An Analysis of Frequency, Morphology, and Locations of Maxillary Sinus Septa Using Cone Beam Computed Tomography

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**Purpose:** To evaluate the frequency, morphology, and locations of maxillary sinus septa using cone beam computed tomographic (CBCT) imaging of the entire maxillary sinus and to analyze factors influencing the presence or absence of septa. **Materials and Methods:** CBCT images of the maxilla taken during a 1-year study period (October 1, 2012, to September 30, 2013) were evaluated for the presence and type of septa as well as the health or pathology of the maxillary sinus. Differences in age, gender, type of dentition, septa location, and sinus pathology with regard to the incidence of sinus septa were analyzed statistically. **Results:** The study included 294 maxillary sinuses in 212 patients (126 women and 86 men) with a mean age of 53.8 years. Sinus septa were present in 141 patients (66.5%) and in 166 of 294 sinuses (56.5%). The most common orientation of the septa was coronal (61.8%), 7.6% were oriented axially, and 3.6% were aligned sagittally. Most septa were located on the floor of the maxillary sinus (58.6%), commonly (60.7%) in the region of the first and second molars. The maxillary sinuses were diagnosed in 36.4% of cases as healthy and without thickening of the sinus membrane. Sex was a significant variable in the health of the maxillary sinus; 57.7% of the sinuses in women and 72.3% in men were diagnosed as pathologic. **Conclusion:** Septa are common anatomical structures and are most often found in the first or second molar region on the floor of the maxillary sinus. To prevent possible complications during sinus floor elevation procedures, a thorough three-dimensional radiographic examination of the sinus prior to surgery is recommended. J Oral Maxillofac Implants 2016;31:280–287. doi: 10.11607/jomi.4188

**Keywords:** cone beam computed tomography, interobserver reliability, maxillary sinus, maxillary sinus pathology, maxillary sinus septa

Implant placement in the posterior maxilla may be a challenging surgical procedure because of the reduced vertical bone height resulting from the expansion of the maxillary sinus. Sinus floor elevation (SFE) procedures are often needed to treat such bone deficiencies to allow the correct placement of dental implants. Perforation of the sinus membrane is the most common intraoperative complication during SFE, occurring in 11% to 56% of procedures.1,2 The presence of maxillary sinus septa has been associated with an increased risk of sinus membrane perforation during SFE.3–5

A thorough preoperative radiographic evaluation of the maxillary sinus is recommended to prevent complications during SFE.6 According to recent guidelines for the use of cross-sectional diagnostic radiographic imaging in implant dentistry created by the European Association of Osseointegration and the International Team for Implantology,7,8 cone beam computed tomography (CBCT) is considered an appropriate technique for diagnosing potential pathology and assessing the anatomical boundaries of the maxillary sinus. Studies have shown...
that panoramic radiographs have significant limitations for the correct identification of sinus septa. Thus, to achieve better accuracy in detecting sinus septa that may pose a surgical risk for complications during SFE, cross-sectional imaging has been recommended.

In the literature, the data regarding frequency, locations, and height of maxillary sinus septa show considerable variations and methodologic differences. In a recent study, Pommer and coworkers aimed to gain insight into the frequency, location, and morphology of maxillary sinus septa by means of a meta-analysis. They reported a frequency of 28.4% of septa in 8,923 pooled maxillary sinus septa by means of a meta-analysis. The majority of septa (54.6%) were found in the region of the first or second maxillary molars, and the most common orientation of septa (87.6%) was in the buccopalatal plane.

Recent studies have used CBCT to evaluate maxillary sinus septa, although most studies did not image the entire sinus. As a consequence, the area below the roof of the maxillary sinus (the orbital floor) and septa arising in that region have not been assessed and reported widely. The purpose of the present study was to evaluate the frequency, morphology, and location of maxillary sinus septa using CBCT imaging of the entire maxillary sinus. Furthermore, factors influencing the presence or absence of septa such as age, sex, dental/oral status, and the health/pathology of the maxillary sinus will be analyzed.

