

Case Report: Dextra Maxillary Sinusitis with Bilateral Concha Hypertrophy

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ABSTRACT

KEYWORDS

Maxillary sinusitis;
Functional endoscopic
sinus surgery; Turbinate
hypertrophy

Maxillary sinusitis is a common inflammatory condition of the paranasal sinuses, often exacerbated by anatomical variations and dental pathology. This case report examines a case of right maxillary sinusitis with bilateral concha hypertrophy in an adolescent, highlighting the diagnostic and therapeutic challenges. This study aims to present the clinical presentation, diagnostic workup, and comprehensive management of a 15-year-old female with unilateral maxillary sinusitis suspected to have a dentogenic origin, complicated by bilateral concha hypertrophy. A qualitative descriptive case study methodology was employed. Data were collected through patient history, physical examination, nasoendoscopy, and paranasal sinus CT scan. The patient was managed with Functional Endoscopic Sinus Surgery (FESS) combined with adjunctive pharmacotherapy (azithromycin, ambroxol, ibuprofen, decongestant) and lifestyle counseling. Clinical and CT findings confirmed right maxillary sinusitis with mucosal thickening and bilateral concha hypertrophy. FESS, aimed at restoring sinus drainage and mucociliary function, alongside medical therapy, led to successful management. The case underscores the role of anatomical and odontogenic factors in sinusitis. This report emphasizes the importance of a combined surgical and medical approach for effective treatment. It also highlights the need for thorough evaluation to identify predisposing anatomical and dental factors to prevent chronicity and complications in adolescent sinusitis.

INTRODUCTION

Sinusitis is defined as inflammation of the mucosa of the paranasal sinuses. The main cause is the flu (common cold), which is a viral infection that can be further followed by a bacterial infection (Johnson & Parham, 2015). Some of the etiological and predisposing factors include ISPA due to viruses, various rhinitis, especially allergic rhinitis, hormonal rhinitis in pregnant women, nasal polyps, anatomical abnormalities such as septal deviation or concha hypertrophy, ostio-meatal complex (KOM) blockage, tonsil infections, dental infections, immunological abnormalities, ciliary dyskinesia as in Kartagen syndrome, and abroad cystic fibrosis disease.

Specific data on the epidemiology of sinusitis in Indonesia are not yet available. However, the prevalence of chronic rhinosinusitis globally ranges from 5% to 12% (Poluan & Marlina, 2021). In Indonesia, sinusitis cases are most likely included in the category of Acute Respiratory Infections (ARI), whose prevalence is around 9.3% based on the 2018 Riskesdas through the Ministry of Health's LMS. Acute bacterial sinusitis occurs in about 8% of pediatric ARI, with higher incidence rates in rainy and humid seasons.

Children of all ages tend mainly to experience viral infections or allergies of the upper respiratory tract (DeMuri et al., 2016). Prevalent sequelae of these conditions include mucosal edema and loss of cilia in viral infections, causing sinus ostia occlusion (Vozel, 2025). Once the ostium is closed, the air in the sinuses is absorbed and replaced by an ephrite that is easily secondarily infected by bacteria. Mechanical factors such as adenoid hypertrophy, foreign bodies,

atresia koana, and stenosis can significantly affect the physiology of the airway that is bubbling and secretory dams (Class III & Class, 2023). In addition, bacterial infections in childhood sinusitis differ slightly from adults; the main difference is *H. influenzae* is more commonly found in sinusitis in children of all ages (Hu et al., 2021).

Sinusitis symptoms in children seem to be less affected by pain and tenderness than in adults (Leung, Hon, & Chu, 2020). Symptoms of persistent mucopurulent nasal secretion should raise the doctor's awareness of the possibility of sinusitis (Davraj et al., 2021). Recurrent or persistent laryngitis and chronic cough, especially at night, are the main complaints in pediatric sinusitis. Complications of sinusitis, especially cellulitis of the face and orbit, are more common in children than adults and arise more quickly. Due to the close anatomical location, similar histological layers, and drainage of the sinuses into the nasopharynx, otitis media can also accompany sinus disease in childhood. Thus, both the sinuses and middle ear need to be examined in children with symptoms in both areas.

The principle of therapy of acute sinusitis in childhood is antibiotics such as amoxicillin, ampicillin, or erythromycin plus sulfonamide, with alternatives including amoxicillin/clavulanate, cefaclor, cefuroxime, and trimethoprim plus sulfonamide. Surgical drainage is only performed when there are complications or infections that cannot be cured (Mujagic et al., 2019). The importance of adequate therapy for sinusitis in children should not be underestimated. Failure to adequately treat can result in chronic sinusitis and complications of the lower respiratory tract. In this paper, it is reported that cases of acute maxillary sinusitis et causa suspected dentogen in 15-year-old children were treated with functional endoscopic sinus surgery.

Previous research, such as the systematic review by Papadopoulou et al. (2022), has extensively documented how anatomical variations in the sinonasal region, including concha bullosa and septal deviations, critically impact osteomeatal complex patency and predispose individuals to sinusitis. Concurrently, studies have established that odontogenic factors are responsible for approximately 10% of maxillary sinusitis cases, as the thin bone separating the dental roots from the sinus floor facilitates the spread of infection (Martu, Martu, Maftai, Diaconu-Popa, & Radulescu, 2022). These foundational studies have largely shaped the current understanding of the multifactorial etiology of sinusitis.

Despite this established knowledge, a significant research gap exists in the detailed reporting and management of cases where these etiological factors converge, particularly in adolescent populations (Cha et al., 2018). The existing literature often addresses anatomical variations and dental causes in isolation, with fewer comprehensive case studies exploring the synergistic effect of bilateral concha hypertrophy and a suspected dentogenic focus in a single presentation (Melsen & Athanasiou, 2024). This gap is critical because the co-occurrence of multiple predisposing factors can complicate the clinical picture, potentially leading to diagnostic delays, inadequate treatment, and an increased risk of chronicity or complications such as orbital cellulitis, as highlighted in older surgical texts like Adams & Boies.

The urgency of addressing this gap is underscored by the substantial morbidity associated with poorly managed sinusitis, including chronic facial pain, persistent cough, and impaired

quality of life (Rădeanu, Bronescu, Stan, Palade, & Maniu, 2025). In the context of Indonesia, where specific epidemiological data on sinusitis is limited but Acute Respiratory Infections (ARI) are prevalent, optimizing diagnostic and therapeutic strategies is a public health priority. This is especially pressing for younger patients, in whom sinusitis can present with atypical symptoms and in whom complications like orbital cellulitis are more common than in adults (Velayudhan, Chaudhry, Smoker, Shinder, & Reede, 2017). Effective management in this demographic is crucial to prevent long-term sequelae and the development of difficult-to-treat chronic conditions (Saglani, Fitzpatrick, Papadopoulos, Reznik, & Stokes, 2025).

