

Case Report

Evaluation of CBCT Images: Two Case Reports of Calcifications and Anatomical Variations

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Citation: Ozturk HP, Gunduz K, Ozgedik S, Karacayli U, Avsever H, et al. (2018) Evaluation of CBCT Images: Two Case Reports of Calcifications and Anatomical Variations. Dent Adv Res 3: 146. DOI: 10.29011/2574-7347.100046

Received Date: 11 January, 2018; **Accepted Date:** 24 January, 2018; **Published Date:** 01 February, 2018

Abstract

CBCT (Cone-Beam Computerized Tomography) allows multiplanar visualization of the craniofacial structures to evaluate patients for several pathologies and problems. Because of two dimensioned imaging modalities' limitations and the carelessness of most clinicians about the anatomical structures or pathologies which are outside of the regions of primary interest; some pathologies, calcifications or anatomic variations may be missed. Most incidental findings such as anatomical variations and calcifications are asymptomatic or requires no intervention but some of them may be lifethreatening. At the same time these incidental findings can be indicator for important systemic diseases. Aim of these case reports to take attention and increase of the knowledge of some anatomical variations and the structures which was found incidentally while dental implant planning. Accurate diagnosis of these structures plays a precious role to avoid complications in surgical procedures.

Keywords: Anatomical Variation; Cone Beam Computed Tomography; Nasopalatine Canal; Soft Tissue Calcification

Introduction

CBCT allows multiplanar visualization of the craniofacial structures to evaluate patients for several pathologies and problems. It provides precious and detailed information not only for dental implant procedure but also for orthodontics, endodontics, trauma, cysts or tumor assessment, teeth and TMJ evaluation [1,2].

Because of two dimensioned imaging modalities' limitations, some pathologies, calcifications or anatomic variations may be missed. One another reason for misdiagnosis or malpractice is that the most of clinicians did not notice the anatomical structures or pathologies outside of the regions of primary interest [1,3].

A better understanding of incidental findings and improving the knowledge of the head and neck anatomy will provide clinicians to avoid misinterpretations. Although most incidental findings such as anatomical variations and calcifications are asymptomatic or requires no intervention, but some of them may be life-threatening.

Identify the localization of accurate anatomical structures and anatomic variations will lead to success in implant placement. It will also provide to avoid undesired bleedings or nerve damage [4]. Nasopalatine canal is the most important anatomical structure in surgical procedures of anterior maxilla. It connects the palate to the floor of the nasal cavity and contains nasopalatine nerve, the terminal branch of nasopalatine artery, as well as fibrous connective tissue, fat and small salivary glands [5].

In the last decade dental implants have become widely used in dentistry as a treatment option to replace missing teeth. During the treatment planning process, the alveolar structure is routinely assessed by visual examination and palpation, as well as by conventional radiographic techniques such as periapical and panoramic radiology. Accurate diagnosis of nasopalatine canal and its variations plays a precious role to avoid complications in surgical procedures of anterior maxilla. Although conventional two-dimensional modalities are commonly used for radiographic examination in dental practice, due to their some limitations such as magnification, distortion or superimpositions, they provide low detailed, insufficient information of anatomical structures and variations.

Therefore, three-dimensional sectional imaging modalities have been gained popularity in evaluation of anatomical structures, their variations and pathologies to obtain more sufficient and accurate information. On the other hand improving the knowledge of the head and neck anatomy will provide clinicians to avoid misinterpretations [1,5-9].

Soft tissue calcifications such as calcified plaques of arteries are well-known marker of cardiovascular disease are mostly observed as an incidental finding. The plaques cause affected arteries to harden and narrow, which can be a serious condition as restricted blood flow, ischemia or stroke [10]. In case of incidental detection of cervical carotid artery calcifications, clinicians should aware of cardiovascular consultation requirement.

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.

These case report series aim to describe and take attention to several anatomical variations which were not noticed on conventional radiographic technique but incidentally found in CBCT images in the pre-operative dental implant assessment of two patients. This report will provide precious information to the clinicians to increase of the knowledge of some anatomical variations and the structures which was found incidentally while dental implant planning.

