Maxillary Sinus Findings in the Elderly:  
A Panoramic Radiographic Study in Iraq

Shahad Dhugham Ali¹, Lubna Makki Hussein², Ameer MJ Twair³

1. B.D.S., MSc Oral and maxillofacial radiology  
2. B.D.S., MSc Orthodontics  
3. HD of Oral & maxillofacial surgery

Abstract

Aim: This study aimed to investigate the prevalence of maxillary sinus findings in elderly subjects above the age of 50 years through panoramic radiography and test the hypothesis that such findings are more prevalent in dentate subjects. Methods and Materials: A total of 99 subjects over the age of 50 years were examined clinically and radiographically in the Department of Oral Radiology at the Al Shaheed Nasser Specialist Dental Center in Najaf, Iraq over a period of five months for various reasons. Six subjects were excluded due to the lack of diagnostic quality of their radiographs. The manually calculated kappa test was used to determine the statistical significance of intra-examiner reliability. Other data were analyzed using the SPSS version 23 computer software. The chi-square test was performed to evaluate the statistical significance.

Results: The prevalence of radiographic maxillary sinus findings in 93 elderly subjects (aged above 50 years) was investigated through panoramic radiography. A total of 58 subjects had at least one natural tooth radiographically in the upper jaw, and 35 subjects were radiographically edentulous in the upper jaw. Mucous cysts and diffused mucosal thickenings were found in 39.78% of the subjects. Of the mucosal thickenings, 82.85% were found in subjects with a dentate upper jaw (p<0.05). The prevalence of a mucous cyst was 2.15% in subjects with dentate upper jaw. The finding of no mucous cyst in edentulous subjects suggested anodontogenic cause.

Conclusions: The presence of mucosal thickening or cysts may be due to the presence of irritative stimuli, which are often an infection of dental origin because mucosal thickening and cysts are more prevalent in dentulous subjects.


Introduction

The maxillary sinus begins to develop in the uterus at about three months and is about the size of a pea at birth and increases in size through adulthood. The maxillary sinus is the largest of the paranasal sinuses. The panoramic view is superior to the Water’s projection in detecting the cyst-like densities in the maxillary sinus, but the Water’s view is preferred for demonstrating the cloudiness of the maxillary sinus and the sclerotic changes in the adjacent bony structures. The maxillary sinus has a close proximity to the orbit, alveolar ridge, and maxillary teeth and shares its nerve supply with these structures. The floor of the sinus in an adult is around 1–1.25 cm below the level of the floor of the nasal cavity. The importance of this floor is related to its relationship to the roots of the maxillary sinus.
teeth and the alveolar process. The bony floor may be dehisced completely above the apices of the roots, bringing the periapical tissues into direct contact with the membranous lining of the sinus. The close relationship between the sinus and the teeth may facilitate the spread of pathologic conditions with dental origin into the sinus. Maxillary premolars and molars are most consistently situated below the floor of the sinus. The root apices of the second molar are in closest proximity to the sinus floor, followed by the first molar, the third molar, the second premolar, and the first premolar and canine.\(^1\) The maxillary sinus mucosa responds to oscillating stimuli by swelling from its normal 1 mm thickness to 10–15 mm. If a duct of a seromucinous gland is blocked during the inflammatory period, the secretion dilates the gland and the duct, forming a cyst lined with the epithelium. This cyst is the secretory type of mucous cyst and also called a retention cyst.\(^4\) The polyps that are usually seen in allergic conditions are formed when fluid accumulates in the loose connective tissue. A mucocele, a large bone destroying the cyst that occurs as a result of a blocked ostium, is rare in the maxillary sinus. Mucous cysts and other mucosal thickenings do not usually present with symptoms but may be occasionally related to facial pain, headache, and toothache.\(^8\) Mucous cysts tend to rupture, and the mucosal thickening is resolved after the cause is removed. Radiographically, the retention cyst appears as a well-defined “dome-shaped” uniform radiopacity with a rounded outline arising from the floor of the sinus.\(^4,5\) Most retention cysts in the maxillary sinus spontaneously regress or show no significant change in size over the long term. These findings suggest that in the absence of associated complications, “wait and see” may be the appropriate management strategy for retention cysts.\(^4\) Odontogenic cysts may also encroach on the maxillary sinus, but they have a thin radiopaque bony margin that is absent in mucous cysts. A mucosal thickening appears as a diffuse, often polypous radiopacity along the margin of the sinus without a well-defined rounded outline. The diffuse mucosal thickening and mucous cysts are most common in maxillary sinus at frequencies of up to 50% of the incidental radiographic findings.\(^1,8\) Periodontal and periapical infections may also cause mucosal swelling or sinusitis.\(^6\) Odontogenic sinusitis presents in 5%–45% of all sinusitis cases. The roof of the maxillary sinus is not clearly imaged in a normal panoramic projection, but the floor is clearly visible. However, mucous cysts and other mucosal thickenings are usually well demonstrated because they almost always arise from the antral floor. Few studies have been carried out to assess the prevalence of maxillary sinus findings in the elderly.\(^9\) The present study aimed to determine the prevalence of maxillary sinus findings in elderly subjects above the age of 50 years through panoramic radiography and test the hypothesis that such findings are more prevalent in dentate subjects.