The novelty of this research lies in its detailed, multi-modal analysis of a complex pediatric case, integrating clinical examination, endoscopic findings, and CT imaging to delineate the interplay between bilateral concha hypertrophy and a suspected dentogenic source. By employing Functional Endoscopic Sinus Surgery (FESS) as a primary intervention, this case demonstrates a modern, function-preserving surgical approach that has largely replaced more radical techniques like the Caldwell-Luc procedure (Reinert, 2023). This report provides a contemporary template for managing complex sinusitis in a resource-limited setting, emphasizing a targeted approach that addresses all contributing factors simultaneously (Huang, 2021).

The primary purpose of this case report is to elucidate the diagnostic pathway and successful integrated management strategy for a case of dextra maxillary sinusitis with bilateral concha hypertrophy in an adolescent (Furculița, 2023). It aims to highlight the critical importance of a thorough evaluation that considers both anatomical and dental etiologies (Liebgott, 2023). The ultimate benefit of this research is to provide clinicians, particularly in similar clinical settings, with a structured framework for managing complex sinusitis, thereby improving patient outcomes through timely diagnosis, appropriate intervention, and patient education, ultimately reducing the risk of recurrence and chronic disease.

METHOD

Based on the case report Dextra Maxillary Sinusitis with Bilateral Concha Hypertrophy, the research methodology was a qualitative descriptive case study. This approach provided a detailed and contextualized analysis of a single clinical case to explore the presentation, diagnosis, and management of the condition. The data population included patients presenting with symptoms suggestive of sinusitis, while the sample focused on one 15-year-old female patient diagnosed with right maxillary sinusitis and bilateral concha hypertrophy. Purposive sampling was used, selecting the case based on specific clinical features relevant for in-depth examination, particularly the combination of sinusitis with dental and anatomical contributing factors.

The research instruments involved clinical and diagnostic tools to ensure comprehensive data collection. These included patient history-taking, physical examinations (anterior and posterior rhinoscopy), nasoendoscopy, and paranasal sinus CT scans. Surgical and pharmacological interventions—such as Functional Endoscopic Sinus Surgery (FESS) and prescribed medications—were part of the clinical management and data documentation.

Data analysis employed a thematic and descriptive approach. Clinical findings, imaging results, and treatment outcomes were interpreted to identify key themes related to etiology,

diagnostic criteria, and treatment efficacy. This method allowed a holistic understanding of the case, emphasizing the interaction between anatomical variations and clinical management in sinusitis.

RESULT AND DISCUSSION

CASE STUDY

Patient Identity and Anamnesis

The patient named Mrs. N. N, is 15 years old, female, Muslim, student status, and unmarried. The patient is domiciled in Cilegon and has BPJS health insurance. The examination was carried out on June 4, 2024 at the ENT Polyclinic of Cilegon Hospital. Autoanamnesis was carried out at 10.00 WIB, with the main complaint in the form of foul-smelling snot discharge from the nose that had not improved since 11 weeks before the examination. These complaints are accompanied by nasal pain, headache, tightness, and nausea. Patients also reported a thick clear snot that flowed down the throat, accompanied by symptoms of cough, runny nose, nasal congestion, fatigue, and fever disappeared. Headaches feel throbbing and heavy when bowing, prostrating, or bending. The patient had a history of atopic dermatitis and pulmonary TB that had been completed with OAT for 6 months, and had no history of drug allergies, diabetes, asthma, or heart disease. Family history shows the patient's mother has hypertension and heart disease.

Physical Examination, Diagnosis, and Management

On physical examination, the patient appeared to be mildly ill with composing consciousness. Vital signs showed blood pressure of 100/60 mmHg, pulse of 98x/min, breathing of 20x/min, temperature of 36.5°C, and SpO₂ of 98%. Generalist status within normal limits, unless pressure is found in the maxillary sinuses dextra. Anterior rhinoscopy results showed hypertrophy and hyperemia in the bilateral rice concha with mucopurullene secretion in both mediated rice meatus, while posterior rhinoscopy showed post nasal drip (+) as well as caries in the upper right molar tooth.

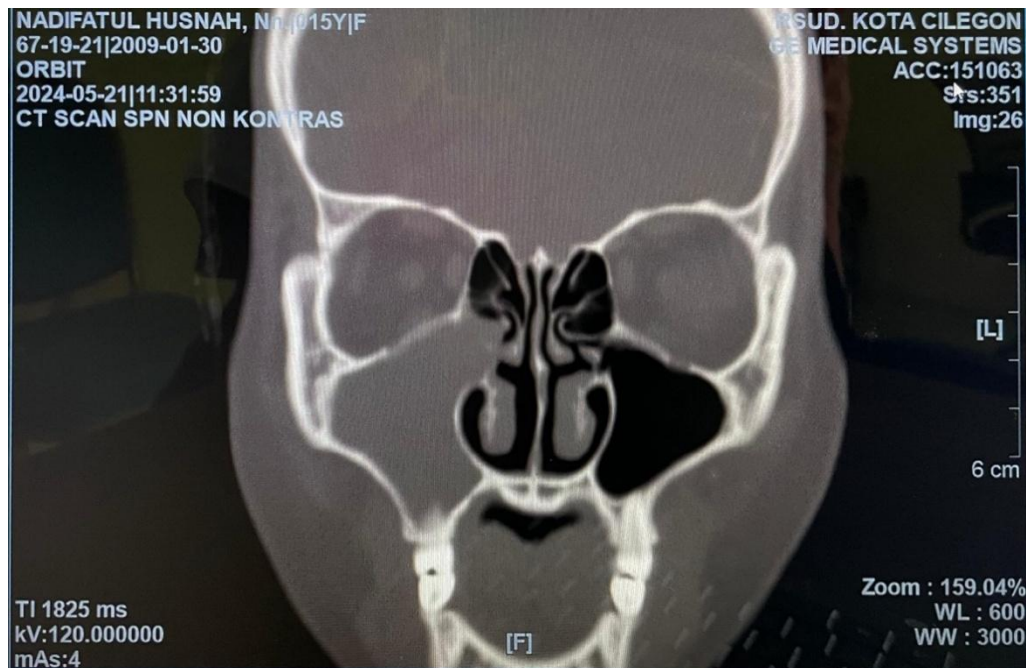


Figure 1. CT-Scan

CT-Scan results showed hypodentic lesions with thickening of the maxillary dextra sinus wall and thickened bilateral concha. The working diagnosis was established as Dextra Maximilar Sinusitis with Bilateral Concha Hypertrophy, with a comparative diagnosis of Allergic Rhinitis and Vasomotor Rhinitis. Management includes operative Functional Endoscopic Sinus Surgery (FESS) and medicated therapy in the form of Azithromycin 500 mg, Tremenza, Ambroxol 30 mg, and Ibuprofen 400 mg. Patients are also educated to get enough rest, sleep with their heads elevated, and avoid cigarette smoke, cold air, and extreme heat.

Discussions

Anatomy of the maxsila sinus

The paranasal sinuses are one of the organs of the human body that is difficult to describe because the shape varies greatly from person to individual. There are four pairs of paranasal sinuses, starting from the largest ones, namely the maxillary sinuses, frontal sinuses, ethmoid sinuses, and right and left sphenoid sinuses. The paranasal sinuses are the result of pneumatization of the bones of the head, so that cavities are formed in the bones. All sinuses have an estuary (ostium) into the nasal cavity.

