

# **Textbook of Oral and Maxillofacial Surgery**

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**Chapter 15**

**Diseases of the maxillary sinus of dental origin**

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**Description**

The maxillary sinus is generally larger than any of the other sinuses and lies chiefly in the body of the maxilla. It is also called the antrum of Highmore because this antrum, meaning a cavity or hollow space especially found in bone, was first described by Nathaniel Highmore, an English anatomist of the seventeenth century. It is actually present as a small cavity at birth, starting its development during the third fetal month and usually reaching its maximum development in early adult life about the eighteenth year. The capacity of the average adult antrum is from 10 to 15 mL, and its complete absence is rare. Often subcompartments, recesses and crypts, are present, being formed by osseous and membranous septa.

The maxillary sinus is pyramidal in shape with its base at the nasoantral wall and its apex in the root of the zygoma. The upper wall or roof in the adult is thin; it is situated under the orbit and is the orbital plate of the maxilla. This plate usually possesses a bony canal for the infraorbital nerve and vessels. The floor of the sinus is the alveolar process of the maxilla. In front the anterolateral or canine fossa wall is the facial part of the maxilla. The posterior or sphenomaxillary wall, which is of lesser importance, consists of a thin plate of bone separating the cavity from the infratemporal fossa. The nasal wall separates the sinus from the nasal cavity medially. The nasal cavity contains the outlet from the sinus, the ostium maxillae, which lies just beneath the roof of the antrum. The location of this opening precludes the possibility of good drainage when the individual is in a vertical position.

The sinus is lined with a thin mucosa, which is attached to the periosteum. The ciliated epithelium aids in the removal of excretions and secretions that form in the sinus cavity. The cilia hold foreign material at their tips much as twigs or leaves are held on the surface of many blades of grass. Waves of ciliary action carry the material from one ciliated region to another toward the ostium. These waves could be compared to gusts of wind indenting a wheat field from one side to the other. Only a pathological membrane that has deficient ciliary action or is devoid of cilia in whole or in part will allow foreign materials to rest on its surface.

The thickness of the sinus walls is not constant, especially the roof and floor. The walls may vary in thickness from 2 to 5 mm in the roof and from 2 to 3 mm in the floor. Edentulous areas in the alveolar ridge vary from 5 to 10 mm. In the event that the posterior wall is penetrated, causing entrance into the infratemporal fossa, care must be exercised in any operative procedure because of the presence of large vessels such as the maxillary artery

and vein. Infraorbital and superior alveolar vessels are frequently ruptured in midfacial fractures, giving rise to the formation of hematomas in the antrum.

Below the floor are found the deciduous and permanent teeth, and often the roots of the permanent molar or premolar teeth may extend into the sinus itself. In children and infants the floor of the sinus is always higher than the floor of the nose so that better drainage is readily obtainable from window operations, which will be described later. In adults the reverse is true; the floor of the sinus is lower than the nasal floor.

The nerve supply is from the maxillary branch of the fifth cranial nerve, the posterosuperior alveolar branch of this nerve supplying the lining of the mucous membrane. Its blood supply is derived from the infraorbital artery, a branch of the maxillary artery. Some collateral supply is derived from the anterosuperior alveolar artery, a branch of the same vessel. The lymphatic supply is abundant and terminates into the submandibular nodes.

The functions or purposes of the paranasal sinuses are as follows: (1) to give resonance to the voice (note the change in the sounds of words of persons with colds), (2) to act as reserve chambers to warm the respired air, and (3) to reduce the weight of the skull. During inspiration the suction through the nasal cavity draws some warmed air from the sinuses. The sinuses are connected with the nasal cavities by openings or channels so that the mucous membrane of the sinuses is continuous with that of the nose. Because of this, ventilation and drainage of the sinuses are made possible.

Frequently, radiographs reveal unusually large sinuses, with the root ends residing directly in the floor. This may be confusing, resulting in an erroneous suspicion of a pathological condition. Intraoral views are obtained of the opposite side, and comparison is made; if the bony architecture is the same, then a diagnosis of no apparent pathological abnormality is readily made. The taking of skull films is to be encouraged because a study of them is most revealing, and comparison of all the anatomical structures may be made readily. Of all the diagnostic aids used in the study of the maxillary sinus, the radiograph is the most dependable.

In this connection, any time that the usual intraoral radiographs reveal the absence of a tooth in the arch and no history of previous extraction of that tooth is found, then extraoral views should be made. Many times the absent tooth will be shown to be aberrant and residing high in the superior part of the maxillary sinus. Often these teeth will be the cause of headaches or neuralgias, and on the removal of the displaced tooth and associated pathological abnormalities, these unpleasant condition will disappear.

