THE MASTOID BLOOD-CLOT OPERATION, THEORETICALLY GOOD; WHAT RESULTS WILL SHOW.

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Since the introduction of the mastoid blood-clot operation, recommended by Dr. Clarence Blake of Boston in 1892, a considerable amount of literature has appeared in favor, and very little against, the use of the method in aural surgery. Dr. Blake's initial experiments "had in view the determination of the value of the blood-clot in mastoid operations as a substitute for the usual method of packing and healing by granulation and began naturally with its application to acute cases only, but later on was applied to chronic cases, it being of course understood that the most complete possible removal of all diseased tissue was an important preliminary to success."

The procedure was as follows: "At the close of the operation the mastoid wound was allowed to fill with fresh blood either from the depth of the mastoid or, if this remained dry, from the scraped edges of the superficial wound, which was then closed either by stitches or by simple apposition with dry pressure pads."

In later years, to meet nature's demand for some drainage, the method was slightly modified and the incision closed with the exception of a slender wick, not extending, however, as far as the mastoid antrum. The blood clot in this closed cavity was intended to become organized within a very short time with the formation of new osteo-blasts in forty-eight hours. Under these circumstances a condition more nearly approaching the restoration to normal was thought to have been secured than if the wound were packed and allowed to fill in by granulations.

In general surgery, the method was at that time distinctly new. Successful attempts had already been carried out on cavities and dead bone spaces by filling them with material which might become organized, such as blood-clot alone or in association with decalcified bone chips. Even here the majority of the blood clots in long bones became infected and broke down, which perhaps accounts for the fact that it is now proposed to substitute a mixture of paraffin and iodoform. The above had also been done as fully in accordance with the fundamental surgical teaching—where there is pus forming, drain—as possible, and was only used in wounds in which the surgeon was confident that all of the diseased tissue had been removed

and there was small chance for an acute suppurative process to be developed. This cavity prepared for the blood-clot was actually a closed one and not constantly receiving the purulent discharge from an adjacent suppurating space.

In the mastoid process, with its innumerable bony cells extending in every direction—backward over the occipital bone, forward into the zygoma, downward beneath the facial canal, and even inward beyond the labyrinth—we may, in the first place, consider the case as most fortunate in which all septic material can be removed. In the second place, owing to the opening of the aditus into the middle ear, the mastoid cavity is not a closed one. Suppuration continuing in the tympanum flows backward into cavity as easily as into the external auditory meatus. It is impossible to expect the swelling of the delicate lining of the aditus to be sufficient to block off the mastoid wound from the middle ear. We know that this is not so from the fact that in every acute inflammation of the middle ear there is a certain amount of concomitant inflammation of the membranous lining of the bony mastoid cells. Such a sequel could not occur if the aditus was closed. It is claimed by the advocates of the blood-clot method that the bactericidal power of the blood-clot resides principally in the serum. Reasoning from this, it would seem possible for the greater part of the blood serum allowed to fill the mastoid cavity to run out through the middle ear and external canal. I cannot agree with the decidedly biased opinions of some that the term blood-clot is almost a misnomer, the clot wholly draining out through the middle ear. If a wick, however, be it ever so thin, is introduced from the outside, it does then seem improper to speak of the operation as a blood-clot, there being no more clot than found in any surgical wound.

Dr. Blake continues: "Apparently the serum during the first forty-eight hours preserves its powers of resistance, for in the cases of thorough breaking down of the blood-clot this did not occur until forty-eight hours had elapsed. By that time the clot is so thoroughly organized that it resists the infection, or else provides a culture media which breaks down very thoroughly, giving immediate external evidence of what is going on and leaving the mastoid cavity as free and open as it would have been if it had been packed."

While the above may hold true in a few selected cases, any risk of reinfection in this region, with the nearness of such vital structures as the brain and cranial sinuses, should be avoided. Products of suppuration must burrow somewhere, and there is no escape externally unless the wound be again reopened. Of course considerable

drainage is afforded through the middle ear and canal, as indicated by a profuse discharge. With an added increase in the quantity of discharge from the middle ear, the danger of permanent, even though slight, impairment of hearing is proportionately greater. One of the chief benefits derived from draining the mastoid wound with a wick has been the good effect on the middle ear. That we could not expect in the blood-clot method, as Dr. R. C. Myles has pointed out.