Embryologically, the paranasal sinus originates from the invagination of the mucosa of the nasal cavity and its development begins in the fetus at 3-4 months of age, with the exception of the sphenoid sinuses and frontal sinuses. The maxillary sinus and ethmoid sinuses are already present when the baby is born, while the frontal sinus develops from the anterior ethmoid sinus in children who are approximately 8 years old. Pneumatization of the sphenoid sinuses begins at the age of 8-10 years and originates in the postero-superior part of the nasal cavity. These sinuses generally reach maximum size at the age of between 15-18 years.

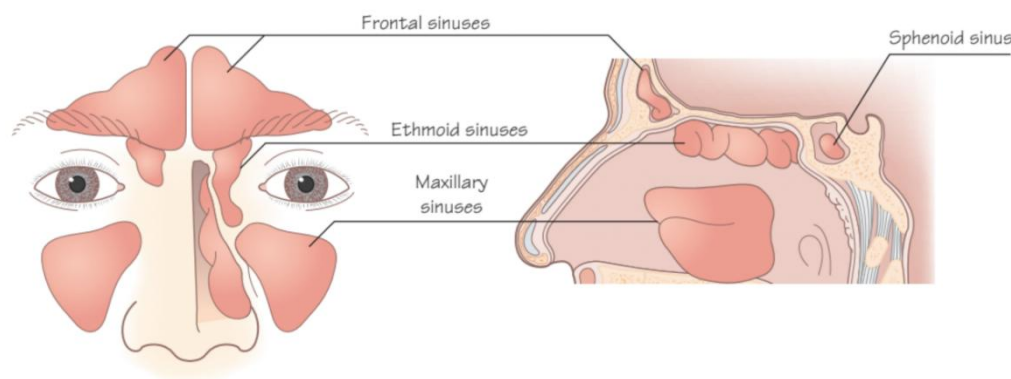


Figure 2. Sinus Paranasal

The maxillary sinuses are the largest paranasal sinuses. At birth, the maxillary sinus has a volume of 6-8 ml, the sinuses then develop rapidly and the maxillary sinus reaches its maximum size, which is 15 ml in adulthood. The maxillary sinuses are pyramid-shaped. The anterior wall of the sinuses is the facial surface of the maxillary os called the canine fossa, its posterior wall is the infra-temporal surface of the maxilla, its medial wall is the lateral wall of the nasal cavity, its superior wall is the base of the orbit and its inferior wall is the alveolar and palatal processes. The maxillary sinus ostium is next to the superior medial wall of the sinus and empties into the semilunar hiatus through the ethmoid infundibulum.

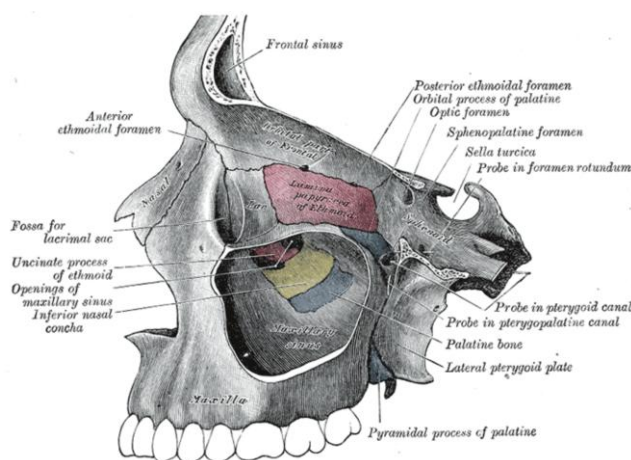


Figure 3. Anatomy of Maksila Sinus

In terms of clinicality, the anatomical needs to be considered from the anatomy of the maxillary sinus are 1) the base of the maxillary sinus is very close to the root of the upper jaw teeth, namely the premolar (P1 and P2), molar (M1 and M2), sometimes also the canine teeth (C) and the molar teeth M3, even the roots of these teeth can protrude into the sinuses, so that the gum tooth infection easily rises upwards causing sinusitis; 2) Maxillary sinusitis can cause orbital complications; 3) The maxillary sinus ostium is located higher than the bottom of the sinuses, so the drainage only depends on the movement of the cilia, after all, the drainage must also go through a narrow infundibulum. The Infundibulum is part of the anterior ethmoid sinus and inflammation

or allergy swelling in this area can block the drainage of the maxillary sinuses and further lead to sinusitis.

Functions of the paranasal sinuses

Some of the theories put forward as the function of the paranasal sinuses include:

1. As an *air conditioning* regulator: The sinuses serve as an additional chamber to heat and regulate the humidity of the inspired air. The objection to this theory is that there is no definitive exchange of air between the sinuses and the nasal cavity. The volume of air exchange in sinus ventilation is approximately 1/1000 of the volume of the sinuses at each breath, so it takes several hours for the total air exchange in the sinuses. Moreover, the sinus mucosa does not have vascularization and glands as large as the nasal mucosa.
2. As thermal *insulators*: The paranasal sinuses function as a buffer, protecting the orbit and cerebral fosa from fluctuating nasal cavity temperatures. However, the reality is that the large sinuses are not located between the nose and the protected organs.
3. Helps with head balance: The sinuses help with head balance as it reduces the weight of the facial bones. However, if the air in the sinuses were replaced by bones, it would only provide a weight gain of 1% of the weight of the head, so this theory is considered meaningless.
4. Helps with sound resonance: The sinuses may serve as cavities for sound resonance and affect sound quality. However, some argue that the position of the sinuses and ostiums does not allow the sinuses to function as effective resonators. After all, there was no correlation between sound resonance and sinus size in low-level animals.
5. As a damping change in air pressure: This function works when there is a large and sudden change in pressure, for example when sneezing or snorting.
6. Helps mucus production: The mucus produced by the paranasal sinuses is small compared to the mucus from the nasal cavity, but it is effective in cleaning the particles that enter with inspired air because this mucus comes out of the meatus medius, the most strategic place.

Definition of Sinusitis

Sinusitis is defined as inflammation of the mucosa of the paranasal sinuses. It is generally accompanied or triggered by rhinitis so it is often called rhinosinusitis. The main cause is the flu (*common cold*) which is a viral infection, which can be further followed by a bacterial infection. When it hits several sinuses, it is called multisinusitis, while when it hits all paranasal sinuses, it is called pansinusitis. The maxillary sinus is also called the Highmore antum and is located near the root of the upper jaw teeth, so dental infections easily spread to the sinuses, called dentogenic sinusitis.

Etiology and Risk Factors

Some of the etiological and predisposing factors include ISPA due to viruses, various rhinitis, especially allergic rhinitis, hormonal rhinitis in pregnant women, nasal polyps, anatomical abnormalities such as septal deviation or concha hypertrophy, ostio-meatal complex (KOM) blockage, tonsil infections, dental infections, immunological abnormalities, cilia dyskinesia as in Kartagen syndrome, and abroad cystic fibrosis disease. In children, adenoid hypertrophy is an important factor in causing sinusitis so it is necessary to perform an adenoidectomy to remove the blockage and cure the rhinosinusitis. Adenoid hypertrophy can be diagnosed with a plain photograph of the neck lateral position. Other factors that also affect the polluted environment, cold and dry air and smoking habits. This condition over time causes changes in the mucosa and damages the cilia.