Toothache is frequently a symptom of maxillary sinus infection. The superior alveolar nerves run for a considerable distance in the walls of the antrum. They are contained with small blood and lymph vessels in narrow, sometimes anastomosing canals. Progressive expansion of the sinus in older persons invariably causes resorption of the inner walls of one or more of these canals, and thus the connective tissue covering the structures in the canals is brought into direct contact with the connective tissue of the mucoperiosteum of the sinus. This will cause involvement of dental nerves if sinus inflammation occurs. The quality of the pain sometimes resembles that of pulpitis. Examination of the teeth by cold stimulation will reveal, however, that not one but an entire group of teeth, sometimes all of the teeth in one maxilla, are hypersensitive.

## Diseases

*Maxillary sinusitis* occurs in acute, subacute, and chronic forms. A careful diagnosis is important, since the cure of the disease depends on the removal of the cause. It is important to determine whether any other nasal sinuses are involved. In many instances the maxillary sinus remains infected from the ethmoids or from the nose itself.

The symptoms of *acute* maxillary sinusitis depend on the activity or virulence of the infecting organism and the presence of an occluded ostium. The main symptom is severe pain, which is constant and localized. It may seem to affect the eyeball, cheek, and frontal region. The teeth in that area may become extremely sore and painful. Any unusual motion or jarring may accentuate the suffering. The nasal discharge may at first be thin and watery and serous in character, but soon it becomes mucopurulent in form, dripping into the nasopharynx and causing a constant irritation. This produces spitting, swallowing, and a constant clearing of the throat. In the type of sinusitis that develops from infected teeth the secretion has a very foul odor. General toxemia develops with the disease, producing chills, sweats, elevation of temperature, dizziness, and nausea. Difficult breathing is common.

*Subacute* sinusitis is devoid of the symptoms associated with acute congestion such as pain and generalized toxemia. Discharge is persistent and is associated with nasal voice and stuffiness. Throat soreness is common. The patient feels run down, tires easily, and often cannot sleep well because of an irritating cough that keeps him awake. The diagnosis is based on the symptoms, rhinoscopy, transillumination, x-ray examination, sinus lavage, and a history of a persistent head cold or sinus attack of a few weeks' or months' duration.

Subacute sinusitis may be the interim stage between acute and chronic sinusitis, and many cases continue on to a stage of chronic suppuration. Proper medical and surgical treatment is important to prevent the acute case from ultimately becoming a chronic one. The relief may come on slowly or suddenly, but it usually takes place soon after improvement of drainage from the sinus reaches the point that secretions are able to leave the cavity as rapidly as they form.

*Chronic* maxillary sinusitis is produced by the following factors: (1) repeated attacks of acute antritis or a single attack that has persisted to a chronic state, (2) neglected and overlooked dental focus, (3) chronic infection in the frontal or ethmoid sinuses; (4) altered metabolism, (5) fatigue, (6) overindulgence, worries, dietary deficiencies, and lack of sleep, (7) allergies, and (8) endocrine imbalances and debilitating diseases of all kinds.

The fundamental pathological change in chronic sinusitis is that of cellular proliferation. The lining is thick and irregular. In some cases the lumen of the cavity may be almost occluded by the thickened membranes. This edematous process involves the ostium, causing a complete blockage so that drainage ceases. Medical treatment is of little value in chronic sinus disease. Roentgen-ray therapy and shortwave diathermy are advocated but are of questionable value without the establishment of proper sinus drainage. This can best be done by performing an intranasal antrostomy or creating an antral window. Conditions conducive to early repair are supplied by the establishment of adequate drainage. The success obtained by this procedure along with other conservative measures properly carried out has practically eliminated the need of radical procedures on the maxillary sinus.

## Pathology

It is generally estimated that from 10% to 15% of the pathological conditions involving the maxillary sinus is of dental origin or relationship. This includes accidental openings in the floor of the antrum during the extraction of teeth, the displacement of roots and even entire teeth into the antrum during the attempted removal of teeth, and infections introduced through the antral floor from abscessed teeth, either of the apical or the parietal variety. Usually infections are most likely to occur in those cases in which the roots of the teeth are separated from the floor of the antrum by a thin lamella of bone, but many cases are reported in which this bone is thick and heavy.