**Materials and Methods**

A total of 93 subjects over the age of 50 years were selected from a pool of 99 patients for this study. Six subjects were excluded due to the lack of diagnostic quality of their radiographs (Table 1).
The subjects were individuals who were examined clinically and radiographically for various purposes during a period of five months at the Department of Oral Radiology at the AlShaheed Nasser Specialist Dental Center in Najaf, Iraq. Medical history was obtained to determine if any allergy or chronic sinusitis and medical problems existed prior to the clinical examination. Subjects with a history of any allergy or chronic sinusitis were excluded from the study. A panoramic radiograph was obtained for each patient by using a panoramic X-ray machine (KavoGendexOrthoralix9200 Digital OPG, 2019, Germany) and charge couple device sensor. The radiographs were studied by a dental radiologist under standard conditions, and the maxillary sinus findings were recorded. In two cases, the intraoral periapical radiographs were obtained using the Bluex 70 X-ray machine (Italy) and the Kodak E speed intraoral film (USA), whenever any doubt existed regarding the presence of a mucosal finding. The panoramic radiographs of poor diagnostic quality, in which the floor of the maxillary sinus cannot be evaluated diagnostically, were excluded from the study. The findings for increased radiopacity in the sinus floor were recorded as follows.

1. Well-defined radiopacity with a rounded (convex) outline arising from the floor or walls of the sinus was categorized as a mucous cyst.

2. Diffuse band-like radiopacity along the margins of the sinus without well-defined outline was categorized as a mucosal thickening. A total of 20 randomly selected (five edentulous and 15 dentulous) panoramic radiographs were viewed after a gap of two months to assess and determine the statistical significance of the intraexaminer variability by using the manually calculated kappa test. Other data were analyzed using the SPSS version 23 computer software. The chi-square test was performed to evaluate the statistical significance.

### Results

With regard to the status of the dentition, 53 subjects had clinically visible natural teeth, whereas 40 subjects were clinically edentulous. Among the subjects, 58 had at least one radiographically visible natural tooth or root in the maxillary arch, and 35 had radiographically edentulous maxillary arch. The gender and age distribution of the maxillary sinus findings is summarized in (Tables 2 and 3). The intraexaminer agreement between the two rounds of viewing was 100%.

Of the 93 patients, 35 (37.63%), 2 (2.15%), and 56 (60.22%) had mucosal thickenings, mucous cysts, and normal findings, respectively. The prevalence of maxillary sinus findings in males (48.72%) was greater than that in females (33.33%) (p<0.05).
Among the 58 patients aged 50–59 years, 22 (37.93%) had mucosal thickenings (figure1), and 1 (1.72%) had mucous cyst (figure2). Among the 30 patients aged 60–69 years, 11 (36.67%) had mucosal thickenings, and 1 (3.33%) had mucous cysts. Among the five patients aged 70–79 years, two (40%) had mucosal thickenings, and no mucous cyst was found. No statistical difference was found among the age groups.

