



Case Report

What Surprises Lie Beneath a Panoramic Radiograph in Dental Implant Planning

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Abstract

Panoramic radiography as well as periapical radiography are routinely used in dental practice. Because of some limitations and providing low detailed, insufficient information reveal some difficulties in assessment of vital structures. By the increase of dental implant procedures and widespread acceptance of CBCT applications showed that accurate diagnosis can only be achieved by choosing the appropriate imaging modality. CBCT allows accurate and high resolution images to assess anatomical structures including incidental findings. Although, incidental findings mostly asymptomatic and requiring any treatment but some variations or pathologies which incidentally found in radiographic examination may be a cause for an alteration of treatment plans or priority. Aim of this case report is to present an unusual situation which was incidentally found in CBCT assessment before dental implant procedure.

Keywords: Cone Beam Computed Tomography; Incidental Findings; Panoramic Radiography

Introduction

Since the first insertion of dental implant in 1965 by Branemark [1] and with the significant development of implant technology, dental implants have become widely used in dentistry to replace missing teeth. Therefore, evaluation of alveolar structure plays an important role to achieve success in dental implant practice. This procedure was routinely made by a comprehensive clinical and radiographic examination.

Conventional radiographic techniques such as periapical and panoramic radiology are used commonly in dental practice. Although they have some limitations but they have also provide significant information about anatomical structures. They provide two-dimensioned images of three dimensioned structures. The images obtained by using these modalities have some disadvantages such as magnification, distortion or superimpositions. Due to poor quality images of anatomical structures, practitioners need to obtain more sufficient and accurate information. Therefore, three-dimensional sectional imaging modalities have been gained popularity in evaluation of anatomical structures, their variations and pathologies. With widespread acceptance of CBCT applications in dentistry, CBCT scans provide more accurate information

on anatomic structures and characteristics of pathologies rather than the conventional techniques. It also provides high-resolution cross-sectional images and diagnostic reliability at lower costs and radiation doses [2-7].

CBCT images allow to obtain more accurate information not only from structural knowledge of anatomy but also incidental findings. Incidental findings are defined as results that are outside the original purpose for which a procedure was conducted. An incidental finding would be an anatomic variation or a pathology. They are mostly asymptomatic and requiring any treatment. But in a presence of an incidentally found anatomical variation or pathologies may be a reason for an alteration of treatment plans or priority. Increasing the knowledge of dentomaxillofacial anatomy and a better understanding of incidental findings will lead practitioners to avoid misinterpretations and misdiagnosis [6,8].

Antroliths defined as calcified masses within the paranasal sinuses. The origin of the calcified deposits may be extrinsic or intrinsic. Most of them are small and asymptomatic. Unless they reach larger sizes and present sinusitis findings such as pain and discharge, intervention is not required. Due to their asymptomatic nature when they were small, and because of the limitations of imaging technique, they are rarely detect by conventional radiographic modalities but easily discovered in CBCT images as an incidental finding [9].

Anatomical variations is one of the incidental findings. Canalis sinuosus is a bony canal where the anterior superior alveolar nerve passes through, contains arteries and veins. Especially in presence of accessory canals deriving from canalis sinuosus reveal some difficulties to practitioners in anterior maxillary surgery procedures. Accurate diagnosis should be made of this anatomical variant to avoid complications. Hence, more comprehensive radiographic evaluation should be performed by CBCT. But due to superimpositions in panoramic radiography which routinely performed in dentistry, it is not always possible to obtain accurate diagnosis [10,11].

The aim of this case presentation is to report some incidental findings which were not observed in panoramic radiographs but incidentally found on CBCT images.