Empyema of the sinus may occur as a result of too active curettage of root sockets after extractions. This procedure, of course, is frowned on, and only light and gentle curettement, if any, should ever be employed. The blind and indiscriminate use of the curet is to be condemned, since it is the means of spreading infection into bone and soft tissues in any part of the mouth. However, it is possible at times for the infection to involve the sinus for no apparent reason.

Dentigerous cysts are often found in the sinus. Other pathological entities include cysts of the mucosa of the sinus, benign and malignant neoplasms, osteomyelitis, antral rhinoliths, and polyps. Angiomas, myomas, fibromas, and central giant cell tumors seldom invade the sinus. Cystic odontomas may encroach on the sinus. They are usually encapsulated and can be shelled out readily without involving the antrum. The osteoma, a benign tumor, is often treated radically when it invades this area. If it obliterates the sinus, it often causes mechanical constriction to vital structures so that a hemimaxillectomy is necessary.

Ameloblastoma invading the sinus causes marked expansion of both facial and nasal walls. X-ray studies usually disclose the character of the lesion. Mixed tumors undergo malignant changes and result in rapid growth and invasion of this area. Connective tissue lesions such as fibrogenic and osteogenic sarcomas seldom involve the sinus. If they do occur, it is usually in childhood, and they offer a poor prognosis. Unfortunately, characteristic symptoms of malignant tumors develop in this region when the disease has reached an inoperable stage.

Epidermoid carcinoma of the antrum is more common than sarcoma. These conditions may be present for some time without producing clinical evidence. The teeth may become loose, and pain develops. If extraction of the teeth is done, the sockets fail to heal. Metastases to vital organs may cause death before local extension occurs. Often swelling of the face is the chief reason for seeking medical advice. In the interest of early diagnosis, close attention should be given to persistent or recurrent pain in the teeth or face without clear-cut dental cause. Early diagnosis is pertinent whether the dentist assumes the responsibility of the treatment of the disease or not.

Trauma such as fractures of the maxilla with associated crushing of the sinus region sometimes occurs. Occasionally, after traumatic zygoma impactions, the zygoma is forced into the sinus. An acute sinus infection may follow because of the retention of an accumulation of blood in the sinus.

## Treatment

### Accidental openings

If information is obtained from the preoperative radiographs that root ends of the teeth to be extracted penetrate the floor of the sinus and if this condition is suspected after exodontics is completed, the patient is instructed to compress the nares with the fingers and blow the nose gently. If an opening has occurred through the membrane lining the sinus, the blood that is present in the tooth socket will bubble.

If this opening is small and great care is exercised, such as the avoidance of the use of irrigations, vigorous mouth washing, and frequent and lusty blowing of the nose, then in the majority of cases a good clot will form and organize and normal healing will occur. At no time should these sockets be packed with gauze, cotton, or other materials because in most instances these procedures will perpetuate the opening rather than serve as a means of causing it to close. Probing of the sockets with instruments must be avoided as much as possible so that infection will not be introduced into uncontaminated areas.

If the floor of the antrum is completely disrupted and portions of the bone remain on roots of the teeth after their removal and inspection reveals a large patent opening, then immediate closure should be done. Primary closure reduces the possibility of contamination of the sinus by oral infections and diseases. Such immediate closure circumvents pathological changes of the sinus, which may persist for some time and require considerably more effort to manage and cure. It often prevents the formation of an oroantral fistula, which would require subsequent surgery of a more difficult and extensive nature.

A simple procedure that yields good results for the closure of large, accidental sinus openings is described as follows: The mucoperiosteum is raised both buccally and lingually, and the height of the alveolar ridge is reduced at the site of the opening substantially. Edges of the soft tissue that is to be approximated are freshened so that raw surfaces will be in contact with each other. Relaxing incisions are made. Suturing may then be done without tension. The edges are drawn together with mattress sutures and reinforced with multiple, interrupted black silk sutures, No 3-0. This type of material is preferred to the absorbable type (for example, catgut) because it obviates the possibility of the sutures coming out too soon, which could possibly limit the success of the closure. The sutures are left in place from 5 to 7 days. Nose drops are prescribed to shrink the nasal mucosa and promote drainage.

The anatomical proximity of the roots of the molar and bicuspid teeth to the floor of the sinus leads to potential infection of the sinus, either by direct extension of an apical abscess or through the accidental perforation of the sinus floor during exodontics. A fractured root apex that is separated from the floor of the sinus by a paper-thin lamina of bone can easily be pushed into the sinus and inoculate it with virulent bacteria. Unless the operator is skillful in the removal of such an accidentally displaced root tip, manipulation and trauma will usually be followed by an acute infection. If a short, precise primary endeavor to remove the root tip is unsuccessful, it should be abandoned and the wound encouraged to heal. If the wound is large, the buccal and palatal mucoperiosteum should be approximated.

