ASSOCIATED OTOMYCOSES (A VESICULAR-PUSTULAR AFFECTION OF THE EXTERNAL AUDITORY MEATUS CAUSED BY ASSOCIATED MICROPHYTES AND PATHOGENIC BACTERIA. DIAGNOSIS AND TREATMENT.

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There are numerous kinds of polymorphic affections of the external auditory meatus, phlyctenular or vesicopustular, which are caused by more or less well defined microorganisms, and which are more or less easily curable. In such cases there should be no difficulty in diagnosing them from furuncle, or the changes due to herpes, eczema or even syphilis, although striking resemblances to cases of this kind demand a precise diagnosis. In this disease, there is an otitis externa diffusa with very marked characteristics, an otitis which is mild and very painful in the different phases of the disease, more or less secretion and even hemorrhages, being somewhat analogous to the mycotic inflammations of the external auditory canal. In certain points they recall the disease which Politzer¹ called "Otitis parasitica," and to which Weiden² had assigned the aspergillus as a cause; disease whose origin Virchow tried to recall by the name otomycosis, while to observations by Mayer³, Paccini⁴, Carl Kramer⁵, Schwartz⁶, etc., were added the contributions of Burnett, Blake, Patterson, Cassels, Bezold, Lewenberg and others which were important in establishing their pathology. In a previous publication, devoted to otomycoses⁷ I tried to add to the study of this disease, as much

*Read before the International Congress of Otology, Bordeaux, 1904.

- (1) Politzer—Text-book of Diseases of the Ear.
- (2) Wieden—Monograph, 1888.
- (3) Mayer—Arch. f. Anatomie (Muller's) 1866.
- (4) Florence—1851.
- (5) Vierteljahrschr. d. Natur (Zurich 1859-1860).
- (6) Schwartz—Surgical Diseases of the Ear.
- (7) General Studies and Experiments on Otomycosis (Moscow, 1897).

to its deliniation as its therapy, while in another work of the same kind⁸, I called attention to the fact that otitis externa diffusa is caused not only by the aspergillus, but also by other microscopic fungi, such as the trichophyton. According to bacteriologic studies, the cases of otitis externa whose observations I will report later, do not appear to belong to the same class of otitis parasitica as those due to the aspergillus and trichophyton, because of this one difference, that instead of being simple, and caused by only one microphyte, they are complex and caused by associated organisms. In short to that generic element the microphyte, there is added the most diverse micrococci whose presence contributes to the virulence and stubbornness of the disease. For the parasites present having caused a stubborn inflammation, as will be seen below give way to frequently recurring inflammations of the external auditory canal and tympanum, whose nature is frequently unknown, and which is one of the most frequent of the non-traumatic external otitides in the adult. The microorganisms are especially the mucedins (aspergillus glaucus et niger, eschophora elegans, trichothecium roseum, mucor mucedo, oidium albicans) which are unable to attack the auditory meatus of man at first, since no mucedin can live in the normal skin of the meatus, but without doubt, as Schwartze thought and as seems to be proven by my observations, its entrance into the integument is due to some abnormality, such as a detachment of the epidermis, and excoriation, or a superficial inflammation of the skin, where the micrococci are already present and rapidly increase. Here the different micrococci (streptococci, staphylococci, and even the coli bacilli) find suitable nutrition; they germinate and multiply rapidly, while their presence in and on the epidermis gives a complicating character to the previous inflammation, which latter might be called the preparing disease. There can then appear an otitis externa hemorrhagica, preceded by the parasitic inflammation, which soon dominates the scene; or a severe dry hyperemia followed by a very severe inflammation may give way to a caseous or pseudo-membranous exudate, which can be detached only with great difficulty, which is constantly renewed, and which each time that it is removed reveals the subjacent lining of the meatus and the red tympanum. The entire canal, even its superior part, deprived for a large part of its epidermal coat,

(8) Tricophytes of the External Auditory Meatus (Congress at Paris, 1900).

shows in its place scales, masses more or less adhering to its epidermis, infiltrated, in places, with spores of the mucor, with or without micrococci. More recently I have observed that the blebs or phlyctenula filled with red blood, or purulent fluids are frequent in the diseased meatus. They seem to follow the erythema. They are rarely absorbed. They rupture, and when their contents are discharged, they dry up and are soon detached as scales. At the same time, also, vesicopustules follow hyperemic macules. If they remain simple vesicles, they break and dry up when they are in the interior or at the entrance of the meatus. If they become vesicopustules, they cause profound changes in the dermis. They are very painful. They become umbilicated or rupture to form an ulcer whose red base comprises the deeper layers of cells, the Malpighian, and whose borders are enclosed by a dry cornified zone, which adheres for a long time. In certain cases, however, they form numerous, true abscesses, which close the lumen of the meatus and which either by their appearance or their pain resemble the acute ulcerating tumors of tuberculosis, so that they should be the cause of frequent errors in our daily practice.

