

XXXIX.

WHAT IS THE BEST TYPE OF RADICAL, FRONTAL SINUS OPERATION, VIEWED FROM SIMPLICITY OF TECHNIC, TIME OF HEALING, AND COSMETIC RESULTS?*

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The operative measures developed in recent years, dealing with both acute and chronic frontal sinus troubles, vary greatly. Though the objective point is the same, i. e.; the drainage and ventilation, or obliteration of the sinus, depending on the duration and extent of the trouble, yet each individual surgeon seems to have devised a new technic or modified an old one; all of which goes to show that, though we may have attained to a successful standard, as yet we have not achieved the ideal. This is especially so in reference to the radical frontal sinus operation.

Undoubtedly the classic Killian operation, judged by all the stipulations of the text of this discussion, barring the first, perhaps, is the best type of radical frontal sinus operation to date. But it is not perfect, and I beg your indulgence while I briefly detail yet another modification which perusal of the literature and my personal experience prompted me to make. It is meant not to supplant, but merely to supplement by simplifying the technic, and in a manner enhancing the cosmetic effect.

Citations from my case reports and the report, with photographs, of one case in particular, where I was fortunate in being able to compare the results of this modification and the original Killian in a simultaneous double radical frontal sinus operation, I trust will furnish evidence sufficient to justify the claims of my procedure.

Indications. When we bear in mind the purpose of the

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radical operation, i. e., drainage and ventilation, or obliteration of the sinus, we appreciate that the rationale of all operative measures devised to meet these indications must be based upon a proper knowledge of the anatomy of the sinus and its relations to contiguous vital and special sense organs.

Anatomy. I shall not attempt to detail the anatomy of the frontal sinus, with which you are so familiar, further than to emphasize the importance of a thorough knowledge of its location and relations to the nasal fossæ, the other accessory nasal sinuses, the orbit and the brain; thereby to aid the interpretation of clinical phenomena in frontal sinus troubles and explain the technic of operative measures undertaken for their relief and cure.

The frontal sinuses are air cavities situated between the two tables of the vertical portion of the frontal bone, and when normal or of average size, lie immediately above the root of the nose, but when large, may extend laterally over the orbit to its external angle or posteriorly to the optic foramen. A septum usually separates them.

The development of the frontal sinuses is accomplished by an upward expansion of the anterior ethmoidal labyrinth. This process of expansion begins very early in life, probably at the end of the first year, but does not attain to a distinct, recognizable cavity, at the level of the frontonasomaxillary suture, before the sixth or seventh year, and not to full development before the eleventh or twelfth year.

Whatever may be the function of the various sinuses, which is problematic, we note in the case of the frontal sinuses, at least, that nature by developing them from below upward has provided an avenue of communication between the sinuses and the nasal fossæ, which begins at the most dependent portion of the floor of the sinus—the anterior inferior angle—and which terminates by an ostium at the upper end of the infundibulum in the majority of cases, or, slightly more anteriorly and medially, directly into the middle meatus, the channel of communication being termed the nasofrontal duct, which passes downward, backward and inward, surrounded by the anterior ethmoidal cells. These cells are contained for the most part in the anterior end of the middle turbinate and the uncinate process. The cells of the bulla ethmoidalis bound the duct posteriorly, and frequently there are one or two small

cells external to the duct, between it and the lacrimal bone. Therefore, the anatomic location of the nasofrontal duct at the bottom of the sinus is clinically important in that it furnishes positive evidence of its function—drainage and ventilation of the sinus. Furthermore, its relation to the sinus and the anterior ethmoidal labyrinth is of interest from a therapeutic and surgical view, as it is the natural, direct and simple route to reestablish drainage and ventilation, practically in all acute and subacute and many chronic pathologic conditions. But if the disease is of long standing and the mucous lining and bony walls are greatly involved, obliteration of the sinus is demanded, and it will be necessary to supplement measures, from below and within, with operative procedures directed from without. Particularly is this so where the sinus is large, when it is important, if not imperative, to have direct inspection to remove thoroughly and safely all diseased tissues.

With this brief review of the anatomic location and relations of the frontal sinuses and their ostia as a guide in interpreting clinical phenomena and to nature's way of relief, we have valuable suggestions in formulating treatment, therapeutic and surgical. To the latter we will confine our discussion.

