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Clinical Case

Canalis Sinuosus Mimicking Apical Pathology: CBCT Diagnosis to Prevent Unnecessary Endodontic Treatment – a Case Report

Canalis Sinuosus Simulando Patologia Apical: Diagnóstico por TCFC para evitar Tratamento Endodôntico Desnecessário – Relato de Caso

El Canalis Sinuosus Simulando Patología Apical: Diagnóstico Mediante CBCT para Evitar Tratamientos Endodóncicos Innecesarios – Presentación de un Caso

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Abstract

The canalis sinuosus (CS) is an anatomical neurovascular canal of the anterior maxilla that may mimic periapical pathology on conventional radiographs because of its variable anatomical course. Failure to recognize this anatomical variation may result in misdiagnosis and unnecessary endodontic treatment. This report describes the role of cone-beam computed tomography (CBCT) in establishing the correct diagnosis of the canalis sinuosus. Case Report: A 56-year-old man was referred for endodontic treatment after panoramic and periapical radiographs revealed a radiolucent finding adjacent to the apex of tooth 13, raising suspicion of periapical pathology. Because the clinical and radiographic findings were inconsistent with endodontic disease, CBCT was performed. Three-dimensional imaging demonstrated that the radiolucent finding corresponded to the terminal portion of the right canalis sinuosus, with no involvement of the root or periapical tissues. Root canal treatment was therefore deemed unnecessary, and the patient proceeded with the planned prosthetic rehabilitation. This case demonstrates the value of CBCT in differentiating anatomical variations from true periapical disease when conventional radiographic findings are inconclusive. Recognition of the canalis sinuosus can prevent diagnostic errors and avoid unnecessary endodontic treatment. Conclusion: Awareness of the canalis sinuosus and the appropriate use of CBCT are essential for distinguishing anatomical variations from pathological conditions, improving diagnostic accuracy, and supporting appropriate patient management.
Descriptors: Canalis Sinuosus; Cone-Beam Computed Tomography; Anatomical Variation; Diagnosis, Differential; Periapical Lesion.

Resumo

O *canalis sinuosus* (CS) é um canal neurovascular anatômico localizado na maxila anterior que, devido ao seu trajeto anatômico variável, pode simular uma patologia periapical em radiografias convencionais. A falha em reconhecer essa variação anatômica pode levar a um diagnóstico incorreto e à realização de tratamento endodôntico desnecessário. Este relato descreve o papel da tomografia computadorizada de feixe cônico (TCFC) no estabelecimento do diagnóstico correto do *canalis sinuosus*. Relato de caso: Um homem de 56 anos foi encaminhado para tratamento endodôntico após radiografias panorâmica e periapical revelarem uma imagem radiolúcida adjacente ao ápice do dente 13, levantando a suspeita de patologia periapical. Como os achados clínicos e radiográficos não eram compatíveis com uma doença endodôntica, foi solicitada uma TCFC. A imagem tridimensional demonstrou que a área radiolúcida correspondia à porção terminal do *canalis sinuosus* direito, sem qualquer envolvimento da raiz ou dos tecidos periapicais. Portanto, o tratamento endodôntico foi considerado desnecessário, e o paciente seguiu com o planejamento de reabilitação protética. Este caso demonstra a importância da TCFC na diferenciação entre variações anatômicas e patologias periapicais reais, especialmente quando os achados radiográficos convencionais são inconclusivos. O reconhecimento do *canalis sinuosus* pode prevenir erros de diagnóstico e evitar tratamentos endodônticos desnecessários. Conclusão: O conhecimento sobre o *canalis sinuosus* e o uso adequado da TCFC são fundamentais para distinguir variações anatômicas de condições patológicas, aumentando a precisão diagnóstica e auxiliando na condução clínica adequada do paciente.
Descritores: Canalis Sinuosus; Tomografia Computadorizada de Feixe Cônico; Variação Anatômica; Diagnóstico Diferencial; Lesão Periapical.

