

# Facial pain due to contact between dental implant with the Canalis Sinuosus

## Dor facial devido ao contato entre o implante dentário com o Canalis Sinuosus

Matheus Souza Vilas Boas Santos<sup>1</sup> , Luciana Loyola Dantas<sup>1</sup> , Rafael Drummond Rodrigues<sup>2</sup> , Fernanda Bulhões Fagundes<sup>3</sup> , Lucas de Paula Lopes Rosado<sup>3</sup> , Frederico Sampaio Neves<sup>3</sup> 

1. Department of Propedeutics and Integrated Clinic, Division of Oral Radiology, School of Dentistry, Federal University of Bahia, Brazil. 2. Department of Dental Clinics, Division of Oral Surgery, School of Dentistry, Federal University of Bahia, Brazil. 3. Department of Oral Diagnosis, Division of Oral Radiology, Piracicaba Dental School, University of Campinas, Piracicaba, Brazil.

### Abstract

The Canalis Sinuosus is a structure of the maxilla that allows the passage of the anterosuperior alveolar nerve and has a neurovascular activity. To visualize this structure, Conical Beam Computed Tomography (CBCT) is best recommended. This article aimed to report a case of facial pain after the insertion of a dental implant due to compression of the Canalis Sinuosus. Thus, the implant was removed, followed by the insertion of a bone graft. After that, the facial pain stopped. In conclusion, the identification of anatomical structures in preoperative examinations is essential in surgical dental procedures.

**Keywords:** Canalis Sinuosus; Dental Implants; Cone-Beam Computed Tomography; Facial Pain.

### Resumo

O Canalis Sinuosus é uma estrutura da maxila, que permite a passagem do nervo alveolar anterosuperior e tem uma atividade neurovascular. Para visualizar essa estrutura, a Tomografia Computadorizada de Feixe Cônico (TCFC) é melhor recomendada. Este artigo teve como objetivo relatar um caso de dor facial após a inserção de um implante dentário, devido à compressão do Canalis Sinuosus. Assim, o implante foi removido, seguido pela inserção de um enxerto ósseo. Depois disso, a dor facial foi interrompida. Em conclusão, a identificação de estruturas anatômicas em exames pré-operatórios é essencial em procedimentos odontológicos cirúrgicos.

**Palavras-chave:** Canalis Sinuosus; Implantes Dentários; Tomografia Computadorizada de Feixe Cônico; Dor Facial.

### INTRODUCTION

In the facial anterior region, specifically in the maxilla, a series of surgical procedures are performed. In that region, also known as premaxilla, are common exodontia of supernumerary teeth, bone grafts, removal of cysts, periodontal surgeries, insertion of dental implants, and even osteotomies for performing orthognathic surgeries<sup>1</sup>. Therefore, it should take into account some structures responsible for the neurovascular supply of the anterior region of the maxilla. Complications such as haemorrhages and paresthesia in soft tissue may occur and cause discomfort to the patient<sup>2,3</sup>. The main innervation of that region is conducted by the infraorbital nerve, which often has its terminal branches neglected by surgeons, and sensorineural alterations could be presented by some patients after surgery<sup>1</sup>.

The infraorbital canal emits a small branch on its lateral part called the Canalis Sinuosus (CS) that allows the passage of the anterior superior alveolar nerve (ASAN)<sup>4,5</sup>. These canals are considered anatomical structures since they are present in the majority of the population, despite their possible variations<sup>6</sup>. About the influence of gender on the presence or absence of CS, the results are inconclusive, but studies show that gender and age do not influence the diameter, location, and end of the

CS trajectory.<sup>6</sup> They may be presented bi- or unilateral in the patient, and those may have a path below the inferior wall of the orbit and medially an anterior wall of the maxillary sinus, passing through the lateral and inferior limits of the nasal cavity<sup>7,3</sup>. Still, those CS usually terminate their trajectory in the anterior region of the maxilla, more precisely in the region between the incisive foramen and the canine<sup>2</sup>.

The anatomical location of the CS was first reported by Jones in 1939<sup>8</sup>. Being the term an analogy as path variations that it can be presented. Also, it can be emphasized that the maxillary bone close to CS has lower bone density, making this region thin.<sup>9</sup> Thus, ASAN lesion is more common in surgical procedures, such as dental implant insertion<sup>4</sup>.