The polymorphism of this affection is an evident reason for its difficulty of diagnosis. Really, it can not be actually established except by a microscopic examination of the material directly removed *a loco dolente*. It should be examined as soon as possible, and again immediately after the results of the culture made direct from the meatus are known. These cultures made at the temperature of the room or a constant temperature of 38° at the Pasteur Institute on gelatine or better on Raulin's fluid, give, after 48 hours, the first signs of development of microorganisms, and this continues for some time, since we know tubes where the development has gone on without stopping for three months. Seen under the microscope (Leitz No. 4. obj. i. e. 960X). the mass removed from the diseased ear and the cultures present different appearances. Stained with Kuhn's fuchsin-phenique (carbol-fuchsine), the specimens show very clearly mycelium filaments, some single, some branched, sometimes budding, sometimes in full bloom with their hyphes and gonoids. Certain specimens, however, show only spores which are free and very mobile¹. In most of the specimens, I noted the presence of different bacteria,

(1) Investigations made at the Laboratory of Hygiene of the city of Nice, in collaboration with Dr. Beunat, of the laboratory, whose assistance has been very valuable to me.

such as the streptococcus pyogenes, staphylococcus, and diplococcus; micrococci in a diffuse mass and even the coli bacillus (a specimen of Beunat). In the diseases of the ear, the presence of the coli bacillus could justly cause surprise, if it were not for the well known tendency of the bacillus, indigenous to the large intestines, to wander, even into the meninges, where it finds a favorable soil and causes a meningitis purulenta. But whatever be the pathogenic bacterium, microorganisms belonging to the lowest order of vegetables, their presence by the side of cryptograms and algae in the course of an inflammatory disease, seems to me to give to the latter all the morphologic appearances of a mixed infection, being at the same time a disease clearly parasitic and clearly infectious. In the same way it seems to me that physiologically, the kind of otitis should have the characteristic of the one or the other, according to the dominating element in each case. Therefore, our patient sometimes has to endure very severe and painful symptoms, while others suffer only a nervousness due to a continued otorrhea. As a result, the symptomatology is variable, according to the species of the parasites, their pathologic action, their stenosing of the external auditory meatus, or their presence deep down, and the subjective state of the patient. Statistics give a relatively small percentage, 0.1, of otomycosis, which is at the same time the simplest and most studied of this class of affections. Bezold at Munich found the percentage 1.5, but no conclusion can be drawn from this because there was little true diagnosis, due to the fact that because of the lack of time, they rarely used the microscope, and because confusion with other otitides diffusae externae is very easy.

Considering the ease with which these microorganisms are communicated, and their growth on culture media, we can declare that it is certain that this disease is contagious. Likewise there is no doubt that the spores of the parasites are carried into the meatus by non-aseptic instruments, badly kept syringes, instillations of contaminated solutions, and finally by instillations of oily substances which remain in the ear and furnish an acid soil, so favorable to the development of microphytes. I have already remarked that an otitis externa parasitica is hard to cure, that is, its prognosis. The persistence of the disease depends not only on the microphytes and schyzomycetes which cause it, but also on the association of these with pathogenic bacteria. The otomycosis is stubborn,

nevertheless it is completely curable, if one has the patience to continue treatment, which, ought to be continued to complete cure, however complicated and associated with pathogenic bacteria it may be, or however involved in the usual complications which the different microorganisms cause. The otomycosis, as we have seen, can be completely cured, however complicated, but the work is doubled. It is necessary that neither patient nor doctor give up, for it is only after very long treatment, and earnest, diligent, various though uninterrupted efforts, only after having passed the aftermath of unexpected and inexplicable relapses, that we arrived at definite results. Except the possibility of tympanic perforation, as Bezold and Politzer fear, and except the hypertrophy of the integument of the meatus auditorius externus, to which the mild but tenacious inflammation disposes, we need dread only neurasthenia, which is induced by an affection that never gets well. Furthermore, many nervous sounds may result from it.

