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After-treatment of the Radical Mastoid Operation.¹

By E. SCHMIEGELOW.

As an introduction to my paper I will lay stress upon the truth of what Ludwig Stacke² wrote twenty-four years ago in the chapter headed «Nachbehandlung» in his excellent book, still well worth reading, on the radical surgical treatment of middle-ear suppuration. Now as then, there is no doubt that «*das schwierigste Kapitel der ganzen Radikaloperation ist unstreitig die Nachbehandlung*». Next to a correctly performed operation everything depends on the after-treatment, and, continues Stacke, nothing but an uninterrupted practice of years will give the skill and assurance, which are absolutely necessary for succeeding. I myself have lived in the time, which, about 1890, marked the emergence of the modern otological surgical methods, and I have witnessed during the following years the enormous progress which the introduction of these methods meant for the success of the treatment of middle-ear suppuration; but in spite of everything I cannot but wonder when I see how little the fundamental principles of the after-treatment nowadays differ from those in vogue at that time, and which in the main are already given in Stacke's abovementioned work. Stacke wrote: «Das Ziel, nach welchem die Nachbehandlung zu streben hat, ist nicht eine Obliteration der eröffneten Knochenräume oder von Teilen derselben, sondern eine Überhäutung derselben auf dem

¹ The above paper was read together with all those included in this number, at the third Northern Oto-Laryngological Congress held in Christiania, in June 1920.

² Ludwig Stacke: Die operative Freilegung der Mittelohrräume. Tübingen 1897, p. 93.

Boden eines dünnen, aber gesunden Narbengewebes. Die innere Oberfläche der Knochenhöhlen bedeckt sich zunächst mit einem Polster gesunden Granulationsgewebes, welches später zu einem dünnen Bindegewebestratum wird, dessen Oberfläche durch das Einbringen von Epidermis sich überhäutet. Die Nachbehandlung hat dahin zu streben, daß die Granulationsbildung in denjenigen Schranken gehalten wird, daß einerseits die Epidermisierung möglichst schnell vonstatten geht, anderseits die Entstehung von Verwachsungen, erheblicheren Brücken, Strängen, Buchten und abgeschlossenen Hohlräumen verhindert wird. Zwei Hauptmittel stehen uns hier zu Geböte, die Tamponade und die Ätzung beziehungsweise Kauterisation.»

In conformity with these fundamental rules the after-treatment has since then been carried ont in otological clinics and hospital departments all over the world.

The end has been the same everywhere, while the means used have somewhat differed; and in the following I will allow myself to discuss these different means a little more in detail. The first question is whether to use

After-treatment with or without Packing?

As we know the packing method has been the chief method ever since the radical mastoid operation was introduced. At first iodoform gauze plugs were introduced into the operation cavity through the opening of the auditory canal or through the retroauricular opening which was kept open, either so long that there arose a permanent, mainly retroauricular fistula leading to the middle ear, or else, as Stacke recommended, the packing of the retroauricular wound was interrupted after four or five weeks' time, and only the dressing of the middle ear through the auditory canal was continued. The retroauricular wound then closed either spontaneously or by help of a secondary suture. For the rest Stacke advised that the packing should be abandoned entirely after four to six weeks and powder treatment begun—boric powder, Aristol, iodoform or some other powder—to reduce the secretion.

Since, in 1894, Körner¹ had for the first time demonstrated his flap-treatment of the auditory canal and shown that by its help a sufficiently large opening of the canal could be made for inspection of the internal dressing and the after-treatment of the middle ear from the beginning the retroauricular wound as a rule healed by first intention in immediate connection with the operation; afterwards it is customary to pack through the auditory canal, changing the packing daily, the first dressing being left in situ for five to seven days after the operation.

The success of the packing treatment depends on a *strict observance of asepsis*. If that cannot be accomplished, the plug will act as a greatly irritating «foreign body» in the wound, produce a strong foulsmelling suppuration, furthering profuse granulations, which fill up the middle ear and causes coalescence and disadvantageous local conditions, blind canals and closed sections of the middle ear, which will keep up the suppuration; imperfect asepsis will also lead to bad complications such as erysipelas and perichondritis auriculæ.

Stacke's great merit was, not only that he introduced the splitting of the membraneous auditory canal as a necessary condition for a successful epithelialization of the middle ear, but he also laid down the necessity of a strictly observed asepsis, if a good result was to be obtained. He writes in his work, p. 95: «Einen ganz fundamentalen Wert lege ich auf die Handhabung der peinlichsten Asepsis.» And if the packing treatment is not successful, it is in most cases due to imperfect aseptic precautions during the operation and in the after-treatment. The after-treatment, Stacke says, demands patience and perseverance, it will become trying and fatiguing only when grave mistakes have been made, but it is extraordinarily successful when you master it, possess the necessary experience and technical skill, and are supported by the consciousness of a never-failing, strict and consistent asepsis.

