



The benefit of cone-beam computed tomography (CBCT) in comparison to OPG in the incidental finding (among 70 patients) that they indicate surgical removal of impacted teeth rather than wisdom

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ABSTRACT

Impacted teeth could be defined as UN succeeded tooth eruption at its proper position. Mostly impacted teeth are wisdom, and after followed by upper canine and lower premolar. During and after removal of the impacted teeth, some complications may be seen such as damage to adjacent teeth. Conventional radiograph in dentistry such as periapical, cephalometric and panoramic radiographs (OPG) provide only (2D) examination. Thus, they provide limited information about the anatomical structures, size, and localization of any incidental lesions. Also, there are many disadvantages of (2D) imaging methods such as cross-bite, magnification, and distortion of images. Due to insufficiency of (2D) imaging methods, a novel method named cone-beam computed tomography (CBCT) which is specially developed to use in head and neck imaging. CBCT has several benefits including low radiation dose, accurate precise evaluation, faster scan, lesser artifact, and magnification. In our study, we attempt to detect many incidental finding in the maxillofacial region during pre-evaluation of impacted teeth (that they have indications of surgical removal) by OPG or CBCT images of 70 patients were assessed and resulting data were compared. We want to conclude that when examining the patient by any investigating tool for finding of the exact cause of any problem that encounters them, we get early diagnosis of many diseases or problems and it will result of easy and early treatment of them, also we can say that CBCT imaging is obligation not a choice in today's technology.

Keywords: Incidental finding, CBCT (Cone Beam Computed Tomography), OPG (panoramic radiograph), impacted teeth.

Introduction

Three-dimensional (3D) cone-beam computed tomography (CBCT) was advanced from conventional computed tomography in the

1990s. The first profitable CBCT unit, the NewTom 9000 (Quantitative Radiology, Verona, Italy), as defined in 1998 (1). In CBCT imaging a conical X-ray beam which circles in a single or

partial rotation about the patient to generate multiple two-dimensional(2D) projections. By using reconstruction algorithms, the developed 2D images are converted to a three-dimensional data set that can be viewed in the (axial, sagittal and coronal) planes. Using functionalities such as magnification and visual enhancement (for instance: greyscales, brightness and contrast level); the CBCT gives clinicians a powerful tool for diagnosis of various pathologies and dental treatment planning. Compared to CT, CBCT has a comparable diagnostic rate for numerous indications while allowing for minor radiation dose, lower price, and a faster, easier image achievement and display (2). 3D CBCT has benefits over 2D unoriginal radiographs in that it describes a more accurate three-dimensional relationship between anatomic structures, thus eliminating two major problems that usually plague conventional radiographs: geometric distortion and superimposition of surrounding anatomical structures. Marmulla et al (3), reported that a major advantage of CBCT is its three-dimensional geometric exactness matched with unoriginal radiographs. CBCT can reveal hidden anatomy as well as occult pathology, reducing the possibility of missing a clinically appropriate disease. Nakata et al (4) establish that CBCT may distinguish the occurrence of formerly undiagnosed infection where previous clinical assessment and unoriginal radiographic conclusions miscarried to expose the pathology. The CBCT is quickly developing in many fields

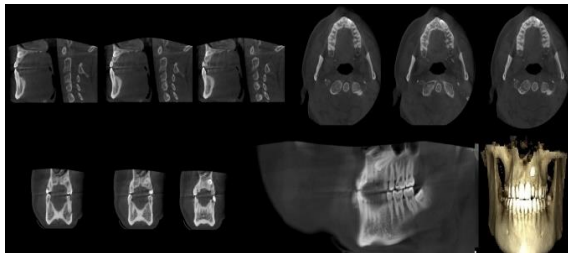
like dental implantology (5) Orthodontic treatment (6), endodontic evaluations (7,8), and oral surgery (9). It has an important role in the evaluation of pathology (10), assessment of the temporomandibular joints (TMJs) (11), and airway analysis (12) It has been used in the precise localization of foreign bodies (13). Moreover, CBCT is beneficial for confining anatomy, pathoses, developmental abnormalities and the magnitude of trauma inside the oral and maxillofacial region. Despite the advantages, CBCT is known to have its limitations that include poor soft tissue contrast (14) and image noise due to scattering radiation. CBCT cannot be used with any reliability on the typical patient at high risk for caries due to the presence of false-positive lesions resulting from the presence of metallic restorations. (15)The cautious and comprehensive assessment allows recognition of incidental discoveries with clinical importance. We to conclude that when examining the patient by any investigating tool for finding of the exact cause of any problem that encounters them, we get an early diagnosis of many diseases or problems and it will result of easy and early treatment of them.

