

Case Report

Aplasia and hypoplasia of the maxillary sinus: A case series

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ABSTRACT

Maxillary sinus aplasia and hypoplasia are rare conditions that can cause symptoms such as headaches and voice alteration. The majority of patients are asymptomatic, but these conditions must be noticed for importance of differential diagnosis such as infection and neoplasms. Conventional radiographs could not differentiate between inflammatory mucosal thickening, neoplasm, and hypoplasia of the sinus. Computed tomography (CT) and also cone beam computed tomography (CBCT) are the proper modalities to detect these conditions. In the present study, CBCT findings of three cases with maxillary sinus hypoplasia and aplasia are reported.

Key Words: Aplasia, cone beam computed tomography, hypoplasia, maxillary sinus

INTRODUCTION

The maxillary sinuses develop in the 3rd month of intrauterine life.^[1,2] At the time of the birth, the volume of the sinus is 6-8 mm.^[3,4] The volume of the maxillary antrum increases by 2 mm in the vertical and lateral dimensions and by 3 mm in the anteroposterior dimension yearly until the age of 8 years. At the age of 10, the lower boundary of the maxillary sinus and the floor of the nasal cavity are on the same level.^[3] This growth lasts until the age of puberty.^[5] Hypoplasia of the paranasal sinuses is a rare condition.^[6] The frontal and sphenoid sinuses are most frequently involved.^[7] The incidence of maxillary sinus hypoplasia ranges between 1.5 and 10%,^[6] but some studies have reported less than this range.^[7,8] Many of the patients with aplasia or hypoplasia of the maxillary sinus are asymptomatic and unaware of their conditions and it is identified on routine radiographs.^[6] However, some

of the patients may suffer from chronic headaches, facial pain, and voice problems.^[4-6] Maxillary sinus hypoplasia can lead to diagnostic problems, especially in conventional radiographs because it can be misdiagnosed as mucosal thickening in infectious disease or neoplasms involving the sinus.^[6] Also, atelectasis of the sinus due to chronic sinusitis can be diagnosed as aplasia or hypoplasia of the sinus.^[9] Computed tomography (CT) scanning and also cone beam computed tomography (CBCT) and endoscopic examination of the sinus are the necessary diagnostic tools to detect the underlying abnormality.^[9] In this study, three cases with unilateral hypoplasia of the sinus, unilateral aplasia of the sinus, and bilateral aplasia of both maxillary sinuses are reported.

CASE REPORT

Case 1

A 68-year-old female was referred to the clinic of Oral and Maxillofacial Radiology for CBCT preparation, as pre-operative imaging for implant insertion in the maxilla. She looked healthy without any history of sinus disease such as headaches, nasal discharge, facial pain and voice abnormalities, hyposmia or anosmia, and purulent rhinorrhea. On physical examination, it was found that the right maxillary region was slightly depressed compared with the opposite side. She did

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not remember any history of infection or trauma in the right maxillary sinus. CBCT was performed by a Gallileos set (Sirona dental systems GmbH, Bensheim, Hessen, Germany), and analyzed by Sidexis-XG software with slices having an interval of 2 mm. Evaluation of coronal and axial views revealed that the maxillary sinus of the right side was completely absent in all of the cuts. Ethmoid, sphenoid, and frontal sinuses were normal [Figure 1].

Due to the lack of any symptoms, no additional treatment was done and the patient was informed about the sinus condition for possible future symptoms.

Case 2

A 20-year-old female was admitted to the clinic of Radiology for CBCT of the maxilla as pre-operative diagnostic imaging for implant insertion. She was completely healthy without any history of headaches, nasal discharge, facial pain, voice abnormalities, hyposmia or anosmia, and purulent rhinorrhea. Also, she had no history of infection or trauma in the sinus areas. CBCT was performed and evaluation of coronal and axial views revealed that all the left sinus dimensions were less than those of right sinus, and its dimensions seemed to be only equal to half of those of right sinus [Figure 2].

Due to the lack of any symptoms, no additional treatment was done and the patient was informed about the sinus condition for possible future symptoms.

Case 3

A 12-year-old female was referred to the clinic of Dentomaxillofacial Radiology by her orthodontist for CBCT of both mandible and maxilla. She had a history of cleft palate and lip that had been treated surgically. She suffered from chronic headaches, nasal discharges, and voice abnormality because of hypernasalism. On physical examination, the scar of previous surgery was seen in the philtrum region. Also, the maxillary sinus regions in both sides were depressed. CBCT was performed and evaluation of coronal view revealed that the maxillary sinuses in both sides were absent in all slices, which was confirmed by the axial view as a bilateral aplasia of the maxillary sinuses [Figure 3].

The patient was informed about the sinus condition and was referred to an otolaryngologist for further assessment.

