VERIZONA PUBLISHER
Publishing Your Ideas

www.verizonaonlinepublishing.com
Vol: 2, Issue: 1

Journal of Dental Science and Therapy

Anatomical Variation of Canalis Sinuosus: Reports of Two Cases

Özlem Okumuş*, Z. Zuhal Yurdabakan and Semih Özbayrak

Department of Oral and Dentomaxillofacial Radiology, Altınbaş University, Faculty of Dentistry, Istanbul, Turkey

***Corresponding author:** Özlem Okumuş, Department of Oral and Dentomaxillofacial Radiology, Altınbaş University,Faculty of Dentistry, Istanbul, Turkey; Tel: +90(212)709-45-28; Fax: +90(212)445-81-71; E mail: dtozlemsen@hotmail.com

Article Type: Case Report, **Submission Date**: 29 November 2017, **Accepted Date:** 19 December 2017, **Published Date:** 22 January 2018.

Citation: Özlem Okumuş, Z. Zuhal Yurdabakan and Semih Özbayrak (2018) Anatomical Variation of Canalis Sinuosus: Reports of Two Cases. J. Dent. Sci. Ther 2(1): 12-14. doi: https://doi.org/10.24218/jdst.2018.17.

Abstract

The canalis sinuosus is a neurovascular canal, a branch of the infraorbital canal through which the anterior superior alveolar nerve passes. This article describes an anatomical variation of the canalis sinuosus extending from the nasal cavity lateral wall to an accessory foramen located on the hard palate, adjacent to the maxillary left canine. Two cases of the canalis sinuosus are reported that were detected by CBCT done for the dental implant treatment planing in a 46-year-old male and a 40-year-old female. Identification of these anatomical variations may help the surgeon to avoid injuries to nerves during surgical processes.

Keywords: Accessory canal, Canalis sinuosus, Cone beam computed tomography, Oral surgery.

Introduction

The trigeminal nerve divides into three branches which are the ophthalmic, maxillary and mandibular nerve. The infraorbital nerve, a branch of the maxillary nerve, it divides into three alveolar branches including anterior, middle and posterior superior alveolar nerves. The anterior superior alveolar (ASA) nerve rises in the anterior region of the maxilla to innervate the anterior teeth, as well as adjacent soft tissues. The infraorbital nerve runs through the infraorbital canal, which has a small branch on its lateral face, called the canalis sinuosus (CS), to allow the transition of the ASA nerve [1,2].

This anatomical structure is a neurovascular canal that rises the infraorbital nerve through the posterior part of the infraorbital foramen and passes through a bone duct with a diameter of approximately 2 mm alongside the nasal cavity. The CS is a major concern in the anterior maxillary region any surgical procedure such as maxillary sinus surgery, orthognathic surgery and mostly implants placement [2,3].

The identification of this anatomic structure is more apparent with the use of cone beam computed tomography (CBCT) in dentistry due to the quality and accuracy. In the past, these morphological changes were hardly detected as a result of poor quality images which could lead to intraoperative complications in which the etiology was unknown during a surgical procedure in the anterior maxillary region [4]. The technical developments in diagnostic imaging have increased the accuracy of the diagnostic data obtained, particularly the use of CBCT [5,6].

This article describes an anatomical variation of the CS with the presence of unilateral accessory canals using CBCT images.

Case Presentation

Case 1

A 46-year-old men referred for dental implant treatment underwent CBCT. CBCT (NewTom Vgi evo, Verona, Italy) was performed to evaluate bone thickness and width of the maxilla. Sagittal and coronal scans on CBCT images (Figure 1a,b) revealed a canal extending from the region of the floor of the nasal cavity on the left side to an accessory foramen located on the hard palate, at the maxillary left canine region. An axial CBCT scan (Figure 1c) showed the location of the CS at the left canine region with a diameter of 2.0 mm.

Case 2

A 40-year-old female underwent CBCT (NewTom Vgi evo, Verona, Italy) of the maxilla for dental implant planning. A canal extending from the region of the floor of the nasal cavity on the left side to an accessory foramen located on the hard palate, adjacent to the maxillary left canine was observed in sagittal and coronal scans on CBCT images (Figure 2a,b). An axial CBCT scan (Figure 2c) showed the location of the CS behind the left canine with a diameter of 1.0 mm.

