CASE REPORT

# THE IMPORTANCE OF THE IMAGING ASPECTS OF RHINOSINUSITIS IN DENTISTRY: A CASE REPORT

## *A IMPORTÂNCIA DOS ASPECTOS IMAGINOLÓGICOS DA RINOSSINUSITE NA ODONTOLOGIA: UM RELATO DE CASO*

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## Resumo

A rinossinusite é uma das patologias mais comuns que afetam os seios paranasais, sendo basicamente subdividida em aguda ou crônica. Os seios maxilares são os mais acometidos e sendo esses intimamente relacionados às raízes dos dentes posterosuperiores, é de suma importância que os cirurgiões dentistas detenham o perfeito conhecimento dos aspectos clínicos e imaginológicos dessa afecção. Objetivando o enfático direcionamento para a utilização da tomografia computadorizada, mais especificamente a tomografia computadorizada de feixe cônico, discutiu-se um caso clínico expondo a subjetividade da sintomatologia dessa afecção e do importante papel desse exame de imagem no diagnóstico assertivo e, consequentemente, em uma correta terapêutica.


**Palavras-chave:** Rinossinusite aguda. Rinossinusite crônica. Seios maxilares. Tomografia computadorizada. Tomografia computadorizada de feixe cônico.


## *Abstract*

*Rhinosinusitis is one of the most common pathologies affecting the paranasal sinuses and is basically subdivided into acute or chronic. The maxillary sinuses are the most affected and these are closely related to the roots of the posterosuperior teeth. It is of utmost importance that dentists have a perfect knowledge of the clinical and imaging aspects of this condition. Aiming at an emphatic direction for the use of computed tomography, more specifically cone beam computed tomography, a clinical case was discussed exposing the subjectivity of the symptomatology of this condition and the important role of this imaging examination in assertive diagnosis and, consequently, in a correct therapy.*


***Keywords:*** *Acute rhinosinusitis. Chronic rhinosinusitis. Maxillary sinuses. Computed tomography. Cone-Beam Computed Tomography.*

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## INTRODUCTION

In the craniofacial complex there are four parallel sets of cavities filled with air called paranasal sinuses, which are represented by the maxillary, frontal, sphenoid sinuses and by the ethmoid air cells. Among these, the most important for the dental surgeon are the maxillary sinuses, as due to their close proximity to teeth and support structures, they can be affected by pathologies of odontogenic origin or dental pathologies can mimic conditions inherent to them (1).

Paranasal sinuses have a mucosal lining made up of pseudo-stratified columnar epithelium. These cilia remain in constant motion, propelling the mucus towards the sinus ostia. The mucosal flow is specific to each sinus and is maintained even if alternative openings are created. This dynamics is easily observed in the maxillary sinus, where the flow is directed towards the ostium primum, from where it is transported through the infundibulum to the semilunar hiatus and from there to the middle meatus. From the middle meatus, secretions from the maxillary, frontal and ethmoid sinuses finally go to the nasopharynx (2,3).

Infections of the upper airways, including the paranasal sinuses, are one of the most common problems found in medical care services. Among these, rhinosinusitis is one of the most common clinical conditions, and the maxillary sinus is the most affected, followed only by ethmoid air cells. Rhinosinusitis causes inflammatory changes that trigger the retention and ciliary dysfunction of sinus secretions, which can cause the obstruction of the ostiomeatal complex (4).

Rhinosinusitis is usually triggered by an allergen, bacteria or virus and can be classified according to its duration: acute (<12 weeks) or chronic (≥ 12 weeks), and, depending on the severity of the condition, mild, moderate or severe (5,6). The acute variant is the most common of the pathologies involving the maxillary sinuses and also the most associated with complications such as edema of the face and orbit and brain abscesses (1).

The diagnosis of rhinosinusitis is essentially based on clinical aspects, and auxiliary diagnostic methods can be used, such as anterior rhinoscopy, nasal endoscopy, radiographs, computed tomography and magnetic resonance imaging. Classically, auxiliary methods are reserved for recurrent cases or those that present some complication (1,3,7).

This study aims to report a case of rhinosinusitis, exploring the imaging aspects of this condition, using radiographs and cone beam computed tomography, discussing the differential diagnoses and their importance in dental practice.

## CASE REPORT

Female patient, 29 years old, ballerina, with no history of systemic pathologies, long-term medication use or allergies. She sought the Emergency Service of Hospital Naval Marcílio Dias complaining of pain and facial pressure, on the left side, in the region coinciding with that of the upper left 1nd premolar tooth (12), approximately two weeks ago, without reporting a previous event of similar clinical aspects. Based on the symptoms reported by the patient, she was referred for evaluation at the Odontoclínica Central da Marinha (OCM) for displaying a picture that suggested to be of odontogenic origin.