Usually the secondary mastoid abscess evacuates itself spontaneously. With the breaking down of this carefully sutured wound and the attendant inflammation one is prepared to believe that the time of healing is actually delayed rather than shortened.

In a discussion following the second paper in 1899, Dr. J. Orne Green is quoted as follows: "I have had really no experience in the use of the blood-clot because it did not appeal to me on account of the uncertainty in getting the infected cavity absolutely clean. What could be the advantage of the blood-clot over the cases we see so many of, especially the acute cases, when we clean them all out, get them aseptic and in the course of a week or ten days the bone

It has occasionally been stated that in order to secure a real blood-clot in the mastoid antrum something like the following experiment would be necessary: "At the close of the operation and just before allowing the cavity to fill with blood some sterile substance, such as a piece of lead foil, would be required to plug the opening leading into the middle ear. With the closure of the external incision the cavity would then be a sealed one filled with blood. We might expect primary union from this throughout. The following case is an interesting example of a blood-clot performed under uncommon circumstances: The patient, an adult thirty-five years of age, was admitted to the Massachusetts Charitable Eye and Ear Infirmary December 11, 1905, on the aural service of Dr. F. L. Jack. There had been a history of two or three previous attacks of moderately acute inflammation of the left middle ear. Present otorrhoea (serous) was of two weeks' duration. Persistent mastoid tenderness at tip for several days. An exploratory operation was advised by Dr. Jack. The operation was as follows: Membrana tympani incised. Mastoid cells curetted out—one or two cells found rather soft and containing a few questionable granulations. The bone was chiseled away toward the antrum for a very considerable depth but the antrum was not reached. With the mastoid process apparently normal and the antrum unopened, the cavity was allowed to fill with blood and the external wound closed as tightly as possible. Sterile pad and bandage. The serous discharge from the middle ear continued. On the sixth day following this ideal operation, and much to my surprise, the posterior wound suddenly began to bulge. The wound was reopened and a dark reddish-brown blood-clot just beginning to break down was evacuated. The wound not being allowed to close entirely, healed rapidly in two weeks.

Reik: "The normal human blood possesses bactericidal power, varying in degree in its antagonism to different micro-organisms; this property of the blood is greater after it is drawn from the vessels than while circulating intravascularly; the microbe destroying substance is found in the serum, but is produced by the leucocytes; certain chemical changes in the blood may be induced either to increase or to diminish its bactericidal power, and this property of the blood naturally diminishes after the clot is forty-eight hours old."

Smith, Theobald, is quoted as saying: "We are not yet sufficiently well acquainted with the favoring or inhibiting action of the blood upon bacteria. Laboratory work has largely been done with blood serum in contradistinction to the entire blood and the possibly favoring action of the blood corpuscles or their constituents has not been hitherto considered. It is highly probable that the blood corpuscles themselves do favor the growth of many bacteria. For the growth of certain bacteria, such as the influenza bacillus, haemoglobin or its derivatives are essential."

granulates without any discharge and we then let the wound heal up? That is a process we see not infrequently. We do not get that down to nine days, but we get healing within two or three weeks that way. I must say that I am afraid of closing a wound that has been septic, and especially a wound like mastoid where there is so much uncertainty about rendering it aseptic. I cannot but think that in certain cases we might make a mistake by using the blood-clot method."

At present the disagreeable features constantly presenting themselves are as follows: The mastoid cavity being allowed to fill with blood at the end of the operation, the posterior wound is closed for primary union. A couple of days later an increase in the discharge from the middle ear is noticed with tenderness around the auricle. In four or five days the posterior wound fills with pus and there develops considerable pain, temperature, with perhaps slight tenderness in the neck just below the incision. The stitches being at once removed, the wound thoroughly reopened and drained, there is then no further difficulty. Occasionally the wound opened spontaneously. In one or two instances I have seen secondary counter-incisions in the neck made necessary where the pus had extended downward under the sheath of the muscles. One is of course obliged to admit that bad results may follow any operation even with the best drainage.