Two-dimensional radiographs are not appropriate complementary examinations for the observation of some structures, such as CS during the planning of dental implant surgeries. Over time, three-dimensional images have gained more space in those situations. Currently, the Cone-Beam Computed Tomography (CBCT) is widely used for this purpose.<sup>7</sup> Therefore, this article aimed to report a case of facial pain after

**Correspondence:** Frederico Sampaio Neves. Department of Propedeutics and Integrated Clinic, Division of Oral Radiology, School of Dentistry, Federal University of Bahia. Av. Araújo Pinho, nº 62, Canela - Salvador, Bahia, Brazil. Zip Code: 40110-913 Phone: +55 71 3283-8962 E-mail: fredsampaio@yahoo.com.br

**Conflict of interest:** The authors declare that there is no conflict of interest.

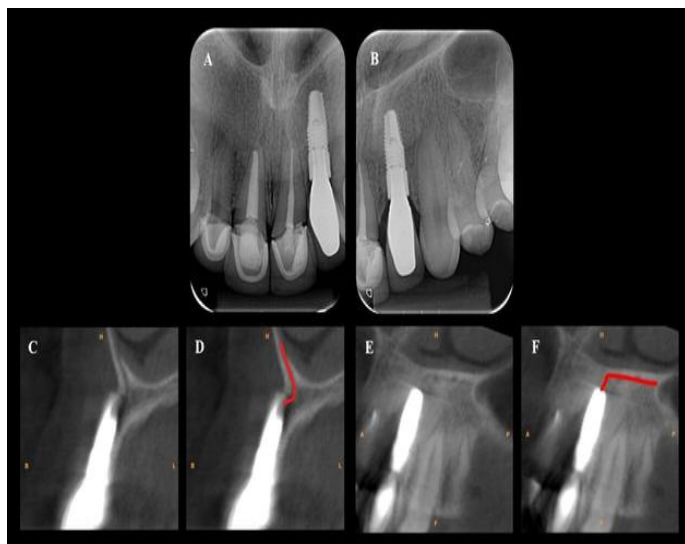
Received: 2022 Apr. 1; Revised: 2022 Sep 19; 2022 Oct 17; Accepted: 2022 Oct 25

the insertion of a dental implant due to compression of CS.

## CASE REPORT

This case report was approved by the local Ethical committee (CAAE: 68038117.7.0000.5024). A 36-year-old female patient was referred to the Radiological Private Dental Clinic to perform periapical radiographs of the upper maxillary teeth. The patient complained about severe and periodical facial pain (which disseminates to the ear region), after the implant placement in the region of the left maxillary lateral incisor region. In the anterior maxillary periapical radiographs was observed a satisfactory endodontic treatment of the central incisors (without any radiological signs of root fracture) and the implant in the region of the upper left lateral incisor with normal patterns of osteointegration (Figure 1 – A and B).

**Figure 1.** Preoperative periapical radiographs showing the dental implant normal patterns of osteointegration (A and B). Preoperative coronal (C, D) and sagittal (E, F) CBCT slices showing the direct contact of the branch of the CS with the implant.



To evaluate the relationship of the dental implant with surrounding anatomical structures, the patient underwent an examination by CBCT examination (Kodak 9000, Carestream Health, Rochester, New York, USA). In different tomographic slices (Figures 1 – C, D, E, and F) was possible to observe the direct contact of the branch of the CS with the apical portion of the implant screw. Based on the CBCT images, the hypothesis was facial pain was caused by the contact between the implant with the CS. Thus, the implant was removed, and a bone graft was used (Bio-Oss®, Geistlich, Wolhusen, Switzerland). After that, the patient did not complain about pain or any other clinical symptoms.

## DISCUSSION

During surgeries in the premaxilla region, CS innervation can be observed. Therefore, it can be highlighted that there is an

important neurovascular activity in that region. Once damaged, it can generate neurosensorial changes in the patient.<sup>2</sup> So, we reported a case of facial pain after the insertion of a dental implant in the anterior maxilla caused by the damage in the CS.

In the postoperative investigation, periapical radiographs were requested, in which no abnormalities were observed. Two-dimensional radiographs, such as intraoral and/or panoramic radiography, there is no diagnostic efficacy regarding CS injury<sup>10</sup>. Although having a variated path, periapical radiographs, when obtained, reveal CS as a thin radiolucent area that can often be confused with other structures or periapical pathology<sup>1,3</sup>. Thus, CS can resemble a periapical lesion, influencing the therapeutic conduct of the case and allowing possible errors if the professional is not properly trained<sup>6</sup>.

To avoid misinterpretation and erroneous diagnosis, the use of CBCT to evaluate structures such as arteries, veins, and nerves in the preoperative phase is recommended<sup>4</sup>. The patient from this clinical study was diagnosed with CS injury after being submitted to CBCT examination, once it has higher accuracy to show more delicate and intraosseous structures<sup>10</sup>. The presence of structures such as foramina and accessory canals are occasionally neglected by surgeons. A way to avoid injury in that structure is by requesting three-dimensional exams to facilitate preoperative planning and increase postoperative success because it reduces the chance of overlapping different anatomical structures and has a variety of tomographic slices<sup>9</sup>.

