

Maxillary Sinus Pathology in Orthopantomography – A Retrospective Study

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Abstract

Background: The maxillary sinus is of paramount importance for otolaryngologists, rhinologists, oral and maxillofacial surgeons, head and neck, and dental and maxillofacial radiologists. Radiography is frequently used to diagnose diseases of the maxillary sinus. The aim of the present study is to evaluate and record the prevalence of incidental maxillary sinus pathologies in patients presenting with dental problems on panoramic radiograph. **Materials and Methods:** A retrospective study was conducted on 1000 orthopantomography (OPGs) taken using Genoray Papaya device in the Department of Oral Medicine and Radiology at Goenka Research Institute of Dental Science. Using Triana software, the maxillary sinus and its floor, roof, medial, and lateral wall were evaluated for the presence of any pathologies. **Results:** The analyzed sample of 1000 panoramic radiograph was comprised 268 pathologies of maxillary sinus. The most frequent pathology was the unspecified sinusitis (56.34%), followed by retention pseudocyst (21.64%), mucositis (10.44%), mucocoele (7.46%), and polyp (4.10%). **Conclusion:** The incidental maxillary sinus abnormalities are highly prevalent in the asymptomatic dental patients. Panoramic imaging modality can be a useful imaging modality not only for routine dental purpose but also for the evaluation of maxillary sinus pathologies. The oral radiologist should be aware of the maxillary sinus pathologies, their radiographic appearance, and the clinical significance.

Key words: Maxillary sinus pathology, Mucocoele, Mucositis, Polyp, Retention pseudocyst, Sinusitis

INTRODUCTION

There are four pairs of paranasal sinuses: the maxillary, ethmoid, frontal, and sphenoid. They are air-filled, mucosa-lined spaces within the maxillofacial region, and skull centered on and communicating with the nasal cavity.^[1] The maxillary sinus also known as maxillary antra or antra of Highmore is one of the largest paranasal sinuses which are pyramidal in shape. The apex of the maxillary sinus pyramid points toward the zygomatic process of maxilla and its base points toward the lateral wall of the nose.^[2]

The maxillary sinus can be visualized using various imaging modalities such as orthopantomography (OPG), water's view (paranasal sinus view), conventional tomography (CT), magnetic resonance imaging (MRI), and cone-beam computed tomography (CBCT).^[3] The location and distribution of the maxillary sinus condition and pathologies require the participation of several medical specialists such oral and maxillofacial surgeon, otorhinolaryngologists, or even an allergist in the diagnosis and management.

The maxillary sinus pathologies can be broadly classified into intrinsic disease (originating primarily from maxillary sinus)

and extrinsic disease (originating outside the sinus which either impinge or infiltrate into maxillary sinus). The intrinsic maxillary sinus pathologies include sinusitis, mucositis, retention pseudocyst, antral polyp antrolith, benign, and malignant neoplasms arising from maxillary sinus. The extrinsic maxillary sinus pathologies include benign odontogenic cyst and neoplasms, bone dysplasia's, and dental structures such as root stumps or impacted teeth displaced into maxillary sinus.^[4]

The incidence of maxillary sinus pathologies in asymptomatic patients has been reported to vary from 10.9% to 69.1% in various studies.^[5]

The aim of the present study is to evaluate and record the prevalence of incidental maxillary sinus pathologies in patients presenting with dental problems on panoramic radiograph.

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MATERIALS AND METHODS

A retrospective study was conducted on 1000 OPGs taken using Genoray Papaya device in the Department of Oral Medicine and Radiology, Goenka Research Institute of Dental Science. The inclusion criteria included good quality OPG images and patients aged between 18 and 80 years of age. The exclusion criteria included images with any positioning and radiographic errors, and the presence of metallic artifacts impairing the maxillary sinus visualization was excluded. Using Triana software, the maxillary sinus and its floor, roof, medial, and lateral wall were evaluated for the presence of any pathologies. The research protocol was approved by the Institutional Research Ethics Committee.