MATERIALS AND METHODS

Study Design and Patient Selection
Initially, all CBCT scans of the maxilla taken during a 1-year study period (October 1, 2012, to September 30, 2013) in the Section of Dental Radiology and Stomatology were screened. The images were included in the present study if (1) the scans showed at least one complete maxillary sinus, (2) no previous surgeries had been performed in the region of the maxillary sinus, and (3) no artifacts (acquisition or patient-related) were present in the maxillary sinus region. Only CBCT scans from patients who had given written consent for the use of their data according to the principles of the Helsinki Declaration were evaluated. Because of its retrospective nature, the study was exempt from formal approval of the local ethical committee.

CBCT Imaging and Analysis
All CBCT images were taken using variable fields of view (FOV) of $6 \times 5$ cm, $6 \times 6$ cm, $8 \times 5$ cm, $10 \times 5$ cm, $14 \times 5$ cm, $8 \times 8$ cm, $10 \times 10$ cm, or $14 \times 10$ cm (3D Accuitomo 170, Morita Corp). A basic voxel size of 0.08 mm or 0.125 mm was used for evaluation. The operating parameters were set at 5.0 mA and 80 kV, and the exposure time was 17.5 seconds. The data were reconstructed in slices at an interval of 0.5 mm. Assessments of the maxillary sinuses were done in the axial, sagittal, and coronal planes using dedicated CBCT software (i-Dixel, Morita Corp). When needed, the digital magnifying tool and ruler within the i-Dixel viewer were included.

Patient age (at the time of imaging) and sex were recorded. The status of the dentition in the posterior maxilla with regard to the maxillary sinus under investigation was classified as completely edentulous, partially edentulous, or dentate. Maxillary sinus pathology was recorded radiographically based on criteria modified by Schneider and coworkers: 0 = inconspicuous/no thickening of the sinus membrane; 1 = flat, shallow thickening (> 2 mm); 2 = flat, shallow thickening (> 4 mm); 3 = semispheric thickening of the membrane; 4 = complete opacification of the sinus; 5 = mixed flat and semispheric thickening; and 6 = other (eg, bone destruction, cyst, aspergilloma, foreign body, suspected neoplasia).

Septa measuring more than 2.5 mm in height were included in the analysis. The frequencies and types of septa were recorded and categorized as: sagittal (vertical, with an anteroposterior direction, Fig 1); coronal (vertical, with an orofacial/mediolateral direction, Fig 2); axial (horizontal, Fig 3); or other (not corresponding to any of the previous types). Coronal and sagittal septa of the maxillary sinus floor were further classified as primary (in relation to a root of a maxillary tooth/considered as congenital) or secondary (if appearing in an area without teeth/considered as having developed after tooth extraction).

The origin of each septum was also registered; these were classified as arising from the floor, roof, or anterior,
posterior, lateral, or medial wall of the maxillary sinus. The locations of septa on the sinus floor were recorded as anterior (in the premolar area), middle (from the distal aspect of second premolar to the distal aspect of the second molar), or posterior (from the distal aspect of second molar region to the tuberosity region). Furthermore, all coronal and sagittal septa were classified as complete if they crossed the sinus from one wall to the opposing wall. Complete septa were further classified into septa with or without compartmentalization of the maxillary sinus into two separate cavities.

All examinations and measurements were done by one observer (CS), who was initially calibrated by an experienced dentomaxillofacial radiologist (MMB). A second examiner (LMF) re-evaluated 50 randomly selected cases using the Cohen kappa test.21 A $P$ value < .05 was considered statistically significant. All tests were performed using R software (R 3.1.0, www.r-project.org).

**RESULTS**

**Population Under Investigation**

Initially, a total of 1,509 CBCT scans of the maxilla were screened. After the initial selection process, 221 CBCT scans visualizing at least one entire maxillary sinus were included. An additional 9 scans had to be excluded because the patients had already undergone surgery such as sinus floor elevation procedures and ear, nose, and throat procedures in the nasal cavity and paranasal sinuses. The final study sample consisted of 212 patients/CBCT scans (294 maxillary sinuses), with 82 scans exhibiting both maxillary sinuses and 130 exhibiting one sinus (unilateral). In the population analyzed, 126 patients were women (59.4%) and 86 were men (40.6%); the mean age was 53.8 years (range, 8 to 84 years). In the posterior maxilla, 43 patients (14.6%) were edentulous, 145 (49.3%) were partially edentulous, and 106 (36.1%) were dentate. The most frequent indication for CBCT imaging in the 212 patients included in the present study was implant treatment planning (81 patients; 38.2%).

