

vention of such deaths will be attained most effectually, and this report is made with the hope that with full realization of the need, serious consideration of such details will be undertaken, for to a large degree such deaths are preventable.

CONCLUSIONS

In view of the facts as stated these conclusions seem justified:

1. A concerted effort should be made toward designing a standard hospital window and screen which would absolutely prevent such accidents from occurring and yet be satisfactory from the mechanical standpoint, as regards convenience in washing, use of fire escape, ventilation and lighting.

2. Nurses and attendants, especially those on duty during the afternoon and the first half of the night, should be continually warned of the possibility of such accidents occurring and should be prepared to act quickly and wisely in emergencies.

3. Every toilet room used by patients should be protected by bars or gratings across the windows.

4. Special precautions should be taken not only as regards those who are actually delirious but also with respect to others who from the nature of their sickness may become delirious.

5. With regard to foreigners as patients an effort should be made to have with them, from time to time, if not regular attendants, at least others who speak their language.

MASTOIDECTOMY

POSTOPERATIVE TREATMENT BY USE OF SURGICAL
SOLUTION OF CHLORINATED SODA AND MODI-
FICATION NECESSARY TO SECURE THE
BEST RESULTS *

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OMAHA

This paper is not given as an original contribution, but as an adaptation of the Carrel-Dakin treatment to postoperative mastoid wounds.

There are several methods of closing the wound after a mastoidectomy. This very fact is evidence that we have not as yet an entirely satisfactory method, and I am taking the liberty of presenting this method to the section in the hope that it or some modification of it may aid in a solution of our difficulties.

The ideal we are striving for is for a method that will fulfil the following conditions:

1. The maximum safety for the patient.
2. The minimum time of convalescence.
3. The minimum deformity.

AUTHOR'S METHOD

In order that any method of closing the mastoid wound may be uniformly successful, a thorough mastoidectomy must be done. Considering now that this operation has been done, a Carrel Dakin tube is placed in the excavated mastoid cavity, starting at the tip of the mastoid and having its exit at the upper angle of the wound. A second tube is adjusted so that it lies in the opening of the antrum and has its exit in the lower angle of the wound. These tubes are brought

forward and upward and fastened with a strip of adhesive plaster to a point on the temporal region of the forehead. The wound is closed with the usual catgut sutures, care being taken to carry them through all the layers of tissue. It is well not to place the stitches closer than three-sixteenths inch to each angle of the wound in order that a little space may be left for drainage around each tube. This precaution adds greatly to the comfort of the patient at the time of irrigation. A small sponge is placed directly over the mastoid cavity and pressed down firmly so as to obliterate as much dead space as possible. A cotton pack about 8 inches square enclosed in gauze is placed over the ear, and the head is bandaged in the usual way. It is very essential for the comfort of the patient that the cotton pack be sufficiently thick to absorb all the moisture from the irrigations. In applying the bandage, from one-half inch to 2 inches of the tubing is left free. These ends are wrapped in sterile gauze, and care should be taken that they be kept sterile.

Irrigations are begun at once with a properly prepared and carefully titrated surgical solution of chlorinated soda (Carrel-Dakin solution) about 1 ounce to each tube every two hours. The dressings are replaced every twenty-four hours. The condition of the wound and discharge governs the frequency and amount of solution to be used during the ensuing twenty-four hours. Ordinarily no change is made in the orders for the first two days. After this the irrigation is continued every two hours during the day, but the night period is extended to four hours. As the secretion decreases, the frequency of irrigation is diminished. Usually in from four to eight days the wound is sterile. If one has access to a laboratory, this can be ascertained by removing one of the tubes and taking a culture by the ordinary method with a platinum loop. If the laboratory is not available, one will have to use his judgment and be guided by the appearance of the wound, and the amount and character of the secretion. The latter when sterile is of a serous nature and should only slightly stain the dressing. I have frequently found it unnecessary to retain both tubes longer than three days. The upper tube was then removed, the lower being retained as it better facilitated drainage. In some cases after four or five days the secretion instead of diminishing became more or less profuse and of a thick, slimy consistency and brownish color. When this occurred, I removed both tubes, cleansed them thoroughly, resterilized, and before reintroducing them thoroughly cleansed the wound with a hot saturated solution of boric acid or hydrogen peroxid. The tubes were then introduced to their original positions and a solution of mercuric chlorid 1:5,000 used in the same manner as the Carrel-Dakin for a twenty-four hour period. In some cases it was necessary to repeat the mercuric chlorid for two or three twenty-four hour periods. When using the mercuric chlorid I always protect the skin by covering it with a layer of gauze saturated with zinc oxid ointment. This protection was necessary also in some cases as a protection from the Carrel-Dakin solution.