The patient should be informed of the existence of the displaced root fragment. The surgical approach for removal of a root in the maxillary sinus should not be made through the alveolus after the primary attempt to recover the root has been done. It should be made through a Caldwell-Luc incision, which will permit adequate visualization of the entire sinus.

Occasionally during the procedure for removal of an impacted upper third molar tooth, it will suddenly disappear. The tooth could have been residing in the floor or in the distal portion of the maxillary sinus, or it could have formed a part of the wall. It may have been dislodged from its crypt in the maxillary bone to slide into the infratemporal fossa.

No effort at recovery should be instituted until the exact location of the tooth is determined by careful clinical and radiographic examination. It is traumatic to the patient, if under local anesthesia, and to the operator to suddenly find that he or she is working in the wrong area.

The employment of stereoscopic and panoramic radiographs will definitely assist in the location of the aberrant tooth. If, on probing the area where the tooth had previously resided, the instrument goes directly into the antral cavity, and if a nosebleed occurs immediately after tooth loss (produced by blood escaping from the sinus through the natural ostium into the nose), then the tooth is certainly in the maxillary sinus. The approach for its removal is the Caldwell-Luc procedure.

In the event that the tooth is not in the sinus cavity and definitely in the soft tissues, then a practical and careful approach is most important. The cause of loss may have been inadequate exposure by not having a proper flap reflected. For example, when pressure was applied by means of an elevator to remove the tooth from its socket, the tightness and elasticity of the mucoperiosteal flap propelled the tooth out of sight into the soft tissues. At this time the flap should be more liberally extended and raised so that the tissue may be explored for the lost tooth. Often the buccal fat pad will be exposed and opened, and this further conceals the tooth. Do not persist in exploring and probing after a few minutes of careful effort.

The patient should be informed of the problem and the search should be abandoned for a period of 5 or 6 weeks. Most patients will react favorably to a complete and proper explanation of the situation.

The law of gravity is a law that cannot be broken. There will be some movement toward a dependent position, and after awhile the tooth will become fibrosed and will not move around when removal is attempted. Incision is made directly to the tooth, and it can be recovered with minimal effort.

### **Preoperative considerations**

Anesthesia for operation on the maxillary sinus may be either local or general, depending on the operator's choice and the type especially indicated for the case concerned. If general anesthesia is to be employed in the hospital, then, of course, that becomes the responsibility of the anesthesiologist.

In the event that local anesthesia is to be employed, this may be obtained satisfactorily in the following manner: The patient is premedicated with 100 mg of pentobarbital sodium and 0.4 mg of atropine about 30 minutes prior to operation. Then a pledget of cotton saturated with cocaine (5% to 10% solution) or tetracaine (Pontocaine), 2% in ephedrine, is carefully applied just above and below the inferior turbinate. This is left in place 10 to 15 minutes. An anterior infraorbital nerve block or a second division block then is administered, using any local anesthetic agent of choice.

It should be stressed strongly that any patient who receives the application of cocaine to the oral or nasal mucosa should not be left alone but should be constantly observed by someone trained to recognize the symptoms of sensitivity and shock that may occur in those individuals who are sensitive to the drug. When an idiosyncrasy is present, positive and immediate steps must be instituted, including the intravenous injection of agents such as thiopental sodium (Pentothal) and the employment of oxygen therapy. This may be lifesaving, and delay or failure to recognize symptoms may precipitate a crisis that may lead to a fatality. These conditions are rare, and, if they are suspected, tests for sensitivity may be made. The ophthalmic test is easy to do and consists of dropping some of the substance that is to be used into one of the patient's eyes. This will produce a conjunctivitis within 5 minutes if the patient is sensitive to the drug; no harm will occur to the eye otherwise.

The skin test may be used in the patient suspected of an idiosyncrasy. It is done by making a wheal or bleb with the drug between the dermis and epidermis; if a marked erythema develops within 5 minutes, that particular drug should not be used. These tests require only the expenditure of a few minutes of time but may be the means of saving hours of worry and confusion or even the individual's life. Definitive tests are made by an allergist.