In deciding the type and extent of operative procedures to be adapted in frontal sinus operations, not only the surgical conditions, but the patient must be considered. With private patients, ladies especially, the question of deformity is of prime importance, while with hospital cases and laborers, who may have dependent families, the time of healing must be regarded and the question of deformity relegated to secondary consideration. In both these classes, if the surgical conditions be such as require only drainage and ventilation of the sinus, as in nearly all acute and subacute cases, nature has pointed the way of relief to be intranasally, through the nasofrontal duct and the anterior ethmoidal labyrinth. In fact, many of these cases, seen early, yield to therapeutic measures. But if the surgical conditions be such as demand obliteration of the sinus, then the external operation substitutes or supplements the intranasal operation. Thereby the surgical conditions can be dealt with more sanely and safely, and the time of healing greatly shortened, while the deformity is nil or slight in the great majority of cases.

Preceding the external operations, skiagrams should be made showing the exact location and the extent of the sinuses, as they prove of material aid in formulating and expediting operative procedures. When it is impossible to obtain skiagrams, an effort should be made to ascertain the height of the sinuses by catheterizing through the natural passages or by breaking through the agger nasi cell, by a method recently detailed by Mosher,¹ and which will be referred to later.

When the toxemia is severe, a bacteriologic examination of the pus from the sinus should be made, and if streptococci predominate, injections of antistreptococcic serum, antedating the operation, will hasten convalescence. Moreover, some days previous to the external operation communication between the sinus and the nose should be established by an intranasal operation. This procedure may prove not only a preliminary step to, but a preventive measure of the external operation. Mosher,² outlining a new method of obliterating the nasofrontal duct by entering the sinus through the agger nasi cell, cites two cases, in one of which this procedure prevented him from doing the Killian operation.

Doubtless all of us have had this experience, so it is useless to dwell on the technic of partial or complete turbinectomy of the middle turbinate and obliteration of the nasofrontal duct and anterior ethmoidal cells, etc. But, in passing, I wish to refer to the location and relation of the agger nasi cell as described by Mosher. He claims that "in a large proportion of subjects there is a distinct swelling on the inner upper surface of the ascending process of the superior maxilla. The mound made by this swelling is just in front of the anterior end of the middle turbinate and often merges with it. This mound is caused by a cell of the anterior group, which has been named from its position the agger nasi cell." Bearing on this point, P. Watson Williams³ states that, "just as large cells at the summit of the unciform groove may bulge up into the floor of the frontal sinus, forming the frontal bulla, so may cells develop in the unciform lamella, a large cell there forming the cell of the agger nasi, either projecting up so as to mound into the floor of the frontal sinus, or backwards so as to encroach on and block the hiatus semilunaris or unciform groove." My observations are, that while the agger nasi cell may encroach slightly over the margin of the inner upper sur-

face of the ascending process of the superior maxilla, it develops in the anterior portion of the unciform lamella and lies for the most part on a plane posterior and behind the ascending process of the superior maxilla.

External to the agger nasi cell and in line with it above lies the nasal duct. In the Mosher operation to obliterate the nasofrontal duct and catheterize the frontal sinus, care must be exercised with the curette in breaking through the median walls of the ethmoid cells, lest the outer walls are also penetrated and entrance made into the nasal duct, or, if further back, into the orbit through the lacrimal bone.

Technic of External Operation: Make the initial incision in the line of the brow, beginning at the supraorbital notch or foramen, and carry the incision inward and downward until it reaches a point corresponding to the junction of the T-like suture formed by the articulation of the frontal bone with the nasal and superior maxillary bones. This incision may extend outward if the sinus extends to the outer angle of the orbit, or it may extend downward 5 to 8 mm., should it be decided to remove the upper end of the nasal process of the superior maxilla. After retracting the skin, soft tissues and periosteum, in mass, upward over the anterior sinus wall, remove with chisel and forceps a strip of bone 6 to 8 mm. wide from the anterior wall of the sinus, beginning at a point above the supraorbital notch and extending inward and downward until its median margin reaches the nasal process of the superior maxilla at the junction of its articulation with the frontal and nasal bones. Thence continue down the nasal process of the maxilla 5 to 8 mm. only if the emergencies of the case demand it, being careful that the median border of this bone removal does not trespass upon the nasal bone, but follows its articulation with the nasal process of the maxillary bone. To expose the nasal process of the maxilla, after extending the incision through the soft parts along the line above indicated, retract same, with the periosteum, externally to the inner orbital margin. The nasal process having been removed to the extent desired, 5 to 8 mm., preferably with strong biting forceps, we have free and direct access not only to the anterior ethmoidal cells, but to the posterior ethmoidal cells and the sphenoidal sinus, should these latter groups be involved.

