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A Case Report of Bilateral Canalis Sinuosus with Accessory Canals

[1]Dr. T. Jones Raja Deva Thambi, Ph. D Research Scholar, Bharath Institute of Higher Education and Research.

[2]Dr. Nalini Aswath, Professor & Head, Department of Oral Medicine & Radiology, Sree Balaji Dental College & Hospital.

Corresponding Author: Dr. T. Jones Raja Deva Thambi, Ph. D Research Scholar, Bharath Institute of Higher Education and Research.

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Abstract

Canalis Sinuosus (CS) is a neurovascular canal, an anatomical variation through which an accessory branch of anterior superior alveolar nerve passes and then curves medially in course between the nasal cavity and the maxillary sinus, reaching the anterior maxilla. Anterior maxilla is more prone for trauma and infections, thus requiring surgical management and implant placement for replacing missing teeth. Cone Beam Computed Tomography (CBCT) is a vital diagnostic imaging modality in preoperative planning, since it allows the three-dimensional reconstruction of the anatomical details and helps in diagnosing various neurovascular variations. The knowledge about anatomical structures in anterior maxilla helps to perform safe surgical and dental procedures.

Keywords: Canalis Sinuosus (CS), Cone Beam Computed Tomography (CBCT), Anterior Superior Alveolar nerve (ASA).

Introduction

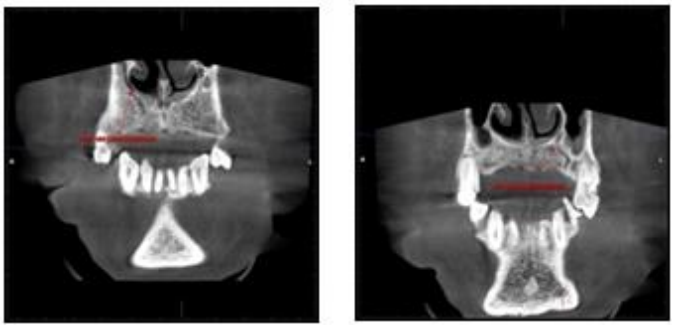
The infraorbital nerve, a branch of the maxillary nerve, divides into three alveolar branches including anterior, middle and posterior superior alveolar nerves. The anterior superior alveolar (ASA) nerve rises in the anterior region of the maxilla to innervate the anterior teeth, as well as adjacent soft tissues. Canalis Sinuosus is one of the accessory canals in this region and was first described by Jones in 1939 [(1)]. The canal was named due to its double-curved course. This small canal originates from infraorbital canal, and medially bends to anterior wall of the maxillary sinus, passing below the infraorbital foramen. Reaching the anterior margin of the nasal aperture in front of the anterior end of the inferior concha, it follows the lower margin of the aperture and opens next to the nasal septum in front of the incisive canal. Within the CS, the arteries and veins of the same name accompany ASA nerve [(1, 2)]. Panoramic and periapical radiographs are not able to diagnose accessory

canals in anterior maxillary region due to superimpositions of various anatomical structures in this region. CBCT plays an important role in diagnosing these anatomical structures in various planes and helps in preventing any neurovascular damage during surgical procedures. This article describes this anatomical variation and bilateral presence of CS using CBCT images

Case Report

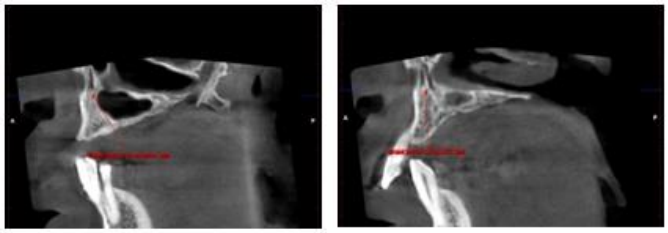
A 68-year-old man underwent CBCT of the maxilla (Planmeca ProMax 3D Classic with following parameters; 90 kVp, 4-10 mA, 200 µm voxel size). The measurement was performed using Planmeca Romexis 5.1.0.R software for the planning of rehabilitative treatment with dental implant in maxilla.