Materials & methods

Our study was approved and decided by No 406 / 2014 from a committee of ethical clinical research – health science institute faculty of dentistry at Gaziantep University at

15.12.2014. In our research we collected the data from those patients that they attend our clinic during the periods of (1.Jan.2015) to (31.march.2015), in which they suffering from pain due to presence of impacted teeth that they have indication of surgically removal and some of them need extraction for either pre-prosthetic or orthodontic purpose, for that reason we planning for surgical removal of them, and prevention of any pre or post-operative complications, for instance: trauma to the significant anatomical landmark like mental nerve injury. Also, our research aims to establish the benefit of CBCT in the pre-evaluation of surgical removal of impacted teeth, rather than wisdom. For obtain that

purpose we collected all OPG films that previously taken from those patients that they attended our clinic of diagnostic department in faculty of dentistry in Gaziantep University in where before anything they took OPG for every patient, thus to confirm our thought about the benefit of CBCT than OPG, we have taken CBCT for every patient that they have indications and collected also ,and after that we start the evaluation of every patient (our seventy-70) pre-operatively to prevent any undesirable complications that may encounter the surgeon during or postoperatively, if only assessed the cases by OPG films, also in the same time we found many **incidental findings**. (1A-E)



(Figure 1A): CBCT obtained from the patient. Axial, coronal, sagittal, panoramic and permit 3D inspection.



(Figure 1B): CBCT obtained from a patient. 3-D semi-transparent facilities inspection.



(Figure 1C): CBCT obtained from a patient. 3-D (black-white) facilities inspection.



(Figure 1D): CBCT obtained from a patient. 3D soft tissue facilities inspection.



(Figure 1E): CBCT obtained from a patient. 3D of the maxillofacial bone structure facilities inspection.

In the study we took OPG for all of the patient by Planmeca Promax (Helsinki, Finland) device for each film we obtained by 64 kVp, 6 mA and the average dose of them is about 16 seconds and for obtained CBCT images by using Planmeca ProMax 3D MID (Helsinki, Finland) device and for obtaining each film we must utilize 90 kVp and 12mA in approximately 27 seconds using an average doses (mGy 2,300 / cm²) were taken. Also from patients' age, gender and data related systemic conditions were taken. Pregnant with pregnancy is suspected, the chief who had received radiotherapy in the neck area,

systemically using bisphosphonates or derivative drugs, cancer treated with the data of patients taking drugs to suppress their immune system is not included in the study. **On the other hand**, in our research, rather than impacted teeth, in all OPG and CBCT radiographs we recorded any pathological lesions or abnormalities in all: maxillary, frontal, sphenoid and the ethmoid sinus, and also in the nose and ears were examined.

Results

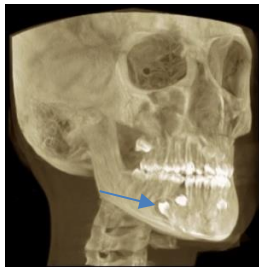
In our research from a total of 70 patients (41 males and 29 female), When we evaluated all

cases for incidental finding by both OPG and CBCT. We don't see any pathological lesion, only among extracted teeth, (4) of them, they

have small cyst around their crowns (Figure 2-3).



(Figure 2): Cyst formation around the teeth no.13, which is seen clearly on both OPG and CBCT.



(Figure 3): **CBCT 3-D view which displays the presence of supernumerary tooth in the region of tooth no.45 and associated with cystic lesions.**

Also in our research, we evaluated both OPG and CBCT for each patient to collect any incidental finding, if the presence or not. In OPG evaluations we found that: in about (30) patients they have (69) dental caries (figure 4), also in about (17) patients we found (22) periapical lesion (figure 5), and in about (33) patients we found totally about (94) impacted wisdom teeth (figure 6), also in our research field we don't observed any cystic or tumours lesion. When evaluated CBCT for any incidental finding we found that approximately in about (30) patients in the research field they have approximately (45) maxillary sinus mucosal wall thickening(MMWT) (figure 7), also in about

(15) patients they have (16) mucous retention cyst in the maxillary sinus(MRC) (figure 8), in about (28) patients they have approximately (55) soft tissue density in the dacryocystitis channel(STD) (figure 9), in about (24) patients they have nasal septum deviation (NSD) (figure 10), in about (7) patients they have (10) frontal sinus mucosal wall thickening(FMWT) (figure 11), in (1) patient found that have sphenoid sinus mucosal wall thickening(SMWT) (figure 12), and in about (3) patients found that they have ethmoid sinus mucosal wall thickening(EMWT) (figure 13). On the other hand in (1) patient we found that having acute maxillary sinusitis (figure 14), also in (1) patient we found that having

narrowing problem in the external channel of the ears, in (1) patient we found that having acute sphenoid sinusitis, in (1) patient we found that having acute sphenoid sinusitis



