

## Physiologic maxillary antrostomy

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### SUMMARY

*A resume of the recent developments in physiological sinus surgery is presented. A ten-step surgical technique utilizing these principles is presented. This restores the sinus to its normal anatomy and physiology. The incision is made over the gum line. The periosteum is elevated over the canine fossa. Entrance is made into the sinus through a bone-drill-produced osteoplastic flap elevated to visualize the maxillary sinus pathology, which can be handled readily through this approach. A method of tailoring and placing the ventilation tube with a radiopaque strip is described. The trap-door flap is pressed back into its original position with thumb pressure over the cheek. The gumline incision is closed with interrupted sutures. After the tube has been removed the normal anatomy of the sinus is restored and adequate ventilation through the natural ostium has been provided to restore the normal physiology of the antrum. There were 77 patients who had this surgery on a total of 97 maxillary sinuses; 43% obtained an excellent result, 53% obtained a good result and 4% a poor result.*

Surgery on the maxillary sinuses is entering a new phase due to the recent advances brought out by Drettner (1965, 1967, 1971), Kortekangas (1971), Lavelle and Harrison (1971). Rhinometric testing and an evaluation of physiologic function have made it obvious that our older techniques were not adequate or proper. Many investigators and clinicians have contributed to the new method which we shall present. Among the most notable are Cottle (1966), Horowitz (1967), Shiffman (1970) and Krajina (1972). The techniques used have evolved over a period of 16 years, but the basic principles are the same as presented by the author (1971).

The physiologic antrostomy provides the following advantages:

1. Direct visualization of all but the anterior aspect of the maxillary sinus. To paraphrase the Chinese, "One look is worth a thousand guesses" or "One good look is worth ten 'feels'." The total sinus can be visualized with the use of a small hand mirror or sinuscope.
2. It minimizes the loss of sensation in the teeth and the mucous membranes of the upper gum due to less injury to the bone, vascular, neural and soft tissues.

3. It requires less postoperative care.
4. It restores the maxillary sinus to its normal anatomy and physiology.

When a diagnosis of chronic irreversible maxillary sinus disease is confirmed by history, physical findings, x-rays, rhinometric pressure studies, bacteriological and other laboratory tests, then a physiological maxillary sinus antrostomy may be indicated.

The ten-step technique is as follows:

1. After the patient has been prepared in surgery antrum punctures are done and maxillary sinus pressure studies (Figure 1) are made to evaluate the patency of each natural ostium. If on snuffing and snorting the patient cannot raise or lower the manometer level by 10 millimeters of water pressure the sinus is inadequate.
2. After preparing the mouth for surgery and anesthetizing the tissues of the upper gum, an incision is made along the gum line (Figure 2) as recommended by Shiffman (1970), extending from the canine tooth laterally.
3. The periosteum is elevated (Figure 3) above the level of the roots of the teeth as demonstrated on x-ray, roughly  $\frac{1}{2}$  to 1 centimeter above the gum line.

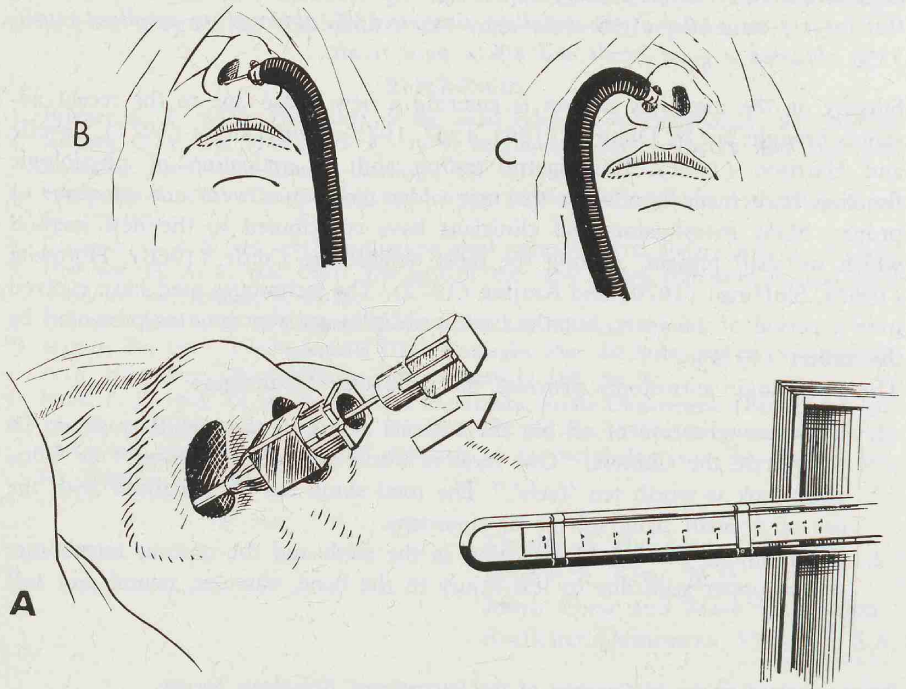


Figure 1. Before surgery antrum punctures with rhinometric pressure tests are done.