In performing the operation we found it an advantage not to extend the incision upward into the temporal muscle. In those cases in which the temporal muscle was injured, there was liable to be some edema over that area.

Following the removal of the tubes, in cases in which there has been a large mastoid there is sometimes an

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accumulation of fluid. When this occurred, we thought it was an advantage to cleanse the cavity once daily with a hot saturated solution of boric acid.

The irrigation with the Carrel-Dakin solution had one advantage which we had not anticipated. The solution passed through the antrum into the middle ear and out through the membrana tympani, thus cleansing and sterilizing this tract.

The stitches were usually removed on the sixth day. In order that the cavity may not be infected by extraneous bacteria, it is necessary that the nurse exercise great care in her asepsis when giving the irrigations.

RESULTS

In a series of fifty cases in which we kept accurate data in the University of Nebraska Red Cross Base Hospital 49, Allerey Hospital Center, France, the average time in which the wound became sterile and the tubes could be removed was 9.35 days. All secretions had ceased and the wound was entirely healed in most of these cases by the fourteenth day, and none longer than the eighteenth day. The shortest time in which the tubes were removed was four days and the longest time was eighteen days. The discharge from the external auditory canal ceased in from one to twenty-one days.

COMPLICATIONS

One patient had marked swelling, and the stitches were removed on the second day. This was an early case in the series and did not have sufficient irrigation.

One patient developed infection of the neck below the mastoid.

ADVANTAGES

The principal advantages this mode of treatment has are:

1. It enables the operator to close his wound and still feel that he has as perfect drainage as it is possible to secure.

2. Exposure of the sinus or dura is no contraindication to closing the wound.

3. The ultimate result is a smooth, clean scar without depression.

ABSTRACT OF DISCUSSION

DR. EWING W. DAY, Pittsburgh: At different times different methods have been brought forth to produce rapid healing of the mastoid. We all remember the blood clot. Its failure was the inability to obtain a sterile cavity. Anything that will produce a sterile cavity will bring quicker healing. The surgical solution of chlorinated soda is one of the best. Shortly after this solution was introduced in Europe, the Carnegie Steel Company sent Dr. W. O'Neil Sherman, the chief surgeon of that company, to Europe to study this method. On his return we tried it out in the Eye and Ear Hospital to a considerable extent and found it to be surer and quicker than any other. Some patients complain of the irritating influence of the solution on the skin, and especially the external auditory canal, for some of the solution will get through in spite of gauze shields and ointments. Since my return home I have adopted a slightly different procedure. I never like to quite close a mastoid until it is sterile, although I do have free drainage. Instead of using the surgical solution of chlorinated soda immediately after an operation I pack the wound rather tightly with a piece of gauze which has been saturated in a 3.5 per cent. tincture of iodine. The next morning I commence cleansing the wound every four hours, using a good green soap and washing it out and drying it thoroughly and redressing it. Do this every four hours during the day. Beginning on the third day, I take cultures to see when

the wound is sterile. As soon as the wound is sterile, close it by freshening the edges of the wound, which can be done quickly, elevate the flaps a little and let the blood run in; close it with metal clamps, and your work is practically done. Within a few days I send the patient home, and he reports back in one week. I have had complete closure and practically healing of the wound in fourteen days. It is utilizing the blood clot, which I formerly opposed, but using it in a sterile cavity. You can follow the same procedure if you do not want to do the primary suture. You can do it without cocaine, the patient does not mind it, and the results have been good in my cases.

DR. ARTHUR C. STOKES, Omaha: I was chief of the surgical service in Base Hospital No. 49, during the time in which Dr. Potts was engaged in this work at Allerey, France. His results seemed to be phenomenal. I had been accustomed in my general observation to see cases go on weeks discharging and granulating and finally healing with large and ugly scars. These cases did not do this. The tubes were put in as the doctor has described and the wound closed. It healed in three or four days and the patients were walking around the hospital. One point the doctor did not mention, and that is, that instead of using petrolatum for his protecting ointment around the wound, he used zinc oxid on gauze. This seemed to be an improvement on the ordinary method of protecting the skin around the wound. It stuck to the wound better and protected it better. The surgical solution of chlorinated soda certainly does excoriate the skin at times. Of course, the nearer neutral the titration, the less frequently excoriation follows, but the value of the solution, if it has any value, depends on the free chlorine present, and that is bound to irritate at times. We learned that if the solution is of any value at all—I am not discussing that question—it is in cases of acute wounds. I am opposed to packing all kinds of wounds, everywhere and anywhere, with tight gauze, where there is pus, and this method makes packing unnecessary. To pack a wound with pus in it seems to be a bad proposition. In general surgery we do not pack infected wounds with gauze. It has been hard for surgeons to learn that gauze does not drain pus. We have gone through that until we know it does not. One more point is the use of mercuric chlorid. It is interesting to see how after using surgical solution of chlorinated soda for a time and then changing to mercuric chlorid, there was in some cases a very sudden reduction in the bacteriologic count. There must then be certain organisms or relations in wounds in which mercuric chlorid is of more value than surgical solution of chlorinated soda.