Case Report 1

A 79-year-old male patient referred to the Department of Dentomaxillofacial Radiology, Gulhane Faculty of Dentistry, Ankara, Turkey with a complaint of maxillary total and mandibular partial edentulism. Except of having hypertension, he had no history of any systemic disease. It was learned that he had been using antihypertensive drugs. It was also learned that the patient wanted to have an implant rehabilitation. First of all, an informed consent was obtained from the patient and it was performed a panoramic radiograph to assess whole dentomaxillofacial structures. On panoramic evaluation, it was detected severe bone resorption on maxillary bone structure and bilaterally low hanging maxillary sinuses. On the other hand, it was detected more quantitative bone

to perform for an implant procedure relatively to maxillary molar area. 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 evaluation maxillary and mandibular bone structures and their close relationships were assessed as intended. It was also noticed some anatomical variations and calcifications which were not seen on panoramic radiograph. At the first sight it was noticed several calcifications over sphenoid sinus on CBCT image. A total of 6 ring like calcifications were seen on coronal view and a pipe like view were seen on axial view (Figure 1). According to our anatomical knowledge, it was decided that they were internal carotid artery calcifications. In addition, it was seen right carotis artery calcification (Figure 2) and facial artery calcification at the same side (Figure 3). The patient had also bilaterally elongated styloid (Figure 4), four dot-like and one irregular shaped tonsilloliths (Figure 5). Besides, after examined carefully several slices of mandible on dimly light, it was detected a lingual accessory foramina which runs along symphysis and opens next to genial tubercle (Figure 6). After comprehensively clinical and radiologic examination, it was asked for a consultation to the Department of Prosthodontics and the Department of Dentomaxillofacial Surgery for a detailed dental implant treatment planning.

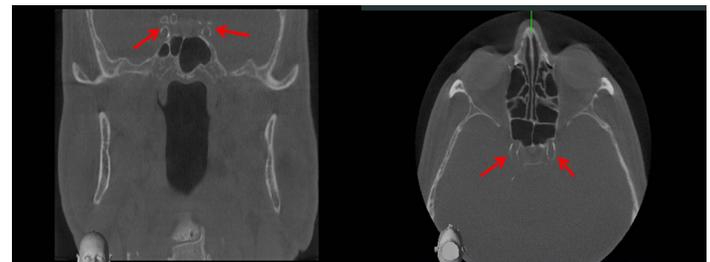


Figure 1: Coronal and axial view of the patient. Arrows show calcifications of internal carotid artery.

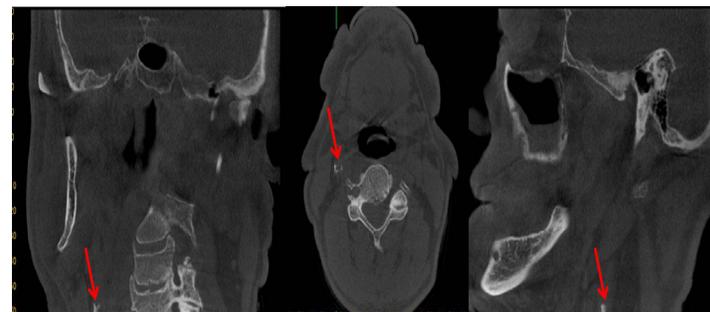


Figure 2: Coronal, axial and sagittal views show calcification of right carotid artery.

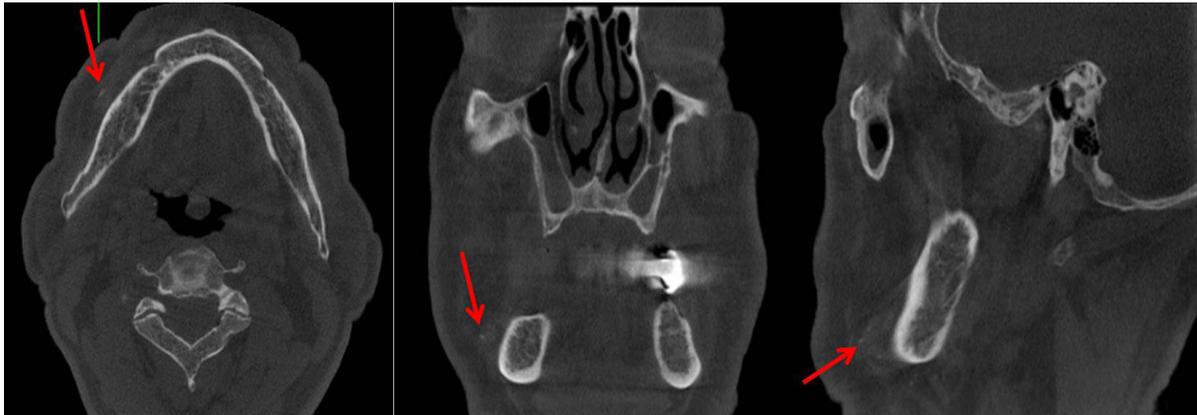


Figure 3: Axial, coronal, and sagittal views show calcification of right facial artery.