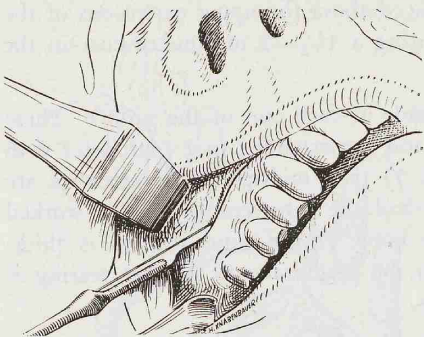


Figure 2. The incision is made along the gum line from the root of the canine tooth laterally.

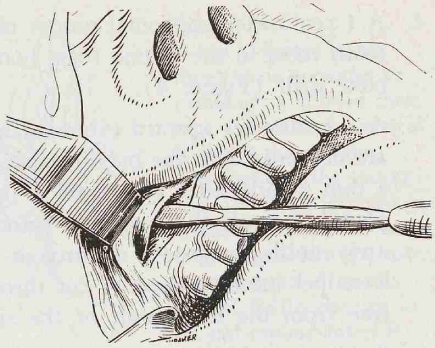


Figure 3. The periosteum is elevated exposing the canine fossa.

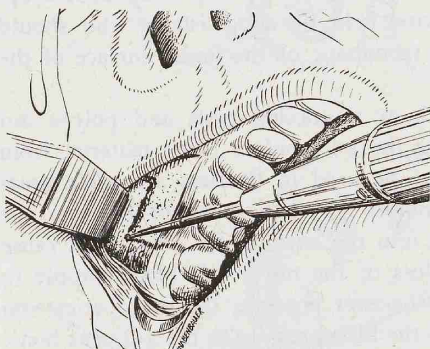


Figure 4. A 1 cm horizontal groove is produced with the bone drill and a 3 mm superior extension is made at each end. These are deepened into the sinus cavity.

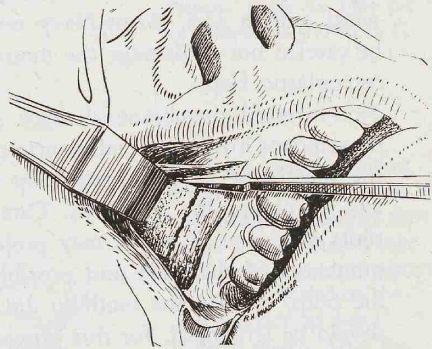


Figure 5. The superior extensions are carried upward for a distance of 1 cm with a 3 mm osteotome. The horizontal groove is deepened into the sinus cavity.

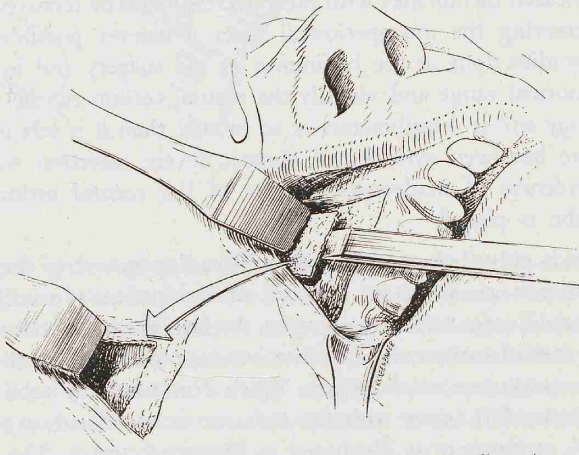


Figure 6. A sturdy chisel is used to elevate the osteoplastic flap (trap-door) anteriorly and superiorly revealing the contents of the antrum. The pathology within the sinus is cared for at this time.

4. A 1 centimeter horizontal groove is placed above the upper extensions of the tooth roots in the canine fossa bone using a  $1\frac{1}{2}$ —2 millimeter burr in the bone drill (Figure 4).
5. A 3 millimeter upward extension is made at each end of the groove. These are deepened into the maxillary sinus and are extended to 1 centimeter with a thin 3 millimeter osteotome (Figure 5) then multiple drill punctures are placed through the horizontal groove and the intervening bone is worked away until the groove is through the bone. If the sinus mucosa is thick, a scalpel must be used to cut through the membrane to prevent tearing it free from the inner wall of the sinus.
6. An 8 to 10 millimeter sturdy chisel is placed beneath the osteoplastic flap (trap-door) (Figure 6) and used as a wedge, raising the flap anteriorly and superiorly, revealing the contents of the antrum. The trap door is held upward with a U.S. Army-Navy retractor held by an assistant, who should be careful not to damage the mucous membrane of the under surface of the osteoplastic flap.

