THE TECHNIQUE OF THE RADICAL OPERATION FOR CHRONIC SUPPURATIVE OTITIS MEDIA.*

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I have already written so fully upon this subject, at a previous meeting of this Society, and it is with some hesitation that I present the following paper to you. I beg to say that I do so only at the urgent request both of our honorable President and of our distinguished Secretary.

As I do not wish to take up more than a few moments in presenting the paper, I will proceed immediately to the consideration of the subject with which we have to deal.

The patient, if possible, should be placed in the hospital or under the immediate supervision of the surgeon, at least twelve hours before the operation. The hair should be shaved over an area of three inches from the centre of the meatus, in every direction. This point is of great importance. Female patients frequently object to this thorough shaving of the hair, especially of that portion of the head lying just above and in front of the line of superior auricular attachment. It is of the utmost importance that the shaving be thorough and complete, if a good result is to be obtained. I have found not only that female patients object to this preparation, but males also, who wear a beard.

Too much stress cannot be laid upon a thorough preparation of the field of operation. The hair and beard constitute, probably, the most fruitful source of infection of the superficial wound in these cases. It is, therefore, necessary that the area immediately surrounding the field of operation should be thoroughly denuded of hair. After thorough shaving, the ear is irrigated with an aqueous solution of bichloride of mercury, of a strength of 1-5,000, and the external auditory canal is packed as far as the fundus, with a strip of iodoform gauze. The entire shaved area and the auricle are then carefully scrubbed with tincture of green soap and sterile water; they are then rinsed with sterile saline solution, to remove all the soap, then with an aqueous solution of bichloride of mercury, of a

* Read before the Annual Meeting of the American Laryngological, Rhinological and Otolaryngological Society, Lexington, Kentucky, April 30, 1903.

strength of 1-1,000, and last of all are thoroughly wiped off with equal parts of alcohol and ether. A sterile dressing is then applied, so as to cover the entire field of operation, including the auricle. This dressing is left in place until patient is under the anæsthetic, and the operator is ready to make the primary incision.

At the time of operation, the operative field is surrounded either with dry sterile towels or with sterile towels wrung out in an aqueous solution of bichloride of mercury, of a strength of 1-1,000. All instruments are previously thoroughly sterilized by boiling. The hands of the operator and of his assistants are thoroughly sterilized, and it is my practice to not only myself wear sterilized gloves, either of cotton or of rubber, but to insist upon my assistants doing the same.

The initial incision begins over the tip of the mastoid process at a point a quarter of an inch behind the insertion of the lobule. The incision runs upward and backward in a curved line, so that at a point opposite the centre of the meatus it lies, at least three-quarters of an inch behind the line of auricle attachment. It is then carried upward at this distance behind the line of auricular attachment, and to a point just above the apex of the auricle. From this point it is carried downward and forward over the top of the ear to a point one-half to three-quarters of an inch in front of the anterior termination of the helix. It is important to make the incision as nearly as possible along these lines. If the incision is carried too close to the auricle, the external surface of the mastoid will be insufficiently exposed and in order to remove all carious bone, it may be necessary to strongly retract the posterior flap, or in other words, to undermine this. While it is sometimes necessary to do this, in spite of the cutaneous incision already described, it is always undesirable, and may be avoided in most instances, if the incision is made as far behind the ear as I have directed. It is also of great importance, in completing the upper portion of the incision, to make it in a horizontal direction or in a direction forward and slightly downward over the top of the ear. If this is not done, it will be found almost impossible to thoroughly expose the upper wall of the bony canal, and to remove the external wall of the tympanic vault. All surgeons who have performed this operation, know it is just here that the operation frequently fails. It is, therefore, necessary to extend the incision well forward in a horizontal direction in order to make a complete exposure of the upper wall of the bony external auditory canal, and to enable the operator to thoroughly remove the outer wall of the tympanic vault. After the incision has been made in the manner described, all bleeding points are grasped with clamps, and