If the single otomycosis responds to the indications, which are precise enough though variable, and which results in a cure in one or two months, it is necessary to admit that in associated otomycoses, it is not the same. The most varied treatment remains often without effect, and this class of otitis resists most stubbornly the usual antiseptics. While we have employed in the simple cases, with much success, lavage of the meatus with solutions of calcium hypochlorite 0.1 to 200-300 of filtered water, recommended by Wreden; while absolute alcohol, tannin and alcohol 1% of Weber Liel, 2% salicylic acid of Bezold, 2% carbolic acid, and subacetate of lead V-X drops in a glass, of water have been recommended as sometimes useful, we are able to state that the associated forms of otitis externa parasitica have been, in our experience, always refractory not only the usual indication but also to solutions of sublimate and cyanide of mercury, of each 1-100: that they have been unaffected by applications of the tincture of iodine and nitrate of silver; that a saturated solution of boric acid in alcohol seemed for a while to give hope, but that it was necessary to give it up on account of the irritation and caustic action caused by it. The usual resources being so futile, we have studied microscopically the microphytes and bacteria for a new tentative therapy. This seemed to us should be founded on the variety and mode of life of the microbic elements found in the microscopic examinations we have made of our cases. Now, the biology of bacteria has

informed us that the spores of the schyzomycetes and microphytes are, in general insensible to physical and chemical influences, that they are even refractory for a long time to temperatures around 212° , and that their vitality is extraordinary. Gruber, who was the first to study this question seriously arrived at this conclusion, that the only indispensable condition in the development of the *oidium albicans* is the constant presence of a medium impregnated with a sweet or amylaceous substance, which is fermentable, and consequently acidifiable. Now it is logical to conclude, by analogy with their congeners, that an acid medium is the one favorable to the development of the mucidines, and that the acid of the mucus in which the parasitic concretions are continually bathed, a phenomenon consecutive to parasitic development, contributes, when once produced, to the welfare of the cryptogenous vegetations. And it is also logical to conclude that every alkaline or alkalifiable medium is or should be unsuitable to the vitality of cryptogams. As a result of these biologic considerations we have been led, in the treatment of those otitides whose fundamental cause is a fungus schyzomyces, to try the rational means which study as well as experience showed to Niemeyer and Gruber as the most efficacious in arresting the development of and the destruction caused by the *oidium albicans*, namely, the cure of thrush.

In the treatment of this class of cases, we should use alkalines. But since a large part of the virulence of this particular inflammation of the external auditory canal must be attributed to the pathogenic microbes that accompany the microphytes, we have added to the alkaline solution an energetic non-acidigenous antiseptic such as sublimate, which seems best for the purpose. Furthermore, considering the well known insensibility of the spores of the schyzomycetes to physical and chemical changes we have used medicated alkaline solutions in the form of profuse irrigations, in order to add to the chemical action of the alkali, the mechanical action of lavage with large quantities of fluid, the only method of removing from the meatus, the spores or gonoids, which are surgically inaccessible.

The method of treatment of associated otomycosis may be outlined as follows:

- (1) Daily cleansing of the diseased meatus, so as to remove completely the integument that is not ulcerated, the

scales, the concretions and the caseous deposits that clog the meatus.

(2) Immediately following the cleansing, and several times a day, according to the importance of the case, a profuse lavage of the canal with a solution of distilled water containing to the litre 4.0 of sodium bicarbonate or borate, to which has been added 25 centigrams of sublimate.

(3) Insert in the meatus a wick of sterile gauze saturated with the alkaline solution, in order to keep the walls of the meatus apart, and to prevent as far as possible all auto-infections.

(4) As an internal treatment, alkalines or malt.

In certain ones of the cases we treated, the treatment was immediately followed by an encouraging result, although all treatment had been ineffective. From the very first alkalino-antiseptic application, the cryptogamous concretions were detached with an every increasing facility, the white foci disappeared to reappear more mildly and less intense, the redness and heat of the meatus diminished as the cure progressed. Nevertheless the cure was prolonged, and this rebelliousness proves how tenacious this affection is but in spite of everything we are able to say henceforth without fear of contradiction that whoever has to treat a case of associated cryptogamous otitis will not find, for the present at least, any treatment so rapid, so efficacious and at the same time so simple as that of an alkaline with sublimate, as has been given above.

To summarize:

Certain diffuse otitides externæ with phlyctenulæ or vesicopustules are only simple or associated dematomycoses with different pathogenic bacteria, which cause polymorphism and difference in intensity.

Although their evolution is characteristic of the different schyzomycetes (*aspergillus glaucus et niger*, *oidium albicans*, *mucor mucedo*, *tricothecium roseum*, *trichophyton* of Molstein, etc.), which cause them, by virtue of their association with different pathogenic bacteria (*streptococci*, *staphylococci pyogenes*, *micrococci*, etc.), they acquire certain influences which profoundly modify their symptoms, course and termination. These are e. g. frequent hemorrhagic phlyctenulæ at the beginning of the disease, vesicopustular forms, inflammatory stenosis of the external meatus, whitish deposits and pseudomembranes.

Resistant to all simple treatments, these parasitic otitides be-

come more and more severe, intractable, and recurrent because of the microbic complication. They always yield to treatment after a longer or shorter time.