Chronic maxillary sinusitis is maxillary sinusitis that has caused histological changes in the maxillary sinus mucosa, namely fibrosis and metaplasia of squamosa. The presence of certain anatomical variations is suspected to affect osteomatal complex patency (KOM) which can cause chronic maxillary rhinosinusitis. The patency of the KOM is determined by the width of the maxillary sinus ostium, processus uncinatus, ethmoid bulla, konka media, and the width of the mediated meatus. These specific anatomical variations are haller cells (infraorbital cells), enlargement/widening of the ethmoidalis bulus, the process of uncinatus that deviates or pneumatizes, the shape of paradoxical konka, konka bulosa, and septum deviation.

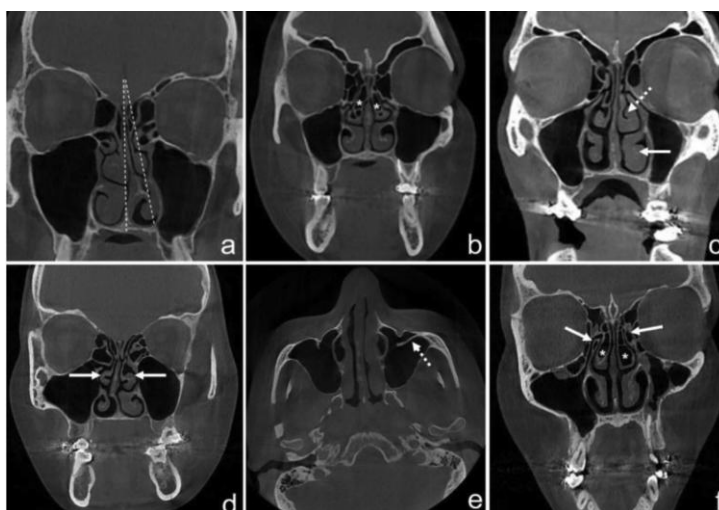


Figure 4. CBCT image of synanasal anatomical variations

Septal deviation (a); (b); hypertrophy of the media conca (dotted arrow), inferior conca hypertrophy (white arrow) (c); the middle of the bilateral paradox (white arrow) (d); the presence of septa in the maxillary sinus (dotted arrow) (e); pneumatization of bilateral uncinatus (white arrow) and (f) processes

Role of Drainage & Ostiomeatal Complex in Maxillary Sinusitis:

1. Role of Drainage & Ostiomeatal Complex

- a. Anatomical variations around the ostiomeatal complex (OMC) can constrict or inhibit mucus flow and sinus ventilation, leading to stagnation, mucosal edema, and infection.
 - b. Because the maxillary ostium is located somewhat superior in the medial wall of the sinuses, even a slight narrowing can make its drainage very susceptible to disturbance.
2. Sel Haller (Infraorbital Ethmoid Cell / Haller Cells)
- a. Haller cells can grow into the orbital wall or side wall of the maxillary sinuses and irritate or shrink the maxillary ostium or its drainage channels.
 - b. When inflamed or enlarged, these cells can worsen the narrowing and predisposition to maxillary sinusitis.
3. Concha Bullosa & Turbinatus Tengah Paradoxical
- a. Pneumatization (concha bullosa) or reverse curvature of the central concha (paradoxical middle turbinate) can push or compress the infundibulum or middle meatus, inhibiting the flow of air and mucus from the maxillary sinuses.
 - b. In some studies, concha bullosa was statistically associated with an increased incidence of rhinosinusitis especially in the maxillary sinuses.
4. Nasal Septal Deviation
- a. Septal deviation can cause changes in airflow flow (ventilation) and mucosal pressure on certain sides, which can worsen the local condition of sinus drainage.
 - b. When the deviation contributes with other variations (e.g. concha bullosa), the risk of sinusitis is higher than that of just one variation.

Pathophysiologists Sinusitis

Sinus health is affected by sinus ostium-ostium-ostium patency and smooth mucociliary clearance (*mucociliary clearance*) in KOM. Mucus also contains antimicrobial substances and substances that function as the body's defense mechanism against germs that enter with the breathing air. The organs that make up the KOM are located close together and when edema occurs, the facing mucosa will meet each other so that the cilia cannot move and the ostium is blocked. As a result, there is negative pressure in the sinus cavity which causes transudation, initially serous. This condition can be considered non-bacterial rhinosinusitis and usually resolves within a few days without treatment.

When this condition persists, the secretions collected in the sinuses are a good medium for the growth and multiplication of bacteria. The secretion becomes purulent. This condition is referred to as bacterial acute rhinosinusitis and requires antibiotic therapy. If therapy is not successful (e.g. because there are predisposing factors), inflammation continues, hypoxia occurs and anaerobic bacteria develop. The mucosa becomes more swollen and this is a chain of cycles that continues to rotate until finally the mucosa changes to become chronic, namely hypertrophy, polypoid or the formation of polyps and cysts. In this situation, surgical action may be required.

Maxillary Sinusitis with Gelic Origin

A specific form of geligi-maxillary disease is responsible for 10 percent of sinusitis cases that occur after a tooth disorder. The cause of tenering is the extraction of the molar tooth, usually the first molar, in which a small piece of bone between the root of the molar tooth and the maxillary sinus is also lifted. It was Nathaniel Highmore who proposed the thin bone membrane that separates the gums from the sinuses in 1651. He stated: "The bone that wraps the maxillary antrum and separates it from the socket is not more thick than wrapping paper." Therefore, the maxillary antrum is often referred to as the Highmore antrum. Other dental infections such as apical abscesses or periodontal disease can cause similar conditions. The bacteriological picture of sinusitis is mainly dominated by gram-negative infections. That's why this infection causes a foul-smelling pus and as a result a foul odor arises from the nose. The principle of therapy is the administration of antibiotics, sinus irrigation and correction of lubricating disorders.

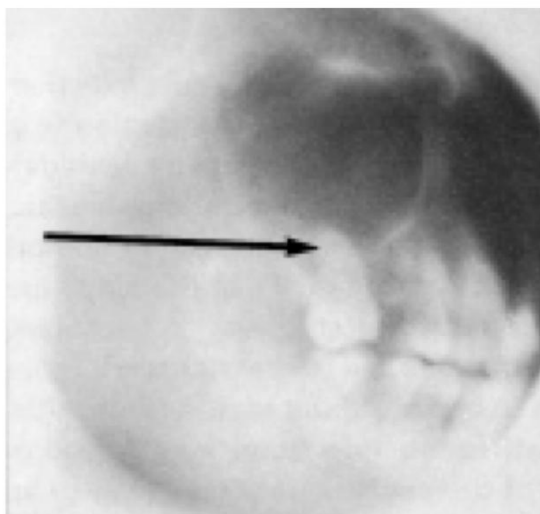


Figure 4. Dentogenic sinusitis: The tips of the molar teeth may be very close to the antral mucosal layer. The upper wisdom teeth visible on this radiograph (arrow), if infected will most likely cause maxillary sinusitis or if removed will be at risk of causing oroantral fistula.