However, in a great majority of cases the removal of a strip

of bone 5 to 8 mm. wide from the anterior sinus wall, extending from the supraorbital notch to the nasal process of the superior maxilla, gives direct inspection of the entire sinus and affords ample access to break down all septa and to curette the pyogenic or necrotic mucous membrane of the sinus, as well as the nasofrontal duct and anterior ethmoidal cells, if these latter have not already been obliterated by a preliminary intranasal operation. But if the posterior ethmoidal and sphenoidal sinuses are involved, the partial removal of the nasal process of the maxilla furnishes the needed room for direct inspection and access with curette and forceps to obliterate them with entire safety. In very rare cases it may be feasible to remove a portion of the sinus floor and median orbital wall. The sinus may be lightly packed with a narrow strip of sterile gauze and drainage secured by allowing the ends of this gauze strip to pass below intranasally, and externally, at the lower angle of the external incision, which is sutured save at this point. This gauze should be removed on the second day and an adhesive strip adjusted to the lower angle of the external wound. In suturing the external wound it is important that close coaptation of the periosteum be made throughout, to facilitate granulation beneath. Through and through sutures should be used. Equal care should be taken to accurately approximate the skin margins, with fine sutures, and the line of healing will be imperceptible.

Advantages: (1) The simplicity in this modification of the Killian operation, the author hopes, will appeal to the man of average skill and moderate experience who may be confronted with this important work. Simple technic is safe in itself, and it indirectly shortens the time of operation and anesthesia, thereby lessening shock. (2) With the largest sinuses, reaching to the temporal side of the orbit, by extending the bone removal of the frontal sinus wall 5 to 7 mm. outward from the supraorbital notch, where it began, to the temporal side, direct inspection and access is gained to the remotest recesses, affording easy and complete removal of septa and diseased tissue. And in case the posterior ethmoidal and sphenoidal sinuses are involved, by the extension of the bone removal 5 to 8 mm. down the nasal process of the superior maxilla, we again obtain direct inspection and access from the front and on straight lines, instead of making entrance from the side, as in the Killian

operation. The last condition is no mean advantage when directions mean so much in guiding and limiting us within the bounds of safety in dangerous regions. Moreover, by limiting the median margin of the bone removal to a line corresponding to the articulation of the nasal bone with the nasal process of the maxilla, the danger of injury to the olfactory groove and cribriform plate is minimized. (3) This modification not only conserves the supraorbital ridge, but also the median orbital margin, and leaves the contour and symmetry of the face normal; therefore, the cosmetic effect is ideal. The risk of diplopia is avoided as the pulley of the oblique is not disturbed.

The accompanying photographs of a case where I did a double radical frontal sinus operation, the original Killian and the modified Killian, on the right and left sides, respectively, illustrate the ideal cosmetic effects obtained on both sides, though the right side is slightly flatter at the inner orbital angle, due to the partial removal of the orbital floor.

I regret that the attempt at skiagrams in this case was a failure, as I should like to have illustrated the magnitude of the sinuses, both of which extended beyond the outer orbital angles and contained many septa.

The patient left the hospital on the sixth day, resumed her household duties in two weeks, required practically no after-treatment, and in twelve weeks had gained thirty pounds.

REFERENCES.