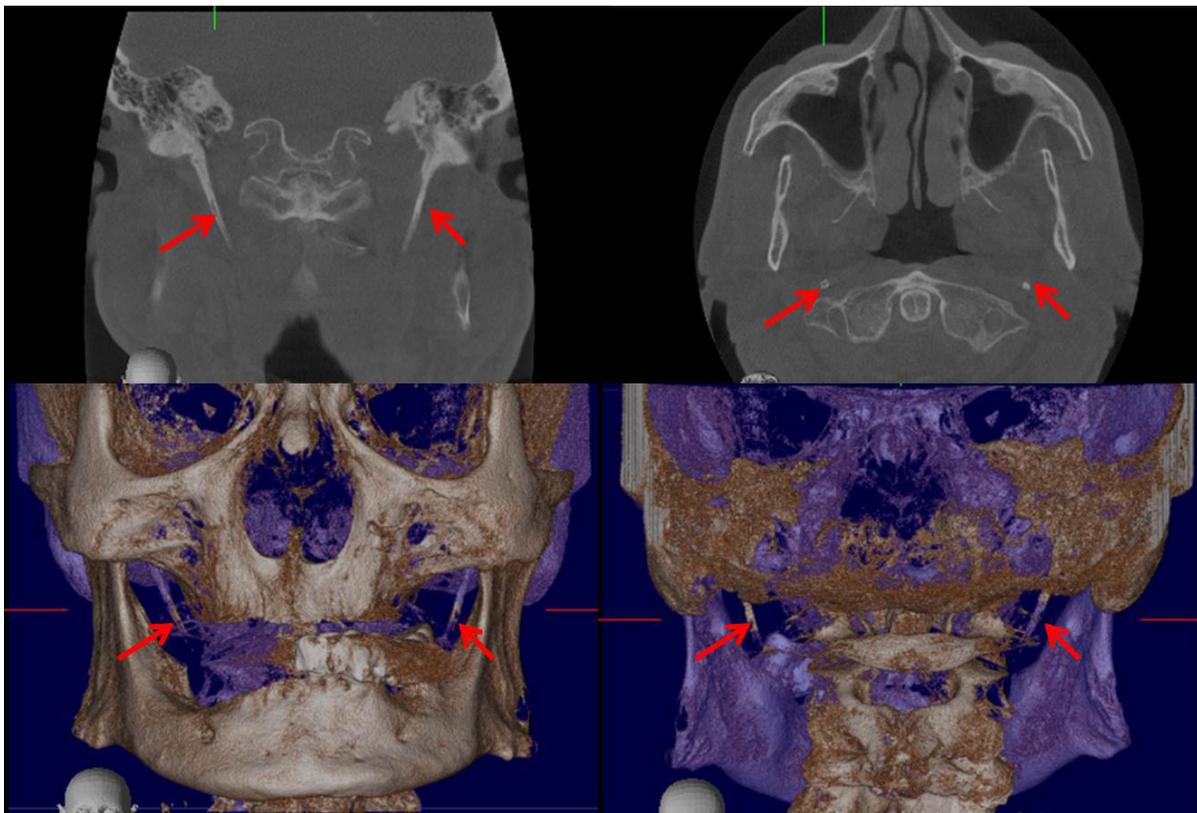


Figure 4: Bilateral elongated styloid process.