Local Predisposing Factors

Another local predisposing factor causing acute maxillary sinusitis is a foreign body in the nose and deviation of the rice septum. Removal of foreign bodies is clearly a must, and surgical correction of the deviated rice septum is usually performed after the acute phase has fully healed. Since sinusitis can also occur after the insertion of a nasal tampon to treat epistaxis, it is common practice to prescribe prophylactic antibiotics with each nasal tampon insertion. Facial fractures can disrupt the normal physiological drainage of the sinuses and lead to infection. Barotrauma causes

mucosal edema and occlusion of the sinus ostium, resulting in an accumulation of sinus secretions followed by infection.

Classification and microbiology

The 1995 international consensus divided rhinosinusitis into only acute with a limit of up to 8 weeks and chronic if it is more than 8 weeks. The 2004 consensus divided it into acute with a limit of up to 4 weeks, subacute between 4 weeks to 3 months, and chronic if it is more than 3 months. Chronic sinusitis with rhinogenic causes is generally a continuation of acute sinusitis that is not adequately treated. In chronic sinusitis, the presence of predisposing factors must be sought and treated completely.

According to various studies, the main bacteria found in acute sinusitis are *Streptococcus pneumonia* (30-50%), *Hemophilus influenzae* (20-40%), and *Moraxella catarrhalis* (4%). In children, *M. catarrhalis* more commonly found (20%). In chronic sinusitis, predisposing factors play a more important role, but generally the bacteria present are more inclined towards gram-negative and anaerobic bacteria.

Dentogenous sinusitis

It is one of the important causes of chronic sinusitis. The base of the maxillary sinus is the alveolar process where the root of the upper jaw teeth, so that the maxillary sinus cavity is only separated by thin bone with the tooth root, sometimes even without a barrier bone. Infection of the upper jaw teeth such as apical infection of the tooth root or inflammation of periodontal tissue easily spreads directly to the sinuses, or through blood vessels and lymph. Dentogenic sinusitis should be suspected in chronic maxillary sinusitis that hits one side with purulent snot and foul-smelling breath. To treat this sinusitis, the infected tooth must be extracted or treated, and the administration of antibiotics that include anaerobic bacteria. Often it is also necessary to perform maxillary sinus ligation.

Fungal Sinusitis

Fungal sinusitis is a fungal infection of the paranasal sinuses whose incidence rate increases with the increasing use of antibiotics, corticosteroids, immunosuppressant drugs and radiotherapy. Conditions that are predisposed include diabetes mellitus, neutropenia, AIDS and long hospital stays. The types of fungi that most often cause paranasal sinus infections are *Aspergillus* and *Candida* species. It is necessary to be aware of the presence of fungal sinusitis in the following cases: unilateral sinusitis that is difficult to cure with antibiotic therapy, there is a picture of bone damage to the sinus wall, or if there is a grayish-white membrane in the antrum irrigation.

Experts divide fungal sinusitis into invasive and non-invasive forms. Invasive fungal sinusitis is divided into acute invasive, fulminant and chronic invasive, indolent. In acute invasive fungal sinusitis, low immunity and invasion of blood vessels cause the fungus to spread very quickly and can damage the sinus walls, orbital tissues and cavernous sinuses, often ending in death. Non-invasive fungal sinusitis, or mycetoma, is a collection of fungi in the sinus cavity without invading into the mucosa and not destroying bones.

Therapy for invasive fungal sinusitis is surgical, debridement, systemic antifungal and treatment of the underlying disease. The standard drug is amphotericin B, which can be added to rifampicin or flucytosine to make it more effective. In mucormycosis only surgical therapy is needed to clean the fungal mass, maintain drainage and ventilation of the sinuses. No systemic antifungal is required.

Sinusitis Maxillary

Acute maxillary sinusitis usually follows a mild upper respiratory tract infection. Chronic nasal allergies, foreign bodies, and nasal septal deviations are the most commonly found local predisposing factors. Jaw-facial deformities, especially palatoschisis, can cause problems in children. These children are more likely to suffer from chronic nasopharyngeal or sinus infections with higher incidence rates. Meanwhile, gum disorders are responsible for about 10 percent of acute maxillary sinus infections.

Sinusitis Ethmoidalis

Isolated acute ethmoiditis sinusitis is more prevalent in children, often manifesting as orbital cellulitis. In adults, it is often accompanied by maxillary sinusitis, and is considered an inevitable companion of frontal sinusitis. Symptoms include pain and tenderness between the eyes and above the bridge of the nose, drainage and nasal congestion. In children, the lateral wall of the ethmoiditis labyrinth (lamina papyracea) often cracks and therefore tends to cause orbital cellulitis more often. Treatment of ethmoiditis sinusitis is in the form of systemic antibiotics, nasal decongestants, and topical vasoconstrictor sprays or drops. The threat of complications or inadequate repair is an indication for ethmoidectomy.

Frontal Sinusitis

Acute frontal sinusitis is almost always synonymous with anterior ethmoiditis sinus infection. The frontal sinuses develop from the anterior ethmoidal air cells, and the notched frontal nasalis duct runs very close to these cells. Thus the predisposing factors for acute frontal sinus infection are the same as those for other sinus infections. The disease is mainly found in adults, and in addition to the common symptoms of infection, in frontal sinusitis there is a typical headache. The pain is located above the eyebrows, usually in the morning and worsens towards noon, then slowly subsides until late at night. Patients usually state that the forehead feels painful to the touch, and there may be supraorbital swelling. A pathognomonic sign is intense pain on palpation or percussion over the infected sinus area. Transillumination may be disrupted, and a sinus radiogram confirms the presence of periosteum thickening or total sinus turbidity, or an air-fluid level. Treatment is in the form of the administration of appropriate antibiotics as described earlier, decongestants, and vasoconstrictor nasal drops. Failure of immediate healing or complications requires drainage of the frontal sinuses with trepanation techniques.

Sinusitis Sfenoidalis

Isolated acute sphenoidal sinusitis is extremely rare. This sinusitis is characterized by headaches that lead to the cranial vertex. However, the disease is more prevalent to be part of pansinusitis, and therefore the symptoms become one with other symptoms of sinus infections. Sphenoidal sinus trephanaia was quite common before the era of pn-antibiotics, but this procedure is now almost never performed.

Manifests of clinical sinusitis

In general, the main complaint of acute rhinosinusitis is nasal congestion accompanied by pain/feeling of pressure on the face and purulent snot, which often descends into the throat (posf nasal drip). Dapal is accompanied by systemic symptoms such as fever and lethargy. Complaints of pain or a feeling of pressure in the affected sinus area are characteristic of acute sinusitis, and sometimes pain is also felt elsewhere (*referred pain*). Cheek pain indicates maxillary sinusitis, pain between or behind the two eyeballs indicates ethmoid sinusitis, pain in the forehead or the entire head indicates frontal sinusitis. In sphenoid sinusitis, pain is felt in the vertex, occipital, back of the eyeball and mastoid region. In maxillary sinusitis there is sometimes pain that moves to the teeth and ears.