Discussion

Several surgical procedures are carried out in the maxillary anterior region. Numbers of postoperative complaints are rising

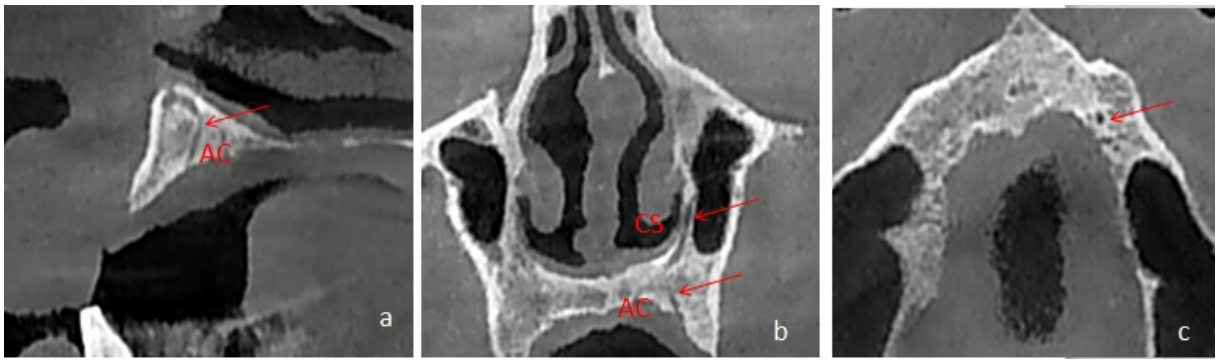

Figure 1: a) Sagittal **b)** coronal, CBCT slices showing the presence of the accessory canal on the left side. **c)** axial, CBCT slice showing the location of the CS at the left canine region. *CS: canalis sinousus, AC: accessory canal*

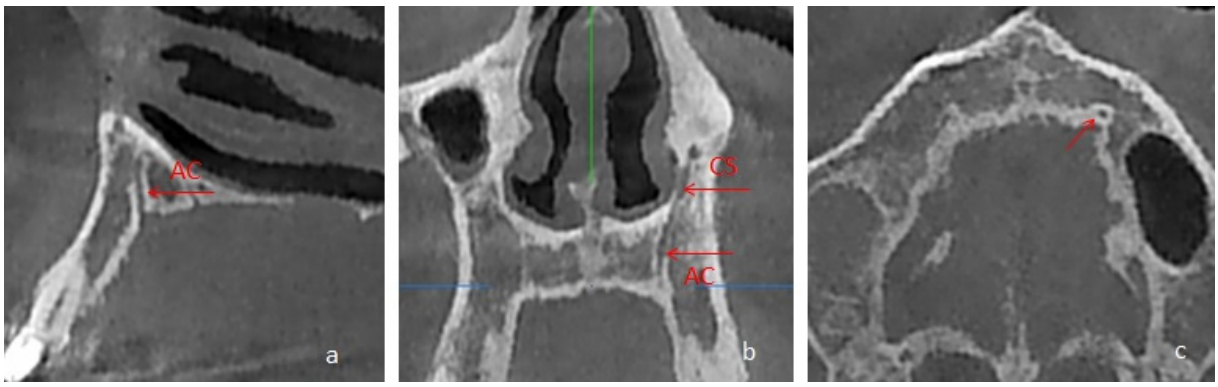

Figure 2: a) Sagittal **b)** coronal, CBCT slices showing the presence of the accessory canal on the left side. **c)** axial, CBCT slice showing the location of the CS at the palatal to the left canine. *CS: canalis sinousus, AC: accessory canal*

with the increase in placements of dental implantation and bone grafting procedures [2]. The presence of accessory foramen and ducts may avoid neurosensory disorders and nerve damages such as bleeding, anesthesia and pain [2].

The presence of CS can be detected by 3D imaging before the surgical process in the anterior maxillary region through CBCT. Neves et al. [2] confirmed in a case report that CS is not a simply a nutrient canal by means of dissecting the periosteum and observing innervation of it. So they approved that the CS contains neurovascular bundles.

Wanzeler et al. [6] evaluated 100 CBCT scans for the presence of CS and they detected 88% of the sample so they reported the CS is common finding and not anatomical variation. However, in 2D imaging techniques, CS is hardly ever seen owing to the porosity of its cortical layers or its small caliber [1,7].

The CS generally terminates on the lower border of the nasal aperture; but, it may run downward to the alveolar ridge and can seldom be detected near to the apical region of anterior teeth [8]. The CS and its variations may mimic a periapical lesion due to its anatomical position [7]. Shelley et al. [7] reported that the CS appeared like a periapical lesion in a periapical X-ray and after further periapical X-ray was performed with the film in a vertical position so the authors defined that it was a CS. Hence, it is essential to distinguish the CS from periapical lesions to prevent unnecessary treatments.

In this study, accessory canals with communications with CS end at the palatal aspect of the alveolar process. In both cases, accessory channels endpalatal to the canine. Similarly, von Arx T et al. [3] also described a few accessory canals with communications with CS. They evaluated accessory bone channels in the anterior maxilla using CBCT. They observed that 38 accessory branches (56.7%) were a curved communication with the CS which are curving downward from the CS to the alveolar ridge. The location of accessory channels was palatal to the lateral and central incisors and canine.