**Frequency of Maxillary Sinus Septa**

Of the 212 included patients, 141 had at least one septum, resulting in a frequency of 66.5%, and 25 of the 82 bilateral sinus scans showed septa in both maxillary sinuses. In the 294 maxillary sinuses evaluated, a total of 251 septa were present, and 166 sinuses presented...
with at least one septum (56.5%). The frequency of septa for the left sinus was 63.1% (n = 89); 54.6% of right sinuses (n = 77) had septa. This difference was not statistically significant (P = .18; Table 1). Of the sinuses presenting with septa, 59% (n = 98) had one, 31.9% (n = 53) had two, 7.9% (n = 13) showed three, and 1.2% (n = 2) had four maxillary sinus septa, respectively (Table 2).

With respect to patient sex, the frequency of septa in women was 69.0% (87 of 126) and it was 62.8% (54 of 86) in men; this difference was not statistically significant (P = .38; Table 1). No significant differences were found for the frequency of septa in relation to patient age (P = .65). Regarding the distribution of sinus septa in relation to the status of the dentition in the posterior maxilla, septa were present in 53.5% of completely edentulous, 57.9% of partially edentulous, and 55.7% of dentate regions (Table 2). No significant difference was found in the frequency of septa based on the type of dentition (P = .83 and P = .92 for the left and right sides, respectively; Table 1).

**Types, Morphology, and Locations of Maxillary Sinus Septa**

The most common orientation of septa was coronal (61.8%; n = 155; Fig 4), followed by axial (7.6%; n = 19; Fig 5) and sagittal (3.6%; n = 9). Most of the septa were located on the floor of the maxillary sinus (58.6%; n = 147). Therefore, the most frequently found septum type was located on the floor, had a coronal orientation, and was complete (38.6%; n = 97). More than one-fourth of the septa (n = 68; 27%) could not be classified as coronal, sagittal, or axial and were designated as “other.” The vast majority (66 of 68) were located at the roof of the maxillary sinus. In all sinuses analyzed, there were no septa with compartmentalization (Figs 1 to 3, Table 3).

The majority of the coronal septa on the floor were found in the region of the first or second maxillary molars (60.7%; n = 85), 21.4% (n = 30) were located in the retromolar (posterior) area, and 17.9% (n = 25) were in the premolar area. This difference was statistically significant (P < .001; Table 1). Of the 251 septa identified, 83 (33.1%) were located at the roof of the sinus, and 24.3% (n = 61) were located in the infraorbital canal. Of the 147 coronal and sagittal septa located on the sinus floor, 84 (58.3%) were considered primary and 41.7% (n = 60) were classified as secondary. Three sagittal septa on the floor could not be classified as primary or secondary (Table 4).

The differences in the orientation of the septa in relation to the type of dentition (dentate, partially edentulous, edentulous) were not statistically significant (P = .551 and P = .456 for left and right sides, respectively; Table 1). Furthermore, no significant differences were found with regard to the locations (anterior/middle/posterior) of the septa according to dentition (P = .169 and P = .683 for left and right sides, respectively; Table 1).

### Table 1: Analyses of Potential Correlations of Different Variables with Frequency, Location, and Type of Maxillary Sinus Septa

<table>
<thead>
<tr>
<th>Measurement</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of septa and maxillary sinus side</td>
<td>.183*</td>
</tr>
<tr>
<td>Frequency of septa and gender</td>
<td>.376*</td>
</tr>
<tr>
<td>Frequency of septa and age</td>
<td>.650</td>
</tr>
<tr>
<td>Frequency of septa and dentition (left)</td>
<td>.829</td>
</tr>
<tr>
<td>Frequency of septa and dentition (right)</td>
<td>.917</td>
</tr>
<tr>
<td>Frequency of septa and location for coronal septa on the floor</td>
<td>&lt; .001†</td>
</tr>
<tr>
<td>Dentition and septa orientation (left)</td>
<td>.551</td>
</tr>
<tr>
<td>Dentition and septa orientation (right)</td>
<td>.456</td>
</tr>
<tr>
<td>Dentition and septa on the floor: CSC/CS/ICS (left)</td>
<td>.650</td>
</tr>
<tr>
<td>Dentition and septa on the floor: CSC/CS/ICS (right)</td>
<td>.151</td>
</tr>
<tr>
<td>Dentition and type of septa (left)</td>
<td>&lt; .001†</td>
</tr>
<tr>
<td>Dentition and type of septa (right)</td>
<td>&lt; .001†</td>
</tr>
<tr>
<td>Dentition and location for coronal septa on the floor (left)</td>
<td>.169</td>
</tr>
<tr>
<td>Dentition and location for coronal septa on the floor (right)</td>
<td>.683</td>
</tr>
</tbody>
</table>

CSC = complete septa with compartmentalization; CS = complete septa without compartmentalization; ICS = incomplete septa.