As reported by Jones, CS has a variable trajectory and comes from the infraorbital nerve to give passage to ASAN.<sup>8</sup> In the patient in question, it can be observed by the CBCT the presence of CS in the left maxillary region, located very close to the dental implant. Studies stated that CS may not be presented in some people and, therefore, it is easily neglected during surgeries in the premaxillary region<sup>1,7</sup>.

In table 1, it is possible to notice the proximity of the CS to the region corresponding to the apex of the upper incisors and canines and how this can affect the success of rehabilitation with dental implants. CBCT was the examination of choice to visualize the CS. We note that pain is the characteristic symptomatology in these cases, even if the implant is fully osseointegrated. This pain can be at the implant site, but it can also be irradiated to the face region. In cases of CS damage by dental implants, the removal was the most used solution, with good efficacy in the treatment of pain.

Injury to CS besides bringing postoperative discomfort to the patient as a patient in question may lead to a worse prognosis for dental implants.<sup>1</sup> When the surgeon does not properly plan the surgery by using imaging examinations, the placement of the dental implant may cause injuries to the neurovascular system of the region, in this case, exemplified by CS.<sup>4</sup> Injury to this structure may lead to a decrease in nervous sensitivity in the premaxillary region, called paresthesia. Also, intraoperative hemorrhage may occur, making the surgery more complicated<sup>7</sup>.

### 3 Facial pain due to contact between dental implant with the Canalis Sinuosus

**Table 1.** Different studies related to CS and associated pain.

	Gender	Symptoms	Image examination	Main cause	Implant Location	Final path of CS	Treatment	Pain after treatment
Arruda et al., 2017	Female	Pain in the right upper lateral incisor region and upper lip paresthesia on the right side	CBCT	Damage to CS by dental implant	Upper right lateral incisor region	Between the region corresponding to the apex of the right upper lateral incisor and the right upper canine	No treatment	N/A
Volberg and Mordanov, 2019	Female	Pain and paresthesia in the right upper canine region	CBCT	Damage to CS by dental implant	Upper left lateral incisor region	A branch near the palatine side and another branch near the vestibular face of the left upper lateral incisor region	Implant removal	No
Shintaku et al., 2020	Male	Discomfort in the upper right canine region	CBCT	Damage to CS by dental implant	Upper right canine region	Region corresponding to the apex of the right upper canine	N/A	N/A
Shintaku et al., 2020	Female	“Tightening in the bone” in the anterior region of the right maxilla	CBCT	Damage to CS by dental implant	Right upper central incisor region	Region corresponding to the apex of the right upper central incisor	N/A	N/A
Shintaku et al., 2020	Male	Acute pain when chewing	CBCT	Damage to CS by dental implant	Upper right lateral incisor region	Region corresponding to the apex of the right upper lateral incisor	N/A	N/A
Lopes dos Santos et al., 2020	Male	Facial pain	Panoramic radiography + CBCT	Exposure of canalis sinuosus due to bone resorption	No implant	Between the incisor foramen and the floor of the nasal cavity	Avoid the use of maxillary prosthesis and referred to implant-bearable total dentures	N/A
Rosano et al., 2021	Female	Pain in the right upper central incisor region	CBCT	Damage to CS by dental implant	Right upper central incisor region	Region corresponding to the apex of the right upper central incisor	Replacing the implant with a shorter one	No
Present Case	Female	Facial pain	Periapical radiography + CBCT	Damage to CS by dental implant	Upper left lateral incisor region	Region corresponding to the apex of the upper left lateral incisor	Removed the implant and placed bone graft	No

N/A - Not available

The patient in this case did not present paresthesia. However, the main complaint related was pain irradiated to the pre-auricular region. The pain associated with CS is usually localized in the region of incisors and canines that can radiate along the maxilla and its processes. In those cases, pain is seen as a secondary deficiency to dental implantation by neurovascular compression of CS or ASAN associated with midface paresthesia<sup>4</sup>.

Removal of the dental implant results in discomfort to the patients because they are submitted to another surgery.<sup>5</sup> It is worth mentioning that in addition to painful symptoms and hemorrhage, injuries to CS can hinder the osseointegration of the implant into the bone and the stability of the patient's implant<sup>1</sup>. Although, in the present case, the patient reported painful symptomatology, the injuries did not compromise the osseointegration and stability.

It can be stated that a better understanding study about the course of CS and ASAN should be made. To that end, studies

should explore this theme to alert surgeons about the importance of some structures located in the premaxilla that may interfere with the durability of dental implants<sup>2,3</sup>.