Case Report

A 44-year-old male patient referred to the Department of Dentomaxillofacial Radiology, **Gulhane Faculty of Dentistry, Ankara, Turkey** with a complaint of maxillary and mandibular partial edentulism. A comprehensive examination started after we obta-

ined an informed consent from the patient. He had no history of any systemic disease and did not use any medication. It was learned that the patients wanted to have an implant rehabilitation. First of all, it was performed a panoramic radiograph to assess whole dentomaxillofacial structures. On panoramic evaluation, broad periodontal disease with severe bone resorption and a calcified mass in the right maxillary sinus were observed (Figure 1). In order to determine the appropriate surgical approach and to obtain more detailed information, it was decided for an examination by 3D Accuitomo 170 (3D Accuitomo; J Morita Mfg. Corp., Kyoto, Japan). On CBCT assessment it was seen bilateral antroliths which was not noticed on panoramic radiograph. On coronal view of CBCT it was seen partial opacification in the left and mucosal thickening in the right maxillary sinus. It was also seen irregular, well defined calcified masses in both maxillary sinuses (Figure 2). Sagittal and axial views were seen on (Figures 3,4). On evaluation of anterior maxilla, it was also seen a canalis sinuosus which runs from the floor of nasal fossa to alveolar ridge (Figure 5). Therefore, the oral and maxillofacial surgeon was informed about the findings and a comprehensive and detailed dental implant treatment planning was performed in order to avoid neurovascular bundle damage.

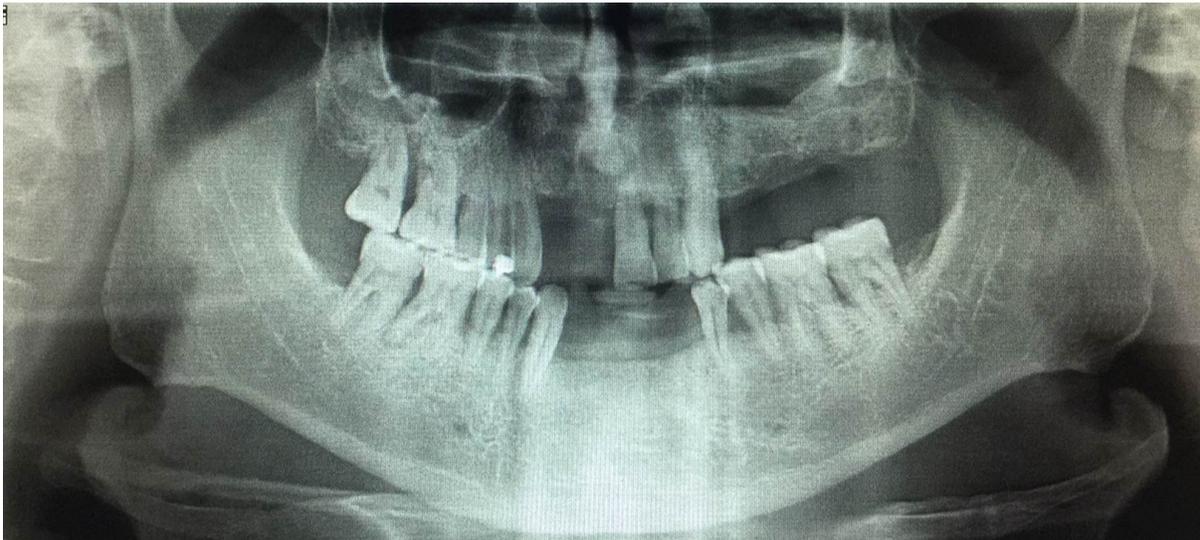


Figure 1: A panoramic radiograph was obtained from the patient who was referred for implant rehabilitation. Although the panoramic radiograph reveals sufficient information about vertical height it has also some limitations to evaluate bone quality. It was also detected a suspected radiopacity in the right maxillary sinus (arrow).



Figure 2: Coronal slices show mucosal thickening in the right, partial opacification in the left maxillary sinus. In addition it is also seen bilateral antraloliths.