Granting that a certain small percentage of very excellent results have been shown in picked cases, what are we to expect in the remainder less fortunate? It does not seem reasonable to suppose, as outlined by Reik⁴ and Bryant,¹² that "in cases in which the blood-clot fails to organize there is no additional risk to the patient, should the wound not have been as clean as supposed or should the clot become infected in any one of the various possible ways." Is the patient, after the wound has been reopened, cleaned and packed in the usual way, in the same position that he would have occupied had the open method been employed primarily? Considered physiologically, the blood-clot may be and indeed is reasonable enough, but practical tests in this special region leave much to be desired.

Dr. Jack⁶ reports a series of sixty cases of blood-clot operations taken from the records of the Massachusetts Charitable Eye and Ear Infirmary, ten of his own and the remainder by the different members of the staff. The blood-clot became disorganized in forty-eight or eighty per cent. Of the small number which did not require reopening, the discharge from the middle ear was protracted with con-

sequent destruction of the membrana tympani and increased impairment of hearing. The length of time for recovery in some cases extended over several months. Uncomplicated healing was obtained in but four of the entire series. After a careful consideration he "fails to appreciate the advantages of the so-called blood-clot method over the one generally in use."

Dr. Bryant¹⁰ has modified the blood-clot operation by performing what he terms a drained blood-clot, that is to say, a light wick is introduced at the lower corner of the wound. Twenty-four hours later the drain is removed, allowing the corner of the wound to collapse. This he claims insures a more rapid healing than in those cases in which the drain is left as long as a week. He uses this in all cases that do not promise well for the simple blood-clot. On what grounds he proposes to separate the indications for each it is hard to say. For justification in allowing the wound to remain closed he points to the chance of rapid healing and the improved cosmetic results which are supposed to be so noticeable after the blood-clot dressing.

One naturally agrees with Hammond that "in all operative procedures the question of paramount importance is not the production of as little scar as possible or making the treatment of short duration, but what measures will be safest for the patient." Dr. Dench of New York says that every case in which he has given the blood-clot dressing a trial the wound has broken down, requiring reopening and drainage.

The employment of the organized blood-clot in the healing of mastoid wounds is, according to Sprague,¹¹ still an experimental procedure. If this be true, we may yet hope to have a substantial percentage of primary healing following this method. At present the expe-

Blake: "In twenty-five cases of mastoid evacuation, made the subject of the blood-clot experiment in 1896-7, sixteen were so-called acute and nine cases of long continued suppuration with later mastoid implication. Of the sixteen acute cases, seven recovered by primary healing and were discharged well, one in twelve days, two in eleven days, two in ten days; and two in eight days, thus giving an average of ten days. In the nine remaining acute cases and the nine chronic cases, it was necessary to reopen the wound in the manner mentioned and allow it to heal by granulation from the bottom. In this series of twenty-five cases, therefore, the percentage of recovery in the time mentioned in acute cases is 43½ per cent, and is the total number of cases in this series twenty-eight per cent."

Sprague: "In sixty-nine cases the typical blood-clot method was used and forty-two of them healed without interruption in from seven to fifteen days. In the use of the blood-clot in the radical operation my experience is limited to sixteen cases and only two of these succeeded."

Dr. Bryant reports favorable results in the use of the blood-clot in the radical operation. The external wound was closed, except for the introduction of a small cigarette drain. Out of twenty-three cases done according to this method three became infected.

Drs. Gruening, Sheppard, Phillips and Duel are opposed to closing wounds by the blood-clot method. This method of closing mastoid wounds where the dura or sinus has been exposed was most strongly condemned by Dr. W. Le-compte (now deceased).

riments in blood-clot operations teach us not so much the value of the blood-clot in the mastoid as the fact that it is also unnecessary to leave a large wound gaping throughout its length to heal by granulations. Between the two there is a more practical path. We may close the wound almost entirely and cover whatever bone possible so long as there is left sufficient space for drainage, even though that be small.

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