DR. FRANCIS P. EMERSON, Boston: I have been very much interested in this paper. I hoped that in our surgical mastoid work we were getting away from complicated methods to a more simple technic. In any surgical procedure there should be some definite reason for every step we take, and in the mastoid operation the first indication is the removal of diseased tissue and drainage. After you have done a complete and thorough mastoid operation, you pack the cavity to stop bleeding and set up reaction. In the procedure which I have adopted, and which is used in the hospital with which I am connected, we rarely disturb the packing until the fourth day. At the end of the fourth day the packing is removed. After removing the packing we want to keep control of the middle ear until it is dry. A simple drain carried up to the aditus will control the middle ear until it is dry. Then after the middle ear is dry and the aditus has been walled off, there is no danger whatever in letting the whole mastoid cavity close by what you might call a modified blood clot method. In the last series of seven cases in which I operated, the middle ear was dry, with the exception of one case, on the fourth day. That means that the operation has been radical enough to remove the diseased tissue, and that the mastoid cavity is free from necrotic areas. There is no one principle in surgery more important than to let Nature alone when she is doing all right, and to wipe out a cavity when it is granulating normally is bad practice; to irrigate a cavity when it is granulating normally is also bad practice. In fact, to do anything that is meddlesome when the cavity is in good condition is bad surgery. If you have excessive granulations,

remove them; if you have a septic wound, use surgical solution of chlorinated soda; nothing is better. But if you have done a radical thorough operation and the middle ear is dry, let it alone, unless you know that there is a septic cavity, and if so, the use of the surgical solution of chlorinated soda is one of the best measures that we have at our command.

DR. C. J. SWAN, Evanston, Ill.: In our experience at Camp Wheeler, those mastoids which were found at the operation to contain much pus, where the necrotic process had gone far, were those that healed the most readily. Cases in which operation was done very early and which were infected with streptococci were the cases that continued to suppurate and were slow to heal. They were operated early, the necrotic process had not been delimited, and the patient apparently had not set up a resistance to the infection. On the other hand, cases that had gone far and that we did not see until they had had the mastoid infection for weeks, healed very quickly. We tried the Carrel treatment in ten cases that were sent directly from the operating room to the Carrel treatment ward. We controlled these cases by ten other cases in which we used a treatment similar to the one Dr. Emerson described. We sewed the wound primarily down to about two-thirds of the way with three sets of stitches, one through the pericranium, one through the subcutaneous tissue and then a skin suture. We packed the cavity and left the packing in for three or four days, then removed it, and maybe packed it once or twice more. Healing was accomplished in the favorable cases in a little over two weeks. We had one case, a very necrotic case, that healed in ten days. With the Carrel treatment we had more scar, and the average time of healing was about a week longer. The cases that were suppurating very much did better with this treatment. The favorable cases did better with the simple treatment. In other words, there is no one method of treatment applicable to all cases. Each case should be treated according to the condition presented.

DR. WENDELL C. PHILLIPS, New York: I have been very much impressed with the aggressive work that has been accomplished by Dr. Potts and by those who have taken part in the discussion. But I think there are one or two words of caution that may well be mentioned at this point. Evidently in the case of those who have fallen into the hands of the men who have been doing this operation, their "lines have fallen in pleasant places," because the experiences that some of us have in hospital work in great cities would not bear out the testimony that has been given here today. If the method of treatment that the surgical solution of chlorinated soda offers means the results given in this paper, there is no question that its adoption will be warranted. I do think, however, that if you use it in the ordinary run of cases seen in the large hospitals, the results could not possibly be the same. The word of caution I wish to give is this, that unless the discharge from the external auditory canal ceases entirely after a few hours or days of use of the Carrel treatment, the case should not be reported cured even if the postauricular wound is healed, for otherwise a recurrence may be expected. Closing the posterior wound before the discharge has ceased from the external auditory canal means trouble. A case is cured only when the mastoid is healed and when the discharge has ceased from the external auditory canal, and if the cases reported at this time have not had that course they are not cured. In the care and treatment of patients, a dressing every four hours may be very easy where there are not very many mastoid patients to care for, but if you take them in a hospital where you have from forty to eighty such patients under treatment all the time, postoperative cases, and you dress them every four hours, it will require an increase in the hospital staff, because you cannot trust the nurses to make these dressings, and I can see where there will be an enormous amount of labor.