Initially, the patient was evaluated in the OCM Semiology sector, where she reported pain referred to that upper premolar, in decubitus, which exacerbated with differences in level and impact, and was disabling her in her dance practice. The patient also complained of clicks related to the left Temporomandibular Joint (TMJ). In clinical analysis, no evidence was found to be related to the patient's complaint, so a periapical radiography of upper premolars was performed on the left side premolars (Figure 1).

When analyzing the periapical radiography, images compatible with caries or periapical lesions on teeth 12 and 13 were not observed. In addition, teeth 14 and 15, seen in the same radiographic shot, also did not present images corresponding to caries, and it is not possible to view the periapical portion in full because the image is framed for analysis of premolar teeth in the same quadrant. In addition to the clinical data, the radiographic image suggests that the patient's main complaint is not of odontogenic origin.

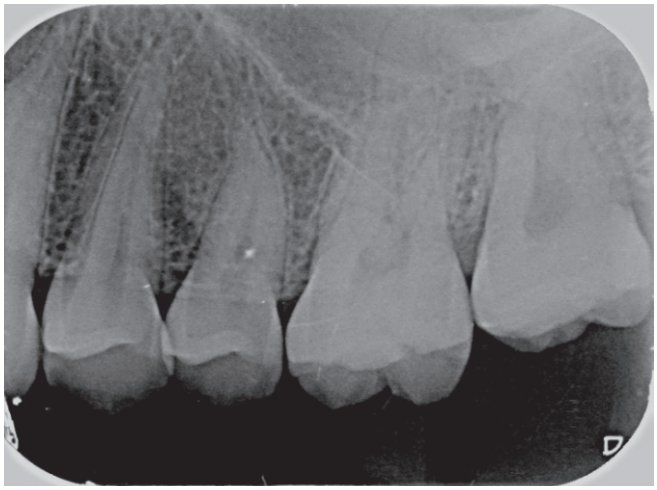

Figure 1 - Periapical radiography of the 1st premolar (tooth 12)

Taking into account the conclusions of these preliminary analyses and the complaint presented by the patient, the dental radiology sector was asked a panoramic radiography and the patient was referred for evaluation at the Temporomandibular Disorder (TMD) clinic.

At the TMD clinic, the patient was examined and when pressing the periapical region of teeth 12 and 13, she manifested painful symptoms. When analyzing the panoramic radiography, it was possible to notice a slight opacification in the left maxillary sinus (Figure 2).

However, panoramic radiography has limitations linked to the many overlaps of anatomical structures, distortions and ghost images, thus for a better visualization of the observed condition, volumetric acquisition in the Imaging sector was requested. In this method of imaging, there are no overlaps or distortions that compromise diagnosis.

The volumetric acquisition by cone beam was made using the Ortophos® device, with 0.1mm voxel and subsequent axial, sagittal and coronal multiplanar reconstruction with a thickness of 1mm ( Figure 3).

Figure 2 - Panoramic radiography

When analyzing axial reconstruction of CBCT it was possible to observe an image with isodensity of soft tissue, in the form of a dome, suggestive of mucosal secretion, associated with mucosal thickening in all the walls of the left maxillary sinus.

In sagittal reconstruction it is possible to notice the same image inside the sinus, without any connection with the dental roots in question, with the sinus floor having a normal bone aspect and without hypodense images associated with the roots of the molar teeth framed in the image (Figure 4). When viewing the coronal reconstruction, it is possible to observe the

Figure 3 - CBCT - Axial reconstruction

same image with soft tissue density in the shape of a dome (Figure 5). In addition, it is possible to see that the thickly mucosal membrane already mentioned extends to the drainage ostium of the left maxillary sinus, suggesting its obstruction.When navigating the axial reconstruction

Figure 4 - CBCT - Sagittal reconstruction

and intersectional analysis, it was possible to notice hypodense images (air bubbles) in between.

In view of the mucosal thickening involving all the walls of the left maxillary sinus, with an image of density compatible with that of soft tissue

Figure 5 - CBCT - Coronal reconstruction

(mucosal secretion), covering the left maxillary sinus drainage ostium, showing obstruction and hypodense images (air bubbles) in between, the case presented by the patient suggests chronic rhinosinusitis in an acute episode. Thus, the patient was referred for treatment with an otorhinolaryngologist (Figures 6 and 7).