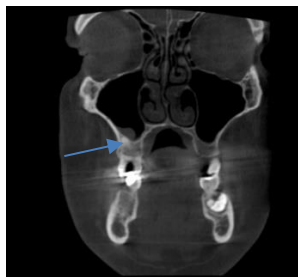
(Figure 4): **the presence of dental caries in the teeth no. s:16, 34, 46, and 47.**



(Figure 5): **The presence of periapical lesions in the teeth no. 21, and 22.**



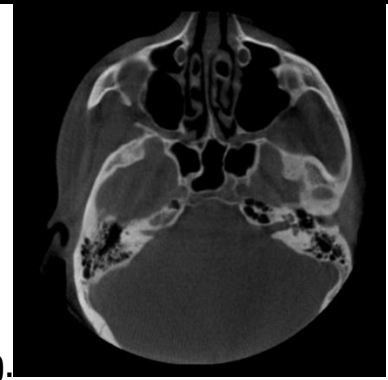
(Figure 6): **The presence of impact in the teeth no.38, and 48.**



(Figure 7): **MMWT (maxillary sinus mucosal wall thickening).**

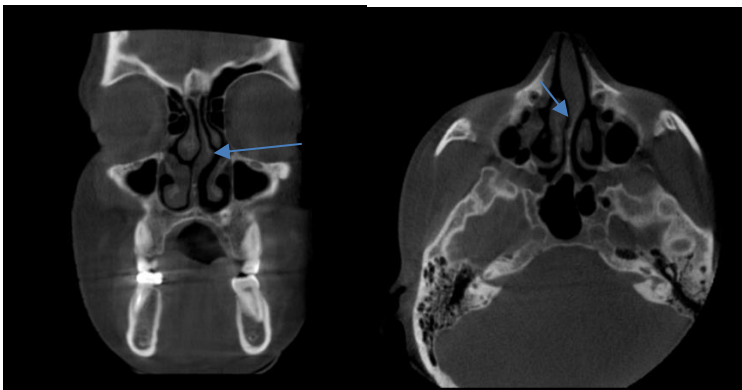


pneumatic in the pterygoid process (figure 15)and about (3) patients we found that having undeveloped frontal sinus (figure 16).

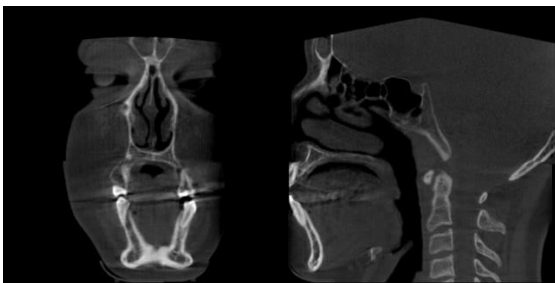


(Figure 8): MRC (mucous retention cyst in the maxillary sinus).

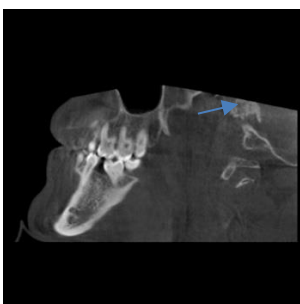
(Figure 9): Presence of (Soft Tissue Density) in both nasolacrimal duct (STD).



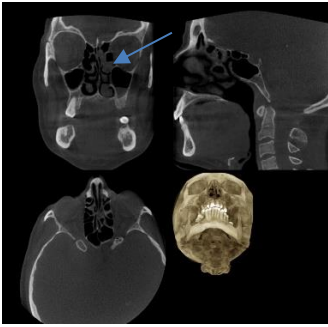
(Figure 10): nasal septum deviation (NSD).



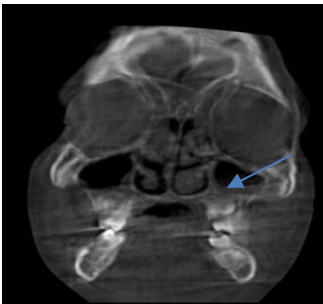
(Figure 11): Presence of frontal sinus mucosal wall thickening (FMWT).



