

locally fail to do so, but more often have the opposite effect, when the prognosis becomes bad indeed.

Complications by way of extension of the suppurative process to neighboring parts may be a cause for delayed recovery in acute middle ear suppuration. The most frequent extension is to the mastoid cells, with resulting mastoid abscess; less frequently to the internal ear, the lateral sinus, the dura and other membranes of the brain and the brain itself. It would take entirely too much time to discuss these various conditions in a limited paper. Nevertheless, they are important factors that deserve careful consideration and study, and should be borne in mind, if not anticipated, in all cases of delayed recovery. This calls for a searching examination, suggested in the earlier part of the paper, for by it alone are we enabled to approximate an exact diagnosis in the full sense of the term.

It may be well to mention the fact that none of the complications arise suddenly, even in those cases in which they appear to, for on the contrary we generally find prodromal symptoms of longer or shorter duration. These prodromal symptoms are generally due to a serous form of inflammation due to the action of bacterial toxins that filter through the bony partition that separates the infected area from that which is threatened. For the alert diagnostician, therefore, sufficient time is generally allowed to intercept the more dangerous suppurative form of inflammation.

Susceptibility to a particular organism, lack of immunity or failure to generate proper immune bodies in sufficient quantities may be a cause of chronic middle ear suppuration. Theoretically the vaccine treatment should be ideal for this condition. In behalf of this treatment a great deal was promised a few years ago. I almost hesitate to confess what little service the treatment has been to me. I tried it early and carefully and over a long period, and was encouraged at first, thinking I had at last found a panacea; but later disappointment came and the disappointments were repeated. Autogenous vaccines were used when the time and circumstances permitted; when they were not used the stock preparations were. When the results were apparently most brilliant with the vaccines the conditions were favorable and the same results were duplicated in other cases in which vaccines had not been used. In the most trying cases the vaccines failed me as did other methods. There is a field for vaccines, but it is a limited one. I have not given up their use, in spite of my many failures to obtain results with them. If the preparation of the vaccines is all right, failure to obtain results would seem to show that we are not on the right track, and the cause of the chronicity must be sought in some other factors previously referred to.

My effort has been merely to outline some of the causes of delayed recovery in acute middle ear suppuration, the prompt cure of which would mean the prevention of chronic middle ear suppuration.

The Heritage of the Profession.—We are a curious mixture of heredity and environment—a curious blend of optimism and pessimism. Our heritage is a glorious one, for we present an unbroken line of professional workers with one ideal which was old before the Christian era. From the time Hippocrates taught his disciples at Cos to the present, the one great idea, the one great controlling thought, has been to find the truth, and, having found it, to use it for the benefit of mankind. The truth sought for has never been sought that it may be put to the base use of man's destruction.—J. M. Putnam, Address before Buffalo Academy of Medicine.

NONOPERATIVE TREATMENT OF OTITIS MEDIA *

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Chronic suppurative otitis media is rather easily cured in a large number of cases if proper methods are adopted, but it is exceedingly difficult to obtain men with sufficient self-abnegation, one might say, to carry them out. I refer here especially to our public clinics, in which we find that assistants do not give the attention to nonoperative treatment of chronic suppurative otitis media that they should. Such work is regarded as an uninteresting grind; hence the tendency is all toward hastening these patients to the operating table.

The proper treatment depends on the location of the area of the middle ear involved, that is, whether the disease is more or less located in the tube, the cavum or the mastoid portion of the middle ear; on the stratum that is involved, that is, whether it is relatively superficial, the epithelial structures being most affected, or the tissue under the epithelium, or whether it is the periosteal layer and bone. You know the mucoperiosteum, as its name would indicate, serves two purposes, as a mucous membrane and as a periosteum, the bone beneath deriving its nutrition immediately from the mucoperiosteum. The treatment also depends on the character of the pathologic process, that is, whether it is merely a pus-producing microorganism, being a streptococcus, staphylococcus, or one of the various forms of diplococci, whether it occurs as the result of diphtheria or scarlet fever, or of tuberculosis or syphilis.