Non-infected membrane changes such as mucocoeles, cysts and polyps can be removed by superficially suctioning the polypoid or cystic material from the membrane. Light curettement may be used in the less accessible areas and to obtain the specimen. Care should be taken to avoid injuring the roots of the teeth which may project into the antrum, for this might cause numbness of the teeth and possibly loss of the nerve and blood supply to the pulp, causing the tooth to die. Whenever possible, the mucoperiosteum should be left intact, for this provides the blood supply to the adjacent bone. Infectious processes such as pyoceles and extensive membrane infection with hypertrophy usually are best managed with a large bore aspirating tip sucking away the gelatinous mucous membrane, polypoid appendages and other debris. Diseased membranes with pus pockets should be removed the same way, again preserving the mucoperiosteal layer whenever possible. If the sinus pressure studies done at the beginning of the surgery and in the office are within a normal range and visually the natural ostium can be seen to be free of pathology and is 4 millimeters or so in size, then it is left intact; however, when there has been evidence of chronic severe infection within the sinus and/or evidences of inadequate patency of the natural ostium then a ventilation tube is placed.

7. A 20 French polyethylene chest tube with radiopaque strip the length of the tube is tailored according to the size of the patient's maxillary sinus and nose. It should extend from a point on the lateral wall of the maxillary sinus up to the normal ostium and into the nose approximately 1 to 2 centimeters, usually 5 centimeters total length. When trimming the tube the middle 2 centimeters are left intact with the tails on each end cut away for approximately  $1\frac{1}{2}$  centimeters as illustrated in Figures 7 and 8. The tube is placed through the trap-door opening into the sinus where it is grasped with the Takahashi forceps which has been placed through the natural ostium.

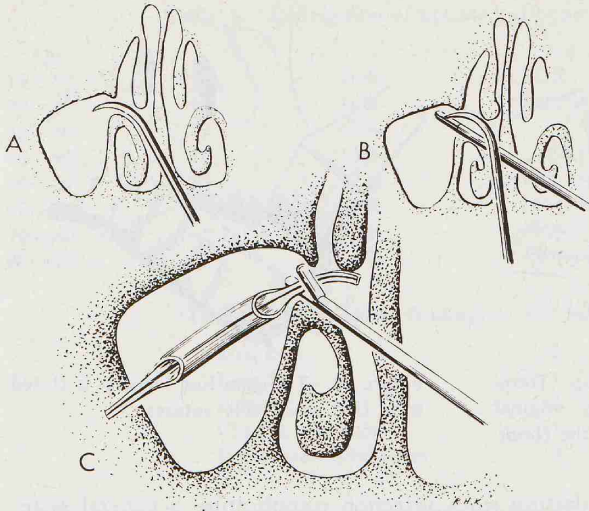


Figure 7. When indicated by the rhinometric pressures or pathology, a tailored chest tube with radiopaque strip is passed through the trap-door into the antrum and one tail is grasped by a Takahashi forceps. It is then tugged into the natural ostium. Insert A reveals curved Cottle elevator in natural ostium. Insert B shows how a Takahashi forceps is passed alongside the elevator into the natural ostium. There the tube can be grasped as shown in C.

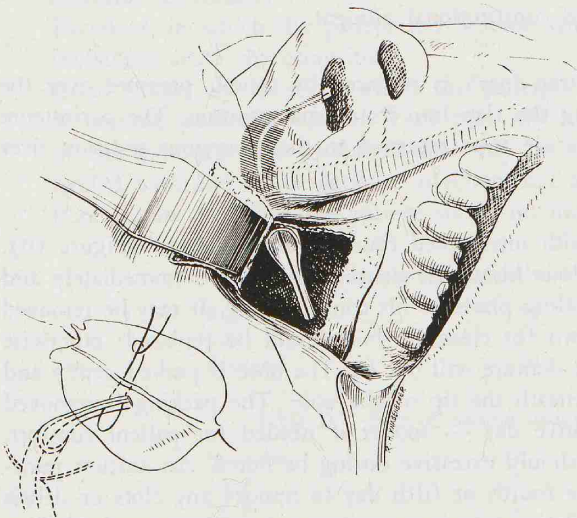


Figure 8. With a double-armed two-0 black silk eye suture (needles straightened) the tail of the naso-antral tube is sutured onto the septum. The suture is tied on the opposite side, as noted in small sketch. After six months the suture is cut and the tube removed.

