benzene or by boiling. The dressing must be changed hourly or every other hour in case of profuse discharge, or two or three times daily if the discharge is slight. The point is that the strips should remain in the ear only so long as they absorb the secretion. If it is entirely saturated with pus, it must be removed before fresh pus collects behind it. We recognize that the dressing is being changed sufficiently often whenever there is little or no pus left in the external auditory meatus when the strip of gauze is removed, and whenever the patient is free from pain and the canal is open. Syringing is necessary only when the secretion is thick and ropy, and should be made with water at a temperature of 38° to 40° C. Insufflation of antiseptic powders is entirely unnecessary when the discharge is copious.

This method of treatment has the advantage that the physician is informed as to the condition of the suppuration, even if he doesn't see the patient daily. The latter will observe the decrease in the suppuration when the strips are not entirely saturated or are dry.

In a disease running a normal course, at the end of the first week of suppuration a viscid mucous secretion is found, which very soon thereafter becomes stringy. Therefore, simple re-

removal of the gauze strips will be insufficient, since the semi-solid pus has the tendency to remain in the tympanic cavity or in the external auditory canal. It is now advisable to use hydrogen peroxid (3 to 5 per cent hydrogen peroxid, or perhydrol 0.5, aquæ destil. 30.0), which should be heated to 40° C. and dropped into the ear two or three times daily. The pus is removed from the tympanic cavity three or four times a week by politzeration, and subsequent cleansing of the external meatus is done with cotton pledgets moistened with a 5 per cent aqueous solution of perhydrol. The hearing is improved by the politzeration, though it will become temporarily worse when the cavities again become full of secretion. Cautious aspiration by means of a Siegle's speculum or a suction bell will sometimes be beneficial.

Special care must be taken in connection with the external auditory meatus, since an eczema or an inflammation of it would increase the purulent stagnation in the middle ear. In the later stages of the disease, the ear must be inflated daily, until the hearing is permanently good, and the lateral surface of the tympanic membrane is pale and dry.

When the suppuration has ceased, the perforation will usually close in a few days. The first sign of the healing of the perforation is that the edges become white. This color is due to the young epidermis.

The opening closes by gradual diminution. The growth of the new epidermis takes its course from the center of the tympanic membrane towards the periphery. All local treatment at this stage is contraindicated (Politzer). The closure of the perforation is spontaneous, and the tympanic membrane and hearing become normal. After an otitis media of longer duration, a scar or intermediate calcareous deposit may develop in the drum. It is advisable to keep the external auditory canal closed by a small plug of cotton for some weeks after the cure of the otitis media suppurativa.

In order to prevent repeated attacks of otitis media and also catarrhal relapses, it is necessary to treat the nasopharynx, to provide a free passageway through the posterior nares, to treat the epipharynx, and to restore normal conditions at the pharyngeal tubal orifices.

As to the treatment of otitis in nursing infants, it differs very little from that of later years. Early paracentesis is im-

portant, as otherwise we may be surprised by a sudden onset of cerebral symptoms (meningism), or even by a purulent meningitis. An important point is the very careful treatment of the external auditory meatus, the cutaneous covering of which must be greased repeatedly. Free drainage must be provided for by thorough removal of the secretion and the macerated epithelial substance, which collects in the form of small scales. If the canal is constricted or obstructed by eczematous swelling, inflammations, etc., the treatment of the otitis becomes more difficult, and there may be a retention of secretion with the most serious consequences. Repeated paracentesis is recommended in cases which are very prolonged. Granulations should be removed, for if allowed to remain the course of the disease is more prolonged, and it may even become chronic on account of proliferation of the granulation. After the patient has recovered, it is often necessary to remove the hypertrophied tonsillar or adenoid growths, in order to avoid repeated inflammations.