*Fisher exact test; all other correlations evaluated with the Pearson chi-square test.

†Statistically significant difference (P < .05).

### Maxillary Sinus Pathology

Of the included maxillary sinuses, 107 (36.4%) were diagnosed as healthy and without thickening of the sinus mucosa, 42 (14.3%) showed a shallow thickening of > 2 mm, 40 (13.6%) showed moderate thickening of > 4 mm, 51 (17.3%) had a semispheric membrane, 7 (2.4%) presented with complete opacification of the sinus, and 5 (1.7%) had mixed flat and semispheric thickenings. In 42 sinuses (14.3%), other pathologic processes were present. With respect to the sex of the patients, the frequency of maxillary sinus pathology in women was 57.7% (101 of 175), and it was 72.3% (86 of 119) in men. This difference was statistically significant (P = .013; Table 5). More pathologic sinuses were seen in older patients, resulting in borderline significance for the frequency of maxillary sinus pathology in relation to patient age (P = .064).

No significant differences were found for maxillary sinus pathology with respect to dentition type (P = .254 and P = .899 for the left and right sides, respectively).

Regarding the presence of septa and maxillary sinus pathology, 61.7% of the maxillary sinuses without pathology had at least one septum present (66 of 107 sinuses), and 53.3% of the maxillary sinuses with pathology had at least one septum (100 of 187). No significant differences
were found for the presence of septa in relation to maxillary sinus pathology ($P = 0.081$ and $P > .999$ for the left and right sides, respectively; Table 5).

### Interobserver Reliability

The Cohen kappa value for the 50 cases evaluated by both observers was almost perfect regarding septa frequency (Table 6). Furthermore, there was almost perfect concordance regarding the orientation of septa (classified into coronal, sagittal, axial, or other) and regarding the classification of coronal and sagittal septa into incomplete and complete types. Interobserver reliability was substantial for the location of the coronal septa on the floor, as grouped into anterior (premolar area), middle, and posterior (from the distal aspect of the second molar to the tuberosity) regions.
DISCUSSION

Different methods have been used to evaluate and analyze the presence, types, and locations of septa in the maxillary sinus in previous studies, including panoramic radiographs, computed tomographic imaging, and direct assessment of patients undergoing sinus surgery and human cadavers. In addition to these methodologic differences between studies in visualizing sinus septa, there have also been variations in the definition of septa. To avoid including mere irregularities on the bony surface of the maxillary sinuses, a threshold of at least 2.5 mm in septa height, as proposed by Ulm and coworkers, was used for the present study.

In the present investigation, 66.5% of the patients had septa and 56.5% of the sinuses had septa. These percentages are higher than those reported by Pommer et al in their meta-analysis, with septa present in 28.4% of the sinuses evaluated. González-Santana and coworkers used 2.5 mm as the minimal septum height for inclusion; they evaluated panoramic radiographs and CT scans and found a septa frequency of 36.7% of patients and 25% of maxillary sinuses. A study by Park et al, which used a minimal septum height of 3 mm and an analysis based on CT scans, reported a septa frequency of 37% for patients (27.7% for maxillary sinuses). Although Neugebauer et al evaluated CBCT scans and considered 2 mm as a threshold value for septum diagnosis, they reported a lower frequency of maxillary sinus septa (47% of patients, 33.3% of maxillary sinuses). Neugebauer and coworkers specified that they examined the sinus floor before SFE. Thus, they did not include the entire sinus in the analysis, which may explain the lower frequency of sinus septa compared to the frequency observed in the present study.