The first condition for a thorough aseptic packing is that the operation cavity should be in every respect perfectly smooth

¹ Körner: May 1894, at the third German otological Congress in Bonn. Arch. f. Ohrenh. 1894, p. 37.

without any carious foci hidden behind projecting edges of bone, which must be carefully removed. Then the thing is to carry out a very careful preliminary cleansing of the operation cavity, after the chiselling itself has been performed. This may be very difficult and even impossible in many cases at first, because it is often a case of foul smelling suppuration, years old, which has brought on deeply penetrating septic inflammatory processes in the walls of the operation cavity. I consider, however, that a great deal can be done in this respect, if the operation cavity, after having been carefully treated with chisel and sharp spoon in order to remove the septicallly infected parts as far as is possible, is exposed to the action of ample quantities of a 3 per cent. solution of peroxide of hydrogen poured into the middle ear.

For the plugging I, like Stacke, use strips of iodoform gauze, but while Stacke advises using fairly small ones, two to four square centimetres, I consider this form of packing less suitable. Stacke's claim for the use of small gauze strips rests upon the assumption that only with small gauze strips is it possible to fulfill the first condition of the packing being properly performed, which is a careful and complete filling of the furthest nooks and corners of the operation cavity, whereas the application of wider and longer strips would mean that you cannot reach everywhere, and thus there would be empty spaces where the secretions of the wound would accumulate and decompose.

This view may hold good, when small flaps are used, which do not widen the outer opening of the auditory canal, but is untenable, when Körner's flap method is employed, for this—specially during the first fortnight after the operation—will allow of the operation cavity being easily reached and inspected and will make it possible to plug the middle ear with longer and wider pieces of gauze in a perfectly secure fashion. And at the same time we have this great advantage, that the packing will act as a drain for the discharge in the middle ear and will aid in absorbing it much more completely than would be the case with the small stripes lying separated from one another, which Stacke and many others still use for deep packing of the wound cavity, in the middle ear. In my early days I tried

small gauze strips for the deep plugging myself, but found—a thing Stacke also draws attention to—that these deep plugs always were saturated with foul smelling secretion, when they were changed, a fact that Stacke partly connected with the circumstance that the narrow opening of the auditory canal did not admit of sufficient communication between the outside gauze bandage and the plug in the deep part. After having used Körner's flap, which I have done systematically for the last twenty years in more than a thousand cases of radical operation of middle-ear suppuration, I have used iodoform gauze strips, 4 to 5 centimetres wide and about 30 centimetres long, three or four in number, which are introduced into the operation cavity through the opening of the auditory canal which is kept artificially widened by means of a bivalve otoscope, so that it is easy to survey the whole operation cavity in all its details. I begin by filling the foremost part of the operation cavity with a small part of strip number 1, fill the rest of the operation cavity with part of strip number 2, possibly also of strip number 3, while the remaining larger part of the strips stay outside the ear and make up part of the sterilized gauze bandage that covers the whole ear. After five days the bandage is changed and I then proceed to pack with sterilized pieces of gauze which are moistened with 1 or 2 per cent. solution of nitrat of silver, and as in the case of the first bandaging I use three or four nitrate of silver gauze strips at a time. In the last six months I have occasionally, instead of the nitrate of silver gauze, used gauze slightly moistened with alcohol.

How long are we to go on with the plugging? Opinions differ on that head. Stacke held that the plugging ought to be continued for four or six weeks, but for the rest he treated each case on its merits, the time for the internal dressing depending on the degree of epithelialization. When the atticus and the aditus were in a fair way to epithelialization and showed no sign of narrowing, the packing could cease. Without any doubt it is a mistake to go on too long with it, for, as Stacke correctly expresses it: «Das Weglassen der Tamponade hat an und für sich schon einen ganz überraschenden Effekt.» We all of us

know a number of patients, whose middle ear goes on suppurating and filling with granulations in spite of plugging, cauterization and the use of a sharp spoon, and where the whole aspect changes for the better when the plugging is discontinued; the granulations peel off, the suppuration diminishes and the natural lumen of the wound cavity gradually forms. These conditions, however, I have only observed in patients, where the asepsis of the after-treatment has been defective or could not be carried out from the beginning, and where consequently the plugs have been soaked the whole time in foul-smelling pus or have become so during the course of the after-treatment. Under these circumstances the packing should cease, for in its septic condition it has a highly irritating effect and injures the epithelialization of the walls of the wound cavity.

On the other hand I entirely agree with Stacke who is of opinion that plugging is quite necessary and indispensable at the beginning and during the first stage of the after-treatment, but that a time will come when it hampers the healing. We may individualize in each special case with regard to the time when the plugging ought to cease, but as a rule syringing or powder treatment can be begun after three or four weeks.

