

CHAPTER 17

MAXILLARY SINUS

Four pairs of paranasal sinuses surround the nasal cavities and are named from the bones in which they are located: maxillary, frontal, sphenoid, and ethmoid sinuses. The maxillary sinuses are located lateral to the nasal cavities. Each of the two sinuses is pyramidal in shape with the apex of each located near the zygomatic bone. Each maxillary sinus communicates with the nasal cavity by the ostium which opens into the middle nasal meatus under the overlapping middle nasal turbinate. Although the ostium is located at a higher level than the floor of the maxillary sinus, the normal sinus drains satisfactorily because of the action of the cilia of the pseudostratified columnar epithelium. The functions of the maxillary sinuses are 1) to lighten the weight of the skull, 2) to give resonance to the voice, and 3) to warm and moisten the inspired air.

Most of the lesions of the maxillary sinus are clinically asymptomatic, especially those localized in the inferior portion of the antrum. These lesions do not block the free flow of fluid or gas through the ostium and thus, pressure is not increased within the sinus. Conversely, when disease conditions block the ostium, the stage is set for considerable discomfort and pain. When maxillary sinus pathoses encroach on neighboring tissues, they may produce symptoms related to the face, eye, nose and oral cavity. Pain of the maxillary bone is the most frequent symptom and may be referred to the face, eye, nose, or premolar-molar teeth. This may be accompanied by a vague headache. The facial symptoms include unilateral paresthesia, anesthesia, and feeling of fullness. Ophthalmologic symptoms include unilateral decrease in vision, pain, diplopia, epiphora

and change in position of eyeball. Nasal symptoms include epistaxis, drainage, allergic rhinitis, and postnasal drip. Intraoral symptoms include pain in the premolar-molar teeth on the involved side, and paresthesia or anesthesia of the gingiva and mucosa. Occasionally, a patient may complain of expansion of the alveolar process and problems with the dental occlusion. Although patients may have disturbances of the maxillary sinus, they frequently first seek professional dental service in the belief that the pain they experience is of dental origin.

Waters' projection is the most useful conventional radiographic technique to image the maxillary sinuses. In this projection, the radiographic densities of normal maxillary sinuses are the same on both sides and equal to those of the orbits. If one of the sinuses is diseased, Waters' projection will exhibit either a radiopaque (fluid) level, a sinus opacification, mucosal hyperplasia, a radiopaque growth or a loss of cortical borders of sinus. Other useful projections include periapical, panoramic, occlusal, lateral head, and Caldwell.

NORMAL VARIATIONS

Fig. 17-1 Septa in the maxillary sinus give a compartmentalized appearance to the sinus.

Fig. 17-2 Maxillary sinus showing septa that divide it into separate compartments.

Fig. 17-3 Pneumatization of the sinus. Pneumatization is the enlargement of a sinus by resorption of alveolar bone that formerly served to support a missing tooth or teeth and then occupies the edentulous space. A thin cortex remains over the alveolar ridge (arrow) to maintain a normal contour.

Fig. 17-4 Pneumatization of the sinus. Extension of the maxillary sinus into the tuberosity as a result of pneumatization.

MAXILLARY SINUSITIS

Maxillary sinusitis (inflammation of maxillary sinus) may or may not be of dental source. The dental source of maxillary sinusitis may be periapical infection, periodontal disease, or perforation of the antral floor and antral mucosa at the time of dental extraction. Roots and foreign objects forced into the maxillary sinus at the time of operation may also be the causative factors of sinusitis. The non-dental source of maxillary sinusitis may be allergic conditions, chemical irritation, or facial trauma (fracture involving a wall or walls of the maxillary sinus). The spectrum of radiographic appearances that may result from maxillary sinusitis are opacification (cloudiness) of the sinus, mucosal thickening (hyperplastic mucosa), and presence of a fluid level.

Under normal circumstances, the maxillary sinus communicates with the nasal cavity through the ostium. In sinusitis, the ostium may be blocked by a swelling of the nasal mucosa, thus causing pain and difficulty in discharging inflammatory fluid from the maxillary sinus. Maxillary sinusitis is a common complication of a nasal cold. After a few days, there is a discharge of yellowish mucopus or frank pus which may be blood stained. The patient may complain of a sense of fullness over the cheek, especially on bending forward. Other complaints in maxillary sinusitis may include headache, facial pain and tenderness to pressure. The pain may also be referred to the premolar and molar teeth which may be sensitive or painful to percussion.

Fig. 17-5 Maxillary sinusitis caused by apical infection and extensive periodontal lesions involving the molars and premolar. Notice the cloudiness (radiopacity) of the sinus (s).

Fig. 17-6 Maxillary sinusitis caused by an apical inflammatory lesion (probably, a granuloma) at the root apices of the second molar. Notice the cloudiness (radiopacity) of the sinus.