Tubal disease is very rarely purulent. Large quantities are blown out with the catheter. Purulency in a discharge from the ear means, as a rule, disease of the bone. When the discharge from the tube is purulent, it indicates involvement of the tubal cells, a series quite separate from the mastoid system, and calls for operative intervention; obviously, not the so-called radical operation, but one outside the scope of this paper to describe. The mucus or purulent mucus comes invariably from the tissues above the periosteal layer of the mucoperiosteum. The mucus from the cavum is exceedingly scant, the moisture here being secreted by the surface epithelium; there is little or no glandular tissue in the cavum. In the tube these structures are quite evident, being more abundant at the pharyngeal opening and decreasing as the isthmus is approached, where it is absent, and again gradually increasing toward the caval opening. The perforations in the tympanic membrane from tubal disease are situated in the anterior portion of the pars tensa practically always. They are usually large in chronic cases, but may be small. They are central and never marginal in uncomplicated tubal disease, that is, an area of tympanic membrane intervenes between the perforation and the annulus. In centrifuging this discharge we find no evidence of bone cells or bone chips. This discharge may be quite abundant, may be quite fluid, is usually stringy and tenacious, but not purulent. This discharge may continue a long time, for years, more or less, with exacerbations occasionally, diminishing to a point at which the patient scarcely notices the discharge, or completely ceasing for a time. But it is chronic and continuous in many cases. The treat-

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ment should be directed to the tube. These are the cases that depend for their continuance on pathologic conditions outside of the aural structures per se. This has been sufficiently brought out in preceding papers. Besides removing the associated pathologic conditions in the nose and postnasal space, we should get rid of the hyperplastic tissue in the tube itself. This may be done by application to the tube by means of the eustachian catheter, applicator, Weber-Liel catheter or syringe. Schwartze long ago recommended that in such cases the tube be syringed out. This can be done through a catheter, the irrigating fluid coming through the perforations of the tympanic membrane. We should, therefore, be careful in these cases to have a large perforation, a perforation of proper size made by the condition or artificially by surgical enlargement. The irrigating fluid we use for this purpose should be nonirritating. A normal salt solution is ideal. Nitrate of silver may be applied in these cases. A small wire, preferably not silver wire, one strand being wound about another, makes a very cheap and efficacious applicator for this purpose. A small piece of cotton is wound on the end and this is immersed in the nitrate of silver solution, and carried to the cavum. In such operations the hard rubber catheter should be employed. One should begin with a low percentage, 2.5, and increase, according to the resistance of the patient, to 10 per cent. This should be carried through the isthmus to the caval opening of the tube. We may apply the medicament to the tube with a syringe fitted into the catheter, but this method is less effective.

In a majority of cases, when uncomplicated by diabetes, syphilis, etc., or when the tubal cells are not involved, this will bring such a discharge to a close. In case, however, these patients do not recover, then the question comes up whether ossiculectomy is permissible, or whether we should take away a large portion of the tympanic membrane, establish a permanent opening by way of the external auditory canal, and by some method endeavor to seal up the eustachian tube and destroy the tubal cells.

Now we come to inflammations of the cavum. For descriptive purposes anatomists have divided the middle ear into the tube, the cavum and the mastoid cells. As regards the pathology, these divisions do not hold. They are artificial, in other words. The middle ear begins with the pharyngeal opening of the eustachian tube and ends with the most remote pneumatic space of the mastoid, all being covered by a membrane of unbroken continuity. We may have these so-called superficial inflammations that do not involve the bone, but the covering of the bone, extending from the tube to the cavum, and even the mastoid cells themselves. It is a rarity to find either an acute or chronic inflammation limiting itself to any one division of the middle ear. It is in the epitympanic space that we behold the anatomic conditions which tend to perpetuate even simple inflammation, because of insufficient drainage conditions. I refer to those innumerable little pockets in the epitympanic space formed by the various ligaments that attach the malleus and incus to the surroundings, all covered with mucosa. For a long time undrained, infectious material causes the mucosa to take on the usual inflammatory changes, causing a discharge which resembles that from pure tubal disease. In a large majority of these cases the perforations will be anterior or posterior to the manubrium, and in the pars tensa.

