

## The use of Cone Beam CT Imaging in Dentistry Reprogramming

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New imaging technologies advance in dentistry are becoming increasingly popular for diagnosis and treatment assessment [1]. 3D computed tomography (CT) which is cross-sectional modality, inherently avoids the superimposition and problems due to magnification and offers to visualize of the craniofacial structures with more precision than the 2D method [2-4]. In dentistry, in order to obtain images at first, medical CT (MDCT) was used for this purpose. Studies on MDCT showed that 3D CT analysis can be performed accurate and reliable assessments for dental procedures [4,5]. Despite these advantages, the effective dose of MDCT is much higher than the conventional radiographs which are using dental and maxillofacial imaging. This renders its use for routine examinations (especially those for cephalometric analysis and growth assessments) unjustifiable. Besides, MDCT is also expensive procedure and scanners are not easily accessible by dentists and small clinics for maxillofacial imaging [2,6].

In the last decade, a new technique called as cone beam computed tomography (CBCT) was proposed for the maxillofacial imaging which was first reported in the literature by Mozzo et al. [7]. A CBCT scan uses a different type of acquisition than the tradition MDCTs. The x-ray source produces a cone shaped x-ray beam and this makes it possible to capture the image in a single shot, rather than capturing slice separately as in MDCT. The advantages of this imaging modality are; much more lower radiation dose than MDCT, the possibility of individualized overlap-free reconstructions and DICOM data can be in- and exported for other applications. Moreover, this imaging technology allows 3D imaging and information on 3<sup>rd</sup> dimensional which offers to visualize of the craniofacial and dental structures for maxillofacial surgical applications and orthodontics use [5,8,9].

However, like all imaging techniques, CBCT produce ionizing radiation and imaging of the patients' should base upon diagnostic or image-guidance necessity. An article examining the use of cone-beam computed tomography (CBCT) appeared on the front page of the New York Times on November 23, 2011 [10]. In this article, the use of CBCT technology in orthodontics is questioned and pointed out that the children and adolescents are particularly vulnerable to radiation which gathers from this new CBCT technique requiring higher amounts of radiation than conventional imaging methods for imaging needs of orthodontists and other specialists. Following this article, the public awareness of this technology and growing concern about radiation has increased especially in United States and the use of this imaging protocol as a routine dental imaging procedure is in argument esp. those for orthodontic imaging [11].

It should be stated that the precise role that CBCT will play in all fields of dentistry is still in a state of flux. It is clear, however, that it will be used across all disciplines, more for some than for others, and certainly in orthodontics. In addition to the appropriate use of CBCT in diagnosis and treatment, a purely "medical" issue, the advent of CBCT has raised a number of medico legal questions, among them issues of ownership, the image volume to be covered, interpretation, and licensure [12]. Because general dentists are not trained to read CBCT scans, maxillofacial radiologists and medical radiologists should be responsible for reading the volumes

of a maxillofacial imaging. Although there are still no regulations or guidelines for CBCT use by general dentists, European Academy of DentoMaxilloFacial Radiology (EADMF) established a guideline on "Basic principles for use of Dental Cone Beam CT" in 2010 which was a FP 7 project with support of EURO TOM, namely SEDENTEXCT project. In the conclusion of the guideline, it was clearly stated that CBCT trainings should be given for small volumes (dental area) to dental private practitioners who would like to use this imaging technique. This training should be standardized and given by the national associations of dental or medical imaging. However, larger CBCT volumes must be read medical radiologists or maxillofacial radiologists which require transfer of these images to those specialists [13].

Even so, there will be the potential legal issues that may entangle those who wish to use CBCT examinations esp. for larger field of imaging. The various states have the obligation to license physicians in United States. Although there are no still regulations for dentistry, some States will require dose calculations in CBCT imaging such as California [14]. It seems that regulatory surveillance should be prepared and made for accurate usage and control of this imaging modality by dental professionals not only for States but also for Europe in the very near future. Still there needs to be further standardized and evidence based clinical studies in order to justify the way of using the CBCT technology especially on larger volumes of imaging for dental use.

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Received January 18, 2012; Accepted January 19, 2012; Published January 23, 2012

Citation: ORHAN K (2012) The use of Cone Beam CT Imaging in Dentistry. *OMICS J Radiology*. 1:e101. doi:10.4172/2167-7964.1000e101

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