Other symptoms are headache, hyposmia/anosmia, halitosis, post-nasal drip which causes coughing and tightness in the chest. Complaints of chronic sinusitis are not typical so they are difficult to diagnose. Sometimes only 1 or 2 of the following symptoms are chronic headache, post nasal drip, chronic baldness, throat disorders, ear disorders due to chronic blockage of the Eustachian tube estuary, disorders to the lungs such as bronchitis (sinobronchitis), bronchiectasis and most importantly an asthma attack that is increased and difficult to treat. In children, ingested mucous can cause gastroenteritis.

Symptoms of acute maxillary sinus infection are dexam, malaise and an unexplained headache that usually subsides with the administration of regular analgesics such as aspirin. The face feels swollen, full, and the teeth are painful when making sudden head movements, such as when going up or down stairs. There is often a typical blunt and stabbing cheek pain, as well as pain on palpation and percussion. Mucopurulent secretions can come out of the nose and sometimes smell bad. Non-productive irritating cough is often present.

Diagnosis Sinusitis

The diagnosis is established based on an anamnesis, physical examination and supporting examinations. Physical examination with anterior and posterior rhinoscopy, naso-endoscopic examination is highly recommended for a more precise and early diagnosis. A typical sign is the presence of pus in the meatus medius (in anterior and frontal maxillary and ethmoid sinusitis) or in the superior meatus (in posterior and sphenoid ethmoid sinusitis). In acute rhinosinusitis, mucosa edema and hyperemia. In children, there is often swelling and redness in the area of the kantus medius.

An important main examination is a plain photo or CT scan. Plain photographs of Waters' position, PA and lateral, are generally only able to assess the condition of large sinuses such as maxillary and frontal sinuses. Abnormalities will be visible in the shadow, air-fluid boundary (*air fluid level*) or thickening of the mucosa. A CT scan of the sinuses is *gold standard* diagnosis of sinusitis because it is able to assess the anatomy of the nose and sinuses, the presence of diseases in the nose and sinuses as a whole and its extension, but because it is expensive, it is only done as a support for the diagnosis of chronic sinusitis that does not improve with treatment or pre-surgery as an operator's guide when performing sinus surgery.

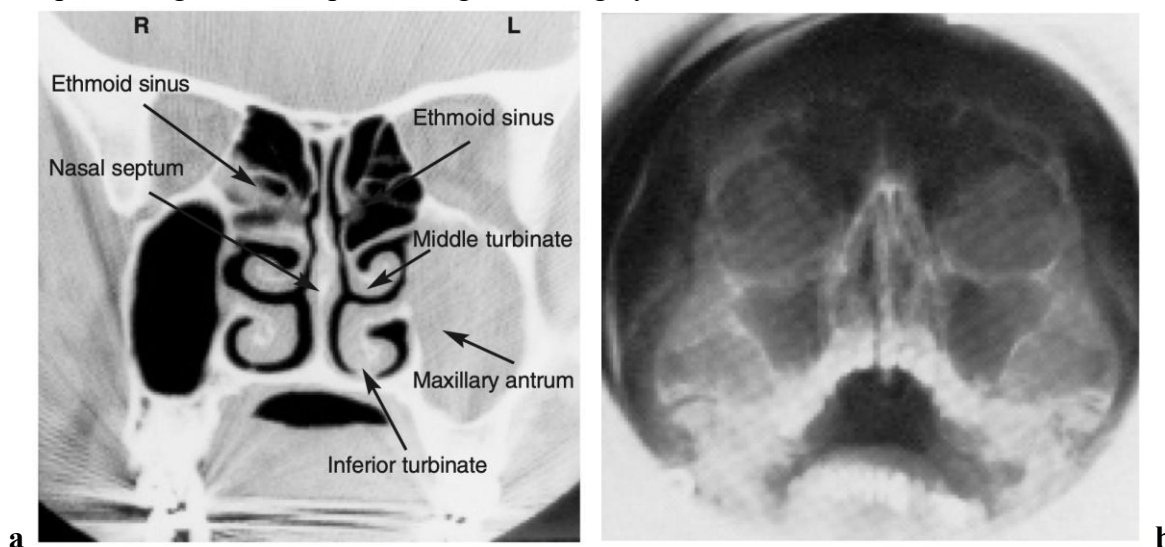


Figure 5. Plain Photo Examination and CT Scan of the Paranasal Sinuses. Plain radiography is useful in diagnosing infections, polyposis and bone expansion or erosion that indicate neoplasms. Plain radiography is also inexpensive and involves minimal radiation compared to CT scans. Even so, CT scans of the sinuses are clearly more detailed, especially the ethmoid sinuses, which are not clearly visible on plain radiography.

On transillumination examination, the sick sinuses will become gloomy or dark. This check is rarely used because of the

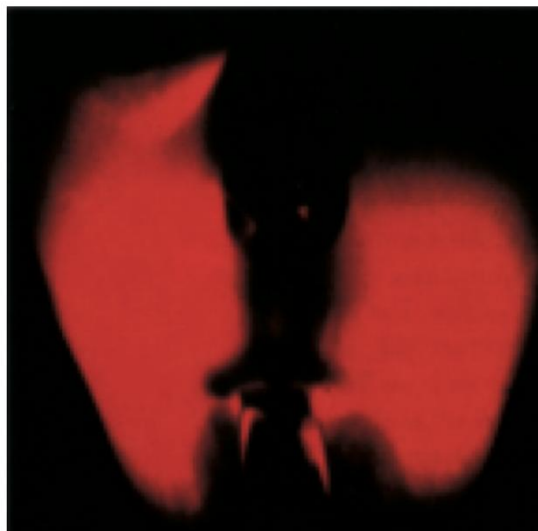


Figure 6. Transillumination: Light introduced into the mouth in a dark room is a very rarely used examination. However, a dim antrum is an additional sign in the diagnosis of maxillary sinus disease. Transillumination is limited in its usefulness.

Microbiological examination and resistance tests are carried out by taking secretions from the meatus medius/superior, to get the appropriate antibiotics. It is even better if secretions are taken that come out of the maxillary sinus joints. Sinuscopy is carried out by penetrating the medial wall of the maxillary sinus through the inferior meatus, with an endoscope device you can see the actual condition of the maxillary sinuses, then sinus irrigation can be carried out for therapy.

During the course of the acute maxillary sinusitis, a physical examination will reveal the presence of pus in the nose, usually from the meatus media, or pus or mucopurulent secretions in the nasopharynx. The maxillary sinuses are painful on palpation and percussion. Transillumination is reduced when the sinuses are full of fluid. The radiological picture of acute maxillary sinusitis is first in the form of thickening of the mucosa, followed by complete opacification of the sinuses due to severe swelling of the mucosa or due to the accumulation of fluid that fills the sinuses.