the anterior flap pushed forward by means of the periosteal elevator, exposing the posterior, superior and inferior margins of the bony meatus. With a narrow, blunt dissector the fibrocartilaginous meatus is carefully dissected out of the bony tube which it lines. In most cases, if care is used, the fibrous meatus may be preserved intact for a length of one-third to three-eighths of an inch beyond the margin of the bony meatus. The anterior flap being held in position by means of a retractor, the surgeon next proceeds to enter the mastoid antrum in the region of election, that is, in the suprameatal triangle. In the majority of cases which present for the radical operation, the mastoid will be found sclerosed, and the antrum will never be entered until an opening has been made in the bone, at least half an inch in depth, and frequently more. Where the antrum lies deeply—and it does in the large majority of these cases—the operator will do well to enlarge the funnel-shaped opening by which he is to enter the antrum, by removing the cortex from below, and even invading the posterior margin of the bony canal. As the funnel-shaped opening in the bone is deepened, the operator may remove the cortex as far down as the level of the floor of the meatus and may work cautiously backward for a distance of a fourth of an inch behind the posterior margin of the bony meatus. It is unwise to broaden the funnel above. Sufficient space can always be gained by working close to the posterior wall of the canal and removing the bone below. In this way, the operator works on until the probe enters the antrum and passes through this cell and through the *aditus* into the tympanic vault. Exploration with the probe will then enable the operator to judge as to the size of the antrum in each individual case, and its extent either backward, upward or downward. It is then wise to enlarge the opening in the antrum by a few strokes of the gouge, so that its inner wall can be easily seen. The operator should then turn his attention to the fibrous meatus which we will remember, has been carefully dissected up from the bony canal. The fibrous meatus should be divided posteriorly, as close to the tympanic ring as possible. This division may be effected either by a sharp scalpel, cutting from behind into the lumen of the meatus, or accomplished by angular knives devised for the purpose, which are introduced into the meatus through the posterior opening, the posterior wall of the canal being invariably opened at its deeper portion during the process of dissecting it up from the bony canal, and the soft parts divided by an incision at right angles to the lumen of the meatus. In this way, the auricle and fibrous canal constitute a funnel-shaped flap which, by forcible traction may be completely

pulled out of the bony meatus. The retractor holding the anterior flap forward, should next be removed, and a strip of iodoform gauze should be threaded through the external auditory meatus and brought out through the opening in the posterior wall of the canal. The two ends of this gauze strip are then tied together, and this fillet is used as a retractor to pull the auricle forward and to pull the fibrous meatus out of the bony tube which it lines. The operator next proceeds to break down the partition between the mastoid antrum and the external auditory meatus. This is best done by removing the posterior wall of the canal by chiseling upward toward the mastoid antrum. Above, the posterior wall of the canal is cut through by carrying the gouge or chisel directly inward on a plane slightly above the superior wall of the bony canal. As the wound is deepened above along the plane of the upper meatal wall, that portion of the external wall of the attic, formed by the junction of the posterior and superior walls of the meatus, will come into view. This bony segment should next be removed by the gouge, the instrument being directed upward and inward, so as to remove this portion of the outer wall of the tympanic vault. In this way, the *aditus ad antrum* is exposed and forming its floor will be seen the prominence of the horizontal semi-circular canal and closely amalgamated with this, the aqueductus Fallopii, lodging the facial nerve. The position of this bony ridge varies considerably in different subjects, sometimes lying rather high up and sometimes much lower down, and the operator should always proceed carefully in the removal of the posterior wall of the meatus, until the *aditus* has been entered, and these important landmarks seen. As soon as the prominence of the horizontal semi-circular canal comes into view, the operator may proceed rapidly with the gouge, to throw the mastoid antrum, the external auditory canal and the middle ear into one large cavity, always remembering never to encroach upon the hard bony ridge which protects the horizontal semi-circular canal and the facial nerve. The remainder of the external wall of the tympanic vault should then be removed, that is, the entire inner extremity of the upper wall of the bony canal should be chiseled away, leaving only the thin internal table forming the tympanic roof and separating the middle ear from the middle cranial fossa. After the tympanic cavity, antrum and external canal have thus been merged into one cavity, the remnants of the two larger ossicula can be easily seen and extracted.

If the field of operation is carefully dried by means of gauze strips pressed firmly into the depth of the wound, allowed to remain there a few moments and then removed, the operator can make out the

head of the stapes, if this has not already been destroyed by caries, and can also see the notch of the round window. In order to see the notch of the round window and the region of the oval window perfectly, it is necessary to remove a thin scale of bone from the posterior wall of the canal, lying just below the prominence of the Fallopian aqueduct. Too much care cannot be exercised in performing this step of the operation, and yet it must be done in order to obliterate perfectly what might be called the posterior tympanic space or that portion of the cavity lying posteriorly to the posterior margin of the tympanic ring; in other words, the posterior meatal wall must be cut down until it is continuous with the posterior wall of the tympanic cavity, the tympanic ring being entirely removed at this point. After this is done, the notch of the round window can be easily seen, as well as the head of the stapes, if the ossicle is in position, and if not, the foot-plate can be seen lying in the notch of the oval window.

