In this paper I have considered many of the more common nerve and brain conditions in which drug addiction plays a part as cause or as effect. The isolated cases, however, in which we find drug addiction associated are very numerous. This is conspicuously so in those cases in whom some perverted metabolism or toxic secretion is the exciting cause. Recently the case of a patient brought to the hospital for treatment for alcoholism had been diagnosed as neurasthenia; the woman had long been intolerantly looked on as a perverse habitué, her complaints set down as purely psychic. Though the psychic disease was a prominent feature, it was clearly due to perverted thyroid functioning; and alcohol had been resorted to because of the relief it afforded from the distressing mental and nervous symptoms characteristic of hyperthyroidism.

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THE NON-SURGICAL TREATMENT OF CHRONICALLY DISCHARGING EARS

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What to do for his patients with chronic discharging ears has been long a troublesome question to the general practitioner. He has always among his clientele a number of these cases, which have persisted for years, some of them despite the most earnest efforts to bring about a cure.

To have an ear attended with a constant secretion of purulent matter presenting at the external auditory meatus, especially if it be foul-smelling, is a disgusting affliction, from which the unhappy subject naturally yearns to be relieved. But the esthetic discomfort, though great, is the least of the disadvantages of such a condition.

A continually suppurating ear means the persistence of a destructive process going on in a physiologically important portion of the auditory organ. The middle ear cavity is essentially concerned in sound transmission, and it is impossible for it to be long the seat of a suppurative process without serious impairment of the hearing function.

In the course of time, if the process is not checked, the drum-membrane will gradually slough away and become almost or completely destroyed. The little ossicles, denuded of their thin layer of membrane, fall a ready prey to necrosis and are exfoliated, and sooner or later other important structures are involved in the destructive process. The hearing must surely, though slowly, grow worse if the disease is unchecked, and eventually may become lost. In addition to this actually present evil, there is in every case of suppurative otitis, a large chance of something more serious happening, because of an extension of the infection to neighboring vital organs.

It is unnecessary, I am sure, to have to insist on the seriousness of suppurative otitis to intelligent practitioners of the present day, although it is only recently that they came to realize the full measure of the dangerous possibilities of such an affection. The fact that life-insurance companies, basing their proposition on cold statistics, exclude from risks subjects of chronic discharging ears, is significant enough.

The patients generally look sickly and have muddy complexions, no doubt due to the absorption of bacterial toxins from the pus pent up in the pneumatic cavities. They are subject to frequent headaches from exacerbations of the disease, often with some involvement of the mastoid cells. But worst of all, they are in imminent danger of grave, it may be fatal, intracranial complications, due directly to an extension of the process. Most brain abscesses are known to come from this cause. Lateral sinus thrombosis is an even more frequently fatal result, and meningitis, septicemia, labyrinthitis, epidural abscess and facial paralysis are all possibilities seriously to be feared.

It is because of these dangers and disadvantages attending a suppurative otitis that many otologists who, from their experiences with the fatal consequences possible, are naturally more impressed than others with the gravity of the situation, have advocated radical surgery in such cases. Unfortunately the only operation which we can offer with a promise of almost certain success is one that is extremely radical. The milder or conservative measures, such as ossiculectomy, which are sometimes practiced, have been generally disappointing. To effect a certain cure it has been found necessary not only to remove the drum membrane and all the contents of the tympanic cavity, including the ossicles, but also to enter the antrum and the attic and throw all these into one by breaking down the partitions which lie between, concluding with the performance of a proper plastic operation on the auricle to form a new meatus leading to the cavity which has been thus artificially created.

An operation of this kind is one that the thoughtful and conscientious surgeon hesitates to advocate except for the most positive indications. At any rate, even when the operation seems for the best of reasons to be positively indicated, the wisest plan is not to intervene until conservative measures have been exhausted, and the patient has been given the benefit of a course of medical treatment.

It is quite evident that in many cases surgical treatment is out of the question, because of the personal attitude of the patient, and we must content ourselves with doing the best that can be done in other ways. On the other hand, there are cases, of course, in which it is plain to see from the beginning that no kind or amount of medical treatment alone can be successful, cases, for instance, dependent on chronic mastoiditis, the existence of large cholesteatomatous masses in the antrum and attic, or large polyps and granulations blocking the way of drainage. But there still remains a large percentage of cases which may be guided to a successful termination if we use the right kind of treatment and use it properly.