This form of after-treatment, the characteristic feature of which is the regular, carefully watched and daily undertaken packing of the operation cavity, was, as I mentioned, enunciated by Stacke twenty-two years ago, and is practised in nearly all public and private ear clinics all over the world. It is admitted by all experienced ear specialists to be the surest and best means, by which the best and most lasting results are arrived at, but it requires patience, experience, great technical skill, a high standard of carefulness and the most complete asepsis.

Nevertheless,

The After-treatment without packing

now and then occurs in otological literature and is recommended as a painless, reliable method, which not only gives as good results as the packing method, but is even superior to it.

I do not believe in the truth of this judgment, because the results brought forward by the advocates of this method do not impress me as being convincing in this respect, and because I cannot recognize it to be true, that the principles on which the open wound treatment has been recommended as favourable in the case of surgical lesions on the arms and legs, the skin or other parts of the body should be equally applicable to the case of middle-ear suppuration, where it is necessary, with regard to the final functional result, to keep the cavity of the temporal bone, especially as far as regards the labyrinth fenestrae and their nearest surroundings, as unchanged as possible.

Denker and Hessler, as early as 1897, during the discussion following Noltinius' paper on the radical mastoid operation¹ recommended the aftertreatment without packing. Denker asserted that the Thiersch skin grafts adhered better when there was no inner dressing and the wound cavity was exposed to the drying effect of the air, while Hessler recommended the method from a purely surgical point of view, as the firm packing acted as an irritant. His experience rested on one (1) observation of chronic middle-ear suppuration with adenoid growths, which he had operated upon radically and dressed with a loosely fitting gauze which only served to mop up the secretion; the healing set in during the course of three weeks. Two years later, Denker² exhaustively described his open wound treatment, the non-packing character of which does not in reality differ from the commonly practised packing method, left off after three or four weeks' time. For Denker recommends his open wound treatment as effective on those occasions when he performs a skin graft; but this he only does with patients, where he is certain about having removed all carious matter from the walls of the cavity. After having treated the cavity for two to four weeks with packing, he scrapes off the granulations under cocaine anaesthesia; then he waits six to twenty-four hours, before the

¹ See: Deutsche otolog. Gesellschaft, Verhandl. 1897.

² Denker: Über offene Wundbehandlung bei der Transplantation nach Thiersch im Anschluß an die Radikaloperation zur Freilegung sämtlicher Mittelohrräume. Deutsche otolog. Gesellschaft, 1899, p. 93.

walls of the cavity are covered by skin grafts taken from the anterior surface of the thigh. These skin grafts are put in place by the help of Jansen spatulae and are not covered with gauze but allowed to stay exposed to the influence of the air. Outside the ear an Ezmarck's latticed mask or similar latticed basket is applied, on which a gauze or cottonwool bandage is fixed, to absorb the secretion. Scheibe also has recommended Denker's open wound treatment after the grafting, which he had tried for a long time and found to give good results and to make the after-treatment considerably simpler.

Contrary to Denker, Zarniko recommended the *primary* non-packing after-treatment in 1898¹. Zarniko adopted the *Bezold* boric acid treatment of middle-ear suppuration with patients radically operated upon, filling the whole operation cavity with boric acid, which thus was made to replace the inner dressing. This treatment was highly recommended by A. von Zur Mühlen in Riga², who used a firm iodoform plug during the first week, in order to let the skin grafts in the auditory canal «take» root, then he stopped the packing. Should the discharge become fetid, naphthaline oil was instilled, profuse granulations being removed by a sharp spoon. Further he states that the method in question does not prevent stenosis or adhesions, and that in such cases the packing has to be resumed. The results of the treatment are illustrated by three incompletely recorded cases, showing that the method may give good results, but in no wise better than those arrived at by packing.

The boric acid treatment, praised by Zarniko has, by the way, been tried by Henri Caboché³ who prefers it to the gauze treatment, because the discharge is non offensive, the epithelialization takes places more quickly, the danger of peri-

¹ Zarniko: Sitzung d. ärztl. Vereins zu Hamburg, publ. in der Deutschen Med. Wochenschr. 1898.

² Mühlen: Die Nachbehandlung der Radikaloperation ohne Tamponade. Zeitschr. f. Ohrenh., Bd. 39, 1901, p. 380.