1. The Laryngoscope, September, 1911, p. 946.
2. Ibid.
3. Rhinology, p. 24.

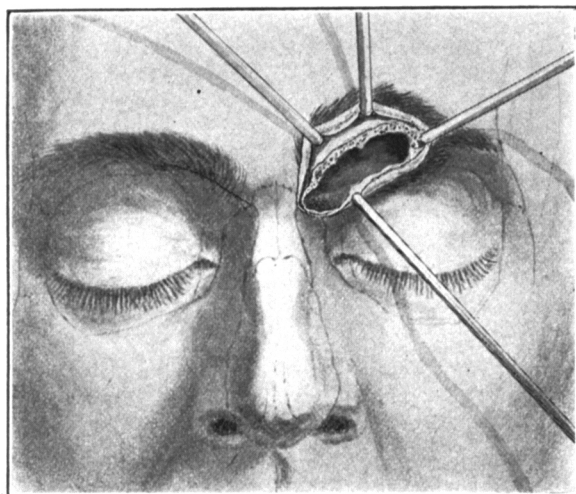


FIGURE 1.

This drawing, by light line tracings, shows the articulations of the frontal and nasal bones and the ascending process of the superior maxilla. The incision in the soft tissue is indicated on the right by a heavy line. The extent of the bone removal from the anterior wall of the sinus is indicated on the left.

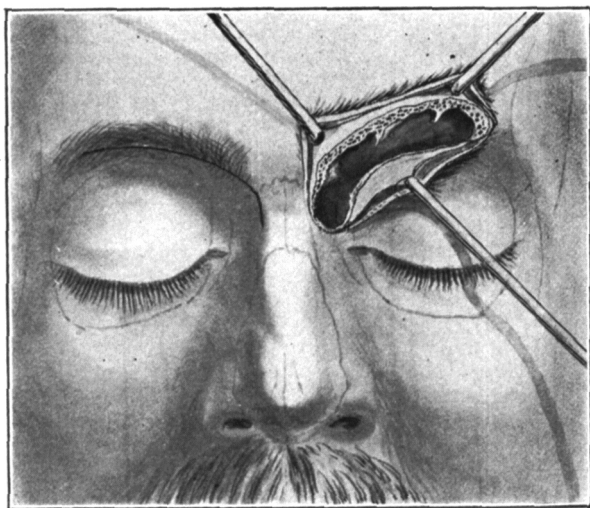


FIGURE II.

This drawing shows the more extensive incision in the soft tissues, also the greater bone removal required when the frontal sinus is very large and other sinuses are involved. By the removal of the upper end of the ascending process of the superior maxilla, direct access, on straight lines, is had to the ethmoid and sphenoid sinuses.

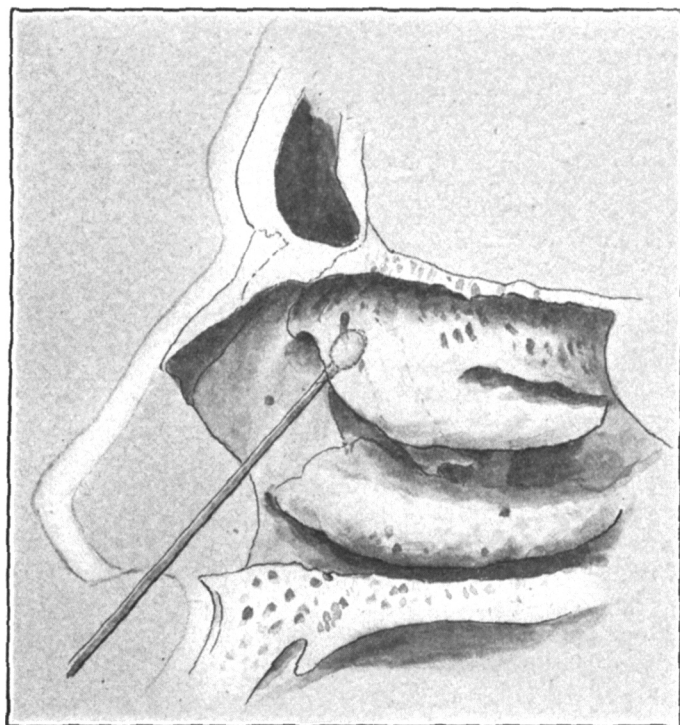


FIGURE III.

This drawing shows the location and relation of the agger nasi cell and Moshé's method of breaking through it with curette to enter the frontal sinus intranasally.