It is necessary, in these cases, to remove all diseased bone. It is not necessary, however, to completely obliterate the entire pneumatic structure of the mastoid, provided all of these pneumatic spaces have not been invaded by the destructive process. In most cases, subjected to this operation, the mastoid will be found either sclerosed or diploic. We are occasionally required to perform radical operations upon patients in whom the pneumatic structure of the mastoid is preserved. It is sometimes a rather nice question for the operator to decide, as to whether or not all of the pneumatic cells are to be obliterated. In my own experience, it has been easy to decide, however, when firm and healthy bone is encountered. In cases of chronic suppuration, operated upon simply for the relief of the chronic trouble, and in which no acute symptoms are present, the surgeon should not obliterate the pneumatic structure of the mastoid much beyond the limits of the diseased tissue, as by so doing an unnecessarily large cavity is formed. After the exposure of cells by the removal of the cortical layer of the mastoid process—if these are found to be healthy, it is not necessary, in order to secure a favorable result, to entirely obliterate these healthy spaces. After all diseased bone has been removed, these spaces may be treated as if they did not exist, and the soft parts may be sutured over them, closing the wound, exactly the same as they would be sutured over diploic bone tissue, or even over undisturbed mastoid cortex. After the bony cavity has been thoroughly curetted, and the operator has assured himself that no diseased bone remains, either in the middle ear or in the mastoid cells which have been broken down, attention should be

turned to the Eustachian tube. A small curette should be passed into the tympanic orifice of the tube, and any softened bone removed from this region. Remembering the relation of the internal carotid artery to the Eustachian tube, the curette must be used in this region with the utmost gentleness. The mucous membrane lining the tympanic orifice of the tube should, however, in every instance, be entirely scraped away from the bone. After the entire bone cavity has been curetted in this manner, it is well to smooth off the walls of the cavity, either by means of the curette or, better still, by the burr, actuated either by the electric or hand-motor, or by means of a large burr or osteotribe, which is easily manipulated with the hand. Such an instrument is not at all essential to the thorough performance of the operation, but it certainly does enable the surgeon to smooth off the bony walls of the cavity with great rapidity, and perhaps, somewhat more perfectly than can be done with either the gouge or the sharp spoon. The osteotribe has another advantage, in that as it removes but a thin layer of bone, and removes this in so finely a divided form, that it does tend to check somewhat any oozing from the walls of the bony cavity. The entire cavity is now firmly packed with sterile gauze.

After the cavity has been smoothed in any of the ways above described, it should be firmly packed with a strip of sterile gauze. The next step is the formation of cutaneous flaps from the fibrous meatus and the concha in order to line this bony cavity as completely as possible with epidermis. Several methods are in vogue for the formation of these flaps. The simplest method is to split the posterior wall of the fibrocartilaginous meatus by a horizontal incision from a point where it is divided close to the drum membrane, outward along the posterior wall of the canal to the concha. In this way, two triangular flaps are formed, one of which can be sutured to the periosteum above and behind the bony opening and the other to the periosteum below and behind the bony opening. In this way, the deep portion of the fibrous meatus is spread apart, as it were, and by means of the sutures passed in the manner described, is held more or less closely in contact with the upper and lower wall of the bony cavity. The sutures used should be of strong catgut, and should be passed through the entire thickness of the meatus, at a considerable distance from the cut margin, and should also pass through the periosteum at a considerable distance from its cut margin, so that when traction is employed upon these sutures, quite a little force may be used without the danger of their pulling out.

Another and better method of forming the flaps is by continuing the horizontal incision along the posterior median wall of the canal out to about the middle of the concha. From the conchal extremity of the horizontal incision, one vertical incision is made upward and another downward. In this way, two quadrilateral flaps are formed; the one composed of the upper and posterior wall of the fibrous meatus and the corresponding portion of the concha, the other of the inferior and posterior wall of the meatus, and the corresponding portion of the concha. The conchal cartilage included in each of these flaps is then dissected out, and each of these flaps folded back upon itself, that is, the lower flap downward, and the upper flap upward, and these flaps are stitched in position, raw surface to raw surface, by means of fine catgut sutures. It is sometimes wise, in addition to these stitches, to introduce the deep retention sutures, of strong catgut, before mentioned; that is, sutures passing from the upper posterior angle of the cut meatus to the periosteum above and behind the opening and from the posterior and inferior margin of the cut meatus to the periosteum below and behind the bony opening. These retention sutures are, however, in many cases, unnecessary.