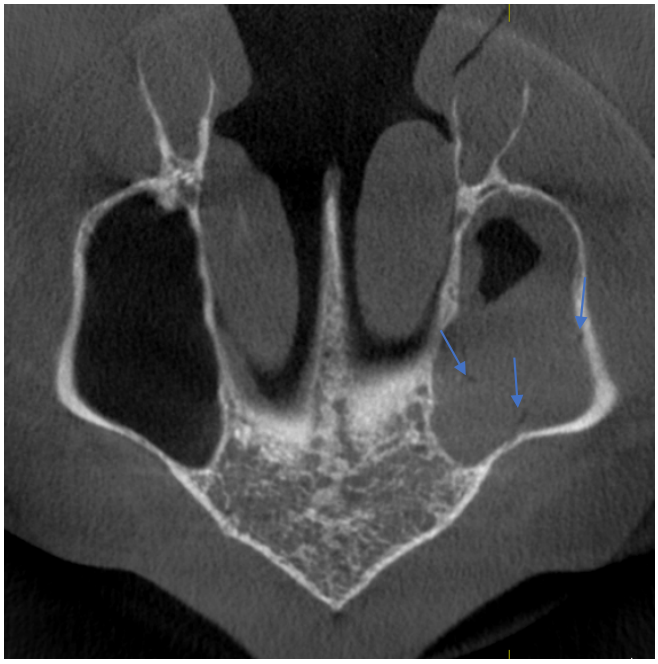

Figure 6 - Axial reconstruction with hypodense images in between (air bubbles).

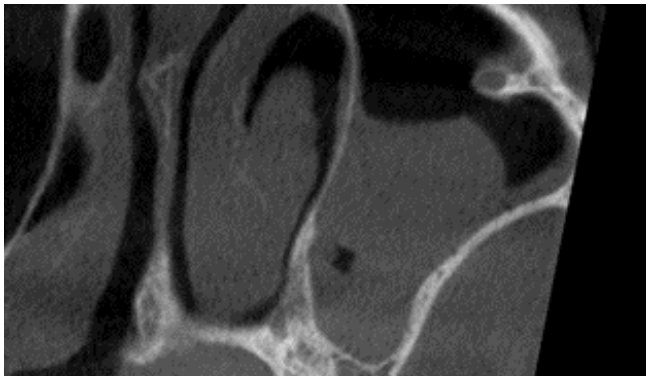

Figure 7 - Hypodense image (air bubble) in intersectional view.

## DISCUSSION

Classically, the diagnosis of rhinosinusitis, acute and chronic, is subjective, with faithful observance of the main symptoms of these pathologies, which vary basically in terms of time and intensity (8,9). The main factors to be observed in these conditions are: nasal obstruction/congestion or rhinorrhea (anterior or posterior), accompanied or not by facial pressure/pain and/or reduction or loss of smell. Minor factors that can also be observed are: headache, fever, halitosis, fatigue, dental pain, cough, pain, pressure or fullness in the ear. However, in the chronic spectrum, patients may be asymptomatic, experiencing sporadic acute exacerbations. This brings us to the present case, in which the patient experienced symptoms listed here, however without correlating a similar episode previously, denoting the asymptomatic aspect, for a long period of time, that the chronic variant may assume in some individuals (10,11,12).

In practice, the accurate diagnosis of rhinosinusitis, especially the acute form, is difficult to establish, being often mistaken for a common cold or allergic conditions and is invariably based on clinical examination and conventional radiological examinations. This practice often leads to false positive or false negative diagnoses, resulting, for example, in the unnecessary use of antimicrobials. This theme was quite evident in the case reported in this article, where the great subjectivity of the symptoms presented made the assertive diagnosis extremely difficult, preventing the establishment of adequate treatment (7).

Conventional radiology is the oldest auxiliary method available for the diagnosis of rhinosinusitis. The complete radiological study of the paranasal sinuses is done through the Frontonaso (Caldwell), Mentonaso (Waters), Profile and Axial views of Hirtz. In addition to these, there is also the dental overview, which highlights the possible infectious foci in the dental apices and analyzes the relationships between the maxillary teeth and the maxillary sinuses. However, sinus radiography and dental overview have a high rate of misdiagnosis, so its value has been progressively decreasing, which is understandable, given its limited value for diagnostic information compared to more

modern methods. When making a contextualization with the present clinical case, it was clear that the radiographs may suggest alterations, but due to the limited ability to portray the imagological aspects that this pathology prints in the anatomical structures, having the possibility of appropriating more advanced diagnostic methods represents great opportunities to obtain correct diagnoses (9,11,13).

Thus, it is possible to assess the high value that computed tomography (CT) adds, making this diagnostic method to be considered the gold standard for assessing paranasal sinuses and their pathologies. Its ability to demonstrate and differentiate bone structures, soft tissues and air, without overlapping structures by making sectional images, allows a thorough assessment of anatomy, anatomical variations and the presence and extent of intra and extra-sinus lesions. Many of these variations are closely related to cases of recurrent and chronic rhinosinusitis. CT should be performed in sagittal, axial and coronal planes. The coronal view is particularly rich in information and the most explored, especially when performed in a plane perpendicular to the hard palate allowing a detailed study of the frontal sinus, the maxillary alveolar recess, the lateral and upper walls of the ethmoid and the anatomical elements that make up the ostiomeatal complex. There is also magnetic resonance imaging (MRI), which allows better visualization of soft tissues than CT, but does not adequately represent the bone walls and ostia of the paranasal sinuses (14,15,16).