8. It is tugged by its tail into the nose until properly positioned, then sutured to the septum by a double-armed two 0 black silk eye suture with straightened needles. The radiopaque strip permits the tube to be easily located by x-ray should it break loose from the septum and fall back into the sinus. In the following instances, a large middle or inferior meatus antrostomy is performed and no natural ostium intubation is done. We have not included this type of case in our study

A. When the patient cannot or probably will not return for full follow-up care.

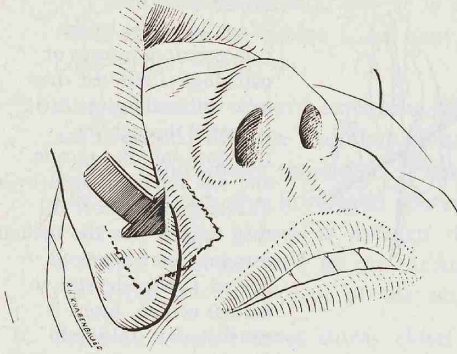


Figure 9. The osteoplastic flap (trap-door) is pressed back into its original position by thumb pressure over the cheek.

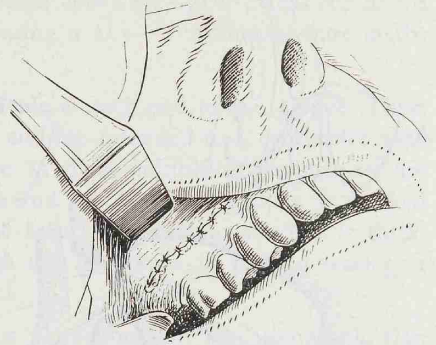


Figure 10. The gum line incision is closed with fine absorbable sutures.

B. In an extensive long-lasting sinus infection complicating a general systemic disease such as diabetes, chronic glomerulonephritis, cardiac, liver lung or other serious constitutional ailment.

9. The osteoplastic flap (trap-door) is replaced by thumb pressure over the cheek (Figure 9) forcing the flap into its normal position. The periosteum and attached membranes are then returned to their previous position over the canine fossa.
10. The incision is closed with interrupted four 0 chronic sutures (Figure 10). If the patient is edentulous his upper denture is replaced immediately and kept there during the healing phase of his convalescence. It may be removed daily for a minute or two for cleaning, but should be replaced; otherwise edema will form and the denture will not fit. The nose is packed gently and a nasal pad is placed beneath the tip of the nose. The packing is removed on the second postoperative day — sooner if needed for patient comfort. It can be left in longer should excessive oozing be noted. An antrum puncture may be done on the fourth or fifth day to remove any clots or debris from the sinus. If a ventilating tube is in position a 2 millimeter polyethylene or teflon tube fitted over a 17 or 18 gauge needle can be used to irrigate the sinus. The flexible tubing is placed through the ventilating tube and into the sinus and the irrigation is performed through the small tubing. Six months following the surgery the ventilating tube is removed. After this length of time scar tissue is not likely to stricture so a permanent adequate natural ostium remains.

The distribution of our operated cases as to age, sex and race is shown in Table I. In Table II the nature of pathology found is given. Table III reveals results of our surgery. The oldest case was operated on in January 1970 and the most recent November 1972. No conclusions as to results

Table 1. Distribution of operated cases as to age, sex, race

Age			Sex		
13—20	8	10%	Male	43	55.8%
20—30	11	14%	Female	34	44.2%
30—40	13	17%	Race		
40—50	10	13%	Caucasian	68	88.3%
50—60	17	22%	Mexican	7	9.1%
60—70	7	9%	Negro	1	1.3%
70—80	8	10%	Filipino	1	1.3%
80—90	3	4%			

Table II. Pathological findings in the maxillary sinuses

Mucocele	32	42%
Pyocele	11	14%
Polyps	14	18%
Chronic sinusitis	11	14%
Combined pathologies	9	12%

were made in less than six months postoperative observation. Results were classified as follows:

Excellent, in which the patient has become symptom free and has only an occasional acute rhinosinusitis.

Good results are those in which the patient's symptoms have disappeared or become markedly reduced. They may still have occasional acute episodes of rhinosinusitis with symptoms that may be severe, but can be easily controlled with antrum irrigations, infection and allergy control.

Poor results are when the patient shows no improvement or may be worse.

Table III. Sinuses surgically corrected

Right	34	44%
Left	23	30%
Bilateral	20	26%

Table IV. Size of natural ostium tube

No tube	37	38 %
14 F	2	2 %
16 F	1	1 %
20 F	46	47.4%
24 F	11	11.3%

Note: F = French size calibration.

Table V. Results of surgery

Excellent	33	43%
Good	41	53%
Poor	3	4%

In Table IV is revealed the size of the natural ostium tubes inserted. I prefer the 20 French tube because it is small and contains the radiopaque strip. No smaller

tube is available with the radiopaque strip. These last two tubes are excellent after intranasal middle meatus antrostomies to enlarge the natural ostium. Table V reveals 43% of the patients obtained an excellent result, 53% obtained a good result and 4% a poor result.

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