How are we to get at these little pockets? The best way is by irrigation through the eustachian tube and through the opening in the pars tensa. This can be done by means of the epitympanic cannula. It can be done through the tube itself by the Weber-Liel catheter, a catheter made of woven silk, which is introduced through the eustachian catheter to the cavum, or to the isthmus, and the fluid forced in through the epitympanic space by means of a syringe. I do not hesitate to do this. I believe in these chronic cases the danger of forcing infectious material into the antrum is more or less, preferably more, fallacious.

Here comes in the use of the boric acid and the dry gauze drain. There was a war preceding the present war in Europe by some years, between the various camps in Germany, Munich and Halle being the respective citadels, and it became almost as deadly as the present conflict, one camp standing for the irrigation of the ear and battling against the dry method, the other upholding the standard of the dry and bitterly militating against the wet method. Now we all know that irrigation has its place. It has its place to remove debris, to remove secretions. But we should be very careful how much we irrigate the ears in chronic otitis media suppurativa. There is no doubt that there are cases in which injudicious irrigation only perpetuates the discharge; but when we find that this is true, all we have to do it to use either a boric acid pack or a dry gauze drain. The dry gauze drain that I prefer is one made from xeroform gauze, one-half inch wide, packed against the perforation in the tympanic membrane, not pressing it, but in contact with it, and changed as often as this drain becomes moist. Or the boric acid will produce results in cases in which the dry gauze drain will not, and this is especially so in cases in which the promontory of the cavum is largely exposed, in which perhaps the malleus handle has become necrotic and disappeared, and in which the mucoperiosteum of the promontory is granular. In these cases, if the dry gauze drain does not produce dryness or a decrease of secretions, the head is bent to one side and the whole external auditory canal is tamped with boracic acid. This can be done, of course, only in cases in which the perforation in the tympanic membrane is large.

Granulation tissue in the cavum, projecting as a polyp through a perforation above or below the short process of the malleus or covering the promontory as a sodden mass, means that profound changes in the circulation of the mucoperiosteum have taken place, and that therefore the bone beneath has become more or less involved. This should be removed by snare or cautery (chromic acid, iron perchlorid, trichloroacetic acid), with proper precautions. Alcohol, with or without salicylic acid or boric acid, is a most useful application in this class of cases, as well as in small cholesteatomas of Prussak's space.

Now we come to the cases in which the mastoid is involved, and these are cases in which the bone must be taken into consideration. Here we may have perforations in the pars tensa, or most frequently in Shrapnell's membrane; these are usually situated at the periphery of the tympanic membrane. These are usually cases of cholesteatoma produced by the overgrowing of the epithelium from the auditory canal into the epitympanic space, which causes pressure, and this pressure causes destruction of the bone within the antrum and mastoid. This is not a condition which

necessarily demands operation. It is our duty to ascertain the extent of the disease. I have cured numerous cases of this kind, when small and not too old, by the use of the epitympanic cannula and alcohol. This epitympanic cannula is inserted through the perforation of the epitympanic space, or in case there is a fistula, posterior or anterior, and that is washed out, and frequently I wash out large masses of cholesteatoma. After this I either pack with boracic acid or dry gauze.

How do we know the mastoid is involved? By the history of the patient, as to whether there have been symptoms of spontaneous pain or tenderness on pressure, of swelling back of the mastoid at the beginning of the otitis media; as to whether the discharge produced is purulent; as to whether the perforation is situated in the pars tensa or pars flaccida; by the skiagraph; by the recovery of cholesteatomatous tissue from the washings; by the presence of cholesterol crystals and bone plaques in the centrifugalized pus; by the presence of symptoms indicating meningeal or labyrinthine irritation. Certain groupings of these symptoms indicate radical operative procedures, but this subject cannot be even touched on in this paper.