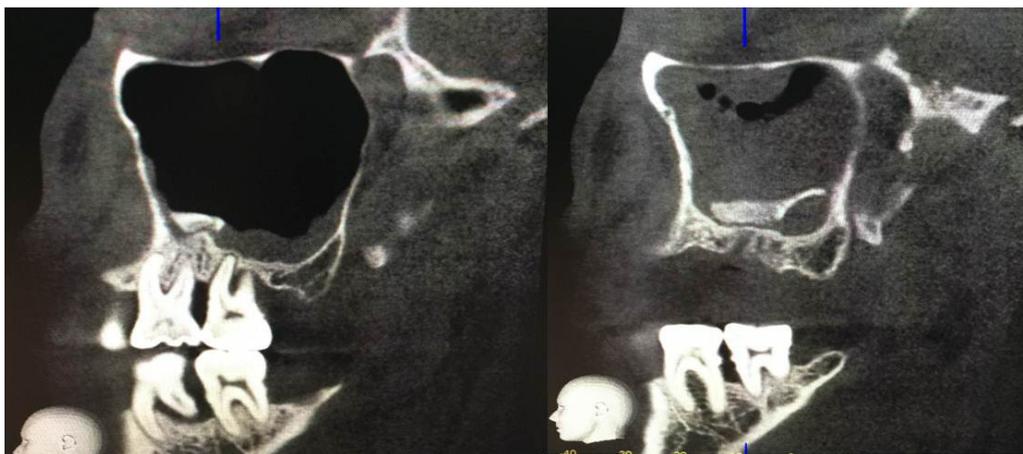


Figure 3: Sagittal view of CBCT scan. Calcified masses are in the both maxillary sinuses.

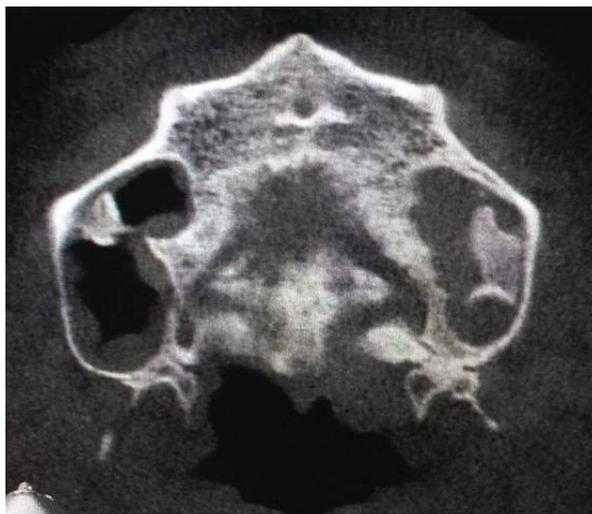


Figure 4: Axial view of bilateral calcifications in maxillary sinus.

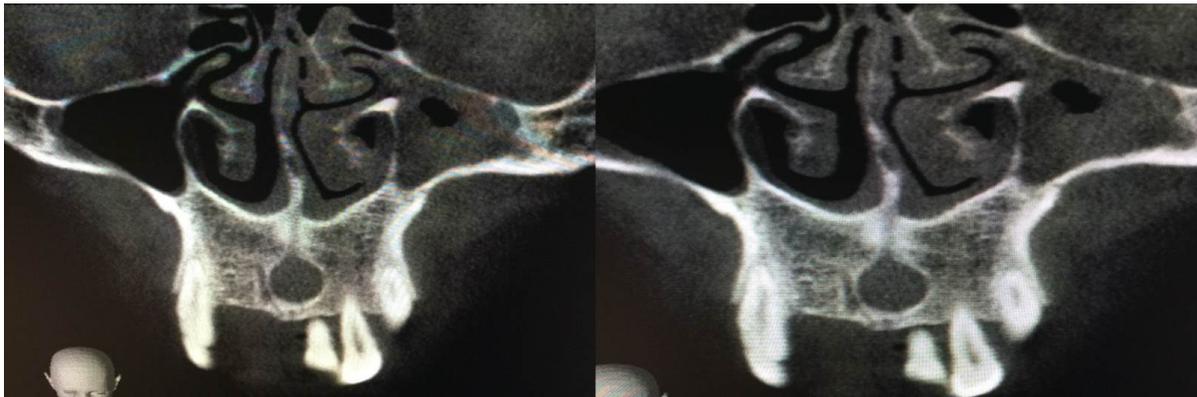


Figure 5: Coronal slices show branch of canalis sinuosus. It is a branch of anterior superior alveolar nerve. Presence of this variation will be forced clinician to alter implant planning. This bony canal where the anterior superior alveolar nerve passes through, contains arteries and veins.