Fig. 17-7 Apical infection associated with the first molar. A thickened sinus mucosa (arrow) surrounds the lesion in response to the apical infection.

Fig. 17-8 Hyperplastic mucosa. Thickened sinus mucosa (swollen mucoperiosteum). The various causes of a hyperplastic mucosa are: infection (periapical, periodontal, perforation of antral floor and mucosa), allergy, chemical irritation, foreign body and facial trauma.

Fig. 17-9 Hyperplastic mucosa. Thickened sinus mucosa.

Fig. 17-10 Waters' view demonstrating thickened sinus mucosa (hyperplastic mucosa) of all the walls of the right maxillary sinus. The various causes are: infection (periapical, periodontal, perforation of the antral floor and mucosa), allergy, chemical irritation, foreign body, and facial trauma.

Fig. 17-11 Maxillary sinusitis. Waters' view shows the radiopacity (fluid) in the involved sinus and radiolucency in the normal sinus. The unaffected sinus has the same radiolucency as the orbits. The radiopacity in the affected sinus is caused by the presence of fluid in the sinus. The most common causes of fluid in a sinus are pus caused by infection, and blood resulting from trauma (fractures).

Fig. 17-12 Maxillary sinusitis exhibiting a fluid level (arrow) in the right antrum.

MUCOUS RETENTION CYST

The mucous retention cyst of the antrum represents an inflammatory lesion with mucous extravasation into the submucosa of the antrum. It emanates from the antral floor as a smooth-surfaced dome-shaped elevation.

Refer to chapter "Cysts of the Jaws" for details on mucous retention cyst.

Fig. 17-13 Mucous retention cyst (antral retention cyst) seen as a dome-shaped lesion on the floor of the sinus. It is usually asymptomatic but may sometimes cause some pain and tenderness in the teeth and face over the sinus. In some cases the cyst disappears spontaneously due to rupture as a result of abrupt pressure changes from sneezing or "blowing" of the nose. Later on, the cyst may reappear after a few days.

Fig. 17-14 Mucous retention cyst producing a dome-shaped soft tissue radiopacity emanating from the floor of the maxillary sinus. The cyst may disappear spontaneously due to rupture and may reappear after a few days.

FOREIGN OBJECTS IN SINUS

A root of a tooth that remains after extraction may be accidentally pushed into the maxillary sinus by a clinician. The root tip acts as a nidus for calcific deposits and may form a calcified mass or stone (antrolith). A root tip in the sinus cavity does not have a surrounding lamina dura and it may change its position in the sinus with changes in head tilt. If a root tip is situated between the antral mucosa and the floor of the maxillary sinus, it does not change its position with changes in head tilt. This location of the root below the antral mucosa is not conducive for calcific deposits.

An antrolith is a stone produced by the calcification of a nidus, which may be a root tip, blood clot, mucus, foreign body such as a fruit pit or a gauze. An antrolith is asymptomatic and found incidentally on radiographic examination. The shapes of antroliths vary from round to very irregular.

Fig. 17-15 A root tip of the maxillary first molar was accidentally pushed into the sinus at the time of tooth extraction. The root tip is asymptomatic and has been present for many years. A root tip in the sinus does not have a lamina dura around it.

Fig. 17-16 Root tip of the extracted first molar accidentally pushed into the sinus. The root tip may change its position in the sinus with changes in patient's head position. It will not change its position when it is trapped between the mucosa and the floor of the sinus.

Fig. 17-17 Antrolith (stone) in the maxillary sinus. Antroliths are calcified masses found in the maxillary sinus. They are formed by deposition of calcific material on a nidus such as a root fragment, bone chip, foreign object, or a mass of stagnant mucus in sites of previous inflammation.

Fig. 17-18 Antrolith in the maxillary sinus.

Fig. 17-19 Antrolith in the maxillary sinus.

Fig. 17-20 Dental cement material inadvertently pushed into the sinus during endodontic treatment of the first molar before it was extracted. The peculiar radiopacity of the dental cement distinguishes it from an antrolith.

Fig. 17-21 Tooth in the maxillary sinus. Sometimes a tooth in the maxillary sinus may be associated with an odontogenic cyst in the sinus. (Courtesy, Dr. A. Acevedo)

Fig. 17-22 A supernumerary microdont in the maxillary sinus.

ORO-ANTRAL FISTULA

An oro-antral fistula is formed by a break in the floor of the maxillary sinus producing a communication between the maxillary sinus and the oral cavity. Thus, the oral cavity indirectly communicates with the nasal cavity via the oro-antral fistula and the ostium of the maxillary sinus. An oro-antral fistula usually arises subsequent to tooth extraction, usually in the maxillary premolar and molar regions. The clinician often becomes aware of the opening in the sinus floor during the surgical procedure. Sometimes the communication may develop a few days after the procedure. The patient frequently complains of regurgitation of food through the nose while eating and may be aware of air entering the mouth through the nose during eating and smoking. In some patients the communication between the sinus and oral cavity may remain patent and still be devoid of erythema and purulent discharge. In other patients, the inflammation in the antral cavity may discharge an exudate through the unobstructed oro-antral fistula. Sinus infection may also produce postnasal drip. In some cases the oro-antral fistula may eventually be blocked by a hyperplastic growth of the sinus mucosa or by an antral polyp herniating through the fistula.