The object of treatment of suppurative otitis is not primarily the cessation of the discharge, but the cure of the pathologic process on which it depends. The discharge is but a symptom and its relief is incidental to the cure of the disease. Since, however, the latter is never completely cured until the former stops, we may regard the two, from the standpoint of treatment, as synonymous. Our treatment should be directed, in some cases, to the general health, in many cases to the state of the nose, nasopharynx and Eustachian tubes, and in all cases to the seat of the suppuration in the middle-ear cavity and its immediate adnexa.

In some cases the continuance of the suppuration is maintained by systemic dyscrasia, impoverished or depraved states of the blood and general lowering of the

vitality. For such patients iron, quinin, arsenic, manganese, or strychnin, should be prescribed, and fresh air, exercise and a proper hygienic environment insisted on.

Where either tuberculosis or lues is present, it is of course impossible to get results unless the general condition receives its appropriate general treatment. Infection from the nasopharynx by the Eustachian tubes is in almost all cases the original cause of the otitis. Attention to these parts is therefore very important to the successful cure of this disease.

In children a chronic suppuration of the ear that has not been left by either measles, diphtheria or scarlatina is almost certainly dependent on adenoids. In cases in which adenoid growths are present their thorough removal should be the first step adopted toward bringing about a cure. In some cases it is all that is necessary. In many cases of adults in which adenoids might not be suspected, there will be found, on careful examination, a little growth lurking in the fossa of Rosenmüller close to the mouth of the tube, which is a frequent source of infection passing through to the middle ear. A careful curettement of this region in such cases may prove a great help to treatment.

PRINCIPLES OF TREATMENT

As to the local treatment to be directed to the ear itself, there are various agents and various means of using them, but they will be found, all of them, to be based on one, or a combination of the following three principles:

1. The removal of the purulent secretion or other products of the disease process.
2. The sterilization of the parts and the prevention of sepsis.
3. The use of selected medicinal agents to assist Nature in restoring the diseased parts to a normal healthy condition.

Very few of the measures ordinarily employed are limited to one of these principles alone. As a rule they endeavor to combine two or, it may be, all three.

1. Of agents used strictly for cleansing the parts and the removal of secretions, we have Politizerization, irrigation with sterile water and the employment of a suction apparatus at the external meatus. If there is a sufficient perforation in the drum-membrane, Politizerization may be done with impunity. The fear that secretion may be driven into the accessory pneumatic cavities is not well founded. With a well-open drum-membrane experiments have amply demonstrated that the blast of air coming through the Eustachian tube drives everything to the external meatus. I have been in the habit, however, of first seeing that the pharyngeal mouth of the Eustachian tube is free of secretion and as sterile as we can make it by local application of antiseptics, to avoid bringing fresh infection from the nasopharynx. When irrigation is done with simple sterile water, it is done, of course, to fulfil only the first indication, viz., that of cleansing the parts. The use of a normal saline solution materially assists this function, as thereby the albuminous products are dissolved and are more effectually removed. As a rule, however, the practice is to use for irrigating purposes solutions that are actually germicidal, it being the aim of these not only to cleanse, but to have some beneficial effect at the same time in sterilizing the affected parts.

Of methods aimed to remove secretion, a valuable one is the rarefaction of the air in the external meatus.

This has been practiced for some time, but has recently come more into vogue by reason of the construction of effective suction apparatus adapted to this end. The Fowler apparatus which I have used with apparent benefit combines the suction principle with irrigation, the vacuum being produced by siphonage.

Of methods which depend on the cure of an otorrhea by virtue of a cleansing alone, we should mention one that is extolled by some specialists as the only correct method, namely, the frequent mopping out of the secretion from the canal by the use of cotton-tipped applicators. When this is done to the exclusion of irrigation it is spoken of as the "dry treatment." It has many advantages, but requires painstaking attention on the part of the physician, or that the patient shall be unusually careful, intelligent and persevering. It is much better applicable in cases of acute suppuration than in chronic cases.

The same is to be said of what is termed the "wick treatment," meaning the frequent introduction of sterile or antiseptic strips of gauze into the depths of the canal to be left *in situ* a certain number of hours for the purpose of absorbing the secretion as fast as it forms. This is my favorite method of treatment in acute suppuration, but it is too tedious to be carried out faithfully in long-standing chronic otorrhea.