DR. EDWARD J. BERNSTEIN, Detroit: I would like to add a word of caution about the use of iodine gauze. I used it in one case and in a very short time it set up a meningeal irritation which was not relieved until I took out the gauze. It seems to me we ought to be very cautious about putting iodine solution into mastoid wounds.

DR. JOHN B. POTTS, Omaha: In this series of cases we had an acute *Streptococcus hemolyticus* infection following influenza. We had some cases of fracture of the mastoid following accidents with high explosives. Three cases that had had an old otitis media and which was stirred up again, and we had cases that had been dragging along for weeks and even months. The boys at the front did not stop fighting for a little thing like a running ear; they had to be really hurt. It was very interesting to see how the different cases responded to treatment. The time in which we could get an ear sterile depended somewhat on how long it had been discharging. In some old cases the discharge did not cease as promptly as in acute cases. In answer to Dr. Phillips, I think his criticism is very just. You will find, however, as you develop your technic that you can instruct one or two nurses to carry out this dressing, and it becomes a simple matter. The dressing is only done once in twenty-four hours. In other words, the doctor or intern only sees the patient once in twenty-four hours. The introduction of the surgical solution of chlorinated soda can be done rapidly by the nurse if she is careful. She can go about with a sterile syringe, we use a little gynecologist's syringe, the kind that were shipped in great quantities to France, and it works very well. The dressings do not take really as much time as when done in the other way.

New and Nonofficial Remedies

THE FOLLOWING ADDITIONAL ARTICLES HAVE BEEN ACCEPTED AS CONFORMING TO THE RULES OF THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION FOR ADMISSION TO NEW AND NONOFFICIAL REMEDIES. A COPY OF THE RULES ON WHICH THE COUNCIL BASES ITS ACTION WILL BE SENT ON APPLICATION.

W. A. PUCKNER, SECRETARY.

BARBITAL SODIUM (See N. N. R., 1919, p. 83).

Barbital Sodium-Abbott.—A brand of barbital sodium complying with the N. N. R. standards.

Manufactured by the Abbott Laboratories, Chicago, under U. S. patent No. 782,739 (Feb. 14, 1905; expires 1922); by license of the U. S. Federal Trade Commission.

OVARIAN SUBSTANCE-HOLLISTER-WILSON.—The entire, fresh ovaries (including the corpora lutea) of the hog, cleaned, freed from fat, dried and powdered. It contains no diluent or preservative.

Actions and Uses.—See Ovary (New and Nonofficial Remedies, 1919, p. 202).

Dosage.—From 0.06 to 0.2 Gm. (1 to 3 grains).

Manufactured by the Hollister-Wilson Laboratories, Chicago. No U. S. patent or trademark.

Ovarian substance Hollister-Wilson is a yellowish powder, having a characteristic odor. It is partially soluble in water.

One part of ovarian substance Hollister-Wilson represents approximately seven parts of the fresh ovary. When incinerated, it yields not more than 7 per cent. of ash.

DESICCATED CORPUS LUTEUM-HOLLISTER-WILSON.—The fresh substance from the corpora lutea of the hog, dried, freed from fat and powdered. It contains no diluent or preservative.

Actions and Uses.—See Ovary (New and Nonofficial Remedies, 1919, p. 202).

Dosage.—From 0.03 to 0.12 Gm. ($\frac{1}{2}$ to 2 grains).

Manufactured by the Hollister-Wilson Laboratories, Chicago. No U. S. patent or trademark.

Desiccated corpus luteum Hollister-Wilson is a yellowish powder, having a characteristic odor. It is partly soluble in water.

One part of ovarian substance Hollister-Wilson represents approximately 5 parts of the fresh corpus luteum substance. When incinerated, it yields not more than 6 per cent. of ash.

SODIUM PEROXIDE (See N. N. R., 1919, p. 216).

Sodium Dioxide, Dental-R. and H.—A nonproprietary brand of sodium peroxide complying with the N. N. R. standards, but containing at least 90 per cent. of sodium peroxide, and iron not to exceed 0.006 per cent.

Manufactured by Roessler and Hasslacher Chemical Co., New York. No U. S. patent or trademark.