Original

3D CBCT Assessment of Incidental Maxillary Sinus Abnormalities in a Saudi Arabian Population

Ibrahim A. Al-Zoubi1, Santosh R Patil2, Ikuro Kato3, Yoshihiko Sugita4, Hatsuhiko Maeda5 and Mohammad Khursheed Alam6

1) Department of Preventive Dentistry, College of Dentistry, AlJouf University, Sakaka, Saudi Arabia
2) Department of Oral Medicine and Radiology, College of Dentistry, AlJouf University, Sakaka, Saudi Arabia
3) Department of Oral Pathology, School of Dentistry, Aichi Gakuin University, Nagoya, Japan
4) Orthodontic Department, College of Dentistry, AlJouf University, Sakaka, Saudi Arabia

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Abstract: To determine the prevalence of incidental maxillary sinus findings and assess their relationships with age and gender. CBCT scans of 412 patients, comprising of 824 maxillary sinuses were evaluated. The maxillary sinuses were observed for increased mucosal thickening, polypoidal-mucosal thickening, opacification and other pathological changes. Correlations of these pathologic findings with age and gender were analyzed. The incidence of the pathological findings in maxillary sinuses observed was 30.1%. The most common abnormality observed as mucosal thickening followed by opacification. No significant correlation was observed between genders and different age groups. Based on the observations of the present study, it can be concluded that the prevalence of incidental maxillary sinus abnormalities in Saudi Arabian observed on CBCT is considerably high.

Keywords: Maxillary sinus, CBCT, pathology, abnormality

Introduction

During the most recent decade, cone beam computed tomography (CBCT) has been swiftly assimilated in the dental specialty and today it is one of the popular maxillofacial radiographic imaging tools. The introduction CBCT in the field of dentistry led to an extraordinary advancement in maxillofacial imaging1. Even though it has been reported that panoramic radiography provides the most information on the maxillary antral pathologies and it may serve as an adequate imaging modality. Nonetheless, some of the specific findings of the maxillary sinus on panoramic radiographic imaging are relied upon the examiner. Along these lines, an industrious and exact assessment of particular conditions of the maxillary antrum may just be conceivable using CBCT on the grounds that it gives additional data contrasted with panoramic radiographs.2,3. The CBCT offers advantages over conventional imaging techniques, by eradicating the superimposition of the adjacent structures and also provides images with no geometric distortion. Moreover, the patient’s exposure to radiation is minimal with CBCT when compared with conventional medical computed tomography imaging.4.

CBCT imaging is indicated for numerous conditions and pathologies in the head and neck region like, odontogenic infections, tumors, cysts, carcinomas, traumatic conditions, to evaluate bone density, temporomandibular joint disorders, congenital and developmental anomalies, for treatment planning and follow-up in almost all disciplines.5

It has been reported that CBCT might be employed to find the existence of undiscovered intrabony pathologies that past clinical appraisal and traditional radiographic imaging could not determine.6 While interpreting the CBCT scans, it is necessary for the examiners to translate the entire picture volume as opposed to being bound to an evaluation of the territory of intrigue. Cautious and deliberate assessment permits disclosure of coincidental findings with clinical connotation.7 Till date, no studies in the literature have directly and rigorously addressed the prevalence of incidental maxillary sinus pathologies by using CBCT in a Saudi population. Therefore, the objective of this study is to determine the prevalence of incidental maxillary sinus findings and assess the relationships of the findings with age and gender.

Materials and Methods

The present study was carried out in College of Dentistry, AlJouf University, Kingdom of Saudi Arabia. Clearance was obtained from the ethical committee and consent was obtained from all the participants. CBCT scans of 412 patients, comprising of 824 maxillary sinuses were evaluated. The age of the patients included in the study ranged from 12-70 years and were further divided into the six age groups: (1) 12-20; (2) 21-30; (3) 31-40; (4) 41-50; (5) 51-60 and (6) 61-70.

All the CBCT scans were obtained scan using Cranex (SOREDEX, Tuusula, Finland), tube current, 6 mA; tube voltage of 65 kV; exposure time for 20 seconds at 50 Hz; inherent filtration, 1.8 mm Al; and total filtration of 2.7 mm Al. Axial, coronal and sagittal orthogonal CBCT views were analyzed.

Individuals less than 12 years old were excluded from this study because of their incomplete sinus development. Known cases of antral pathologies and scans with artefacts, low resolution quality were also excluded.