Under the head of cleansing agents I might mention those which are intended to digest or dissolve the products of inflammation. I have especially in mind enzymol and peroxid of hydrogen. The latter is used with certain precautions to meet special indications. It is undoubtedly an excellent cleansing agent as well as a good antiseptic. When the dioxid is decomposed the bactericidal action of the liberated nascent oxygen is exerted throughout the cavity, and the active effervescence serves a good purpose in dislodging the purulent material and getting rid of it in a way that syringing alone could not so successfully accomplish. I do not share the fear of those who hesitate to use it thinking that thereby they will cause a spread of the disease to unaffected parts. There is no place that it can carry infection where it does not already exist and wherever it goes it naturally exerts a favorable influence.

2. The second principle which I have named as applying in the local treatment of discharging ear is one that has both a passive and an active function, the former consisting in the maintenance of aseptic conditions by the avoidance of additional infection from the outside; the latter in the use of directly active germicidal agents with a view to overcoming as far as possible the septic conditions already present.

The passive part of this proposition should of course be kept in view and respected, no matter what treatment is used. When we reflect that we are dealing with parts separated by the thinnest partitions from surrounding vital organs, where infection generally means death, we should appreciate the importance of scrupulous asepsis. But in addition to a mere passive asepsis, much is expected in suppurative otitis by the employment of active germicidal agents brought into contact with the suppurating focus. It is the custom to add some antiseptic agent to the solution used in irrigating the ears, and drugs which come more properly under the next class to be mentioned depend in no little measure on their antiseptic properties.

3. This third class, however, includes especially those agents which are recommended and used because of

their supposed direct therapeutic action on diseased mucous membrane.

Incidentally, as stated, these agents have usually considerable antiseptic properties, and therefore exert favorable influence in preventing decomposition and putrefaction. But apart from this they are given because of their special physiologic action, which renders them valuable agents in this condition. They will be seen to excite often marked reactions, altering for the better the circulation and nutrition of the parts. In other cases they promote an absorption of the round cells, while to still others they act by destroying necrosed tissues. The agents used are chiefly astringents, stimulants, alterative desiccants, caustics and absorbi-facients.

METHODS OF APPLYING MEDICATION

There are three methods that can be employed in bringing medicinal agents in contact with the diseased surfaces of the middle ear cavities, viz., irrigation, insufflation and instillation.

By irrigation is meant the directing of a liberal quantity of solution through the external auditory canal, which in case of a sufficient defect in the drum-membrane will accomplish a general cleansing of the tympanic cavity. It may be done by means of a bulb or piston hand syringe or by the use of a fountain irrigation bag with a proper nozzle. The solution should have a temperature of 90 to 100 F., and care should be taken to use only moderate force. Too great a pressure will produce often a very unpleasant vertigo. To avoid this it is well to have the nozzle of the instrument so placed that the stream will be directed against the upper or posterior wall, instead of going straight inward. After irrigation, the canal should be dried as thoroughly as possible with cotton-tipped applicators.

Of solutions which are recommended for use in this way I may mention boric acid, 4 per cent., phenol, 1 to 2 per cent., liquor cresolis compositus, 1 to 2 per cent., liquor formaldehydi, 1 to 2,000, mercury bichlorid 1 to 5,000.

The objection to irrigation, at least when frequently practiced, is that it tends to produce maceration of the parts and favors sloughing. Heat and moisture are, moreover, as is well known, the two chief requirements for the growth of bacteria and perhaps for that reason should be avoided where possible. As done by the patient it is generally inefficient and I am of the opinion of Gleason that "discharging ears do better under methods of treatment in which syringing has little or no part." At times, however, it is indispensable, at least in the beginning of the treatment.

Insufflation is the blowing of a powder into the canal of the ear to become spread over the diseased parts. Various powders are used, but mainly boric acid, aristol, eucrophen and iodoform. They are aimed to have a drying effect on the membrane and at the same time to exert a germicidal action. Powders should not be used unless there is an almost or complete destruction of the drum membrane and the discharge happens to be very scant. If these precautions are disregarded, caking is likely to occur, and it may be that the perforation in the drum will be clogged, interfering with drainage. This, of course, is dangerous. In all cases in which the use of powder is contemplated an otoscopic examination must be first made, and the ear again carefully inspected from time to time to ascertain the state of things.

