

# Chapter-17

## **SURGICAL ANATOMY OF PARANASAL SINUSES AND THEIR CLINICAL IMPLICATIONS**

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## **ABSTRACT**

*The achievement of treatment depends on enough knowledge of the normal and abnormal anatomy of the paranasal sinuses, which is variable. It is key to identify the clinical and surgical matter of these variations. This article aims to describe the anatomy with common terminologies. Sure, infection and anatomic variations are determinants for the occurrence of sinus diseases.*

**Keywords:** Sinusitis, nasal polyps, Deviated septum

## **1. INTRODUCTION**

The system of hollow spaces in the bone processes of the face around the nose in the skull are called sinuses and these hollow spaces are called paranasal sinuses. There are four groups of paranasal sinuses called in accordance with the bone name at which point they are situated: - the maxillary, ethmoid, frontal, and sphenoid sinuses. The sinuses reduce the weight of the facial bones and skull while ensuring the strength as well as shape of the bones. The air-filled spaces of nose and sinuses also increase reverberation of voice (David M. et al 2022). providing a safeguard against facial trauma, protecting sensitive structures in the nose from rapid temperature fluctuations, protect the nose from dryness to produce mucus, humidifying and warming stimulated air (Zachary J. et al 2023). Before discussing the inflammation in these sinuses and its causes, the anatomy of these sinuses is important and must.

## **2. MAXILLARY SINUSES**

The maxillary sinus is an airy cavity situated in the maxillary bone. It is pyramidal organized, with a base looking to the nasal cavity, anterior, posterior walls, and a lateral blunt tip that extends into the zygomatic process of the maxillary bone. The size of the maxillary sinus at the adult stage is nearly 15 mL, making it excellent paranasal sinus.

The anterior wall complements to the facial surface of the maxillary bone, with three openly recognized landmarks, the canine fossa and the infraorbital foramen and groove. The infraorbital foramen is situated at 5 to 8 mm below the middle of inferior border of the orbit. The posterior wall equates to the maxillary swollen object, that shapes the anterior surface of the pterygo-palatine fossa. The posterior wall is in close relationship accompanying the capacities of the pterygopalatine fossa, including the pterygopalatine center of activity and different branches of the maxillary artery, vein and nerve. Tumors and infection of maxillary sinus and oral cavity can increase to the pterygopalatine fossa and affect these essential structures. The superior wall, as known

or named at another time or place the sinus roof, is made for one orbit floor. The infraorbital artery (branch of the maxillary artery) and nerve (branch of the maxillary estrangement of the trigeminal nerve) use up this wall and come in the infraorbital groove. The medial wall divides the maxillary sinus from the nasal cavity, but they communicate during the whole of the ostium, placed in the medial wall inferior or at the unchanging level of the orbit floor (Whyte, A., et al 2019). The inferior wall, popular as the sinus floor, is in close relation with the posterior teeth apices, from what or which place it is divided only by a coating of compact bone. The mean distance between the dental apices and the sinus floor is 1.97 mm, and the apices of the molars are closer to the sinus floor than the premolars (Eberhardt, et al 1992). The first molars have been starting to perforate the sinus floor in 2.2% of cases, and the second molars in 2% of cases. The Bucco distal root of the second molar is the nearest to the maxillary sinus floor (Iwanaga, J et al 2019). The maxillary sinuses repeatedly present septa, that are thin plates of cortical bone emergent from the sinus floor, better visualized on cone-beam CT scans. Primary septa appear all the while the development of the sinus, inasmuch as secondary septa arise following in position or time tooth loss (Krennmair, G. et al 1999). Apart from septa, tooth deficit causes a local lowering of the sinus floor and alveolar bone physical resistance (Whyte, A., et al 2019). Mucus producing ciliated pseudostratified columnar epithelium lines the maxillary sinus, that lacks periosteum. The cilia have the heavy task of draining the mucous into the ostium (situated superiorly in the medial wall), and they are large in numbers near the ostium (Iwanaga, J et al 2019).

### **3. ETHMOID SINUSES**

The composition of ethmoid sinus is large numbers of individual cells, divided into anterior and posterior compartments apiece basal lamella of the middle turbinate. The lateral borderline of the ethmoid is the medial wall as lamina papyracea of the orbit. The medial line is made by the middle turbinate in the anterior ethmoid and for one superior turbinate in the posterior ethmoid. The posterior border is the face of the sphenoid sinus. Superiorly, the ethmoid roof separates the ethmoid sinus from the intracranial cavity. Superomedially the ethmoid roof thins significantly in the field of the cribriform plate, by which olfactory filae come in the cranial cavity.