Resumen

El *canalis sinuosus* (CS) es un conducto neurovascular anatómico situado en la región anterior del maxilar que, debido a su trayecto anatómico variable, puede simular una patología periapical en las radiografías convencionales. No reconocer esta variante anatómica puede conducir a un diagnóstico erróneo y a la realización de tratamientos endodóncicos innecesarios. Este informe describe el papel de la tomografía computarizada de haz cónico (CBCT, por sus siglas en inglés) en el establecimiento de un diagnóstico correcto del *canalis sinuosus*. Presentación del caso: Un hombre de 56 años fue remitido para un tratamiento endodóncico después de que las radiografías panorámicas y periapicales revelaran una imagen radiolúcida adyacente al ápice del diente 13, lo que suscitó la sospecha de una patología periapical. Dado que los hallazgos clínicos y radiográficos no eran coherentes con una patología endodóncica, se realizó una CBCT. Las imágenes tridimensionales demostraron que la imagen radiolúcida correspondía a la porción terminal del *canalis sinuosus* derecho, sin afectación de la raíz ni de los tejidos periapicales. Por consiguiente, se determinó que el tratamiento de conductos era innecesario y el paciente continuó con la rehabilitación protésica planificada. Este caso demuestra la utilidad de la CBCT para diferenciar las variantes anatómicas de una verdadera patología periapical cuando los hallazgos radiográficos convencionales no son concluyentes. El reconocimiento del *canalis sinuosus* puede prevenir errores diagnósticos y evitar tratamientos endodóncicos innecesarios. Conclusión: Conocer la existencia del *canalis sinuosus* y hacer un uso adecuado de la CBCT resulta fundamental para distinguir las variantes anatómicas de las afecciones patológicas, mejorar la precisión diagnóstica y favorecer un manejo adecuado del paciente.
Descriptores: Canalis Sinuosus; Tomografía Computarizada de Haz Cónico; Variación Anatómica; Diagnóstico Diferencial; Enfermedades Periapicales

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INTRODUCTION

The canalis sinuosus (CS) is a neurovascular canal arising from the infraorbital canal that carries the anterior superior alveolar nerve and accompanying vessels through the anterior maxilla. Cone-beam computed tomography (CBCT) studies have demonstrated that the CS and its accessory canals are common anatomical structures exhibiting considerable morphological variability[1-3].

Due to its variable anatomical course and close relationship with the roots of the maxillary anterior teeth, the CS may mimic pathological conditions on conventional radiographs, particularly periapical lesions and external root resorption. The inherent limitations of two-dimensional imaging, including anatomical superimposition and the absence of depth information, may further contribute to diagnostic misinterpretation[4,5].

Despite its clinical relevance, the canalis sinuosus remains underrecognized in routine dental practice, which may result in misdiagnosis and unnecessary endodontic treatment or other invasive procedures. Cone-beam computed tomography (CBCT) enables three-dimensional evaluation of the anterior maxilla without the anatomical superimposition inherent to conventional radiography, allowing accurate identification of the canalis sinuosus and its relationship with adjacent dental structures[1,3]. Greater awareness of this anatomical variation may improve diagnostic accuracy and prevent unnecessary interventions[2].

This report describes a case in which the terminal portion of the canalis sinuosus mimicked apical pathology on conventional radiographic examination. Cone-beam computed tomography (CBCT) enabled the accurate diagnosis of this anatomical variation, emphasizing the importance of three-dimensional imaging in the differential diagnosis of radiolucent lesions in the anterior maxilla and in preventing unnecessary endodontic treatment.

CASE REPORT

A 56-year-old male patient presented to the dental school seeking oral rehabilitation with a removable prosthesis. During the initial appointment, a panoramic radiograph was obtained (Figure 1A). Upon image analysis, a periapical radiograph of tooth 13 was requested due to the presence of a radiolucent finding adjacent to the apical region of the tooth (Figure 1B). Because the radiolucent finding was suspected to be of endodontic origin, the patient was referred to the Endodontics Department for root canal treatment.

While awaiting the scheduled endodontic appointment, the patient sought emergency dental care due to dislodgement of the metal coping of tooth 23, which resulted in the loss of the fixed prosthesis. During this visit, the attending dentist reviewed the radiographic examinations and questioned the initial diagnosis. Given the apparent proximity of the radiolucent finding to the apex of tooth 13, several diagnostic hypotheses were considered, including external root resorption, inflammatory periapical lesions, a lateral periodontal cyst, and anatomical variations of the anterior maxilla. However, the absence of clinical symptoms and radiographic signs of root involvement, such as apical blunting, root canal perforation, or disruption of the lamina dura, made these diagnoses less likely. Given the discrepancy between the radiographic findings and the clinical presentation and the clinical findings, a cone-beam computed tomography (CBCT) examination was requested to clarify the nature of the radiolucent finding and its relationship with the adjacent anatomical structures.

CBCT examination revealed that the structure initially suspected to represent a pathological finding was located adjacent to tooth 13, without direct involvement of the root or periapical tissues. The lamina dura and surrounding periapical structures were preserved, with no evidence of bone rarefaction, root resorption, or other pathological changes (Figures 2A–C). Three-dimensional assessment further demonstrated a well-defined intraosseous canal originating from the superior aspect of the maxilla and extending inferiorly toward the anterior maxillary region, terminating in a palatal foramen near tooth 13 (Figures 2D and 3E). The continuity, anatomical course, and relationship of the canal with adjacent anatomical structures were consistent with the canalis sinuosus.