Fig. 17-23 Oro-antral fistula formed by a break in the floor of the maxillary sinus between the premolar and molar. It is a pathologic tract that connects the oral cavity to the maxillary sinus. The patient complained of regurgitation of food through the nose while eating. The patient also felt air entering his mouth during eating and smoking. Sinus infection may result in postnasal drip.

Fig. 17-24 Oro-antral fistula at the site of the extracted second premolar and first molar.
Patient had the usual complaint of regurgitation of food through the nose.

Fig. 17-25 Oro-antral fistula at the site of the extracted first molar and second premolar.
The mucosa of the sinus has proliferated over the fistula (arrows).

CYSTS, ODONTOGENIC AND NONODONTOGENIC

Any cyst of the maxilla, odontogenic and nonodontogenic, may slowly expand and grow into the maxillary sinus. The two most common cysts to involve the sinus are the radicular and the dentigerous cysts. A radicular cyst or a granuloma may elevate the sinus floor and produce a round shape with a thin radiopaque border, separating it from the sinus. In such cases, a radicular cyst is likely to produce an oro-antral fistula after extraction of the associated tooth. A dentigerous cyst, although fairly uncommon in the maxilla, may arise in association with a maxillary third molar tooth malposed in the maxillary sinus.

Fig. 17-26 Waters' view showing a dentigerous cyst in the maxillary right sinus. A careful examination of the radiograph shows a tooth in the sinus. Any odontogenic cyst (primordial, dentigerous, radicular, or keratocyst) can encroach upon the sinus. (Courtesy, Dr. A. Acevedo)

Fig. 17-27 A radicular cyst at the apices of the first molar and extending into the maxillary sinus.

GENETIC, METABOLIC AND TUMOR-LIKE DISEASES

Some of the genetic, metabolic and tumor-like diseases that may commonly involve the maxillary sinus are osteopetrosis, Paget's disease, fibrous dysplasia, leontiasis ossea, and giant cell granuloma.

Fig. 17-28 Osteopetrosis showing excessive bone accumulation in the paranasal sinuses. All the paranasal sinuses are radiopaque.

Fig. 17-29 Paget's disease showing abnormal bone which usually does not penetrate but encircles the sinus. Notice the cotton-wool appearance of the skull.

Fig. 17-30 Fibrous dysplasia has encroached upon and obliterated most of the sinus cavity. The lesion has a "ground glass" appearance.

TUMORS

Some of the tumors that may commonly involve the maxillary sinus are squamous cell carcinoma, osteoma, ameloblastoma, cemento-ossifying fibroma, odontogenic myxoma, odontoma, and osteogenic sarcoma.

Fig. 17-31 Osteoma in the floor of the maxillary sinus may be misdiagnosed for a mucous retention cyst. Notice the distinguishing presence of the trabeculae in the lesion. Osteoma is the most common of the benign nonodontogenic tumors in the paranasal sinuses.

Fig. 17-32 Osteoma in the floor of the maxillary sinus.

Fig. 17-33 Ameloblastoma of the left maxillary sinus. The patient had pain, swelling, blurred vision and blockage of nose. Ameloblastoma is the most common benign odontogenic tumor affecting the paranasal sinuses.

Fig. 17-34 Ameloblastic fibro-odontoma in the left maxillary sinus in a 12 year old patient. There are radiopacities in the radiolucency associated with the displaced maxillary molar.

Fig. 17-35 Waters' view showing a cementifying fibroma (ossifying fibroma) occluding, and producing expansion of the whole left maxillary sinus. A similar appearance may sometimes be seen in fibrous dysplasia.

Fig. 17-36 Odontogenic myxoma in the right maxillary sinus.

Fig. 17-37 Squamous cell carcinoma in the right maxillary sinus producing destruction of the sinus floor and walls. Clinically the lesion extended into the oral soft tissues. Squamous cell carcinoma is the most common malignant tumor of the paranasal sinuses.

Fig. 17-38 Squamous cell carcinoma of the left maxillary sinus as seen on a Waters' projection. Notice the destruction (disappearance) of the walls and floor of the sinus.

Fig. 17-39 Osteosarcoma showing expansion of the left maxillary sinus. A squamous cell carcinoma could also give a similar radiographic appearance and expansion. Notice the destruction (disappearance) of the walls and floor of the sinus.