Instillation means the dropping of a small quantity of any fluid medicinal agent in the canal, with the inten-

tion that it shall arrive at the diseased parts and there produce its healing effects. It is especially designed for the introduction of agents which have for their purpose the fulfilling of the third of the indications, following my classification. This method, I believe, is the ideal one for the treatment of the chronic form of otitis. In this condition profound changes have taken place in certain parts of the middle ear, and it is necessary to reach them if we are to get results. It is only by the instillation method, properly done, as I hope to point out, that the medicine can be made to arrive successfully at the desired place, especially in a degree of concentration sufficient for the purpose.

Permit me to call attention briefly to one or two points in the anatomy and pathology directly relevant to the main points of my contention.

The tympanic cavity, it must be remembered, does not constitute of itself the entire middle ear. Situated above and behind this cavity lies the so-called antrum, the largest of the mastoid cells. This cell is connected directly with the tympanic cavity by a channel, the aditus and antrum, through which the lining of these two cavities become continuous. It is a well-known fact that in all cases of profuse suppurative otitis, the antrum, no less than the tympanic cavity itself, must be regarded as the source of the discharge. The tympanic cavity being more accessible to treatment, and besides being the more advantageously situated for drainage, naturally yields the more readily to treatment and returns the sooner to normal. In favorable cases inflammation of the antral walls subsides *pari passu*, and the case terminates in recovery with a complete cessation of all discharge.

But it often happens that the virulency of the infection is such that, though the tympanic cavity proper may clear up, the antrum still lingers in the throes of the suppurative process. Sometimes the aditus or channel connecting these two cavities becomes much narrowed by the inflammatory thickening of the wall or the presence of inspissated secretions, which naturally increases the difficulties of drainage and may lead to a complete imprisonment of the purulent matter in the antral cavity.

Let no one object that these statements are merely theoretical and speculative. Otologists know well enough that they are based on undisputed pathologic facts as revealed by the findings of autopsy and the experience of the mastoid surgeon. Those who are in the habit of opening the mastoid process so frequently encounter an antrum filled with granulation tissue, cholesteatoma, polyps and other products of a degenerated mucosa in cases of old suppurative otitis, that there is never a doubt in their minds that here lies the focus chiefly responsible for the persistence of the discharge. In view of these facts the futility of attempting to cure old otorrheas by the methods ordinarily practiced must be evident.

What more can the routine syringing of the ear accomplish than merely clearing out such secretions as are present in the tympanic cavity? The irrigating fluid, supposing the drum-membrane defect to be adequate, flows through the opening and returns without coming in contact at all with the region which most requires treatment. Even though some of the fluid did succeed in reaching the more remote recesses of the middle ear, it could not be expected to have any very decided effect, as only dilute solutions of mildly antiseptic qualities can be employed in this fashion.

In the classes of cases under discussion it is necessary not only to employ medicaments of extraordinary strength and potency, but also to be sure that they are brought into direct contact with the parts particularly affected, if we are to secure results. This object can best be realized by the employment of instillations. The usual manner of employing instillations is to have the patient flex the head laterally or to lie on one side with the diseased ear uppermost, when the fluid is dropped into the ear, whereafter he immediately assumes again the erect position. If the object to be accomplished be to bring the medicament especially in contact with the internal wall of the tympanic cavity, then this manner of procedure is to be commended. But the internal wall is the most resistant of all to necrotic processes and therefore the one we can best afford to neglect.

As I have already, I hope, made sufficiently clear, the region to which it is essential to direct the healing fluid is the antrum, located a little above as well as behind the tympanic cavity. To do this it is necessary to have the head in such a position that when the fluid is dropped into the auditory canal it will gravitate upward and backward and find its way through the aditus. Instead, therefore, of inclining sidewise, the patient should be recumbent, with the head in a position of over-extension. It is a good plan to order the instillation to be used at the patient's hour for retiring, in which case we can be sure that sufficient time will be allowed to enable the fluid to percolate to the deepest recesses and be a sufficiently long time in contact with the diseased parts.