Sinusitis

The thickening of sinus mucosa and the accumulation of secretions that accompany sinusitis reduces the maxillary sinus air space and result in appearing the maxillary sinus more radio-opaque comparatively [Figure 1].^[6]

Mucositis

Thickened mucosa is readily detectable on imaging as a well-defined and non-corticated radiopaque band of soft-tissue density that follows the contour of the bony wall of the sinus [Figures 2 and 3].^[6]

Retention pseudocyst

Retention pseudocysts usually appear as well-defined mostly sessile radiopaque masses that are non-corticated, smooth, and



Figure 1: Panoramic images of maxillary sinusitis with colored arrows denoting complete radio-opacification of the maxillary sinus



Figure 2: Panoramic images of maxillary mucositis with colored arrows showing well-defined radiopacity along the floor of the maxillary sinus

dome-shaped. These pseudocysts usually form on the floor of the sinus, although they may form on any wall or the roof, or they may fill most of the sinus cavity.^[6]

Mucocele

About 90% of mucoceles occur in the ethmoid air cells and frontal sinuses; they are rarely found in the maxillary and sphenoid sinuses. Internally, the sinus cavity is uniformly radiopaque [Figure 4].^[6]

Polyp

A polyp may be differentiated from a retention pseudocyst on an image by noting that a polyp usually occurs with a thickened mucosal lining, because the polypoid mass is no more than an accentuation of mucosal thickening [Figure 5].^[6]

RESULTS

A total of 1000 panoramic images of patients were examined. Among the analyzed sample, maxillary sinus pathology was present in 268 patients (26.8%) and absent in 732 (73.2%) patients [Table 1 and Graph 1].

Among the 268 maxillary sinus pathologies, sinusitis was most frequently present and seen in total 151 (15.1%) patients. Retention pseudocyst was seen in total 58 (5.8%) patients. Mucositis was seen in 28 (2.8%) and mucocele was found in



Figure 3: Retention pseudocyst presents on the floor of the maxillary sinus with colored arrows denoting a well-defined, non-corticated, smooth, dome-shaped radiopaque mass with homogenous internal aspect, and more radiopaque than the surrounding air of the sinus cavity



Figure 4: Panoramic images of mucocele with colored arrow showing well-defined homogeneously expansile lesion within a maxillary sinus

total 20 (2%) patients. Maxillary antral polyp was the least frequently present pathology present in 11 (1.1%) patients [Table 2 and Graph 2].

Out of 471 male, pathology was present in 131 males and absent in 340 and out of 529 female, pathology was present in 137 and absent in 392 [Table 3].

DISCUSSION

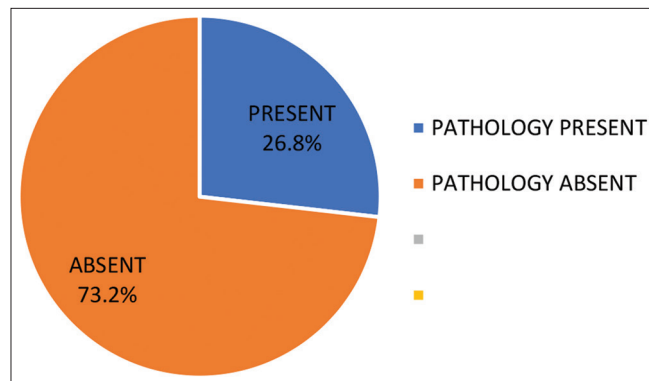
In this study, 1000 (2000 maxillary sinus) OPGs were evaluated retrospectively for the presence of maxillary sinus pathologies.

The results confirmed the existence of a wide range of diseases with different origins and complexity, not only in terms of diagnosis but also in terms of prognosis.

Results showed that the most frequent pathology was the unspecified sinusitis (56.34%), followed by retention pseudocyst (21.64%), mucositis (10.44%), mucocoele (7.46%), polyp (4.10%).