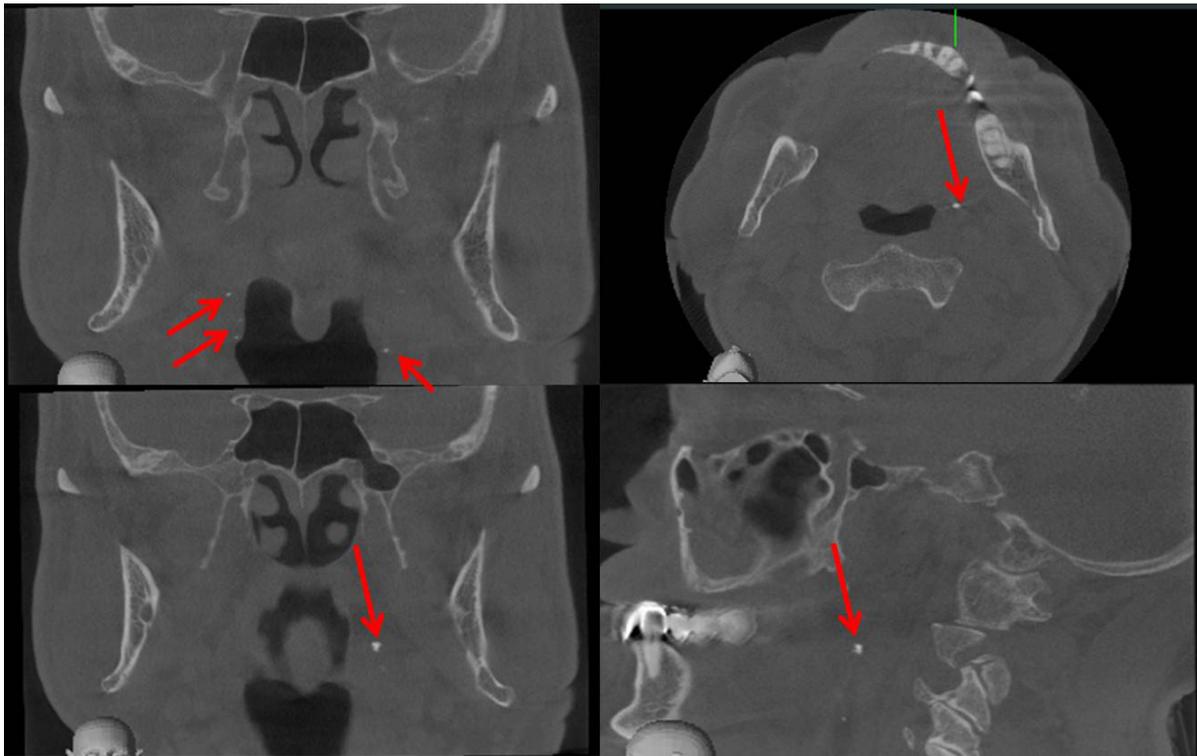


Figure 5: Multiple dot like tonsilloliths and an irregular shaped tonsillolith (coronal, axial and sagittal view).

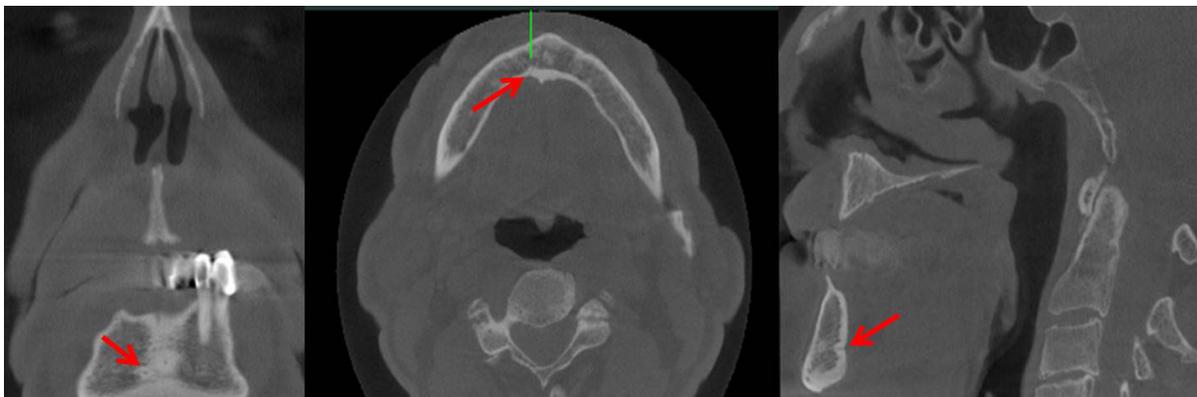


Figure 6: Lingual foramina.