³ Caboché: Sur le traitement post-opératoire de l'évidement petro-mastoidien par les insufflations d'acide borique etc. Ann. de Mal. d'oreille etc. 1904, vol. 30, p. 2, 15.

chondritis is removed, and the after-treatment simpler and less painful. Caboche's recommendation, however, does not rest on numerous observations; on the contrary, it is only a matter of a few cases, and he limits himself chiefly to recommending the method by way of trial; he promises nothing definite, he admits that the boric acid treatment is by no means infallible, and that he himself has tried it unsuccessfully. Boenninghaus in giving an abstract of Caboche's work¹ recommends the method, because it irritates less and makes the patients more independent of the doctor, in my opinion two minor advantages which must certainly be neglected in estimating an after-treatment, the value of which must primarily be the power to create the most favorable healing conditions for the patients. In a work published in 1906, Paul Laurens² recommended a mixed boric acid treatment; he first packed as usual and later, after a few weeks when the cavity had been «calibrated», *i. e.* when it had regained its natural shape and size, he filled the whole cavity with boric acid; an almost similar secondary boric acid treatment is used by Luc³.

Mühlen's abovementioned plugless method was highly praised by Stein⁴ in Königsberg, who had treated thirty cases without using an inner dressing, just as Gerber (in a paper: *Über Tubenabschluß nach der Totalaufmeißelung*. Arch. f. Ohrenh. Bd. 70, 1907, p. 211) recommended the same treatment. In 1904, during the Russo-Japanese war, Lieck, working as surgeon and ear specialist, met with his fellow-countryman Zur Mühlen in Charbin, and Mühlen proposed to Lieck that he should use the «open» after-treatment. Lieck treated about twenty soldiers and continued using this method afterwards in Petrograd in Professor B. Werchowski's clinic. He in 1904⁵, demonstrated

¹ Zeitschr. f. Ohrenh. Bd. 49, p. 378.

² Paul Laurens: Pansements d'évidés. Méthode mixte. Ann. de Mal. d'oreille 1906, XXXII, p. 253.

³ Luc: Leçons sur les suppurations de l'oreille moyenne. Paris 1910.

⁴ Stein: Die Nachbehandlung der Totalaufmeißelung ohne Tamponade. Arch. f. Ohrenh. Bd. 70, 1907, p. 271.

⁵ Lieck: Über Nachbehandlung der Totalaufmeißelung ohne Tamponade. Zeitschr. f. Ohrenh. Bd. 58, 1909, p. 49.

those same advantages that the method is declared by Zur Mühlen and Stein to possess: Lieck, however, is not quite blind to the fact that it is encumbered with grave drawbacks, the most important of which is the frequent formation of septums and stenoses in the auditory canal, which, according to Ruttin¹ who had tried the method on 22 patients, appeared in more than a third of the cases, for in eight of them he found septums, which in seven cases produced headache, earache, giddiness and nystagmus. Similar observations have also been mentioned in the Berlin Otological Society, Dec. 10th 1907, where Brühl stated that artificial atresia of the auditory canal was brought on by using this method.

The «open» after-treatment brings about, what Lieck points out as a special merit, that the operation cavity gets partly filled with osseous tissue and that, therefore, one rarely sees the fine large cavity which is and ought to be the final result of the packing treatment. I look upon this as a great drawback to the «open» after-treatment and consider Uffenorde² to be in the right when he also pronounces this after-treatment without packing, as a general method, to be unadapted to the purpose, because the hearing gets weaker, the thicker the granulation pad and the growth of fibrous tissue joining on to it are on the walls of the labyrinth and the atticus.

The advocates of the non-packing method whom I have mentioned up till now have, in spite of their strong recommendations of the method, not been able to get this kind of aftertreatment universally accepted; on the contrary, it will fall into oblivion because, inferior to the packing, it does not deserve to be remembered. Nevertheless, quite lately, in 1918, a work has appeared by Linck of Königsberg, on the basis of the experience gained by him of the tamponless method as used on patients from the Carpathian front during the late war. In his book³

¹ Ruttin: Zur tamponlosen Nachbehandlung mit Bemerkungen über die Ausheilung nach der Radikaloperation. *Mon. f. Ohrenh.* Bd. 42, 1908, p. 113.

² Uffenorde: Beiträge zur Indikation der Labyrinthöffnung. *Arch. f. Ohrenh.* Bd. 73, 1907, p. 230, at the bottom of the page.

³ Linck: Über Anwendung d. offenen Wundbehandlung in d. Otochirurgie. *Zeitschr. f. Ohrenh.* Bd. 77, 1918, p. 247.

he recommends the «open» method from general surgical experience during the war, where he found that the open wound treatment offered great advantages in the treatment of war lesions, and thus he wanted, just as Lieck did in the Russo-Japanese war, to try the method in radical ear operations. At first he practised the method so consistently that, after the operation was over, he left the patients to their fate without a vestige of inner dressing, but the results were very bad. The wounds became septic and the whole progress of the case greatly jeopardized by this form of entirely open wound treatment; and thus, after several trials, Linck substituted a first packing which was left for a week, and after that the packing was discontinued.