Finally, the water level was formed *air-fluid level* which is typical due to the accumulation of pus that can be seen in the upright photo of the maxillary sinuses. Therefore, a sinus radiogram should be made in a supine position and a tense position which are the two most advantageous positions for the detection of maxillary sinuses. An ultrasound mode screening is also referred to as a safe non-invasive diagnostic method. Further examination may require a complete blood count and nasal culture. In the interpretation of nasal culture, the word caution should be emphasized. Culture from the maxillary sinus can be considered correct, but the pus locates in a bone cavity. A culture from the front nose, on the other hand, will reveal organisms in the nasal vestibulum including normal flora such as *Staphylococcus* and some gram-positive cocci that have nothing to do with bacteria that can cause sinusitis. Therefore, bacterial cultures taken from the front nose are of little value in the interpretation of bacteria in the maxillary sinuses, and may even provide incorrect information.

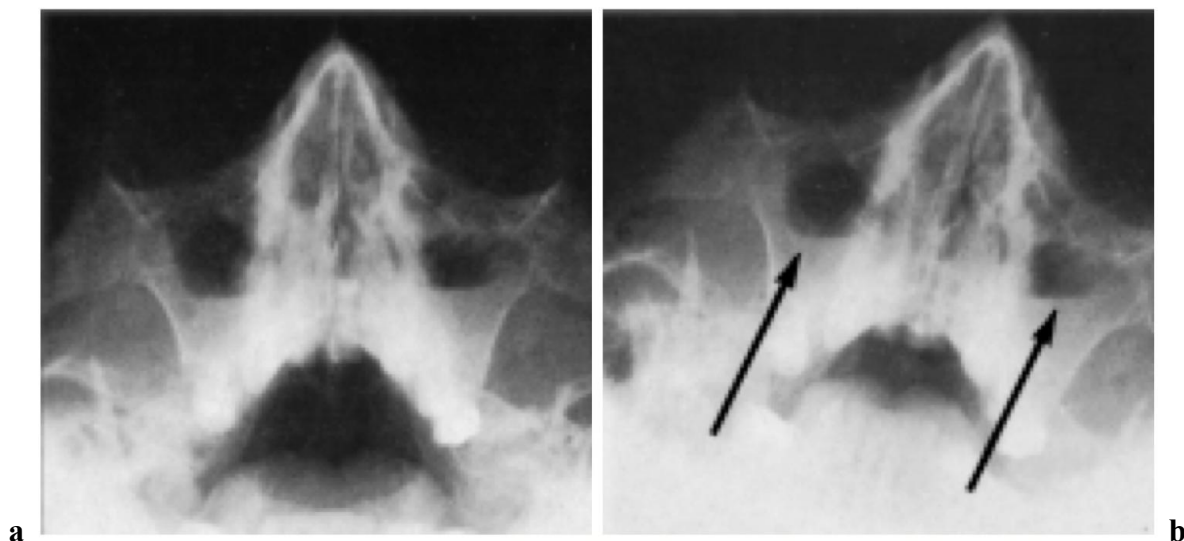


Figure 7. Radiogram of Maxillary Sinus Position Waters: In acute and chronic maxillary sinusitis, the *air-fluid level* can be seen on the radiograph. An angled photo is taken to confirm the presence of liquid (arrow b). Thickened mucous membranes that are somewhat "straight" in shape can look like *water-fluid level*, as can bone shadows if the radiography is at the wrong angle.

A culture of the posterior part of the nose or nasopharynx would be much more accurate, but technically very difficult to take. Specific bacterial cultures in sinusitis are carried out by maxillary irrigation. An appropriate antibiotic is often given to eradicate organisms that are more commonly involved in the disease (*Streptococcus pneumoniae*, *Haemophilus influenzae*, bacteria anaerobe, *Branhamella catarrhalis*).

Tatalaksana sinusitis

The purpose of sinusitis therapy is 1) to speed up healing, 2) to prevent complications; and 3) prevent changes to become chronic, The principle of treatment is to open the blockage in the KOM so that the drainage and ventilation of the sinuses recover naturally. Acute maxillary sinusitis is generally treated with broad-spectrum antibiotics such as amoxicillin, ampicillin or erythromycin plus sulfonamide, with alternatives in the form of amoxicillin/clavulanate, cephalochlor, cephoroxima, and trimethoprim plus sutfonamide. Decongestants such as pseudoephedrine are also beneficial, and potent nasal drops such as phenylephrine (NeoSynephrine) or oxymetazolin may be used during the first few days of infection but must then be discontinued. Warm compresses on the face, and analgesics such as aspirin and acetaminophen are useful for relieving symptoms. Patients usually show signs of improvement within two days, and the disease process usually resolves within 10 days, although radiological confirmation in terms of complete recovery takes two weeks or more.

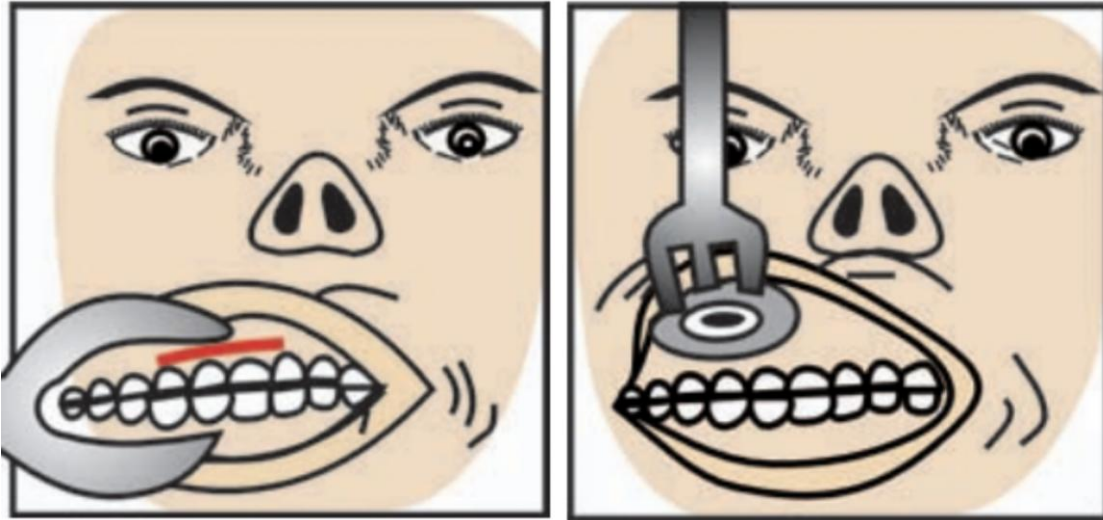


Figure 8. Caldwell–Luc surgery in which the antrum is opened with a sublabial antrostomy, the mucous membrane of the antrum is removed, and an intranasal antrostomy is performed. Surgery that uses a needle pierced through the canine fossa is rarely done.