### **Closure of the oroantral fistula**

Closure of the oroantral fistula, especially in the case of a large opening, may be accomplished well by employing the palatal flap method. A pedicle flap raised from the palate is thick and has good blood supply, so that the chances of success are definitely enhanced. The design of the flap can be determined by a trial or practice procedure prior to surgery. A cast of the maxilla showing the defect or opening is made, and a soft acrylic palate is formed on this cast. The flap is outlined on the acrylic, the incision made, and the flap turned, covering the defect. This provides a preview of results that should be obtained. The material may be sterilized and placed in the mouth for use at the time that the incisions are made through the mucoperiosteum of the palate. This procedure will show that the flap to be raised will be adequate to cover the opening.

With a No 15 blade, the tissue is incised and the flap is raised. A V-shaped section of the tissue may be excised at the region of greatest bend to prevent folding and wrinkling. The pedicle is raised with the periosteum and of course should contain a branch of the palatal artery. The margins of the fistular defect are freshened and the edges undermined. The flap is then tucked under the undermined edge of the buccal flap. This procedure permits two raw or fresh bleeding surfaces to be in contact. With mattress sutures the tissues are drawn in good contact, and the margins are sutured with multiple interrupted sutures. Catgut is not used because it may not hold for a sufficient length of time for healing to occur. The silk or Dermalon sutures should be left in position for 5 to 7 days. The exposed bone at the donor site on the palate may be covered with surgical cement or a gauze strip saturated with compound tincture of benzoin.

Berger, a dentist, described in 1939 a satisfactory method of closing oroantral openings by obtaining tissue from the buccal or cheek area. The tissues that form the rim of the fistula are incised. From the extreme edges, diagonal incisions are made through the mucoperiosteum to the bone. The incisions are carried upward into the mucobuccal fold. The flap is elevated, exposing the bone defect. In the undersurface of the flap the periosteum is incised horizontally at different points, care being taken to incise the periosteum only so that there will be no interference with the blood supply. The incision in the periosteum lengthens the flap so that it may slide down over the opening. Mattress sutures are then introduced over the area, and

definite coaptation is secured. The edges are sutured with multiple black silk sutures, which are allowed to remain in place for 5 to 7 days.

The Berger technique can be combined with the Caldwell-Luc operation. Chronic antral infection, so often present in the patient with a persistent fistula, must be eradicated and antral polyps removed before healing can occur. To obtain good access to the antrum in the combined technique, the anterior limb of the flap used in the Berger technique is extended forward in the sulcus from its upper end, making a separate Caldwell-Luc incision unnecessary.

Another method of closure that is simple and has been successful was described by Proctor. He places a cone-shaped piece of preserved cartilage into the defect. The tooth socket is prepared by curettement, and the cartilage is wedged into place. It is important to have the cartilage of sufficient size so that it can be definitely wedged into place. If loose fitting, it may become dislodged and drop out before the membrane grows over it or it may pass upward into the sinus and become a foreign body.

Gold disks, or 24-karat, 36-gauge gold plate, have been used most successfully by many oral surgeons over the country. The procedure is practical, effective, and uncomplicated. The sinus is thoroughly cleaned and adequately exposed. It is imperative that the sinus be as free from infection as possible. The bone is prepared for the reception of the metal, and then the metal is placed over the opening and maintained there by suturing the soft tissue flaps over it. The patient is placed on an antibiotic to reduce the possibility of an antral or soft tissue infection. A nasal spray is advised to maintain good nasoantral drainage and avoid stasis over the gold implant.

Autogenous bone disks have been advocated for closure of the oroantral fistula combined with a Caldwell-Luc procedure and nasal antrostomy.

The possible closure of oroantral fistulas by means of free, full-thickness transplants obtained from the opposite side of the palate or from the mucobuccal fold is an approach that should not be overlooked. It is feasible and uses tissue that is not foreign to the mouth, since it is a transfer of tissue from one part of the mouth to another. The donor site heals readily, being protected initially by the application of compound tincture of benzoin or sedative dressings.

Causes of failure in the closing of an oroantral fistula may be listed as follows:

1. Complete elimination of all infection within the antral cavity prior to closure not accomplished. This may be done by lavage or antibiotics that have been proved effective against the bacteria present or both.
2. The patient's general physical condition not adequately explored and treated. Such diseases as diabetes, syphilis, and tuberculosis can influence adversely the normal healing of wounds.
3. Flaps placed over the opening with too much tension, and failure to provide a fresh or raw surface at the recipient site of the flap.