A similarly high frequency of septa was seen only in a study from Spain, which reported a frequency of 58.3% (35 of the 60 sinuses included). All the patients in that study were undergoing treatment planning for implant-supported restorations in the maxilla, and the proportion of dentate sites was very low (6 of 60). The authors explained the high frequency of septa with the hypothesis proposed by Kim and coworkers, who attributed the higher prevalence of septa in edentulous patients to secondary septa formation in edentulous areas. In the present study, only 14.6% of posterior sites were edentulous. Thus, the aforementioned theory may only partially explain the high frequency of septa detected. The inclusion and analysis of only those CBCT scans that depicted the entire maxillary sinus might have been of more importance for the present investigation. This is also demonstrated by the fact that 83 (33.1%) of the 251 septa identified were located at the roof of the sinus. In a recent study from Turkey that evaluated CBCT scans, an even higher percentage was reported, with 83.8% of the patients and 58% of the maxillary sinuses exhibiting maxillary sinus septa.

In the present study, no significant differences were found regarding the frequency of septa and age or sex of the patients and type of dentition (dentate, partially edentulous, edentulous). On the other hand, Rossetti et al concluded from their review that septa were more frequent in edentulous jaws. This was also reported in the meta-analysis of Pommer et al, which showed a significantly higher prevalence of septa in edentulous ridges than in dentate ridges. However, the authors emphasized that, since radiographic investigations are frequently carried out in selected patient groups such as those referred for implant treatment planning, recruitment bias may be present. Again, the data in the literature may also vary from the findings in the present study owing to the inclusion of the whole maxillary sinus and the high percentage of septa located on the roof of the sinus.

The most common orientation of the septa found in the present study was coronal (61.8%), followed by axial (7.6%) and sagittal (3.6%), and most septa (58.6%) were located on the floor of the maxillary sinus. The proportion of axial septa registered by Pommer et al was lower (1.3%), which may have been a result of the difficulty in identifying these when exploring the sinus during surgery and in panoramic radiographs. Also, axial septa are not easy to identify when three-dimensional radiography is used, if the resolution of CT/CBCT is not sufficiently high, and if septa are only evaluated by looking at axial planes, as has been proposed by several authors. This may explain why the frequency of axial septa in those studies was not mentioned or axial septa were not detected.

In the present investigation, the majority of coronal septa located on the floor of the sinus were found in the region of the first or second maxillary molars, corroborating data reported in earlier studies. For the coronal and sagittal septa located on the floor of the sinus, 58.3% were classified as primary and 41.7% as secondary in the present investigation, which is in contrast to data reported in earlier studies. This may be explained by the fact that, in the present investigation, there was a high percentage of dentate maxillae (106 of 294), and the analysis was based on CBCT scans taken for a variety of indications. In contrast, in the aforementioned studies, patients were preparing for treatment with implant-supported restorations in the maxilla, and the majority of the study population was partially dentate or edentulous. Nevertheless, when considering the data from the present study, the concept of classifying maxillary sinus septa into primary and secondary is of limited clinical significance, as septa can be found throughout the maxillary sinus, and their locations, morphology, and orientations may be of greater importance to the clinician.

Several studies have compared the number of septa localized in panoramic radiographs with the actual number
of septa detected during surgery\(^\text{25}\) or with those diagnosed using CT scans\(^\text{10-12}\), these have demonstrated the poor reliability of panoramic radiographs for the detection of maxillary sinus septa. Thus, a meticulous study by means of three-dimensional imaging using CT or CBCT is recommended, especially prior to SFE procedures\(^7,8\). The presence of septa has been related to an increased risk of perforation of the sinus membrane during SFE. In a study of 100 patients scheduled for SFE, Zijderveld and coworkers\(^\text{30}\) reported 11 membrane perforations, 5 of which were directly related to the presence of septa. In a recent investigation, von Arx et al\(^2\) observed a rate of perforations in patients with septa of 42.9%; the rate of perforations was 23.8% in patients without septa. Thus, detailed knowledge of the anatomic structures of the maxillary sinus seems to be beneficial prior to SFE to avoid surgical complications.

Thirty-six percent of the maxillary sinuses included were diagnosed as healthy and without thickening of the sinus membrane. Similar results were found in studies by Janner et al\(^\text{31}\) (45%) and Schneider et al\(^\text{12}\) (35.5%), who also used CBCT scans and similar threshold values of mucosa thickening for classification as pathologic. In the present study, no significant association was found between the presence of septa and maxillary sinus pathology. To the authors’ knowledge, there are no studies that have linked pathologic findings of the maxillary sinus to the presence of septa.