Still another method of forming these flaps—and the method which I prefer in the very large majority of cases—is to incise the fibro-cartilaginous meatus in the direction of its long axis, along the line of the postero-inferior aspect. This incision is carried well out into the concha. From the point where it enters the concha, the incision is then curved upward, parallel to the antihelix and a short distance in front of this, to a point just below the anterior crus of the antihelix. In this way, a large flap is formed, consisting of the posterior and upper wall of the fibrous meatus, and a tongue-shaped conchal flap. The conchal integument is then raised and dissected up from the cartilage of the flap. The cartilage is grasped with forceps, dissected up from its posterior attachments, and excised. The meatal flap is then turned backward upon itself and stitched in position by fine interrupted catgut sutures. The tongue-shaped conchal flap—which after the removal of the cartilage, consists simply of integument—is now turned backward and upward through the large meatal opening which is formed by the cutting of this flap and is stitched in position to the raw surface posteriorly, by means of fine catgut sutures. In this manner, a large flap composed of integument and of the upper and posterior wall of the fibrous meatus, is formed which, upon replacing the auricle, so that the margins of the original posterior incision approximate, will be found to line the outer part of the upper wall of the cavity which has been formed in

the bone. So much for the formation of flaps. The particular method to be followed, must vary in each individual case. I have said nothing of the Koerner method of performing the operation, because I have had but little experience in this line, and the methods already given, have been followed by excellent results in my hands.

In almost every case, it is possible to hasten the process of repair by lining the bony cavity completely by means of Tiersch skin grafts. These I have taken from the internal aspect of the thigh, usually choosing the left thigh, as it is more convenient for the surgeon to cut grafts from the left thigh of the patient than from the right. At the time the patient is prepared for the operation, the anterior and internal surface of the left thigh is scrubbed, first with soap and water, shaved, again scrubbed with a 1-1,000 bichloride solution, and last of all washed off with equal parts of alcohol and ether. An antiseptic dressing is then carefully applied to the entire shaved area and confined in position first by means of adhesive straps, a layer of cotton and a firm bandage being subsequently applied over the entire area.

After the flaps have been formed in the manner above described, the surgeon next proceeds to cut grafts by the Tiersch method, from this sterile area upon the thigh. These grafts should be of large size, and are best cut with a large heavy razor. The one I use has a blade, at least eight inches long and one and a half inches wide. This instrument is sufficiently heavy to keep the skin flat in front of it, provided the skin is first drawn tense above by the hands of an assistant, while the surgeon places his left hand upon the lower portion of the thigh and stretches the skin by pulling forcibly downward. When I say that a large graft should be cut, I mean a graft, at least, an inch and a half wide by two or two and a half inches long. A little experience will enable the surgeon to cut the grafts of this size with extreme rapidity, and to cut them very thin. It is well to have the grafts as thin as possible, as a thin graft is much easier manipulated than a thick one. After the graft has been cut, it is removed from the razor to a large spatula by means of a sharp needle. A few drops of normal saline solution should be dropped upon the graft, and the spatula should also be moistened with saline solution before attempting to slip the graft from the blade on to the spatula. It is usually my practice to cut two or three grafts, some perhaps a little smaller than the dimensions given, so that if the surgeon fails to place the first one in position successfully, a second one will be ready at hand. The grafts being placed upon the spatulae, the surgeon then has the auricle drawn forward by means of an

assistant who places a sponge along the cut margin of the anterior flap so as to prevent any oozing into the bony cavity while the graft is being introduced. The posterior margin of the incision may also be protected in a similar manner, although this is much less apt to bleed. In cases where persistent oozing takes place from the margins of the incision, this may frequently be controlled by applications of a very hot saline solution, sponges being wrung out in this solution and applied to the raw surfaces. The margins of the incision being protected in the manner already described, the packing is next carefully withdrawn from the bony cavity. The spatula, carrying the large graft, is then taken in the left hand and carried completely across the bony cavity so that the free margin of the spatula rests close to the anterior wall of the meatus. By means of the sharp needle the edge of the graft is pushed off from the spatula and held against the anterior wall of the meatus. The spatula is then gradually drawn backward, and as the anterior end of the graft is firmly fixed, the graft slides off from the spatula and falls into the bony cavity. This manipulation must be performed somewhat rapidly, in order that the graft may sink deeply into the bony cavity as it leaves the spatula; otherwise, the deeper portions of the bony wound will fill with blood. If the manipulation is conducted quickly, the graft simply sinks into the middle ear, and can be applied closely to the internal wall of the tympanum, to the tympanic roof, can be made to cover the prominence of the aqueductus Fallopii, and of the horizontal semi-circular canal, and to also partially line the mastoid antrum. As soon as the graft has fallen into position, it is held in place by small pledgets of cotton which are impregnated with aristol. The first pledget introduced should be carried forward, downward and inward, so as to force a portion of the graft well into the mouth of the Eustachian tube. Another pledget should be quickly placed on top of this and the deeper portion of the cavity plugged as rapidly as possible, so as to hold the graft in position. During the process of packing the graft in position, it almost always happens that the edges of this thin layer of integument will roll more or less. After the deeper pledgets have been introduced, the graft may be spread out more perfectly by means of the long sharp needle, so as to line the more superficial parts of the cavity. The entire space occupied by the graft should be completely filled with these little pledgets, in order to press the graft firmly against the bony walls in every direction. It sometimes happens that in packing the graft into position, it may so fold upon itself as to make it impossible to spread it out completely over the walls of the cavity. When this takes place, a