In conclusion, the CS presence and its possible anatomical variations should be taken into account during pre-surgical planning in the anterior maxilla region. For this purpose, three-dimensional imaging exams such as CBCT are recommended. That exam reduces the overlap of anatomical structures and has different tomographic slices, which facilitates seeing some structures that are often not seen in conventional radiographs. So, the present case reinforces the importance of correct preoperative planning because the contact of the implant with the CS caused painful symptoms in the region involved and on the face, requiring the removal of the implant. For errors like this not to be repeated, it is essential not only to request a CBCT in the planning of the case but also a correct training of professionals to avoid this type of problem for patients as much as possible.

## REFERENCES

- Machado VC, Chrcanovic BR, Felipe MB, Manhães Júnior LRC, 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 Dec; 45(12): 1586-1591. doi: 10.1016/j.ijom.2016.09.007.
- Torres MGG, Valverde LF, Vidal MTA, Crusoé-Rebello IM. Branch of the canalis sinuosus: a rare anatomical variation—a case report. *Surg Radiol Anat.* 2015 Sep; 37(7): 879-881. doi: 10.1007/s00276-015-1432-9.
- Arruda JA, Silva P, Silva L, Álvares P, Silva L, Zavanelli R, et al. Dental implant in the canalis sinuosus: a case report and review of literature. *Case Rep Dent.* 2017; 2017: 4810123. doi: 10.1155/2017/4810123.
- Olenczak JB, Hui-Chou HG, Aguila DJ, Shaeffer CA, Dellon AL, Manson PN. Posttraumatic midface pain: clinical significance of the anterior superior alveolar nerve and canalis sinuosus. *Ann Plast Surg.* 2015 Nov; 75(5): 543-547. doi: 10.1097/SAP.0000000000000335.
- Wanzeler AM, Marinho CG, Alves Junior SM, Manzi FR, Tuji FM. Anatomical study of the canalis sinuosus in 100 cone beam computed tomography examinations. *Oral Maxillofac Surg.* 2015 Mar; 19(1): 49-53. doi: 10.1007/s10006-014-0450-9.
- Aoki R, Massuda M, Zenni LTV, Fernandes KS. Canalis sinuosus: anatomical variation or structure? *Surg Radiol Anat.* 2020 Jan; 42(1): 69-74. doi: 10.1007/s00276-019-02352-2.
- Manhães LRC Júnior, Villaga-Carvalho MFL, Moraes MEL, Lopes SLPC, Silva MBF, Junqueira JLC. Location and classification of canalis sinuosus for cone beam computed tomography: avoiding misdiagnosis. *Braz. Oral res.* 2016; 30(1): e49. doi: 10.1590/1807-3107BOR-2016.vol30.0049.
- Jones FW. The anterior superior alveolar nerve and vessels. *J Anat.* 1939 Jul; 73(Pt4): 583-591.
- Gurler G, Delilbasi C, Ogut EE, Aydin K, Sakul U. Evaluation of the morphology of the canalis sinuosus using cone-beam computed tomography in patients with maxillary impacted canines. *Imaging Sci Dent.* 2017 Jun; 47(2): 69-74. doi: 10.5624/isd.2017.47.2.69.
- Kim JH, Aoki EM, Baladi MG, Cortes ARG, Watanbe PCA, et al. Canalis sinuosus and radiographic procedures in the region of anterior maxilla. *CLRD* 2015; 21(3): 180-184.
- Volberg R, Mordanov O. Canalis Sinuosus Damage after Immediate Dental Implant Placement in the Esthetic Zone. *Case Rep Dent.* 2019 Dec; 2019: 362794. doi: 10.1155/2019/3462794.
- Shintaku WH, Ferreira CF, Venturin JS. Invasion of the canalis sinuosus by dental implants: A report of 3 cases. *Imaging Sci Dent.* 2020 Dec; 50(4): 353-357. doi: 10.5624/isd.2020.50.4.353.
- Santos GL, Ikuta CRS, Salzedas LMP, Miyahara GI, Tjioe KC. Canalis sinuosus: An Anatomic Repair that May Prevent Success of Dental Implants in Anterior Maxilla. *J Prosthodont.* 2020 Dec; 29(9):751-755. doi: 10.1111/jopr.13256.
- Rosano G, Testori T, Clauser T, Del Fabbro M. Management of a neurological lesion involving Canalis Sinuosus: A case report. *Clin Implant Dent Relat Res.* 2021 Feb; 23(1): 149–155. doi: 10.1111/cid.12977.

## How to cite this article/ Como citar este artigo:

Santos MSVB, Dantas LL, Rodrigues RD, Fagundes FB, Rosado LPL, Neves FS. Facial pain due to contact between dental implant with the Canalis Sinuosus. *J Health Biol Sci.* 2022; 10(1):1-4.