The results arrived at by Linck in this way seem to me to be in no respect better than those obtained by the packing method which had been generally used earlier, and in many cases Linck has had to fall back on the packing treatment, either in order to hasten the formation of granulations in patients whose bone surfaces do not easily granulate, or to hasten epithelialization, which in the case of many patients came to a standstill, because the non packing after-treatment was incapable of stimulating the growth of the epidermis. Under these circumstances Linck recommends the old complete packing, but makes the mistake of leaving the plug in situ for several days, which leads to maceration of the freshly grown epidermis. But when for that reason Linck recommends a daily change of internal dressing, he is in perfect accordance with the majority of ear-specialists who from a wide experience of many years assert the necessity of changing the dressing daily during the first four weeks after the operation.

Moreover, in three cases Linck had to resort to the packing treatment on account of too profuse a growth of granulations, and in three patients erysipelas developed. When Linck states that his results are bad when he cannot leave the first internal dressing in situ for eight days, this is a recognition of what the packing most essentially signifies for a good result, which would certainly have been better still, if he had continued a *correct packing*

in the following three weeks. The results he has arrived at are not convincing, and his verdict is given in general terms. Linck's experience rests on 26 observations, the earliest of which, being quite unsuccessful, are not included. Then he leaves out three cases where there was a considerable formation of granulations, and does not say how often he has had to repeat the packing on that account. Furthermore it appears from his communication that he referred to patients in war hospitals, where circumstances did not allow him to treat all the patients long enough to decide whether there was a recovery or not. Notwithstanding, he pronounces that the open wound treatment in the surgical treatment of middle-ear suppuration is «überaus günstig».

Quite lately E. Urbantschitsch, in *Monatsschrift für Ohrenheilkunde* 1919, p. 761, has recommended the open wound treatment in the case of complications setting in (serous meningitis, brain oedema, labyrinthitis) after a radical mastoid operation; if these complications arise during the after-treatment, he discontinues the packing method, and then he has seen the complications cease. It is an old experience that a too firmly applied plug can under certain circumstances do harm by producing labyrinthitis, meningeal symptoms, etc. If it can be effected, a quick change of the plug and a renewed, less firm packing will have the same favourable effects on the retention symptoms as the abandoning of the internal dressing advised by Urbantschitsch.

If I were to sum up my opinions about the open wound after-treatment on the basis of what I have here said, it would be: I do not in any wise consider that the results which the advocates of the method have arrived at are convincing. First of all, the numbers are too small; secondly there are a great many cases of chronic middle-ear suppuration, that can be treated with a packing of short duration and give good results. Thirdly it appears that often the open wound after-treatment cannot be carried through, because the suppuration and granulating of the wound is too profuse, or because erysipelas, perichondritis etc. set in. Fourthly, it seems to me that the after-treatment, the most critical chapter of oto-surgery, is led on to a dangerously downhill road, if the daily, efficient watching over the operation

cavity is given up. For I greatly fear, that a recommendation of the non packing method will lead to looking upon the operation as the most important part of the treatment of middle-ear sup-puration and regarding the after-treatment as the less important one, when the latter may be and even ought to be left to itself. Finally, there is hardly any difference in the discomfort felt by the patient in the packing or non packing after-treatment, for the first dressing, which is common to both, is just as painful, and later on the packing after-treatment troubles the patient very little, provided it is done correctly and with strict observance of asepsis. In the packing you have the results in your own hands, so to speak; with few exceptions you get large, well calibrated, easily seen operation cavities with good functional results; whereas the results of the tamponless method are of a far more uncertain character, frequent stenosis and obstructing septums being not uncommon (see Ruttin's experiences above).

The chief condition for a successful tamponing after-treatment is, however, as I have already pointed out, a careful

Asepsis,

about which I would like to say a few words. If only general surgical aseptic measures are taken during the after-treatment, the operation cavity will in most cases be kept aseptic. If the asepsis should fail it is not always the fault of the surgeon, for the walls of the middle ear may have been infected and this cannot always be successfully dealt with at the operation. If that is the case, the operation cavity will, in spite of all precautions, contain fetid secretion during the first period after the operation, and only later when all septic foci are cleansed can the operation cavity be rendered aseptic.