second graft should be applied to complete the lining of the cavity. Experience has taught me that it makes no great difference if two grafts overlap, or if the second graft partially overlaps the cotton packing. So long as the graft is brought into contact with the walls of the bony cavity, the overlapping part, or the part not applied to the bony walls, sloughs, while the remainder of the graft becomes attached. It will be seen therefore, that the entire bony cavity may be lined throughout its entire extent, in this manner. After the surface has been grafted as thoroughly as possible, a strip of sterile gauze is placed on top of the cotton pledgets, used to hold the grafts in position, and its end brought out through the enlarged meatus. The posterior incision is then completely closed by interrupted sutures of silkworm gut and of silk. I usually introduce about four or five sutures of silkworm gut and then fine silk sutures between these, so as to obtain perfect apposition.

After the posterior wound has been sutured, it is sometimes wise to apply a graft through the meatus to cover the cut conchal margin. I have done this in a number of cases, and have in this way, avoided the development of granulations along the edge of the conchal incision.

The first dressing is changed on the eighth day, unless there is some odor from the wound, or the patient complains of severe pain; also if there is any leakage through the dressing or any marked elevation of body temperature. At the first dressing, the entire cutaneous wound will usually be found to be united throughout. In only a very small proportion of the cases that I have operated upon, have I failed to obtain primary union throughout the entire extent of the incision. In a few cases, where there was an acute inflammation present at the time of the radical operation, I have had extensive breaking down of the posterior wound. This has seldom given rise to any trouble, however, and in only three instances, has a permanent fistula remained. At this first dressing the strip of gauze is removed from the canal, and usually one or two of the cotton pledgets. Quite frequently, there is a very foul odor upon the removal of the first dressing, caused by the sloughing of the unattached portions of the grafts. This should not disturb the operator, as it does not, in the slightest degree, indicate that the operation has not been perfectly successful, and that the grafts have not adhered, to a great extent, at least. Where the odor is foul, it is well to remove as many pledgets as possible at the time of the first dressing. Whether or not these are removed, the canal is lightly dusted with aristol, a loose gauze packing introduced into the meatus and a light antiseptic

dressing applied over the ear and over the posterior wound. This dressing is then changed every second day, and at each subsequent dressing a few of the cotton pledgets are removed until all have been taken out, and the entire cavity remains free to view.

Out of 28 cases, in which the radical operation has been performed, and in which the skin-grafting method has been employed, in sixteen cases the grafts were applied at the time of the first operation, and in twelve cases, owing either to hemorrhage at the time of operation, or to the extensive involvement of the osseous structures, primary grafting was impossible; in these twelve, secondary grafting was done. Out of these 28 cases, 26 have been cured, and two, both of them cases of primary grafting, are still under treatment.

CORRESPONDENCE.

JUNE 11th, 1903.

EDITOR THE LARYNGOSCOPE:

Dear Sir:—I have read Dr. E. L. Shurly's "Remarks on the Etiology of Hypertrophic Rhinitis," in the May number of THE LARYNGOSCOPE *twice*, because of a fear that I may have overlooked what I consider a most important omission.

It seems incredible that an article of this nature should omit to enumerate dust inhalation as the most important causative factor (excepting the exanthematous diseases) in hypertrophies of the nasal mucous membrane and lymphoid ring. Dust is the universal carrier of pus germs and pus germs are the cause of hypertrophies in the respiratory tract.

Respectfully,

E. J. KUH.

LONDON, MARCH 20th, 1903.

EDITOR THE LARYNGOSCOPE:—Seeing to-day the article by Dr. Chambers on removal of the epiglottis in the February number of THE LARYNGOSCOPE, it has occurred to me that the enclosed cutting from the *British Medical Journal** may be of interest. I am,

Yours truly,

E. FURNISS POTTER.

* See next page.