### Table (2): Maxillary sinus findings according to gender

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
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<tr>
<td>Normal</td>
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<tr>
<td>Cyst</td>
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<tr>
<td>MT</td>
<td>17</td>
<td>43.59</td>
<td>18</td>
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<tr>
<td>Total</td>
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</table>

### Table (3): Maxillary sinus findings according to age groups

<table>
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<th>Age Groups</th>
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<th>60-69</th>
<th>70-79</th>
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<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Normal</td>
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<td>60.34</td>
<td>18</td>
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<tr>
<td>Cyst</td>
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<td>1.72</td>
<td>1</td>
</tr>
<tr>
<td>MT</td>
<td>22</td>
<td>37.93</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>100</td>
<td>30</td>
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</table>

The maxillary sinus findings among dentulous and edentulous maxillary arches are shown in Table (4). Out of the 58 subjects who had at least one radiographically visible natural tooth or root in their maxillary arch, 31 (53.45%) had radiopaque findings in their maxillary sinus, 29 (50%) had mucosal thickenings (Figure 1), and 2 (3.45%) had mucous cysts (Figure 2). Out of the 35 subjects who had radiographically edentulous maxillary arch, six (17.14%) had mucosal thickenings, and no mucous cyst was found. The prevalence of maxillary sinus findings in the dentulous maxillary arch (53.45%) was greater than that in the edentulous maxillary arch (17.14%) (p<0.05). No destructive mucocele was found in any of our subjects.
Table (4): Maxillary sinus findings among a dentulous and an edentulous maxilla

<table>
<thead>
<tr>
<th></th>
<th>Dentulous</th>
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<th>Edentulous</th>
<th></th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Normal</td>
<td>27</td>
<td>46.55</td>
<td>29</td>
<td>82.86</td>
<td>56</td>
<td>60.22</td>
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<tr>
<td>Cyst</td>
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<td>3.45</td>
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<td>0</td>
<td>2</td>
<td>2.15</td>
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<tr>
<td>MT</td>
<td>29</td>
<td>50</td>
<td>6</td>
<td>17.14</td>
<td>35</td>
<td>37.63</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>100</td>
<td>35</td>
<td>100</td>
<td>93</td>
<td>100</td>
</tr>
</tbody>
</table>

Discussion

The prevalence of mucous cysts in the maxillary sinus was 2.15%, greater in males than that in females, and not dependent on age. This finding was in agreement with those in previous studies that showed the prevalence of mucous cysts in maxillary sinus ranging from 2%–13%.[8,9,10] Myall, Eastep, and Silver[11] observed 1469 orthopantomographs and found that 5.1% show mucous cysts and that the occurrence in men was twice of that in women. According to Mattila[12], the prevalence of mucous cysts is not age-dependent and is more prevalent among men than women. The prevalence of mucosal thickening in all paranasal sinuses is up to 50% in the facial radiographs obtained for purposes other
than suspected sinus disease[13]. The prevalence of mucosal thickening is higher in younger subjects who have more teeth[14], and the majority of mucous cyst and mucosal thickening are found in dentate subjects[8,15,16]. These findings were in agreement with the observations in the present study, in which 31 out of 37 (83.8%) of mucosal thickening and mucous cysts were found in subjects with dentulous maxillary arch. Thus, the 29 out of 37 (78.4%) mucosal thickenings present in dentulous maxillary arch may be a consequence of odontogenic infection. Moreover, the mucous cysts were present only in dentulous subjects. Halstead[8] conducted a study on 75 patients and concluded that odontogenic causes can be considered in 90.4% of patients with mucous cysts. In the present study, mucosal thickening and mucous cysts were found in 6 out of 37 (16.2%) subjects with edentulous maxilla. Even though a higher prevalence of maxillary findings was observed in the present study, no history of allergy or chronic sinusitis was reported by the subjects. In most cases, the maxillary posterior teeth were present, and either caries with periapical changes, root stumps, periodontal problems, or deep/large restorations was present. These odontogenic factors can lead to mucosal thickening or the formation of mucosal cysts on the floor of the maxillary sinus.

Conclusions

The presence of mucosal thickening or mucosal cysts may be due to the presence of irritative stimuli, which are often an infection of dental origin because these findings are more prevalent in dentulous subjects. The accurate diagnosis of infective foci (chronic apical periodontitis and deep pockets caused by periodontitis) is necessary because decreased host resistance may lead to acute sinusitis.

Clinical Significance

The panoramic radiograph is an excellent diagnostic tool to identify mucosal thickening and mucosal cysts. The accurate diagnosis of infective foci (chronic apical periodontitis and deep pockets caused by periodontitis) is necessary because reduced host resistance may result in acute sinusitis.

References

1) Mathew AnunaLaila Mathew, BDS, MDS; Amar A. Sholapurkar, BDS, MDS, FAGE; Keerthilatha M. Pai, BDS, MDS
7) Halstead CL. Mucosal cysts of the maxillary sinus: report of 75