Formerly it was always more difficult to carry out an aseptic after-treatment, because the primary disinfection then in use was incomplete. But since Grossich¹ had recommended painting with iodine, we got a practicable and efficient anti-

¹ Grossich: Eine neue Sterilisierungsmethode der Haut bei Operationen. Zentralbl. f. Chirurgie 1908, Heft 44.

septis, which was capable of completely disinfecting the operation field, so that the results which we have obtained during the last ten years in the way of aseptic after-treatment have been far better than before. But although painting with iodine has rendered excellent service in this respect, it has had certain drawbacks, due to the fact that iodine in certain individuals caused a marked irritation of the skin, that may lead to disagreeable eczema, disturbing the after-treatment. During the last year I have therefore used thymol spirit (3 per cent.) as recommended by Hoffmann¹; it possesses extraordinarily strong antiseptic qualities and does not cause eczema. Caesar Hirsch has used thymol spirit for six years and is most satisfied with it². I have also gained a similar experience with the patients on whom I have operated in the course of the last year, their skin having remained soft and normal.

As a disinfectant thymol spirit is greatly superior to iodine as regards rapidity of action (v. Hoffmann); and the slight smarting which the thymol sets up on a delicate skin soon passes off and causes no inconvenience. After the operation field has been shaved, the ear and its surrounding parts are painted over with 3 per cent. thymol spirit; the auditory canal also being treated with tampons soaked in thymol. The painting is repeated twice in the course of five minutes before the operation.

When the operation is over the wound cavity is rinsed, as described above (p. 4) with 3 per cent. peroxidated hydrogen, whereupon careful packing with long narrow strips of iodoform gauze is undertaken; by the aid of a bivalve speculum it is necessary to provide an entrance through the meatus (enlarged by means of a flap), wide enough to permit inspection of the whole operation cavity. Again I will utter an urgent warning against using small short gauze strips, for the result of this kind

¹ Hoffmann: Experimentelles und Klinisches zur Desinfektion des Operationsfeldes mit Thymolspiritus. Bruns Beiträge zur klinischen Chirurgie Bd. 76, p. 496, and Bd. 80, p. 431.

² Caesar Hirsch: Die Desinfektion des Operationsfeldes und der Hände mit Thymolspiritus. Zeitschr. f. Ohrenh. Bd. 77, 1918, p. 211.

of plugging will easily lead to a lessening of the intense osmotic action between the deep plug in the operation cavity and the external dressing. And the consequence of that is that the gauze strips at the bottom become soaked with offensive discharge and act as irritating foreign bodies, which injure the normal course of the after-treatment, further an excessive granulation growth and retard epithelialization.

When the first dressing is changed on the fifth day after the operation, I go on changing daily, and instead of the iodoform gauze strips I then use gauze strips moistened with 1 or 2 per cent. solution of nitrate of silver or alcohol, which are applied after washing out with 3 per cent. peroxidated hydrogen or sterilized water and mopping with sterilized cottonwool tampons. The gauze strips should have the same length and width as the iodoform gauze and be applied in the same manner, so that only a small portion is introduced into the operation cavity while the larger part is left outside and goes to make up the outer bandage. After three weeks' time the epithelialization has proceeded so far that the internal dressing can be given up; afterwards the patient himself can instil peroxidated hydrogen twice or three times daily, followed by rinsing with boiled, lukewarm water.

By Eschweiler's advice¹, I at the time tried the vioform gauze recommended by Schede² for packing as it was supposed not to possess the irritating quality of the iodoform gauze, so that the plug could thus be left for a fortnight without injury, but I quickly gave it up, not being able to perceive any special advantage in using the vioform gauze. For some time I used isoform gauze, which Heine recommended³, but have again reverted to the iodoform for the first dressing and the nitrate of silver gauze later. In rare cases one comes across patients whose skin has an idiosyncrasy to iodoform, which will at once cause exsudative dermatitis accompanied by pain and a rise of temperature; in such cases the iodoform gauze must be quickly removed and replaced with nitrate of silver or alcohol gauze.

¹ Eschweiler: Deutsche otol. Gesellschaft 1903, p. 131.

² Schmieden: Deutsche Zeitschr. f. Chirurgie Bd. 61, p. 552.

³ Heine: Operationen am Ohr. 2. Aufl., 1906.

The epithelialization

of the wound cavity will be accomplished in the course of four to eight weeks, when the after-treatment is carried out in the right manner and all infected osseous tissue has been successfully removed at the operation. As is known, it was alleged, especially at the end of the last century, that by artificial covering of the operation wound surfaces with Thiersch skin grafts the epidermisation could be quickened and the operation cavities were better calibrated than when this grafting was not used. It was Jansen¹ especially who recommended the Thiersch skin transplantations which were either applied primarily, immediately after the operation, or secondarily, at the first or second dressing, by the aid of specially constructed metal spatulae. Siebenmann made the grafts so big and so numerous that he covered the whole surface with them. I believe, however, that the great majority of aurists consider the difficulties in using the Thiersch skin grafts so great and the usefulness of the method on the whole so doubtful, that it has nowadays for the most part been abandoned. There may possibly still be some surgeons who use the skin transplantation, but they are certainly very few. In England and America the transplantation was as frequently used as in Germany during the 'nineties, and at the time I tried the method myself in a number of cases, but without any particular success. The difficulties are that it is very hard to bring the skin patches into place and to keep them there, as they are easily removed when the bandages are changed. The method is both difficult and time-wasting. Nor are the results better if Denker's method² is used; this method consists in deferring the transplantation till two to four weeks after the operation and then preparing it by curetting the granulations in the wound cavity 6—24 hours before the transplantation is to take place. Afterwards the whole wound cavity is covered with skin graftes, taken from the front of the thigh, and no packing is used; in

¹ Jansen: *Einiges zur Plastik bei Radikaloperationen*. Deutsche otol. Ges. 1898, p. 197.