Table 1: Incidence of maxillary sinus pathology

Total OPG seen (n=1000=100%)	Pathology present	Pathology absent
1000	268 (26.8%)	732 (73.2%)



Graph 1: Incidence of maxillary sinus pathology

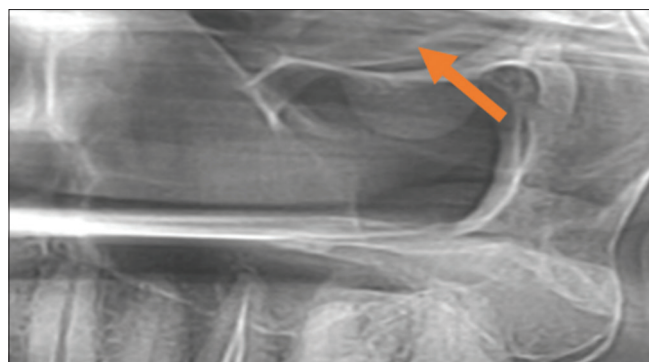


Figure 5: Panoramic images of antral polyp present on the floor of the maxillary sinus with colored arrows denoting a well-defined, non-corticated, smooth, dome-shaped radiopaque mass with homogenous internal aspect, and more radiopaque than the surrounding air of the sinus cavity

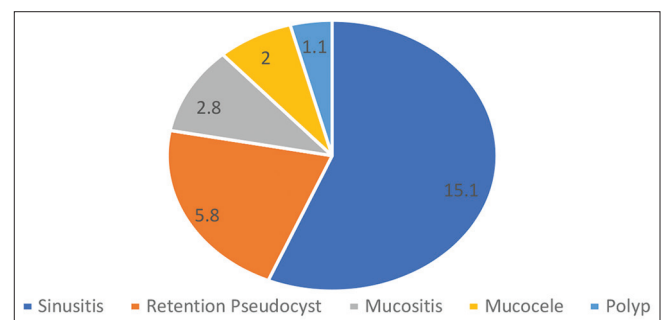
Maragathavall *et al.* (2021) also conducted the same study and they found on analyzing 2000 maxillary sinuses in 1000 panoramic radiographs, maxillary sinus pathology was present in 250 patients with retention pseudocyst being the most frequently found maxillary sinus seen in 105 patients. The result was similar to our study.^[5]

Raghav *et al.* (2014) also conducted same study in CBCT and they found on analysis in this study, 201 (402 maxillary sinus) CBCT datasets were retrospectively evaluated for pathologies in the maxillary sinus. The present study showed 59.7% incidence of maxillary sinus pathologies, which is slightly higher than some previous studies.^[7]

Pérez-Sayáns *et al.* (2020) also conducted same study and they found on analysis of 214 maxillary sinus lesions belonging to 133 men (62.1%) and 81 women (37.9%) patient with sinusitis being the most frequently found maxillary sinus seen in 95 patient.^[8]

Constantine *et al.* (2019), the sensitivity of OPG for detecting mucosal thickening was 36.7%. The positive predictive value of OPG for diagnosing mucosal thickening was 79.9%.^[9]

OPG can be used for screening of maxillary sinus pathologies in asymptomatic dental patients. The maxillary sinus pathologies detected in OPGs can also help in early diagnosis and treatment before the progression of the disease.^[5]



Graph 2: Maxillary sinus pathologies

Table 2: Incidence of individual maxillary sinus pathology

Individual pathology	Total number of incidence	Percentage, n=268 (100%)
Sinusitis	151	56.34
Retention pseudocyst	58	21.64
Mucositis	28	10.44
Polyp	11	4.10
Mucocoele	20	7.46

Table 3: Gender distribution

Maxillary sinus pathologies	Males (n=471=100%)	Females (n=529=100%)
Present	131	137
Absent	340	392
Total	471 (100%)	529 (100%)

Even though OPG has several advantages over CBCT, it can only be used for screening maxillary sinus pathologies for confirmatory diagnosis a three-dimensional imaging modality such as conventional CT or CBCT remains to be a gold standard. The limitations of the present study are all the diagnosed maxillary sinus pathologies are not further evaluated using 3D imaging or histopathological evaluation. Since panoramic image has numerous superimposition and blurring, the diagnostic validity is highly variable.^[5]

In spite of the limitation, the present study indicates that OPG can be useful in early identification and evaluation of maxillary sinus pathologies.^[5]

CONCLUSION

In addition to being useful for ordinary dental work, panoramic imaging can also be used to assess diseases of the maxillary sinus. Asymptomatic dental patients frequently have incidental maxillary sinus pathologies. The oral radiologist should be aware of the maxillary sinus pathologies, their radiographic appearance, and the clinical significance. Therefore, a thorough analysis of the panoramic image and putting the patient through 3D imaging whenever necessary can aid in early diagnosis, therapy, and patient follow-up.

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