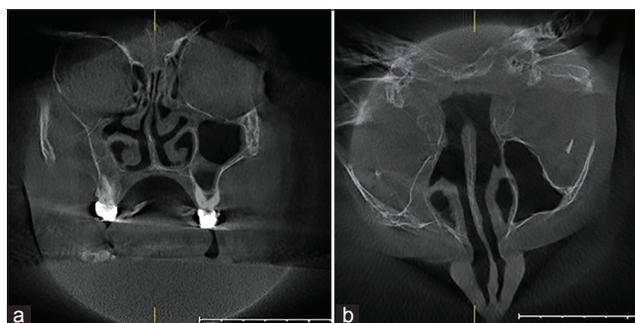


Figure 1: CBCT: (a) coronal view shows absence of the right maxillary; (b) axial view shows aplasia of the right maxillary sinus

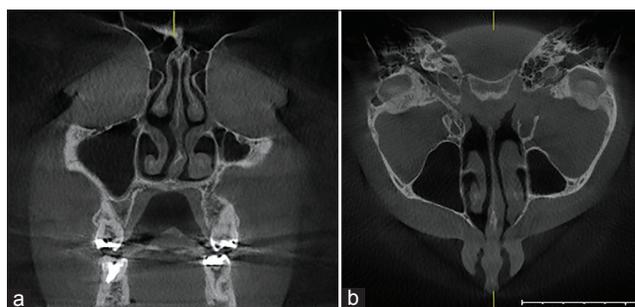


Figure 2: CBCT: (a) coronal view shows the smaller size of left maxillary sinus; (b) axial view shows the smaller size of left maxillary sinus

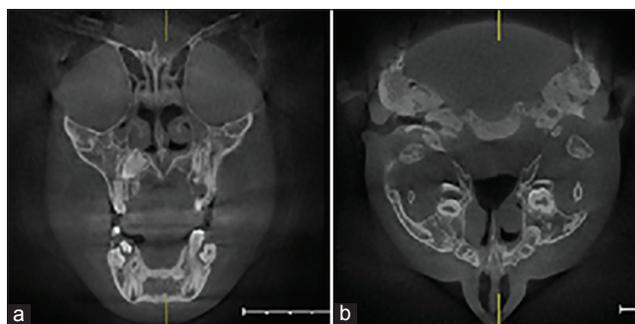


Figure 3: CBCT: (a) coronal view shows the bilateral absence of both maxillary sinuses; (b) axial view shows the bilateral absence of both maxillary sinuses

DISCUSSION

Hypoplasia of maxillary sinus is less likely than of sphenoid and frontal sinuses,^[4] which can be acquired or congenital.^[1] Some reasons have been mentioned as a cause of congenital hypoplasia or aplasia, such as:

1. Arresting of the development because of infection, injuries, and irradiation.
2. Congenital first arch syndrome.
3. Developmental anomalies such as craniosynostosis, osteodysplasia, and Down syndrome.^[8]

Also, some reasons are responsible for an acquired category of maxillary sinus hypoplasia, such as:

1. Trauma with deformity due to fracture or surgery in the sinus region.
2. Thalassemia and cretinism.
3. Wegener's granuloma (inflammatory osteitis).
4. Neoplasms that cause osteitis.^[1]

By the age of 15, the sinus is fully developed^[8] with average dimensions of 34 × 33 × 25 mm. In case 3, the patient was 12 years old, which was under the age of complete development of sinus. However, by this age, the dimensions of normal sinus must be at least at the level of middle turbinate. She had a history of cleft lip and palate that was a result of disturbance in the first arch development and the congenital first arch syndrome can be a cause of aplasia of the sinus.^[8]

The function of the sinuses is controversial. Some of the putative roles that have been ascribed to the sinuses are as follows: air conditioning (heating and humidification), acting as an air reservoir, ventilation, aiding in olfaction, reduction in weight of the cranium, addition of resonance to the voice, insulation of the cerebrum and orbits, and participation in the formation of the cranium. The paranasal sinuses may also have no function.^[4,5] Hypoplasia or aplasia of the maxillary sinus may cause symptoms such as headaches, facial pain, nasal discharge, and speaking voice problems. But the majority of patients are asymptomatic and unaware of their conditions.^[4-6] In this case series, two cases presented were asymptomatic, but case 3 had signs and symptoms of headaches, nasal discharge, and hypernasal speech.

Maxillary sinus opacification on plain radiographs can be diagnosed as a mucosal thickening of infectious disease, tumor, or aplasia of the sinus. CT examination is the ideal method for detecting this pathology.^[9] CBCT has the advantages of CT, in addition to requiring lower radiation dose,^[10-13] and is a good modality of diagnostic imaging in the evaluation of sinus conditions like aplasia or hypoplasia. Radiological diagnosis of maxillary sinus hypoplasia and aplasia helps the otolaryngologists to differentiate that from chronic sinusitis and neoplasm.^[14] It is important to diagnose these abnormalities to prevent possible complications during endoscopic sinus surgery, such as causing potential harm to the orbit.^[15,16]

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