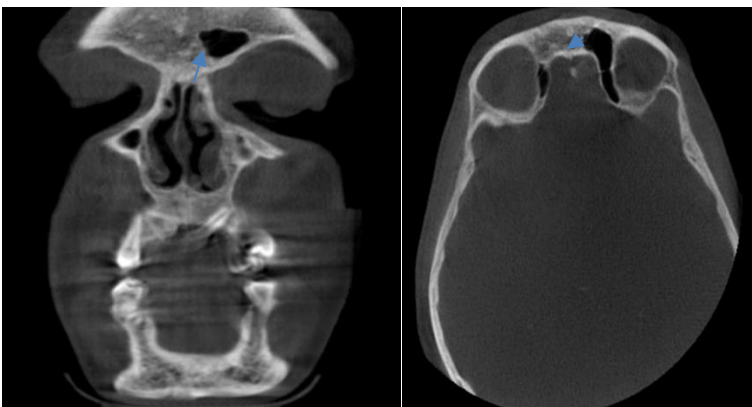
(Figure 12): Presence of sphenoid sinus mucosal wall thickening (SMWT).



(Figure 13): Presence of ethmoid sinus mucosal wall thickening (EMWT).



(Figure 14) Acute maxillary sinusitis.



(Figure 15): The right frontal sinus was developed.



(Figure 16): Presence of the pneumatized spaces in the pterygoid process.

Discussion

Impaction could be defined as unsatisfactory tooth eruption at its suitable location in the arch, within its usual time of growth. Dental impaction as reported has been affected for about 25% to 50% of the population as much as possible (16). Before the preparation of the patient for the removal of their impacted tooth must be checked the tomographic correlation between anatomical structures and their spaces with the adjacent teeth, to avoid undesirable complications such as damage to surrounding structures. (17). The most well-known complication of deeply impacted third molars is damage to the inferior alveolar nerve throughout surgical extraction of it (18). The frequency of impacted teeth may vary between populations. The lowest incidence of maxillary impacted canine seen in the Japanese is about (%0.27), whereas this percentage can increase up to %1.57 in the American community (19-20). Aydin et al. (21) in their study that had been done in the Turkish population, reported that the rate of occurrence is %3.29, this ratio is quite high if compared to other populations. In our research were used CBCT imaging techniques to determine the position of the impacted tooth, the traditional methods such as multiple irradiations do not need a further application, for extra-oral imaging method that is much easier than traditional methods.

Thaw (22) 2010 thesis examined the incidental lesions on CBCT, which was presented. In the corresponding study, the highest proportion of lesions is in the airways about %35, about %20 soft tissue calcifications, %17.5 bone lesions, the rate of TMJ problems about %15.4, the rate of endodontic lesions about %11.3, developmental lesions about %0.7, while reported that about %0.1 of pathological lesions have increased. Among these incidental lesions: sinusitis is about %14.2 which is in the first grade of the occurrence. Incidental findings from the study to study vary greatly according to age group population and classification as a result of studied findings. Cha et al. (14) found that the overall amount of maxillofacial essential findings in CBCT images of 500 uninterrupted patients was %24.6 and that the maximum ratio of essential discoveries was in the airway area. On the other hand, Popat et al. (23) also described an incidental finding of mid-line clefts of the cervical vertebrae ascending from the CBCT of a dental patient.

In our study, were examined patients for incidental lesions separately on both CBCT and OPG. When examined OPG were observed 30 patients on 69 teeth caries lesions presence, 17 apical lesions in 22 patients, in 33 patients the total of 94 molars, from the outside of the study zones were detected related to the impacted was not observed any cyst or tumor When evaluating all CBCT

among patients we discovery that in 30 patients find 45 MWTS (maxillary mucosal wall thickening in the sinuses), a total of 16 maxillary sinus in 15 patients MRK (maxillary mucous retention cyst in the sinus), a total of 55 nasolacrimal duct in 28 patients with STD (the nasolacrimal duct Soft Tissue Density), in 24 patients NSD (Nasal Septum Deviation), in 7 patients with a total of 10 frontal sinus MWFS (mucosal wall thickening in the frontal sinus), in 1 patient MWSS (mucosal wall thickening in the sphenoid sinus), and in 3 patients MWES (mucosal wall thickening in the ethmoid sinuses) was determined randomly. In addition, in one of these patients we find acute maxillary sinusitis, in one of these patients suffering from way contraction in the outer ear area, in one of these patients we found the presence of acute sphenoid sinusitis, in one patient presence of pterygoid process pneumatized gaps and were determined in three patients the frontal sinus are undeveloped. Finally, we can say that the ratio of incidental finding is varied according to population, race, gender, environment factor...etc., if compared our outcomes to other incidental findings.

Conclusions

In our study, we confirm the benefit of CBCT, if compared to OPG in the determination of incidental finding among the Turkish population especially in the Gaziantep region

which is located in the west-south of the country, when we are planning for pre-surgical assessment in the field of our research. Finally we concluded that; the rapid growth of CBCT technology and rapid commercialization seems that greatly contributed in eliminations of unwanted complications, in comparison to OPG imaging more beneficial especially in suspicious cases, and also in the incidental finding detecting problems, which is our field research, taking new CBCT with their OPG; is a necessity not a choice.

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