² Denker: *Deutsche otol. Ges.* 1899, p. 93.

order to expose the wound cavity to the effect of the air, only a small piece of sterilized gauze is placed at the bottom and lower wound angle to absorb the secretion. Neither Denker's nor Eschweiler's method¹, the latter mainly depending on the use of vioform gauze packing, has succeeded in winning any followers; nor is it likely that Dan Mackenzie's method² will be more of a success, it was published in 1915 and consists in simply keeping the Thiersch skin patch in place by letting the wound cavity fill with blood and use no proper plugging at all. In the course of a few weeks the skin patch was supposed to have become adherent; Mackenzie said he had made sure of that in cases when he had had to open the wound again. The blood clot he left to itself in the beginning.

By using the Körner flap it is possible to make the epidermisation take place just as surely and quickly, whether the Thiersch grafting method is employed or not, supposing that the after-treatment is aseptic. If the epidermisation fails, that is due to other circumstances than the omission of transplantation. I mean the existence of inert areas shut off by «dead» fortuitous membranes—or stringy adherences, just as carious hidden foci in the walls cause discharge of long duration in the middle ear.

One of the most frequent reasons for defective epidermisation is an affection of the tubal opening. All the rest of the middle ear shows a smooth epidermis, but in some cases a muco purulent secretion remains in the lower front part of the tympanic cavity, arising from a catarrh in, and about the tympanic end of the tube, of an intermittent, most often remitting character and sometimes producing a process of maceration, that attacks the epidermis and spreads over a smaller or larger part of the middle ear.

There are in the oto-laryngological literature numerous contributions bearing on this matter, and Sidney Yankauer³ has

¹ Eschweiler: Deutsche otol. Gesellschaft 1903, p. 131.

² Dan Mackenzie: A note on mastoid grafting. Royal Soc. of Medicine, otological section, Report May 14, 1915, p. 47.

³ Sidney Yankauer: Amer. laryngol., rhinolog. and otological Society, June 1915, Reports p. 69.

published, in 1915, a collective examination of the results of the treatment of chronic middle-ear suppuration that are obtained by treating the tympanic end of the Eustachian tube with the aid of a raspator, which he described in 1910¹. Yankauer lays particular stress on the treatment of the tubal opening in chronic middle-ear suppuration, so much so, that he begins the treatment of these complaints with a curetting of the tuba, and if that is not successful he performs a radical operation, the results of which on his own statement are better than those arrived at by others, a fact which he attributes to the circumstance that the tubal opening is closed by the curetting beforehand.

As early as 1903, Winckler in Bremen² made the affections of the tubal opening the subject of a close investigation, and showed the many troubles that the recurrent suppuration starting from the tuba may give rise to; he suggests fairly energetic methods of treatment, as for instance removing the whole front wall of the auditory canal in order to get at the tuba opening. He had used the method with thirty patients and had not observed any injurious effect on the masticatory movements. In order to get a view of the tubal opening he proposes to start by making the front wall thinner through chiselling, and only to chisel out the whole front wall when absolutely necessary when space is deficient, being careful not to injure the internal Carotia. Then he introduces a small sharp spoon into the tubal opening to remove the diseased mucous membrane and get a firm closing. This has always seemed to me too radical and too dangerous an operation, and one which as a rule is superfluous, because the same thing that Winckler reaches by his operation can be reached by the aid of small rougines, sharp spoon, cauterization with chromic acid or galvanic cautery. The curetting of the tubal opening ought preferably to be undertaken systematically at the end of every middle-ear suppuration, in accordance with B. Dench's expounding at the International Otological Congress of Bordeaux in 1904³. In order to bring about as solid a

¹ Sidney Yankauer: *The Laryngoscope*. July 1910.

² Winckler: *Deutsche otolog. Gesellsch.* 1903, p. 81.

³ See: Reports of the Int. otol. Congress of Bordeaux 1904, p. 625

coalescence of the tube as possible, A. Blumenthal¹ has constructed a special tubal-scraper, which he introduces into the tube at every middle-ear operation, and thus by moving it backwards and forwards destroys the mucous membrane there. He says, that he has treated a number of patients after a radical operation in this manner, and that afterwards he has not seen a single tubal suppuration.