The Cohen kappa values for the 50 randomly selected cases evaluated by two observers in the present study were very high, ranging from 0.764 to 1. Shibli and coworkers\(^\text{32}\) studied the prevalence of septa in completely edentulous subjects using panoramic radiographs, which were evaluated by three different calibrated examiners. They found similarly high interobserver agreement, with kappa values that ranged from 0.77 to 0.87. In an analysis of panoramic versus CT images, Maestre-Ferrín et al\(^\text{12}\) reported the frequency of septa in 30 patients evaluated by three observers. The interobserver agreement for the detection of septa on panoramic radiographs ranged between 0.50 and 0.62, whereas the values were clearly higher for CT scans and ranged from 0.66 to 0.97. Based on the findings of the present investigation, the reliability of CBCT image analysis seems to be very high for various parameters and similar to or slightly better than that reported for panoramic radiography or CT.

**CONCLUSIONS**

Because of the retrospective nature of this study and the limited number of cases included, the results must be interpreted with some caution. On the basis of the presented data, the following can be concluded:

- In the majority of cases, septa were observed in the first or second molar region on the floor of the maxillary sinus.
- Of the septa identified, 33.1% were located at the roof of the sinus, whereas 24.3% were related to the infraorbital canal.
- The most common orientation of the septa was coronal (61.8%), followed by axial (7.6%) and sagittal (3.6%).
- More than one-fourth of the septa could not be classified as coronal, sagittal, or axial and were designated as “other.” This group certainly merits a more detailed analysis regarding morphology and location in future studies.
- The present study showed no evidence that the frequency of maxillary sinus septa is associated with age, sex, or status of the dentition of the patients.

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**Table 5 Analysis of Potential Correlations of Different Variables with Maxillary Sinus Pathology**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Test</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of septa and pathology (left)</td>
<td>Fisher exact test</td>
<td>.08097</td>
</tr>
<tr>
<td>Frequency of septa and pathology (right)</td>
<td>Fisher exact test</td>
<td>&gt; .9999</td>
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<tr>
<td>Dentition and pathology (left)</td>
<td>Pearson chi-square</td>
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</tr>
<tr>
<td>Dentition and pathology (right)</td>
<td>Pearson chi-square</td>
<td>.8993</td>
</tr>
<tr>
<td>Sinus side and pathology</td>
<td>Fisher exact test</td>
<td>.2744</td>
</tr>
<tr>
<td>Gender and pathology</td>
<td>Fisher exact test</td>
<td>.0134*</td>
</tr>
<tr>
<td>Age and pathology</td>
<td>Pearson chi-square</td>
<td>.0641</td>
</tr>
</tbody>
</table>

*Statistically significant difference \((P < .05)\).

**Table 6 Interobserver Reliability (Cohen \(\kappa\) Values) for Different Variables Among the 50 Cases Evaluated by Both Observers**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>(\kappa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of septa</td>
<td>0.987</td>
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<tr>
<td>Septa orientation</td>
<td>0.916</td>
</tr>
<tr>
<td>Coronal and sagittal septa on the floor: CSC/CS/ICS</td>
<td>0.833</td>
</tr>
<tr>
<td>Location for coronal septa on the floor</td>
<td>0.764</td>
</tr>
<tr>
<td>Type of septa</td>
<td>1</td>
</tr>
<tr>
<td>Sinus pathology</td>
<td>0.9</td>
</tr>
</tbody>
</table>

CSC = complete septa with compartmentalization; CS = complete septa without compartmentalization; ICS = incomplete septa. \(\kappa\) values: no agreement ≤ 0; slight = 0 to 0.2; fair = 0.21 to 0.40; moderate = 0.41 to 0.60; substantial = 0.61 to 0.80; almost perfect = 0.81 to 1.\(^2\)
• Further studies may assess whether a diagnosis of maxillary sinus septa with cone beam computed tomographic imaging leads to modifications of dental implant treatment planning or may be beneficial prior to sinus floor elevation to avoid surgical complications.

ACKNOWLEDGMENTS

The authors report no conflicts of interest related to this study.

REFERENCES