The best insurance for a successful closure is the obtaining of good drainage from the sinus to the nose by the establishment of an intranasal antrostomy prior to making any attempt to close the chronic fistula. This may be performed in the following manner: A cotton pledget



with 2% tetracaine (Pontocaine) in ephedrine 1% solution, is applied to the inferior meatal wall and the inferior turbinate. After anesthesia is established, the wall is penetrated with a punch or trocar, which will make a sufficiently large opening to admit cutting forceps. The window is enlarged in all directions until a diameter of at least 2 cm is obtained at its narrowest point. It is important to lower the nasoantral ridge to the floor of the nasal cavity. If any of the ridge is left standing, it might defeat the entire purpose of the new opening, which is to permit a free flow of secretions from the sinus into the nose.

### **Caldwell-Luc operation**

Indications for the Caldwell-Luc radical sinus operation are many, including the following:

1. Removal of teeth and root fragments in the sinus. The Caldwell-Luc operation eliminates blind procedures and facilitates the recovery of the foreign body.

2. Trauma of the maxilla when the walls of the maxillary sinus are crushed or when the floor of the orbit has dropped. This type of injury is best corrected by the approach furnished by this operation.

3. Management of hematomas of the antrum with active bleeding through the nose. The blood may be evacuated and the bleeders located. Hemorrhage is arrested with epinephrine packs or hemostatic packs.

4. Chronic maxillary sinusitis with polypoid degeneration of the mucosa.

5. Cysts in the maxillary sinus.

6. Neoplasms of the maxillary sinus, which are best removed by this technique.

The surgical procedure employed is described as follows: With the use of the anesthetic best suited for the patient, the mouth and face are prepared in the usual manner. If the patient is asleep, he will be intubated and the throat packed along the anterior border of the soft palate and tonsillar pillars. The upper lip is elevated with retractors. A U-shape incision is made through the mucoperiosteum to the bone. Vertical incisions are made in the cuspid and second molar areas from points just above the gingival attachment up to and above the mucobuccal fold. A horizontal line connecting the two vertical incisions is made in the alveolar mucosa several millimetres above the gingival attachments of the teeth. The tissue is elevated from the bone with periosteal elevators, going superiorly as high as the infraorbital canal. Care is exercised here to prevent injury to the nerve. An opening is made into the facial wall of the antrum above the bicuspid roots by means of chisels, gouges, or dental drills, and this is enlarged by means of bone-cutting forceps to a size that permits inspection of the cavity. The size ultimately obtained is about the size of the end of an average index finger.

The opening should be made high enough to avoid the roots of the teeth in that area. The purpose of the operation (for example, the removal of root ends or foreign bodies) is readily accomplished. Seldom is the radical removal of the entire sinus mucosa required, but if it is deemed advisable, this is readily done by means of periosteal elevators and curets. The cavity is cleansed, and the soft tissue flap is replaced and sutured over the bone with multiple, interrupted black silk sutures. These are allowed to remain for a period of 5 to 7 days.

Anesthesia of the cheek and teeth may follow injury to the infraorbital nerve or nerves of the teeth during chiseling of the bony wall. Swelling of the cheek is common but usually disappears in a few days. The prognosis is good, and the development of severe conditions is rare.

Modern techniques of orthognathic surgery, performed so frequently today, often violate the integrity of the maxillary sinus. Complete control or eradication of latent or incipient infection is important. The most effective antibiotic may be determined preoperatively by bacterial sensitivity tests on material obtained from the antrum. This precaution will reduce or avoid potential complications. Nasal decongestants are recommended preoperatively and postoperatively to shrink the mucous membrane, thereby preventing the development of gross edema.

### **Summary**

Intimate juxtaposition of the antrum and roots of the teeth with their surrounding alveolar bone is complicated by occasional maxillary sinusitis of dental origin. Teeth and roots that are to be removed from the alveolus sometimes slip above the thin bony plate separating the alveolus from the sinus. Sometimes they lodge between the bone and the antrum membrane. Frequently, they enter the antrum, in which case the problem of the opening in the antrum cavity is complicated by an opening into the mouth as well as residual dental infection in the alveolus. The operator is then faced with the problem of deciding how far to probe through the alveolus for a lost root or tooth, whether the buccal plate of the alveolus should be opened at that site, or whether a Caldwell-Luc operation is indicated.

The oroantral fistula is a problem that requires detailed attention to the management of a flap in the mouth. However, in all these conditions the problem of antral infection is potential or real. For the sake of obtaining the best results and to give the patient the benefit of mutual or specialized knowledge, a close liaison between the otolaryngologist and the oral surgeon and the unhesitating call for consultation, if needed and available, are certainly to be encouraged.