As mentioned above, stringy or membranous adhesions may cause defective epidermisation and continued suppuration. *The treatment of these intratympanic adhesions* consists of a section or cutting of them or else they may be destroyed by galvanic cauterization. The difficulty is often not to remove the adhesions, but to prevent their recurrence. Not unfrequently it is necessary to undertake their removal under anaesthesia.

A third cause of deficient epidermisation may be sought in *hypergranulomatosis*, which usually appears in patients where the after-treatment has not been aseptic. Sometimes it is also caused by an internal dressing continued too long, especially in malodorous, freely suppurating wound cavities. Most frequently the granulomatosis is met with in patients, who stay away before the treatment is quite finished, who neglect to treat their middle ears themselves according to the directions given by the surgeon and only return after weeks and months have passed. In such a case, the middle ear will be found more or less filled with profuse granulation masses, secreting highly offensive pus.

A strictly observed asepsis prevents the formation of granulations in the wound cavity. If the growth becomes too profuse it may be kept in check by chromic acid or galvanic cauterization. If it is a case of early suppurating masses of granulations, that fill up the wound cavity more or less, the granulations ought to be removed under anaesthesia with a sharp spoon and the aseptic tamponing renewed.

In the case of persistent foul smelling suppuration Carrell's solution has been found to be useful.

Occasionally I have tried *picric acid* for the after-treatment of middle-ears radically operated upon, when they were foul

¹ Blumenthal: Monatschr. f. Ohrenh. 1917, Jahrg. 51, p. 552.

smelling, suppurating, if they granulated and the epithelialization did not set in. This expedient has been recommended by French and English writers at the end of the last century, and Bondy¹ in 1905 praised the picric acid as strongly analgesic, antiseptic and cheratoplastic. It is used in 10 per cent. ether solution, and with this the middle ear is painted every two or three days, and in addition boric acid, dermatol or aïrol is blown in without tamponing. Bondy chiefly uses this method with patients, whose middle-ear, in spite of operation and regular tamponing treatment, continues suppurating and granulating, and he publishes the histories of fourteen cases of this kind, which show that he had succeeded in bringing about recovery by the aid of picric acid. As I said, I have tried it, but have not been able to prove any special cheroplastic effect.

The regular course of the after-treatment is sometimes disturbed in a most unpleasant way by the developing of

Perichondritis auriculæ,

that prolongs the treatment and carries with it extremely bad cosmetic results, for if it is left alone, the perichondritis will spread all over the outer ear and only cease after weeks and months of painful illness, leaving the outer ear badly shrivelled, shrunk and atrofied.

The perichondritis is caused by insufficient asepsis, which cannot always be avoided in a large polyclinic with different assistants, who day after day have to change a great many bandages, and very often have to do with old stinking middle-ear suppurations with cholesteatomic growth, where a strict asepsis from the beginning is almost impossible to observe; and in the course of two or four weeks it will be seen, that in the incision through the cartilage there arise pains, swelling and redness, accompanied by a slight rise of temperature. Formerly I used in such cases only to split the soft parts above the inflamed cartilage, then I packed with iodoform gauze, soaked in boric acid solution and cover the whole with a boric acid

¹ Bondy: *Monatsschr. f. Ohrenh.* Bd. 39, 1905, p. 166.

bandage, but the result was bad. The inflammation spread, in spite of preventive incisions. Only after having, during the last fifteen years, consistently used methodical excision of the inflamed cartilage, have I succeeded in stopping the inflammatory process and getting good cosmetic results in almost every case. But the necessary condition for this is to step in as soon as the perichondritis begins to show itself. The excision must be performed under anaesthesia, and after dissecting the skin from the affected cartilage, all the affected parts must be gradually removed till the sound, normal cartilage is reached. Thereafter the middle ear is dressed with iodoform gauze soaked in 2 per cent. carbolic acid solution, and all the space between the skin patches and the sound cartilage must be packed so that nowhere a stagnation of secretion can occur. A boric dressing is applied round the whole and is changed every day, while the iodoform gauze tamponing is left three or four days and is afterwards changed daily. After a week nitrat of silver gauze bandages are used instead. All cases of perichondritis of the outer ear which I have had the opportunity of treating in this way, I have been able to stop in the beginning, and the cosmetic results have been excellent.

Even though Ruttin¹ has shown that by daily draining the exsudate with a Pravaz syringe he has succeeded in removing really bad perichondritis with good cosmetic result, I still believe that one does well in proceeding in the manner here recommended.

¹ Ruttin: Zur Behandlung d. Perichondritis auriculæ. Monatsschr. f. Ohrenh. Bd. 50, 1916, p. 485.