Of course the patient needs, first of all, to assume the lateral position with the affected ear upward, for the drops must enter the tympanic cavity before they arrive at the aditus of the antrum. When time enough has elapsed for this—but a few seconds if the defect in the membrana tympani is large—the position must be changed to the recumbent. In order to get the over-extension needed to have the fluid go upward as well as backward, it is well to direct the patient to place a bolster under the back of the neck or shoulders in such a way that the head can fall backward. As regards the best agent to use, it is to be borne in mind that for these old stubborn chronic cases, in which the membranes are thickened and degenerated and the walls perhaps carious, the mild antiseptic solutions used in ordinary irrigation will be generally ineffective. We must employ remedies of exceptional virtues. The best agent for this method is alcohol, either alone or serving as a menstruum for other drugs, such as boric acid, iodine, silver nitrate, mercuric bichlorid, liquor formaldehydi and resorcin.

Alcohol not only is a splendid antiseptic, but also has dehydrating properties that commend it especially in this class of cases. In the case of granulations or polyps its tendency to produce a shrinkage or ultimate devitalization of these structures makes it particularly valuable. Absolute alcohol in some patients gives rise to so much smarting that they will object to its use. They can, however, be brought eventually to tolerate the full strength by a process of beginning with a 50 per cent. dilution with water and gradually increasing day by day the proportion of the alcohol. Other patients will tolerate the full strength at once if we adopt the plan of first instilling a mere drop or two, and then waiting a few seconds before putting it in freely. To get results from the instillation method, as from any other, the

first requisite is to get the middle-ear cavities as clear as possible. This can be done by any of the methods I have mentioned in discussing the first indication of treatment.

Irrigation may occasionally be necessary, but its general use should be discouraged, and when it has been used the canal of the ear should be mopped and the parts thoroughly dried. I am in the habit of preceding the alcohol treatment by a two weeks' course of enzymol or hydrogen peroxid, each 50 per cent., administered by the same method. The object of these drugs is to digest and assist in the removal of the debris, thus preparing the way for the curative agents.

The alcoholic instillations may be used every day, every other day or even twice a day, according to the case, always having regard for the postural requirement as I have specified. About once a week a preparation of silver may be used of a strength varying from 1 to 5 per cent., or of tincture of iodine, 1 part to 10 of alcohol. The latter preparation is one of special value, but cannot be used frequently because of irritation which would be caused. Silver nitrate must also be used cautiously on account of the reaction which follows.

In certain of the London clinics anilin oil is highly extolled, used by instillation, for the cure of suppurative otitis. It has undoubtedly rare penetrating qualities which render it very efficacious, but it cannot be generally recommended because of the cyanosis which is likely to follow, even when only a few drops are used. Especially ought it to be avoided in the case of children. Individualization is of course necessary in the selection and use of a remedy, as each case is different in some respect from every other.

A preliminary otoscopic examination is important, to discover the size and location of the aperture in the tympanic membrane and the existence or other obstructive conditions which interfere with the drainage. Not infrequently in these cases the bottom of the canal will be found filled with the epithelial debris mixed perhaps with inspissated pus, constituting a serious hindrance to drainage. In other cases polyps and granulation tissue are seen protruding from the tympanic cavity and occasionally large cholesteatomatous masses are present. Unless such conditions first receive our attention, all efforts to bring about a cure by other methods will be defeated.

There will be, of course, a certain number of cases of old chronic otorrhea dependent on such profound and extensive bone destruction that nothing short of radical surgery can be effective. But I am convinced that the proportion can be greatly lessened and many apparently hopeless patients finally healed by assiduous local treatment, and especially by scrupulous attention to the few principles which I have emphasized in this paper.

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Discovery of the Transmission of Disease-Causing Protozoa.

—We are justified in having no little pride in the fact that two of our countrymen, Smith and Kilbourne, in 1893 actually proved for the first time the transmission of disease-causing protozoa by blood-sucking arthropods. The honor for their discoveries and patient observations and experiments on Babesia in connection with Texas fever in cattle was not shunted from the ridge-pole, but came with the fact that their results were immediately applied to human diseases. To Smith and Kilbourne, then, belong a great part of the credit and honor of paving the way to the present-day control of malaria and sleeping-sickness, and the practical extinction of yellow fever in epidemic form.—G. N. Calkins in *Science*.