Case Report 2

A 68-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. 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. 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). Before performing a CBCT, the patient was informed that the data for the case would be submitted for publication and prior to evaluation he signed an informed consent. On sagittal view of CBCT it was seen an accessory canal runs from the floor of nasal fossa to alveolar ridge in front of nasopalatine canal (Figure 7). It was also seen on axial and coronal images (Figures 8,9). 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 7: Sagittal view of the variation of nasopalatine canal (red arrows). Yellow arrow shows nasopalatine canal.

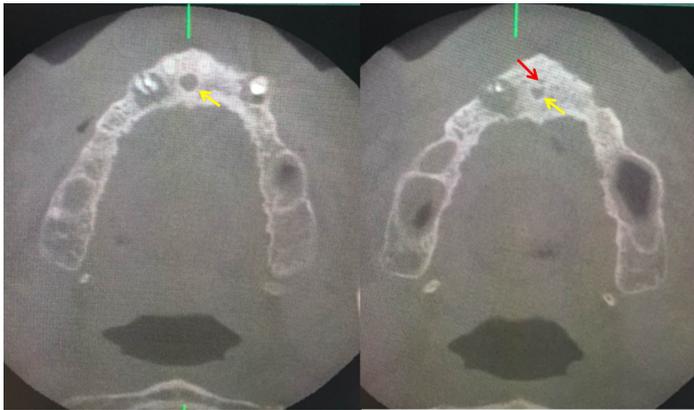


Figure 8: Axial view of the variation of nasopalatine canal (red arrow). Yellow arrows also indicate nasopalatine canal.



Figure 9: Coronal view of CBCT image show the nasopalatine canal (yellow arrow) and its variation (red arrow) in different slices.

Discussion

Conventional imaging modalities are generally used in dental practice by clinicians for ages as a diagnostic tool. Since the use of dental implant procedures has gained widespread acceptance in the treatment of edentulous areas of the jaws, three dimensional

imaging techniques such as CT or CBCT became a necessary part of precise implant planning. They provide precious information about sectional anatomy of dentomaxillofacial structures. By performing three dimensional radiographic modalities, clinicians also obtained an advantage to get information not only from interested area but also the out of the region. The out of interested region findings which is described as incidental findings may sometimes have greater importance of determining an appropriate treatment plan. These findings sometimes occur as an anatomical variation, a soft tissue calcification or a pathology.

Numerous case reports and several studies which investigate incidental findings are available in literature [1,3, 11-16]. Increasing the use of CBCT in dental implant procedures, authors report that the most referral reason of CBCT was implant evaluation [1,12,13]. In both cases, patients were referred for a possible dental implant rehabilitation. In first case report it is incidentally found soft tissue calcifications. They frequently occur in vessels, ligaments, glandular tissues mostly as a result of chronic inflammation or scarring. They may be pathological, age-related or idiopathic. Accurate definition of this calcifications is based on some characteristics such as location, morphology and distribution [12].

Among the soft tissue calcifications, some of them are rare and some of them are found commonly. According to literature, tonsil calcifications are the most common calcification but intracranial or arterial calcifications are relatively rare. Altindag et al [12] reported that incidentally found calcifications such as tonsillolith, arterial calcifications and stylohyoid calcification were, respectively, found 31.25%, 1.88% and 5.06%. Although the literature reports that arterial calcifications were found between 1.88% and 10.04% [1,12,13,17] but we found three different arterial calcifications in the same patient.

Tonsil calcifications are common in population. They are frequently asymptomatic unless they cause halitosis or dysphagia. Tonsilloliths are classified according to their shape. Although Oda et al. [18] reported that dot-like shaped tonsil calcifications were the most common but Altindag et al. [12] suggested irregular shaped calcifications were seen frequently. In our first case report we found four dot-like and one irregular shaped tonsilloliths.

Authors suggested that the most of the soft tissue calcifications require no treatment but some incidentally discovered findings such as anatomical variations or pathologies may require to modify treatment plan. Especially when performing dental implant procedures anatomical structures and variations cause difficulties and require clinicians to make changes to treatment plans. Besides, although soft tissue calcifications asymptomatic but correct identification of arterial calcifications will lead practitioners to prevent patients' life by early diagnosis. Therefore, clinicians should increase their knowledge about exact anatomy and be aware of incidental findings and anatomical variations. This will also provide to

reduce treatment costs by avoiding further diagnostic assessments and will prevent the loss of prestige [11-13,15-17].

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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