I have just two more points: first, as to suction. That has been tried a great deal. Personally, I have seen very little good come from it. I do not believe, however, that it does harm or that it may be dangerous. It should certainly be tried if any one would like to try it. In one sphere it is especially useful, and that is in diagnosis as to the region whence comes the pus. Second, as to vaccines: I have seen only one kind of case of chronic suppurative inflammation in the middle ear benefited by vaccines, and that was a case in which the epitympanic space was involved, characterized by a considerable discharge of mucus, and here we have found in two cases a pure culture, in one the staphylococcus, and in the other staphylococcus greatly in excess of the other kinds of bacteria. Here the autogenous vaccine produced a cure in a little over two weeks in one patient who had been under treatment for as many months.

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THE END-RESULTS OF TREATMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA *

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The end-results of treatment naturally fall under two heads, namely, the nonoperative and the operative.

In nonoperative cases the results depend much on the correctness of the diagnosis. In any case that is, in fact, a nonoperative one, the end-result should always be a cure of the discharge and improvement of function, provided the cause of the aural discharge is not a constitutional one, such as syphilis or tuberculosis, and there is no labyrinthine involvement present. Many cases that are properly classified as nonoperative in so far as concerns the ear are, nevertheless, operative in the sense that the environment of the ear is bad, so bad indeed that operative measures for the improvement of nasal breathing are necessary. In such as these the end-results of treatment depend

much on surgical means for the removal of infectious foci of the nose, nasopharynx or pharynx.

We may, therefore, dismiss the nonsurgical aural cases with the statement that when assured that any given one is actually in the nonsurgical class, cure should in the vast majority of cases be expected, and the hearing power should usually be improved.

The end-results of the surgical treatment of chronic suppurative otitis media depend on many things.

1. The age of the patient: This, in my own experience, has had little to do with the outcome of surgical treatment, further than that the radical measures necessary to cure are somewhat more difficult in children than in adults, and the after-treatment usually cannot be so thorough with crying children as with older patients. However, in cases of children in whom the aural disease or its treatment is not modified in any way by the conditions I shall shortly mention, I have found the end-results satisfactory in a high percentage of cases.

2. The condition of the nose, nasopharynx and pharynx: The end-results of surgical measures for the cure of chronic otorrhea are often failures to a great extent if the diseased environment of the ear is not corrected. This fact is now generally accepted, I believe, by aural surgeons, for if, as believed, the nasal and nasopharyngeal diseases were the chief predisposing factor in the causation of the chronic aural affection, then cure of the aural disease must be unlikely so long as the diseased environment remains. Clinical experience in the treatment of chronic running ears bears out entirely the correctness of this belief.

3. The nature and violence of the original aural infection: These probably more than any other factors determine the end-results of surgical treatment. If the bacteria of invasion were violent of action, as is usually the case in the infectious diseases of childhood or in the severe epidemics of grip and as a result serious invasion of the osseous walls of the drum cavity or of the deeper portions of the adjacent mastoid or petrous parts of the temporal bone occurred, the nature of the final outcome may be in doubt; however, the end-result of surgical treatment will even then usually be a cure, but may possibly be only a partial cure and sometimes is a failure. While of course the proportion of cures, partial cures and failures depends much on the conditions present in the patient, as set forth in the points of argument to follow, much depends on the skill of the surgeon at the time of the operation, and on his energy in following the case personally a sufficiently long time afterward.

4. The presence of complications at the time surgical measures are attempted: The end-results of surgical treatment of chronic aural affections, when complicated by extension of the infective processes to the labyrinth, meninges or lateral sinus, furnish a brilliant example of the progress and efficiency of aural surgery. The end-result, of course, here depends very much on early diagnosis, since success in this class of surgery goes hand in hand with prompt diagnosis, which alone gives the surgeon his essential opportunity. Increased knowledge on the part of the internist concerning the possibilities that may arise from a chronic aural discharge and the greatly increased facilities to early diagnosis of aural complications now at hand, when taken together with a better surgical knowledge on the part of the aurist than ever before existed, furnish the reason for the many brilliant cures that have been reported as a result of surgical measures for the relief

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