The CS should be assessed carefully when its branches are near the apical region of the incisor teeth and extend to the alveolar ridge [8]. Gurler et al. [8] described the evaluation of the morphology of the CS using CBCT. They used hundreds of data for analysis. They observed that the CS terminated on the nasal floor in almost all the samples. But a few patients were detected anatomical variations which have accessory branches extend to the alveolar crest. Their localization was variable, but the localization was most frequently observed at the palatal to the lateral incisors followed by the central incisors and canine [8].

In another study, Machado et al. [9] reported that the accessory canals of the CS were observed relatively high incidence (52.1%) and they concluded that accessory canals of the CS are a common anatomical structure.

Following a midface trauma, posttraumatic midface nerve

disturbances such as pain, anesthesia, paresthesia can be observed by injury to the ASA nerve. Fracture of the bone overlying the CS can result in posttraumatic midface pain localized to the central incisors, lateral incisors, canines, or anterior maxilla because this region covers by a thin bone [10].

It is essential to consider the presence of these neurovascular structures in the anterior maxilla during the surgical processes including placement of the dental implant, treatment of pathologies or fractures in order to avoid hemorrhage, pain or anesthesia. Machado et al. [9] reported a clinical case who was installed dental implants in the anterior region of the maxilla and presented postoperative pain and the postoperative CBCT showed a close relationship of the implants with the accessory canal of the CS. Moreover, Arruda et al. [10] reported a case with notified paresthesia and pain in the right upper lip region after the installation of a dental implant. Then CBCT was performed and revealed the presence of CS, located between the apical region of the implant and in the upper lateral incisor area and the upper canine apex. So they concluded that CBCT should be performed before surgical procedures such as dental implant placement, teeth extraction including the anterior maxillary region to evaluate any anatomical variation and avoid complications.

Developments in 3D imaging techniques, CBCT is superior technology in dentistry due to its advantages including high-resolution images with greater reliability. CBCT creates images with thin slices and allows better visualization of bony structures [2,11].

Conclusion

In conclusion, the present study describes the case of a unilateral anatomical structure of the ASA nerve, called CS. The defining of critical anatomical structures and their variations, particularly through 3D imaging, is essential for better quality diagnosis accurate surgical, dental implant treatment planning and to prevent the post-operative complications.

References

1. Torres MG, de Faro Valverde L, Vidal MT, Crusoé-Rebello IM. Branch of the canalis sinuosus: a rare anatomical variation--a case report. Surg Radiol Anat. 2015; 37(7):879–881. doi: 10.1007/s00276-015-1432-9.
2. Neves FS, Crusoe´-Souza M, Franco LC, Caria PH, Bonfim- Almeida P, Crusoe´-Rebello. Canalis sinuosus: a rare anatomical variation. Surg Radiol Anat. 2012; 34(6):563–566. doi: 10.1007/s00276-011-0907-6.
3. von Arx T, Lozanoff S, Sendi P, Bornstein MM. Assessment of bone channels other than the nasopalatine canal in the anterior maxilla using limited cone beam computed tomography. Surg Radiol Anat. 2013; 35(9):783-790. doi: 10.1007/s00276-013-1110-8.
4. Manhães Júnior LR, Villaça-Carvalho MF, Moraes ME, Lopes SL, Silva MB, Junqueira JL. 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.
5. Oliveira-Santos C, Rubira-Bullen IRF, Monteiro SAC, Léon JE, Jacobs R. Neurovascular anatomical variations in the anterior palate observed on CBCT images. Clin Oral Implants Res. 2013; 24(9):1044-1048. doi: 10.1111/j.1600-0501.2012.02497.x.
6. Wanzeler AM, Marinho CG, Junior SM, Manzi FR, Tuji FM. Anatomical study of the canalis sinuosus in 100 cone beam computed tomography examinations. Oral Maxillofac Surg. 2015; 19(1):49-53. doi: 10.1007/s10006-014-0450-9.
7. Shelley AM, Rushton VE, Horner K. Canalis sinuosus mimicking a periapical inflammatory lesion. Br Dent J. 1999; 186(8):378–379.
8. Gurler G, Delilbası C, Ogut EE, Aydın 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; 47:69-74. doi: 10.5624/isd.2017.47.2.69.
9. Machado VC, Chrcanovic BR, Felippe MB, Manha˜es Ju´nior 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; 45(12):1586-1591. doi: 10.1016/j.ijom.2016.09.007.
10. 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 the Literature. Case Rep Dent. 2017:4810123. doi: 10.1155/2017/4810123.
11. Olenczak JB, Hui-Chou HG, Aguila DJ 3rd, Shaeffer CA, Dellon AL, Manson PN. Posttraumatic Midface Pain: Clinical Significance of the Anterior Superior Alveolar Nerve and Canalis Sinuosus. Ann Plast Surg. 2015; 75(5):543-547. doi: 10.1097/ SAP.0000000000000335.