In the coronal sections, bilateral canalis sinuosus were observed, which was thicker on the right sidewhen compared to left side (Figures 1 & 2).



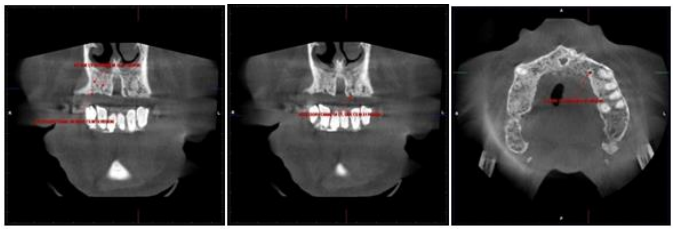
Figures 1 & 2: Coronal section shows bilateral canalis sinusosus.

The main trunk of Canalis Sinuosus extending from the lateral nasal wall to the nasal floor region branchedagain to form accessory branches (Figures 3 & 4).



Figures 3 & 4: Sagital section shows bilateral branching of CS to form accessory canals.

Accessory canals werelocated on the hard palate in 12, 11, 21 & 23 regions(Figures 5, 6& 7).



Figures 5, 6 & 7: Coronal & axial section shows presence of accessory canals of CS.

The course of accessory canals were observed in the coronal and axial planes. Coronal section of 23 region showed ‘S’ shaped course CS in left side (Figure 8).

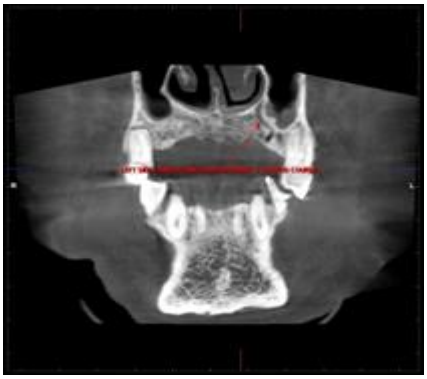
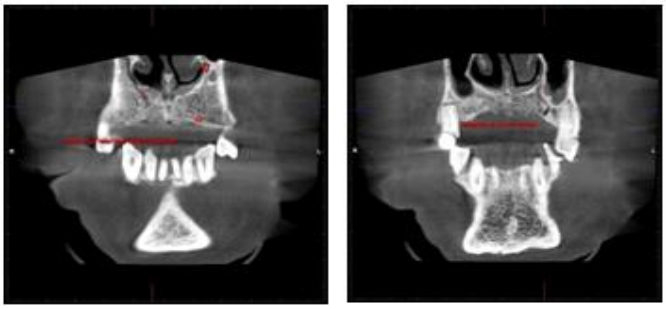


Figure 8 : Coronal section shows “S” shaped course of CS in left side.

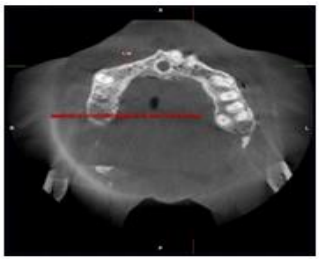
In coronal section the diameter of CS opening in 11 region was 2.26 mm which was larger than the diameter of CS opening in 23 region was 2.11 mm (Figures 9 & 10).

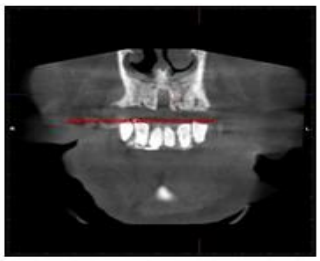


Figures 9 & 10: Coronal section shows diameter of CS in right & left sides.

Axial images showed the diameter of accessory branch of CS opening in 12 region was 1.36 mm which was

larger when compared to 21 region was 1.20 mm (Figures 11 & 12).





Figures 11 & 12: Section shows diameter of accessory canals of CS in right & left sides.