All the scans were evaluated by two qualified and experienced observers. To check the intra-observer variations, the same examiners repeated measurements after two weeks. Both the observers were trained and calibrated using 10% of the sample in a pilot study before interpreting all the scans. The maxillary sinuses were observed for increased mucosal thickening (Figure 1), polypoidal-mucosal thickening (Figure 2), polyps (Figure 3), opacification, and other pathological changes.
We found no significant difference between the genders regarding the incidence of maxillary sinus abnormalities. Chi-square = 0.196, P = 0.681. The male gender had a higher prevalence of abnormalities, with 55.6% compared to 44.4% in females. No significant difference between different age groups was noted. Chi-square = 0.234, P = 0.792. The inter-examiner and intra-examiner reliability was carried out using the Kappa analysis. A kappa value of 0.40 was considered to be poor agreement, 0.40-0.59 fair agreement, 0.60-0.74 good agreement, and 0.75-1.00 was considered as excellent agreement.

**Results**

The reliability was excellent, with Kappa values of 0.92 for intra-operator agreement and of 0.94 for inter-operator agreement. Among 412 subjects, 238 (57.8%) were males and 174 (42.2%) were females with a mean age of 38.6 years. The incidence of the pathological findings in maxillary sinuses observed was 30.1% (248 images). Among the total of 30.1% of abnormalities, 55.6% were found in males and 44.4% in females with no significant difference among the genders (Table 1). In the present study, highest percent of abnormalities were noted in individuals belonging to 41-50 years of age followed by 12-20 years of age group but no significant difference between different age groups was noted (Table 2). Table 3 shows the list of the incidental findings observed in maxillary sinus. The most common finding was mucosal thickening, this observation was in consistent with the findings of Elwakeel et al.8) Rege et al.,9) Jangam et al.10), Raghav et al.,11) and Ritter et al.12)

Mucosal thickenings are regarded as inflammatory changes in the maxillary sinus, they may be caused due various aetiologies most commonly related to odontogenic pathologies such nonvital posterior maxillary teeth, periodontal infections, retained roots, impacted teeth and severely carious teeth. Apart from these factors etiological causes are exposure to allergens, trauma and microbial infections. These could manifest in the maxillary sinus as linear mucosal thickening which may progress to partial and total opacification10,13,14,15,16). In the present study, the most common finding was mucosal thickening, this observation was in consistent with the findings of Elwakeel et al.8) Rege et al.,9) Jangam et al.10), Raghav et al.,11) and Ritter et al.12)

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**Discussion**

In the present study, CBCT scans of 412 patients, comprising of 824 maxillary sinuses were examined retrospectively for pathologies in the maxillary antrum. The prevalence of pathological findings in maxillary sinuses observed was 30.1% (248 images). This observation was less than some of the previous studies. Elwakeel et al., noted 73% of Incidental abnormalities in maxillary sinus8). Rege et al., observed maxillary sinus abnormalities in 68.2% of cases9). In contrast to this there are few studies who reported a lower percentage of abnormalities of maxillary sinuses. Jangam et al., reported the prevalence of incidental pathologies in 43.54% of cases10). Raghav et al., observed incidental findings in 59.7% of maxillary sinus CBCT scans11). The study carried out by Ritter et al. using CBCT showed incidental findings in the maxillary sinus was 56.3%12). Gracco et al., noted that 50% of the orthodontic patients revealed incidental findings in the maxillary antrum13). Pazera et al., reported 46.8% incidental maxillary sinus pathologies in 134 Swiss patients14).
the prevalence of pathologies observed in the maxillary sinus, this finding was in accordance with Jangam et al., who noted no gender predilection in their study sample for the prevalence of abnormal findings in the maxillary antrum. Where as Elwakeel et al., observed a greater prevalence of abnormalities in females. In contrast to this Ritter et al. and Vallo et al. observed a significantly more number of sinus abnormalities among males.

In the present study highest percent of abnormalities were found in individuals belonging to 41-50 years of age but no significant difference between different age groups was noted. Elwakeel et al., reported that the patients belonging to second decade in their study presented with highest percent of abnormalities. This contrasts with the observations of Raghav, et al., who noticed that the patients in the third decade presented with more pathologies in the maxillary sinus and Ritter et al. reported that individuals aged more than 60 years most commonly to be affected. Daya et al. noted that patients in the age group of 4th to 6th decade showed higher prevalence of maxillary sinus pathologic findings and the difference in the frequency among different age group was statistically significant. Similarly, Gracco et al., reported that individuals belonging to the age group of 41 to 60 years known to have increased risk for maxillary sinus pathologies.

Based on the results of this study, it can be concluded that the prevalence of incidental maxillary sinus pathologies is more in the asymptomatic patients attending the dental clinics. Therefore, dental practitioners should be aware of these incidental abnormalities observed in the maxillary sinus. A thorough examination of the whole CBCT scans aids the clinicians in accurate diagnosis, timely referrals, comprehensive treatment planning and follow-up.

Conflict of Interest
The author have declared that no COI exists.

References
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