Despite the vast literature indicating CT as a resource to be used in refractory, recurrent and complicated cases of rhinosinusitis, when analyzing the clinical case it is possible to verify that the less sporadic use allows a better identification of the structures and possible variations of the nasal and paranasal cavities. In addition, it allows for better screening and treatment of cases of rhinosinusitis, especially those in which the subjectivity of clinical aspects generates diagnostic confusion, which can result in complications due to inadequate treatment, erroneous referrals to other professionals, demanding time to start the therapy and impact on the patient's quality of life, or even administration of unnecessary medications, such as corticosteroids and antibiotics (17).

Helical CT is used in specific cases due to its high cost and high radiation dose. In this work, with the use of CBCT, it was possible to diagnose it through an image exam that offers a low dose of radiation when compared to helical CT, shorter acquisition time and better image resolution, justifying a less punctual use, but maintaining always faithful observance of the ALARA principle (as low as reasonably achievable). Using this method of volumetric acquisition, it was possible to evaluate the imaging aspects of rhinosinusitis, in addition to allowing the visualization of the structures of the ostiomeatal complex in coronal reconstruction. As already mentioned in this article, this reconstruction is the most valuable for the appreciation of sinus structures. It is important to note that the only imaging exam capable of bringing this valuable complex to light is the CT scan, and it was through it that the observation of a possible obstruction of the drainage ostium of the left maxillary sinus could be observed, subsidizing the necessary clinical conduct to cease the probable feedback process of the condition (1.18).

It is of special importance to know the imaging aspects of these pathologies, aiming at a correct differential diagnosis. Therefore, it must be considered that acute viral rhinosinusitis usually presents mucosal thickening in the nasal cavity, involving the nasal turbinates, with a non-specific aspect. The findings of the bacterial infection reflect ostial obstruction, with the formation of a liquid level, mainly in the maxillary sinuses, which can also occur in the other paranasal sinuses, usually with gaseous "bubbles" inside and nasosinusal mucosal thickening (9,18). While with CT, chronic rhinosinusitis reveals bone sclerosis, accompanied by thickening of the bone walls of the affected sinus, with polypoid mucosal thickening. Because the mucosal content is high in protein, it can sometimes be more hyperdense on CT. However, by combining this knowledge with the clinical case discussed in this work, it is easy to notice that the acute and chronic entities are didactically divided and the mastery of their clinical and imaging characteristics is paramount, always keeping in mind that they may correlate in a single case, as reported (9).

Unlike the images observed in this clinical case, there is still fungal rhinosinusitis, which on CT appears as a mucosal thickening in different

thicknesses, or in the form of a total or partial opacification of the involved sinus, and it is also possible to notice calcifications and permeated hyperdense material between the mucosal secretion (11,18,19).

A clinical entity that deserves mention is the rhinosinute of odontogenic origin. Despite having clinical and imaging aspects similar to those observed in rhinosinutes of non-odontogenic origin, it differs from these in its cause and, consequently, in the microbiological aspect of the condition. The posterior upper teeth are closely related to the maxillary sinus, and the presence of inflammation, infection or iatrogenesis of dental origin can affect the integrity of the floor of that sinus, triggering a rhinosinusitis. Especially due to the fact of having similar symptoms, it is imperative the correct extra and intraoral evaluation, using a physical and image examination, with CT being the most relevant. An imaging aspect worthy of note in this condition that distances itself from those seen in the others are the well-known alveolar domes, which are formed due to the fact that the roots of the upper posterior teeth are separated from the sinus cavity only by the mucoperiosteum membrane. Realistically, by making a timely retrospective of the case discussed here, it is possible to see the importance of eliminating the odontogenic cause, as it can mimic or cause pathologies of sinus origin. Without the correct screening of the causes, and including diseases of dental origin, it would not have been possible to differentiate the purely sinus condition from an odontogenic one. (18,20).

The perfect knowledge of the tomographic aspects of the rhinosinusitis variants allows the differential diagnosis and ends up proving to be a primordial ally for the establishment of the correct therapy (7,18).

## CONCLUSION

The report of the present clinical case showed that the faithful observance of clinical aspects, combined with the imaging information that computed tomography adds, resulted in an assertive diagnosis, which led to the correct therapy, returning the quality of life to the patient, preventing recurrent cases, refractory or even possible complications.

The authors declare no conflicts of interest

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