Discussion

Various surgical procedures have been performed in dento-maxillofacial area by oral surgeons. But dental implant placement procedures is no longer performed only by oral surgeons; practitioners are also increasingly providing difficult surgical implant performances. To avoid unexpected complications and to increase the success rate, accurate radiographic evaluation is a crucial aspect. Furthermore, clinicians should increase their knowledge of anatomical structures.

Digital or conventional a number of imaging modalities have been used to evaluate bone quality, quantity, and location of anatomic structures. Although, panoramic radiography is the most commonly used and relied imaging modality by clinicians but it should be understood the inherent fundamental limitations such as superimpositions, magnifications, distortions and low image quality [11,12]. Although their relatively low cost and widespread availability, but because of the difficulty of interpret anatomical structures on two-dimensional plane, made necessary to be developed three-dimensional imaging techniques. To overcome of these disadvantages and to obtain more accurate images of anatomical structures, a new era opened by the invention of CBCT.

CBCT technology allows clinicians precious information not only about anatomical structures, but also about the pathologies or findings outside the primary area of interest. The findings which were unexpectedly discovered outside the primary area of interest are defined as incidental findings. Owing to CBCT, it became difficult to misdiagnosis of normal anatomic variants, developmental anomalies or artifacts as pathology [6,7].

Antroliths occur by the precipitation of calcium phosphate, calcium carbonate and magnesium salts [13,14]. They are rare and are commonly discovered by conventional radiographic modalities only if they reach larger size. And also, they usually don't cause

any symptoms unless they're large. Hence asymptomatic smaller sized antroliths have been overlooked and there is only a few studies about their prevalence in population in the literature. Although the study of Nalcaci and Gorgun [15] were performed by using panoramic radiographs, they reported that incidence of this condition was 5.4%. Nass Duce et al [16] found three cases in 1957 patients' CT scans. Altindag et al.[7] was reported as 2.33%, and one another report by Khadija et al. reported as 3% [17]. Except the study which were reported only three antrolith cases by Nass Duce et al. [16], literature shows an increased female gender predisposition [7,15,17].

Accessory canals of canalis sinuosus are rare condition which located in the anterior maxilla. This anatomic structure and its variation are not well known and ignored by clinicians. Due to it contains anterior superior alveolar nerve as well as vein and arteries, exact diagnosis will provide surgeons to avoid nerve damage, unexpected bleeding, hemorrhage and complications. In addition to these complications, replacing an implant contacted with the neurovascular bundle will be led to non-integration [11].

There are only a few articles which were available in literature. According to Pubmed database, "canalis sinuosus" term reveals only 16 results. Only 6 of 16 results were case reports. According to the publishing dates, by the increase of dental implant procedures and widespread acceptance of CBCT applications showed that this phenomenon has been gained its popularity in the last two decades.

There are several reports [18,19] which emphasized that canalis sinuosus were rare but Wanzeler et al.[20] reported the frequency of this structure as 87.5% in 100 CBCT scans. These differences can be explained by the size of the sample, and the radiological interpretation that was performed by different radiologists. Aim of this case report is to pay attention to a rare variation of canalis sinuosus.

Conclusion

The anatomical variations or pathologies could be missed frequently in routine panoramic radiographic examination. Increasing the knowledge about anatomical structures and their variations will provide the clinicians to avoid complications during surgery procedures. The limitations of conventional imaging modalities should be known and especially in suspected cases, multiplanar imaging modalities should not be ignored as an alternative approach for accurate information. Hence, comprehensive and detailed preoperative radiologic evaluation should be applied by using appropriate radiologic technique.

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