The radiolucent finding initially observed on conventional radiographs was ultimately identified as the terminal portion of the right canalis sinuosus, representing a normal anatomical variation rather than a pathological condition. The patient was informed of the diagnosis, and the previously proposed endodontic treatment was deemed unnecessary. The patient subsequently resumed the planned prosthetic rehabilitation. This study was approved by the Research Ethics Committee involving Human Subjects (CAAE: 97880126.2.0000.5420; Approval Number: 8.447.626). The requirement for informed consent was waived by the Ethics Committee due to the retrospective nature of the study.



Figure 1. Figure 1. Conventional radiographic findings. (A) Initial panoramic radiograph showing a radiolucent area in the periapical region of tooth 13. (B) Periapical radiograph of tooth 13 showing the radiolucent area adjacent to the apical third of the root.

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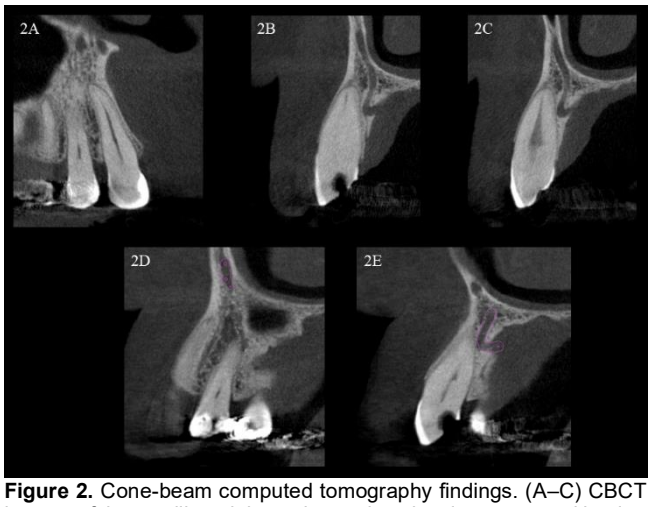


Figure 2. Cone-beam computed tomography findings. (A–C) CBCT images of the maxillary right canine region showing preserved lamina dura and absence of periapical bone rarefaction, with the radiolucent structure adjacent to the root apex but without direct involvement of the periapical region. (D, E) CBCT images demonstrating the course of the canalis sinuosus, extending toward the anterior maxilla and terminating at a palatal foramen near the maxillary right canine region.

DISCUSSION

The canalis sinuosus has gained increasing attention with the widespread use of cone-beam computed tomography (CBCT) in dental practice. Although historically underrecognized, recent studies have demonstrated that the canal and its accessory branches are common anatomical findings in the anterior maxilla and exhibit considerable variability in their prevalence, course, morphology, and terminal distribution[1-3.6-8]. This anatomical complexity may complicate radiographic interpretation, particularly when conventional two-dimensional imaging is used for evaluating the anterior maxillary region.

In the present case, the radiolucent finding was initially interpreted as a potential endodontic lesion, leading to referral for root canal treatment. The apparent proximity of the radiolucency to the apex of tooth 13 on panoramic and periapical radiographs raised suspicion of pathological conditions requiring clinical intervention. However, CBCT demonstrated that the finding was unrelated to the root or periapical tissues and instead corresponded to the terminal portion of the canalis sinuosus. Similar diagnostic challenges have been described in previous reports in which the canalis sinuosus was initially mistaken for periapical pathology because of the inherent limitations of conventional radiographic techniques, particularly anatomical superimposition and the absence of depth information[4,5,9].

The differential diagnosis of radiolucent findings in the anterior maxilla should extend beyond inflammatory periapical disease. External root resorption, developmental cysts such as the lateral periodontal cyst, and normal anatomical variations may present with similar radiographic appearances, particularly when evaluated using two-dimensional imaging[10,11]. Consequently, careful correlation between clinical findings and imaging characteristics is essential before establishing an irreversible treatment plan.

The present findings further highlight the diagnostic value of CBCT in situations where conventional radiographs provide inconclusive or potentially misleading information[12]. By eliminating anatomical superimposition and enabling three-dimensional visualization of the region of interest, CBCT allows accurate assessment of the relationship between anatomical structures and adjacent dental tissues. In the present case, this imaging modality was decisive in demonstrating that the radiolucent finding was unrelated to the root or periapical region, thereby excluding pathological conditions that would otherwise require endodontic intervention. Current recommendations from the American Association of Endodontists and the American Academy of Oral and Maxillofacial Radiology support the use of CBCT as an adjunctive imaging modality when conventional examinations are inconclusive and additional three-dimensional information may influence diagnosis or treatment planning[13].