Reconstructed 3D image of CBCT shows presence of bilateral accessory branch of CS in 12, 11, 21 & 23 region (Figure 13).

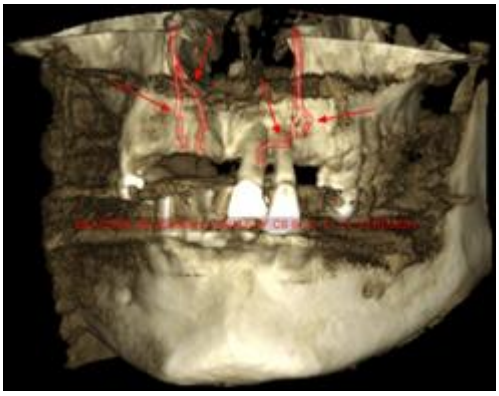


Figure 13: 3D view of bilateral Canalis Sinuosus and its accessory canals.

Discussion

The canalis sinuosus is a normal anatomical feature that corresponds to a poorly recognized neurovascular canal that carries the ASA nerve, vein and artery[3]. This canal was named “canalis sinuosus” by Fredric wood Jones (1939), and this term was suggested due to its doubled curved course. The entire course of the canalis sinuosus stretches for around 5.5 cm in length, with the orbital floor part accounting for around 1.5 cm, the transverse facial part with 2 cm, and the circumnarial part with around 2 cm [2].

Volberg et al. reported a case with intense pain and paresthesia at the implant site, which increased after the first post-operative week and was not relieved by analgesics. A burning pain was felt around the left maxillary canine, the palate, and the nasal region which relieved only with an infraorbital block. The second evaluation found a CS with a 2.3 mm diameter in the pre-operative CBCT images. Following the extraction of the implant, the paresthesia and pain faded; however, a necrotic area appeared on the palatal mucosa due to a compromised palatal blood supply[4]. In our case report, we found CS with maximum of 2.26 mm diameter in right side and 2.11 mm diameter in left side. This should be considered while implant planning or any surgical procedures in the maxillary anterior region to avoid complications.

Neves et al. reported that, during a surgical procedure for the placement of a bone graft in the anterior maxilla, the periosteum was dissected and the innervation of the CS could be observed and tested, confirming that this canal contains a neurovascular bundle and is therefore not simply a nutrient canal[5].

Oliveira-Santos et al. who assessed CBCT scans of 178 subjects found that 28 (15.7%) had an additional foramen on the palate, with a total of 34 additional foramina being recorded. He described seven possible emergency sites of CS in the hard palate: Central incisors region; between central and lateral; lateral incisors region; canine region; first premolar region; lateral to incisive foramen and posterior to incisive foramen [6]. In our case, the presence of CS and its accessory branches were noted in 12, 11, 21 and 23 region.

Kohavi reported that relatively wide canals were registered bilaterally on computerized tomography (CT) images, with palatine openings in the canine/premolar region [7]. Similar to this our case report also shows bilateral presence of CS and accessory canals in anterior maxillary region.

Gurler G et al. reported that the average canal diameter was 1.37 mm and it was significantly larger in males than in females. They also noted accessory canals in 5.4% of the study group with most common location being palatal to the lateral incisors (62.5%) [8].

Manhães Júnior et al. detected the presence of CS, in which they had grouped the scans according to gender and named as female and male group. The results showed the presence of 99 scans with CS out of 284 scans in the female group and 82 out of 216 scans in the male group, comprising of 34.86% and 37.97% to be the prevalence rate in both groups, respectively[9].Machado et al. found accessory canals of the CS by CBCT in 51.7% of their 1000 patients[10].

Conclusion

CS is an important neurovascular anatomical variation in anterior maxilla, with the help of CBCT we can identify CS and prevent nerve damage, unexpected hemorrhage and complications. This case report is an attempt to alert and guide the dentist with the help of maxillofacial radiologist towards commonly ignored anatomical variation in anterior maxilla.

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