Failure to cure with an active therapy may indicate that the organism is no longer sensitive to antibiotics, or that the antibiotic has failed to reach the loculation of infection. In such cases, the sinus ostium can be so edematous that sinus drainage is obstructed and a true abscess forms. If so, there is an indication of immediate antrum irrigation. The trokar insertion pathway in maxillary antrum irrigation is usually below the inferior konka, after previously cocaine of the mucosal membrane. An alternative route is through a sublabial approach where a needle is inserted through the opening of the gum buccal through the incisive fossa. Then the warm saline solution is flowed into the maxillary antrum through this pathway, and pus will be pushed out through the natural ostium.

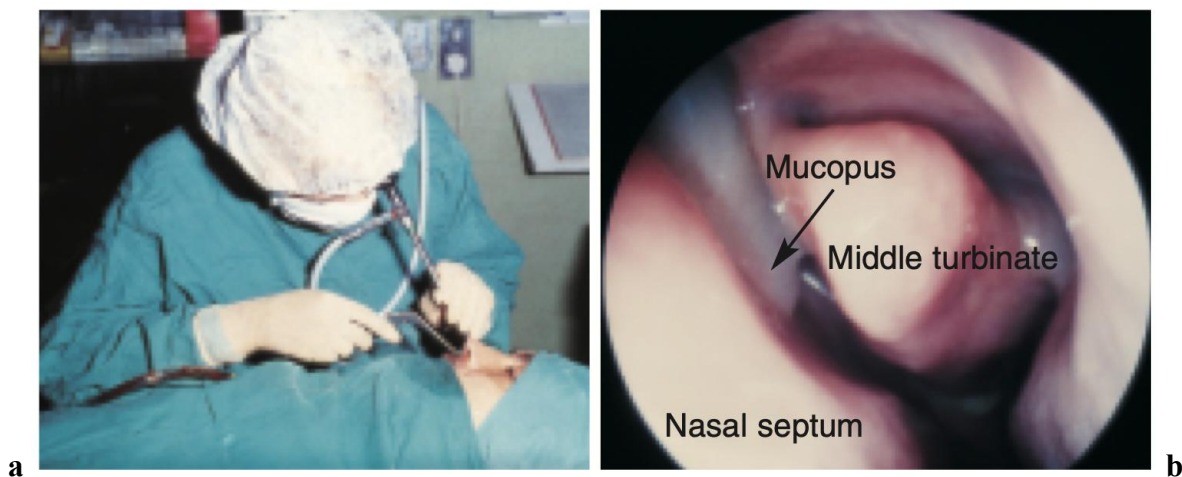


Figure 9. Endoscopic Sinus Surgery: In cases of persistent sinusitis that does not respond to medical treatment, endoscopic sinus surgery now successfully cures most cases. The

development of instruments and techniques for nose and sinus surgery allows biopsy of the antrum mucosa, excision of nasal cysts and foreign bodies in the antrum, for example, misplaced apical dental fillings, which can be treated through sinus endoscopy.

Functional endoscopic sinus surgery (BSEF/FESS) is the latest surgery for chronic sinusitis that requires surgery. This procedure has replaced almost all previous types of sinus surgery because it provides more satisfactory results and is lighter and less radical. The indications are: chronic sinusitis that does not improve after adequate therapy; chronic sinusitis accompanied by cysts or irreversible abnormalities; extensive polyps, the presence of complications of sinusitis as well as fungal sinusitis.

Sinusitis Complications

Sinusitis complications have decreased markedly since the invention of antibiotics. Severe complications usually occur in acute sinusitis or in chronic sinusitis with acute exacerbations, in the form of orbital or intracranial complications. Orbital abnormalities, caused by the paranasal sinuses close to the eye (orbita). The most common is ethmoid sinusitis, then frontal and maxillary sinusitis. The spread of infection occurs through thrombophlebitis and per continuitatem. Abnormalities that can arise are palpebra edema, orbital cellulitis, subperiosteal abscess, orbital abscess and then cavernous sinus thrombosis can occur. Intracranial abnormalities can be meningitis, extradural or subdural abscesses, brain abscesses and cavernous sinus thrombosis. Complications can also occur in chronic sinusitis, in the form of:

1. Osteomyelitis and subperiosteal abscesses. It most often arises as a result of frontal sinusitis and is usually found in children. In osteomyelitis the maxillary sinus can be limbulated, an oroantral fistula or a fistula on the cheek.
2. Lung disorders, such as chronic bronchitis and bronchiectasis. The presence of paranasal sinus abnormalities accompanied by this lung disorder is called sinobronchitis. In addition, it can also cause a recurrence of bronchial asthma which is difficult to eliminate before the sinusitis is cured.

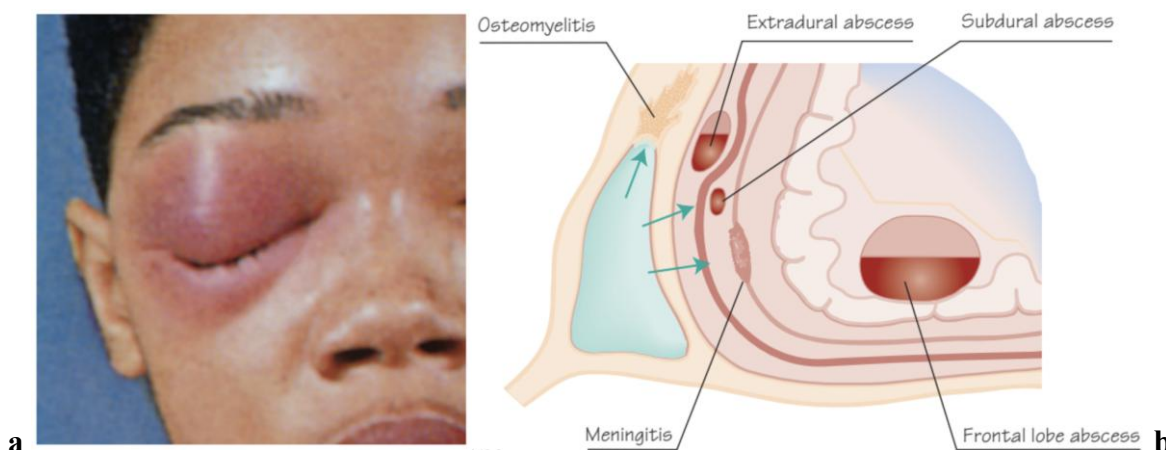


Figure 10. a) Periorbital Dextra Cellulitis and b) Intracranial Complications of Acute Rhinosinusitis

CONCLUSION

A 15-year-old female patient with maxillary dextra sinusitis and bilateral concha hypertrophy presented symptoms including mucopurulent secretion, facial pain, headache, and post-nasal drip. CT scans revealed hypodentent lesions in the right maxillary sinus, indicating chronic inflammation. Treatment combined medical therapy with Functional Endoscopic Sinus Surgery (FESS) to enhance sinus drainage and restore mucociliary function. Patient education on nasal hygiene, avoidance of triggers like cigarette smoke and cold air, and allergy management were also emphasized to prevent recurrence. Future research should explore long-term outcomes of combined surgical and medical management in adolescent sinusitis cases with anatomical abnormalities to optimize treatment protocols and reduce chronic complications.

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