Beyond diagnosis, recognition of the canalis sinuosus has important clinical implications for surgical and implant procedures involving the anterior maxilla. Injury to the neurovascular bundle contained within the canal or its accessory branches may result in bleeding, sensory disturbances, or postoperative discomfort, emphasizing the importance of preoperative identification of this anatomical structure[8,14]. Increased awareness of the canalis sinuosus and its anatomical variations may therefore contribute not only to improved diagnostic accuracy but also to safer surgical planning and the prevention of iatrogenic complications[1,2].

The present case reinforces that anatomical variations should always be considered in the differential diagnosis of radiolucent findings in the anterior maxilla, particularly when clinical and radiographic findings are inconsistent. Appropriate use of CBCT enabled the correct diagnosis, prevented unnecessary endodontic treatment, and allowed continuation of the planned prosthetic rehabilitation, highlighting the importance of comprehensive clinical and radiographic assessment in routine dental practice.

CONCLUSION

Anatomical variations such as the canalis sinuosus should be considered in the differential diagnosis of radiolucent findings in the anterior maxilla, as they may mimic apical pathology and lead to unnecessary treatment when evaluated solely with conventional radiographs. CBCT plays a critical role in distinguishing normal anatomical structures from true pathological conditions, thereby supporting accurate diagnosis, appropriate treatment planning, and the avoidance of unnecessary endodontic intervention.

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REFERENCES

1. Ferlin R, Pagin BSC, Yaedú RYF. Canalis sinuosus: a systematic review of the literature. Oral Surg Oral Med Oral Pathol Oral Radiol 2019;127:545-551.
2. de Oliveira-Neto OB, Barbosa FT, de Lima FJC, de Sousa-Rodrigues CF. Prevalence of canalis sinuosus and accessory canals of canalis sinuosus on cone beam computed tomography: a systematic review and meta-analysis. Int J Oral Maxillofac Surg 2023;52:118-131.
3. Samunahmetoglu E, Kurt MH. Assessment of Canalis sinuosus located in maxillary anterior region by using cone beam computed tomography: a retrospective study. BMC Med Imaging 2023;23:46.
4. Bissoon A, Bandoo C, Naraynsingh C, Mohamed S. Canalis Sinuosus Mimicking Periapical Pathology on, Radiographic Assessment. J Endod 2024;50:1159-1162.
5. Aoki R, Massuda M, Zenni LTV, Sá Fernandes K. Canalis sinuosus: anatomical variation or structure? Surg Radiol Anat 2020;42:69-74.
6. Beckenstrater MA, Gamieldien MY, Smit C, Buchanan GD. A cone-beam computed tomography study of canalis sinuosus and its accessory canals in a South African population. Oral Radiol 2024;40:367-374.
7. Kałuża O, Regulski PA, Tomczyk J, Pogorzelska A, Szopiński K. Analysis of course of canalis sinuosus on cone-beam computed tomography and in osteological specimens: a systematic review. Folia Morphol (Warsz) 2026;85:e01726020.
8. Alkis HT, Ata GC, Tas A. Evaluation of the morphology of accessory canals of the canalis sinuosus via cone-beam computed tomography. J Stomatol Oral Maxillofac Surg 2023;124:101406.
9. Shah PN, Arora AV, Kapoor SV. Accessory branch of canalis sinuosus mimicking external root resorption: a diagnostic dilemma. J Conserv Dent 2017;20:479-481.
10. Friedrich RE, Scheuer HA, Zustin J. Lateral periodontal cyst. In Vivo 2014;28:595-598.
11. Patel S, Saberi N, Pimental T, Teng PH. Present status and future directions: Root resorption. Int Endod J 2022;55 Suppl 4:892-921.
12. Chanani A, Adhikari HD. Reliability of cone beam computed tomography as a biopsy-independent tool in differential diagnosis of periapical cysts and granulomas: an in vivo study. J Conserv Dent 2017;20:326-331.
13. Special Committee to Revise the Joint AAE/AAOMR Position Statement on use of CBCT in Endodontics. AAE and AAOMR Joint Position Statement: use of cone beam computed tomography in endodontics 2015 update. J Endod 2015;41:1393-1396.
14. de C Machado V, Chrcanovic BR, Felippe MB, Manhães Júnior LRC, de Carvalho PSP. Assessment of accessory canals of the canalis sinuosus: a study of 1000 cone beam computed tomography examinations. Int J Oral Maxillofac Surg 2016;45:1586-1591

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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