### **4. FRONTAL SINUSES**

The frontal sinus is made by an outgrowth of the ethmoid labyrinth that pneumatizes superiorly into the frontal bone. The drainage concerning this sinus happens at its inferior and medial magnitude. The frontal sinus outflow tract starts at

the frontal infundibulum, and before descends through the frontal ostium to the middle meatus via the frontal recess. The edges of the frontal recess are the lamina papyracea laterally, the middle turbinate middle from two points, the posterosuperior wall of the agger nasi anteriorly, and the ethmoid bulla posteriorly. The agger nasi, that means “nasal eminence,” is the portion of the lateral nasal wall situated just anterior to the middle turbinate insertion. (media lecture Mustansiriyah University 2016).

## 5. SPHENOID SINUSES

The sphenoid sinus is situated in the middle and posteriorly inside the frame of the sphenoid bone, and it is posteriorly and superiorly bounded by the sella turcica. Sphenoid sinus, present only in human beings and primates, maybe recognized in radiographs from the age of two. It keeps forming during the whole of life but matures in amount at about 12 to 14 age grown-ups. The common adult size is 0.5 to 8 ml. Several main structures have a close relation to the sphenoid sinus, containing the internal carotid artery and the optic nerve. The carotid artery is situated next to the lateral wall of the sinus, and in 25% of patients, it is unfastened or in general area. The optic nerve leaves an anteroposterior division on the roof of the sphenoid, and the overlying bone maybe dehiscent in nearby 4% of individuals. The sphenoid sinus is more adjacent to the cavernous sinus and hypophysial gland. The patterns of the sphenoidal sinus pneumatization were classified into conchal, pre-sellar, and sellar, depending on the continuation of pneumatization having to do with the sella turcica. But, Štokovic and others. additional a *split into* four equal parts type- post sellar. The sphenoid ostium drains into the sphenothmoidal recess situated inside the superior meatus (Zachary J. et al 2023).

## 6. SINUSITIS

Sinusitis is inflammation of the paranasal sinuses due to viral, bacterial, or fungal infections or allergic reactions. Symptoms include nasal obstruction and blockage, decaying rhinorrhea, and facial pain or pressure; occasionally malaise, headache, and/or fever are present (Marvin P. Fried ,2023).

## 7. NASAL POLYP

Nasal polyp is one cause of all causes of sinusitis. Nasal polyps are smooth, jelly-like overgrowths of the interlining of the sinuses. At the end of the *stalk, they* look like grapes. They appear in around one in 200 people, mainly by 40 years of age.

## **8. DEVIATED NASAL SEPTUM**

The medial wall of the nose divides the nose into two equal parts, some part of this wall is bony and some part cartilaginous. This medial wall is called nasal septum. When the nasal septum becomes crooked then this condition is called deviated nasal septum. Deviation of nasal septum is liable for various anatomical, physiological and pathological changes in the nose.

## **9. CLINICAL IMPLICATION**

Paranasal sinuses are compulsive inflammation and infection. The mucus drainage is stopped when the paranasal sinuses turn into obstructed from secretions or a mass, generating sinusitis. Depending on the cause, sinusitis is treated accompanying corticosteroids, decongestants, nasal irrigation, steam inhalation and hydration. Not often surgical invasion is necessary to enhance drainage. Malignancies of the paranasal sinuses are rare. The most of cancers happen in the maxillary sinus and are more ordinary in men than girls. Maxillary sinus malignancies happen middle from two points 45 to 70 ages, and ultimate frequent is a sarcoma. However, metastases are rare, these malignancies are locally invasive and hurtful. Diagnosis in most cases is postponed, and the prognosis is weak. Acute sinusitis and chronic sinusitis are symptomatic inflammation of the nose and paranasal sinuses. There are two important established the duration of the illnesses. Generally speaking, acute sinusitis is widely thought-out expected an infectious disorder. On the other hand, chronic sinusitis is usually defined as an inflammatory disorder. In acute sinusitis, the fundamental etiology is ordinarily viral or bacterial and occasionally fungal. Its pathogenesis includes contamination followed by tissue invasion. The most widely authorized classification system divides chronic sinusitis into chronic sinusitis accompanying and without nasal polyps based on nasal endoscopy (Stevens WW, et al2016). Initially, it was trusted that chronic sinusitis of nasal polyps was a disease process based on continuous inflammation resulting in an incomplete resolution of acute sinusitis. In another way, chronic sinusitis with nasal polyps was thought expected a noninfectious disease process accompanying unclear etiology, possibly had connection with allergic sinusitis. Instead, present research has revealed that the etiology and pathogenesis of either form of chronic sinusitis are much more complex (Zachary J. et al 2023).

## **10. CONCLUSION**

Paranasal sinuses are understanding to have various roles: less the respective weight of the skull, enhancing voice reverberation, providing a safeguard against facial

trauma, saving the nose from accelerated temperature fluctuations, protecting sensitive structures, and air caused humidification and warming.

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