In carrying out the treatment, we remember a fermentable and acidigenous medium is the condition favorable to the development of microphytes, and it is necessary to make the medium alkaline and antiseptic. Rationally, and by analogy, the treatment of thrush would be the best applicable to the ear. Profuse lavage with an alkaline sublimated solution, i. e., an antiseptic, non-acidigenous, alkaline solution, is indicated.

Case I. M. T., Moscow, act 56, without special history, was sent to us by our worthy confere Dr. Ollnitz, for abscesses of the left auditory meatus, abscesses which apparently showed so perfect a resemblance to those which characterize furunculosis, that we came to that diagnosis, and hoped for a speedy cure by the method of Lewenberg, alcohol borated to saturation, incision of the abscess. But there was no amelioration, and as the meatus had become stenosed, two days later, by the inflammation and abscesses, we repeated the necessary incisions, and after an energetic curettage placed a drain in the meatus. Relief, but not radical. Then the same conditon appeared again. We asked for an analysis of the mass removed from the meatus, which was made by Dr. Beunat. Culture on gelatine at 38°; development in 48 hours. After staining with Kuhne's blue the microscope showed—micrococci, a few streptococci, staphylococci tetragenes; (2) plaques of the same elements; (3) plaques of Kuhne's blue, bacilli and diplococci; bacilli resembling in every way coli bacilli (Beunat). Some days later, the right ear of the patient became affected and a microscopic examination showed, after culture on gelatine, the presence of mycelia and streptococci. Treatment—various solution, sublimate 1-1000, 1% carbolic acid, 10% silver nitrate, tincture of iodine, boric acid, salicylic acid, potassium cyanide, etc. Malt was also tried, with no good results. The idea then came to us to try treatment with alkalines, and cure was reached in 4 weeks, after previous treatment of three months. May, 1904. Having every day completely cleansed the meatus with the curette, of all thrush—purulent secretion, we had the disappointment of seeing it covered again with vesicopustules, some superficial, others deep, surrounded by a scaly and regularly pitted zone, at the bottom of which, a red zone showed the Malpighian layer, the whole covered with a

purulent secretion or sprinkled with whitish thrush. After treatment by cleansing and profuse lavage with 4% solution of sodium bicarbonate and 1 pro mil. sublimate, the patient experienced an amelioration which led to a complete cure.

Case II. Sch., German, 25 years old, was sent to us by our worthy colleague, Dr. Wolff, on account of severe pains in his ear, and the hemorrhages which indicated an otitis hemorrhagica externa. The patient had become better after long and assiduous treatment, but while convalescing, and while his meatus was very delicate, he suddenly returned to ask us to examine his left ear. The integument had become red, and was covered with whitish spots, similar to a deposit of frost. No new eruption of hemorrhagic phlyctenulae. Culture and analysis: Mycelium and micrococci. We tried lavage with calcium hypochlorite, which extremely irritated the meatus. Two days later, the right ear was affected. From then on, we used regularly alkalines and sublimate which quickly gave a favorable result, which was a radical cure only after some weeks.

Case III. M. R., young woman, 24 years old, was sent to us by our distinguished confrere Dr. Gaziglia, for a suppuration of the ear, and progressed well towards cure, after we removed a large polyp from the posterior superior segment of the left external auditory meatus. Suddenly she returned to have us see the meatus, and the seropurulent discharge. We found a white mass in the meatus, and each time, the lavage removed small whitish concretions mixed with epidermal scales. Roughness of the dermis of the meatus over which were disseminated innumerable small whitish spots. Culture on serum, gelatine and the mineral solution of Raulin. Growth after 48 hours. Microscope of 960-D showed mycelia with their spores, epidermal cells and micrococci. The alkaline-antiseptic treatment, amelioration, very marked. Diffuse cauterization with silver nitrate or zinc chlorid. Result nil. Amelioration evident as soon as we recommended the treatment with sodium borate, etc. After two months, the cure was not yet complete. Departure of patient.

Case IV. M., Monte Carlo, youth 16 years old, anemic, was sent to us by our distinguished confrere, Dr. Colliquin of Monte Carlo, for suppuration of the left ear, which promptly became better on the extraction of a huge polyp from the meatus. There was only a slight oozing. Soon we found, in the operated ear, hemorrhagic phlyctenulae, detached epidermal scales, and white, disseminated spots. Same culture, same

findings, same treatment as Case III. Cure was almost complete in 6 weeks, but treatment should have been continued longer.

All these cases show by their symptoms, as well as by the microscopic examination, the same disease, associated otomycosis. Three of them showed what we said on the subject of inoculation by spores, viz., that an excoriation of the skin or some anomaly of the dermis seems indispensable for the penetration of the gonoids. Furthermore the efficacy of the alkaline treatment answers both theoretically and practically in checking and destroying the vitality of the microphytes, to which an acid medium is absolutely necessary. The cases we have just quoted conform to the resume, with which we closed our study.